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REACTION PARAMETERS FOR HEAVY-ION COLLISIONS*

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These tables present reaction parameters for all combinations of 27 projectile and 16 target nuclei in a laboratory bombarding energy range of 1–50 MeV/u. The reaction parameters are derived from the Fresnel model of heavy-ion scattering, the droplet model, and the rotating liquid-drop model, or from systematics of experimental data.

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INTRODUCTION

These tables were prepared to allow quick reference to pertinent reaction parameters for 432 projectile–target combinations for a bombarding energy range of 1 to 50 MeV/u.

The table entries were selected with the intention of providing the experimentalists working in the fields of heavy-ion-induced fusion and strongly damped (deep-inelastic) reactions with useful parameters which characterize the main features of the angular and energy distributions of the reaction products. Among these are the estimated values of quarter-point angle for elastic scattering, total reaction and fusion cross sections, various characteristic energies in the laboratory system for elastic and highly inelastic scattering, and kinetic energies of evaporation residues and of evaporated, secondary neutrons. In addition, several quantities useful in macroscopic calculations such as nuclear radii, masses, and characteristic values of angular momentum are tabulated.

It should be noted that most of the concepts and models on which this tabulation is based have been tested only in an energy range up to several MeV/u above the Coulomb barrier. These models are used for extrapolation to much higher energies, where experimental data are scarce. In addition, concepts developed for heavy nuclei, such as the droplet model, are applied also to very light nuclei without an attempt to verify the validity of the results. Therefore, these tables should be used with appropriate caution.

Discussion of Models

In the Fresnel model[1] it is assumed that for each projectile–target system there is a well-defined, almost energy-independent interaction radius R_{int}, which separates the domains of elastic scattering and nuclear reactions in configuration space. In the context of this model this radius determines uniquely the angular momentum l_{max} of a grazing Coulomb trajectory, the total reaction cross section σ_R, and the quarter-point angle $\theta_{1/4}$. The experimentally determined interaction radius R_{int} is always larger than the sum of the matter half-density radii C_P and C_T of projectile and target, respectively, which can be related by the droplet model[2] to the nuclear mass numbers. In Fig. 1 the difference $\zeta = R_{int} - C_P - C_T$ is plotted as a function of $C_T + C_P$ for 230 systems, where R_{int} has been determined[3] by an analysis of elastic-scattering angular distributions. The resulting linear least-squares fit to ζ is used to calculate R_{int} for all systems in the table.

The droplet model[2] is used to determine static nuclear parameters which are not dependent on the bombarding energy. Besides the matter half-density radius C the most important parameters are the equivalent sharp-surface radius R of projectile and target; the charge radius R_C; the coefficient of surface tension γ entering in the strength factor of the proximity model potential[4] for heavy ions; and the nuclear mass excesses for projectile, target, and compound nucleus.

The critical angular momentum l_{cr} for fusion is calculated by equating the maximum possible attractive nuclear force due to the proximity potential to the sum of the repulsive Coulomb and the l-dependent centrifugal forces.[5] Solving this equation is nearly equivalent to counting the number of partial waves with pockets in the effective potential. If it is assumed that target and projectile have reached the rolling condition at the fusion barrier, dissipation of angular momentum due to tangential friction can be approximately accounted for[6] by increasing the resulting value for l_{cr} by 7/5. This increased value of l_{cr} is tabulated and used in all subsequent calculations.

Further bombarding-energy-independent parameters include the limiting angular momentum l_{RLD} for the rotating liquid-drop model,[7] beyond which a nucleus is unstable against fission, and the total kinetic energy (TKE) released in symmetric fission of the compound nucleus (A_C, Z_C), which has been found[8] to depend linearly on $Z_C^2/A_C^{1/3}$ for a wide range of nuclei.

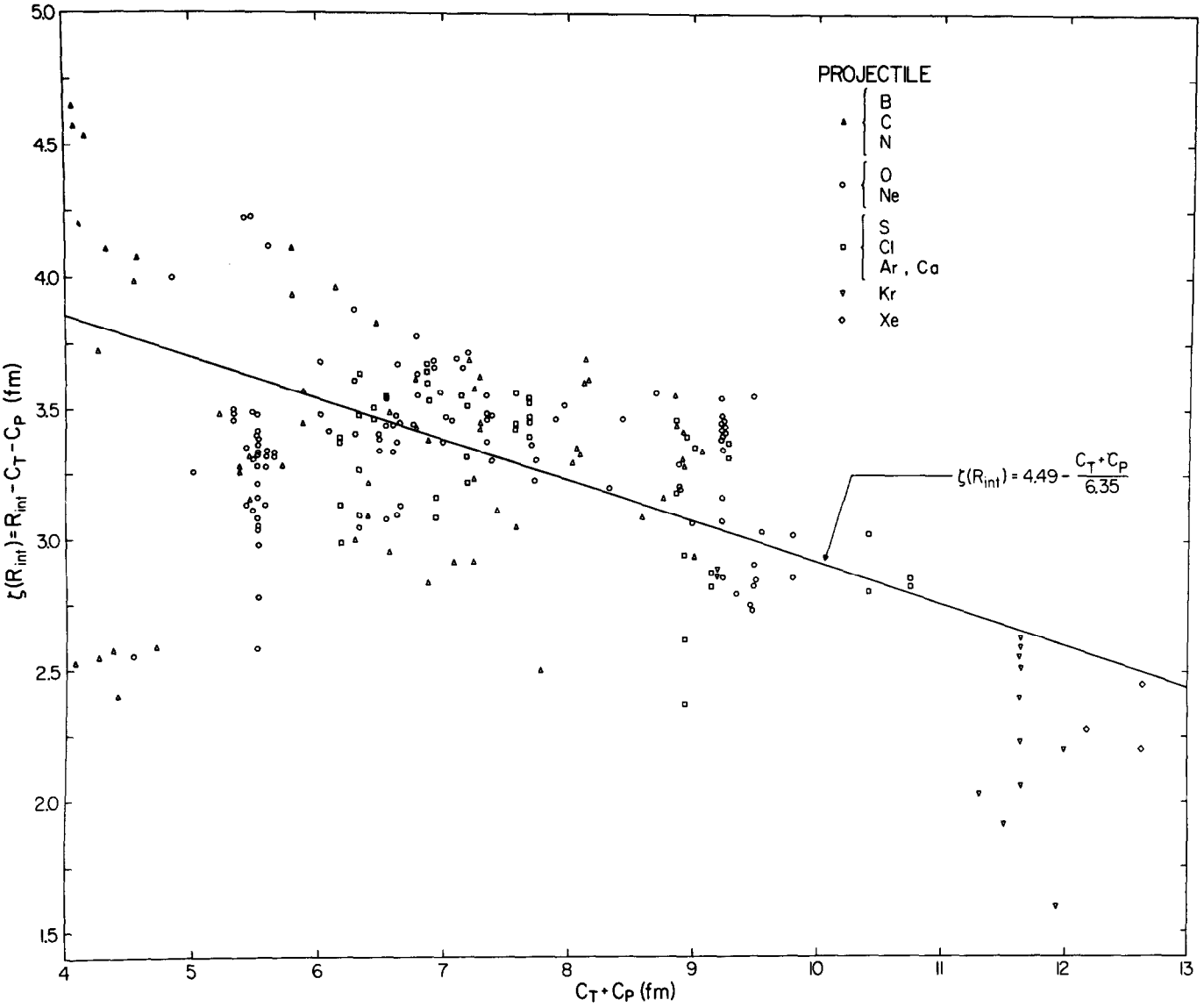

Fig. 1. The difference $\zeta = R_{int} - (C_P + C_T)$ between the experimentally deduced interaction radii R_{int} and the sum of the matter half-density radii of projectile and target $C_P + C_T$ is plotted as a function of $C_P + C_T$ for 230 systems. The straight line represents a least-squares fit to the data.

The minimum final TKE for totally relaxed events observed in binary, strongly damped collisions can be expected to be related to the energy release in fission, the obvious difference being that the scaling factor Z_C^2 has to be replaced by $4Z_PZ_T$. Such a scaling implies that for the most relaxed events the energy is determined by the Coulomb repulsion of the reaction fragments and that the geometry at scission is the same for fission and such binary events. This value of TKE is given and used to define a maximum reaction Q-value.

The tabulated parameters dependent on bombarding energy are the laboratory and center-of-mass energies, the relativistic momentum of the projectile, the wave number and Coulomb parameter in the entrance channel, and all quantities derived from the Fresnel model discussed above. The quarter-point angle is given in the center-of-mass and laboratory systems along with the associated kinetic energies for projectile and target nuclei, both for elastic scattering and for the maximum Q-value defined above.

An attempt has been made to classify[9] the expected angular distribution of the damped reaction products in terms of a modified Coulomb parameter η', which is inversely proportional to the relative ion velocity at the interaction radius. Further parameters associated with damped reaction processes given are

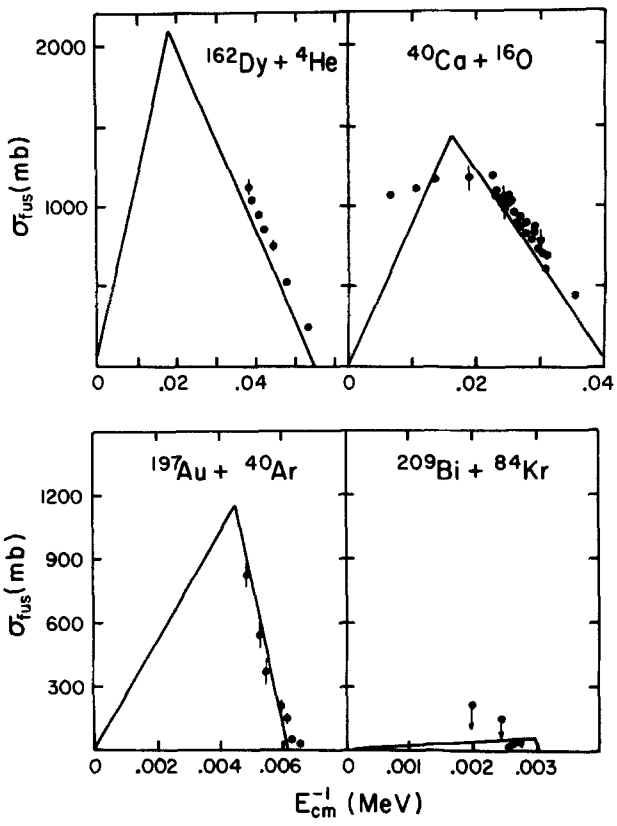

Fig. 2. Experimental fusion excitation functions for projectiles ^{4}He, ^{16}O, ^{40}Ar, and ^{84}Kr are compared to a simple model described in the text.

the time for a full rotation of the system in a nonsticking configuration at the grazing angular momentum, and the laboratory energies of evaporation neutrons[10] emitted in the direction of flight by the fully accelerated projectile-like fragment scattered to the quarter-point angle. Two energies are given to characterize the continuous neutron energy spectrum. At one of these the laboratory differential neutron cross section is at its maximum, whereas at the higher neutron energy the cross section is 1% of the maximum value. In both cases, half the maximum Q-value defined above is assumed in order to calculate the kinematics of the primary two-body reaction and the nuclear temperature of the intermediate dinuclear complex.

The remaining parameters tabulated are related to fusion. The fusion cross section is derived from the classical expressions

$$\sigma_{fus}(E_{c.m.}) = \pi R_B^2\left(1 - \frac{V(R_B)}{E_{c.m.}}\right), \qquad E_{c.m.} < E_m,$$

$$= \pi\lambda^2\left(l_{cr} + \frac{1}{2}\right)^2, \qquad E_{c.m.} \geq E_m,$$

where E_m coincides with the effective potential for the critical angular momentum l_{cr} at the barrier radius R_B. The conservative potential V is taken as the sum of the nuclear proximity potential and the Bondorf–Sobel–Sperber (BSS) Coulomb potential.[11] The radius R_B is derived from an analysis[5] of 56 systems and is parameterized[12] in terms of the interaction radius R_{int}. The above expression yields a triangular fusion excitation function when plotted vs. $E_{c.m.}^{-1}$. The model has been compared to data[5] for 22 systems with projectiles ranging from ^{4}He to ^{84}Kr. Four examples of such comparisons are shown in Fig. 2. Except for systems with projectiles lighter than ^{16}O, where the maximum cross section is strongly overestimated, the available data or the results of more sophisticated trajectory calculations are generally well reproduced. However, for energies with $E_{c.m.} > E_m$ only a few data sets are available for comparison with the above model formula.

Further fusion-related parameters include the temperature of the compound nucleus as a function of bombarding energy and the laboratory kinetic energy of the evaporation residues after the mass loss due to neutron evaporation has been taken into account. The multiplicity of the neutrons is tabulated, calculated under the assumption that the total excitation energy of the compound nucleus is removed by neutrons.

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EXPLANATION OF TABLES

Equations marked below with a dagger contain dimensioned numerical constants and are valid as given only if the following units are used:

energy	MeV
distance	fm, 10^{-15} m
cross section	mb, 10^{-27} cm^2
time	10^{-21} s
mass	$m_u = 931.5$ MeV/c^2

Parameters Independent of Bombarding Energy

ZP, ZT, ZC	Atomic number of the projectile, target, and combined system
NP, NT, NC	Neutron number of projectile, target, and combined system
AP, AT, AC	Mass number of projectile, target, and combined system
ELSCAT [deg]	The largest angle in the laboratory system for elastic scattering of the projectile. The angle is given only if $A_P \geq A_T$
REDUCED MASS NUMBER	$\mu = A_P A_T/(A_P + A_T)$
INTERACTION RADIUS RINT [fm]	$\dagger R_{int} = C_T + C_P + 4.49 - (C_T + C_P)/6.35$ (Ref. 3)
RØ [fm]	$R_0 = R_{int}/(A_P^{1/3} + A_T^{1/3})$
CP, CT [fm]	Matter half-density radius for projectile and target
$\overline{C}$ [fm]	Reduced half-density radius $\overline{C} = C_P C_T/(C_P + C_T)$
RP, RT [fm]	Equivalent sharp radius for projectile and target. These radii are related[13] by $C \cong R(1 - (1/R)^2)$ $\dagger R = 1.28A^{1/3} - 0.76 + 0.8A^{-1/3}$
RCP, RCT [fm]	Charge (Coulomb) radius for projectile and target[14] $\dagger R_C = 1.16[2Z/(1 - 3\bar{\epsilon})(1 - \bar{\delta})]^{1/3}$ Expressions for the small terms $\bar{\epsilon}$ and $\bar{\delta}$ can be found in Ref. 14

BSS-COULOMB POTENTIAL — The BSS[11] Coulomb potential for heavy ions is defined as

[MeV]

$$\dagger\ VC(r) = Z_P Z_t e^2/r, \qquad r \geq R_{CP} + R_{CT} = R_{\hat{C}},$$

$$= V_0 - Kr^n, \qquad r < R_{CP} + R_{CT} = R_{\hat{C}},$$

where

[MeV]

$$V_0 = 0.6e^2\left[\frac{(Z_T + Z_P)^2}{(R_{CT}^{1/3} + R_{CP}^{1/3})^3} - \frac{Z_T^2}{R_{CT}} - \frac{Z_P^2}{R_{CP}}\right]$$

$$n = e^2 Z_P Z_T/[R_{\hat{C}}(V_0 - e^2 Z_P Z_T/R_{\hat{C}})]$$

[MeV/fm^n]

$$K = (V_0 - e^2 Z_P Z_T/(R_{\hat{C}})/R_{\hat{C}}^n$$

VC(RINT) [MeV] — BSS Coulomb potential at $r = R_{int}$

FISSION-TKE [MeV] — Total kinetic energy for symmetric fission[8] of the combined system

$$\dagger\ TKE = 0.1071 Z_C^2/A_C^{1/3} + 22.3$$

ASYMM FISSION-TKE [MeV] — This quantity is roughly equal to the total kinetic energy of completely relaxed events in strongly damped collisions (see Introduction)

$$TKEZZ = (TKE)4Z_P Z_T/Z_C^2$$

Liquid-Drop Parameters

GAMMA [MeV/fm^2] — Nuclear liquid-drop surface-tension coefficient[4]

$$\dagger\ \gamma = 0.9517(1 - 1.7826I^2)$$

$$I = (N_C - Z_C)/A_C$$

PROX-FACTOR [MeV] — Factor to convert the dimensionless proximity potential[4] function $\Phi(s/b)$ into a nuclear potential $V_N(s)$ via

$$V_N(s) = (4\pi\gamma b\bar{C})\Phi(s/b)$$

$$b = 1 \text{ fm}$$

L-RLD [$\hbar$] — The limiting angular momentum l_{RLD} for fission of the compound nucleus as given by the rotating liquid-drop model.[7] l_{RLD} corresponds to the rotational parameter γ_{II} or γ_I in Ref. 7 for values of the fissility χ below or above a critical fissility of $\chi_C = 0.81$, resp.

C [MeV/(Z-UNIT)^2] — Curvature (stiffness)[15] parameter of nuclear liquid-drop potential-energy surface for two touching spherical nuclei

$$C = 2a_C(A_P^{-1/3} + A_T^{-1/3}) + 4a_{sym}(A_P^{-1} + A_T^{-1}) - 2e^2/R_{int}$$

$$a_C = 0.696 \text{ MeV}$$

$$a_{sym} = 46.57 \text{ MeV}$$

MASS EXCESS [MeV/c²] The mass excess ΔM for projectile, target, and combined system defined as

$$\Delta M = M(A, Z) - A \cdot m_u$$

M and A are the mass (in units of MeV/c²) and mass number of the nucleus. For $Z < 10$ experimental masses[16] are given, whereas for $Z \geq 10$ the droplet model[2] with shell corrections is used to calculate ΔM

Fusion-Related Parameters

R-BARRIER [fm] Fusion barrier radius R_B for s-waves

$$R_B = R_{int} - D$$

D has been parameterized[12] as

$$\dagger D = 0.3117(Z_P Z_T)^{0.2122}, \quad Z_P Z_T < 500,$$

$$\dagger D = 1.096 + 1.391 Z_P Z_T/10000, \quad Z_P Z_T \geq 500$$

V (R_B) [MeV] The total conservative potential at $r = R_B$ for s-waves

$$V = V_C(R_B) + V_N(R_B)$$

The BSS Coulomb potential V_C and the nuclear proximity potential V_N are used to calculate V

Q-VALUE [MeV] The ground-state Q-value for fusion

$$Q = (\Delta M(A_P, Z_P) + \Delta M(A_T, Z_T) - \Delta M(A_C, Z_C))c^2$$

L-CRITICAL [$\hbar$] The maximum critical angular momentum for fusion

$$l_{cr} = \frac{7}{5}\left\{\frac{-\mu m_u S^3}{\hbar^2} \times \left[4\pi\gamma\bar{C}\phi b + e^2\frac{Z_P Z_T}{S^2}\right]\right\}^{1/2}$$

with $S = C_T + C_P + 0.3$ [fm] and $\phi = -0.96$. A discussion of this formula can be found in the Introduction and in Refs. 5, 6, and 17. Note that the angular momentum which determines the fusion cross section is $\min(l_{cr}, l_{max})$

Parameters Dependent on Bombarding Energy

EL/u [MeV/u]
Laboratory bombarding energy per nucleon

ELAB [MeV]
Laboratory bombarding energy

ECM [MeV]
Center-of-mass energy

$$E_{c.m.} = E_{lab}A_T/(A_T + A_P)$$

ECM/VC
Ratio $E_{c.m.}/V_C(R_{int})$

p [MeV/c]
Relativistic momentum of the projectile in the laboratory system

$$p = ((E_{lab}/c)^2 + 2m_uA_PE_{lab})^{1/2}$$

k [fm^{-1}]
Asymptotic wave number in the center-of-mass system

$$k = (2\mu m_u E_{c.m.}/\hbar^2)^{1/2}$$

$$\dagger\ k = 0.2187A_T(A_PE_{Lab})^{1/2}/(A_T + A_P)$$

ETA
Coulomb parameter

$$\eta = Z_PZ_Te^2/\hbar v$$

$$\dagger\ \eta = 0.15746Z_PZ_T(A_P/E_{lab})^{1/2}$$

LMAX [$\hbar$]
The grazing angular momentum l_{max} determined[1] by the quarter-point angle $\theta_{1/4}$

$$l_{max} = \eta \cot(\theta_{1/4}/2)$$

SGMAR [mb]
The reaction cross section[1] derived from l_{max}

$$\sigma_R = (\pi/k^2)(l_{max} + 1/2)^2$$

SIGFUS [mb]
The fusion excitation function is approximated by a triangular distribution, defined as

$$\sigma_{fus} = \min(\sigma_1, \sigma_2)$$

$$\sigma_1 = \pi R_B^2(1 - V(R_B)/E_{c.m.})$$

$$\sigma_2 = (\pi/k^2)(l_{cr} + 1/2)^2$$

where R_B, V, and l_{cr} are defined under Parameters Independent of Bombarding Energy

QP-CM [deg]
Quarter-point angle $\theta_{1/4}$ in the center-of-mass system

$$\theta_{1/4} = 2 \text{ arc sin } (\eta/(kR_{int} - \eta))$$

For bombarding energies below the threshold ($E_{c.m.} < V_C$) the quarter-point value is set to 180

QP-LP [deg] Quarter-point angle in the laboratory system for the projectile-like fragment

QP-LT [deg] Quarter-point angle in the laboratory system for the target-like fragment

EP-QP [MeV] Laboratory energy of the projectile elastically scattered at the quarter-point angle

ET-QT [MeV] Laboratory energy of the recoil nucleus scattered at the angle $QP-LT$

EPQMX [MeV] The laboratory energy of the projectile-like fragment for events with $Q = Q_{max} = TKEZZ - E_{c.m.} < 0$, the largest negative Q-value expected in a binary heavy-ion collision. *EPQMX* is calculated for a center-of-mass scattering angle equal to $\theta_{1/4}$

ETA′ The modified[9] Coulomb parameter η' may be used to classify approximately the angular distribution in strongly damped collisions as a function of Q-value (Wilczyński diagram)

$$\eta' = Z_P Z_T e^2/\hbar v'$$

† $$\eta' = 0.15746 Z_P Z_T (\mu/(E_{c.m.} - V_C))^{1/2}$$

where v' is the relative velocity of the nuclei in the entrance channel at the interaction radius. The following empirical rules have been found:

$0 < \eta' < 150$	The ridge of maximum reaction cross section moves to small scattering angles with increasing energy loss
$250 < \eta' < 400$	The scattering angle is only weakly dependent on the energy loss
$500 < \eta'$	The Coulomb potential dominates the reaction—large energy losses are associated with large scattering angles

Systems with other values of η' show an intermediate behavior

TAU [nps]

Period of rotation for the dinuclear system at $l = l_{max}$, assuming a nonsticking moment of inertia $\mathcal{J}_{NS} = \mu m_u R_{int}^2$

$$\tau = \mathcal{J}_{NS} 2\pi/\hbar l_{max}$$

$$\dagger\ \tau = 0.0989 \mu R_{int}^2/l_{max}$$

[nanopicosecond] = [10^{-21} s]

E-ER [MeV]

Laboratory kinetic energy of the evaporation residues. The recoil velocity of the compound nucleus is given as

$$v_C = (2A_P E_{lab}/m_u)^{1/2}/(A_P + A_T)$$

It is assumed that the total excitation energy $E_C^* = E_{c.m.} + Q_{fus}$ of the compound nucleus is carried away by isotropic evaporation of reactions with multiplicity ν, which is defined below. Since the average recoil velocity is not changed by isotropic particle emission, the average kinetic energy of the evaporation residues is given as

$$\bar{E}_{er} = \frac{1}{2} m_u (A_P + A_T - \nu) v_C^2$$

$$= \frac{(A_P + A_T - \nu)}{(A_P + A_T)^2} A_P E_{lab}$$

For compound nuclei with $Z < 10$ no correction for mass loss due to evaporation is applied

EN—EN [MeV]

Two representative values for the kinetic energy E_n of neutrons emitted from a projectile-like fragment are tabulated. Under the assumption of isotropic evaporation in the rest frame of the fragment the double differential cross section for neutron emission in the laboratory system is given[10] as

$$\frac{d^2\sigma}{d\Omega dE_n} = \frac{\nu}{2(\pi T)^{3/2}} E_n^{1/2} \cdot$$

$$\times \exp[-(E_n - 2(\epsilon E_n)^{1/2} \cos\alpha + \epsilon)/T].$$

The lower energy tabulated corresponds to the value where this cross section, evaluated as described below, has its maximum, whereas the cross section for neutron emission at the higher energy quoted is 1% of the maximum value. The following assumptions about the underlying kinematics are made:

1. The laboratory kinetic energy per nucleon ϵ of the projectile-like fragment is evaluated for inelastic scattering at the quarter-point angle with a Q-value equal to half of the maximum Q-value defined above.
2. The angle α between neutron velocity vector and fragment velocity vector is set to zero.
3. The effective temperature[18] T for neutron emission is calculated with a level-density parameter $a = A_C/8$.

$$T = \frac{11}{12}\left(\frac{1}{2}\frac{Q_{max}}{a}\right)^{1/2}$$

TEMP [MeV]

The temperature of the compound nucleus is calculated as

$$T = (E_C^*/a)^{1/2}$$

and

$$E_C^* = E_{c.m.} + Q_{fus}$$

where Q_{fus} is the ground-state Q-value for fusion and a is the level density given above

MULT

Multiplicity ν of neutrons emitted from the compound nucleus calculated under the assumption that the total excitation energy E_C^* is carried away by statistical evaporation of neutrons. ν is then the largest integer fulfilling the relation

$$\sum_{i=1}^{\nu} (B_n(i) + 2T_i) < E_C^*$$

where $B_n(i)$ is the binding energy in the ith step of the evaporation cascade and $2T_i$ is the average kinetic energy of one neutron emitted from a nucleus of temperature T_i, which is calculated for each step of the evaporation cascade with a level-density parameter $a = A_C/8$. For $Z < 10$ or $E_{lab}/u > 30$ MeV/u, no attempt has been made to calculate a neutron multiplicity since charged particle emission and nonstatistical processes are expected to reduce the neutron multiplicity considerably. For heavy systems, however, ν is quoted even if the calculated fusion cross section is zero

Table Labels for Compound Nuclei

COMPOUND NUCLEUS	SYSTEM REFERENCE # (ATOMIC MASS NUMBER)				
N < 7>	# 1(13)				
O < 8>	# 17(16)				
F < 9>	# 2(17)				
Ne < 10>	# 18(20)	# 33(21)			
Mg < 12>	# 34(25)	# 49(24)			
Al < 13>	# 65(26)				
Si < 14>	# 3(28)	# 50(28)	# 81(28)		
P < 15>	# 19(31)	# 66(30)	# 97(31)		
S < 16>	# 82(32)	#113(32)			
Cl < 17>	# 35(36)	# 98(35)			
Ar < 18>	#114(36)	#129(36)			
K < 19>	# 51(39)				
Ca < 20>	# 67(41)	#130(40)	#145(40)		
Sc < 21>	# 4(41)	# 83(43)			
Ti < 22>	# 20(44)	# 99(46)	#146(44)	#161(44)	
V < 23>	#115(47)	#177(47)			
Cr < 24>	# 36(49)	#162(48)	#193(52)		
Mn < 25>	#131(51)	#178(51)			
Fe < 26>	# 52(52)	#194(56)	#209(52)		
Co < 27>	# 5(57)	# 68(54)	#147(55)		
Ni < 28>	# 21(60)	# 84(56)	#210(56)	#225(58)	
Cu < 29>	#100(59)	#163(59)			
Zn < 30>	# 6(64)	# 37(65)	#116(60)	#179(62)	#226(62)
Ga < 31>	# 22(67)	#195(67)			
Ge < 32>	# 53(68)	#132(64)	#241(68)		
As < 33>	# 38(72)	# 69(70)	#211(67)		
Se < 34>	# 85(72)	#148(68)	#242(72)		
Br < 35>	# 54(75)	#101(75)	#227(73)	#257(75)	
Kr < 36>	# 70(77)	#117(76)	#164(72)		
Rb < 37>	# 86(79)	#180(75)	#258(79)		
Sr < 38>	#102(82)	#133(80)	#196(80)	#273(86)	
Y < 39>	#118(83)	#243(83)			
Zr < 40>	#149(84)	#212(80)	#274(90)		
Nb < 41>	#134(87)				
Mo < 42>	#165(88)	#228(86)	#259(90)	#289(96)	
Tc < 43>	# 7(93)	#150(91)	#181(91)		
Ru < 44>	# 23(96)	#197(96)	#290(100)		
Rh < 45>	#166(95)	#275(101)			
Pd < 46>	# 39(101)	#182(98)	#213(96)	#244(96)	
Ag < 47>	#198(103)				
Cd < 48>	# 8(109)	# 55(104)	#229(102)		
In < 49>	# 24(112)	# 71(106)	#214(103)	#260(103)	#291(111)
Sn < 50>	# 87(108)				
Sb < 51>	# 40(117)	#103(111)	#230(109)		
Te < 52>	#119(112)	#245(112)	#276(114)		
J < 53>	# 56(120)	#305(121)			
Xe < 54>	# 72(122)	#135(116)			
Cs < 55>	# 88(124)	#246(119)	#261(119)	#306(125)	
Ba < 56>	#104(127)	#151(120)	#292(124)	#321(132)	
La < 57>	#120(128)				
Ce < 58>	#167(124)	#262(126)	#277(130)	#322(136)	
Pr < 59>	# 9(141)	#136(132)	#183(127)		
Nd < 60>	# 25(144)	#199(132)	#307(136)	#337(148)	
Pm < 61>	#152(136)	#278(137)			
Sm < 62>	# 41(149)	#215(132)	#293(140)	#338(152)	
Eu < 63>	# 10(155)	#168(140)	#323(147)		
Gd < 64>	# 26(158)	# 57(152)	#184(143)	#231(138)	

Table Labels for Compound Nuclei

COMPOUND NUCLEUS	SYSTEM REFERENCE # (ATOMIC MASS NUMBER)						
Tb <65>	# 73(154)	#200(148)	#294(147)				
Dy <66>	# 42(163)	# 89(156)					
Ho <67>	#105(159)	#216(148)	#308(149)	#339(163)			
Er <68>	# 11(166)	# 58(166)	#121(160)	#247(148)	#353(164)		
Tm <69>	# 27(169)	# 74(168)	#232(154)				
Yb <70>	# 90(170)	#137(164)	#324(160)	#354(168)			
Lu <71>	# 43(174)	#106(173)	#263(155)				
Hf <72>	#122(174)	#153(168)					
Ta <73>	# 59(177)	#248(164)	#309(165)	#369(177)			
W <74>	# 12(182)	# 75(179)	#138(178)	#169(172)	#279(166)	#340(176)	
Re <75>	# 28(185)	# 91(181)	#185(175)	#355(179)	#370(181)		
Os <76>	#107(184)	#154(182)	#201(180)	#264(171)	#310(172)	#325(176)	
Ir <77>	# 44(190)	#123(185)					
Pt <78>	#170(186)	#217(180)	#295(176)				
Au <79>	# 60(193)	#139(189)	#186(189)	#280(182)	#326(183)	#385(193)	
Hg <80>	# 13(198)	# 76(195)	#202(194)	#233(186)	#341(192)	#371(192)	
Tl <81>	# 29(201)	# 92(197)	#155(193)	#386(197)			
Pb <82>	#108(200)	#218(194)	#356(192)				
Bi <83>	# 14(209)	# 45(206)	#124(201)	#171(197)	#296(192)	#342(199)	
Po <84>	# 15(210)	# 30(212)	#187(200)	#234(200)	#249(196)		
At <85>	# 31(213)	# 61(209)	#140(205)	#203(205)			
Rn <86>	# 46(217)	# 77(211)	#387(208)				
Fr <87>	# 47(218)	# 93(213)	#156(209)	#219(205)	#265(203)	#372(205)	
Ra <88>	# 62(220)	#109(216)	#250(210)	#357(208)	#401(220)		
Ac <89>	# 63(221)	# 78(222)	#125(217)	#172(213)	#235(211)	#311(201)	
Th <90>	# 79(223)	# 94(224)	#188(216)	#281(214)	#402(224)		
Pa <91>	# 95(225)	#110(227)	#141(221)	#204(221)	#266(217)	#358(215)	
U <92>	#111(228)	#126(228)	#327(212)				
Np <93>	# 16(239)	#127(229)	#157(225)	#220(221)	#251(221)	#373(221)	#388(221)
Pu <94>	# 32(242)	#142(232)	#282(228)	#297(224)	#312(217)		
Am <95>	#143(233)	#173(229)	#236(227)	#403(235)			
Cm <96>	# 48(247)	#158(236)	#189(232)	#267(228)	#343(228)	#374(228)	
Bk <97>	#159(237)	#205(237)	#328(228)				
Cf <98>	# 64(250)	#174(240)	#298(238)	#417(250)			
Es <99>	# 80(252)	#175(241)	#190(243)	#221(237)	#252(237)	#283(239)	#389(237)
Fm <100>	# 96(254)	#191(244)	#206(248)	#418(254)			
Md <101>	#112(257)	#207(249)	#237(243)	#344(244)			
No <102>	#128(258)	#222(248)	#268(244)	#390(244)	#404(248)		
Lw <103>	#223(249)	#299(249)					
<104>	#144(262)	#238(254)	#359(244)				
<105>	#239(255)	#253(253)	#284(255)	#313(249)	#419(265)		
<106>	#160(266)						
<108>	#176(270)	#254(264)	#269(260)	#329(260)	#405(264)		
<109>	#192(273)	#255(265)	#300(265)	#314(263)	#360(260)	#375(257)	
<110>	#208(278)						
<111>	#270(271)	#285(271)	#406(271)				
<112>	#224(278)	#271(272)	#330(274)	#345(276)	#420(278)		
<114>	#240(284)	#286(282)	#315(274)	#376(273)			
<115>	#287(283)	#301(281)	#391(273)				
<116>	#346(290)						
<117>	#331(285)						
<118>	#256(294)	#302(292)	#421(294)				
<119>	#303(293)						
<120>	#316(290)	#361(292)	#392(289)				

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 1 1 H on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 6. ZC= 7.(N)
NEUTRON NUMBERS: NP= 0. NT= 6. NC= 6.

AP**1/3= 1.000 AT**1/3= 2.289
REDUCED MASS NUMBER= 0.92 AP+AT=AC= 13.

INTERACTION RADIUS RINT= 6.75 fm RO= 2.05 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 2.12 CT+CP= 2.69 $\bar{C}$= 0.44

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 2.52

COULOMB RADII [fm]:
RCP= 1.22 RCT= 2.51 RC=RCP+RCT= 3.74

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 3.16 MeV K= .02344 n=2.722
VC(RINT)= 1.3 MeV

FISSION-TKE= 24. MeV
ASYMM. FISSION-TKE= 12. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 5.26 MeV
L-RLD= 12 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=203.38 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: 0.0
COMPOUND NUCLEUS: 5.3

FUSION RELATED PARAMETERS:
R-BARRIER= 6.30 fm V(RB)= 1.2 MeV
Q-VALUE= 1.9 MeV
L-CRITICAL= 2.

1 H on 12 C — 1 H on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.72	43	0.2	0.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	2	2	1.44	61	0.3	0.7	1	1649	420	64.0	59.9	58.0	2	0	0	1	3.90	0.	0 0	1.5	0
3.0	3	3	2.17	75	0.3	0.5	2	1918	695	35.0	32.4	72.5	3	0	0	1	2.40	0.	0 0	1.7	0
4.0	4	4	2.89	86	0.4	0.5	2	1978	832	24.2	22.4	77.9	4	0	0	1	1.89	0.	0 0	1.9	0
4.5	5	4	3.25	92	0.4	0.4	2	1987	878	21.0	19.4	79.5	4	0	0	1	1.73	0.	0 0	1.9	0
5.0	5	5	3.61	97	0.5	0.4	3	1989	915	18.5	17.1	80.7	5	0	0	0	1.61	0.	0 0	2.0	0
5.5	6	5	3.97	101	0.5	0.4	3	1987	945	16.6	15.3	81.7	5	0	0	0	1.51	0.	0 0	2.1	0
6.0	6	6	4.33	106	0.5	0.4	3	1982	970	15.0	13.9	82.5	6	0	0	0	1.42	0.	0 0	2.1	0
6.5	7	6	4.70	110	0.5	0.4	3	1977	991	13.7	12.7	83.1	6	0	0	0	1.35	0.	0 0	2.2	0
7.0	7	6	5.06	114	0.5	0.4	3	1970	1009	12.6	11.7	83.7	7	0	0	0	1.29	1.	0 0	2.3	0
7.5	8	7	5.42	118	0.6	0.3	3	1963	1025	11.7	10.8	84.2	7	0	0	0	1.23	1.	0 0	2.3	0
8.0	8	7	5.78	122	0.6	0.3	4	1956	967	10.9	10.1	84.6	8	0	0	0	1.19	1.	0 0	2.4	0
8.5	9	8	6.14	126	0.6	0.3	4	1949	910	10.2	9.4	84.9	8	0	0	0	1.14	1.	0 0	2.5	0
9.0	9	8	6.50	130	0.6	0.3	4	1942	859	9.6	8.8	85.2	9	0	0	0	1.11	1.	0 0	2.5	0
9.5	10	9	6.86	133	0.6	0.3	4	1935	814	9.0	8.3	85.5	9	0	0	0	1.07	1.	0 0	2.6	0
10.0	10	9	7.22	137	0.6	0.3	4	1928	773	8.5	7.9	85.7	10	0	0	0	1.04	1.	0 0	2.6	0
10.5	11	10	7.59	140	0.7	0.3	4	1921	736	8.1	7.5	85.9	10	0	0	0	1.01	1.	0 0	2.7	0
11.0	11	10	7.95	144	0.7	0.3	4	1914	703	7.7	7.1	86.1	11	0	0	0	0.98	1.	0 0	2.7	0
11.5	12	11	8.31	147	0.7	0.3	4	1908	672	7.4	6.8	86.3	11	0	0	0	0.96	1.	0 0	2.8	0
12.0	12	11	8.67	150	0.7	0.3	4	1902	644	7.0	6.5	86.5	12	0	0	0	0.94	1.	0 0	2.8	0
13.0	13	12	9.39	156	0.7	0.3	5	1890	595	6.5	6.0	86.8	13	0	13	0	0.90	1.	13 18	2.9	0
14.0	14	13	10.11	162	0.8	0.3	5	1879	552	6.0	5.5	87.0	14	0	13	0	0.86	1.	14 27	3.0	0
15.0	15	14	10.84	168	0.8	0.2	5	1868	515	5.6	5.1	87.2	15	0	13	0	0.83	1.	15 31	3.1	0
16.0	16	15	11.56	173	0.8	0.2	5	1859	483	5.2	4.8	87.4	16	0	13	0	0.80	1.	15 35	3.2	0
17.0	17	16	12.28	179	0.8	0.2	5	1849	455	4.9	4.5	87.6	17	0	13	0	0.77	1.	16 37	3.3	0
18.0	18	17	13.00	184	0.9	0.2	6	1841	429	4.6	4.2	87.7	18	0	13	0	0.75	1.	17 40	3.4	0
19.0	19	18	13.73	189	0.9	0.2	6	1833	407	4.3	4.0	87.8	19	0	13	0	0.73	1.	17 42	3.5	0
20.0	20	18	14.45	194	0.9	0.2	6	1825	386	4.1	3.8	87.9	20	0	13	0	0.71	2.	18 44	3.5	0
25.0	25	23	18.06	217	1.0	0.2	7	1792	309	3.3	3.0	88.4	25	0	14	0	0.63	2.	21 54	3.9	0
30.0	30	28	21.67	238	1.1	0.2	7	1767	257	2.7	2.5	88.6	30	0	14	0	0.57	2.	24 62	4.3	0
35.0	35	32	25.29	258	1.2	0.2	8	1746	221	2.3	2.1	88.8	35	0	14	0	0.53	3.	27 70	4.6	
40.0	40	37	28.90	276	1.3	0.1	8	1729	193	2.0	1.9	89.0	40	0	15	0	0.49	3.	30 78	4.9	
45.0	45	42	32.51	293	1.4	0.1	9	1714	171	1.8	1.7	89.1	45	0	15	0	0.46	3.	33 85	5.2	
50.0	50	46	36.12	309	1.4	0.1	10	1701	154	1.6	1.5	89.2	50	0	15	0	0.44	4.	36 92	5.4	

\# 2 1 H on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 8. ZC= 9.(F)
NEUTRON NUMBERS: NP= 0. NT= 8. NC= 8.

AP**1/3= 1.000 AT**1/3= 2.520
REDUCED MASS NUMBER= 0.94 AP+AT=AC= 17.

INTERACTION RADIUS RINT= 7.01 fm RO= 1.99 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 2.42 CT+CP= 2.99 $\bar{C}$= 0.46

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 2.78

COULOMB RADII [fm]:
RCP= 1.22 RCT= 2.78 RC=RCP+RCT= 4.01

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 3.89 MeV K= .02064 n=2.811
VC(RINT)= 1.6 MeV

FISSION-TKE= 26. MeV
ASYMM. FISSION-TKE= 10. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 5.43 MeV
L-RLD= 16 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=199.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -4.7
COMPOUND NUCLEUS: -1.5

FUSION RELATED PARAMETERS:
R-BARRIER= 6.52 fm V(RB)= 1.6 MeV
Q-VALUE= 4.0 MeV
L-CRITICAL= 3.

1 H on 16 O — 1 H on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.57	43	0.2	1.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	2	2	1.15	61	0.3	0.9	1	1104	202	101.7	98.1	39.2	2	0	0	2	6.30	0.	0 0	1.7	0
3.0	3	3	1.72	75	0.4	0.7	2	1689	580	48.5	45.9	65.7	3	0	0	1	2.83	0.	0 0	1.8	0
4.0	4	4	2.29	86	0.4	0.6	2	1856	769	32.4	30.6	73.8	4	0	0	1	2.11	0.	0 0	1.9	0
4.5	5	4	2.58	92	0.4	0.6	2	1897	832	27.9	26.3	76.1	4	0	0	1	1.91	0.	0 0	2.0	0
5.0	5	5	2.87	97	0.5	0.6	3	1923	882	24.4	23.0	77.8	5	0	0	1	1.76	0.	0 0	2.0	0
5.5	6	5	3.15	101	0.5	0.5	3	1940	923	21.8	20.5	79.1	5	0	0	1	1.64	0.	0 0	2.1	0
6.0	6	6	3.44	106	0.5	0.5	3	1952	958	19.6	18.5	80.2	6	0	0	1	1.54	0.	0 0	2.1	0
6.5	7	6	3.73	110	0.5	0.5	3	1959	987	17.9	16.8	81.1	6	0	0	1	1.45	0.	0 0	2.2	0
7.0	7	7	4.01	114	0.5	0.5	3	1963	1012	16.4	15.4	81.8	7	0	0	1	1.38	0.	0 0	2.2	0
7.5	8	7	4.30	118	0.6	0.5	3	1965	1033	15.1	14.3	82.4	7	0	0	1	1.32	0.	0 0	2.3	0
8.0	8	8	4.59	122	0.6	0.4	4	1966	1052	14.1	13.3	83.0	8	0	0	1	1.27	0.	0 0	2.3	0
8.5	9	8	4.87	126	0.6	0.4	4	1966	1069	13.2	12.4	83.4	8	0	0	0	1.22	0.	0 0	2.4	0
9.0	9	8	5.16	130	0.6	0.4	4	1965	1036	12.3	11.6	83.8	9	0	0	0	1.18	1.	0 0	2.4	0
9.5	10	9	5.45	133	0.6	0.4	4	1963	981	11.6	10.9	84.2	9	0	0	0	1.14	1.	0 0	2.5	0
10.0	10	9	5.73	137	0.7	0.4	4	1961	932	11.0	10.3	84.5	10	0	0	0	1.10	1.	0 0	2.5	0
10.5	11	10	6.02	140	0.7	0.4	4	1958	888	10.4	9.8	84.8	10	0	0	0	1.07	1.	0 0	2.6	0
11.0	11	10	6.30	144	0.7	0.4	4	1956	847	9.9	9.3	85.1	11	0	11	0	1.04	1.	11 19	2.6	0
11.5	12	11	6.59	147	0.7	0.4	5	1953	811	9.4	8.9	85.3	11	0	11	0	1.01	1.	11 22	2.6	0
12.0	12	11	6.88	150	0.7	0.4	5	1950	777	9.0	8.5	85.5	12	0	11	0	0.99	1.	12 24	2.7	0
13.0	13	12	7.45	156	0.7	0.3	5	1944	717	8.3	7.8	85.9	13	0	11	0	0.94	1.	13 28	2.8	0
14.0	14	13	8.02	162	0.8	0.3	5	1937	666	7.6	7.2	86.2	14	0	11	0	0.90	1.	13 30	2.8	0
15.0	15	14	8.60	168	0.8	0.3	5	1931	621	7.1	6.7	86.5	15	0	11	0	0.87	1.	14 33	2.9	0
16.0	16	15	9.17	173	0.8	0.3	5	1924	582	6.6	6.2	86.7	16	0	11	0	0.84	1.	14 35	3.0	0
17.0	17	16	9.74	179	0.8	0.3	6	1918	548	6.2	5.8	86.9	17	0	11	0	0.81	1.	15 37	3.1	0
18.0	18	17	10.32	184	0.9	0.3	6	1912	518	5.8	5.5	87.1	18	0	11	0	0.79	1.	16 39	3.1	0
19.0	19	18	10.89	189	0.9	0.3	6	1907	490	5.5	5.2	87.2	19	0	11	0	0.76	1.	16 41	3.2	0
20.0	20	19	11.46	194	0.9	0.3	6	1901	466	5.2	4.9	87.4	20	0	11	0	0.74	1.	17 43	3.3	0
25.0	25	24	14.33	217	1.0	0.3	7	1876	373	4.1	3.9	87.9	25	0	11	0	0.66	1.	20 51	3.6	0
30.0	30	28	17.19	238	1.1	0.2	8	1856	310	3.4	3.2	88.3	30	0	12	0	0.60	2.	23 59	3.9	0
35.0	35	33	20.06	258	1.2	0.2	8	1838	266	2.9	2.8	88.5	35	0	12	0	0.55	2.	26 66	4.2	
40.0	40	38	22.93	276	1.3	0.2	9	1824	233	2.6	2.4	88.7	40	0	12	0	0.51	2.	28 73	4.4	
45.0	45	42	25.79	293	1.4	0.2	9	1811	207	2.3	2.1	88.9	45	0	12	0	0.48	3.	31 80	4.7	
50.0	50	47	28.66	309	1.5	0.2	10	1800	186	2.0	1.9	89.0	50	0	12	0	0.46	3.	34 87	4.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 3 1 H on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 13. ZC= 14.(Si)
NEUTRON NUMBERS: NP= 0. NT= 14. NC= 14.

AP**1/3= 1.000 AT**1/3= 3.000
REDUCED MASS NUMBER= 0.96 AP+AT=AC= 28.

INTERACTION RADIUS RINT= 7.53 fm RO= 1.88 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 3.05 CT+CP= 3.61 C= 0.47

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 3.35

COULOMB RADII [fm]:
RCP= 1.22 RCT= 3.32 RC=RCP+RCT= 4.55

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.439*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 5.49 MeV K= .01486 n=2.990
VC(RINT)= 2.5 MeV

FISSION-TKE= 29. MeV
ASYMM. FISSION-TKE= 8. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 5.68 MeV
L-RLD= 28 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=194.65 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -20.6
COMPOUND NUCLEUS: -25.1

FUSION RELATED PARAMETERS:
R-BARRIER= 6.99 fm V(RB)= 2.5 MeV
Q-VALUE= 11.8 MeV
L-CRITICAL= 3.

1 H on 27 Al

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.39	43	0.2	2.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0 0	0.0	0
2.0	2	2	0.78	61	0.3	1.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0 0	0.0	0
3.0	3	3	1.17	75	0.4	1.2	1	973	230	97.7	95.6	41.2	3	0	0	3	5.24	0. 0	0 0	2.0	0
4.0	4	4	1.55	86	0.4	1.0	2	1480	557	56.8	55.0	61.6	4	0	0	2	2.86	0. 0	0 0	2.1	0
4.5	5	4	1.75	92	0.4	1.0	2	1610	666	47.3	45.8	66.3	4	0	0	1	2.46	0. 0	0 0	2.1	0
5.0	5	5	1.94	97	0.5	0.9	2	1703	753	40.6	39.3	69.7	5	0	0	1	2.19	0. 0	0 0	2.2	0
5.5	6	5	2.14	101	0.5	0.9	3	1773	824	35.6	34.4	72.2	5	0	0	1	1.99	0. 0	0 0	2.2	0
6.0	6	6	2.33	106	0.5	0.8	3	1826	883	31.7	30.7	74.1	6	0	0	1	1.84	0. 0	0 0	2.2	0
6.5	7	6	2.53	110	0.5	0.8	3	1868	934	28.6	27.6	75.7	6	0	0	1	1.72	0. 0	0 0	2.3	0
7.0	7	7	2.72	114	0.6	0.8	3	1901	977	26.1	25.2	77.0	7	0	0	1	1.62	0. 0	0 0	2.3	0
7.5	8	7	2.91	118	0.6	0.7	4	1928	1014	23.9	23.1	78.0	7	0	0	1	1.53	0. 0	0 0	2.3	0
8.0	8	8	3.11	122	0.6	0.7	4	1949	1047	22.1	21.4	78.9	8	0	0	1	1.46	0. 0	0 0	2.4	0
8.5	9	8	3.30	126	0.6	0.7	4	1967	1075	20.6	19.9	79.7	8	0	8	1	1.40	0. 8	15	2.4	0
9.0	9	9	3.50	130	0.6	0.7	4	1982	1101	19.2	18.6	80.4	9	0	8	1	1.34	0. 9	18	2.4	0
9.5	10	9	3.69	133	0.7	0.7	4	1994	1124	18.1	17.4	81.0	9	0	8	1	1.29	0. 9	19	2.4	0
10.0	10	10	3.89	137	0.7	0.6	4	2005	1145	17.0	16.4	81.5	10	0	8	1	1.25	0. 9	21	2.5	1
10.5	11	10	4.09	140	0.7	0.6	4	2013	1163	16.1	15.5	82.0	10	0	8	1	1.21	0. 10	22	2.5	1
11.0	11	11	4.27	144	0.7	0.6	5	2021	1180	15.3	14.7	82.4	11	0	8	1	1.17	0. 10	23	2.5	1
11.5	12	11	4.47	147	0.7	0.6	5	2027	1178	14.5	14.0	82.8	11	0	8	1	1.14	0. 10	24	2.6	1
12.0	12	12	4.66	150	0.7	0.6	5	2032	1129	13.8	13.3	83.1	12	0	8	1	1.11	0. 11	25	2.6	1
13.0	13	13	5.05	156	0.8	0.6	5	2040	1042	12.6	12.2	83.7	13	0	8	1	1.05	0. 11	27	2.6	1
14.0	14	14	5.44	162	0.8	0.5	5	2046	968	11.6	11.2	84.2	14	0	8	1	1.01	0. 12	29	2.7	1
15.0	15	14	5.83	168	0.8	0.5	6	2050	903	10.8	10.4	84.6	15	0	8	1	0.97	1. 12	31	2.7	1
16.0	16	15	6.22	173	0.8	0.5	6	2053	847	10.1	9.7	85.0	16	0	8	1	0.93	1. 13	32	2.8	1
17.0	17	16	6.60	179	0.9	0.5	6	2055	797	9.4	9.1	85.3	17	0	8	1	0.90	1. 14	34	2.8	1
18.0	18	17	6.99	184	0.9	0.5	6	2056	753	8.8	8.5	85.6	18	0	8	1	0.87	1. 14	36	2.9	1
19.0	19	18	7.38	189	0.9	0.5	6	2056	713	8.3	8.0	85.8	19	0	8	1	0.84	1. 15	37	2.9	1
20.0	20	19	7.77	194	0.9	0.5	7	2056	677	7.9	7.6	86.1	20	0	8	0	0.82	1. 15	39	3.0	1
25.0	25	24	9.71	217	1.1	0.4	8	2052	542	6.2	6.0	86.9	25	0	8	0	0.72	1. 18	46	3.2	1
30.0	30	29	11.66	238	1.2	0.4	8	2044	451	5.1	5.0	87.4	30	0	9	0	0.65	1. 21	52	3.4	2
35.0	35	34	13.60	258	1.2	0.3	9	2036	387	4.4	4.2	87.8	35	0	9	0	0.60	1. 24	59	3.6	
40.0	40	39	15.54	276	1.3	0.3	10	2028	338	3.8	3.7	88.1	40	0	9	0	0.56	1. 26	65	3.8	
45.0	45	43	17.48	293	1.4	0.3	10	2021	301	3.4	3.3	88.3	45	0	9	0	0.52	1. 29	71	4.0	
50.0	50	48	19.43	309	1.5	0.3	11	2013	271	3.0	2.9	88.5	50	0	9	0	0.49	2. 32	77	4.1	

 # 4 1 H on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 20. ZC= 21.(Sc)
NEUTRON NUMBERS: NP= 0. NT= 20. NC= 20.

AP**1/3= 1.000 AT**1/3= 3.420
REDUCED MASS NUMBER= 0.98 AP+AT=AC= 41.

INTERACTION RADIUS RINT= 7.99 fm RO= 1.81 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 3.59 CT+CP= 4.15 C= 0.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 3.85

COULOMB RADII [fm]:
RCP= 1.22 RCT= 3.84 RC=RCP+RCT= 5.07

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 7.46 MeV K= .01016 n=3.185
VC(RINT)= 3.6 MeV

FISSION-TKE= 36. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 5.81 MeV
L-RLD= 40 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=192.38 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -33.0
COMPOUND NUCLEUS: -28.4

FUSION RELATED PARAMETERS:
R-BARRIER= 7.40 fm V(RB)= 3.6 MeV
Q-VALUE= 2.7 MeV
L-CRITICAL= 4.

1 H on 40 Ca

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.27	43	0.2	3.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0 0	0.0	0
2.0	2	2	0.54	61	0.3	2.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0 0	0.0	0
3.0	3	3	0.81	75	0.4	1.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0 0	0.0	0
4.0	4	4	1.08	86	0.4	1.6	1	651	123	118.2	116.9	30.9	4	0	0	6	6.53	0. 0	0	1.1	0
4.5	5	4	1.22	92	0.5	1.5	2	982	300	88.3	86.8	45.9	4	0	0	3	4.02	0. 0	0	1.2	0
5.0	5	5	1.36	97	0.5	1.4	2	1199	442	71.7	70.4	54.1	5	0	0	3	3.16	0. 0	0	1.2	0
5.5	6	5	1.49	101	0.5	1.3	2	1359	559	60.7	59.5	59.6	5	0	0	2	2.69	0. 0	0	1.3	0
6.0	6	6	1.63	106	0.5	1.3	3	1481	655	52.8	51.7	63.6	6	0	0	2	2.38	0. 0	0	1.3	0
6.5	7	6	1.76	110	0.5	1.2	3	1578	737	46.8	45.8	66.6	6	0	0	2	2.16	0. 0	0	1.3	0
7.0	7	7	1.90	114	0.6	1.2	3	1657	808	42.0	41.1	69.0	7	0	7	2	1.99	0. 7	12	1.4	0
7.5	8	7	2.03	118	0.6	1.1	3	1722	868	38.1	37.3	70.9	7	0	7	2	1.85	0. 7	14	1.4	0
8.0	8	8	2.17	122	0.6	1.1	4	1776	922	34.9	34.1	72.5	8	0	7	2	1.74	0. 8	16	1.4	0
8.5	9	8	2.30	126	0.6	1.1	4	1822	969	32.2	31.5	73.9	8	0	7	1	1.65	0. 8	17	1.5	0
9.0	9	9	2.44	130	0.6	1.0	4	1861	1010	29.9	29.2	75.0	9	0	7	1	1.57	0. 8	18	1.5	0
9.5	10	9	2.57	133	0.7	1.0	4	1895	1048	27.9	27.3	76.0	9	0	7	1	1.50	0. 9	19	1.5	0
10.0	10	10	2.71	137	0.7	1.0	4	1924	1081	26.2	25.6	76.9	10	0	7	1	1.44	0. 9	20	1.6	0
10.5	11	10	2.85	140	0.7	1.0	4	1950	1112	24.7	24.1	77.7	10	0	7	1	1.38	0. 9	21	1.6	0
11.0	11	11	2.98	144	0.7	0.9	5	1973	1140	23.3	22.7	78.4	11	0	7	1	1.34	0. 9	22	1.6	0
11.5	12	11	3.12	147	0.7	0.9	5	1993	1165	22.1	21.5	79.0	11	0	7	1	1.29	0. 10	23	1.6	0
12.0	12	12	3.25	150	0.7	0.9	5	2011	1188	21.0	20.5	79.5	12	0	7	1	1.25	0. 10	24	1.7	0
13.0	13	13	3.52	156	0.8	0.9	5	2041	1229	19.1	18.6	80.5	13	0	7	1	1.18	0. 11	25	1.7	0
14.0	14	14	3.79	162	0.8	0.8	5	2065	1264	17.5	17.1	81.3	14	0	7	1	1.13	0. 11	27	1.8	0
15.0	15	15	4.07	168	0.8	0.8	6	2085	1189	16.1	15.8	81.9	15	0	7	1	1.07	0. 12	28	1.8	0
16.0	16	16	4.34	173	0.9	0.8	6	2101	1114	15.0	14.6	82.5	16	0	7	1	1.03	0. 12	30	1.9	0
17.0	17	17	4.61	179	0.9	0.8	6	2115	1049	14.0	13.7	83.0	17	0	7	1	0.99	0. 13	31	1.9	1
18.0	18	18	4.88	184	0.9	0.7	6	2127	990	13.1	12.8	83.4	18	0	7	1	0.96	0. 13	33	2.0	1
19.0	19	19	5.15	189	0.9	0.7	7	2136	938	12.4	12.1	83.8	19	0	7	1	0.92	0. 14	34	2.0	1
20.0	20	20	5.42	194	1.0	0.7	7	2145	891	11.7	11.4	84.2	20	0	7	1	0.89	0. 14	35	2.1	1
25.0	25	24	6.78	217	1.1	0.6	8	2171	713	9.2	8.9	85.4	25	0	7	1	0.78	1. 17	42	2.3	1
30.0	30	29	8.13	238	1.2	0.6	9	2184	594	7.5	7.3	86.2	30	0	7	1	0.70	1. 20	48	2.5	1
35.0	35	34	9.49	258	1.3	0.5	10	2190	509	6.4	6.2	86.8	35	0	7	1	0.65	1. 23	54	2.7	
40.0	40	39	10.84	276	1.3	0.5	10	2192	445	5.5	5.4	87.2	40	0	7	1	0.60	1. 25	60	2.9	
45.0	45	44	12.20	293	1.4	0.5	11	2192	396	4.9	4.8	87.5	45	0	7	0	0.56	1. 28	65	3.0	
50.0	50	49	13.55	309	1.5	0.4	12	2191	356	4.4	4.3	87.8	50	0	7	0	0.53	1. 31	71	3.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	--MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 5 1 H on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 26. ZC= 27.(Co)
NEUTRON NUMBERS: NP= 0. NT= 30. NC= 30.

AP**1/3= 1.000 AT**1/3= 3.826
REDUCED MASS NUMBER= 0.98 AP+AT=AC= 57.

INTERACTION RADIUS RINT= 8.43 fm RO= 1.75 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 4.12 CT+CP= 4.68 C= 0.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 4.35

COULOMB RADII [fm]:
RCP= 1.22 RCT= 4.27 RC=RCP+RCT= 5.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 8.87 MeV K= .00747 n=3.299
VC(RINT)= 4.4 MeV

FISSION-TKE= 42. MeV
ASYMM. FISSION-TKE= 6. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 5.89 MeV
L-RLD= 56 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=191.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -61.4
COMPOUND NUCLEUS: -60.8

FUSION RELATED PARAMETERS:
R-BARRIER= 7.81 fm V(RB)= 4.5 MeV
Q-VALUE= 6.7 MeV
L-CRITICAL= 5.

1 H on 56 Fe

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	1	1	0.22	43	0.2	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.44	61	0.3	2.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.66	75	0.4	2.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.89	86	0.4	2.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	1.00	92	0.5	1.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	1.11	97	0.5	1.8	1	693	170	111.1	110.1	34.5	5	0	0	6	5.50	0.	0	1.3	0
5.5	6	5	1.22	101	0.5	1.7	2	966	328	88.4	87.4	45.8	5	0	0	4	3.85	0.	0	1.3	0
6.0	6	6	1.33	106	0.5	1.7	2	1165	461	74.3	73.3	52.8	6	0	0	3	3.13	0.	0	1.3	0
6.5	7	6	1.44	110	0.5	1.6	3	1319	572	64.4	63.5	57.8	6	0	0	3	2.71	0.	6	11	1.4	0
7.0	7	7	1.55	114	0.6	1.5	3	1444	668	56.9	56.1	61.5	7	0	6	3	2.42	0.	7	13	1.4	1
7.5	8	7	1.66	118	0.6	1.5	3	1546	752	51.1	50.3	64.5	7	0	6	2	2.21	0.	7	14	1.4	1
8.0	8	8	1.77	122	0.6	1.4	3	1632	824	46.4	45.6	66.8	8	0	6	2	2.04	0.	7	15	1.4	1
8.5	9	8	1.88	126	0.6	1.4	4	1705	888	42.5	41.8	68.8	8	0	6	2	1.91	0.	8	16	1.5	1
9.0	9	9	1.99	130	0.6	1.4	4	1767	946	39.2	38.5	70.4	9	0	6	2	1.80	0.	8	17	1.5	1
9.5	10	9	2.10	133	0.7	1.3	4	1822	997	36.4	35.8	71.8	9	0	6	2	1.71	0.	8	18	1.5	1
10.0	10	10	2.22	137	0.7	1.3	4	1869	1043	33.9	33.4	73.0	10	0	6	2	1.63	0.	9	19	1.5	1
10.5	11	10	2.33	140	0.7	1.3	4	1911	1084	31.8	31.3	74.1	10	0	6	2	1.56	0.	9	20	1.5	1
11.0	11	11	2.44	144	0.7	1.2	5	1948	1122	30.0	29.5	75.0	11	0	6	2	1.50	0.	9	21	1.6	1
11.5	12	11	2.55	147	0.7	1.2	5	1981	1156	28.3	27.8	75.8	11	0	6	2	1.44	0.	9	22	1.6	1
12.0	12	12	2.66	150	0.7	1.2	5	2011	1188	26.8	26.4	76.6	12	0	6	1	1.39	0.	10	22	1.6	1
13.0	13	13	2.88	156	0.8	1.1	5	2062	1244	24.3	23.9	77.9	13	0	6	1	1.31	0.	10	24	1.7	1
14.0	14	14	3.10	162	0.8	1.1	6	2103	1292	22.2	21.8	78.9	14	0	6	1	1.24	0.	11	25	1.7	1
15.0	15	15	3.32	168	0.8	1.1	6	2138	1334	20.4	20.1	79.8	15	0	6	1	1.18	0.	11	27	1.7	1
16.0	16	16	3.55	173	0.9	1.0	6	2167	1370	18.9	18.6	80.5	16	0	6	1	1.13	0.	12	28	1.8	1
17.0	17	17	3.77	179	0.9	1.0	6	2192	1371	17.6	17.3	81.2	17	0	6	1	1.08	0.	12	29	1.8	1
18.0	18	18	3.99	184	0.9	1.0	7	2213	1295	16.5	16.2	81.7	18	0	6	1	1.04	0.	13	31	1.9	1
19.0	19	19	4.21	189	0.9	0.9	7	2232	1226	15.5	15.2	82.2	19	0	6	1	1.00	0.	14	32	1.9	1
20.0	20	20	4.43	194	1.0	0.9	7	2248	1165	14.6	14.4	82.7	20	0	6	1	0.97	0.	14	33	1.9	2
25.0	25	25	5.54	217	1.1	0.8	8	2303	932	11.4	11.2	84.3	25	0	6	1	0.84	0.	17	39	2.1	2
30.0	30	29	6.65	238	1.2	0.7	9	2335	777	9.3	9.2	85.3	30	0	6	1	0.76	1.	19	45	2.3	2
35.0	35	34	7.75	258	1.3	0.7	10	2353	666	7.9	7.8	86.0	35	0	6	1	0.69	1.	22	50	2.4	
40.0	40	39	8.86	276	1.4	0.6	11	2365	582	6.9	6.7	86.6	40	0	7	1	0.64	1.	25	56	2.5	
45.0	45	44	9.97	293	1.4	0.6	12	2373	518	6.1	6.0	87.0	45	0	7	1	0.60	1.	27	61	2.7	
50.0	50	49	11.08	309	1.5	0.6	12	2378	466	5.4	5.3	87.3	50	0	7	1	0.57	1.	30	66	2.8	

\# 6 1 H on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 29. ZC= 30.(Zn)
NEUTRON NUMBERS: NP= 0. NT= 34. NC= 34.

AP**1/3= 1.000 AT**1/3= 3.979
REDUCED MASS NUMBER= 0.98 AP+AT=AC= 64.

INTERACTION RADIUS RINT= 8.60 fm RO= 1.73 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 4.31 CT+CP= 4.88 C= 0.50

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 4.53

COULOMB RADII [fm]:
RCP= 1.22 RCT= 4.45 RC=RCP+RCT= 5.67

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 9.55 MeV K= .00654 n=3.352
VC(RINT)= 4.9 MeV

FISSION-TKE= 46. MeV
ASYMM. FISSION-TKE= 6. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 5.91 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=190.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -65.2
COMPOUND NUCLEUS: -65.6

FUSION RELATED PARAMETERS:
R-BARRIER= 7.96 fm V(RB)= 4.9 MeV
Q-VALUE= 7.7 MeV
L-CRITICAL= 5.

1 H on 63 Cu

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	1	1	0.20	43	0.2	4.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.41	61	0.3	3.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.61	75	0.4	2.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.81	86	0.4	2.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.91	92	0.5	2.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	1.01	97	0.5	2.0	0	296	6	153.7	153.2	13.2	5	0	0	17	15.06	0.	0	1.3	0
5.5	6	5	1.12	101	0.5	1.9	1	706	186	108.8	108.0	35.6	5	0	0	6	5.16	0.	0	1.3	0
6.0	6	6	1.22	106	0.5	1.9	2	958	337	88.6	87.6	45.7	6	0	0	4	3.76	0.	0	1.3	0
6.5	7	6	1.32	110	0.5	1.8	2	1147	464	75.4	74.5	52.3	6	0	6	4	3.11	0.	6	11	1.3	1
7.0	7	7	1.42	114	0.6	1.7	3	1298	573	65.9	65.1	57.0	7	0	6	3	2.70	0.	7	13	1.4	1
7.5	8	7	1.52	118	0.6	1.7	3	1421	668	58.7	57.9	60.7	7	0	6	3	2.43	0.	7	14	1.4	1
8.0	8	8	1.62	122	0.6	1.6	3	1524	750	52.9	52.2	63.5	8	0	6	3	2.22	0.	7	15	1.4	1
8.5	9	8	1.73	126	0.6	1.6	3	1612	823	48.3	47.6	65.9	8	0	6	2	2.06	0.	8	16	1.4	1
9.0	9	9	1.83	130	0.6	1.5	4	1687	888	44.4	43.7	67.8	9	0	6	2	1.93	0.	8	17	1.4	1
9.5	10	9	1.93	133	0.7	1.5	4	1752	946	41.1	40.5	69.5	9	0	6	2	1.82	0.	8	18	1.5	1
10.0	10	10	2.03	137	0.7	1.4	4	1809	998	38.2	37.7	70.9	10	0	6	2	1.73	0.	8	19	1.5	1
10.5	11	10	2.13	140	0.7	1.4	4	1860	1046	35.8	35.2	72.1	10	0	6	2	1.65	0.	9	20	1.5	1
11.0	11	11	2.23	144	0.7	1.4	5	1904	1089	33.6	33.1	73.2	11	0	6	2	1.58	0.	9	20	1.5	1
11.5	12	11	2.33	147	0.7	1.3	5	1944	1128	31.7	31.2	74.2	11	0	6	2	1.52	0.	9	21	1.5	1
12.0	12	12	2.44	150	0.7	1.3	5	1980	1164	30.0	29.5	75.0	12	0	6	2	1.46	0.	10	22	1.6	1
13.0	13	13	2.64	156	0.8	1.3	5	2042	1227	27.1	26.7	76.5	13	0	6	2	1.37	0.	10	23	1.6	1
14.0	14	14	2.84	162	0.8	1.2	6	2092	1282	24.7	24.3	77.7	14	0	6	2	1.29	0.	11	25	1.6	1
15.0	15	15	3.04	168	0.8	1.2	6	2135	1329	22.7	22.4	78.6	15	0	6	1	1.23	0.	11	26	1.7	1
16.0	16	16	3.25	173	0.9	1.1	6	2171	1370	21.0	20.7	79.5	16	0	6	1	1.17	0.	12	27	1.7	1
17.0	17	17	3.45	179	0.9	1.1	6	2201	1407	19.5	19.2	80.2	17	0	6	1	1.12	0.	12	29	1.7	1
18.0	18	18	3.65	184	0.9	1.1	7	2228	1416	18.3	18.0	80.9	18	0	6	1	1.08	0.	13	30	1.8	1
19.0	19	19	3.86	189	0.9	1.0	7	2251	1341	17.2	16.9	81.4	19	0	6	1	1.04	0.	13	31	1.8	2
20.0	20	20	4.06	194	1.0	1.0	7	2271	1274	16.2	15.9	81.9	20	0	6	1	1.00	0.	14	32	1.9	2
25.0	25	25	5.07	217	1.1	0.9	8	2341	1019	12.6	12.4	83.7	25	0	6	1	0.87	0.	17	38	2.0	2
30.0	30	30	6.09	238	1.2	0.8	9	2382	849	10.3	10.1	84.9	30	0	6	1	0.78	0.	19	44	2.2	2
35.0	35	34	7.10	258	1.3	0.8	10	2408	728	8.7	8.6	85.7	35	0	6	1	0.71	1.	22	49	2.3	
40.0	40	39	8.12	276	1.4	0.7	11	2425	637	7.5	7.4	86.2	40	0	6	1	0.66	1.	25	55	2.4	
45.0	45	44	9.13	293	1.4	0.7	12	2436	566	6.6	6.5	86.7	45	0	6	1	0.61	1.	27	60	2.5	
50.0	50	49	10.15	309	1.5	0.6	12	2444	509	5.9	5.9	87.0	50	0	6	1	0.58	1.	30	65	2.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 7 1 H on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 42. ZC= 43.(Tc)
NEUTRON NUMBERS: NP= 0. NT= 50. NC= 50.

AP**1/3= 1.000 AT**1/3= 4.514
REDUCED MASS NUMBER= 0.99 AP+AT=AC= 93.

INTERACTION RADIUS RINT= 9.18 fm R0= 1.66 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 5.00 CT+CP= 5.57 C= 0.51

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 5.20

COULOMB RADII [fm]:
RCP= 1.22 RCT= 5.08 RC=RCP+RCT= 6.30

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 12.29 MeV K= .00397 n=3.544
VC(RINT)= 6.6 MeV

FISSION-TKE= 66. MeV
ASYMM. FISSION-TKE= 6. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 5.99 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=189.69 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -87.5
COMPOUND NUCLEUS: -84.7

FUSION RELATED PARAMETERS:
R-BARRIER= 8.49 fm V(RB)= 6.7 MeV
Q-VALUE= 4.5 MeV
L-CRITICAL= 6.

1 H on 92 Mo — 1 H on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.15	43	0.2	6.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.30	61	0.3	4.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.45	75	0.4	3.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.60	86	0.4	3.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.68	92	0.5	3.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.75	97	0.5	3.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.83	101	0.5	2.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.90	106	0.5	2.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.98	110	0.6	2.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	1.05	114	0.6	2.5	1	447	74	130.3	129.8	24.9	7	0	6	11	7.12	0.	6	12	1.0	0
7.5	8	7	1.13	118	0.6	2.4	2	712	220	106.0	105.4	37.0	7	0	6	7	4.53	0.	7	13	1.0	0
8.0	8	8	1.20	122	0.6	2.3	2	913	348	91.0	90.3	44.5	8	0	6	6	3.59	0.	7	14	1.0	0
8.5	9	8	1.28	126	0.6	2.3	3	1077	460	80.2	79.6	49.9	8	0	6	5	3.06	0.	7	15	1.1	0
9.0	9	9	1.35	130	0.6	2.2	3	1216	561	71.9	71.3	54.0	9	0	6	4	2.71	0.	8	16	1.1	0
9.5	10	9	1.43	133	0.7	2.1	3	1335	650	65.3	64.8	57.3	9	0	6	4	2.46	0.	8	17	1.1	0
10.0	10	10	1.50	137	0.7	2.1	4	1438	731	59.9	59.4	60.1	10	0	6	4	2.27	0.	8	17	1.1	0
10.5	11	10	1.58	140	0.7	2.0	4	1529	804	55.3	54.8	62.3	10	0	6	3	2.12	0.	9	18	1.1	1
11.0	11	11	1.65	144	0.7	2.0	4	1610	870	51.5	51.0	64.3	11	0	6	3	1.99	0.	9	19	1.2	1
11.5	12	11	1.73	147	0.7	2.0	4	1682	931	48.1	47.6	65.9	11	0	6	3	1.89	0.	9	20	1.2	1
12.0	12	12	1.80	150	0.7	1.9	5	1747	986	45.2	44.7	67.4	12	0	6	3	1.80	0.	9	20	1.2	1
13.0	13	13	1.95	156	0.8	1.8	5	1859	1065	40.3	39.9	69.9	13	0	6	3	1.65	0.	10	22	1.2	1
14.0	14	14	2.10	162	0.8	1.8	5	1952	1169	36.4	36.0	71.8	14	0	6	2	1.53	0.	11	23	1.3	1
15.0	15	15	2.26	168	0.8	1.7	6	2030	1242	33.2	32.8	73.4	15	0	6	2	1.44	0.	11	24	1.3	1
16.0	16	16	2.41	173	0.9	1.7	6	2096	1306	30.5	30.2	74.8	16	0	6	2	1.36	0.	12	25	1.3	1
17.0	17	17	2.56	179	0.9	1.6	6	2154	1362	28.2	27.9	75.9	17	0	6	2	1.29	0.	12	27	1.4	1
18.0	18	18	2.71	184	0.9	1.6	7	2204	1412	26.2	26.0	76.9	18	0	6	2	1.23	0.	13	28	1.4	1
19.0	19	19	2.86	189	0.9	1.5	7	2247	1457	24.5	24.3	77.7	19	0	6	2	1.18	0.	13	29	1.4	1
20.0	20	20	3.01	194	1.0	1.5	7	2286	1498	23.0	22.8	78.5	20	0	6	2	1.14	0.	14	30	1.4	1
25.0	25	25	3.76	217	1.1	1.3	9	2425	1357	17.7	17.5	81.2	25	0	6	2	0.97	0.	16	36	1.6	2
30.0	30	30	4.51	238	1.2	1.2	10	2511	1131	14.3	14.2	82.8	30	0	6	1	0.86	0.	19	41	1.7	2
35.0	35	35	5.26	258	1.3	1.1	11	2568	969	12.1	11.9	84.0	35	0	6	1	0.78	0.	22	46	1.8	
40.0	40	40	6.01	276	1.4	1.0	11	2608	848	10.4	10.3	84.8	40	0	6	1	0.72	0.	24	51	1.9	
45.0	45	45	6.77	293	1.5	1.0	12	2637	754	9.2	9.1	85.4	45	0	6	1	0.67	0.	27	56	2.1	
50.0	50	49	7.52	309	1.5	0.9	13	2659	678	8.2	8.1	85.9	50	0	6	1	0.63	1.	29	61	2.2	

\# 8 1 H on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 47. ZC= 48.(Cd)
NEUTRON NUMBERS: NP= 0. NT= 61. NC= 61.

AP**1/3= 1.000 AT**1/3= 4.762
REDUCED MASS NUMBER= 0.99 AP+AT=AC=109.

INTERACTION RADIUS RINT= 9.45 fm R0= 1.64 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 5.32 CT+CP= 5.88 C= 0.51

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 5.50

COULOMB RADII [fm]:
RCP= 1.22 RCT= 5.34 RC=RCP+RCT= 6.56

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 13.17 MeV K= .00335 n=3.589
VC(RINT)= 7.2 MeV

FISSION-TKE= 74. MeV
ASYMM. FISSION-TKE= 6. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.928 MeV/fm**2 PROX-FACTOR= 5.93 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=189.38 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -87.6
COMPOUND NUCLEUS: -88.5

FUSION RELATED PARAMETERS:
R-BARRIER= 8.74 fm V(RB)= 7.3 MeV
Q-VALUE= 8.2 MeV
L-CRITICAL= 7.

1 H on 108 Ag — 1 H on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.14	43	0.2	7.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.28	61	0.3	5.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.42	75	0.4	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.55	86	0.4	3.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.62	92	0.5	3.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.69	97	0.5	3.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.76	101	0.5	3.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.83	106	0.5	3.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.90	110	0.6	2.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.97	114	0.6	2.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	1.04	118	0.6	2.7	1	381	48	137.0	136.6	21.5	7	0	6	14	8.21	0.	7	13	1.1	1
8.0	8	8	1.11	122	0.6	2.6	2	654	195	111.0	110.5	34.5	8	0	6	8	4.87	0.	7	14	1.1	1
8.5	9	8	1.18	126	0.6	2.5	2	861	325	95.4	94.9	42.3	8	0	6	7	3.79	0.	7	15	1.1	1
9.0	9	9	1.25	130	0.7	2.5	3	1031	440	84.3	83.8	47.8	9	0	6	6	3.21	0.	8	15	1.1	1
9.5	10	9	1.32	133	0.7	2.4	3	1175	544	75.8	75.3	52.1	9	0	6	5	2.83	0.	8	16	1.1	1
10.0	10	10	1.39	137	0.7	2.3	3	1300	636	69.0	68.5	55.5	10	0	6	4	2.57	0.	8	17	1.2	1
10.5	11	10	1.45	140	0.7	2.3	4	1409	720	63.3	62.9	58.3	10	0	6	4	2.36	0.	9	18	1.2	1
11.0	11	11	1.52	144	0.7	2.2	4	1506	797	58.6	58.2	60.7	11	0	6	4	2.20	0.	9	18	1.2	1
11.5	12	11	1.59	147	0.7	2.2	4	1592	866	54.6	54.1	62.7	11	0	6	4	2.07	0.	9	19	1.2	1
12.0	12	12	1.66	150	0.8	2.1	4	1669	930	51.1	50.7	64.5	12	0	6	3	1.96	0.	9	20	1.2	1
13.0	13	13	1.80	156	0.8	2.1	5	1802	1043	45.3	44.9	67.3	13	0	6	3	1.78	0.	10	21	1.2	1
14.0	14	14	1.94	162	0.8	2.0	5	1913	1140	40.7	40.4	69.6	14	0	6	3	1.64	0.	11	22	1.3	1
15.0	15	15	2.08	168	0.8	1.9	6	2006	1224	37.0	36.7	71.5	15	0	6	3	1.53	0.	11	24	1.3	2
16.0	16	16	2.22	173	0.9	1.9	6	2086	1298	33.9	33.6	73.0	16	0	6	2	1.44	0.	12	25	1.3	2
17.0	17	17	2.35	179	0.9	1.8	6	2155	1363	31.3	31.1	74.3	17	0	6	2	1.37	0.	12	26	1.4	2
18.0	18	18	2.49	184	0.9	1.7	7	2215	1420	29.1	28.8	75.4	18	0	6	2	1.30	0.	13	27	1.4	2
19.0	19	19	2.63	189	0.9	1.7	7	2267	1472	27.2	26.9	76.4	19	0	6	2	1.25	0.	13	28	1.4	2
20.0	20	20	2.77	194	1.0	1.7	7	2313	1518	25.5	25.3	77.3	20	0	6	2	1.20	0.	14	29	1.4	2
25.0	25	25	3.46	217	1.1	1.5	9	2482	1532	19.5	19.3	80.3	25	0	6	2	1.01	0.	16	35	1.6	2
30.0	30	30	4.16	238	1.2	1.4	10	2586	1276	15.7	15.6	82.1	30	0	6	2	0.90	0.	19	40	1.7	3
35.0	35	35	4.85	258	1.3	1.3	11	2656	1094	13.2	13.1	83.4	35	0	6	1	0.81	0.	22	45	1.8	
40.0	40	40	5.54	276	1.4	1.2	12	2706	957	11.4	11.3	84.3	40	0	6	1	0.75	0.	24	50	1.9	
45.0	45	45	6.23	293	1.5	1.1	13	2743	851	10.0	9.9	85.0	45	0	6	1	0.70	0.	27	55	2.0	
50.0	50	50	6.93	309	1.5	1.0	13	2770	766	8.9	8.9	85.5	50	0	6	1	0.65	0.	29	59	2.1	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 9 1 H on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 58. ZC= 59.(Pr)
NEUTRON NUMBERS: NP= 0. NT= 82. NC= 82.

AP**1/3= 1.000 AT**1/3= 5.192
REDUCED MASS NUMBER= 0.99 AP+AT=AC=141.

INTERACTION RADIUS RINT= 9.91 fm RO= 1.60 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 5.87 CT+CP= 6.44 C̄= 0.51

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.04

COULOMB RADII [fm]:
RCP= 1.22 RCT= 5.82 RC=RCP+RCT= 7.04

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 15.06 MeV K= .00242 n=3.686
VC(RINT)= 8.4 MeV

FISSION-TKE= 94. MeV
ASYMM. FISSION-TKE= 6. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.907 MeV/fm**2 PROX-FACTOR= 5.85 MeV
L-RLD= 95 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.98 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -88.2
COMPOUND NUCLEUS: -86.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.18 fm V(RB)= 8.6 MeV
Q-VALUE= 5.5 MeV
L-CRITICAL= 7.

1 H on 140 Ce

1 H on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.12	43	0.2	9.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.24	61	0.3	6.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.35	75	0.4	5.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.47	86	0.4	4.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.53	92	0.5	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.59	97	0.5	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.65	101	0.5	3.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.71	106	0.5	3.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.77	110	0.6	3.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.83	114	0.6	3.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	0.89	118	0.6	3.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.0	8	8	0.94	122	0.6	3.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.5	9	8	1.00	126	0.6	3.1	0	127	0	170.1	170.0	5.0	8	0	6	56	35.43	0.	7	14	0.9	1
9.0	9	9	1.06	130	0.7	3.0	2	480	109	126.1	125.8	26.9	9	0	6	13	6.24	0.	8	15	0.9	1
9.5	10	9	1.12	133	0.7	3.0	2	705	242	107.6	107.2	36.2	9	0	6	9	4.45	0.	8	15	0.9	1
10.0	10	10	1.18	137	0.7	2.9	3	888	362	94.9	94.5	42.5	10	0	6	7	3.64	0.	8	16	0.9	1
10.5	11	10	1.24	140	0.7	2.8	3	1044	471	85.4	84.9	47.3	10	0	6	6	3.16	0.	9	17	1.0	1
11.0	11	11	1.30	144	0.7	2.8	3	1180	570	77.8	77.4	51.1	11	0	6	6	2.83	0.	9	18	1.0	1
11.5	12	11	1.36	147	0.7	2.7	4	1301	660	71.5	71.1	54.2	11	0	6	5	2.58	0.	9	18	1.0	1
12.0	12	12	1.42	150	0.8	2.6	4	1408	743	66.3	65.9	56.9	12	0	6	5	2.39	0.	9	19	1.0	1
13.0	13	13	1.53	156	0.8	2.5	5	1593	889	57.9	57.6	61.0	13	0	6	4	2.11	0.	10	20	1.0	1
14.0	14	14	1.65	162	0.8	2.4	5	1745	1014	51.5	51.2	64.2	14	0	6	4	1.91	0.	11	21	1.0	1
15.0	15	15	1.77	168	0.8	2.4	5	1874	1123	46.4	46.2	66.8	15	0	6	4	1.76	0.	11	23	1.1	1
16.0	16	16	1.89	173	0.9	2.3	6	1983	1218	42.3	42.0	68.9	16	0	6	3	1.64	0.	12	24	1.1	2
17.0	17	17	2.01	179	0.9	2.2	6	2078	1302	38.8	38.6	70.6	17	0	6	3	1.54	0.	12	25	1.1	2
18.0	18	18	2.12	184	0.9	2.2	7	2161	1377	35.9	35.7	72.0	18	0	6	3	1.45	0.	13	26	1.2	2
19.0	19	19	2.24	189	0.9	2.1	7	2233	1443	33.4	33.2	73.3	19	0	6	3	1.38	0.	13	27	1.2	2
20.0	20	20	2.36	194	1.0	2.0	7	2298	1503	31.2	31.0	74.4	20	0	6	3	1.32	0.	14	28	1.2	2
25.0	25	25	2.95	217	1.1	1.8	9	2533	1732	23.6	23.4	78.2	25	0	6	2	1.10	0.	16	33	1.3	2
30.0	30	30	3.54	238	1.2	1.7	10	2680	1541	19.0	18.8	80.5	30	0	6	2	0.97	0.	19	38	1.4	3
35.0	35	35	4.13	258	1.3	1.5	11	2780	1321	15.9	15.7	82.1	35	0	6	2	0.87	0.	22	43	1.5	
40.0	40	40	4.72	276	1.4	1.4	12	2852	1156	13.6	13.5	83.2	40	0	6	2	0.80	0.	24	48	1.6	
45.0	45	45	5.31	293	1.5	1.4	13	2905	1027	11.9	11.9	84.0	45	0	6	2	0.74	0.	27	52	1.7	
50.0	50	50	5.90	309	1.5	1.3	14	2947	924	10.6	10.6	84.7	50	0	6	1	0.70	0.	29	57	1.8	

 # 10 1 H on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 62. ZC= 63.(Eu)
NEUTRON NUMBERS: NP= 0. NT= 92. NC= 92.

AP**1/3= 1.000 AT**1/3= 5.360
REDUCED MASS NUMBER= 0.99 AP+AT=AC=155.

INTERACTION RADIUS RINT=10.09 fm RO= 1.59 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 6.09 CT+CP= 6.65 C̄= 0.51

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.25

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.00 RC=RCP+RCT= 7.22

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 15.68 MeV K= .00217 n=3.711
VC(RINT)= 8.8 MeV

FISSION-TKE= 101. MeV
ASYMM. FISSION-TKE= 6. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 5.77 MeV
L-RLD= 97 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -72.1
COMPOUND NUCLEUS: -71.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.35 fm V(RB)= 9.0 MeV
Q-VALUE= 6.6 MeV
L-CRITICAL= 8.

1 H on 154 Sm

1 H on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.11	43	0.2	9.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.22	61	0.3	6.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.34	75	0.4	5.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.45	86	0.4	4.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.51	92	0.5	4.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.56	97	0.5	4.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.62	101	0.5	4.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.67	106	0.5	4.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.73	110	0.6	3.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.79	114	0.6	3.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	0.84	118	0.6	3.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.0	8	8	0.90	122	0.6	3.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.5	9	8	0.96	126	0.6	3.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.0	9	9	1.01	130	0.7	3.3	1	212	0	156.0	155.8	12.0	9	0	6	29	14.46	0.	8	14	0.9	1
9.5	10	9	1.07	133	0.7	3.2	2	510	129	123.6	123.3	28.2	9	0	6	12	5.89	0.	8	15	0.9	1
10.0	10	10	1.12	137	0.7	3.1	2	725	260	106.6	106.3	36.7	10	0	6	9	4.35	0.	8	16	0.9	1
10.5	11	10	1.18	140	0.7	3.0	3	903	378	94.7	94.3	42.6	10	0	6	8	3.61	0.	9	17	0.9	1
11.0	11	11	1.24	144	0.7	2.9	3	1056	486	85.6	85.2	47.2	11	0	6	7	3.15	0.	9	17	1.0	2
11.5	12	11	1.29	147	0.7	2.9	4	1191	584	78.3	77.9	50.9	11	0	6	6	2.83	0.	9	18	1.0	2
12.0	12	12	1.35	150	0.8	2.8	4	1311	674	72.2	71.9	53.9	12	0	6	6	2.59	0.	9	19	1.0	2
13.0	13	13	1.46	156	0.8	2.7	4	1515	833	62.7	62.4	58.6	13	0	6	5	2.25	0.	10	20	1.0	2
14.0	14	14	1.57	162	0.8	2.6	5	1685	970	55.5	55.2	62.2	14	0	6	4	2.02	0.	11	21	1.0	2
15.0	15	15	1.69	168	0.8	2.5	5	1827	1088	49.9	49.6	65.0	15	0	6	4	1.85	0.	11	22	1.1	2
16.0	16	16	1.80	173	0.9	2.4	6	1948	1192	45.3	45.1	67.3	16	0	6	4	1.71	0.	12	23	1.1	2
17.0	17	17	1.91	179	0.9	2.4	6	2053	1283	41.5	41.3	69.2	17	0	6	3	1.60	0.	12	24	1.1	2
18.0	18	18	2.02	184	0.9	2.3	7	2145	1364	38.3	38.1	70.8	18	0	6	3	1.51	0.	13	26	1.1	2
19.0	19	19	2.14	189	0.9	2.2	7	2225	1437	35.6	35.4	72.2	19	0	6	3	1.44	0.	13	27	1.1	2
20.0	20	20	2.25	194	1.0	2.2	7	2296	1502	33.3	33.1	73.4	20	0	6	3	1.37	0.	14	28	1.2	2
25.0	25	25	2.81	217	1.1	2.0	9	2557	1750	25.0	24.9	77.5	25	0	6	2	1.14	0.	16	33	1.3	3
30.0	30	30	3.37	238	1.2	1.8	10	2721	1643	20.1	19.9	80.0	30	0	6	2	0.99	0.	19	38	1.4	3
35.0	35	35	3.94	258	1.3	1.7	11	2832	1408	16.8	16.6	81.6	35	0	6	2	0.89	0.	22	43	1.5	
40.0	40	40	4.50	276	1.4	1.5	12	2913	1232	14.4	14.3	82.8	40	0	6	2	0.82	0.	24	47	1.5	
45.0	45	45	5.06	293	1.5	1.5	13	2973	1095	12.6	12.5	83.7	45	0	7	2	0.76	0.	27	52	1.6	
50.0	50	50	5.62	309	1.5	1.4	14	3019	986	11.2	11.1	84.4	50	0	7	2	0.71	0.	29	56	1.7	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 11 1 H on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 67. ZC= 68.(Er)
NEUTRON NUMBERS: NP= 0. NT= 98. NC= 98.

AP**1/3= 1.000 AT**1/3= 5.495
REDUCED MASS NUMBER= 0.99 AP+AT=AC=166.

INTERACTION RADIUS RINT=10.23 fm R0= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 6.25 CT+CP= 6.81 C= 0.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.41

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.15 RC=RCP+RCT= 7.38

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 16.54 MeV K= .00191 n=3.756
VC(RINT)= 9.4 MeV

FISSION-TKE= 112. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 5.81 MeV
L-RLD= 91 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -63.7
COMPOUND NUCLEUS: -63.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.47 fm V(RB)= 9.6 MeV
Q-VALUE= 7.4 MeV
L-CRITICAL= 8.

1 H on 165 Ho — 1 H on 165 Ho

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.11	43	0.2	10.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.21	61	0.3	7.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.32	75	0.4	6.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.42	86	0.4	5.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.47	92	0.5	5.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.53	97	0.5	4.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.58	101	0.5	4.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.63	106	0.5	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.69	110	0.6	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.74	114	0.6	4.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	0.79	118	0.6	3.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.0	8	8	0.84	122	0.6	3.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.5	9	8	0.90	126	0.6	3.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.0	9	9	0.95	130	0.7	3.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.5	10	9	1.00	133	0.7	3.4	0	110	0	171.6	171.6	4.2	9	0	6	67	40.98	0.	8	15	0.9	1
10.0	10	10	1.06	137	0.7	3.3	2	447	97	129.0	128.7	25.5	10	0	6	15	6.46	0.	8	16	0.9	1
10.5	11	10	1.11	140	0.7	3.3	2	664	226	111.0	110.7	34.5	10	0	6	10	4.60	0.	9	16	0.9	2
11.0	11	11	1.16	144	0.7	3.2	3	843	344	98.6	98.3	40.7	11	0	6	9	3.76	0.	9	17	0.9	2
11.5	12	11	1.21	147	0.7	3.1	3	998	452	89.2	88.8	45.4	11	0	6	7	3.26	0.	9	18	1.0	2
12.0	12	12	1.27	150	0.8	3.0	4	1134	550	81.6	81.3	49.2	12	0	6	7	2.92	0.	10	18	1.0	2
13.0	13	13	1.37	156	0.8	2.9	4	1366	724	70.1	69.8	54.9	13	0	7	6	2.47	0.	10	20	1.0	2
14.0	14	14	1.48	162	0.8	2.8	5	1556	874	61.7	61.4	59.2	14	0	7	5	2.18	0.	11	21	1.0	2
15.0	15	15	1.58	168	0.8	2.7	5	1715	1003	55.1	54.8	62.5	15	0	7	4	1.97	0.	11	22	1.0	2
16.0	16	16	1.69	173	0.9	2.6	6	1851	1117	49.8	49.6	65.1	16	0	7	4	1.81	0.	12	23	1.1	2
17.0	17	17	1.79	179	0.9	2.6	6	1969	1217	45.5	45.3	67.2	17	0	7	4	1.69	0.	12	24	1.1	2
18.0	18	18	1.90	184	0.9	2.5	6	2071	1306	41.9	41.7	69.0	18	0	7	4	1.59	0.	13	25	1.1	2
19.0	19	19	2.01	189	0.9	2.4	7	2161	1385	38.9	38.7	70.6	19	0	7	3	1.50	0.	13	26	1.1	2
20.0	20	20	2.11	194	1.0	2.4	7	2241	1457	36.2	36.0	71.9	20	0	7	3	1.43	0.	14	27	1.1	2
25.0	25	25	2.64	217	1.1	2.1	9	2532	1729	27.1	26.9	76.5	25	0	7	3	1.17	0.	16	33	1.2	3
30.0	30	30	3.17	238	1.2	1.9	10	2716	1735	21.7	21.5	79.2	30	0	7	2	1.02	0.	19	37	1.3	3
35.0	35	35	3.69	258	1.3	1.8	11	2842	1487	18.0	17.9	81.0	35	0	7	2	0.92	0.	22	42	1.4	
40.0	40	40	4.22	276	1.4	1.7	12	2933	1301	15.5	15.4	82.3	40	0	7	2	0.84	0.	24	47	1.5	
45.0	45	45	4.75	293	1.5	1.6	13	3001	1156	13.5	13.5	83.2	45	0	7	2	0.78	0.	27	51	1.6	
50.0	50	50	5.28	309	1.5	1.5	14	3054	1041	12.0	12.0	84.0	50	0	7	2	0.73	0.	29	56	1.7	

 # 12 1 H on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 73. ZC= 74.(W)
NEUTRON NUMBERS: NP= 0. NT=108. NC=108.

AP**1/3= 1.000 AT**1/3= 5.657
REDUCED MASS NUMBER= 0.99 AP+AT=AC=182.

INTERACTION RADIUS RINT=10.42 fm R0= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 6.47 CT+CP= 7.03 C= 0.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.62

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.35 RC=RCP+RCT= 7.58

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 17.50 MeV K= .00166 n=3.800
VC(RINT)= 10.1 MeV

FISSION-TKE= 126. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 5.80 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.67 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -46.0
COMPOUND NUCLEUS: -45.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.64 fm V(RB)= 10.3 MeV
Q-VALUE= 6.8 MeV
L-CRITICAL= 8.

1 H on 181 Ta — 1 H on 181 Ta

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.10	43	0.2	11.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.20	61	0.3	8.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.30	75	0.4	6.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.39	86	0.4	5.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.44	92	0.5	5.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.49	97	0.5	5.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.54	101	0.5	4.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.59	106	0.5	4.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.64	110	0.6	4.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.69	114	0.6	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	0.74	118	0.6	4.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.0	8	8	0.79	122	0.6	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.5	9	8	0.84	126	0.6	3.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.0	9	9	0.89	130	0.7	3.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.5	10	9	0.94	133	0.7	3.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
10.0	10	10	0.99	137	0.7	3.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
10.5	11	10	1.04	140	0.7	3.5	1	348	47	138.4	138.2	20.8	10	0	7	19	7.93	0.	9	16	0.9	2
11.0	11	11	1.09	144	0.7	3.5	2	577	178	117.8	117.5	31.1	11	0	7	12	5.10	0.	9	17	0.9	2
11.5	12	11	1.13	147	0.7	3.4	3	763	297	104.3	104.0	37.9	11	0	7	10	4.05	0.	9	18	0.9	2
12.0	12	12	1.18	150	0.8	3.3	3	923	406	94.2	93.9	42.9	12	0	7	8	3.46	0.	10	18	0.9	2
13.0	13	13	1.28	156	0.8	3.2	4	1190	600	79.6	79.3	50.2	13	0	7	7	2.79	0.	10	19	0.9	2
14.0	14	14	1.38	162	0.8	3.1	4	1407	765	69.3	69.0	55.4	14	0	7	6	2.40	0.	11	21	1.0	2
15.0	15	15	1.48	168	0.8	3.0	5	1589	909	61.5	61.2	59.3	15	0	7	5	2.14	0.	11	22	1.0	2
16.0	16	16	1.58	173	0.9	2.9	5	1743	1035	55.3	55.1	62.3	16	0	7	5	1.95	0.	12	23	1.0	2
17.0	17	17	1.68	179	0.9	2.8	6	1876	1145	50.4	50.1	64.8	17	0	7	4	1.80	0.	12	24	1.0	2
18.0	18	18	1.78	184	0.9	2.7	6	1992	1244	46.2	46.0	66.9	18	0	7	4	1.68	0.	13	25	1.0	2
19.0	19	19	1.87	189	0.9	2.6	7	2094	1332	42.7	42.5	68.6	19	0	7	4	1.58	0.	13	26	1.1	2
20.0	20	20	1.97	194	1.0	2.6	7	2184	1412	39.7	39.5	70.1	20	0	7	4	1.50	0.	14	27	1.1	2
25.0	25	25	2.47	217	1.1	2.3	9	2515	1713	29.5	29.3	75.2	25	0	7	3	1.22	0.	16	32	1.2	3
30.0	30	30	2.96	238	1.2	2.1	10	2724	1856	23.5	23.4	78.3	30	0	7	3	1.06	0.	19	37	1.3	4
35.0	35	35	3.45	258	1.3	1.9	11	2868	1591	19.5	19.4	80.2	35	0	7	2	0.94	0.	22	42	1.4	
40.0	40	40	3.95	276	1.4	1.8	12	2971	1392	16.7	16.6	81.6	40	0	7	2	0.86	0.	24	46	1.4	
45.0	45	45	4.44	293	1.5	1.7	13	3049	1237	14.6	14.5	82.7	45	0	7	2	0.80	0.	27	51	1.5	
50.0	50	50	4.93	309	1.5	1.6	14	3110	1113	13.0	12.9	83.5	50	0	7	2	0.75	0.	29	55	1.6	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 13 1 H on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 79. ZC= 80.(Hg)
NEUTRON NUMBERS: NP= 0. NT=118. NC=118.

AP**1/3= 1.000 AT**1/3= 5.819
REDUCED MASS NUMBER= 0.99 AP+AT=AC=198.

INTERACTION RADIUS RINT=10.59 fm R0= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 6.68 CT+CP= 7.24 C̄= 0.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.83

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.55 RC=RCP+RCT= 7.77

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 18.43 MeV K= .00145 n=3.841
VC(RINT)= 10.7 MeV

FISSION-TKE= 140. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 5.80 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.58 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -28.6
COMPOUND NUCLEUS: -28.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.80 fm V(RB)= 10.9 MeV
Q-VALUE= 7.0 MeV
L-CRITICAL= 8.

1 H on 197 Au — 1 H on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	1	1	0.09	43	0.2	12.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	2	2	0.19	61	0.3	8.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	3	3	0.28	75	0.4	7.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	4	4	0.37	86	0.4	6.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	5	4	0.42	92	0.5	5.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	5	5	0.46	97	0.5	5.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	6	5	0.51	101	0.5	5.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	6	6	0.56	106	0.5	5.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	7	6	0.60	110	0.6	4.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
7.0	7	7	0.65	114	0.6	4.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
7.5	8	7	0.70	118	0.6	4.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
8.0	8	8	0.74	122	0.6	4.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
8.5	9	8	0.79	126	0.6	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
9.0	9	9	0.83	130	0.7	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
9.5	10	9	0.88	133	0.7	4.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
10.0	10	10	0.93	137	0.7	3.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
10.5	11	10	0.97	140	0.7	3.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
11.0	11	11	1.02	144	0.7	3.8	1	252	2	148.9	148.7	15.6	11	0	7	27	10.57	0.	9	17	0.9	2
11.5	12	11	1.07	147	0.7	3.7	2	497	134	124.4	124.1	27.8	11	0	7	15	5.70	0.	9	17	0.9	2
12.0	12	12	1.11	150	0.8	3.6	3	689	254	109.7	109.4	35.2	12	0	7	11	4.36	0.	10	18	0.9	2
13.0	13	13	1.21	156	0.8	3.5	3	998	466	90.5	90.2	44.8	13	0	7	8	3.22	0.	10	19	0.9	2
14.0	14	14	1.30	162	0.8	3.3	4	1245	649	77.7	77.4	51.1	14	0	7	7	2.67	0.	11	20	0.9	2
15.0	15	15	1.39	168	0.8	3.2	5	1450	807	68.4	68.1	55.8	15	0	7	6	2.34	0.	11	22	0.9	2
16.0	16	16	1.48	173	0.9	3.1	5	1624	945	61.2	60.9	59.4	16	0	7	5	2.10	0.	12	23	1.0	2
17.0	17	17	1.58	179	0.9	3.0	6	1773	1067	55.4	55.2	62.3	17	0	7	5	1.92	0.	12	24	1.0	2
18.0	18	18	1.67	184	0.9	2.9	6	1903	1175	50.7	50.5	64.6	18	0	7	5	1.78	0.	13	25	1.0	2
19.0	19	19	1.76	189	0.9	2.9	7	2018	1272	46.8	46.5	66.6	19	0	7	4	1.67	0.	13	26	1.0	2
20.0	20	20	1.86	194	1.0	2.8	7	2119	1360	43.4	43.2	68.3	20	0	7	4	1.58	0.	14	27	1.0	2
25.0	25	25	2.32	217	1.1	2.5	9	2490	1691	32.0	31.8	74.0	25	0	7	3	1.27	0.	17	32	1.1	3
30.0	30	30	2.78	238	1.2	2.3	10	2725	1913	25.3	25.2	77.3	30	0	7	3	1.09	0.	19	37	1.2	3
35.0	35	35	3.25	258	1.3	2.1	11	2886	1691	21.0	20.9	79.5	35	0	7	3	0.97	0.	22	41	1.3	
40.0	40	40	3.71	276	1.4	2.0	12	3003	1480	17.9	17.9	81.0	40	0	7	2	0.89	0.	24	46	1.4	
45.0	45	45	4.17	293	1.5	1.9	13	3091	1315	15.7	15.6	82.2	45	0	7	2	0.82	0.	27	50	1.4	
50.0	50	50	4.64	309	1.5	1.8	14	3159	1184	13.9	13.8	83.0	50	0	7	2	0.76	0.	29	55	1.5	

 # 14 1 H on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 82. ZC= 83.(Bi)
NEUTRON NUMBERS: NP= 0. NT=126. NC=126.

AP**1/3= 1.000 AT**1/3= 5.925
REDUCED MASS NUMBER= 1.00 AP+AT=AC=209.

INTERACTION RADIUS RINT=10.71 fm R0= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 6.82 CT+CP= 7.38 C̄= 0.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.96

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.66 RC=RCP+RCT= 7.88

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 18.84 MeV K= .00136 n=3.854
VC(RINT)= 11.0 MeV

FISSION-TKE= 147. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.880 MeV/fm**2 PROX-FACTOR= 5.74 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -19.5
COMPOUND NUCLEUS: -16.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.91 fm V(RB)= 11.2 MeV
Q-VALUE= 4.3 MeV
L-CRITICAL= 9.

1 H on 208 Pb — 1 H on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	1	1	0.09	43	0.2	12.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	2	2	0.18	61	0.3	9.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	3	3	0.27	75	0.4	7.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	4	4	0.36	86	0.4	6.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	5	4	0.41	92	0.5	6.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	5	5	0.45	97	0.5	5.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	6	5	0.50	101	0.5	5.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	6	6	0.54	106	0.5	5.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	7	6	0.59	110	0.6	5.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
7.0	7	7	0.63	114	0.6	4.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
7.5	8	7	0.68	118	0.6	4.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
8.0	8	8	0.72	122	0.6	4.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
8.5	9	8	0.77	126	0.6	4.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
9.0	9	9	0.81	130	0.7	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
9.5	10	9	0.86	133	0.7	4.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
10.0	10	10	0.90	137	0.7	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
10.5	11	10	0.95	140	0.7	4.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
11.0	11	11	0.99	144	0.7	3.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
11.5	12	11	1.04	147	0.7	3.8	2	363	59	136.8	136.6	21.6	11	0	7	20	7.48	0.	9	17	0.8	1
12.0	12	12	1.08	150	0.8	3.7	2	578	185	118.1	117.9	30.9	12	0	7	13	5.05	0.	10	18	0.8	1
13.0	13	13	1.17	156	0.8	3.6	3	912	408	95.9	95.7	42.0	13	0	7	9	3.49	0.	10	19	0.8	1
14.0	14	14	1.27	162	0.8	3.5	4	1175	600	81.8	81.6	49.1	14	0	7	8	2.83	0.	11	20	0.8	2
15.0	15	15	1.36	168	0.8	3.3	5	1393	765	71.7	71.4	54.1	15	0	7	7	2.45	0.	11	21	0.9	2
16.0	16	16	1.45	173	0.9	3.2	5	1577	911	64.0	63.7	58.0	16	0	7	6	2.18	0.	12	22	0.9	2
17.0	17	17	1.54	179	0.9	3.1	6	1735	1039	57.8	57.6	61.1	17	0	7	5	1.99	0.	12	24	0.9	2
18.0	18	18	1.63	184	0.9	3.0	6	1872	1152	52.8	52.6	63.6	18	0	7	5	1.84	0.	13	25	0.9	2
19.0	19	19	1.72	189	0.9	3.0	7	1993	1254	48.6	48.4	65.7	19	0	7	5	1.72	0.	13	26	0.9	2
20.0	20	20	1.81	194	1.0	2.9	7	2100	1346	45.1	44.9	67.5	20	0	7	4	1.62	0.	14	27	1.0	2
25.0	25	25	2.26	217	1.1	2.6	9	2492	1694	33.1	32.9	73.5	25	0	7	3	1.30	0.	17	32	1.1	3
30.0	30	30	2.71	238	1.2	2.4	10	2741	1926	26.2	26.1	76.9	30	0	7	3	1.11	0.	19	36	1.1	3
35.0	35	35	3.16	258	1.3	2.2	11	2912	1751	21.7	21.6	79.2	35	0	7	3	0.99	0.	22	41	1.2	
40.0	40	40	3.61	276	1.4	2.0	13	3035	1532	18.5	18.4	80.7	40	0	7	2	0.90	0.	24	45	1.3	
45.0	45	45	4.07	293	1.5	1.9	14	3129	1362	16.1	16.1	81.9	45	0	7	2	0.83	0.	27	50	1.4	
50.0	50	50	4.52	309	1.5	1.8	15	3202	1225	14.3	14.2	82.8	50	0	7	2	0.78	0.	29	54	1.4	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 15 1 H on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 83. ZC= 84.(Po)
NEUTRON NUMBERS: NP= 0. NT=126. NC=126.

AP**1/3= 1.000 AT**1/3= 5.934
REDUCED MASS NUMBER= 1.00 AP+AT=AC=210.

INTERACTION RADIUS RINT=10.72 fm R0= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 6.83 CT+CP= 7.39 C= 0.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 6.97

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.68 RC=RCP+RCT= 7.90

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 19.01 MeV K= .00133 n=3.864
VC(RINT)= 11.1 MeV

FISSION-TKE= 149. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 5.77 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: -16.5
COMPOUND NUCLEUS: -14.7

FUSION RELATED PARAMETERS:
R-BARRIER= 9.92 fm V(RB)= 11.4 MeV
Q-VALUE= 5.5 MeV
L-CRITICAL= 9.

1 H on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.09	43	0.2	13.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.18	61	0.3	9.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.27	75	0.4	7.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.36	86	0.4	6.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.40	92	0.5	6.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.45	97	0.5	5.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.49	101	0.5	5.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.54	106	0.5	5.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.58	110	0.6	5.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.63	114	0.6	4.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	0.67	118	0.6	4.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.0	8	8	0.71	122	0.6	4.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.5	9	8	0.76	126	0.6	4.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.0	9	9	0.80	130	0.7	4.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.5	10	9	0.85	133	0.7	4.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
10.0	10	10	0.89	137	0.7	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
10.5	11	10	0.94	140	0.7	4.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
11.0	11	11	0.98	144	0.7	3.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
11.5	12	11	1.03	147	0.7	3.9	1	296	25	143.6	143.5	18.2	11	0	7	24	8.93	0.	9	17	0.8	1
12.0	12	12	1.07	150	0.8	3.8	2	524	152	122.3	122.0	28.9	12	0	7	15	5.44	0.	10	18	0.8	1
13.0	13	13	1.16	156	0.8	3.6	3	868	379	98.5	98.2	40.8	13	0	7	10	3.62	0.	10	19	0.8	2
14.0	14	14	1.25	162	0.8	3.5	4	1137	572	83.7	83.4	48.1	14	0	7	8	2.90	0.	11	20	0.9	2
15.0	15	15	1.34	168	0.8	3.4	5	1359	740	73.2	72.9	53.4	15	0	7	7	2.49	0.	11	21	0.9	2
16.0	16	16	1.43	173	0.9	3.3	5	1546	887	65.2	65.0	57.4	16	0	7	6	2.21	0.	12	22	0.9	2
17.0	17	17	1.52	179	0.9	3.2	6	1707	1017	58.9	58.7	60.6	17	0	7	5	2.01	0.	12	24	0.9	2
18.0	18	18	1.61	184	0.9	3.1	6	1847	1132	53.7	53.5	63.1	18	0	7	5	1.86	0.	13	25	0.9	2
19.0	19	19	1.70	189	0.9	3.0	7	1969	1235	49.4	49.2	65.3	19	0	7	5	1.74	0.	13	26	1.0	2
20.0	20	20	1.79	194	1.0	2.9	7	2078	1328	45.8	45.6	67.1	20	0	7	4	1.63	0.	14	27	1.0	2
25.0	25	25	2.23	217	1.1	2.6	9	2477	1681	33.6	33.4	73.2	25	0	7	4	1.30	0.	17	32	1.1	3
30.0	30	30	2.68	238	1.2	2.4	10	2729	1916	26.6	26.4	76.7	30	0	7	3	1.12	0.	19	36	1.2	3
35.0	35	35	3.13	258	1.3	2.2	11	2903	1762	22.0	21.9	79.0	35	0	7	3	0.99	0.	22	41	1.2	
40.0	40	40	3.57	276	1.4	2.1	13	3029	1541	18.7	18.7	80.6	40	0	7	2	0.90	0.	24	45	1.3	
45.0	45	45	4.02	293	1.5	1.9	14	3124	1370	16.4	16.3	81.8	45	0	7	2	0.83	0.	27	50	1.4	
50.0	50	50	4.47	309	1.5	1.8	15	3198	1233	14.5	14.4	82.8	50	0	7	2	0.78	0.	29	54	1.5	

 # 16 1 H on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 1. ZT= 92. ZC= 93.(Np)
NEUTRON NUMBERS: NP= 0. NT=146. NC=146.

AP**1/3= 1.000 AT**1/3= 6.197
REDUCED MASS NUMBER= 1.00 AP+AT=AC=239.

INTERACTION RADIUS RINT=11.00 fm R0= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 0.56 CT= 7.16 CT+CP= 7.73 C= 0.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.32 RT= 7.30

COULOMB RADII [fm]:
RCP= 1.22 RCT= 6.98 RC=RCP+RCT= 8.20

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 20.26 MeV K= .00111 n=3.907
VC(RINT)= 12.0 MeV

FISSION-TKE= 171. MeV
ASYMM. FISSION-TKE= 7. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.868 MeV/fm**2 PROX-FACTOR= 5.69 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C=188.42 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 7.3 TARGET: 47.2
COMPOUND NUCLEUS: 49.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.19 fm V(RB)= 12.3 MeV
Q-VALUE= 5.0 MeV
L-CRITICAL= 9.

1 H on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	1	1	0.08	43	0.2	14.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	2	2	0.17	61	0.3	10.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	3	3	0.25	75	0.4	8.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	4	4	0.33	86	0.4	7.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	5	4	0.37	92	0.5	6.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	5	5	0.41	97	0.5	6.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	6	5	0.46	101	0.5	6.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	6	6	0.50	106	0.5	5.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.5	7	6	0.54	110	0.6	5.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.0	7	7	0.58	114	0.6	5.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
7.5	8	7	0.62	118	0.6	5.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.0	8	8	0.66	122	0.6	5.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
8.5	9	8	0.70	126	0.6	5.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.0	9	9	0.75	130	0.7	4.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
9.5	10	9	0.79	133	0.7	4.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
10.0	10	10	0.83	137	0.7	4.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
10.5	11	10	0.87	140	0.7	4.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
11.0	11	11	0.91	144	0.7	4.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
11.5	12	11	0.95	147	0.7	4.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
12.0	12	12	0.99	150	0.8	4.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
13.0	13	13	1.08	156	0.8	4.0	2	549	174	120.8	120.6	29.6	13	0	7	15	5.22	0.	10	19	0.8	2
14.0	14	14	1.16	162	0.8	3.9	3	878	395	99.0	98.7	40.5	14	0	7	10	3.60	0.	11	20	0.8	2
15.0	15	15	1.24	168	0.8	3.7	4	1142	586	85.0	84.7	47.5	15	0	7	8	2.92	0.	11	21	0.8	2
16.0	16	16	1.32	173	0.9	3.6	5	1362	753	74.8	74.6	52.6	16	0	7	7	2.52	0.	12	22	0.8	2
17.0	17	17	1.41	179	0.9	3.5	5	1550	900	67.0	66.8	56.5	17	0	7	7	2.25	0.	12	23	0.9	2
18.0	18	18	1.49	184	0.9	3.4	6	1713	1031	60.8	60.6	59.6	18	0	7	6	2.05	0.	13	24	0.9	2
19.0	19	19	1.57	189	0.9	3.3	6	1856	1149	55.6	55.5	62.2	19	0	7	6	1.89	0.	14	25	0.9	3
20.0	20	20	1.66	194	1.0	3.2	7	1982	1254	51.4	51.2	64.3	20	0	7	5	1.77	0.	14	26	0.9	3
25.0	25	25	2.07	217	1.1	2.9	9	2445	1655	37.2	37.1	71.4	25	0	7	4	1.38	0.	17	31	1.0	3
30.0	30	30	2.48	238	1.2	2.6	10	2739	1922	29.2	29.1	75.4	30	0	7	3	1.18	0.	19	36	1.1	4
35.0	35	35	2.90	258	1.3	2.4	11	2941	1919	24.1	24.0	77.9	35	0	7	3	1.04	0.	22	40	1.2	
40.0	40	40	3.31	276	1.4	2.3	13	3088	1679	20.5	20.4	79.7	40	0	7	3	0.94	0.	24	45	1.2	
45.0	45	45	3.73	293	1.5	2.2	14	3199	1493	17.9	17.8	81.1	45	0	7	3	0.87	0.	27	49	1.3	
50.0	50	50	4.14	309	1.5	2.0	15	3286	1343	15.8	15.7	82.1	50	0	7	2	0.81	0.	29	53	1.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 1 H

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 17 4 He on 12 C

4 He on 12 C

4 He on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 6. ZC= 8.(O)
NEUTRON NUMBERS: NP= 2. NT= 6. NC= 8.

AP**1/3= 1.587 AT**1/3= 2.289
REDUCED MASS NUMBER= 3.00 AP+AT=AC= 16.

INTERACTION RADIUS RINT= 7.30 fm RO= 1.88 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 2.12 CT+CP= 3.34 C= 0.77

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 2.52

COULOMB RADII [fm]:
RCP= 1.70 RCT= 2.51 RC=RCP+RCT= 4.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 5.69 MeV K= .04021 n=2.561
VC(RINT)= 2.4 MeV

FISSION-TKE= 25. MeV
ASYMM. FISSION-TKE= 19. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 9.23 MeV
L-RLD= 15 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 63.18 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: 0.0
COMPOUND NUCLEUS: -4.7

FUSION RELATED PARAMETERS:
R-BARRIER= 6.77 fm V(RB)= 2.2 MeV
Q-VALUE= 7.2 MeV
L-CRITICAL= 7.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	3	1.27	173	0.7	1.9	2	748	373	81.3	63.9	49.4	3	1	0	4	7.18	1.	0 0	2.3	0
2.0	8	6	2.54	244	0.9	1.3	5	1435	906	28.4	21.4	75.8	8	0	0	2	3.00	2.	0 0	2.6	0
3.0	12	9	3.81	299	1.1	1.1	7	1605	1084	17.4	13.1	81.3	12	0	0	1	2.22	3.	0 0	2.8	0
4.0	16	12	5.08	346	1.3	0.9	9	1676	1173	12.6	9.4	83.7	16	0	0	1	1.84	4.	0 0	3.1	0
4.5	18	14	5.71	367	1.4	0.9	9	1696	1076	11.0	8.3	84.5	18	0	0	1	1.71	4.	0 0	3.2	0
5.0	20	15	6.35	387	1.5	0.8	10	1712	968	9.8	7.4	85.1	20	0	0	1	1.61	5.	0 0	3.3	0
5.5	22	17	6.98	405	1.5	0.8	10	1723	880	8.9	6.6	85.6	22	0	0	1	1.52	5.	0 0	3.4	0
6.0	24	18	7.62	424	1.6	0.8	11	1732	807	8.1	6.1	86.0	24	0	0	1	1.45	6.	0 0	3.5	0
6.5	26	20	8.25	441	1.7	0.7	11	1739	745	7.4	5.6	86.3	26	0	25	1	1.38	6.	7 16	3.7	0
7.0	28	21	8.88	458	1.7	0.7	12	1745	691	6.8	5.1	86.6	28	0	26	1	1.32	7.	7 20	3.8	0
7.5	30	23	9.52	474	1.8	0.7	12	1749	645	6.4	4.8	86.8	30	0	26	1	1.27	7.	8 23	3.9	0
8.0	32	24	10.15	489	1.9	0.7	13	1753	605	5.9	4.5	87.0	32	0	27	1	1.23	8.	8 25	3.9	0
8.5	34	26	10.79	505	1.9	0.6	13	1756	569	5.6	4.2	87.2	34	0	27	1	1.19	8.	9 28	4.0	0
9.0	36	27	11.42	519	2.0	0.6	14	1758	538	5.3	3.9	87.4	36	0	27	1	1.15	9.	9 30	4.1	0
9.5	38	29	12.06	533	2.0	0.6	14	1760	509	5.0	3.7	87.5	38	0	28	1	1.12	9.	10 31	4.2	0
10.0	40	30	12.69	547	2.1	0.6	15	1762	484	4.7	3.5	87.6	40	0	28	1	1.09	10.	10 33	4.3	0
10.5	42	32	13.33	561	2.1	0.6	15	1763	461	4.5	3.4	87.8	42	0	29	1	1.06	10.	10 35	4.4	0
11.0	44	33	13.96	574	2.2	0.6	15	1764	440	4.3	3.2	87.9	44	0	29	1	1.03	11.	11 37	4.5	0
11.5	46	35	14.60	587	2.2	0.6	16	1765	421	4.1	3.1	88.0	46	0	30	1	1.01	11.	11 38	4.6	0
12.0	48	36	15.23	600	2.3	0.5	16	1765	403	3.9	2.9	88.1	48	0	30	1	0.99	12.	12 40	4.6	0
13.0	52	39	16.50	625	2.4	0.5	17	1766	372	3.6	2.7	88.2	52	0	31	1	0.94	13.	12 42	4.8	0
14.0	56	42	17.77	648	2.5	0.5	17	1767	345	3.3	2.5	88.3	56	0	32	1	0.91	14.	13 45	5.0	0
15.0	60	45	19.04	671	2.5	0.5	18	1767	322	3.1	2.3	88.5	60	0	32	1	0.88	15.	14 48	5.1	0
16.0	64	48	20.31	694	2.6	0.5	19	1767	302	2.9	2.2	88.6	64	0	33	0	0.85	16.	15 51	5.3	0
17.0	68	51	21.58	715	2.7	0.5	19	1767	284	2.7	2.0	88.6	68	0	34	0	0.82	17.	15 53	5.4	0
18.0	72	54	22.85	736	2.8	0.4	20	1766	269	2.6	1.9	88.7	72	0	34	0	0.80	18.	16 56	5.5	0
19.0	76	57	24.11	756	2.9	0.4	20	1766	254	2.4	1.8	88.8	76	0	35	0	0.77	19.	17 58	5.7	0
20.0	80	60	25.38	776	2.9	0.4	21	1765	242	2.3	1.7	88.8	80	0	36	0	0.75	20.	18 60	5.8	0
25.0	100	75	31.73	869	3.3	0.4	24	1762	193	1.8	1.4	89.1	100	0	39	0	0.67	25.	21 72	6.4	0
30.0	120	90	38.08	953	3.6	0.3	26	1759	161	1.5	1.1	89.2	120	0	42	0	0.61	30.	25 82	7.0	0
35.0	140	105	44.42	1031	3.9	0.3	28	1756	138	1.3	1.0	89.3	140	0	45	0	0.56	35.	28 92	7.5	
40.0	160	120	50.77	1104	4.1	0.3	30	1753	121	1.1	0.9	89.4	160	0	48	0	0.53	40.	31 102	8.0	
45.0	180	135	57.11	1172	4.4	0.3	32	1750	107	1.0	0.8	89.5	180	0	50	0	0.50	45.	35 111	8.4	
50.0	200	150	63.46	1237	4.6	0.3	34	1747	96	0.9	0.7	89.5	200	0	53	0	0.47	50.	38 120	8.9	

 # 18 4 He on 16 O

4 He on 16 O

4 He on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 8. ZC= 10.(Ne)
NEUTRON NUMBERS: NP= 2. NT= 8. NC= 10.

AP**1/3= 1.587 AT**1/3= 2.520
REDUCED MASS NUMBER= 3.20 AP+AT=AC= 20.

INTERACTION RADIUS RINT= 7.55 fm RO= 1.84 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 2.42 CT+CP= 3.64 C= 0.81

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 2.78

COULOMB RADII [fm]:
RCP= 1.70 RCT= 2.78 RC=RCP+RCT= 4.48

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 7.08 MeV K= .03752 n=2.633
VC(RINT)= 3.0 MeV

FISSION-TKE= 26. MeV
ASYMM. FISSION-TKE= 17. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 9.67 MeV
L-RLD= 20 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 59.26 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -4.7
COMPOUND NUCLEUS: -9.4

FUSION RELATED PARAMETERS:
R-BARRIER= 6.99 fm V(RB)= 2.9 MeV
Q-VALUE= 7.1 MeV
L-CRITICAL= 8.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	3	1.05	173	0.7	2.5	1	295	138	131.1	118.4	24.4	2	2	0	11	15.77	1.	0 0	2.0	0
2.0	8	6	2.10	244	1.0	1.8	5	1317	837	36.5	29.4	71.8	7	1	0	2	3.34	2.	0 0	2.3	0
3.0	12	10	3.15	299	1.2	1.5	8	1568	1070	21.8	17.5	79.1	12	0	0	2	2.39	2.	0 0	2.6	0
4.0	16	13	4.20	346	1.4	1.3	9	1677	1186	15.5	12.5	82.2	16	0	0	1	1.96	3.	0 0	2.8	0
4.5	18	14	4.73	367	1.5	1.2	10	1711	1225	13.6	10.9	83.2	18	0	0	1	1.81	3.	0 0	2.9	1
5.0	20	16	5.25	387	1.6	1.1	11	1736	1144	12.1	9.7	84.0	20	0	0	1	1.70	4.	0 0	3.0	1
5.5	22	18	5.78	405	1.6	1.1	11	1756	1040	10.9	8.7	84.6	22	0	21	1	1.60	4.	6 14	3.1	1
6.0	24	19	6.30	424	1.7	1.0	12	1772	953	9.9	7.9	85.1	24	0	21	1	1.52	5.	6 18	3.2	1
6.5	26	21	6.83	441	1.8	1.0	12	1785	880	9.1	7.3	85.5	26	0	22	1	1.45	5.	7 20	3.3	1
7.0	28	22	7.35	458	1.9	1.0	13	1796	817	8.4	6.7	85.8	28	0	22	1	1.39	5.	7 23	3.4	1
7.5	30	24	7.88	474	1.9	0.9	14	1805	762	7.8	6.2	86.1	30	0	23	1	1.33	6.	8 25	3.5	1
8.0	32	26	8.40	489	2.0	0.9	14	1812	715	7.3	5.8	86.4	32	0	23	1	1.29	6.	8 26	3.6	1
8.5	34	27	8.93	505	2.0	0.9	15	1818	673	6.8	5.4	86.6	34	0	23	1	1.24	6.	8 28	3.7	1
9.0	36	29	9.46	519	2.1	0.8	15	1824	635	6.4	5.1	86.8	36	0	24	1	1.20	7.	9 30	3.8	1
9.5	38	30	9.98	533	2.2	0.8	15	1828	602	6.1	4.8	87.0	38	0	24	1	1.17	7.	9 31	3.9	1
10.0	40	32	10.51	547	2.2	0.8	16	1832	572	5.7	4.6	87.1	40	0	24	1	1.14	8.	10 33	4.0	1
10.5	42	34	11.03	561	2.3	0.8	16	1835	544	5.4	4.4	87.3	42	0	25	1	1.11	8.	10 34	4.0	2
11.0	44	35	11.56	574	2.3	0.8	17	1838	520	5.2	4.2	87.4	44	0	25	1	1.08	8.	10 36	4.1	2
11.5	46	37	12.08	587	2.4	0.7	17	1841	497	5.0	4.0	87.5	46	0	25	1	1.05	8.	11 37	4.2	2
12.0	48	38	12.61	600	2.4	0.7	18	1843	476	4.7	3.8	87.6	48	0	25	1	1.03	9.	11 39	4.3	2
13.0	52	42	13.66	625	2.5	0.7	18	1847	440	4.4	3.5	87.8	52	0	26	1	0.98	9.	12 41	4.4	2
14.0	56	45	14.71	648	2.6	0.7	19	1850	408	4.0	3.2	88.0	56	0	27	1	0.95	10.	12 44	4.6	2
15.0	60	48	15.76	671	2.7	0.7	20	1852	381	3.8	3.0	88.1	60	0	27	1	0.91	11.	13 46	4.7	2
16.0	64	51	16.81	694	2.8	0.6	21	1854	357	3.5	2.8	88.2	64	0	28	1	0.88	12.	14 49	4.8	2
17.0	68	54	17.86	715	2.9	0.6	21	1856	336	3.3	2.6	88.3	68	0	28	1	0.85	12.	15 51	5.0	2
18.0	72	58	18.91	736	3.0	0.6	22	1857	317	3.1	2.5	88.4	72	0	29	1	0.83	13.	15 53	5.1	2
19.0	76	61	19.96	756	3.1	0.6	22	1858	301	2.9	2.4	88.5	76	0	29	1	0.80	14.	16 55	5.2	2
20.0	80	64	21.01	776	3.1	0.6	23	1858	286	2.8	2.2	88.6	80	0	30	1	0.78	14.	17 58	5.3	2
25.0	100	80	26.26	869	3.5	0.5	26	1860	228	2.2	1.8	88.9	100	0	32	1	0.70	17.	20 68	5.9	3
30.0	120	96	31.52	953	3.8	0.5	28	1860	190	1.8	1.5	89.1	120	0	34	0	0.63	20.	23 78	6.4	3
35.0	140	112	36.77	1031	4.1	0.4	31	1859	163	1.6	1.3	89.2	140	0	36	0	0.59	22.	27 87	6.9	
40.0	160	128	42.02	1104	4.4	0.4	33	1857	143	1.4	1.1	89.3	160	0	38	0	0.55	26.	30 96	7.4	
45.0	180	144	47.28	1172	4.7	0.4	35	1856	127	1.2	1.0	89.4	180	0	40	0	0.51	29.	33 105	7.8	
50.0	200	160	52.53	1237	4.9	0.4	37	1855	114	1.1	0.9	89.4	200	0	42	0	0.49	30.	36 114	8.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 19 4 He on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 13. ZC= 15.(P)
NEUTRON NUMBERS: NP= 2. NT= 14. NC= 16.

AP**1/3= 1.587 AT**1/3= 3.000
REDUCED MASS NUMBER= 3.48 AP+AT=AC= 31.

INTERACTION RADIUS RINT= 8.08 fm RO= 1.76 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 3.05 CT+CP= 4.26 C= 0.87

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 3.35

COULOMB RADII [fm]:
RCP= 1.70 RCT= 3.32 RC=RCP+RCT= 5.02

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 10.12 MeV K= .02983 n=2.785
VC(RINT)= 4.6 MeV

FISSION-TKE= 30. MeV
ASYMM. FISSION-TKE= 14. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.950 MeV/fm**2 PROX-FACTOR= 10.36 MeV
L-RLD= 31 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 54.45 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -20.6
COMPOUND NUCLEUS: -23.8

FUSION RELATED PARAMETERS:
R-BARRIER= 7.46 fm V(RB)= 4.5 MeV
Q-VALUE= 5.6 MeV
L-CRITICAL= 11.

4 He on 27 Al

4 He on 27 Al

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	3	0.75	173	0.8	4.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	8	7	1.51	244	1.1	2.9	5	987	615	59.7	53.0	60.1	7	1	0	5	4.46	1. 0	0	1.8	0
3.0	12	10	2.26	299	1.3	2.4	8	1447	992	33.1	29.0	73.5	12	0	0	3	2.83	1. 0	0	2.0	1
4.0	16	14	3.01	346	1.5	2.0	10	1655	1181	23.0	20.1	78.5	16	0	16	3	2.24	2. 4	7	2.2	1
4.5	18	16	3.39	367	1.6	1.9	11	1720	1244	20.0	17.4	80.0	18	0	16	2	2.05	2. 5	13	2.3	1
5.0	20	17	3.76	387	1.7	1.8	12	1771	1294	17.6	15.4	81.2	20	0	16	2	1.91	2. 5	15	2.4	1
5.5	22	19	4.14	405	1.8	1.7	13	1812	1335	15.8	13.8	82.1	22	0	16	2	1.79	3. 6	17	2.5	1
6.0	24	21	4.52	424	1.9	1.7	13	1845	1349	14.3	12.5	82.8	24	0	17	2	1.69	3. 6	19	2.6	1
6.5	26	23	4.89	441	1.9	1.6	14	1873	1265	13.1	11.4	83.5	26	0	17	2	1.61	3. 6	21	2.7	1
7.0	28	24	5.27	458	2.0	1.5	15	1896	1156	12.1	10.5	84.0	28	0	17	2	1.53	3. 7	22	2.8	2
7.5	30	26	5.65	474	2.1	1.5	15	1915	1079	11.2	9.7	84.4	30	0	17	2	1.47	4. 7	24	2.9	2
8.0	32	28	6.02	489	2.2	1.4	16	1932	1012	10.4	9.1	84.8	32	0	18	2	1.41	4. 7	25	2.9	2
8.5	34	30	6.40	505	2.2	1.4	16	1946	952	9.7	8.5	85.1	34	0	18	2	1.36	4. 8	27	3.0	2
9.0	36	31	6.78	519	2.3	1.4	17	1959	899	9.2	8.0	85.4	36	0	18	1	1.32	4. 8	28	3.1	2
9.5	38	33	7.15	533	2.3	1.3	18	1970	852	8.6	7.5	85.7	38	0	18	1	1.28	5. 8	29	3.2	2
10.0	40	35	7.53	547	2.4	1.3	18	1980	809	8.2	7.1	85.9	40	0	18	1	1.24	5. 9	31	3.2	2
10.5	42	37	7.91	561	2.5	1.3	19	1988	771	7.8	6.8	86.1	42	0	18	1	1.21	5. 9	32	3.3	2
11.0	44	38	8.28	574	2.5	1.2	19	1996	736	7.4	6.4	86.3	44	0	19	1	1.17	5. 9	33	3.4	2
11.5	46	40	8.66	587	2.6	1.2	20	2003	704	7.0	6.1	86.5	46	0	19	1	1.15	6. 10	34	3.4	2
12.0	48	42	9.03	600	2.6	1.2	20	2009	674	6.7	5.9	86.6	48	0	19	1	1.12	6. 10	35	3.5	2
13.0	52	45	9.79	625	2.7	1.1	21	2020	622	6.2	5.4	86.9	52	0	19	1	1.07	6. 11	37	3.6	2
14.0	56	49	10.54	648	2.9	1.1	22	2029	578	5.7	5.0	87.1	56	0	20	1	1.03	7. 11	40	3.7	2
15.0	60	52	11.29	671	3.0	1.1	23	2037	539	5.3	4.6	87.3	60	0	20	1	0.99	7. 12	42	3.9	3
16.0	64	56	12.05	694	3.0	1.0	24	2043	506	5.0	4.3	87.5	64	0	20	1	0.95	7. 13	44	4.0	3
17.0	68	59	12.80	715	3.1	1.0	24	2049	476	4.7	4.1	87.7	68	0	21	1	0.92	8. 13	46	4.1	3
18.0	72	63	13.55	736	3.2	1.0	25	2053	449	4.4	3.8	87.8	72	0	21	1	0.89	8. 14	48	4.2	3
19.0	76	66	14.30	756	3.3	0.9	26	2058	426	4.2	3.6	87.9	76	0	21	1	0.87	9. 15	50	4.3	3
20.0	80	70	15.06	776	3.4	0.9	27	2061	404	3.9	3.4	88.0	80	0	21	1	0.85	9. 15	52	4.4	3
25.0	100	87	18.82	869	3.8	0.8	30	2074	323	3.1	2.7	88.4	100	0	23	1	0.75	11. 18	61	4.9	4
30.0	120	105	22.59	953	4.2	0.7	33	2081	269	2.6	2.3	88.7	120	0	24	1	0.68	13. 21	70	5.3	4
35.0	140	122	26.35	1031	4.5	0.7	36	2085	231	2.2	1.9	88.9	140	0	25	1	0.63	15. 25	78	5.7	
40.0	160	139	30.11	1104	4.8	0.6	38	2088	202	1.9	1.7	89.0	160	0	26	1	0.59	17. 28	86	6.1	
45.0	180	157	33.88	1172	5.1	0.6	41	2089	179	1.7	1.5	89.1	180	0	27	1	0.55	19. 31	94	6.5	
50.0	200	174	37.64	1237	5.4	0.6	43	2090	161	1.5	1.3	89.2	200	0	28	1	0.52	21. 34	102	6.8	

 # 20 4 He on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 20. ZC= 22.(Ti)
NEUTRON NUMBERS: NP= 2. NT= 20. NC= 22.

AP**1/3= 1.587 AT**1/3= 3.420
REDUCED MASS NUMBER= 3.64 AP+AT=AC= 44.

INTERACTION RADIUS RINT= 8.54 fm RO= 1.71 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 3.59 CT+CP= 4.80 C= 0.91

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 3.85

COULOMB RADII [fm]:
RCP= 1.70 RCT= 3.84 RC=RCP+RCT= 5.54

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 13.87 MeV K= .02140 n=2.975
VC(RINT)= 6.7 MeV

FISSION-TKE= 37. MeV
ASYMM. FISSION-TKE= 12. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 10.84 MeV
L-RLD= 43 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 52.17 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -33.0
COMPOUND NUCLEUS: -38.2

FUSION RELATED PARAMETERS:
R-BARRIER= 7.86 fm V(RB)= 6.7 MeV
Q-VALUE= 7.6 MeV
L-CRITICAL= 14.

4 He on 40 Ca

4 He on 40 Ca

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	4	0.54	173	0.8	6.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	8	7	1.08	244	1.1	4.5	3	319	156	119.7	114.5	30.1	6	2	0	16	10.14	1. 0	0	1.6	0
3.0	12	11	1.62	299	1.4	3.6	7	1131	750	53.2	48.9	63.4	11	1	0	6	3.61	1. 0	0	1.8	0
4.0	16	15	2.16	346	1.6	3.1	10	1487	1047	35.1	32.1	72.4	16	0	13	4	2.64	1. 4	11	2.0	1
4.5	18	16	2.43	367	1.7	3.0	11	1601	1146	30.1	27.5	75.0	18	0	13	4	2.37	2. 4	14	2.1	1
5.0	20	18	2.70	387	1.8	2.8	12	1690	1226	26.3	24.0	76.8	20	0	14	4	2.18	2. 5	15	2.2	1
5.5	22	20	2.97	405	1.9	2.7	13	1761	1290	23.4	21.3	78.3	22	0	14	3	2.02	2. 5	17	2.2	1
6.0	24	22	3.24	424	1.9	2.6	14	1819	1344	21.1	19.2	79.5	24	0	14	3	1.90	2. 6	18	2.3	1
6.5	26	24	3.51	441	2.0	2.5	15	1868	1390	19.2	17.4	80.4	26	0	14	3	1.79	2. 6	20	2.4	1
7.0	28	25	3.78	458	2.1	2.4	15	1909	1429	17.6	16.0	81.2	28	0	14	3	1.70	2. 6	21	2.5	1
7.5	30	27	4.05	474	2.2	2.3	16	1944	1418	16.2	14.8	81.9	30	0	15	3	1.62	3. 7	22	2.5	1
8.0	32	29	4.32	489	2.2	2.2	17	1974	1330	15.1	13.7	82.5	32	0	15	3	1.56	3. 7	24	2.6	2
8.5	34	31	4.59	505	2.3	2.2	18	2001	1251	14.1	12.8	83.0	34	0	15	2	1.50	3. 7	25	2.6	2
9.0	36	33	4.86	519	2.4	2.1	18	2024	1182	13.2	12.0	83.4	36	0	15	2	1.44	3. 8	26	2.7	2
9.5	38	35	5.13	533	2.5	2.0	19	2044	1120	12.4	11.3	83.8	38	0	15	2	1.40	3. 8	27	2.8	2
10.0	40	36	5.40	547	2.5	2.0	19	2063	1064	11.7	10.7	84.1	40	0	15	2	1.35	3. 8	28	2.8	2
10.5	42	38	5.67	561	2.6	1.9	20	2079	1013	11.1	10.1	84.4	42	0	15	2	1.31	4. 9	29	2.9	2
11.0	44	40	5.94	574	2.6	1.9	21	2094	967	10.6	9.6	84.7	44	0	15	2	1.28	4. 9	30	2.9	2
11.5	46	42	6.21	587	2.7	1.9	21	2107	925	10.1	9.2	85.0	46	0	16	2	1.24	4. 9	31	3.0	2
12.0	48	44	6.48	600	2.8	1.8	22	2119	886	9.6	8.7	85.2	48	0	16	2	1.21	4. 9	32	3.1	2
13.0	52	47	7.02	625	2.9	1.7	23	2140	818	8.8	8.0	85.6	52	0	16	2	1.16	5. 10	34	3.2	2
14.0	56	51	7.56	648	3.0	1.7	24	2158	760	8.1	7.4	85.9	56	0	16	2	1.11	5. 11	36	3.3	2
15.0	60	55	8.10	671	3.1	1.6	25	2173	709	7.6	6.9	86.2	60	0	16	2	1.06	5. 11	38	3.4	3
16.0	64	58	8.64	694	3.2	1.6	26	2186	665	7.1	6.4	86.5	64	0	16	2	1.03	5. 12	40	3.5	3
17.0	68	62	9.18	715	3.3	1.5	26	2198	625	6.6	6.0	86.7	68	0	17	2	0.99	6. 13	42	3.6	3
18.0	72	65	9.72	736	3.4	1.5	27	2207	591	6.2	5.7	86.9	72	0	17	2	0.96	6. 13	44	3.6	3
19.0	76	69	10.26	756	3.5	1.4	28	2216	560	5.9	5.3	87.1	76	0	17	2	0.93	6. 14	45	3.7	3
20.0	80	73	10.80	776	3.6	1.4	29	2224	532	5.6	5.1	87.2	80	0	17	1	0.91	7. 14	47	3.8	3
25.0	100	91	13.49	869	4.0	1.3	33	2252	425	4.4	4.0	87.8	100	0	18	1	0.80	8. 17	56	4.2	4
30.0	120	109	16.19	953	4.4	1.1	36	2269	354	3.7	3.3	88.2	120	0	19	1	0.73	10. 20	64	4.6	5
35.0	140	127	18.89	1031	4.7	1.1	39	2281	304	3.1	2.8	88.4	140	0	19	1	0.67	11. 23	71	5.0	
40.0	160	145	21.59	1104	5.0	1.0	42	2289	266	2.7	2.5	88.6	160	0	20	1	0.63	13. 26	79	5.3	
45.0	180	164	24.29	1172	5.3	0.9	45	2295	236	2.4	2.2	88.8	180	0	21	1	0.59	14. 29	86	5.6	
50.0	200	182	26.99	1237	5.6	0.9	47	2300	212	2.2	2.0	88.9	200	0	21	1	0.56	15. 32	93	5.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	des	des	des	MeV	MeV	MeV	—	nps	MeV	MeV	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 21 4 He on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 26. ZC= 28.(Ni)
NEUTRON NUMBERS: NP= 2. NT= 30. NC= 32.

AP**1/3= 1.587 AT**1/3= 3.826
REDUCED MASS NUMBER= 3.73 AP+AT=AC= 60.

INTERACTION RADIUS RINT= 8.98 fm R0= 1.66 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 4.12 CT+CP= 5.33 C= 0.94

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 4.35

COULOMB RADII [fm]:
RCP= 1.70 RCT= 4.27 RC=RCP+RCT= 5.97

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 16.59 MeV K= .01672 n=3.075
VC(RINT)= 8.3 MeV

FISSION-TKE= 44. MeV
ASYMM. FISSION-TKE= 12. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 11.11 MeV
L-RLD= 59 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 50.82 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -61.4
COMPOUND NUCLEUS: -65.5

FUSION RELATED PARAMETERS:
R-BARRIER= 8.26 fm V(RB)= 8.3 MeV
Q-VALUE= 6.6 MeV
L-CRITICAL= 16.

4 He on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	4	4	0.45	173	0.8	8.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	7	0.90	244	1.2	5.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	11	1.34	299	1.4	4.7	6	865	557	72.7	68.9	53.6	11	1	0	9	4.64	1.	0	1.5	1
4.0	16	15	1.79	346	1.6	4.1	10	1360	953	45.6	42.8	67.2	15	1	12	6	3.05	1.	4	1.7	1
4.5	18	17	2.02	367	1.7	3.9	11	1518	1065	38.5	36.1	70.7	18	0	12	5	2.70	1.	4	1.8	1
5.0	20	19	2.24	387	1.8	3.7	12	1641	1191	33.4	31.3	73.3	20	0	13	5	2.44	1.	5	1.8	2
5.5	22	21	2.47	405	1.9	3.5	13	1740	1278	29.5	27.6	75.2	22	0	13	5	2.25	1.	5	1.9	2
6.0	24	22	2.69	424	2.0	3.3	14	1822	1350	26.4	24.7	76.8	24	0	13	4	2.09	2.	5	2.0	2
6.5	26	24	2.91	441	2.1	3.2	15	1890	1411	23.9	22.4	78.0	26	0	13	4	1.97	2.	6	2.0	2
7.0	28	26	3.14	458	2.2	3.1	16	1947	1463	21.9	20.5	79.1	28	0	13	4	1.86	2.	6	2.1	2
7.5	30	28	3.36	474	2.2	3.0	17	1997	1508	20.1	18.8	79.9	30	0	13	4	1.77	2.	6	2.1	2
8.0	32	30	3.59	489	2.3	2.9	18	2039	1548	18.7	17.4	80.7	32	0	13	3	1.69	2.	7	2.2	2
8.5	34	32	3.81	505	2.4	2.8	18	2077	1583	17.4	16.3	81.3	34	0	13	3	1.62	2.	7	2.3	2
9.0	36	34	4.03	519	2.4	2.7	19	2110	1531	16.3	15.2	81.9	36	0	13	3	1.56	2.	7	2.3	2
9.5	38	35	4.26	533	2.5	2.7	20	2139	1451	15.3	14.3	82.3	38	0	14	3	1.51	2.	8	2.4	2
10.0	40	37	4.48	547	2.6	2.6	20	2165	1378	14.4	13.5	82.8	40	0	14	3	1.46	3.	8	2.4	3
10.5	42	39	4.71	561	2.6	2.5	21	2188	1312	13.7	12.8	83.2	42	0	14	3	1.41	3.	8	2.5	3
11.0	44	41	4.93	574	2.7	2.5	22	2209	1253	13.0	12.1	83.5	44	0	14	3	1.37	3.	8	2.5	3
11.5	46	43	5.16	587	2.8	2.4	22	2228	1198	12.3	11.5	83.8	46	0	14	3	1.33	3.	9	2.6	3
12.0	48	45	5.38	600	2.8	2.4	23	2246	1148	11.8	11.0	84.1	48	0	14	3	1.30	3.	9	2.6	3
13.0	52	49	5.83	625	2.9	2.3	24	2276	1060	10.8	10.1	84.6	52	0	14	2	1.24	3.	10	2.7	3
14.0	56	52	6.28	648	3.1	2.2	25	2302	984	9.9	9.3	85.0	56	0	14	2	1.18	3.	10	2.8	4
15.0	60	56	6.72	671	3.2	2.1	26	2324	919	9.2	8.6	85.4	60	0	14	2	1.14	4.	11	2.9	4
16.0	64	60	7.17	694	3.3	2.0	27	2343	861	8.6	8.0	85.7	64	0	15	2	1.09	4.	11	3.0	4
17.0	68	63	7.62	715	3.4	2.0	28	2359	810	8.1	7.5	86.0	68	0	15	2	1.06	4.	12	3.1	4
18.0	72	67	8.07	736	3.5	1.9	29	2374	765	7.6	7.1	86.2	72	0	15	2	1.02	4.	13	3.1	4
19.0	76	71	8.52	756	3.6	1.9	30	2387	725	7.2	6.7	86.4	76	0	15	2	0.99	5.	13	3.2	4
20.0	80	75	8.97	776	3.7	1.8	31	2398	689	6.8	6.3	86.6	80	0	15	2	0.96	5.	14	3.3	5
25.0	100	93	11.21	869	4.1	1.6	35	2441	551	5.4	5.0	87.3	100	0	16	2	0.85	6.	17	3.6	5
30.0	120	112	13.45	953	4.5	1.5	39	2468	459	4.4	4.1	87.8	120	0	16	2	0.77	7.	20	4.0	6
35.0	140	131	15.69	1031	4.8	1.4	42	2486	393	3.8	3.5	88.1	140	0	17	1	0.71	8.	22	4.3	
40.0	160	149	17.93	1104	5.2	1.3	45	2499	344	3.3	3.1	88.4	160	0	17	1	0.66	9.	25	4.6	
45.0	180	168	20.17	1172	5.5	1.2	48	2509	306	2.9	2.7	88.5	180	0	17	1	0.62	10.	28	4.8	
50.0	200	187	22.42	1237	5.8	1.2	51	2517	275	2.6	2.4	88.7	200	0	18	1	0.59	11.	31	5.1	

 # 22 4 He on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 29. ZC= 31.(Ga)
NEUTRON NUMBERS: NP= 2. NT= 34. NC= 36.

AP**1/3= 1.587 AT**1/3= 3.979
REDUCED MASS NUMBER= 3.76 AP+AT=AC= 67.

INTERACTION RADIUS RINT= 9.15 fm R0= 1.64 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 4.31 CT+CP= 5.53 C= 0.95

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 4.53

COULOMB RADII [fm]:
RCP= 1.70 RCT= 4.45 RC=RCP+RCT= 6.15

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 17.91 MeV K= .01485 n=3.127
VC(RINT)= 9.1 MeV

FISSION-TKE= 48. MeV
ASYMM. FISSION-TKE= 11. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 11.21 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 50.44 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -65.2
COMPOUND NUCLEUS: -66.1

FUSION RELATED PARAMETERS:
R-BARRIER= 8.41 fm V(RB)= 9.1 MeV
Q-VALUE= 3.4 MeV
L-CRITICAL= 17.

4 He on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	4	4	0.41	173	0.8	9.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.82	244	1.2	6.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	11	1.24	299	1.4	5.3	6	693	431	85.6	82.0	47.2	11	1	0	12	5.47	1.	0	1.3	1
4.0	16	15	1.65	346	1.6	4.6	9	1264	878	51.7	48.9	64.2	15	1	12	7	3.30	1.	4	1.5	1
4.5	18	17	1.86	367	1.7	4.3	11	1444	1027	43.4	41.0	68.3	17	1	12	6	2.87	1.	4	1.6	1
5.0	20	19	2.06	387	1.8	4.1	12	1585	1147	37.4	35.3	71.3	20	0	12	6	2.58	1.	5	1.6	1
5.5	22	21	2.27	405	1.9	3.9	13	1699	1244	32.9	31.0	73.5	22	0	12	5	2.36	1.	5	1.7	1
6.0	24	23	2.47	424	2.0	3.7	14	1793	1326	29.4	27.7	75.3	24	0	13	5	2.19	1.	5	1.8	2
6.5	26	24	2.68	441	2.1	3.6	15	1871	1394	26.5	25.0	76.7	26	0	13	5	2.05	2.	6	1.8	2
7.0	28	26	2.89	458	2.2	3.5	16	1937	1453	24.2	22.8	77.9	28	0	13	4	1.93	2.	6	1.9	2
7.5	30	28	3.09	474	2.3	3.3	17	1993	1505	22.3	21.0	78.9	30	0	13	4	1.84	2.	6	2.0	2
8.0	32	30	3.30	489	2.3	3.2	18	2042	1549	20.6	19.4	79.7	32	0	13	4	1.75	2.	7	2.1	2
8.5	34	32	3.51	505	2.4	3.1	19	2085	1589	19.2	18.1	80.4	34	0	13	4	1.68	2.	7	2.1	2
9.0	36	34	3.71	519	2.5	3.0	19	2123	1624	17.9	16.9	81.0	36	0	13	4	1.61	2.	7	2.1	2
9.5	38	36	3.92	533	2.5	3.0	20	2157	1586	16.8	15.9	81.6	38	0	13	3	1.56	2.	7	2.2	2
10.0	40	38	4.12	547	2.6	2.9	21	2187	1507	15.9	14.9	82.1	40	0	13	3	1.50	2.	8	2.2	2
10.5	42	39	4.33	561	2.7	2.8	21	2214	1435	15.0	14.1	82.5	42	0	13	3	1.46	2.	8	2.3	3
11.0	44	41	4.54	574	2.7	2.8	22	2238	1370	14.2	13.4	82.9	44	0	13	3	1.41	3.	8	2.3	3
11.5	46	43	4.74	587	2.8	2.7	23	2260	1310	13.6	12.8	83.2	46	0	14	3	1.37	3.	9	2.4	3
12.0	48	45	4.95	600	2.8	2.6	23	2280	1255	12.9	12.2	83.5	48	0	14	3	1.34	3.	9	2.4	3
13.0	52	49	5.36	625	3.0	2.5	24	2316	1159	11.8	11.1	84.1	52	0	14	3	1.27	3.	10	2.5	3
14.0	56	53	5.77	648	3.1	2.4	26	2345	1076	10.9	10.2	84.6	56	0	14	3	1.22	3.	10	2.6	3
15.0	60	56	6.19	671	3.2	2.4	27	2371	1004	10.1	9.5	84.9	60	0	14	3	1.17	3.	11	2.7	4
16.0	64	60	6.60	694	3.3	2.3	28	2393	941	9.4	8.9	85.3	64	0	14	2	1.12	4.	11	2.8	4
17.0	68	64	7.01	715	3.4	2.2	29	2412	886	8.8	8.3	85.6	68	0	14	2	1.08	4.	12	2.8	4
18.0	72	68	7.42	736	3.5	2.2	30	2429	837	8.3	7.8	85.9	72	0	14	2	1.05	4.	13	2.9	4
19.0	76	71	7.84	756	3.6	2.1	31	2444	793	7.8	7.4	86.1	76	0	14	2	1.02	4.	13	3.0	4
20.0	80	75	8.25	776	3.7	2.0	32	2458	753	7.4	7.0	86.3	80	0	15	2	0.99	4.	14	3.1	5
25.0	100	94	10.31	869	4.1	1.8	36	2507	602	5.9	5.5	87.1	100	0	15	2	0.87	5.	17	3.4	6
30.0	120	113	12.37	953	4.5	1.7	40	2539	502	4.8	4.5	87.6	120	0	16	2	0.79	7.	19	3.7	6
35.0	140	132	14.44	1031	4.9	1.5	43	2561	430	4.1	3.9	87.9	140	0	16	2	0.72	7.	22	4.0	
40.0	160	150	16.50	1104	5.2	1.4	46	2577	376	3.6	3.4	88.2	160	0	16	1	0.67	8.	25	4.3	
45.0	180	169	18.56	1172	5.5	1.4	49	2589	334	3.2	3.0	88.4	180	0	17	1	0.63	9.	28	4.5	
50.0	200	188	20.62	1237	5.8	1.3	52	2598	301	2.9	2.7	88.6	200	0	17	1	0.60	10.	31	4.8	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 23 4 He on 92 Mo

4 He on 92 Mo

4 He on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 42. ZC= 44.(Ru)
NEUTRON NUMBERS: NP= 2. NT= 50. NC= 52.

AP**1/3= 1.587 AT**1/3= 4.514
REDUCED MASS NUMBER= 3.83 AP+AT=AC= 96.

INTERACTION RADIUS RINT= 9.73 fm R0= 1.59 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 5.00 CT+CP= 6.22 C̄= 0.98

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 5.20

COULOMB RADII [fm]:
RCP= 1.70 RCT= 5.08 RC=RCP+RCT= 6.78

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 23.19 MeV K= .00930 n=3.322
VC(RINT)= 12.4 MeV

FISSION-TKE= 67. MeV
ASYMM. FISSION-TKE= 12. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.940 MeV/fm**2 PROX-FACTOR= 11.53 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 49.48 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -87.5
COMPOUND NUCLEUS: -86.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.93 fm V(RB)= 12.5 MeV
Q-VALUE= 1.2 MeV
L-CRITICAL= 20.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	4	0.31	173	0.8	13.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.62	244	1.2	9.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	12	0.93	299	1.5	7.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	16	15	1.23	346	1.7	6.6	7	732	468	86.0	83.5	47.0	15	1	11	15	5.06	1.	4	1.2	1
4.5	18	17	1.39	367	1.8	6.2	9	1021	694	68.6	66.3	55.7	17	1	12	12	3.92	1.	4	1.2	1
5.0	20	19	1.54	387	1.9	5.9	11	1246	875	57.4	55.3	61.3	19	1	12	10	3.32	1.	4	1.3	1
5.5	22	21	1.70	405	2.0	5.6	12	1427	1023	49.4	47.6	65.3	21	1	12	9	2.93	1.	5	1.4	1
6.0	24	23	1.85	424	2.1	5.4	14	1575	1147	43.5	41.8	68.3	23	1	12	8	2.65	1.	5	1.5	2
6.5	26	25	2.01	441	2.1	5.2	15	1698	1251	38.8	37.3	70.6	26	0	12	7	2.44	1.	5	1.6	2
7.0	28	27	2.16	458	2.2	5.0	16	1803	1341	35.1	33.7	72.4	28	0	12	7	2.27	1.	6	1.7	2
7.5	30	29	2.32	474	2.3	4.8	17	1893	1418	32.0	30.8	74.0	30	0	13	6	2.13	1.	6	1.8	2
8.0	32	31	2.47	489	2.4	4.7	18	1972	1486	29.5	28.3	75.3	32	0	13	6	2.02	1.	6	1.9	2
8.5	34	33	2.62	505	2.4	4.5	19	2040	1546	27.3	26.2	76.4	34	0	13	6	1.92	1.	7	2.0	2
9.0	36	35	2.78	519	2.5	4.4	20	2100	1599	25.4	24.4	77.3	36	0	13	6	1.83	1.	7	2.1	2
9.5	38	36	2.93	533	2.6	4.3	20	2154	1647	23.8	22.8	78.1	38	0	13	5	1.76	2.	7	2.2	2
10.0	40	38	3.09	547	2.7	4.2	21	2202	1690	22.3	21.4	78.8	40	0	13	5	1.69	2.	8	2.3	2
10.5	42	40	3.24	561	2.7	4.1	22	2245	1729	21.1	20.2	79.5	42	0	13	5	1.63	2.	8	2.4	3
11.0	44	42	3.40	574	2.8	4.0	23	2285	1764	19.9	19.1	80.0	44	0	13	5	1.58	2.	8	2.5	3
11.5	46	44	3.55	587	2.8	3.9	23	2320	1749	18.9	18.1	80.6	46	0	13	5	1.53	2.	8	2.6	3
12.0	48	46	3.70	600	2.9	3.8	24	2352	1676	18.0	17.2	81.0	48	0	13	4	1.49	2.	9	2.7	3
13.0	52	50	4.01	625	3.0	3.7	25	2409	1547	16.4	15.7	81.8	52	0	13	4	1.41	2.	9	2.8	3
14.0	56	54	4.32	648	3.1	3.5	27	2458	1437	15.1	14.4	82.5	56	0	13	4	1.34	2.	10	3.0	3
15.0	60	58	4.63	671	3.2	3.4	28	2499	1341	13.9	13.4	83.0	60	0	13	4	1.28	2.	10	3.1	4
16.0	64	61	4.94	694	3.4	3.3	29	2535	1257	13.0	12.4	83.5	64	0	14	4	1.23	3.	11	3.3	4
17.0	68	65	5.25	715	3.5	3.2	30	2567	1183	12.1	11.6	83.9	68	0	14	4	1.19	3.	12	3.4	4
18.0	72	69	5.56	736	3.6	3.1	31	2595	1117	11.4	10.9	84.3	72	0	14	3	1.14	3.	12	3.6	4
19.0	76	73	5.87	756	3.7	3.0	32	2620	1059	10.7	10.3	84.6	76	0	14	3	1.11	3.	13	3.7	4
20.0	80	77	6.17	776	3.7	3.0	33	2642	1006	10.1	9.7	84.9	80	0	14	3	1.07	3.	13	3.9	5
25.0	100	96	7.72	869	4.2	2.6	38	2725	804	8.0	7.6	86.0	100	0	14	3	0.94	4.	16	4.6	6
30.0	120	115	9.26	953	4.6	2.4	42	2778	670	6.6	6.3	86.7	120	0	14	3	0.85	5.	19	5.3	7
35.0	140	134	10.80	1031	5.0	2.2	46	2816	574	5.6	5.3	87.2	140	0	15	2	0.78	5.	22	5.9	3.4
40.0	160	153	12.35	1104	5.3	2.1	49	2843	503	4.8	4.6	87.6	160	0	15	2	0.73	6.	24	6.5	3.6
45.0	180	173	13.89	1172	5.6	2.0	53	2864	447	4.3	4.1	87.9	180	0	15	2	0.68	7.	27	7.2	3.8
50.0	200	192	15.43	1237	5.9	1.9	56	2880	402	3.8	3.7	88.1	200	0	16	2	0.64	7.	30	7.8	4.0

 # 24 4 He on 108 Ag

4 He on 108 Ag

4 He on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 47. ZC= 49.(In)
NEUTRON NUMBERS: NP= 2. NT= 61. NC= 63.

AP**1/3= 1.587 AT**1/3= 4.762
REDUCED MASS NUMBER= 3.86 AP+AT=AC=112.

INTERACTION RADIUS RINT=10.00 fm R0= 1.57 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 5.32 CT+CP= 6.53 C̄= 0.99

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 5.50

COULOMB RADII [fm]:
RCP= 1.70 RCT= 5.34 RC=RCP+RCT= 7.04

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 24.92 MeV K= .00808 n=3.362
VC(RINT)= 13.5 MeV

FISSION-TKE= 76. MeV
ASYMM. FISSION-TKE= 12. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.925 MeV/fm**2 PROX-FACTOR= 11.48 MeV
L-RLD= 90 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 49.18 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -87.6
COMPOUND NUCLEUS: -88.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.18 fm V(RB)= 13.6 MeV
Q-VALUE= 3.3 MeV
L-CRITICAL= 22.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	4	0.29	173	0.8	14.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.57	244	1.2	10.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	12	0.86	299	1.5	8.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	16	15	1.14	346	1.7	7.4	6	525	319	102.9	100.8	38.6	15	1	11	21	6.46	1.	4	1.2	1
4.5	18	17	1.28	367	1.8	7.0	8	865	578	79.5	77.4	50.2	17	1	12	15	4.54	1.	4	1.2	1
5.0	20	19	1.43	387	1.9	6.6	10	1126	785	65.5	63.6	57.3	19	1	12	12	3.70	1.	4	1.3	2
5.5	22	21	1.57	405	2.0	6.3	12	1334	954	55.9	54.2	62.0	21	1	12	10	3.20	1.	5	1.4	2
6.0	24	23	1.71	424	2.1	6.0	13	1505	1095	48.9	47.3	65.6	23	1	12	9	2.86	1.	5	1.5	2
6.5	26	25	1.85	441	2.2	5.8	15	1648	1214	43.4	42.0	68.3	26	0	12	9	2.61	1.	5	1.6	2
7.0	28	27	2.00	458	2.2	5.6	16	1770	1316	39.1	37.8	70.4	28	0	12	8	2.42	1.	6	1.7	2
7.5	30	29	2.14	474	2.3	5.4	17	1874	1405	35.6	34.4	72.2	30	0	13	7	2.26	1.	6	1.8	2
8.0	32	31	2.28	489	2.4	5.2	18	1964	1483	32.6	31.5	73.7	32	0	13	7	2.13	1.	6	1.9	3
8.5	34	33	2.42	505	2.5	5.1	19	2043	1551	30.2	29.1	74.9	34	0	13	7	2.02	1.	7	2.0	3
9.0	36	35	2.57	519	2.5	4.9	20	2113	1612	28.0	27.1	76.0	36	0	13	6	1.93	1.	7	2.1	3
9.5	38	37	2.71	533	2.6	4.8	21	2175	1666	26.2	25.3	76.9	38	0	13	6	1.85	1.	7	2.1	3
10.0	40	39	2.85	547	2.7	4.7	21	2231	1715	24.6	23.7	77.7	40	0	13	6	1.77	1.	7	2.2	3
10.5	42	41	2.99	561	2.7	4.6	22	2281	1760	23.2	22.4	78.4	42	0	13	6	1.71	1.	8	2.3	3
11.0	44	42	3.14	574	2.8	4.5	23	2326	1800	21.9	21.1	79.1	44	0	13	5	1.65	2.	8	2.4	3
11.5	46	44	3.28	587	2.9	4.4	24	2367	1837	20.8	20.0	79.6	46	0	13	5	1.60	2.	8	2.5	4
12.0	48	46	3.42	600	2.9	4.3	25	2405	1870	19.7	19.0	80.1	48	0	13	5	1.55	2.	9	2.6	4
13.0	52	50	3.71	625	3.0	4.1	26	2471	1744	18.0	17.3	81.0	52	0	13	5	1.47	2.	9	2.7	4
14.0	56	54	3.99	648	3.2	4.0	27	2527	1619	16.5	15.9	81.8	56	0	13	5	1.40	2.	10	2.9	4
15.0	60	58	4.28	671	3.3	3.8	29	2575	1511	15.2	14.7	82.4	60	0	13	4	1.33	2.	10	3.0	5
16.0	64	62	4.56	694	3.4	3.7	30	2617	1417	14.2	13.7	82.9	64	0	13	4	1.28	2.	11	3.2	5
17.0	68	66	4.85	715	3.5	3.6	31	2654	1333	13.2	12.8	83.4	68	0	13	4	1.23	2.	11	3.3	5
18.0	72	69	5.13	736	3.6	3.5	32	2687	1259	12.4	12.0	83.8	72	0	13	4	1.19	2.	12	3.5	5
19.0	76	73	5.42	756	3.7	3.4	33	2715	1193	11.7	11.3	84.2	76	0	14	4	1.15	3.	13	3.6	6
20.0	80	77	5.70	776	3.8	3.3	34	2741	1133	11.0	10.6	84.5	80	0	14	4	1.11	3.	13	3.7	6
25.0	100	96	7.13	869	4.2	3.0	39	2838	907	8.7	8.4	85.7	100	0	14	3	0.97	3.	16	4.4	7
30.0	120	116	8.56	953	4.6	2.7	43	2901	755	7.1	6.9	86.4	120	0	14	3	0.88	4.	19	5.1	8
35.0	140	135	9.98	1031	5.0	2.5	47	2945	647	6.1	5.8	87.0	140	0	14	3	0.81	5.	21	5.7	3.1
40.0	160	154	11.41	1104	5.3	2.3	51	2977	566	5.3	5.1	87.4	160	0	15	2	0.75	5.	24	6.3	3.4
45.0	180	174	12.84	1172	5.7	2.2	54	3001	503	4.7	4.5	87.7	180	0	15	2	0.70	6.	27	6.9	3.6
50.0	200	193	14.26	1237	6.0	2.1	57	3021	453	4.2	4.0	87.9	200	0	15	2	0.66	6.	30	7.5	3.7
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

25 4 He on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 58. ZC= 60.(Nd)
NEUTRON NUMBERS: NP= 2. NT= 82. NC= 84.

AP**1/3= 1.587 AT**1/3= 5.192
REDUCED MASS NUMBER= 3.89 AP+AT=AC=144.

INTERACTION RADIUS RINT=10.46 fm RO= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 5.87 CT+CP= 7.09 C= 1.01

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.04

COULOMB RADII [fm]:
RCP= 1.70 RCT= 5.82 RC=RCP+RCT= 7.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 28.61 MeV K= .00601 n=3.457
VC(RINT)= 15.9 MeV

FISSION-TKE= 96. MeV
ASYMM. FISSION-TKE= 12. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.905 MeV/fm**2 PROX-FACTOR= 11.43 MeV
L-RLD= 95 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -88.2
COMPOUND NUCLEUS: -93.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.61 fm V(RB)= 16.0 MeV
Q-VALUE= -2.3 MeV
L-CRITICAL= 24.

4 He on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	4	4	0.24	173	0.9	18.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	8	8	0.49	244	1.2	12.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	12	12	0.73	299	1.5	10.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.0	16	16	0.98	346	1.7	9.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.5	18	18	1.10	367	1.8	8.6	6	419	248	114.0	112.5	33.0	17	1	12	29	7.53	0. 4	10	0.9	1
5.0	20	19	1.22	387	1.9	8.2	8	770	513	88.3	86.7	45.9	19	1	12	19	5.00	1. 4	12	1.0	2
5.5	22	21	1.34	405	2.0	7.8	11	1046	730	73.1	71.5	53.5	21	1	12	15	4.01	1. 5	13	1.0	2
6.0	24	23	1.46	424	2.1	7.5	12	1270	911	62.7	61.2	58.7	23	1	12	13	3.44	1. 5	14	1.1	2
6.5	26	25	1.59	441	2.2	7.2	14	1457	1064	55.0	53.7	62.5	25	1	13	12	3.06	1. 5	15	1.1	2
7.0	28	27	1.71	458	2.3	6.9	15	1616	1195	49.0	47.8	65.5	27	1	13	11	2.78	1. 6	16	1.2	2
7.5	30	29	1.83	474	2.3	6.7	16	1752	1309	44.3	43.2	67.9	30	0	13	10	2.57	1. 6	17	1.2	2
8.0	32	31	1.95	489	2.4	6.5	18	1870	1408	40.4	39.3	69.8	32	0	13	9	2.40	1. 6	18	1.3	2
8.5	34	33	2.07	505	2.5	6.3	19	1973	1496	37.1	36.2	71.4	34	0	13	9	2.26	1. 7	18	1.3	3
9.0	36	35	2.20	519	2.6	6.1	20	2065	1574	34.4	33.5	72.8	36	0	13	8	2.14	1. 7	19	1.3	3
9.5	38	37	2.32	533	2.6	5.9	21	2146	1643	32.0	31.2	74.0	38	0	13	8	2.04	1. 7	20	1.4	3
10.0	40	39	2.44	547	2.7	5.8	22	2219	1706	29.9	29.1	75.0	40	0	13	8	1.95	1. 7	21	1.4	3
10.5	42	41	2.56	561	2.8	5.6	23	2284	1763	28.1	27.4	75.9	42	0	13	7	1.87	1. 8	22	1.5	3
11.0	44	43	2.68	574	2.8	5.5	23	2343	1815	26.5	25.8	76.7	44	0	13	7	1.80	1. 8	23	1.5	3
11.5	46	45	2.80	587	2.9	5.4	24	2397	1862	25.1	24.4	77.5	46	0	13	7	1.74	1. 8	23	1.5	4
12.0	48	47	2.93	600	2.9	5.3	25	2447	1905	23.8	23.2	78.1	48	0	13	6	1.68	1. 9	24	1.6	4
13.0	52	51	3.17	625	3.1	5.1	27	2533	1981	21.6	21.0	79.2	52	0	13	6	1.59	1. 9	26	1.6	4
14.0	56	54	3.41	648	3.2	4.9	28	2607	1957	19.8	19.2	80.1	56	0	13	6	1.50	2. 10	27	1.7	4
15.0	60	58	3.66	671	3.3	4.7	29	2670	1826	18.2	17.7	80.9	60	0	13	6	1.43	2. 10	28	1.8	5
16.0	64	62	3.90	694	3.4	4.6	31	2725	1712	16.9	16.5	81.5	64	0	14	5	1.37	2. 11	30	1.8	5
17.0	68	66	4.15	715	3.5	4.4	32	2774	1611	15.8	15.4	82.1	68	0	14	5	1.32	2. 11	31	1.9	5
18.0	72	70	4.39	736	3.6	4.3	33	2817	1522	14.8	14.4	82.6	72	0	14	5	1.27	2. 12	33	1.9	6
19.0	76	74	4.63	756	3.7	4.2	34	2855	1442	13.9	13.5	83.0	76	0	14	5	1.23	2. 12	34	2.0	6
20.0	80	78	4.88	776	3.8	4.1	35	2889	1369	13.1	12.8	83.4	80	0	14	5	1.19	2. 13	35	2.0	6
25.0	100	97	6.10	869	4.3	3.7	41	3017	1095	10.3	10.0	84.9	100	0	14	4	1.03	3. 16	42	2.3	7
30.0	120	117	7.32	953	4.7	3.3	45	3100	913	8.4	8.2	85.8	120	0	14	4	0.93	3. 18	48	2.5	9
35.0	140	136	8.54	1031	5.0	3.1	49	3159	782	7.1	6.9	86.4	140	0	14	3	0.85	4. 21	54	2.7	
40.0	160	156	9.76	1104	5.4	2.9	53	3202	684	6.2	6.0	86.9	160	0	15	3	0.79	4. 24	60	2.9	
45.0	180	175	10.98	1172	5.7	2.7	57	3235	608	5.5	5.3	87.3	180	0	15	3	0.74	5. 26	66	3.1	
50.0	200	194	12.19	1237	6.0	2.6	60	3262	547	4.9	4.8	87.5	200	0	15	3	0.70	5. 29	71	3.3	

26 4 He on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 62. ZC= 64.(Gd)
NEUTRON NUMBERS: NP= 2. NT= 92. NC= 94.

AP**1/3= 1.587 AT**1/3= 5.360
REDUCED MASS NUMBER= 3.90 AP+AT=AC=158.

INTERACTION RADIUS RINT=10.64 fm RO= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 6.09 CT+CP= 7.30 C= 1.01

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.25

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.00 RC=RCP+RCT= 7.70

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 29.83 MeV K= .00548 n=3.480
VC(RINT)= 16.8 MeV

FISSION-TKE= 103. MeV
ASYMM. FISSION-TKE= 13. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 11.32 MeV
L-RLD= 97 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.65 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -72.1
COMPOUND NUCLEUS: -70.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.78 fm V(RB)= 16.8 MeV
Q-VALUE= 0.4 MeV
L-CRITICAL= 25.

4 He on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	4	4	0.23	173	0.9	19.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	8	8	0.47	244	1.2	13.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	12	12	0.70	299	1.5	11.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.0	16	16	0.93	346	1.7	9.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.5	18	18	1.05	367	1.8	9.2	4	243	127	132.7	131.6	23.6	17	1	12	43	10.84	0. 4	10	1.0	2
5.0	20	19	1.16	387	1.9	8.7	8	636	414	98.1	96.6	41.0	19	1	12	23	5.76	0. 4	11	1.0	2
5.5	22	21	1.28	405	2.0	8.3	10	938	649	80.0	78.5	50.0	21	1	12	18	4.40	1. 5	12	1.1	2
6.0	24	23	1.40	424	2.1	8.0	12	1184	845	68.0	66.6	56.0	23	1	13	15	3.69	1. 5	14	1.1	2
6.5	26	25	1.51	441	2.2	7.7	13	1388	1011	59.3	58.0	60.3	25	1	13	13	3.25	1. 5	15	1.1	2
7.0	28	27	1.63	458	2.3	7.4	15	1561	1154	52.7	51.5	63.7	27	1	13	12	2.93	1. 6	15	1.2	2
7.5	30	29	1.75	474	2.3	7.1	16	1710	1277	47.4	46.4	66.3	30	0	13	11	2.69	1. 6	16	1.2	3
8.0	32	31	1.86	489	2.4	6.9	17	1838	1385	43.2	42.2	68.4	32	0	13	10	2.50	1. 6	17	1.3	3
8.5	34	33	1.98	505	2.5	6.7	19	1951	1480	39.6	38.7	70.2	34	0	13	10	2.35	1. 6	18	1.3	3
9.0	36	35	2.09	519	2.6	6.5	20	2051	1564	36.6	35.7	71.7	36	0	13	9	2.22	1. 7	19	1.3	3
9.5	38	37	2.21	533	2.6	6.3	21	2139	1640	34.0	33.2	73.0	38	0	13	9	2.11	1. 7	20	1.4	4
10.0	40	39	2.33	547	2.7	6.2	22	2219	1708	31.8	31.1	74.1	40	0	13	8	2.02	1. 7	21	1.4	4
10.5	42	41	2.44	561	2.8	6.0	23	2290	1770	29.9	29.1	75.1	42	0	13	8	1.93	1. 8	21	1.4	4
11.0	44	43	2.56	574	2.8	5.9	23	2355	1826	28.1	27.5	75.9	44	0	13	8	1.86	1. 8	22	1.5	4
11.5	46	45	2.68	587	2.9	5.8	24	2414	1877	26.6	26.0	76.7	46	0	13	7	1.79	1. 8	23	1.5	4
12.0	48	47	2.79	600	3.0	5.6	25	2467	1924	25.2	24.6	77.4	48	0	13	7	1.73	1. 8	24	1.5	4
13.0	52	51	3.03	625	3.1	5.4	27	2562	2007	22.9	22.3	78.6	52	0	13	7	1.63	1. 9	25	1.6	5
14.0	56	55	3.26	648	3.2	5.2	28	2642	2078	20.9	20.4	79.5	56	0	13	6	1.55	1. 10	26	1.7	5
15.0	60	58	3.49	671	3.3	5.0	30	2712	1947	19.3	18.8	80.4	60	0	14	6	1.47	1. 10	28	1.7	5
16.0	64	62	3.72	694	3.4	4.9	31	2772	1825	17.9	17.4	81.1	64	0	14	6	1.41	2. 11	29	1.8	6
17.0	68	66	3.96	715	3.5	4.7	32	2825	1717	16.7	16.2	81.7	68	0	14	5	1.35	2. 11	31	1.8	6
18.0	72	70	4.19	736	3.6	4.6	34	2871	1622	15.6	15.2	82.2	72	0	14	5	1.30	2. 12	32	1.9	6
19.0	76	74	4.42	756	3.7	4.5	35	2913	1537	14.7	14.3	82.7	76	0	14	5	1.26	2. 12	33	1.9	7
20.0	80	78	4.65	776	3.8	4.4	36	2950	1460	13.8	13.5	83.1	80	0	14	5	1.21	2. 13	35	2.0	7
25.0	100	97	5.82	869	4.3	3.9	41	3090	1168	10.8	10.5	84.6	100	0	14	4	1.06	2. 16	41	2.2	9
30.0	120	117	6.98	953	4.7	3.6	46	3182	973	8.9	8.6	85.6	120	0	14	4	0.95	3. 18	47	2.4	10
35.0	140	136	8.14	1031	5.0	3.3	50	3246	834	7.5	7.3	86.2	140	0	14	4	0.87	3. 21	53	2.6	
40.0	160	156	9.31	1104	5.4	3.1	54	3294	730	6.5	6.4	86.7	160	0	15	3	0.81	4. 24	59	2.8	
45.0	180	175	10.47	1172	5.7	2.9	58	3330	649	5.8	5.6	87.1	180	0	15	3	0.75	4. 26	64	3.0	
50.0	200	195	11.64	1237	6.0	2.8	61	3359	584	5.2	5.0	87.4	200	0	15	3	0.71	5. 29	70	3.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 27 4 He on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 67. ZC= 69.(Tm)
NEUTRON NUMBERS: NP= 2. NT= 98. NC=100.

AP**1/3= 1.587 AT**1/3= 5.485
REDUCED MASS NUMBER= 3.91 AP+AT=AC=169.

INTERACTION RADIUS RINT=10.78 fm R0= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 6.25 CT+CP= 7.46 $\overline{C}$= 1.02

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.41

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.15 RC=RCP+RCT= 7.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 31.49 MeV K= .00482 n=3.530
VC(RINT)= 17.9 MeV

FISSION-TKE= 114. MeV
ASYMM. FISSION-TKE= 13. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 11.42 MeV
L-RLD= 90 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.56 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -63.7
COMPOUND NUCLEUS: -60.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.90 fm V(RB)= 17.9 MeV
Q-VALUE= -1.3 MeV
L-CRITICAL= 26.

4 He on 165 Ho

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	4	4	0.22	173	0.9	21.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	8	8	0.44	244	1.2	14.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	12	12	0.66	299	1.5	12.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	16	16	0.87	346	1.7	10.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	18	18	0.98	367	1.8	9.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	20	20	1.09	387	1.9	9.4	6	415	249	115.6	114.4	32.2	19	1	12	32	7.55	0.	4 11	0.9	2
5.5	22	21	1.20	405	2.0	9.0	9	754	506	91.2	89.8	44.4	21	1	13	22	5.09	1.	5 12	1.0	2
6.0	24	23	1.31	424	2.1	8.6	11	1026	721	76.4	75.0	51.8	23	1	13	18	4.10	1.	5 13	1.0	2
6.5	26	25	1.42	441	2.2	8.3	13	1251	902	66.0	64.7	57.0	25	1	13	15	3.52	1.	5 14	1.1	2
7.0	28	27	1.53	458	2.3	8.0	14	1442	1057	58.3	57.1	60.9	27	1	13	14	3.14	1.	6 15	1.1	2
7.5	30	29	1.64	474	2.3	7.7	16	1605	1192	52.2	51.1	63.9	29	1	13	12	2.85	1.	6 16	1.2	2
8.0	32	31	1.75	489	2.4	7.5	17	1747	1310	47.3	46.3	66.3	32	0	13	11	2.64	1.	6 17	1.2	3
8.5	34	33	1.86	505	2.5	7.2	18	1871	1413	43.3	42.4	68.3	34	0	13	11	2.46	1.	6 18	1.2	3
9.0	36	35	1.97	519	2.6	7.0	19	1981	1506	40.0	39.1	70.0	36	0	13	10	2.32	1.	7 19	1.3	3
9.5	38	37	2.08	533	2.6	6.8	20	2078	1588	37.1	36.3	71.5	38	0	13	10	2.20	1.	7 19	1.3	3
10.0	40	39	2.18	547	2.7	6.7	21	2165	1663	34.6	33.8	72.7	40	0	13	9	2.09	1.	7 20	1.3	3
10.5	42	41	2.29	561	2.8	6.5	22	2244	1730	32.4	31.7	73.8	42	0	14	9	2.00	1.	8 21	1.4	4
11.0	44	43	2.40	574	2.8	6.4	23	2315	1791	30.5	29.8	74.7	44	0	14	8	1.92	1.	8 22	1.4	4
11.5	46	45	2.51	587	2.9	6.2	24	2380	1847	28.8	28.2	75.6	46	0	14	8	1.85	1.	8 22	1.4	4
12.0	48	47	2.62	600	3.0	6.1	25	2439	1898	27.3	26.7	76.3	48	0	14	8	1.79	1.	8 23	1.5	4
13.0	52	51	2.84	625	3.1	5.9	27	2543	1989	24.7	24.1	77.6	52	0	14	7	1.68	1.	9 25	1.5	4
14.0	56	55	3.06	648	3.2	5.6	28	2631	2067	22.6	22.1	78.7	56	0	14	7	1.59	1.	10 26	1.6	5
15.0	60	59	3.28	671	3.3	5.4	30	2708	2060	20.8	20.3	79.6	60	0	14	7	1.51	1.	10 28	1.6	5
16.0	64	62	3.49	694	3.4	5.3	31	2774	1931	19.2	18.8	80.4	64	0	14	6	1.44	1.	11 29	1.7	6
17.0	68	66	3.71	715	3.5	5.1	32	2832	1817	17.9	17.5	81.0	68	0	14	6	1.38	2.	11 30	1.8	6
18.0	72	70	3.93	736	3.6	5.0	34	2884	1716	16.8	16.4	81.6	72	0	14	6	1.33	2.	12 32	1.8	6
19.0	76	74	4.15	756	3.7	4.8	35	2930	1626	15.8	15.4	82.1	76	0	14	6	1.28	2.	12 33	1.9	6
20.0	80	78	4.37	776	3.8	4.7	36	2971	1545	14.9	14.5	82.6	80	0	14	5	1.24	2.	13 34	1.9	7
25.0	100	98	5.46	869	4.3	4.2	42	3125	1236	11.6	11.3	84.2	100	0	14	5	1.08	2.	16 40	2.1	8
30.0	120	117	6.55	953	4.7	3.9	46	3226	1030	9.5	9.3	85.3	120	0	14	4	0.97	3.	18 46	2.3	10
35.0	140	137	7.65	1031	5.1	3.6	51	3297	882	8.0	7.8	86.0	140	0	15	4	0.88	3.	21 52	2.5	
40.0	160	156	8.74	1104	5.4	3.3	55	3350	772	7.0	6.8	86.5	160	0	15	4	0.82	4.	24 58	2.7	
45.0	180	176	9.83	1172	5.7	3.1	59	3391	686	6.2	6.0	86.9	180	0	15	3	0.77	4.	26 64	2.9	
50.0	200	195	10.92	1237	6.0	3.0	62	3422	618	5.5	5.4	87.2	200	0	15	3	0.72	4.	29 69	3.0	

 # 28 4 He on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 73. ZC= 75.(Re)
NEUTRON NUMBERS: NP= 2. NT=108. NC=110.

AP**1/3= 1.587 AT**1/3= 5.657
REDUCED MASS NUMBER= 3.91 AP+AT=AC=185.

INTERACTION RADIUS RINT=10.96 fm R0= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 6.47 CT+CP= 7.68 $\overline{C}$= 1.02

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.62

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.35 RC=RCP+RCT= 8.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 33.36 MeV K= .00419 n=3.577
VC(RINT)= 19.1 MeV

FISSION-TKE= 128. MeV
ASYMM. FISSION-TKE= 13. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 11.44 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -46.0
COMPOUND NUCLEUS: -40.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.07 fm V(RB)= 19.2 MeV
Q-VALUE= -2.9 MeV
L-CRITICAL= 27.

4 He on 181 Ta

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	4	4	0.20	173	0.9	23.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	8	8	0.41	244	1.2	16.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	12	12	0.61	299	1.5	13.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	16	16	0.82	346	1.7	11.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	18	18	0.92	367	1.8	10.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	20	20	1.02	387	1.9	10.3	3	136	57	147.7	147.0	16.1	18	2	12	70	15.63	0.	4 11	0.8	1
5.5	22	22	1.12	405	2.0	9.8	7	534	341	106.9	105.6	36.6	21	1	13	30	6.40	0.	5 12	0.9	2
6.0	24	23	1.23	424	2.1	9.4	10	841	578	87.3	86.0	46.4	23	1	13	22	4.73	1.	5 13	0.9	2
6.5	26	25	1.33	441	2.2	9.0	12	1093	778	74.4	73.2	52.8	25	1	13	18	3.92	1.	5 14	1.0	2
7.0	28	27	1.43	458	2.3	8.7	14	1306	950	65.1	64.0	57.4	27	1	13	16	3.42	1.	6 15	1.0	2
7.5	30	29	1.53	474	2.3	8.4	15	1488	1099	58.0	57.0	61.0	29	1	13	14	3.07	1.	6 16	1.1	2
8.0	32	31	1.63	489	2.4	8.1	17	1646	1229	52.4	51.4	63.8	31	1	14	13	2.82	1.	6 17	1.1	3
8.5	34	33	1.74	505	2.5	7.9	18	1784	1344	47.8	46.8	66.1	34	0	14	12	2.61	1.	6 17	1.1	3
9.0	36	35	1.84	519	2.6	7.7	19	1906	1446	43.9	43.1	68.0	36	0	14	11	2.45	1.	7 18	1.2	3
9.5	38	37	1.94	533	2.6	7.5	20	2015	1537	40.7	39.9	69.7	38	0	14	11	2.31	1.	7 19	1.2	3
10.0	40	39	2.04	547	2.7	7.3	21	2112	1620	37.9	37.1	71.1	40	0	14	10	2.20	1.	7 20	1.3	4
10.5	42	41	2.15	561	2.8	7.1	22	2200	1694	35.4	34.7	72.3	42	0	14	10	2.09	1.	8 21	1.3	4
11.0	44	43	2.25	574	2.8	6.9	23	2279	1762	33.3	32.6	73.4	44	0	14	9	2.01	1.	8 21	1.3	4
11.5	46	45	2.35	587	2.9	6.8	24	2351	1824	31.4	30.8	74.3	46	0	14	9	1.93	1.	8 22	1.3	4
12.0	48	47	2.45	600	3.0	6.6	25	2417	1880	29.7	29.1	75.1	48	0	14	9	1.86	1.	8 23	1.4	4
13.0	52	51	2.66	625	3.1	6.4	27	2533	1980	26.9	26.3	76.6	52	0	14	8	1.74	1.	9 24	1.4	5
14.0	56	55	2.86	648	3.2	6.1	28	2631	2066	24.5	24.0	77.8	56	0	14	8	1.64	1.	10 26	1.5	5
15.0	60	59	3.07	671	3.3	5.9	30	2716	2141	22.5	22.0	78.7	60	0	14	7	1.56	1.	10 27	1.6	5
16.0	64	63	3.27	694	3.4	5.7	31	2790	2068	20.8	20.4	79.6	64	0	14	7	1.49	1.	11 28	1.6	6
17.0	68	67	3.47	715	3.5	5.6	33	2855	1947	19.4	19.0	80.3	68	0	14	7	1.43	1.	11 30	1.7	6
18.0	72	70	3.68	736	3.6	5.4	34	2913	1838	18.1	17.7	80.9	72	0	14	6	1.37	2.	12 31	1.7	6
19.0	76	74	3.88	756	3.7	5.3	35	2964	1742	17.0	16.7	81.5	76	0	14	6	1.32	2.	12 32	1.8	7
20.0	80	78	4.09	776	3.8	5.1	36	3010	1655	16.0	15.7	82.0	80	0	14	6	1.28	2.	13 34	1.8	7
25.0	100	98	5.11	869	4.3	4.6	42	3182	1324	12.5	12.2	83.8	100	0	15	5	1.11	2.	16 40	2.0	9
30.0	120	117	6.13	953	4.7	4.2	47	3295	1103	10.2	10.0	84.9	120	0	15	5	0.99	2.	18 46	2.2	10
35.0	140	137	7.15	1031	5.1	3.9	51	3375	945	8.6	8.4	85.7	140	0	15	4	0.90	3.	21 51	2.4	
40.0	160	157	8.17	1104	5.4	3.6	56	3434	827	7.5	7.3	86.3	160	0	15	4	0.84	3.	24 57	2.6	
45.0	180	176	9.20	1172	5.7	3.4	59	3479	735	6.6	6.5	86.7	180	0	15	4	0.78	4.	26 62	2.7	
50.0	200	196	10.22	1237	6.1	3.3	63	3515	662	5.9	5.8	87.0	200	0	15	3	0.74	4.	29 68	2.9	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 29 4 He on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 79. ZC= 81.(Tl)
NEUTRON NUMBERS: NP= 2. NT=118. NC=120.

AP**1/3= 1.587 AT**1/3= 5.819
REDUCED MASS NUMBER= 3.92 AP+AT=AC=201.

INTERACTION RADIUS RINT=11.14 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 6.68 CT+CP= 7.89 C= 1.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.83

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.55 RC=RCP+RCT= 8.25

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 35.17 MeV K= .00367 n=3.620
VC(RINT)= 20.4 MeV

FISSION-TKE= 142. MeV
ASYMM. FISSION-TKE= 14. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 11.45 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.37 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -28.6
COMPOUND NUCLEUS: -24.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.23 fm V(RB)= 20.5 MeV
Q-VALUE= -1.4 MeV
L-CRITICAL= 28.

4 He on 197 Au

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	4	0.19	173	0.9	24.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.38	244	1.2	17.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	12	0.58	299	1.5	14.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	16	16	0.77	346	1.7	12.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	18	18	0.86	367	1.8	11.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	20	20	0.96	387	1.9	11.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	22	22	1.06	405	2.0	10.6	5	294	166	128.2	127.3	25.9	21	1	13	46	9.35	0.	5	12	0.9	2
6.0	24	24	1.15	424	2.1	10.2	8	642	426	100.2	99.1	39.9	23	1	13	28	5.67	0.	5	13	0.9	2
6.5	26	25	1.25	441	2.2	9.8	11	923	646	83.9	82.8	48.0	25	1	14	22	4.43	1.	5	14	1.0	2
7.0	28	27	1.35	458	2.3	9.4	13	1159	835	72.7	71.6	53.7	27	1	14	19	3.76	1.	6	15	1.0	2
7.5	30	29	1.44	474	2.3	9.1	14	1361	998	64.3	63.3	57.9	29	1	14	16	3.33	1.	6	15	1.1	2
8.0	32	31	1.54	489	2.4	8.8	16	1535	1141	57.7	56.8	61.1	31	1	14	15	3.02	1.	6	16	1.1	3
8.5	34	33	1.63	505	2.5	8.5	17	1688	1267	52.4	51.5	63.8	33	1	14	14	2.78	1.	6	17	1.1	3
9.0	36	35	1.73	519	2.6	8.3	19	1823	1379	48.1	47.2	66.0	36	0	14	13	2.59	1.	7	18	1.2	3
9.5	38	37	1.83	533	2.6	8.1	20	1943	1479	44.4	43.6	67.8	38	0	14	12	2.43	1.	7	19	1.2	3
10.0	40	39	1.92	547	2.7	7.9	21	2050	1570	41.2	40.5	69.4	40	0	14	11	2.30	1.	7	19	1.2	3
10.5	42	41	2.02	561	2.8	7.7	22	2147	1651	38.5	37.8	70.7	42	0	14	11	2.19	1.	8	20	1.3	4
11.0	44	43	2.11	574	2.8	7.5	23	2234	1726	36.2	35.5	71.9	44	0	14	10	2.09	1.	8	21	1.3	4
11.5	46	45	2.21	587	2.9	7.3	24	2314	1793	34.1	33.4	73.0	46	0	14	10	2.01	1.	8	22	1.3	4
12.0	48	47	2.31	600	3.0	7.2	25	2386	1855	32.2	31.6	73.9	48	0	14	10	1.93	1.	8	22	1.3	4
13.0	52	51	2.50	625	3.1	6.9	27	2514	1965	29.0	28.5	75.5	52	0	14	9	1.80	1.	9	24	1.4	5
14.0	56	55	2.69	648	3.2	6.6	28	2623	2060	26.4	25.9	76.8	56	0	14	8	1.70	1.	10	25	1.5	5
15.0	60	59	2.88	671	3.3	6.4	30	2717	2141	24.3	23.8	77.9	60	0	14	8	1.61	1.	10	27	1.5	5
16.0	64	63	3.08	694	3.4	6.2	31	2799	2203	22.4	22.0	78.8	64	0	15	8	1.53	1.	11	28	1.6	6
17.0	68	67	3.27	715	3.5	6.0	33	2871	2073	20.8	20.4	79.6	68	0	15	7	1.47	1.	11	29	1.6	6
18.0	72	71	3.46	736	3.6	5.9	34	2934	1958	19.5	19.1	80.3	72	0	15	7	1.41	1.	12	30	1.7	6
19.0	76	74	3.65	756	3.7	5.7	35	2991	1855	18.3	17.9	80.9	76	0	15	7	1.36	1.	12	32	1.7	7
20.0	80	78	3.84	776	3.8	5.6	37	3042	1762	17.2	16.9	81.4	80	0	15	6	1.31	2.	13	33	1.8	7
25.0	100	98	4.80	869	4.3	5.0	42	3233	1409	13.4	13.1	83.3	100	0	15	6	1.13	2.	16	39	2.0	8
30.0	120	118	5.77	953	4.7	4.5	46	3358	1174	10.9	10.7	84.5	120	0	15	5	1.01	2.	18	45	2.2	10
35.0	140	137	6.73	1031	5.1	4.2	52	3446	1007	9.2	9.0	85.4	140	0	15	5	0.92	3.	21	51	2.3	
40.0	160	157	7.69	1104	5.4	3.9	56	3512	881	8.0	7.8	86.0	160	0	15	4	0.85	3.	24	56	2.5	
45.0	180	176	8.65	1172	5.8	3.7	60	3562	783	7.0	6.9	86.5	180	0	15	4	0.80	3.	26	61	2.6	
50.0	200	196	9.61	1237	6.1	3.5	64	3602	704	6.3	6.2	86.8	200	0	16	4	0.75	4.	29	67	2.8	

\# 30 4 He on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 82. ZC= 84.(Po)
NEUTRON NUMBERS: NP= 2. NT=126. NC=128.

AP**1/3= 1.587 AT**1/3= 5.925
REDUCED MASS NUMBER= 3.92 AP+AT=AC=212.

INTERACTION RADIUS RINT=11.25 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 6.82 CT+CP= 8.03 C= 1.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.96

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.66 RC=RCP+RCT= 8.36

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 35.97 MeV K= .00347 n=3.632
VC(RINT)= 21.0 MeV

FISSION-TKE= 149. MeV
ASYMM. FISSION-TKE= 14. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.879 MeV/fm**2 PROX-FACTOR= 11.37 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.32 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -19.5
COMPOUND NUCLEUS: -9.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.33 fm V(RB)= 21.0 MeV
Q-VALUE= -7.4 MeV
L-CRITICAL= 28.

4 He on 208 Pb

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	4	4	0.19	173	0.9	25.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.37	244	1.2	18.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	12	0.56	299	1.5	14.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	16	16	0.75	346	1.7	12.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	18	18	0.84	367	1.8	12.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	20	20	0.94	387	1.9	11.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	22	22	1.03	405	2.0	11.0	4	177	88	142.1	141.4	19.0	21	1	13	64	12.99	0.	5	11	0.7	2
6.0	24	24	1.12	424	2.1	10.5	8	551	360	106.9	105.9	36.5	23	1	13	32	6.29	0.	5	12	0.8	2
6.5	26	26	1.22	441	2.2	10.1	10	849	591	88.6	87.5	45.7	25	1	14	24	4.74	0.	5	13	0.8	2
7.0	28	27	1.31	458	2.3	9.8	12	1097	788	76.3	75.3	51.8	27	1	14	20	3.96	1.	6	14	0.9	2
7.5	30	29	1.40	474	2.4	9.4	14	1309	959	67.3	66.3	56.4	29	1	14	18	3.47	1.	6	15	0.9	2
8.0	32	31	1.50	489	2.4	9.1	16	1493	1109	60.2	59.3	59.9	31	1	14	16	3.12	1.	6	16	1.0	2
8.5	34	33	1.59	505	2.5	8.9	17	1653	1241	54.6	53.7	62.7	33	1	14	15	2.87	1.	6	17	1.0	3
9.0	36	35	1.69	519	2.6	8.6	18	1795	1358	50.0	49.2	65.0	36	0	14	13	2.66	1.	7	18	1.0	3
9.5	38	37	1.78	533	2.6	8.4	20	1921	1463	46.1	45.3	66.9	38	0	14	13	2.50	1.	7	19	1.1	3
10.0	40	39	1.87	547	2.7	8.2	21	2033	1558	42.8	42.1	68.6	40	0	14	12	2.36	1.	7	19	1.1	3
10.5	42	41	1.97	561	2.8	8.0	22	2135	1643	39.9	39.2	70.0	42	0	14	11	2.24	1.	8	20	1.1	4
11.0	44	43	2.06	574	2.8	7.8	23	2227	1721	37.5	36.8	71.3	44	0	14	11	2.14	1.	8	21	1.2	4
11.5	46	45	2.15	587	2.9	7.6	24	2310	1792	35.3	34.6	72.4	46	0	14	10	2.05	1.	8	21	1.2	4
12.0	48	47	2.25	600	3.0	7.5	25	2387	1857	33.3	32.7	73.3	48	0	14	10	1.97	1.	8	22	1.2	4
13.0	52	51	2.43	625	3.1	7.2	27	2521	1972	30.0	29.5	75.0	52	0	14	9	1.84	1.	9	24	1.3	4
14.0	56	55	2.62	648	3.2	6.9	28	2635	2071	27.3	26.8	76.3	56	0	15	9	1.73	1.	10	25	1.3	5
15.0	60	59	2.81	671	3.3	6.7	30	2734	2157	25.1	24.6	77.5	60	0	15	8	1.64	1.	10	26	1.4	5
16.0	64	63	3.00	694	3.4	6.5	32	2820	2232	23.1	22.7	78.4	64	0	15	8	1.56	1.	11	28	1.4	6
17.0	68	67	3.18	715	3.5	6.3	33	2895	2146	21.5	21.1	79.2	68	0	15	8	1.49	1.	11	29	1.5	6
18.0	72	71	3.37	736	3.6	6.1	34	2962	2027	20.1	19.7	80.0	72	0	15	7	1.43	1.	12	30	1.5	6
19.0	76	75	3.56	756	3.7	5.9	36	3022	1920	18.8	18.5	80.6	76	0	15	7	1.38	1.	12	31	1.6	7
20.0	80	78	3.75	776	3.8	5.8	37	3075	1824	17.8	17.4	81.1	80	0	15	7	1.33	1.	13	33	1.6	7
25.0	100	98	4.68	869	4.3	5.2	43	3276	1459	13.8	13.5	83.1	100	0	15	6	1.15	2.	16	39	1.8	9
30.0	120	118	5.62	953	4.7	4.7	48	3407	1216	11.2	11.0	84.4	120	0	15	5	1.02	2.	18	44	2.0	10
35.0	140	137	6.55	1031	5.1	4.4	53	3500	1042	9.5	9.3	85.3	140	0	15	5	0.93	2.	21	50	2.2	
40.0	160	157	7.49	1104	5.4	4.1	57	3569	912	8.2	8.1	85.9	160	0	15	4	0.86	3.	24	55	2.4	
45.0	180	177	8.43	1172	5.8	3.8	61	3622	810	7.2	7.1	86.4	180	0	16	4	0.81	3.	26	61	2.5	
50.0	200	196	9.36	1237	6.1	3.7	65	3664	729	6.5	6.4	86.8	200	0	16	4	0.76	3.	29	66	2.7	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 31 4 He on 209 Bi

4 He on 209 Bi

4 He on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 83. ZC= 85.(At)
NEUTRON NUMBERS: NP= 2. NT=126. NC=128.

AP**1/3= 1.587 AT**1/3= 5.934
REDUCED MASS NUMBER= 3.92 AP+AT=AC=213.

INTERACTION RADIUS RINT=11.26 fm R0= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 6.83 CT+CP= 8.04 C= 1.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 6.97

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.68 RC=RCP+RCT= 8.38

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 36.31 MeV K= .00339 n=3.644
VC(RINT)= 21.2 MeV

FISSION-TKE= 152. MeV
ASYMM. FISSION-TKE= 14. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.883 MeV/fm**2 PROX-FACTOR= 11.42 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.32 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: -16.5
COMPOUND NUCLEUS: -6.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.34 fm V(RB)= 21.3 MeV
Q-VALUE= -7.8 MeV
L-CRITICAL= 28.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	4	4	0.19	173	0.9	26.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.37	244	1.2	18.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	12	0.56	299	1.5	15.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	16	16	0.74	346	1.7	13.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	18	18	0.83	367	1.8	12.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	20	20	0.93	387	1.9	11.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	22	22	1.02	405	2.0	11.1	3	122	51	150.3	149.7	14.9	20	2	13	82	16.64	0.	5	11	0.7	1
6.0	24	24	1.11	424	2.1	10.7	7	507	327	110.2	109.1	34.9	23	1	13	34	6.61	0.	5	12	0.8	2
6.5	26	26	1.20	441	2.2	10.3	10	810	560	90.8	89.7	44.6	25	1	14	25	4.87	0.	5	13	0.8	2
7.0	28	27	1.30	458	2.3	9.9	12	1062	760	78.0	76.9	51.0	27	1	14	21	4.03	1.	6	14	0.9	2
7.5	30	29	1.39	474	2.4	9.5	14	1277	933	68.6	67.6	55.7	29	1	14	18	3.52	1.	6	15	0.9	2
8.0	32	31	1.48	489	2.4	9.2	16	1464	1085	61.4	60.4	59.3	31	1	14	16	3.16	1.	6	16	0.9	2
8.5	34	33	1.57	505	2.5	9.0	17	1626	1219	55.6	54.7	62.2	33	1	14	15	2.90	1.	6	17	1.0	3
9.0	36	35	1.67	519	2.6	8.7	18	1770	1338	50.8	50.0	64.6	36	0	14	14	2.69	1.	7	18	1.0	3
9.5	38	37	1.76	533	2.6	8.5	20	1898	1444	46.9	46.1	66.6	38	0	14	13	2.52	1.	7	18	1.1	3
10.0	40	39	1.85	547	2.7	8.3	21	2012	1540	43.5	42.7	68.3	40	0	14	12	2.38	1.	7	19	1.1	3
10.5	42	41	1.94	561	2.8	8.1	22	2115	1626	40.6	39.9	69.7	42	0	14	12	2.26	1.	8	20	1.1	3
11.0	44	43	2.04	574	2.8	7.9	23	2208	1705	38.0	37.4	71.0	44	0	14	11	2.15	1.	8	21	1.2	4
11.5	46	45	2.13	587	2.9	7.7	24	2293	1777	35.8	35.2	72.1	46	0	14	11	2.06	1.	8	21	1.2	4
12.0	48	47	2.22	600	3.0	7.5	25	2370	1843	33.8	33.2	73.1	48	0	15	10	1.98	1.	8	22	1.2	4
13.0	52	51	2.41	625	3.1	7.2	27	2506	1960	30.4	29.9	74.8	52	0	15	9	1.85	1.	9	24	1.3	4
14.0	56	55	2.59	648	3.2	7.0	28	2622	2060	27.7	27.2	76.2	56	0	15	9	1.74	1.	10	25	1.3	5
15.0	60	59	2.78	671	3.3	6.7	30	2722	2146	25.4	24.9	77.3	60	0	15	8	1.64	1.	10	26	1.4	5
16.0	64	63	2.96	694	3.4	6.5	31	2810	2222	23.5	23.0	78.3	64	0	15	8	1.56	1.	11	28	1.4	5
17.0	68	67	3.15	715	3.5	6.3	33	2886	2161	21.8	21.4	79.1	68	0	15	8	1.50	1.	11	29	1.5	6
18.0	72	71	3.33	736	3.6	6.2	34	2954	2041	20.4	20.0	79.8	72	0	15	7	1.44	1.	12	30	1.5	6
19.0	76	75	3.52	756	3.7	6.0	36	3014	1933	19.1	18.7	80.5	76	0	15	7	1.38	1.	12	31	1.6	6
20.0	80	78	3.70	776	3.8	5.8	37	3068	1837	18.0	17.6	81.0	80	0	15	7	1.33	1.	13	33	1.6	7
25.0	100	98	4.63	869	4.3	5.2	43	3272	1469	13.9	13.7	83.0	100	0	15	6	1.15	2.	16	39	1.8	8
30.0	120	118	5.56	953	4.7	4.8	48	3405	1224	11.4	11.2	84.3	120	0	15	5	1.03	2.	18	44	2.0	10
35.0	140	137	6.48	1031	5.1	4.4	53	3500	1049	9.6	9.4	85.2	140	0	15	5	0.94	2.	21	50	2.2	
40.0	160	157	7.41	1104	5.4	4.1	57	3570	918	8.3	8.2	85.8	160	0	15	4	0.87	3.	24	55	2.4	
45.0	180	177	8.33	1172	5.8	3.9	61	3623	816	7.3	7.2	86.3	180	0	16	4	0.81	3.	26	61	2.5	
50.0	200	196	9.26	1237	6.1	3.7	65	3666	734	6.6	6.4	86.7	200	0	16	4	0.76	3.	29	66	2.7	

\# 32 4 He on 238 U

4 He on 238 U

4 He on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 2. ZT= 92. ZC= 94.(Pu)
NEUTRON NUMBERS: NP= 2. NT=146. NC=148.

AP**1/3= 1.587 AT**1/3= 6.197
REDUCED MASS NUMBER= 3.93 AP+AT=AC=242.

INTERACTION RADIUS RINT=11.55 fm R0= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.21 CT= 7.16 CT+CP= 8.38 C= 1.04

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 1.78 RT= 7.30

COULOMB RADII [fm]:
RCP= 1.70 RCT= 6.98 RC=RCP+RCT= 8.68

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 38.76 MeV K= .00287 n=3.688
VC(RINT)= 22.9 MeV

FISSION-TKE= 174. MeV
ASYMM. FISSION-TKE= 14. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.867 MeV/fm**2 PROX-FACTOR= 11.30 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 48.20 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.4 TARGET: 47.2
COMPOUND NUCLEUS: 54.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.61 fm V(RB)= 23.0 MeV
Q-VALUE= -5.2 MeV
L-CRITICAL= 30.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	4	4	0.17	173	0.9	29.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	8	8	0.34	244	1.2	20.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	12	12	0.52	299	1.5	16.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	16	16	0.69	346	1.7	14.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	18	18	0.77	367	1.8	13.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	20	20	0.86	387	1.9	13.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	22	22	0.94	405	2.0	12.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	24	24	1.03	424	2.1	11.8	4	182	96	142.0	141.4	19.0	23	1	14	69	12.73	0.	5	12	0.8	2
6.5	26	26	1.12	441	2.2	11.4	8	543	361	108.9	108.0	35.6	25	1	14	35	6.39	0.	5	13	0.8	2
7.0	28	28	1.20	458	2.3	11.0	11	835	587	91.1	90.2	44.4	27	1	14	27	4.83	0.	6	14	0.9	2
7.5	30	30	1.29	474	2.4	10.6	13	1083	784	79.0	78.1	50.5	29	1	14	22	4.04	0.	6	15	0.9	3
8.0	32	31	1.37	489	2.4	10.2	15	1296	955	70.0	69.1	55.0	31	1	15	20	3.55	1.	6	16	0.9	3
8.5	34	33	1.46	505	2.5	9.9	16	1482	1107	63.0	62.1	58.5	33	1	15	18	3.20	1.	7	16	1.0	3
9.0	36	35	1.55	519	2.6	9.7	18	1646	1242	57.3	56.5	61.4	35	1	15	16	2.93	1.	7	17	1.0	3
9.5	38	37	1.63	533	2.7	9.4	19	1792	1362	52.6	51.8	63.7	38	0	15	15	2.73	1.	7	18	1.0	4
10.0	40	39	1.72	547	2.7	9.2	20	1923	1471	48.6	47.9	65.7	40	0	15	14	2.56	1.	7	19	1.1	4
10.5	42	41	1.80	561	2.8	8.9	21	2040	1569	45.2	44.5	67.4	42	0	15	13	2.42	1.	8	19	1.1	4
11.0	44	43	1.89	574	2.9	8.7	23	2147	1658	42.3	41.6	68.9	44	0	15	13	2.30	1.	8	20	1.1	4
11.5	46	45	1.97	587	2.9	8.5	24	2243	1740	39.7	39.1	70.1	46	0	15	12	2.19	1.	8	21	1.2	4
12.0	48	47	2.06	600	3.0	8.4	25	2332	1815	37.4	36.9	71.3	48	0	15	12	2.10	1.	8	22	1.2	5
13.0	52	51	2.23	625	3.1	8.0	27	2487	1947	33.6	33.1	73.2	52	0	15	11	1.95	1.	9	23	1.2	5
14.0	56	55	2.40	648	3.2	7.7	28	2620	2060	30.5	30.0	74.7	56	0	15	10	1.83	1.	10	24	1.3	6
15.0	60	59	2.58	671	3.3	7.5	30	2734	2158	27.9	27.5	76.0	60	0	15	10	1.72	1.	10	26	1.3	6
16.0	64	63	2.75	694	3.4	7.2	32	2833	2244	25.8	25.3	77.1	64	0	15	9	1.64	1.	11	27	1.4	6
17.0	68	67	2.92	715	3.5	7.0	33	2921	2320	23.9	23.5	78.1	68	0	15	9	1.56	1.	11	28	1.4	7
18.0	72	71	3.09	736	3.7	6.8	35	2998	2226	22.3	21.9	78.9	72	0	15	8	1.50	1.	12	29	1.5	7
19.0	76	75	3.26	756	3.8	6.6	36	3067	2109	20.9	20.6	79.6	76	0	15	8	1.44	1.	12	31	1.5	8
20.0	80	79	3.43	776	3.8	6.5	37	3129	2004	19.7	19.3	80.2	80	0	15	8	1.39	1.	13	32	1.6	8
25.0	100	98	4.29	869	4.3	5.8	44	3362	1603	15.2	14.9	82.4	100	0	15	7	1.19	2.	16	38	1.8	10
30.0	120	118	5.15	953	4.7	5.3	49	3515	1336	12.4	12.2	83.8	120	0	16	6	1.06	2.	18	43	1.9	12
35.0	140	138	6.01	1031	5.1	4.9	54	3623	1145	10.4	10.3	84.8	140	0	16	5	0.97	2.	21	49	2.1	
40.0	160	157	6.87	1104	5.4	4.6	58	3703	1002	9.0	8.9	85.5	160	0	16	5	0.89	2.	23	54	2.2	
45.0	180	177	7.73	1172	5.8	4.3	62	3765	890	7.9	7.8	86.0	180	0	16	5	0.83	3.	26	59	2.4	
50.0	200	197	8.58	1237	6.1	4.1	66	3814	801	7.1	7.0	86.4	200	0	16	4	0.79	3.	29	65	2.5	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 4 He

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 33 9 Be on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 6. ZC= 10.(Ne)
NEUTRON NUMBERS: NP= 5. NT= 6. NC= 11.

AP**1/3= 2.080 AT**1/3= 2.289
REDUCED MASS NUMBER= 5.14 AP+AT=AC= 21.

INTERACTION RADIUS RINT= 7.84 fm RO= 1.79 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 2.12 CT+CP= 3.97 C̄= 0.99

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 2.52

COULOMB RADII [fm]:
RCP= 2.22 RCT= 2.51 RC=RCP+RCT= 4.73

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 10.26 MeV K= .06457 n=2.463
VC(RINT)= 4.4 MeV

FISSION-TKE= 26. MeV
ASYMM. FISSION-TKE= 25. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.948 MeV/fm**2 PROX-FACTOR= 11.77 MeV
L-RLD= 21 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 37.13 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: 0.0
COMPOUND NUCLEUS: -7.6

FUSION RELATED PARAMETERS:
R-BARRIER= 7.23 fm V(RB)= 4.2 MeV
Q-VALUE= 18.9 MeV
L-CRITICAL= 13.

9 Be on 12 C

9 Be on 12 C

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	5	1.17	389	1.1	3.8	3	465	285	97.2	57.8	41.4	4	5	0	10	9.38	4.	0 0	3.0	1
2.0	18	10	2.34	550	1.6	2.7	9	1349	962	31.7	18.2	74.2	17	1	0	4	3.32	7.	0 0	3.3	1
3.0	27	15	3.50	673	1.9	2.2	13	1600	1188	19.2	11.0	80.4	26	1	0	3	2.42	11.	0 0	3.6	1
4.0	36	21	4.67	778	2.2	1.9	16	1716	1270	13.8	7.9	83.1	35	1	0	2	2.00	14.	0 0	3.9	2
4.5	41	23	5.26	825	2.4	1.8	17	1753	1129	12.1	6.9	84.0	40	0	0	2	1.86	16.	0 0	4.0	2
5.0	45	26	5.84	870	2.5	1.7	18	1782	1016	10.8	6.2	84.6	45	0	44	2	1.74	17.	5 12	4.1	2
5.5	50	28	6.42	912	2.6	1.6	19	1805	924	9.7	5.5	85.2	49	0	46	2	1.64	19.	6 18	4.2	2
6.0	54	31	7.01	953	2.8	1.5	20	1824	847	8.8	5.0	85.6	54	0	48	2	1.56	21.	7 21	4.4	2
6.5	59	33	7.59	992	2.9	1.5	21	1839	781	8.1	4.6	86.0	58	0	50	2	1.49	23.	7 24	4.5	2
7.0	63	36	8.18	1030	3.0	1.4	22	1852	726	7.5	4.3	86.3	63	0	51	2	1.43	24.	8 27	4.6	2
7.5	68	39	8.76	1066	3.1	1.4	23	1863	677	7.0	4.0	86.5	67	0	53	1	1.37	25.	8 29	4.7	3
8.0	72	41	9.34	1101	3.2	1.3	24	1872	635	6.5	3.7	86.8	72	0	55	1	1.33	26.	9 31	4.8	3
8.5	77	44	9.93	1135	3.3	1.3	24	1880	597	6.1	3.5	87.0	76	0	57	1	1.28	28.	9 33	4.9	3
9.0	81	46	10.51	1168	3.4	1.3	25	1887	564	5.7	3.3	87.1	81	0	58	1	1.24	30.	10 35	5.0	3
9.5	86	49	11.09	1200	3.5	1.2	26	1894	534	5.4	3.1	87.3	85	0	60	1	1.21	31.	10 37	5.1	3
10.0	90	51	11.68	1232	3.6	1.2	27	1899	508	5.1	2.9	87.4	90	0	61	1	1.17	33.	10 39	5.2	3
10.5	95	54	12.26	1262	3.6	1.2	27	1904	484	4.9	2.8	87.6	94	0	63	1	1.14	35.	11 40	5.3	3
11.0	99	57	12.85	1292	3.7	1.1	28	1908	462	4.6	2.7	87.7	99	0	65	1	1.11	36.	11 42	5.4	3
11.5	104	59	13.43	1321	3.8	1.1	29	1912	441	4.4	2.5	87.8	103	0	66	1	1.09	38.	12 44	5.5	3
12.0	108	62	14.01	1350	3.9	1.1	29	1916	423	4.2	2.4	87.9	108	0	68	1	1.06	40.	12 45	5.5	3
13.0	117	67	15.18	1405	4.1	1.0	31	1922	390	3.9	2.2	88.0	117	0	71	1	1.02	43.	13 48	5.7	3
14.0	126	72	16.35	1459	4.2	1.0	32	1927	363	3.6	2.1	88.2	126	0	74	1	0.98	46.	14 51	5.9	3
15.0	135	77	17.52	1511	4.4	1.0	33	1931	338	3.4	1.9	88.3	135	0	77	1	0.94	47.	15 54	6.0	4
16.0	144	82	18.69	1561	4.5	0.9	34	1934	317	3.2	1.8	88.4	144	0	80	1	0.91	50.	16 57	6.2	4
17.0	153	87	19.85	1609	4.6	0.9	35	1937	298	3.0	1.7	88.5	153	0	82	1	0.88	53.	16 60	6.4	4
18.0	162	93	21.02	1656	4.8	0.9	37	1940	282	2.8	1.6	88.6	162	0	85	1	0.86	56.	17 63	6.5	4
19.0	171	98	22.19	1702	4.9	0.9	38	1942	267	2.6	1.5	88.7	171	0	88	1	0.83	59.	18 65	6.7	4
20.0	180	103	23.36	1747	5.0	0.8	39	1944	254	2.5	1.4	88.7	180	0	91	1	0.81	62.	19 68	6.8	4
25.0	225	129	29.20	1955	5.6	0.8	43	1951	203	2.0	1.1	89.0	225	0	104	1	0.72	73.	23 81	7.5	5
30.0	270	154	35.04	2145	6.2	0.7	48	1954	169	1.7	0.9	89.2	270	0	117	1	0.66	88.	27 93	8.1	5
35.0	315	180	40.88	2320	6.7	0.6	52	1956	145	1.4	0.8	89.3	315	0	130	1	0.61	96.	31 104	8.7	
40.0	360	206	46.72	2483	7.1	0.6	55	1957	127	1.2	0.7	89.4	360	0	142	1	0.57	103.	35 115	9.3	
45.0	405	231	52.55	2637	7.5	0.6	59	1958	112	1.1	0.6	89.4	405	0	154	1	0.53	116.	38 126	9.8	
50.0	450	257	58.39	2783	8.0	0.5	62	1958	101	1.0	0.6	89.5	450	0	166	1	0.51	128.	42 136	10.3	

\# 34 9 Be on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 8. ZC= 12.(Mg)
NEUTRON NUMBERS: NP= 5. NT= 8. NC= 13.

AP**1/3= 2.080 AT**1/3= 2.520
REDUCED MASS NUMBER= 5.76 AP+AT=AC= 25.

INTERACTION RADIUS RINT= 8.09 fm RO= 1.76 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 2.42 CT+CP= 4.27 C̄= 1.05

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 2.78

COULOMB RADII [fm]:
RCP= 2.22 RCT= 2.78 RC=RCP+RCT= 5.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 12.89 MeV K= .06614 n=2.498
VC(RINT)= 5.7 MeV

FISSION-TKE= 27. MeV
ASYMM. FISSION-TKE= 24. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.949 MeV/fm**2 PROX-FACTOR= 12.51 MeV
L-RLD= 25 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 33.21 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -4.7
COMPOUND NUCLEUS: -15.8

FUSION RELATED PARAMETERS:
R-BARRIER= 7.44 fm V(RB)= 5.6 MeV
Q-VALUE= 22.4 MeV
L-CRITICAL= 16.

9 Be on 16 O

9 Be on 16 O

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	6	1.01	389	1.3	5.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	18	12	2.03	550	1.8	3.6	10	1253	900	36.3	24.7	70.8	16	2	0	5	3.64	6.	0 0	3.3	1
3.0	27	17	3.04	673	2.2	2.9	14	1576	1180	22.8	14.6	78.6	26	1	0	4	2.58	9.	0 0	3.6	2
4.0	36	23	4.05	778	2.5	2.5	18	1728	1319	16.2	10.4	81.9	35	1	0	3	2.11	12.	0 0	3.8	2
4.5	41	26	4.56	825	2.7	2.4	19	1777	1259	14.2	9.1	82.9	40	1	38	3	1.95	13.	5 13	3.9	2
5.0	45	29	5.06	870	2.8	2.3	20	1815	1133	12.6	8.1	83.7	45	0	40	3	1.83	15.	5 17	4.0	2
5.5	50	32	5.57	912	3.0	2.1	22	1846	1030	11.3	7.3	84.3	49	0	42	2	1.72	16.	6 20	4.2	2
6.0	54	35	6.08	953	3.1	2.1	23	1871	944	10.3	6.6	84.8	54	0	43	2	1.63	17.	7 23	4.3	3
6.5	59	37	6.58	992	3.2	2.0	24	1892	871	9.4	6.0	85.3	58	0	45	2	1.56	19.	7 25	4.4	3
7.0	63	40	7.09	1030	3.3	1.9	25	1910	809	8.7	5.6	85.6	63	0	46	2	1.49	20.	7 28	4.5	3
7.5	68	43	7.60	1066	3.5	1.8	26	1925	755	8.1	5.2	86.0	67	0	48	2	1.43	21.	8 30	4.6	3
8.0	72	46	8.10	1101	3.6	1.8	27	1938	708	7.6	4.8	86.2	72	0	49	2	1.38	23.	8 31	4.7	3
8.5	77	49	8.61	1135	3.7	1.7	28	1950	666	7.1	4.5	86.5	76	0	50	2	1.33	24.	9 33	4.8	3
9.0	81	52	9.11	1168	3.8	1.7	29	1960	629	6.7	4.3	86.7	81	0	52	2	1.29	26.	9 35	4.9	3
9.5	86	55	9.62	1200	3.9	1.6	30	1968	596	6.3	4.0	86.9	85	0	53	2	1.25	27.	10 37	5.0	3
10.0	90	58	10.13	1232	4.0	1.6	31	1976	566	6.0	3.8	87.0	90	0	54	2	1.22	28.	10 38	5.1	3
10.5	95	60	10.63	1262	4.1	1.6	31	1983	539	5.7	3.6	87.2	94	0	55	2	1.19	30.	10 40	5.2	3
11.0	99	63	11.14	1292	4.2	1.5	32	1989	515	5.4	3.5	87.3	99	0	57	2	1.16	31.	11 42	5.2	3
11.5	104	66	11.65	1321	4.3	1.5	33	1995	492	5.1	3.3	87.4	103	0	58	2	1.13	31.	11 43	5.3	4
12.0	108	69	12.15	1350	4.4	1.5	34	2000	472	4.9	3.2	87.5	108	0	59	2	1.10	33.	12 45	5.4	4
13.0	117	75	13.17	1405	4.5	1.4	35	2009	435	4.5	2.9	87.7	117	0	61	1	1.06	35.	13 48	5.6	4
14.0	126	81	14.18	1459	4.7	1.3	37	2016	404	4.2	2.7	87.9	126	0	64	1	1.01	38.	13 50	5.7	4
15.0	135	86	15.19	1511	4.9	1.3	38	2023	377	3.9	2.5	88.0	135	0	66	1	0.98	41.	14 53	5.9	4
16.0	144	92	16.20	1561	5.0	1.3	39	2028	354	3.7	2.3	88.2	144	0	68	1	0.94	44.	15 56	6.1	4
17.0	153	98	17.22	1609	5.2	1.2	41	2033	333	3.4	2.2	88.3	153	0	71	1	0.91	44.	16 59	6.2	5
18.0	162	104	18.23	1656	5.3	1.2	42	2037	314	3.2	2.1	88.4	162	0	73	1	0.89	47.	16 61	6.4	5
19.0	171	109	19.24	1702	5.5	1.2	43	2040	298	3.1	2.0	88.5	171	0	75	1	0.86	49.	17 64	6.5	5
20.0	180	115	20.25	1747	5.6	1.1	44	2044	283	2.9	1.9	88.5	180	0	77	1	0.84	52.	18 66	6.6	5
25.0	225	144	25.32	1955	6.3	1.0	50	2055	226	2.3	1.5	88.8	225	0	87	1	0.75	62.	22 78	7.3	6
30.0	270	173	30.38	2145	6.9	0.9	55	2062	188	1.9	1.2	89.0	270	0	97	1	0.68	74.	26 90	7.9	6
35.0	315	202	35.44	2320	7.5	0.9	59	2066	161	1.6	1.1	89.2	315	0	107	1	0.63	82.	29 101	8.5	
40.0	360	230	40.51	2483	8.0	0.8	64	2069	141	1.4	0.9	89.3	360	0	116	1	0.59	88.	33 111	9.0	
45.0	405	259	45.57	2637	8.5	0.8	68	2071	125	1.3	0.8	89.4	405	0	125	1	0.55	99.	37 121	9.5	
50.0	450	288	50.64	2783	8.9	0.7	71	2073	113	1.1	0.7	89.4	450	0	134	1	0.52	104.	40 131	10.0	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 35 9 Be on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 13. ZC= 17.(Cl)
NEUTRON NUMBERS: NP= 5. NT= 14. NC= 19.

AP**1/3= 2.080 AT**1/3= 3.000
REDUCED MASS NUMBER= 6.75 AP+AT=AC= 36.

INTERACTION RADIUS RINT= 8.62 fm R0= 1.70 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 3.05 CT+CP= 4.90 C= 1.15

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 3.35

COULOMB RADII [fm]:
RCP= 2.22 RCT= 3.32 RC=RCP+RCT= 5.54

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 18.71 MeV K= .06170 n=2.591
VC(RINT)= 8.7 MeV

FISSION-TKE= 32. MeV
ASYMM. FISSION-TKE= 23. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 13.69 MeV
L-RLD= 36 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 28.40 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -20.6
COMPOUND NUCLEUS: -26.6

FUSION RELATED PARAMETERS:
R-BARRIER= 7.90 fm V(RB)= 8.6 MeV
Q-VALUE= 17.3 MeV
L-CRITICAL= 21.

9 Be on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	9	7	0.78	389	1.5	8.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	14	1.56	550	2.1	5.8	11	993	709	56.7	43.4	61.7	15	3	0	10	4.62	4.	0	0	2.6	2
3.0	27	20	2.33	673	2.6	4.7	17	1496	1126	31.7	23.9	74.1	25	2	0	6	2.98	6.	0	0	2.9	2
4.0	36	27	3.11	778	3.0	4.1	21	1736	1334	22.1	16.6	78.9	35	1	31	5	2.37	8.	4	14	3.1	2
4.5	41	30	3.50	825	3.1	3.9	23	1814	1403	19.2	14.4	80.4	40	1	32	5	2.17	9.	5	17	3.3	3
5.0	45	34	3.89	870	3.3	3.7	25	1876	1455	17.0	12.8	81.5	44	1	33	4	2.02	10.	5	19	3.4	3
5.5	50	37	4.28	912	3.5	3.5	26	1926	1323	15.2	11.4	82.4	49	1	34	4	1.90	11.	6	21	3.5	3
6.0	54	41	4.67	953	3.6	3.3	28	1967	1213	13.8	10.4	83.1	53	1	35	4	1.79	12.	6	23	3.6	3
6.5	59	44	5.06	992	3.8	3.2	29	2002	1119	12.6	9.5	83.7	58	1	36	4	1.71	13.	7	25	3.7	3
7.0	63	47	5.44	1030	3.9	3.1	30	2031	1039	11.6	8.7	84.2	63	0	37	3	1.63	14.	7	27	3.8	3
7.5	68	51	5.83	1066	4.0	3.0	32	2056	970	10.8	8.1	84.6	67	0	38	3	1.56	15.	7	29	3.9	3
8.0	72	54	6.22	1101	4.2	2.9	33	2078	909	10.0	7.5	85.0	72	0	39	3	1.50	16.	8	30	4.0	4
8.5	77	57	6.61	1135	4.3	2.8	34	2097	856	9.4	7.1	85.3	76	0	40	3	1.45	17.	8	32	4.1	4
9.0	81	61	7.00	1168	4.4	2.7	35	2114	808	8.8	6.6	85.6	81	0	40	3	1.40	18.	9	33	4.2	4
9.5	86	64	7.39	1200	4.6	2.7	36	2128	766	8.3	6.3	85.8	85	0	41	3	1.36	19.	9	35	4.3	4
10.0	90	68	7.78	1232	4.7	2.6	38	2142	727	7.9	5.9	86.1	90	0	42	3	1.32	20.	9	36	4.3	4
10.5	95	71	8.17	1262	4.8	2.5	39	2154	693	7.5	5.6	86.3	94	0	43	3	1.28	21.	10	38	4.4	4
11.0	99	74	8.56	1292	4.9	2.5	40	2165	661	7.1	5.3	86.4	99	0	44	3	1.25	22.	10	39	4.5	4
11.5	104	78	8.94	1321	5.0	2.4	41	2174	633	6.8	5.1	86.6	103	0	44	3	1.22	22.	10	40	4.6	5
12.0	108	81	9.33	1350	5.1	2.4	42	2183	606	6.5	4.9	86.8	108	0	45	3	1.19	23.	11	42	4.7	5
13.0	117	88	10.11	1405	5.3	2.3	44	2199	559	6.0	4.5	87.0	117	0	47	2	1.14	25.	12	44	4.8	5
14.0	126	95	10.89	1459	5.5	2.2	45	2212	519	5.5	4.1	87.2	126	0	48	2	1.09	27.	12	47	5.0	5
15.0	135	101	11.67	1511	5.7	2.1	47	2224	485	5.1	3.9	87.4	135	0	49	2	1.05	29.	13	49	5.1	5
16.0	144	108	12.44	1561	5.9	2.0	49	2234	454	4.8	3.6	87.6	144	0	51	2	1.02	30.	14	52	5.3	6
17.0	153	115	13.22	1609	6.1	2.0	50	2242	428	4.5	3.4	87.7	153	0	52	2	0.98	32.	14	54	5.4	6
18.0	162	122	14.00	1656	6.3	1.9	52	2250	404	4.3	3.2	87.9	162	0	53	2	0.95	34.	15	57	5.6	6
19.0	171	128	14.78	1702	6.4	1.9	54	2256	383	4.0	3.0	88.0	171	0	55	2	0.93	36.	16	59	5.7	6
20.0	180	135	15.56	1747	6.6	1.8	55	2262	363	3.8	2.9	88.1	180	0	56	2	0.90	37.	17	61	5.8	6
25.0	225	169	19.45	1955	7.4	1.6	62	2284	291	3.0	2.3	88.5	225	0	62	2	0.80	45.	20	72	6.4	7
30.0	270	203	23.33	2145	8.1	1.5	68	2298	242	2.5	1.9	88.7	270	0	68	2	0.73	52.	24	82	7.0	8
35.0	315	236	27.22	2320	8.7	1.4	74	2308	207	2.1	1.6	88.9	315	0	73	1	0.67	59.	27	92	7.5	
40.0	360	270	31.11	2483	9.3	1.3	79	2315	181	1.9	1.4	89.1	360	0	79	1	0.63	65.	30	102	8.0	
45.0	405	304	35.00	2637	9.9	1.2	84	2320	161	1.7	1.3	89.2	405	0	84	1	0.59	70.	34	111	8.4	
50.0	450	338	38.89	2783	10.4	1.2	89	2324	145	1.5	1.1	89.3	450	0	89	1	0.56	78.	37	120	8.9	

 # 36 9 Be on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 20. ZC= 24.(Cr)
NEUTRON NUMBERS: NP= 5. NT= 20. NC= 25.

AP**1/3= 2.080 AT**1/3= 3.420
REDUCED MASS NUMBER= 7.35 AP+AT=AC= 49.

INTERACTION RADIUS RINT= 9.07 fm R0= 1.65 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 3.59 CT+CP= 5.44 C= 1.22

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 3.85

COULOMB RADII [fm]:
RCP= 2.22 RCT= 3.84 RC=RCP+RCT= 6.06

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 25.95 MeV K= .05105 n=2.729
VC(RINT)= 12.7 MeV

FISSION-TKE= 39. MeV
ASYMM. FISSION-TKE= 22. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 14.59 MeV
L-RLD= 48 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 26.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -33.0
COMPOUND NUCLEUS: -46.8

FUSION RELATED PARAMETERS:
R-BARRIER= 8.28 fm V(RB)= 12.8 MeV
Q-VALUE= 25.1 MeV
L-CRITICAL= 26.

9 Be on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	9	7	0.58	389	1.6	12.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	15	1.16	550	2.3	8.9	8	451	284	99.0	86.0	40.5	12	6	0	24	7.86	3.	0	0	2.5	2
3.0	27	22	1.74	673	2.8	7.3	16	1235	908	47.7	39.5	66.1	24	3	24	11	3.64	5.	3	6	2.8	2
4.0	36	29	2.32	778	3.2	6.3	22	1606	1220	32.0	26.3	74.0	34	2	27	8	2.72	6.	4	14	3.0	3
4.5	41	33	2.61	825	3.4	5.9	24	1728	1324	27.5	22.5	76.3	39	1	28	8	2.46	7.	5	17	3.1	3
5.0	45	37	2.90	870	3.6	5.6	26	1824	1407	24.1	19.7	77.9	44	1	29	7	2.27	8.	5	19	3.2	3
5.5	50	40	3.19	912	3.8	5.4	28	1902	1475	21.5	17.6	79.3	48	1	30	6	2.11	9.	5	21	3.3	3
6.0	54	44	3.48	953	3.9	5.1	30	1966	1498	19.4	15.8	80.3	53	1	30	6	1.99	9.	6	22	3.4	3
6.5	59	48	3.77	992	4.1	4.9	32	2021	1383	17.6	14.4	81.2	58	1	31	6	1.88	10.	6	24	3.4	3
7.0	63	51	4.06	1030	4.3	4.8	33	2067	1284	16.2	13.2	81.9	62	1	32	5	1.79	11.	7	25	3.5	3
7.5	68	55	4.35	1066	4.4	4.6	35	2106	1199	15.0	12.2	82.5	67	1	32	5	1.71	11.	7	27	3.6	4
8.0	72	59	4.64	1101	4.5	4.5	37	2141	1124	13.9	11.4	83.0	71	1	33	5	1.64	12.	7	28	3.7	4
8.5	77	62	4.93	1135	4.7	4.3	38	2171	1058	13.0	10.6	83.5	76	1	33	5	1.58	13.	8	30	3.8	4
9.0	81	66	5.22	1168	4.8	4.2	39	2198	999	12.2	10.0	83.9	80	1	34	5	1.52	14.	8	31	3.9	4
9.5	86	70	5.51	1200	5.0	4.1	41	2222	946	11.5	9.4	84.3	85	1	35	5	1.47	14.	8	33	3.9	4
10.0	90	73	5.80	1232	5.1	4.0	42	2243	899	10.9	8.9	84.6	90	0	35	4	1.43	15.	9	34	4.0	4
10.5	95	77	6.09	1262	5.2	3.9	43	2263	856	10.3	8.4	84.9	94	0	36	4	1.39	16.	9	35	4.1	5
11.0	99	81	6.38	1292	5.3	3.8	44	2280	817	9.8	8.0	85.1	99	0	36	4	1.35	16.	10	36	4.2	5
11.5	104	84	6.66	1321	5.4	3.7	46	2296	782	9.3	7.6	85.3	103	0	37	4	1.31	17.	10	38	4.2	5
12.0	108	88	6.95	1350	5.6	3.6	47	2310	749	8.9	7.3	85.6	108	0	37	4	1.28	18.	10	39	4.3	5
13.0	117	96	7.53	1405	5.8	3.5	49	2336	691	8.2	6.7	85.9	117	0	38	4	1.22	19.	11	41	4.4	5
14.0	126	103	8.11	1459	6.0	3.4	51	2358	642	7.5	6.2	86.2	126	0	39	4	1.17	21.	12	44	4.6	5
15.0	135	110	8.69	1511	6.2	3.3	53	2376	599	7.0	5.7	86.5	135	0	40	3	1.13	22.	12	46	4.7	6
16.0	144	118	9.27	1561	6.4	3.1	55	2392	562	6.5	5.3	86.7	144	0	41	3	1.09	23.	13	48	4.8	6
17.0	153	125	9.85	1609	6.6	3.1	57	2406	529	6.1	5.0	86.9	153	0	42	3	1.05	25.	14	50	4.9	6
18.0	162	132	10.43	1656	6.8	3.0	59	2419	499	5.8	4.7	87.1	162	0	43	3	1.02	25.	14	52	5.1	7
19.0	171	140	11.01	1702	7.0	2.9	61	2430	473	5.5	4.5	87.3	171	0	44	3	0.99	27.	15	54	5.2	7
20.0	180	147	11.59	1747	7.2	2.8	62	2440	449	5.2	4.2	87.4	180	0	44	3	0.96	28.	16	57	5.3	7
25.0	225	184	14.49	1955	8.0	2.5	70	2477	359	4.1	3.3	87.9	225	0	48	3	0.85	35.	19	67	5.8	8
30.0	270	220	17.39	2145	8.8	2.3	78	2501	299	3.4	2.8	88.3	270	0	52	2	0.77	40.	22	76	6.3	9
35.0	315	257	20.28	2320	9.5	2.1	84	2518	256	2.9	2.4	88.5	315	0	56	2	0.71	46.	25	85	6.8	
40.0	360	294	23.18	2483	10.2	2.0	90	2531	224	2.5	2.1	88.7	360	0	59	2	0.66	51.	29	94	7.2	
45.0	405	331	26.08	2637	10.8	1.9	96	2540	199	2.2	1.8	88.9	405	0	62	2	0.62	56.	32	103	7.6	
50.0	450	367	28.98	2783	11.4	1.8	101	2547	179	2.0	1.6	89.0	450	0	66	2	0.59	61.	35	111	8.0	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nms	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 37 9 Be on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 26. ZC= 30.(Zn)
NEUTRON NUMBERS: NP= 5. NT= 30. NC= 35.

AP**1/3= 2.080 AT**1/3= 3.826
REDUCED MASS NUMBER= 7.75 AP+AT=AC= 65.

INTERACTION RADIUS RINT= 9.52 fm RO= 1.61 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 4.12 CT+CP= 5.97 C= 1.28

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 4.35

COULOMB RADII [fm]:
RCP= 2.22 RCT= 4.27 RC=RCP+RCT= 6.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 31.27 MeV K= .04345 n=2.804
VC(RINT)= 15.7 MeV

FISSION-TKE= 46. MeV
ASYMM. FISSION-TKE= 21. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 15.10 MeV
L-RLD= 63 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 24.75 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -61.4
COMPOUND NUCLEUS: -65.6

FUSION RELATED PARAMETERS:
R-BARRIER= 8.68 fm V(RB)= 15.8 MeV
Q-VALUE= 15.5 MeV
L-CRITICAL= 31.

9 Be on 56 Fe

9 Be on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	8	0.49	389	1.7	16.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	16	0.99	550	2.4	11.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	27	23	1.48	673	2.9	9.5	16	1040	755	61.5	54.0	59.3	24	3	22	17	4.37	4.	3	8	2.2	3
4.0	36	31	1.97	778	3.4	8.2	23	1528	1158	39.7	34.5	70.1	34	2	25	12	3.07	5.	4	14	2.4	3
4.5	41	35	2.22	825	3.6	7.7	25	1688	1293	33.9	29.3	73.1	39	2	25	10	2.74	5.	4	16	2.5	3
5.0	45	39	2.47	870	3.8	7.3	28	1814	1400	29.5	25.5	75.3	44	1	26	9	2.50	6.	5	18	2.6	3
5.5	50	43	2.71	912	4.0	7.0	30	1917	1488	26.1	22.6	76.9	48	1	27	9	2.31	6.	5	19	2.7	4
6.0	54	47	2.96	953	4.2	6.7	32	2002	1561	23.5	20.3	78.3	53	1	27	8	2.16	7.	6	21	2.8	4
6.5	59	50	3.21	992	4.3	6.4	34	2073	1623	21.3	18.4	79.3	58	1	28	8	2.04	8.	6	22	2.8	4
7.0	63	54	3.45	1030	4.5	6.2	36	2134	1589	19.5	16.9	80.2	62	1	28	7	1.93	8.	6	24	2.9	4
7.5	68	58	3.70	1066	4.6	6.0	38	2187	1483	18.0	15.5	81.0	67	1	29	7	1.84	9.	7	25	3.0	5
8.0	72	62	3.95	1101	4.8	5.8	39	2232	1391	16.7	14.4	81.6	71	1	29	7	1.76	9.	7	27	3.1	5
8.5	77	66	4.19	1135	4.9	5.6	41	2273	1309	15.6	13.4	82.2	76	1	30	6	1.69	10.	7	28	3.2	5
9.0	81	70	4.44	1168	5.1	5.5	43	2308	1236	14.6	12.6	82.7	80	1	30	6	1.63	10.	8	29	3.2	5
9.5	86	74	4.69	1200	5.2	5.3	44	2340	1171	13.7	11.8	83.1	85	1	31	6	1.57	11.	8	30	3.3	5
10.0	90	78	4.93	1232	5.4	5.2	46	2368	1112	13.0	11.2	83.5	89	1	31	6	1.52	11.	8	31	3.4	5
10.5	95	81	5.18	1262	5.5	5.1	47	2394	1059	12.3	10.6	83.9	94	1	31	6	1.48	12.	9	33	3.5	6
11.0	99	85	5.43	1292	5.6	4.9	48	2417	1011	11.7	10.1	84.2	99	0	32	5	1.44	12.	9	34	3.5	6
11.5	104	89	5.67	1321	5.8	4.8	50	2438	967	11.1	9.6	84.4	103	0	32	5	1.40	13.	9	35	3.6	6
12.0	108	93	5.92	1350	5.9	4.7	51	2458	927	10.6	9.1	84.7	108	0	33	5	1.36	14.	10	36	3.7	6
13.0	117	101	6.41	1405	6.1	4.5	53	2492	856	9.7	8.4	85.1	117	0	33	5	1.30	14.	10	38	3.8	7
14.0	126	109	6.91	1459	6.3	4.4	56	2521	794	9.0	7.7	85.5	126	0	34	5	1.24	16.	11	40	3.9	7
15.0	135	116	7.40	1511	6.6	4.2	58	2546	741	8.3	7.2	85.8	135	0	35	5	1.19	17.	12	43	4.0	7
16.0	144	124	7.89	1561	6.8	4.1	60	2567	695	7.8	6.7	86.1	144	0	35	4	1.15	18.	12	45	4.1	7
17.0	153	132	8.39	1609	7.0	4.0	62	2586	654	7.3	6.3	86.4	153	0	36	4	1.11	19.	13	47	4.3	8
18.0	162	140	8.88	1656	7.2	3.9	64	2603	618	6.8	5.9	86.6	162	0	36	4	1.08	20.	14	49	4.4	8
19.0	171	147	9.37	1702	7.4	3.8	66	2618	585	6.5	5.6	86.8	171	0	37	4	1.04	21.	14	51	4.5	8
20.0	180	155	9.87	1747	7.6	3.7	68	2632	556	6.1	5.3	86.9	180	0	38	4	1.02	21.	15	52	4.6	9
25.0	225	194	12.34	1955	8.5	3.3	77	2682	445	4.8	4.2	87.6	225	0	40	3	0.90	26.	18	62	5.1	10
30.0	270	233	14.80	2145	9.3	3.0	85	2715	370	4.0	3.5	88.0	270	0	43	3	0.81	31.	21	71	5.5	11
35.0	315	271	17.27	2320	10.0	2.8	93	2738	317	3.4	2.9	88.3	315	0	45	3	0.75	36.	24	79	5.9	
40.0	360	310	19.74	2483	10.7	2.6	99	2755	278	3.0	2.6	88.5	360	0	48	3	0.70	40.	27	87	6.3	
45.0	405	349	22.20	2637	11.4	2.4	106	2768	247	2.6	2.3	88.7	405	0	50	2	0.66	43.	30	95	6.7	
50.0	450	388	24.67	2783	12.0	2.3	112	2779	222	2.4	2.0	88.8	450	0	52	2	0.62	48.	33	103	7.0	

\# 38 9 Be on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 29. ZC= 33.(As)
NEUTRON NUMBERS: NP= 5. NT= 34. NC= 39.

AP**1/3= 2.080 AT**1/3= 3.979
REDUCED MASS NUMBER= 7.88 AP+AT=AC= 72.

INTERACTION RADIUS RINT= 9.68 fm RO= 1.60 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 4.31 CT+CP= 6.16 C= 1.29

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 4.53

COULOMB RADII [fm]:
RCP= 2.22 RCT= 4.45 RC=RCP+RCT= 6.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 33.84 MeV K= .03997 n=2.844
VC(RINT)= 17.2 MeV

FISSION-TKE= 50. MeV
ASYMM. FISSION-TKE= 21. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.940 MeV/fm**2 PROX-FACTOR= 15.29 MeV
L-RLD= 68 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 24.38 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -65.2
COMPOUND NUCLEUS: -68.9

FUSION RELATED PARAMETERS:
R-BARRIER= 8.83 fm V(RB)= 17.4 MeV
Q-VALUE= 15.1 MeV
L-CRITICAL= 33.

9 Be on 63 Cu

9 Be on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	8	0.46	389	1.7	18.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	16	0.91	550	2.4	12.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	27	24	1.37	673	3.0	10.5	15	904	646	70.2	62.9	54.9	23	4	21	20	4.87	3.	3	8	2.1	2
4.0	36	32	1.83	778	3.4	9.1	22	1454	1096	44.3	39.1	67.9	34	2	24	14	3.25	4.	4	14	2.3	3
4.5	41	35	2.06	825	3.7	8.6	25	1633	1246	37.5	33.1	71.2	39	2	25	12	2.88	5.	4	16	2.4	3
5.0	45	39	2.29	870	3.9	8.2	28	1776	1367	32.6	28.6	73.7	43	2	26	11	2.61	5.	5	17	2.5	3
5.5	50	43	2.51	912	4.0	7.8	30	1891	1465	28.8	25.3	75.6	48	1	26	10	2.41	6.	5	19	2.5	4
6.0	54	47	2.74	953	4.2	7.5	33	1987	1547	25.8	22.7	77.1	53	1	27	9	2.24	6.	5	20	2.6	4
6.5	59	51	2.97	992	4.4	7.2	35	2067	1616	23.4	20.5	78.3	57	1	27	9	2.11	7.	6	22	2.7	4
7.0	63	55	3.20	1030	4.6	6.9	37	2136	1676	21.4	18.7	79.3	62	1	28	8	2.00	7.	6	23	2.8	4
7.5	68	59	3.43	1066	4.7	6.7	38	2195	1598	19.7	17.3	80.2	67	1	28	8	1.90	8.	7	25	2.9	5
8.0	72	63	3.66	1101	4.9	6.5	40	2247	1498	18.3	16.0	80.9	71	1	29	8	1.82	8.	7	26	2.9	5
8.5	77	67	3.89	1135	5.0	6.3	42	2292	1410	17.0	14.9	81.5	76	1	29	7	1.74	9.	7	27	3.0	5
9.0	81	71	4.11	1168	5.2	6.1	44	2332	1331	15.9	14.0	82.0	80	1	29	7	1.68	9.	8	28	3.1	5
9.5	86	75	4.34	1200	5.3	5.9	45	2368	1261	15.0	13.1	82.5	85	1	30	7	1.62	10.	8	29	3.2	5
10.0	90	79	4.57	1232	5.4	5.8	47	2400	1198	14.1	12.4	82.9	89	1	30	7	1.57	10.	8	31	3.2	5
10.5	95	83	4.80	1262	5.6	5.6	48	2429	1141	13.4	11.7	83.3	94	1	30	6	1.52	11.	9	32	3.3	6
11.0	99	87	5.03	1292	5.7	5.5	50	2455	1089	12.7	11.1	83.7	98	1	31	6	1.48	11.	9	33	3.4	6
11.5	104	91	5.26	1321	5.8	5.4	51	2479	1042	12.1	10.6	84.0	103	1	31	6	1.43	12.	9	34	3.4	6
12.0	108	95	5.49	1350	6.0	5.3	52	2501	998	11.5	10.1	84.2	108	0	31	6	1.40	12.	10	35	3.5	6
13.0	117	102	5.94	1405	6.2	5.1	55	2539	921	10.6	9.2	84.7	117	0	32	6	1.33	13.	10	37	3.6	7
14.0	126	110	6.40	1459	6.4	4.9	57	2572	856	9.7	8.5	85.1	126	0	33	5	1.27	14.	11	39	3.7	7
15.0	135	118	6.86	1511	6.7	4.7	60	2600	799	9.0	7.9	85.5	135	0	33	5	1.22	15.	12	41	3.8	7
16.0	144	126	7.31	1561	6.9	4.6	62	2625	749	8.4	7.4	85.8	144	0	34	5	1.18	16.	12	43	4.0	8
17.0	153	134	7.77	1609	7.1	4.4	64	2647	705	7.9	6.9	86.1	153	0	34	5	1.14	17.	13	45	4.1	8
18.0	162	142	8.23	1656	7.3	4.3	66	2666	665	7.4	6.5	86.3	162	0	35	5	1.10	18.	13	47	4.2	8
19.0	171	150	8.69	1702	7.5	4.2	68	2683	630	7.0	6.1	86.5	171	0	35	4	1.07	19.	14	49	4.3	9
20.0	180	158	9.14	1747	7.7	4.1	70	2698	599	6.6	5.8	86.7	180	0	36	4	1.04	20.	15	51	4.4	9
25.0	225	197	11.43	1955	8.6	3.7	80	2755	479	5.3	4.6	87.4	225	0	38	4	0.92	24.	18	60	4.9	11
30.0	270	236	13.71	2145	9.4	3.3	88	2793	399	4.3	3.8	87.8	270	0	41	3	0.83	28.	21	69	5.3	12
35.0	315	276	16.00	2320	10.2	3.1	96	2819	342	3.7	3.2	88.1	315	0	43	3	0.76	32.	24	77	5.7	
40.0	360	315	18.29	2483	10.9	2.9	103	2839	299	3.2	2.8	88.4	360	0	45	3	0.71	36.	27	85	6.1	
45.0	405	354	20.57	2637	11.6	2.7	109	2854	266	2.9	2.5	88.6	405	0	47	3	0.67	40.	30	93	6.4	
50.0	450	394	22.86	2783	12.2	2.6	115	2866	239	2.6	2.2	88.7	450	0	49	3	0.63	44.	33	101	6.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 39 9 Be on 92 Mo

9 Be on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 42. ZC= 46.(Pd)
NEUTRON NUMBERS: NP= 5. NT= 50. NC= 55.

AP**1/3= 2.080 AT**1/3= 4.514
REDUCED MASS NUMBER= 8.20 AP+AT=AC=101.

INTERACTION RADIUS RINT=10.26 fm R0= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 5.00 CT+CP= 6.85 C= 1.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 5.20

COULOMB RADII [fm]:
RCP= 2.22 RCT= 5.08 RC=RCP+RCT= 7.29

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 44.15 MeV K= .02821 n=3.004
VC(RINT)= 23.5 MeV

FISSION-TKE= 71. MeV
ASYMM. FISSION-TKE= 23. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.938 MeV/fm**2 PROX-FACTOR= 15.92 MeV
L-RLD= 83 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 23.42 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -87.5
COMPOUND NUCLEUS: -85.2

FUSION RELATED PARAMETERS:
R-BARRIER= 9.34 fm V(RB)= 23.9 MeV
Q-VALUE= 9.0 MeV
L-CRITICAL= 39.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	8	0.35	389	1.8	26.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	18	16	0.70	550	2.5	18.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	27	25	1.04	673	3.1	15.3	7	184	79	133.8	129.5	23.1	20	7	18	74	13.12	2.	2	7	2
4.0	36	33	1.39	778	3.6	13.2	20	1029	744	68.2	63.2	55.9	32	4	23	25	4.38	3.	4	12	3
4.5	41	37	1.57	825	3.8	12.5	23	1299	966	56.0	51.6	62.0	38	3	24	21	3.64	3.	4	14	3
5.0	45	41	1.74	870	4.0	11.8	27	1514	1143	47.6	43.7	66.2	43	2	25	18	3.18	4.	4	16	3
5.5	50	45	1.92	912	4.2	11.3	30	1687	1288	41.4	38.0	69.3	47	2	25	16	2.86	4.	5	17	4
6.0	54	49	2.09	953	4.4	10.8	33	1831	1409	36.7	33.6	71.6	52	2	26	15	2.63	5.	5	19	4
6.5	59	53	2.26	992	4.6	10.4	35	1953	1512	33.0	30.2	73.5	57	2	26	14	2.44	5.	6	20	4
7.0	63	57	2.44	1030	4.7	10.0	37	2056	1599	30.0	27.4	75.0	62	1	27	13	2.29	5.	6	21	5
7.5	68	61	2.61	1066	4.9	9.7	40	2145	1675	27.4	25.1	76.3	66	1	27	12	2.16	6.	6	22	5
8.0	72	66	2.79	1101	5.1	9.4	42	2223	1742	25.3	23.1	77.3	71	1	27	12	2.05	6.	7	24	5
8.5	77	70	2.96	1135	5.2	9.1	44	2292	1798	23.5	21.4	78.3	75	1	28	11	1.96	6.	7	25	5
9.0	81	74	3.13	1168	5.4	8.8	46	2352	1698	21.9	20.0	79.0	80	1	28	11	1.88	7.	7	26	5
9.5	86	78	3.31	1200	5.5	8.6	47	2407	1608	20.5	18.7	79.7	85	1	28	10	1.80	7.	8	27	6
10.0	90	82	3.48	1232	5.7	8.4	49	2455	1528	19.3	17.6	80.3	89	1	28	10	1.74	8.	8	28	6
10.5	95	86	3.66	1262	5.8	8.2	51	2499	1455	18.3	16.6	80.9	94	1	29	10	1.68	8.	8	29	6
11.0	99	90	3.83	1292	5.9	8.0	52	2539	1389	17.3	15.8	81.4	98	1	29	9	1.63	8.	9	30	6
11.5	104	94	4.01	1321	6.1	7.8	54	2575	1329	16.4	15.0	81.8	103	1	29	9	1.58	9.	9	31	7
12.0	108	98	4.18	1350	6.2	7.6	56	2608	1273	15.6	14.3	82.2	107	1	29	9	1.54	9.	9	32	7
13.0	117	107	4.53	1405	6.5	7.3	59	2666	1175	14.3	13.0	82.9	116	1	30	8	1.46	10.	10	34	7
14.0	126	115	4.88	1459	6.7	7.1	61	2716	1091	13.1	12.0	83.4	125	1	30	8	1.39	10.	10	36	7
15.0	135	123	5.22	1511	6.9	6.8	64	2759	1018	12.2	11.1	83.9	135	0	31	8	1.33	11.	11	38	8
16.0	144	131	5.57	1561	7.2	6.6	67	2797	955	11.3	10.3	84.3	144	0	31	7	1.28	12.	12	40	8
17.0	153	139	5.92	1609	7.4	6.4	69	2830	899	10.6	9.7	84.7	153	0	32	7	1.23	12.	12	41	9
18.0	162	148	6.27	1656	7.6	6.2	72	2859	849	10.0	9.1	85.0	162	0	32	7	1.19	13.	13	43	9
19.0	171	156	6.62	1702	7.8	6.1	74	2885	804	9.4	8.6	85.3	171	0	32	7	1.16	14.	13	45	9
20.0	180	164	6.97	1747	8.0	5.9	76	2909	764	8.9	8.1	85.6	180	0	33	6	1.12	14.	14	47	10
25.0	225	205	8.71	1955	9.0	5.3	87	2997	611	7.0	6.4	86.5	225	0	34	6	0.99	18.	17	55	11
30.0	270	246	10.45	2145	9.8	4.8	96	3055	509	5.8	5.3	87.1	270	0	36	5	0.89	21.	20	63	13
35.0	315	287	12.19	2320	10.6	4.5	104	3096	436	4.9	4.5	87.5	315	0	37	5	0.82	24.	23	71	14
40.0	360	328	13.93	2483	11.3	4.2	112	3127	382	4.3	3.9	87.9	360	0	39	4	0.76	27.	26	78	15
45.0	405	369	15.67	2637	12.0	3.9	119	3150	339	3.8	3.4	88.1	405	0	40	4	0.72	30.	29	85	15
50.0	450	410	17.41	2783	12.7	3.7	126	3169	305	3.4	3.1	88.3	450	0	41	4	0.68	33.	32	92	15

\# 40 9 Be on 108 Ag

9 Be on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 47. ZC= 51.(Sb)
NEUTRON NUMBERS: NP= 5. NT= 61. NC= 66.

AP**1/3= 2.080 AT**1/3= 4.762
REDUCED MASS NUMBER= 8.31 AP+AT=AC=117.

INTERACTION RADIUS RINT=10.53 fm R0= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 5.32 CT+CP= 7.17 C= 1.37

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 5.50

COULOMB RADII [fm]:
RCP= 2.22 RCT= 5.34 RC=RCP+RCT= 7.55

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 47.57 MeV K= .02532 n=3.038
VC(RINT)= 25.7 MeV

FISSION-TKE= 79. MeV
ASYMM. FISSION-TKE= 23. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.924 MeV/fm**2 PROX-FACTOR= 15.94 MeV
L-RLD= 91 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 23.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -87.6
COMPOUND NUCLEUS: -89.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.59 fm V(RB)= 26.0 MeV
Q-VALUE= 12.8 MeV
L-CRITICAL= 41.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	8	0.32	389	1.8	29.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	18	17	0.65	550	2.6	20.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	27	25	0.97	673	3.1	17.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	36	33	1.29	778	3.6	14.8	18	879	627	78.2	73.6	50.9	32	4	22	31	5.00	3.	4	12	3
4.5	41	37	1.46	825	3.9	14.0	23	1187	878	63.2	59.1	56.4	37	3	23	25	4.02	3.	4	13	4
5.0	45	42	1.62	870	4.1	13.2	26	1431	1078	53.2	49.6	63.4	42	3	24	21	3.45	3.	4	15	4
5.5	50	46	1.78	912	4.3	12.6	30	1629	1243	46.1	42.8	67.0	47	2	25	19	3.07	4.	5	17	4
6.0	54	50	1.94	953	4.5	12.1	33	1793	1380	40.6	37.7	69.7	52	2	25	17	2.79	4.	5	18	4
6.5	59	54	2.10	992	4.6	11.6	35	1931	1496	36.4	33.7	71.8	57	2	26	16	2.58	4.	6	19	5
7.0	63	58	2.27	1030	4.8	11.2	38	2049	1595	33.0	30.5	73.5	62	1	26	15	2.41	5.	6	20	5
7.5	68	62	2.43	1066	5.0	10.8	40	2151	1681	30.1	27.9	74.9	66	1	27	14	2.27	5.	6	22	5
8.0	72	66	2.59	1101	5.1	10.5	42	2239	1756	27.7	25.7	76.1	71	1	27	13	2.15	5.	7	23	6
8.5	77	71	2.75	1135	5.3	10.2	44	2317	1823	25.7	23.8	77.1	75	1	27	13	2.05	6.	7	24	6
9.0	81	75	2.91	1168	5.5	9.9	47	2386	1882	24.0	22.2	78.0	80	1	27	12	1.96	6.	7	25	6
9.5	86	79	3.07	1200	5.6	9.6	48	2448	1785	22.4	20.7	78.8	85	1	28	12	1.88	6.	7	26	6
10.0	90	83	3.24	1232	5.7	9.4	50	2504	1695	21.1	19.5	79.5	89	1	28	11	1.81	7.	8	27	7
10.5	95	87	3.40	1262	5.9	9.1	52	2554	1615	19.9	18.4	80.1	94	1	28	11	1.75	7.	8	28	7
11.0	99	91	3.56	1292	6.0	8.9	54	2599	1541	18.8	17.4	80.6	98	1	28	11	1.69	7.	8	29	7
11.5	104	96	3.72	1321	6.2	8.7	55	2640	1474	17.9	16.5	81.1	103	1	29	10	1.64	7.	9	30	7
12.0	108	100	3.88	1350	6.3	8.5	57	2678	1413	17.0	15.7	81.5	107	1	29	10	1.60	8.	9	31	8
13.0	117	108	4.21	1405	6.6	8.2	60	2745	1304	15.5	14.3	82.2	116	1	29	9	1.51	8.	10	33	8
14.0	126	116	4.53	1459	6.8	7.9	63	2802	1211	14.3	13.2	82.9	125	1	30	9	1.44	9.	10	35	9
15.0	135	125	4.85	1511	7.0	7.6	66	2851	1130	13.2	12.2	83.4	134	1	30	9	1.38	10.	11	36	9
16.0	144	133	5.18	1561	7.3	7.4	69	2894	1059	12.3	11.3	83.9	144	0	30	8	1.33	10.	11	38	10
17.0	153	141	5.50	1609	7.5	7.2	71	2931	997	11.5	10.6	84.3	153	0	31	8	1.28	11.	12	40	10
18.0	162	150	5.83	1656	7.7	7.0	74	2965	942	10.8	10.0	84.6	162	0	31	8	1.23	11.	13	42	11
19.0	171	158	6.15	1702	7.9	6.8	76	2995	892	10.2	9.4	84.9	171	0	31	7	1.19	12.	13	43	11
20.0	180	166	6.47	1747	8.1	6.6	79	3021	847	9.6	8.9	85.2	180	0	32	7	1.16	12.	14	45	12
25.0	225	208	8.09	1955	9.1	5.9	90	3122	678	7.6	7.0	86.2	225	0	33	6	1.02	15.	17	53	14
30.0	270	249	9.71	2145	10.0	5.4	99	3189	565	6.2	5.8	86.9	270	0	34	6	0.92	18.	20	61	15
35.0	315	291	11.33	2320	10.7	5.0	108	3236	484	5.3	4.9	87.3	315	0	35	5	0.84	21.	23	68	16
40.0	360	332	12.95	2483	11.5	4.7	116	3271	423	4.6	4.3	87.7	360	0	37	5	0.78	23.	25	75	19
45.0	405	374	14.56	2637	12.2	4.4	124	3298	376	4.1	3.8	88.0	405	0	38	5	0.74	26.	28	82	21
50.0	450	415	16.18	2783	12.8	4.2	131	3319	339	3.7	3.4	88.2	450	0	39	4	0.70	28.	31	89	21

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	ab	ab	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 41 9 Be on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 58. ZC= 62.(Sm)
NEUTRON NUMBERS: NP= 5. NT= 82. NC= 87.

AP**1/3= 2.080 AT**1/3= 5.192
REDUCED MASS NUMBER= 8.46 AP+AT=AC=149.

INTERACTION RADIUS RINT=11.00 fm RO= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 5.87 CT+CP= 7.72 C= 1.41

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.04

COULOMB RADII [fm]:
RCP= 2.22 RCT= 5.82 RC=RCP+RCT= 8.03

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 54.85 MeV K= .02001 n=3.120
VC(RINT)= 30.3 MeV

FISSION-TKE= 100. MeV
ASYMM. FISSION-TKE= 24. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.904 MeV/fm**2 PROX-FACTOR= 15.98 MeV
L-RLD= 94 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.70 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -88.2
COMPOUND NUCLEUS: -76.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.01 fm V(RB)= 30.7 MeV
Q-VALUE= -0.4 MeV
L-CRITICAL= 46.

9 Be on 140 Ce

9 Be on 140 Ce

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	8	0.28	389	1.8	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	17	0.56	550	2.6	25.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	27	25	0.84	673	3.2	21.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	36	34	1.12	778	3.7	18.3	13	450	289	109.1	105.6	35.4	31	5	22	57	7.78	2.	3	11	1.3	3
4.5	41	38	1.25	825	3.9	17.2	19	848	606	83.2	79.6	48.4	36	4	23	38	5.22	2.	4	12	1.4	4
5.0	45	42	1.39	870	4.1	16.3	24	1161	860	68.2	64.8	55.9	42	3	24	31	4.19	3.	4	14	1.5	4
5.5	50	47	1.53	912	4.3	15.6	28	1414	1068	58.0	55.0	61.0	47	3	25	26	3.60	3.	5	15	1.6	4
6.0	54	51	1.67	953	4.5	14.9	32	1624	1241	50.6	47.8	64.7	52	2	26	24	3.20	3.	5	17	1.6	5
6.5	59	55	1.81	992	4.7	14.3	35	1800	1388	44.9	42.4	67.6	57	2	26	21	2.92	3.	5	18	1.7	5
7.0	63	59	1.95	1030	4.9	13.8	38	1950	1513	40.4	38.1	69.8	61	2	26	20	2.69	4.	6	19	1.8	5
7.5	68	63	2.09	1066	5.1	13.3	40	2080	1622	36.7	34.6	71.6	66	2	27	18	2.52	4.	6	20	1.8	6
8.0	72	68	2.23	1101	5.2	12.9	43	2193	1717	33.7	31.7	73.2	71	1	27	17	2.37	4.	6	21	1.9	6
8.5	77	72	2.37	1135	5.4	12.5	45	2293	1801	31.1	29.3	74.5	75	1	27	16	2.24	4.	7	22	2.0	6
9.0	81	76	2.51	1168	5.5	12.2	47	2381	1876	28.9	27.2	75.6	80	1	27	16	2.14	5.	7	23	2.0	7
9.5	86	80	2.65	1200	5.7	11.9	49	2460	1943	27.0	25.4	76.5	84	1	28	15	2.05	5.	7	24	2.1	7
10.0	90	85	2.79	1232	5.8	11.6	51	2531	1996	25.3	23.8	77.4	89	1	28	14	1.96	5.	8	25	2.1	7
10.5	95	89	2.93	1262	6.0	11.3	53	2595	1901	23.8	22.4	78.1	94	1	28	14	1.89	5.	8	26	2.2	7
11.0	99	93	3.07	1292	6.1	11.0	55	2653	1815	22.5	21.2	78.7	98	1	28	13	1.83	6.	8	27	2.2	8
11.5	104	97	3.21	1321	6.3	10.8	57	2705	1736	21.3	20.1	79.3	103	1	28	13	1.77	6.	9	28	2.3	8
12.0	108	101	3.35	1350	6.4	10.5	59	2754	1663	20.3	19.1	79.9	107	1	29	13	1.72	6.	9	29	2.3	8
13.0	117	110	3.62	1405	6.7	10.1	62	2839	1535	18.4	17.3	80.8	116	1	29	12	1.62	7.	9	31	2.4	9
14.0	126	118	3.90	1459	6.9	9.8	66	2912	1426	16.9	15.9	81.5	125	1	29	11	1.54	7.	10	33	2.5	9
15.0	135	127	4.18	1511	7.2	9.4	69	2975	1331	15.6	14.7	82.2	134	1	30	11	1.47	8.	11	34	2.6	10
16.0	144	135	4.46	1561	7.4	9.1	72	3030	1247	14.5	13.7	82.7	143	1	30	10	1.41	8.	11	36	2.7	10
17.0	153	144	4.74	1609	7.6	8.9	74	3078	1174	13.6	12.8	83.2	153	0	30	10	1.36	9.	12	38	2.8	11
18.0	162	152	5.02	1656	7.8	8.6	77	3121	1109	12.7	12.0	83.6	162	0	30	10	1.31	9.	12	39	2.9	11
19.0	171	161	5.30	1702	8.1	8.4	80	3159	1050	12.0	11.3	84.0	171	0	31	9	1.27	9.	13	41	2.9	12
20.0	180	169	5.58	1747	8.3	8.2	82	3194	998	11.3	10.6	84.3	180	0	31	9	1.23	10.	14	42	3.0	12
25.0	225	211	6.97	1955	9.2	7.3	94	3324	798	8.9	8.3	85.6	225	0	32	8	1.07	12.	16	50	3.4	15
30.0	270	254	8.36	2145	10.1	6.7	105	3409	665	7.3	6.9	86.3	270	0	33	7	0.97	14.	19	57	3.7	17
35.0	315	296	9.76	2320	10.9	6.2	114	3470	570	6.2	5.8	86.9	315	0	34	7	0.89	17.	22	64	4.0	
40.0	360	338	11.15	2483	11.7	5.8	123	3516	499	5.4	5.1	87.3	360	0	35	6	0.82	19.	25	71	4.3	
45.0	405	381	12.53	2637	12.4	5.4	131	3550	443	4.8	4.5	87.6	405	0	36	6	0.77	21.	28	78	4.5	
50.0	450	423	13.94	2783	13.1	5.2	139	3578	399	4.3	4.0	87.9	450	0	36	5	0.73	23.	31	84	4.8	

 # 42 9 Be on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 62. ZC= 66.(Dy)
NEUTRON NUMBERS: NP= 5. NT= 92. NC= 97.

AP**1/3= 2.080 AT**1/3= 5.360
REDUCED MASS NUMBER= 8.50 AP+AT=AC=163.

INTERACTION RADIUS RINT=11.18 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 6.09 CT+CP= 7.94 C= 1.42

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.25

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.00 RC=RCP+RCT= 8.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 57.26 MeV K= .01855 n=3.141
VC(RINT)= 31.9 MeV

FISSION-TKE= 108. MeV
ASYMM. FISSION-TKE= 25. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.890 MeV/fm**2 PROX-FACTOR= 15.87 MeV
L-RLD= 95 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.58 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -72.1
COMPOUND NUCLEUS: -65.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.18 fm V(RB)= 32.3 MeV
Q-VALUE= 4.6 MeV
L-CRITICAL= 47.

9 Be on 154 Sm

9 Be on 154 Sm

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	9	0.27	389	1.9	39.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	17	0.53	550	2.6	27.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	27	26	0.80	673	3.2	22.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	36	34	1.07	778	3.7	19.5	10	288	165	124.5	121.7	27.7	30	6	21	78	10.24	2.	3	10	1.4	4
4.5	41	38	1.20	825	3.9	18.4	18	723	508	91.5	88.2	44.2	36	4	23	45	5.86	2.	4	12	1.5	4
5.0	45	43	1.33	870	4.2	17.5	23	1063	783	74.0	70.8	53.0	42	3	24	35	4.53	2.	4	14	1.5	5
5.5	50	47	1.47	912	4.4	16.7	27	1337	1007	62.5	59.6	58.8	47	3	25	30	3.83	3.	5	15	1.6	5
6.0	54	51	1.60	953	4.6	15.9	31	1564	1194	54.2	51.6	62.9	52	2	26	26	3.37	3.	5	16	1.7	5
6.5	59	55	1.73	992	4.7	15.3	34	1755	1353	48.0	45.6	66.0	56	2	26	24	3.05	3.	5	17	1.7	6
7.0	63	60	1.87	1030	4.9	14.8	37	1918	1488	43.0	40.8	68.5	61	2	26	22	2.81	3.	6	19	1.8	6
7.5	68	64	2.00	1066	5.1	14.3	40	2059	1606	39.0	37.0	70.5	66	2	27	20	2.61	4.	6	20	1.8	6
8.0	72	68	2.13	1101	5.3	13.8	43	2181	1709	35.7	33.9	72.1	71	1	27	19	2.45	4.	6	21	1.9	7
8.5	77	72	2.27	1135	5.4	13.4	45	2289	1800	33.0	31.2	73.5	75	1	27	18	2.32	4.	7	22	1.9	7
9.0	81	77	2.40	1168	5.6	13.0	48	2385	1890	30.6	29.0	74.7	80	1	28	17	2.21	4.	7	23	2.0	7
9.5	86	81	2.53	1200	5.7	12.7	50	2470	1953	28.5	27.0	75.7	84	1	28	16	2.11	4.	7	24	2.0	8
10.0	90	85	2.67	1232	5.9	12.3	52	2547	2018	26.7	25.3	76.6	89	1	28	16	2.02	5.	8	25	2.1	8
10.5	95	89	2.80	1262	6.0	12.1	54	2616	2009	25.2	23.8	77.4	94	1	28	15	1.95	5.	8	26	2.1	8
11.0	99	94	2.93	1292	6.2	11.8	56	2679	1918	23.8	22.5	78.1	98	1	28	15	1.88	5.	8	27	2.2	9
11.5	104	98	3.07	1321	6.3	11.5	58	2736	1834	22.5	21.3	78.7	103	1	28	14	1.82	5.	9	27	2.2	9
12.0	108	102	3.20	1350	6.4	11.3	60	2789	1758	21.4	20.2	79.3	107	1	29	14	1.76	6.	9	28	2.3	9
13.0	117	111	3.47	1405	6.7	10.8	63	2881	1623	19.4	18.4	80.3	116	1	29	13	1.66	6.	9	30	2.4	10
14.0	126	119	3.73	1459	7.0	10.4	67	2960	1507	17.8	16.9	81.1	125	1	29	12	1.58	6.	10	32	2.5	11
15.0	135	128	4.00	1511	7.2	10.1	70	3028	1406	16.5	15.6	81.8	134	1	29	12	1.51	7.	11	33	2.5	11
16.0	144	136	4.26	1561	7.4	9.8	73	3088	1318	15.3	14.4	82.4	143	1	30	11	1.44	7.	11	35	2.6	12
17.0	153	145	4.53	1609	7.7	9.5	76	3140	1241	14.3	13.5	82.9	153	0	30	11	1.39	8.	12	37	2.7	12
18.0	162	153	4.80	1656	7.9	9.2	78	3187	1172	13.4	12.6	83.3	162	0	30	10	1.34	8.	12	38	2.8	13
19.0	171	162	5.06	1702	8.1	9.0	81	3228	1110	12.6	11.9	83.7	171	0	30	10	1.29	9.	13	40	2.9	14
20.0	180	170	5.33	1747	8.3	8.7	84	3266	1055	11.9	11.2	84.1	180	0	31	10	1.25	9.	13	41	2.9	14
25.0	225	213	6.66	1955	9.3	7.8	96	3407	844	9.3	8.8	85.3	225	0	32	8	1.10	11.	16	49	3.3	17
30.0	270	255	8.00	2145	10.2	7.1	107	3500	703	7.7	7.2	86.2	270	0	33	8	0.99	13.	19	56	3.6	19
35.0	315	298	9.33	2320	11.0	6.6	116	3566	602	6.5	6.1	86.7	315	0	33	7	0.90	15.	22	63	3.9	
40.0	360	340	10.66	2483	11.8	6.2	125	3615	527	5.6	5.3	87.2	360	0	34	6	0.84	17.	25	70	4.1	
45.0	405	383	12.00	2637	12.5	5.8	134	3653	468	5.0	4.7	87.5	405	0	35	6	0.79	19.	28	76	4.4	
50.0	450	425	13.33	2783	13.2	5.5	141	3683	422	4.5	4.2	87.8	450	0	36	6	0.74	21.	30	83	4.6	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 43 9 Be on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 67. ZC= 71.(Lu)
NEUTRON NUMBERS: NP= 5. NT= 98. NC=103.

AP**1/3= 2.080 AT**1/3= 5.485
REDUCED MASS NUMBER= 8.53 AP+AT=AC=174.

INTERACTION RADIUS RINT=11.31 fm R0= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 6.25 CT+CP= 8.10 C= 1.43

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.41

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.15 RC=RCP+RCT= 8.37

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 60.52 MeV K= .01670 n=3.184
VC(RINT)= 34.1 MeV

FISSION-TKE= 119. MeV
ASYMM. FISSION-TKE= 25. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 16.04 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.50 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -63.7
COMPOUND NUCLEUS: -53.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.29 fm V(RB)= 34.5 MeV
Q-VALUE= 1.4 MeV
L-CRITICAL= 49.

9 Be on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SCMAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	9	0.25	389	1.9	42.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	17	0.50	550	2.6	29.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	27	26	0.75	673	3.2	24.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	36	34	1.00	778	3.7	21.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	41	38	1.13	825	4.0	19.9	15	512	340	106.0	102.9	37.0	35	5	23	59	7.21	2.	4	12	1.4	4
5.0	45	43	1.25	870	4.2	18.9	21	886	639	83.5	80.4	48.3	41	4	24	42	5.11	2.	4	13	1.4	4
5.5	50	47	1.38	912	4.4	18.0	26	1186	883	69.6	66.7	55.2	46	3	25	34	4.17	2.	5	15	1.5	5
6.0	54	51	1.50	953	4.6	17.2	30	1435	1087	59.9	57.3	60.0	51	3	26	30	3.61	3.	5	16	1.6	5
6.5	59	55	1.63	992	4.8	16.6	33	1643	1259	52.7	50.3	63.7	56	2	26	27	3.23	3.	5	17	1.6	5
7.0	63	60	1.75	1030	4.9	15.9	37	1822	1407	47.1	44.9	66.5	61	2	27	24	2.95	3.	6	18	1.7	6
7.5	68	64	1.88	1066	5.1	15.4	40	1975	1535	42.6	40.6	68.7	66	2	27	23	2.73	3.	6	19	1.7	6
8.0	72	68	2.00	1101	5.3	14.9	42	2109	1647	38.9	37.0	70.6	70	2	28	21	2.56	4.	6	20	1.8	6
8.5	77	73	2.13	1135	5.4	14.5	45	2227	1746	35.8	34.0	72.1	75	1	28	20	2.41	4.	7	21	1.8	7
9.0	81	77	2.26	1168	5.6	14.1	47	2332	1834	33.2	31.5	73.4	80	1	28	19	2.29	4.	7	22	1.9	7
9.5	86	81	2.38	1200	5.8	13.7	50	2425	1913	30.9	29.4	74.6	84	1	28	18	2.18	4.	7	23	1.9	7
10.0	90	85	2.51	1232	5.9	13.3	52	2509	1983	28.9	27.5	75.5	89	1	28	17	2.09	4.	8	24	2.0	8
10.5	95	90	2.63	1262	6.0	13.0	54	2585	2048	27.2	25.8	76.4	93	1	29	17	2.01	5.	8	25	2.0	8
11.0	99	94	2.76	1292	6.2	12.7	56	2653	2012	25.6	24.4	77.2	98	1	29	16	1.93	5.	8	26	2.1	8
11.5	104	98	2.88	1321	6.3	12.4	58	2716	1924	24.3	23.1	77.9	103	1	29	15	1.87	5.	8	27	2.1	9
12.0	108	102	3.01	1350	6.5	12.2	60	2773	1844	23.0	21.9	78.5	107	1	29	15	1.81	5.	9	28	2.2	9
13.0	117	111	3.26	1405	6.7	11.7	63	2874	1702	20.9	19.9	79.5	116	1	29	14	1.71	6.	9	30	2.3	10
14.0	126	119	3.51	1459	7.0	11.3	67	2961	1581	19.2	18.2	80.4	125	1	30	13	1.62	6.	10	31	2.4	10
15.0	135	128	3.76	1511	7.2	10.9	70	3035	1475	17.7	16.8	81.2	134	1	30	13	1.54	7.	11	33	2.4	11
16.0	144	137	4.01	1561	7.5	10.5	73	3100	1383	16.4	15.6	81.8	143	1	30	12	1.48	7.	11	35	2.5	11
17.0	153	145	4.26	1609	7.7	10.2	76	3158	1302	15.3	14.5	82.3	152	1	30	12	1.42	7.	12	36	2.6	12
18.0	162	154	4.51	1656	7.9	9.9	79	3209	1229	14.3	13.6	82.8	162	0	31	11	1.37	8.	12	38	2.7	13
19.0	171	162	4.76	1702	8.1	9.7	82	3254	1165	13.5	12.8	83.3	171	0	31	11	1.32	8.	13	39	2.7	13
20.0	180	171	5.01	1747	8.3	9.4	84	3295	1106	12.7	12.1	83.6	180	0	31	11	1.28	9.	13	41	2.8	14
25.0	225	213	6.26	1955	9.3	8.4	97	3449	865	10.0	9.5	85.0	225	0	32	9	1.12	11.	16	48	3.1	16
30.0	270	256	7.52	2145	10.2	7.7	108	3551	737	8.2	7.8	85.9	270	0	33	8	1.00	12.	19	55	3.4	19
35.0	315	299	8.77	2320	11.0	7.1	118	3624	632	6.9	6.6	86.5	315	0	34	8	0.92	14.	22	62	3.7	
40.0	360	341	10.02	2483	11.8	6.7	127	3677	553	6.0	5.7	87.0	360	0	34	7	0.85	16.	25	69	4.0	
45.0	405	384	11.28	2637	12.5	6.3	135	3719	491	5.3	5.1	87.3	405	0	35	7	0.80	18.	27	75	4.2	
50.0	450	427	12.53	2783	13.2	6.0	143	3752	442	4.8	4.5	87.6	450	0	36	6	0.75	20.	30	81	4.4	

\# 44 9 Be on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 73. ZC= 77.(Ir)
NEUTRON NUMBERS: NP= 5. NT=108. NC=113.

AP**1/3= 2.080 AT**1/3= 5.657
REDUCED MASS NUMBER= 8.57 AP+AT=AC=190.

INTERACTION RADIUS RINT=11.50 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 6.47 CT+CP= 8.32 C= 1.44

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.62

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.35 RC=RCP+RCT= 8.57

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 64.19 MeV K= .01487 n=3.225
VC(RINT)= 36.5 MeV

FISSION-TKE= 133. MeV
ASYMM. FISSION-TKE= 26. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 16.10 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.39 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -46.0
COMPOUND NUCLEUS: -34.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.46 fm V(RB)= 36.9 MeV
Q-VALUE= -0.5 MeV
L-CRITICAL= 50.

9 Be on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SCMAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	9	0.23	389	1.9	46.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	18	17	0.47	550	2.7	32.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	27	26	0.70	673	3.2	26.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	36	34	0.94	778	3.8	23.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	41	39	1.06	825	4.0	21.7	10	262	145	128.4	126.1	25.8	35	6	23	94	10.70	2.	4	11	1.3	4
5.0	45	43	1.17	870	4.2	20.6	19	680	474	96.0	93.2	42.0	41	4	25	53	6.06	2.	4	13	1.3	4
5.5	50	47	1.29	912	4.4	19.6	24	1013	744	78.5	75.8	50.7	46	4	26	41	4.68	2.	5	14	1.4	4
6.0	54	51	1.41	953	4.6	18.8	28	1288	968	66.9	64.3	56.6	51	3	26	35	3.95	2.	5	15	1.5	5
6.5	59	56	1.53	992	4.8	18.0	32	1519	1158	58.4	56.1	60.8	56	3	27	31	3.48	3.	5	17	1.5	5
7.0	63	60	1.64	1030	5.0	17.4	36	1716	1321	51.9	49.8	64.0	61	2	27	28	3.14	3.	6	18	1.6	6
7.5	68	64	1.76	1066	5.1	16.8	39	1886	1462	46.8	44.8	66.6	66	2	28	26	2.89	3.	6	19	1.6	6
8.0	72	69	1.88	1101	5.3	16.3	42	2035	1585	42.6	40.7	68.7	70	2	28	24	2.69	3.	6	20	1.7	6
8.5	77	73	2.00	1135	5.5	15.8	44	2165	1694	39.1	37.4	70.4	75	2	28	22	2.53	3.	7	21	1.7	7
9.0	81	77	2.11	1168	5.6	15.3	47	2281	1791	36.2	34.6	71.9	80	1	29	21	2.39	4.	7	22	1.8	7
9.5	86	81	2.23	1200	5.8	14.9	49	2384	1878	33.6	32.1	73.2	84	1	29	20	2.27	4.	7	23	1.8	7
10.0	90	86	2.35	1232	5.9	14.5	52	2477	1956	31.4	30.0	74.3	89	1	29	19	2.17	4.	8	24	1.9	8
10.5	95	90	2.47	1262	6.1	14.2	54	2560	2026	29.5	28.2	75.2	93	1	29	18	2.08	4.	8	25	1.9	8
11.0	99	94	2.58	1292	6.2	13.9	56	2636	2090	27.8	26.5	76.1	98	1	29	18	2.00	4.	8	26	2.0	9
11.5	104	99	2.70	1321	6.4	13.6	58	2705	2041	26.3	25.1	76.8	103	1	29	17	1.93	5.	8	26	2.0	9
12.0	108	103	2.82	1350	6.5	13.3	60	2769	1956	25.0	23.8	77.5	107	1	30	17	1.87	5.	9	27	2.1	9
13.0	117	111	3.05	1405	6.8	12.8	64	2881	1805	22.6	21.6	78.7	116	1	30	16	1.76	5.	9	29	2.2	10
14.0	126	120	3.29	1459	7.0	12.3	67	2976	1676	20.7	19.7	79.7	125	1	30	15	1.67	6.	10	31	2.2	10
15.0	135	129	3.52	1511	7.3	11.9	71	3059	1565	19.1	18.2	80.5	134	1	30	14	1.59	6.	11	32	2.3	11
16.0	144	137	3.76	1561	7.5	11.5	74	3131	1467	17.7	16.9	81.2	143	1	31	13	1.52	6.	11	34	2.4	12
17.0	153	146	3.99	1609	7.7	11.2	77	3194	1380	16.5	15.7	81.8	152	1	31	13	1.46	7.	12	35	2.5	12
18.0	162	154	4.23	1656	8.0	10.8	80	3251	1304	15.4	14.7	82.3	161	1	31	12	1.40	7.	12	37	2.5	13
19.0	171	163	4.46	1702	8.2	10.5	83	3301	1235	14.5	13.8	82.7	171	0	31	12	1.35	8.	13	38	2.6	13
20.0	180	171	4.70	1747	8.4	10.3	86	3346	1173	13.7	13.1	83.1	180	0	31	12	1.31	8.	13	40	2.7	14
25.0	225	214	5.87	1955	9.4	9.2	98	3517	939	10.7	10.2	84.7	225	0	32	10	1.14	10.	16	47	3.0	17
30.0	270	257	7.04	2145	10.3	8.4	109	3630	782	8.8	8.4	85.6	270	0	33	9	1.03	12.	19	54	3.3	19
35.0	315	300	8.22	2320	11.1	7.8	120	3710	670	7.4	7.1	86.3	315	0	34	8	0.94	13.	22	61	3.6	
40.0	360	343	9.39	2483	11.9	7.3	129	3770	586	6.5	6.1	86.8	360	0	35	8	0.87	15.	25	67	3.8	
45.0	405	386	10.57	2637	12.6	6.9	138	3816	521	5.7	5.4	87.1	405	0	35	7	0.81	17.	27	74	4.0	
50.0	450	429	11.74	2783	13.3	6.5	146	3853	469	5.1	4.9	87.4	450	0	36	7	0.77	18.	30	80	4.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 45 9 Be on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 79. ZC= 83.(Bi)
NEUTRON NUMBERS: NP= 5. NT=118. NC=123.

AP**1/3= 2.080 AT**1/3= 5.819
REDUCED MASS NUMBER= 8.61 AP+AT=AC=206.

INTERACTION RADIUS RINT=11.68 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 6.68 CT+CP= 8.53 C̄= 1.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.83

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.55 RC=RCP+RCT= 8.76

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 67.75 MeV K= .01331 n=3.264
VC(RINT)= 38.9 MeV

FISSION-TKE= 147. MeV
ASYMM. FISSION-TKE= 27. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 16.16 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.31 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -28.6
COMPOUND NUCLEUS: -17.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.62 fm V(RB)= 39.4 MeV
Q-VALUE= 0.6 MeV
L-CRITICAL= 52.

9 Be on 197 Au — 9 Be on 197 Au

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	SIGP-CN	SIGP-LP	SIGP-LT	SIGP-QP	SIGET-QT	SIGPQMX	SIGETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	9	0.22	389	1.9	49.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	18	17	0.44	550	2.7	35.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	27	26	0.66	673	3.3	28.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.0	36	34	0.88	778	3.8	24.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.5	41	39	1.00	825	4.0	23.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
5.0	45	43	1.11	870	4.2	22.3	15	460	301	111.7	109.2	34.2	40	5	25	72	7.68	2. 4	12	1.3	4
5.5	50	47	1.22	912	4.4	21.2	22	829	596	88.8	86.2	45.6	45	4	26	50	5.35	2. 5	14	1.4	4
6.0	54	52	1.33	953	4.6	20.3	27	1131	841	74.6	72.1	52.7	51	3	27	41	4.35	2. 5	15	1.4	5
6.5	59	56	1.44	992	4.8	19.5	31	1385	1049	64.6	62.3	57.7	56	3	27	35	3.76	2. 5	16	1.5	5
7.0	63	60	1.55	1030	5.0	18.8	35	1601	1227	57.1	55.0	61.4	61	2	28	32	3.36	3. 6	17	1.5	6
7.5	68	65	1.66	1066	5.2	18.2	38	1788	1381	51.2	49.3	64.4	65	2	28	29	3.06	3. 6	18	1.6	6
8.0	72	69	1.77	1101	5.3	17.6	41	1951	1516	46.5	44.7	66.8	70	2	29	27	2.83	3. 6	19	1.6	6
8.5	77	73	1.88	1135	5.5	17.1	44	2094	1635	42.6	40.9	68.7	75	2	29	25	2.65	3. 7	20	1.7	7
9.0	81	77	1.99	1168	5.6	16.6	46	2221	1741	39.3	37.7	70.4	79	2	29	24	2.50	3. 7	21	1.7	7
9.5	86	82	2.10	1200	5.8	16.1	49	2334	1836	36.5	35.0	71.8	84	1	29	22	2.37	4. 7	22	1.8	7
10.0	90	86	2.21	1232	6.0	15.7	51	2436	1921	34.0	32.6	73.0	89	1	29	21	2.26	4. 8	23	1.8	8
10.5	95	90	2.32	1262	6.1	15.4	54	2527	1999	31.9	30.6	74.0	93	1	30	20	2.16	4. 8	24	1.9	8
11.0	99	95	2.43	1292	6.2	15.0	56	2611	2069	30.0	28.8	75.0	98	1	30	20	2.08	4. 8	25	1.9	8
11.5	104	99	2.54	1321	6.4	14.7	58	2687	2133	28.4	27.2	75.8	102	1	30	19	2.00	4. 8	26	2.0	9
12.0	108	103	2.65	1350	6.5	14.4	60	2756	2064	26.9	25.8	76.6	107	1	30	18	1.93	5. 9	27	2.0	9
13.0	117	112	2.87	1405	6.8	13.8	64	2879	1905	24.3	23.3	77.8	116	1	30	17	1.81	5. 9	28	2.1	10
14.0	126	120	3.10	1459	7.0	13.3	68	2984	1769	22.2	21.3	78.9	125	1	31	16	1.72	5. 10	30	2.2	10
15.0	135	129	3.32	1511	7.3	12.8	71	3075	1651	20.5	19.6	79.8	134	1	31	15	1.63	6. 10	32	2.2	11
16.0	144	138	3.54	1561	7.5	12.4	74	3154	1548	19.0	18.2	80.5	143	1	31	15	1.56	6. 11	33	2.3	12
17.0	153	146	3.76	1609	7.8	12.1	78	3223	1456	17.7	16.9	81.2	152	1	31	14	1.49	6. 12	35	2.4	12
18.0	162	155	3.98	1656	8.0	11.7	81	3285	1376	16.5	15.8	81.7	161	1	32	14	1.44	7. 12	36	2.5	13
19.0	171	164	4.20	1702	8.2	11.4	84	3341	1303	15.5	14.9	82.2	170	1	32	13	1.39	7. 13	38	2.5	13
20.0	180	172	4.42	1747	8.4	11.1	86	3390	1238	14.7	14.0	82.7	180	0	32	13	1.34	7. 13	39	2.6	14
25.0	225	215	5.53	1955	9.4	10.0	99	3578	990	11.4	10.9	84.3	225	0	33	11	1.17	9. 16	46	2.9	17
30.0	270	258	6.63	2145	10.3	9.1	111	3702	825	9.4	9.0	85.3	270	0	34	10	1.05	11. 19	53	3.2	19
35.0	315	301	7.74	2320	11.1	8.4	121	3790	707	7.9	7.6	86.0	315	0	34	9	0.96	12. 22	60	3.4	
40.0	360	344	8.85	2483	11.9	7.9	131	3856	619	6.9	6.6	86.6	360	0	35	8	0.89	14. 24	66	3.7	
45.0	405	387	9.95	2637	12.6	7.4	140	3907	550	6.1	5.8	87.0	405	0	35	8	0.83	15. 27	72	3.9	
50.0	450	430	11.06	2783	13.3	7.0	148	3948	495	5.4	5.2	87.3	450	0	36	7	0.78	17. 30	78	4.1	

 # 46 9 Be on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 82. ZC= 86.(Rn)
NEUTRON NUMBERS: NP= 5. NT=126. NC=131.

AP**1/3= 2.080 AT**1/3= 5.925
REDUCED MASS NUMBER= 8.63 AP+AT=AC=217.

INTERACTION RADIUS RINT=11.79 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 6.82 CT+CP= 8.67 C̄= 1.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.96

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.66 RC=RCP+RCT= 8.88

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 69.35 MeV K= .01270 n=3.276
VC(RINT)= 40.0 MeV

FISSION-TKE= 154. MeV
ASYMM. FISSION-TKE= 27. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.879 MeV/fm**2 PROX-FACTOR= 16.07 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.25 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -19.5
COMPOUND NUCLEUS: 3.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.72 fm V(RB)= 40.4 MeV
Q-VALUE= -11.9 MeV
L-CRITICAL= 53.

9 Be on 208 Pb — 9 Be on 208 Pb

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	SIGP-CN	SIGP-LP	SIGP-LT	SIGP-QP	SIGET-QT	SIGPQMX	SIGETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	9	9	0.22	389	1.9	51.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	18	17	0.43	550	2.7	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	27	26	0.65	673	3.3	29.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.0	36	35	0.86	778	3.8	25.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.5	41	39	0.97	825	4.0	24.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
5.0	45	43	1.08	870	4.2	23.1	13	360	226	120.2	118.0	29.9	40	5	25	86	8.92	2. 4	12	1.1	4
5.5	50	47	1.19	912	4.4	22.0	21	748	534	93.8	91.4	43.1	45	4	26	56	5.76	2. 5	14	1.1	4
6.0	54	52	1.29	953	4.6	21.1	26	1065	790	78.3	75.9	50.9	51	3	27	44	4.58	2. 5	15	1.2	5
6.5	59	56	1.40	992	4.8	20.3	30	1331	1007	67.5	65.3	56.2	56	3	28	38	3.91	2. 5	16	1.3	5
7.0	63	60	1.51	1030	5.0	19.5	34	1558	1193	59.5	57.4	60.3	61	2	28	34	3.47	3. 6	17	1.3	5
7.5	68	65	1.62	1066	5.2	18.9	38	1753	1355	53.3	51.3	63.4	65	2	28	31	3.15	3. 6	18	1.4	6
8.0	72	69	1.73	1101	5.3	18.3	41	1924	1496	48.3	46.5	65.9	70	2	29	28	2.91	3. 6	19	1.5	6
8.5	77	73	1.83	1135	5.5	17.7	44	2073	1620	44.1	42.5	67.9	75	2	29	26	2.71	3. 7	20	1.5	7
9.0	81	78	1.94	1168	5.7	17.2	46	2206	1731	40.7	39.1	69.7	79	2	29	25	2.55	3. 7	21	1.6	7
9.5	86	82	2.05	1200	5.8	16.8	49	2325	1830	37.7	36.3	71.1	84	1	29	23	2.42	3. 7	22	1.6	7
10.0	90	86	2.16	1232	6.0	16.3	51	2431	1919	35.2	33.8	72.4	89	1	30	22	2.30	4. 8	23	1.7	8
10.5	95	91	2.26	1262	6.1	15.9	54	2527	2000	33.0	31.7	73.5	93	1	30	21	2.20	4. 8	24	1.7	8
11.0	99	95	2.37	1292	6.3	15.6	56	2615	2073	31.0	29.8	74.5	98	1	30	20	2.11	4. 8	25	1.7	8
11.5	104	99	2.48	1321	6.4	15.2	58	2694	2140	29.3	28.1	75.3	102	1	30	20	2.04	4. 8	26	1.8	9
12.0	108	104	2.59	1350	6.5	14.9	60	2767	2126	27.8	26.6	76.1	107	1	30	19	1.97	4. 9	26	1.8	9
13.0	117	112	2.80	1405	6.8	14.3	64	2896	1962	25.1	24.1	77.4	116	1	31	18	1.84	5. 9	28	1.9	10
14.0	126	121	3.02	1459	7.1	13.8	68	3005	1822	22.9	22.0	78.5	125	1	31	17	1.74	5. 10	30	2.0	11
15.0	135	129	3.23	1511	7.3	13.3	72	3100	1700	21.1	20.2	79.4	134	1	31	16	1.66	5. 10	31	2.1	11
16.0	144	138	3.45	1561	7.5	12.9	75	3183	1594	19.5	18.7	80.2	143	1	31	15	1.58	6. 11	33	2.2	12
17.0	153	147	3.67	1609	7.8	12.5	78	3256	1500	18.2	17.5	80.9	152	1	31	15	1.52	6. 12	34	2.2	12
18.0	162	155	3.88	1656	8.0	12.2	81	3321	1417	17.0	16.3	81.5	161	1	32	14	1.46	6. 12	36	2.3	13
19.0	171	164	4.10	1702	8.2	11.8	84	3379	1342	16.0	15.3	82.0	170	1	32	14	1.41	7. 13	37	2.4	14
20.0	180	173	4.31	1747	8.4	11.5	87	3431	1275	15.1	14.5	82.5	180	0	32	13	1.36	7. 13	39	2.4	14
25.0	225	216	5.39	1955	9.4	10.3	100	3627	1020	11.8	11.3	84.1	225	0	33	11	1.18	9. 16	46	2.7	17
30.0	270	259	6.47	2145	10.3	9.4	112	3758	850	9.6	9.2	85.2	270	0	34	10	1.06	10. 19	52	3.0	20
35.0	315	302	7.55	2320	11.2	8.7	123	3850	728	8.1	7.8	85.9	315	0	34	9	0.97	12. 22	59	3.3	
40.0	360	345	8.63	2483	11.9	8.2	132	3919	637	7.1	6.8	86.5	360	0	35	9	0.90	13. 24	65	3.5	
45.0	405	388	9.70	2637	12.7	7.7	141	3972	566	6.2	6.0	86.9	405	0	35	8	0.84	15. 27	71	3.7	
50.0	450	431	10.78	2783	13.3	7.3	150	4015	510	5.6	5.4	87.2	450	0	36	8	0.79	16. 30	78	3.9	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 47 9 Be on 209 Bi (9 Be on 209 Bi) (9 Be on 209 Bi)

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 83. ZC= 87.(Fr)
NEUTRON NUMBERS: NP= 5. NT=126. NC=131.

AP**1/3= 2.080 AT**1/3= 5.934
REDUCED MASS NUMBER= 8.63 AP+AT=AC=218.

INTERACTION RADIUS RINT=11.80 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 6.83 CT+CP= 8.68 C= 1.46

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 6.97

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.68 RC=RCP+RCT= 8.89

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 70.01 MeV K= .01243 n=3.286
VC(RINT)= 40.5 MeV

FISSION-TKE= 157. MeV
ASYMM. FISSION-TKE= 28. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.883 MeV/fm**2 PROX-FACTOR= 16.14 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.25 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: -16.5
COMPOUND NUCLEUS: 7.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.73 fm V(RB)= 40.9 MeV
Q-VALUE= -12.3 MeV
L-CRITICAL= 53.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EM--EN	TEMP	MULT
1.0	9	9	0.21	389	1.9	52.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	18	17	0.43	550	2.7	37.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	27	26	0.64	673	3.3	30.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	36	35	0.85	778	3.8	26.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	41	39	0.96	825	4.0	24.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	45	43	1.07	870	4.2	23.4	12	312	187	124.5	122.4	27.8	39	6	25	94	9.66	2.	4 12	1.1	4
5.5	50	47	1.17	912	4.4	22.3	20	706	499	96.2	93.8	41.9	45	4	26	58	5.95	2.	4 14	1.1	4
6.0	54	52	1.28	953	4.6	21.3	25	1029	759	80.0	77.6	50.0	50	4	27	46	4.67	2.	5 15	1.2	5
6.5	59	56	1.39	992	4.8	20.5	30	1298	979	68.8	66.6	55.6	56	3	28	39	3.97	2.	5 16	1.3	5
7.0	63	60	1.49	1030	5.0	19.8	34	1527	1168	60.6	58.5	59.7	60	3	28	34	3.51	3.	6 17	1.3	5
7.5	68	65	1.60	1066	5.2	19.1	37	1725	1331	54.2	52.3	62.9	65	2	29	31	3.19	3.	6 18	1.4	6
8.0	72	69	1.71	1101	5.3	18.5	40	1898	1474	49.1	47.3	65.5	70	2	29	29	2.94	3.	6 19	1.4	6
8.5	77	73	1.81	1135	5.5	17.9	43	2050	1600	44.9	43.2	67.6	75	2	29	27	2.74	3.	7 20	1.5	6
9.0	81	78	1.92	1168	5.7	17.4	46	2184	1712	41.3	39.7	69.3	79	2	29	25	2.57	3.	7 21	1.5	7
9.5	86	82	2.03	1200	5.8	17.0	49	2305	1813	38.3	36.8	70.8	84	1	30	24	2.43	3.	7 22	1.6	7
10.0	90	86	2.13	1232	6.0	16.5	51	2412	1903	35.7	34.3	72.1	89	1	30	23	2.32	4.	8 23	1.6	7
10.5	95	91	2.24	1262	6.1	16.1	54	2510	1984	33.5	32.2	73.3	93	1	30	22	2.21	4.	8 24	1.7	8
11.0	99	95	2.35	1292	6.3	15.8	56	2598	2059	31.5	30.2	74.3	98	1	30	21	2.13	4.	8 25	1.7	8
11.5	104	99	2.45	1321	6.4	15.4	58	2679	2127	29.7	28.5	75.1	102	1	30	20	2.05	4.	8 26	1.8	9
12.0	108	104	2.56	1350	6.5	15.1	60	2753	2138	28.1	27.0	75.9	107	1	30	19	1.97	4.	9 26	1.8	9
13.0	117	112	2.77	1405	6.8	14.5	64	2883	1973	25.5	24.4	77.3	116	1	31	18	1.85	5.	9 28	1.9	10
14.0	126	121	2.99	1459	7.1	14.0	68	2994	1832	23.2	22.3	78.4	125	1	31	17	1.75	5.	10 30	2.0	10
15.0	135	129	3.20	1511	7.3	13.5	71	3090	1710	21.4	20.5	79.3	134	1	31	16	1.66	5.	10 31	2.1	11
16.0	144	138	3.41	1561	7.5	13.1	75	3174	1603	19.8	19.0	80.1	143	1	31	16	1.59	6.	11 33	2.1	12
17.0	153	147	3.63	1609	7.8	12.7	78	3248	1509	18.4	17.7	80.8	152	1	32	15	1.52	6.	12 34	2.2	12
18.0	162	155	3.84	1656	8.0	12.3	81	3314	1425	17.2	16.5	81.4	161	1	32	14	1.46	6.	12 36	2.3	13
19.0	171	164	4.05	1702	8.2	12.0	84	3373	1350	16.2	15.5	81.9	170	1	32	14	1.41	7.	13 37	2.4	13
20.0	180	173	4.27	1747	8.4	11.7	87	3425	1282	15.3	14.7	82.4	179	1	32	13	1.36	7.	13 39	2.4	14
25.0	225	216	5.33	1955	9.4	10.5	100	3625	1026	11.9	11.4	84.1	225	0	33	12	1.18	9.	16 46	2.7	17
30.0	270	259	6.40	2145	10.3	9.5	112	3757	855	9.7	9.3	85.1	270	0	34	10	1.06	10.	19 52	3.0	19
35.0	315	302	7.46	2320	11.2	8.8	123	3850	733	8.2	7.9	85.9	315	0	34	9	0.97	12.	22 59	3.3	
40.0	360	345	8.53	2483	11.9	8.3	132	3920	641	7.1	6.9	86.4	360	0	35	9	0.90	13.	24 65	3.5	
45.0	405	388	9.60	2637	12.7	7.8	141	3974	570	6.3	6.0	86.8	405	0	36	8	0.84	15.	27 71	3.7	
50.0	450	431	10.66	2783	13.3	7.4	150	4017	513	5.6	5.4	87.2	450	0	36	8	0.79	16.	30 77	3.9	

 # 48 9 Be on 238 U (9 Be on 238 U) (9 Be on 238 U)

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 4. ZT= 92. ZC= 96.(Cm)
NEUTRON NUMBERS: NP= 5. NT=146. NC=151.

AP**1/3= 2.080 AT**1/3= 6.197
REDUCED MASS NUMBER= 8.67 AP+AT=AC=247.

INTERACTION RADIUS RINT=12.08 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 1.85 CT= 7.16 CT+CP= 9.01 C= 1.47

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.29 RT= 7.30

COULOMB RADII [fm]:
RCP= 2.22 RCT= 6.98 RC=RCP+RCT= 9.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 74.87 MeV K= .01078 n=3.327
VC(RINT)= 43.8 MeV

FISSION-TKE= 180. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.868 MeV/fm**2 PROX-FACTOR= 16.03 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.14 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 11.4 TARGET: 47.2
COMPOUND NUCLEUS: 66.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.99 fm V(RB)= 44.2 MeV
Q-VALUE= -7.5 MeV
L-CRITICAL= 55.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EM--EN	TEMP	MULT
1.0	9	9	0.20	389	1.9	57.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	18	17	0.40	550	2.7	41.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	27	26	0.59	673	3.3	33.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	36	35	0.79	778	3.8	29.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	41	39	0.89	825	4.0	27.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	45	43	0.99	870	4.2	25.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	50	48	1.09	912	4.4	24.7	15	421	278	116.5	114.6	31.7	44	5	26	86	8.20	2.	4 13	1.1	5
6.0	54	52	1.19	953	4.6	23.7	22	788	571	93.5	91.3	43.3	50	4	28	59	5.62	2.	5 14	1.2	5
6.5	59	56	1.29	992	4.8	22.7	28	1095	819	79.1	76.9	50.5	55	3	28	48	4.55	2.	5 15	1.3	6
7.0	63	61	1.39	1030	5.0	21.9	32	1355	1032	68.8	66.9	55.6	60	3	29	41	3.92	2.	6 17	1.3	6
7.5	68	65	1.49	1066	5.2	21.2	36	1580	1216	61.1	59.3	59.4	65	2	29	37	3.50	2.	6 18	1.4	7
8.0	72	69	1.58	1101	5.4	20.5	39	1775	1377	55.0	53.3	62.5	70	2	30	34	3.18	3.	6 19	1.4	7
8.5	77	74	1.68	1135	5.5	19.9	43	1947	1519	50.1	48.5	65.0	75	2	30	31	2.94	3.	7 20	1.5	7
9.0	81	78	1.78	1168	5.7	19.3	46	2100	1646	46.0	44.5	67.0	79	2	30	29	2.75	3.	7 20	1.5	8
9.5	86	82	1.88	1200	5.8	18.8	48	2236	1759	42.5	41.1	68.7	84	2	30	27	2.59	3.	7 21	1.6	8
10.0	90	87	1.98	1232	6.0	18.3	51	2358	1861	39.5	38.2	70.2	89	1	31	26	2.46	3.	7 22	1.6	9
10.5	95	91	2.08	1262	6.1	17.9	53	2469	1953	37.0	35.7	71.5	93	1	31	25	2.34	3.	8 23	1.6	9
11.0	99	95	2.18	1292	6.3	17.5	56	2569	2037	34.7	33.5	72.6	98	1	31	24	2.24	3.	8 24	1.7	9
11.5	104	100	2.28	1321	6.4	17.1	58	2660	2113	32.7	31.6	73.6	102	1	31	23	2.15	4.	8 25	1.7	10
12.0	108	104	2.38	1350	6.6	16.7	60	2744	2183	31.0	29.9	74.5	107	1	31	22	2.07	4.	9 26	1.8	10
13.0	117	113	2.57	1405	6.8	16.1	65	2891	2124	27.9	27.0	76.0	116	1	31	21	1.94	4.	9 27	1.8	11
14.0	126	121	2.77	1459	7.1	15.5	69	3017	1972	25.5	24.6	77.3	125	1	32	19	1.83	4.	10 29	1.9	12
15.0	135	130	2.97	1511	7.3	15.0	72	3126	1841	23.4	22.6	78.3	134	1	32	18	1.73	5.	10 30	2.0	12
16.0	144	139	3.17	1561	7.6	14.5	76	3222	1726	21.6	20.9	79.2	143	1	32	18	1.65	5.	11 32	2.1	13
17.0	153	147	3.37	1609	7.8	14.1	79	3305	1624	20.1	19.4	79.9	152	1	32	17	1.58	5.	12 33	2.1	14
18.0	162	156	3.56	1656	8.0	13.7	82	3380	1534	18.8	18.1	80.6	161	1	32	16	1.52	6.	12 35	2.2	15
19.0	171	165	3.76	1702	8.3	13.3	86	3446	1453	17.7	17.0	81.2	170	1	33	16	1.46	6.	13 36	2.3	15
20.0	180	173	3.96	1747	8.5	13.0	89	3506	1381	16.6	16.0	81.7	179	1	33	15	1.41	6.	13 38	2.3	16
25.0	225	217	4.95	1955	9.5	11.6	102	3732	1104	12.9	12.5	83.5	225	0	34	13	1.22	8.	16 44	2.6	19
30.0	270	260	5.94	2145	10.4	10.6	114	3882	920	10.6	10.2	84.7	270	0	34	12	1.09	9.	19 51	2.9	22
35.0	315	304	6.93	2320	11.2	9.8	125	3988	789	8.9	8.6	85.5	315	0	35	11	1.00	10.	22 57	3.1	
40.0	360	347	7.92	2483	12.0	9.2	135	4068	690	7.7	7.5	86.1	360	0	35	10	0.92	12.	24 64	3.3	
45.0	405	390	8.91	2637	12.7	8.6	145	4129	613	6.8	6.6	86.6	405	0	36	9	0.86	13.	27 70	3.5	
50.0	450	434	9.90	2783	13.4	8.2	154	4178	552	6.1	5.9	86.9	450	0	36	9	0.82	14.	30 75	3.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	ms	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 9 Be

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 49 12 C on 12 C — 12 C on 12 C — 12 C on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 6. ZC= 12.(Mg)
NEUTRON NUMBERS: NP= 6. NT= 6. NC= 12.

INTERACTION RADIUS RINT= 8.07 fm RO= 1.76 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 2.12 CT+CP= 4.25 C= 1.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 2.52

COULOMB RADII [fm]:
RCP= 2.51 RCT= 2.51 RC=RCP+RCT= 5.03

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 14.52 MeV K= .08229 n=2.438
VC(RINT)= 6.4 MeV

FISSION-TKE= 28. MeV
ASYMM. FISSION-TKE= 28. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 12.70 MeV
L-RLD= 24 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 31.91 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: 0.0
COMPOUND NUCLEUS: -16.2

FUSION RELATED PARAMETERS:
R-BARRIER= 7.40 fm V(RB)= 6.3 MeV
Q-VALUE= 16.2 MeV
L-CRITICAL= 16.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	6	0.94	518	1.3	5.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	24	12	1.87	733	1.9	4.0	10	1145	810	42.9	21.4	68.6	21	3	0	6	3.78	11.	0	3.1	1
3.0	36	18	2.81	898	2.3	3.3	15	1500	1114	25.1	12.5	77.5	34	2	0	4	2.63	17.	0	3.4	1
4.0	48	24	3.74	1037	2.6	2.8	18	1667	1265	17.8	8.9	81.1	47	1	0	3	2.13	22.	0	3.7	2
4.5	54	27	4.21	1100	2.8	2.7	20	1721	1171	15.5	7.8	82.2	53	1	0	3	1.97	25.	0	3.8	2
5.0	60	30	4.68	1160	2.9	2.5	21	1764	1054	13.8	6.9	83.1	59	1	57	3	1.84	27.	5	15 3.9	2
5.5	66	33	5.14	1216	3.1	2.4	22	1798	958	12.4	6.2	83.8	65	1	60	3	1.73	30.	6	19 4.1	2
6.0	72	36	5.61	1271	3.2	2.3	24	1826	878	11.2	5.6	84.4	71	1	63	3	1.64	33.	7	23 4.2	2
6.5	78	39	6.08	1323	3.3	2.2	25	1849	810	10.3	5.2	84.8	77	1	66	2	1.57	36.	7	25 4.3	2
7.0	84	42	6.55	1373	3.5	2.1	26	1869	752	9.5	4.8	85.2	83	1	68	2	1.50	38.	8	28 4.4	2
7.5	90	45	7.01	1421	3.6	2.1	27	1886	702	8.8	4.4	85.6	89	1	71	2	1.44	41.	8	30 4.5	2
8.0	96	48	7.48	1468	3.7	2.0	28	1900	658	8.2	4.1	85.9	96	0	74	2	1.39	44.	9	32 4.6	2
8.5	102	51	7.95	1514	3.8	1.9	29	1913	620	7.7	3.9	86.1	102	0	76	2	1.34	47.	9	34 4.7	2
9.0	108	54	8.42	1558	3.9	1.9	30	1924	585	7.3	3.6	86.4	108	0	79	2	1.30	47.	10	36 4.8	3
9.5	114	57	8.88	1600	4.0	1.8	31	1934	554	6.8	3.4	86.6	114	0	82	2	1.26	50.	10	38 4.9	3
10.0	120	60	9.35	1642	4.1	1.8	32	1943	527	6.5	3.2	86.8	120	0	84	2	1.22	52.	11	40 5.0	3
10.5	126	63	9.82	1683	4.3	1.7	33	1951	501	6.2	3.1	86.9	126	0	87	2	1.19	55.	11	41 5.1	3
11.0	132	66	10.29	1723	4.4	1.7	33	1958	479	5.9	2.9	87.1	132	0	89	2	1.16	58.	12	43 5.2	3
11.5	138	69	10.75	1762	4.5	1.7	34	1964	458	5.6	2.8	87.2	138	0	92	2	1.13	60.	12	45 5.3	3
12.0	144	72	11.22	1800	4.5	1.6	35	1970	439	5.4	2.7	87.3	144	0	94	2	1.10	63.	12	46 5.4	3
13.0	156	78	12.16	1874	4.7	1.6	37	1980	405	4.9	2.5	87.5	156	0	99	2	1.06	68.	13	50 5.6	3
14.0	168	84	13.09	1945	4.9	1.5	38	1989	376	4.6	2.3	87.7	168	0	104	2	1.01	70.	14	53 5.8	4
15.0	180	90	14.03	2014	5.1	1.5	40	1996	351	4.2	2.1	87.9	180	0	108	2	0.98	75.	15	56 6.0	4
16.0	192	96	14.96	2081	5.2	1.4	41	2002	329	4.0	2.0	88.0	192	0	113	1	0.94	80.	16	59 6.1	4
17.0	204	102	15.90	2145	5.4	1.4	42	2008	310	3.7	1.9	88.1	204	0	118	1	0.91	85.	17	61 6.3	4
18.0	216	108	16.83	2208	5.6	1.3	44	2012	292	3.5	1.8	88.2	216	0	122	1	0.89	90.	18	64 6.4	4
19.0	228	114	17.77	2269	5.7	1.3	45	2016	277	3.3	1.7	88.3	228	0	127	1	0.86	95.	18	67 6.6	4
20.0	240	120	18.70	2329	5.9	1.3	46	2020	263	3.2	1.6	88.4	240	0	131	1	0.84	100.	19	70 6.7	4
25.0	300	150	23.38	2607	6.6	1.1	52	2033	210	2.5	1.3	88.7	300	0	153	1	0.75	119.	24	83 7.4	5
30.0	360	180	28.05	2860	7.2	1.0	57	2042	175	2.1	1.0	89.0	360	0	174	1	0.68	135.	28	95 8.1	6
35.0	420	210	32.73	3093	7.8	1.0	62	2047	150	1.8	0.9	89.1	420	0	195	1	0.63	157.	32	107 8.7	
40.0	480	240	37.40	3311	8.3	0.9	66	2051	131	1.6	0.8	89.2	480	0	215	1	0.58	170.	36	118 9.2	
45.0	540	270	42.08	3516	8.8	0.8	70	2053	117	1.4	0.7	89.3	540	0	235	1	0.55	180.	40	129 9.8	
50.0	600	300	46.75	3711	9.3	0.8	74	2055	105	1.2	0.6	89.4	600	0	255	1	0.52	200.	44	140 10.3	

 # 50 12 C on 16 O — 12 C on 16 O — 12 C on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 8. ZC= 14.(Si)
NEUTRON NUMBERS: NP= 6. NT= 8. NC= 14.

AP**1/3= 2.289 AT**1/3= 2.520
REDUCED MASS NUMBER= 6.86 AP+AT=AC= 28.

INTERACTION RADIUS RINT= 8.32 fm RO= 1.73 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 2.42 CT+CP= 4.55 C= 1.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 2.78

COULOMB RADII [fm]:
RCP= 2.51 RCT= 2.78 RC=RCP+RCT= 5.30

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 18.36 MeV K= .09011 n=2.447
VC(RINT)= 8.3 MeV

FISSION-TKE= 29. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 13.53 MeV
L-RLD= 28 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 27.98 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -4.7
COMPOUND NUCLEUS: -25.1

FUSION RELATED PARAMETERS:
R-BARRIER= 7.61 fm V(RB)= 8.3 MeV
Q-VALUE= 20.4 MeV
L-CRITICAL= 19.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	7	0.83	518	1.5	7.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	24	14	1.65	733	2.1	5.3	11	1019	720	51.5	29.7	64.3	20	4	0	9	4.24	10.	0	3.1	1
3.0	36	21	2.48	898	2.6	4.4	17	1457	1086	29.3	16.8	75.3	34	2	0	6	2.81	14.	0	3.4	2
4.0	48	27	3.31	1037	3.0	3.8	21	1665	1270	20.6	11.8	79.7	47	1	0	5	2.25	19.	0	3.7	2
4.5	54	31	3.72	1100	3.2	3.6	23	1733	1264	17.9	10.2	81.1	53	1	50	4	2.07	21.	5	14 3.8	2
5.0	60	34	4.13	1160	3.4	3.4	24	1787	1137	15.8	9.1	82.1	59	1	53	4	1.93	24.	5	18 4.0	2
5.5	66	38	4.55	1216	3.5	3.2	26	1830	1034	14.2	8.1	82.9	65	1	56	4	1.82	26.	6	21 4.1	2
6.0	72	41	4.96	1271	3.7	3.1	27	1865	948	12.9	7.4	83.6	71	1	58	3	1.72	29.	7	24 4.2	2
6.5	78	45	5.37	1323	3.8	3.0	29	1895	875	11.8	6.7	84.1	77	1	61	3	1.64	31.	7	26 4.3	2
7.0	84	48	5.79	1373	4.0	2.9	30	1920	812	10.9	6.2	84.6	83	1	63	3	1.56	33.	8	28 4.4	2
7.5	90	51	6.20	1421	4.1	2.8	31	1942	758	10.1	5.8	85.0	89	1	65	3	1.50	34.	8	30 4.5	3
8.0	96	55	6.61	1468	4.2	2.7	33	1961	711	9.4	5.4	85.3	95	1	67	3	1.44	37.	9	32 4.6	3
8.5	102	58	7.03	1514	4.4	2.6	34	1977	669	8.8	5.0	85.6	101	1	70	3	1.39	39.	9	34 4.7	3
9.0	108	62	7.44	1558	4.5	2.5	35	1992	632	8.3	4.7	85.9	107	1	72	3	1.35	41.	9	36 4.8	3
9.5	114	65	7.85	1600	4.6	2.5	36	2005	598	7.8	4.5	86.1	113	1	74	3	1.31	44.	10	38 4.9	3
10.0	120	69	8.27	1642	4.7	2.4	37	2016	568	7.4	4.2	86.3	120	0	76	3	1.27	46.	10	39 5.0	3
10.5	126	72	8.68	1683	4.9	2.3	38	2027	541	7.0	4.0	86.5	126	0	78	2	1.23	48.	11	41 5.1	3
11.0	132	75	9.09	1723	5.0	2.3	39	2036	517	6.7	3.8	86.7	132	0	80	2	1.20	48.	11	43 5.2	4
11.5	138	79	9.51	1762	5.1	2.2	40	2044	494	6.4	3.6	86.8	138	0	82	2	1.17	51.	12	44 5.3	4
12.0	144	82	9.92	1800	5.2	2.2	41	2052	474	6.1	3.5	87.0	144	0	84	2	1.15	53.	12	46 5.4	4
13.0	156	89	10.75	1874	5.4	2.1	43	2065	437	5.6	3.2	87.2	156	0	88	2	1.10	57.	13	49 5.6	4
14.0	168	96	11.57	1945	5.6	2.0	45	2077	406	5.2	3.0	87.4	168	0	92	2	1.05	62.	14	52 5.8	4
15.0	180	103	12.40	2014	5.8	2.0	46	2087	379	4.8	2.8	87.6	180	0	96	2	1.01	66.	15	55 5.9	4
16.0	192	110	13.23	2081	6.0	1.9	48	2095	355	4.5	2.6	87.7	192	0	99	2	0.98	68.	15	58 6.1	5
17.0	204	117	14.05	2145	6.2	1.8	50	2102	334	4.2	2.4	87.9	204	0	103	2	0.95	72.	16	60 6.3	5
18.0	216	123	14.88	2208	6.4	1.8	51	2109	316	4.0	2.3	88.0	216	0	107	2	0.92	76.	17	63 6.4	5
19.0	228	130	15.71	2269	6.5	1.7	53	2114	299	3.8	2.2	88.1	228	0	110	2	0.89	80.	18	66 6.6	5
20.0	240	137	16.53	2329	6.7	1.7	54	2120	284	3.6	2.0	88.2	240	0	114	2	0.87	84.	19	68 6.7	5
25.0	300	171	20.67	2607	7.5	1.5	61	2138	227	2.8	1.6	88.6	300	0	131	2	0.77	101.	23	81 7.4	6
30.0	360	206	24.80	2860	8.2	1.4	67	2150	189	2.4	1.3	88.8	360	0	148	1	0.70	116.	27	93 8.0	7
35.0	420	240	28.93	3093	8.9	1.3	73	2158	162	2.0	1.2	89.0	420	0	164	1	0.65	128.	30	104 8.6	
40.0	480	274	33.06	3311	9.5	1.2	78	2164	142	1.8	1.0	89.1	480	0	180	1	0.60	147.	34	115 9.2	
45.0	540	309	37.20	3516	10.1	1.1	83	2168	126	1.6	0.9	89.2	540	0	196	1	0.57	157.	38	126 9.7	
50.0	600	343	41.33	3711	10.6	1.1	87	2171	113	1.4	0.8	89.3	600	0	211	1	0.54	165.	42	136 10.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 51 12 C on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 13. ZC= 19.(K)
NEUTRON NUMBERS: NP= 6. NT= 14. NC= 20.

AP**1/3= 2.289 AT**1/3= 3.000
REDUCED MASS NUMBER= 8.31 AP+AT=AC= 39.

INTERACTION RADIUS RINT= 8.85 fm R0= 1.67 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 3.05 CT+CP= 5.17 C= 1.25

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 3.35

COULOMB RADII [fm]:
RCP= 2.51 RCT= 3.32 RC=RCP+RCT= 5.84

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 26.91 MeV K= .09389 n=2.498
VC(RINT)= 12.7 MeV

FISSION-TKE= 34. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 14.95 MeV
L-RLD= 39 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 23.17 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -20.6
COMPOUND NUCLEUS: -31.4

FUSION RELATED PARAMETERS:
R-BARRIER= 8.06 fm V(RB)= 12.8 MeV
Q-VALUE= 10.7 MeV
L-CRITICAL= 26.

12 C on 27 Al — 12 C on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SCMAR	SCFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	8	0.66	518	1.8	12.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	17	1.31	733	2.6	8.7	11	690	465	76.4	55.0	51.8	16	8	0	18	5.82	7.	0	0	2.4	1
3.0	36	25	1.97	898	3.1	7.1	20	1333	990	40.0	27.9	70.0	32	4	0	10	3.30	11.	0	0	2.7	2
4.0	48	33	2.62	1037	3.6	6.1	25	1642	1253	27.3	19.0	76.3	46	2	42	8	2.54	14.	4	13	3.0	2
4.5	54	37	2.95	1100	3.9	5.8	28	1743	1341	23.6	16.4	78.2	52	2	44	7	2.32	16.	5	17	3.1	2
5.0	60	42	3.28	1160	4.1	5.5	30	1823	1387	20.8	14.4	79.6	58	2	46	7	2.15	18.	5	20	3.3	2
5.5	66	46	3.60	1216	4.3	5.2	32	1898	1261	18.6	12.9	80.7	65	1	48	6	2.01	19.	6	22	3.4	3
6.0	72	50	3.93	1271	4.5	5.0	34	1942	1156	16.8	11.6	81.6	71	1	49	6	1.89	20.	6	24	3.5	3
6.5	78	54	4.26	1323	4.6	4.8	36	1987	1067	15.3	10.6	82.3	77	1	51	6	1.79	22.	7	26	3.6	3
7.0	84	58	4.59	1373	4.8	4.6	38	2026	991	14.1	9.8	83.0	83	1	53	5	1.71	24.	7	28	3.8	3
7.5	90	62	4.91	1421	5.0	4.5	39	2059	925	13.0	9.0	83.5	89	1	54	5	1.64	26.	8	30	3.9	3
8.0	96	66	5.24	1468	5.1	4.3	41	2088	867	12.1	8.4	83.9	95	1	56	5	1.57	28.	8	31	4.0	4
8.5	102	71	5.57	1514	5.3	4.2	42	2113	816	11.3	7.9	84.3	101	1	57	5	1.51	28.	8	33	4.1	4
9.0	108	75	5.90	1558	5.5	4.1	44	2135	770	10.6	7.4	84.7	107	1	59	4	1.46	30.	9	35	4.2	4
9.5	114	79	6.22	1600	5.6	4.0	45	2155	730	10.0	7.0	85.0	113	1	60	4	1.42	31.	9	36	4.3	4
10.0	120	83	6.55	1642	5.7	3.9	47	2173	693	9.5	6.6	85.3	119	1	61	4	1.37	33.	10	38	4.4	4
10.5	126	87	6.88	1683	5.9	3.8	48	2189	660	9.0	6.2	85.5	125	1	63	4	1.34	35.	10	39	4.5	4
11.0	132	91	7.21	1723	6.0	3.7	49	2204	630	8.6	5.9	85.7	131	1	64	4	1.30	36.	10	41	4.6	4
11.5	138	96	7.54	1762	6.2	3.6	51	2217	603	8.2	5.7	85.9	137	1	65	4	1.27	37.	11	42	4.7	5
12.0	144	100	7.86	1800	6.3	3.5	52	2229	578	7.8	5.4	86.1	143	1	67	4	1.24	39.	11	44	4.8	5
13.0	156	108	8.52	1874	6.6	3.4	54	2250	533	7.2	5.0	86.4	155	1	69	4	1.18	42.	12	46	4.9	5
14.0	168	116	9.17	1945	6.8	3.3	57	2268	495	6.6	4.6	86.7	168	0	72	3	1.13	45.	13	49	5.1	5
15.0	180	125	9.83	2014	7.0	3.2	59	2284	462	6.2	4.3	86.9	180	0	74	3	1.09	47.	14	52	5.3	6
16.0	192	133	10.48	2081	7.3	3.1	61	2297	433	5.7	4.0	87.1	192	0	76	3	1.05	50.	14	54	5.4	6
17.0	204	141	11.14	2145	7.5	3.0	63	2309	408	5.4	3.7	87.3	204	0	79	3	1.02	53.	15	57	5.6	6
18.0	216	150	11.79	2208	7.7	2.9	65	2319	385	5.1	3.5	87.5	216	0	81	3	0.99	56.	16	59	5.7	6
19.0	228	158	12.45	2269	7.9	2.8	67	2329	365	4.8	3.3	87.6	228	0	83	3	0.96	58.	17	62	5.9	7
20.0	240	166	13.10	2329	8.1	2.7	69	2337	346	4.6	3.2	87.7	240	0	85	3	0.93	61.	17	64	6.0	7
25.0	300	208	16.38	2607	9.1	2.5	78	2368	277	3.6	2.5	88.2	300	0	96	3	0.83	73.	21	76	6.7	8
30.0	360	249	19.66	2860	10.0	2.2	86	2388	231	3.0	2.1	88.5	360	0	106	2	0.75	85.	25	87	7.3	9
35.0	420	291	22.93	3093	10.7	2.1	93	2402	198	2.6	1.8	88.7	420	0	116	2	0.69	96.	28	97	7.9	
40.0	480	332	26.21	3311	11.5	1.9	100	2412	173	2.2	1.5	88.9	480	0	126	2	0.64	106.	32	107	8.4	
45.0	540	374	29.49	3516	12.2	1.8	106	2420	154	2.0	1.4	89.0	540	0	135	2	0.61	115.	35	117	8.9	
50.0	600	415	32.76	3711	12.8	1.7	112	2426	138	1.8	1.2	89.1	600	0	144	2	0.57	128.	39	127	9.3	

 # 52 12 C on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 20. ZC= 26.(Fe)
NEUTRON NUMBERS: NP= 6. NT= 20. NC= 26.

AP**1/3= 2.289 AT**1/3= 3.420
REDUCED MASS NUMBER= 9.23 AP+AT=AC= 52.

INTERACTION RADIUS RINT= 9.30 fm R0= 1.63 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 3.59 CT+CP= 5.71 C= 1.33

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 3.85

COULOMB RADII [fm]:
RCP= 2.51 RCT= 3.84 RC=RCP+RCT= 6.36

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 37.64 MeV K= .08744 n=2.589
VC(RINT)= 18.5 MeV

FISSION-TKE= 42. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 15.96 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 20.89 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -33.0
COMPOUND NUCLEUS: -51.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.44 fm V(RB)= 19.0 MeV
Q-VALUE= 18.2 MeV
L-CRITICAL= 32.

12 C on 40 Ca — 12 C on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SCMAR	SCFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	9	0.50	518	2.0	18.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	18	1.00	733	2.9	13.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	28	1.49	898	3.5	10.9	19	995	703	60.6	47.7	59.7	29	7	0	19	4.23	8.	0	0	2.7	2
4.0	48	37	1.99	1037	4.0	9.4	26	1456	1087	39.3	30.5	70.4	44	4	37	13	2.98	11.	4	14	2.9	2
4.5	54	42	2.24	1100	4.3	8.9	30	1607	1215	33.5	25.9	73.3	51	3	39	12	2.67	12.	5	17	3.0	2
5.0	60	46	2.49	1160	4.5	8.5	32	1727	1318	29.2	22.6	75.4	57	3	41	11	2.43	13.	5	19	3.1	3
5.5	66	51	2.74	1216	4.7	8.1	35	1825	1401	25.9	20.0	77.1	64	2	42	10	2.25	14.	6	21	3.3	3
6.0	72	55	2.99	1271	4.9	7.7	38	1906	1358	23.2	17.9	78.4	70	2	44	9	2.11	16.	6	23	3.4	3
6.5	78	60	3.24	1323	5.1	7.4	40	1974	1254	21.1	16.3	79.5	76	2	45	9	1.99	17.	6	25	3.5	3
7.0	84	65	3.48	1373	5.3	7.1	42	2032	1164	19.3	14.9	80.3	82	2	46	8	1.88	18.	7	27	3.6	4
7.5	90	69	3.73	1421	5.5	6.9	44	2082	1086	17.8	13.7	81.1	88	2	47	8	1.80	19.	7	28	3.7	4
8.0	96	74	3.98	1468	5.7	6.7	46	2126	1018	16.5	12.7	81.7	95	1	48	8	1.72	20.	8	30	3.8	4
8.5	102	78	4.23	1514	5.9	6.5	48	2164	958	15.4	11.9	82.3	101	1	50	7	1.65	22.	8	31	3.9	4
9.0	108	83	4.48	1558	6.1	6.3	50	2198	905	14.5	11.1	82.8	107	1	51	7	1.59	23.	8	33	3.9	4
9.5	114	88	4.73	1600	6.2	6.1	51	2228	858	13.6	10.5	83.2	113	1	52	7	1.54	24.	9	34	4.0	4
10.0	120	92	4.98	1642	6.4	6.0	53	2255	815	12.8	9.9	83.6	119	1	53	7	1.49	25.	9	36	4.1	5
10.5	126	97	5.23	1683	6.5	5.8	55	2280	776	12.2	9.4	83.9	125	1	54	6	1.44	26.	10	37	4.2	5
11.0	132	102	5.48	1723	6.7	5.7	56	2302	741	11.6	8.9	84.2	131	1	55	6	1.40	28.	10	38	4.3	5
11.5	138	106	5.72	1762	6.8	5.6	58	2322	708	11.0	8.5	84.5	137	1	55	6	1.37	29.	10	40	4.4	5
12.0	144	111	5.97	1800	7.0	5.5	59	2341	679	10.5	8.1	84.8	143	1	56	6	1.33	30.	11	41	4.5	5
13.0	156	120	6.47	1874	7.3	5.2	62	2374	627	9.6	7.4	85.2	155	1	58	6	1.27	32.	11	44	4.6	6
14.0	168	129	6.97	1945	7.6	5.0	65	2401	582	8.9	6.8	85.6	167	1	60	5	1.22	34.	12	46	4.8	6
15.0	180	138	7.47	2014	7.8	4.9	68	2425	543	8.2	6.3	85.9	179	1	62	5	1.17	37.	13	48	4.9	6
16.0	192	148	7.96	2081	8.1	4.7	70	2446	509	7.7	5.9	86.2	191	1	63	5	1.12	38.	14	51	5.1	7
17.0	204	157	8.46	2145	8.3	4.6	73	2465	479	7.2	5.5	86.4	203	1	65	5	1.09	41.	14	53	5.2	7
18.0	216	166	8.96	2208	8.6	4.5	75	2481	452	6.8	5.2	86.6	215	1	66	5	1.05	43.	15	55	5.3	7
19.0	228	175	9.46	2269	8.8	4.3	77	2495	429	6.4	4.9	86.8	227	1	68	5	1.02	44.	16	58	5.5	8
20.0	240	185	9.95	2329	9.0	4.2	80	2508	407	6.1	4.7	87.0	240	0	69	4	0.99	47.	16	60	5.6	8
25.0	300	231	12.44	2607	10.1	3.8	90	2557	326	4.8	3.7	87.6	300	0	77	4	0.88	57.	20	71	6.2	9
30.0	360	277	14.93	2860	11.1	3.4	99	2589	271	4.0	3.1	88.0	360	0	84	4	0.80	67.	23	81	6.7	10
35.0	420	323	17.42	3093	11.9	3.2	108	2611	232	3.4	2.6	88.3	420	0	90	3	0.73	75.	27	90	7.2	
40.0	480	369	19.91	3311	12.8	3.0	116	2628	203	3.0	2.3	88.5	480	0	96	3	0.68	83.	30	100	7.7	
45.0	540	415	22.40	3516	13.5	2.8	123	2641	181	2.6	2.0	88.7	540	0	103	3	0.64	91.	33	109	8.2	
50.0	600	462	24.89	3711	14.3	2.7	130	2651	163	2.4	1.8	88.8	600	0	109	3	0.61	101.	36	118	8.6	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nms	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 53 12 C on 56 Fe — 12 C on 56 Fe — 12 C on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 26. ZC= 32.(Ge)
NEUTRON NUMBERS: NP= 6. NT= 30. NC= 36.

AP**1/3= 2.289 AT**1/3= 3.826
REDUCED MASS NUMBER= 9.88 AP+AT=AC= 68.

INTERACTION RADIUS RINT= 9.75 fm RO= 1.59 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 4.12 CT+CP= 6.24 C= 1.40

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 4.35

COULOMB RADII [fm]:
RCP= 2.51 RCT= 4.27 RC=RCP+RCT= 6.79

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 45.54 MeV K= .07837 n=2.648
VC(RINT)= 23.0 MeV

FISSION-TKE= 49. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 16.65 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 19.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -61.4
COMPOUND NUCLEUS: -66.5

FUSION RELATED PARAMETERS:
R-BARRIER= 8.84 fm V(RB)= 23.6 MeV
Q-VALUE= 5.1 MeV
L-CRITICAL= 37.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	10	0.43	518	2.2	24.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	20	0.86	733	3.1	17.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	30	1.29	898	3.7	14.2	17	744	500	79.0	67.5	50.5	28	8	0	30	5.39	6.	0	0	2.0	2
4.0	48	40	1.72	1037	4.3	12.3	27	1338	988	48.6	40.6	65.7	43	5	34	19	3.41	8.	4	14	2.3	2
4.5	54	44	1.93	1100	4.6	11.6	31	1532	1151	40.9	34.0	69.5	50	4	36	17	2.99	9.	4	16	2.4	3
5.0	60	49	2.15	1160	4.8	11.0	34	1686	1281	35.4	29.4	72.3	57	3	38	15	2.70	10.	5	18	2.5	3
5.5	66	54	2.36	1216	5.1	10.5	37	1812	1388	31.2	25.9	74.4	63	3	39	14	2.48	11.	5	20	2.6	3
6.0	72	59	2.58	1271	5.3	10.0	40	1916	1476	27.9	23.1	76.0	70	2	40	13	2.30	12.	6	22	2.8	4
6.5	78	64	2.79	1323	5.5	9.6	43	2004	1517	25.3	20.9	77.4	76	2	41	12	2.16	13.	6	23	2.9	4
7.0	84	69	3.01	1373	5.7	9.3	46	2079	1408	23.1	19.0	78.5	82	2	42	11	2.04	14.	7	25	3.0	4
7.5	90	74	3.22	1421	5.9	9.0	48	2143	1314	21.2	17.5	79.4	88	2	43	11	1.94	15.	7	27	3.1	4
8.0	96	79	3.43	1468	6.1	8.7	50	2200	1232	19.6	16.2	80.2	94	2	44	10	1.85	16.	7	28	3.1	5
8.5	102	84	3.65	1514	6.3	8.4	52	2249	1160	18.3	15.1	80.9	101	1	45	10	1.77	17.	8	29	3.2	5
9.0	108	89	3.86	1558	6.5	8.2	54	2293	1095	17.1	14.1	81.4	107	1	45	10	1.71	18.	8	31	3.3	5
9.5	114	94	4.08	1600	6.7	8.0	56	2332	1037	16.1	13.3	82.0	113	1	46	9	1.65	19.	8	32	3.4	5
10.0	120	99	4.29	1642	6.8	7.8	58	2368	986	15.2	12.5	82.4	119	1	47	9	1.59	19.	9	33	3.5	6
10.5	126	104	4.51	1683	7.0	7.6	60	2399	939	14.4	11.8	82.8	125	1	48	9	1.54	20.	9	35	3.6	6
11.0	132	109	4.72	1723	7.2	7.4	62	2428	896	13.6	11.2	83.2	131	1	48	8	1.50	21.	9	36	3.7	6
11.5	138	114	4.94	1762	7.3	7.2	64	2454	857	13.0	10.7	83.5	137	1	49	8	1.46	22.	10	37	3.7	6
12.0	144	119	5.15	1800	7.5	7.1	66	2478	821	12.4	10.2	83.8	143	1	50	8	1.42	23.	10	38	3.8	6
13.0	156	128	5.58	1874	7.8	6.8	69	2521	758	11.3	9.3	84.3	155	1	51	8	1.35	25.	11	41	4.0	7
14.0	168	138	6.01	1945	8.1	6.6	72	2557	704	10.4	8.6	84.8	167	1	52	7	1.29	27.	12	43	4.1	7
15.0	180	148	6.44	2014	8.4	6.3	75	2588	657	9.7	8.0	85.2	179	1	53	7	1.24	28.	12	45	4.2	8
16.0	192	158	6.87	2081	8.6	6.1	78	2615	616	9.0	7.4	85.5	191	1	55	7	1.19	30.	13	47	4.4	8
17.0	204	168	7.30	2145	8.9	6.0	81	2639	580	8.4	7.0	85.8	203	1	56	6	1.15	32.	14	50	4.5	8
18.0	216	178	7.73	2208	9.2	5.8	83	2660	547	7.9	6.5	86.0	215	1	57	6	1.11	33.	14	52	4.6	9
19.0	228	188	8.16	2269	9.4	5.6	86	2679	518	7.5	6.2	86.3	227	1	58	6	1.08	35.	15	54	4.8	9
20.0	240	198	8.59	2329	9.7	5.5	89	2696	493	7.1	5.8	86.5	239	1	59	6	1.05	37.	16	56	4.9	9
25.0	300	247	10.73	2607	10.8	4.9	100	2760	394	5.6	4.6	87.2	300	0	64	5	0.93	44.	19	66	5.4	11
30.0	360	296	12.88	2860	11.8	4.5	111	2802	328	4.6	3.8	87.7	360	0	69	5	0.84	52.	22	75	6.0	12
35.0	420	346	15.03	3093	12.8	4.2	120	2832	281	3.9	3.3	88.0	420	0	74	4	0.77	59.	25	84	6.4	
40.0	480	395	17.17	3311	13.7	3.9	129	2854	246	3.4	2.8	88.3	480	0	78	4	0.72	66.	28	93	6.9	
45.0	540	445	19.32	3516	14.5	3.7	138	2871	219	3.0	2.5	88.5	540	0	82	4	0.67	73.	32	102	7.3	
50.0	600	494	21.47	3711	15.3	3.5	145	2884	197	2.7	2.3	88.6	600	0	86	4	0.64	78.	35	110	7.7	

 # 54 12 C on 63 Cu — 12 C on 63 Cu — 12 C on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 29. ZC= 35.(Br)
NEUTRON NUMBERS: NP= 6. NT= 34. NC= 40.

AP**1/3= 2.289 AT**1/3= 3.979
REDUCED MASS NUMBER= 10.08 AP+AT=AC= 75.

INTERACTION RADIUS RINT= 9.91 fm RO= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 4.31 CT+CP= 6.44 C= 1.42

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 4.53

COULOMB RADII [fm]:
RCP= 2.51 RCT= 4.45 RC=RCP+RCT= 6.96

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 49.36 MeV K= .07408 n=2.680
VC(RINT)= 25.2 MeV

FISSION-TKE= 53. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 16.88 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 19.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -65.2
COMPOUND NUCLEUS: -70.4

FUSION RELATED PARAMETERS:
R-BARRIER= 8.98 fm V(RB)= 25.9 MeV
Q-VALUE= 5.2 MeV
L-CRITICAL= 39.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	10	0.40	518	2.2	27.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	20	0.80	733	3.1	19.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	30	1.20	898	3.8	15.8	15	575	362	91.8	80.9	44.1	26	10	0	39	6.39	6.	0	0	1.9	2
4.0	48	40	1.60	1037	4.4	13.7	27	1240	905	54.3	46.4	62.8	43	5	33	22	3.67	7.	4	13	2.2	3
4.5	54	45	1.80	1100	4.7	12.9	31	1457	1086	45.4	38.6	67.3	50	4	35	19	3.18	8.	4	16	2.3	3
5.0	60	50	2.00	1160	4.9	12.3	35	1630	1231	39.1	33.1	70.5	56	4	37	17	2.84	9.	5	18	2.4	3
5.5	66	55	2.20	1216	5.2	11.7	38	1770	1349	34.3	29.0	72.8	63	3	38	16	2.59	10.	5	20	2.5	4
6.0	72	60	2.40	1271	5.4	11.2	41	1886	1448	30.6	25.9	74.7	69	3	39	15	2.40	11.	6	21	2.6	4
6.5	78	66	2.60	1323	5.6	10.7	44	1984	1532	27.6	23.3	76.2	76	2	40	14	2.24	12.	6	23	2.7	4
7.0	84	71	2.80	1373	5.8	10.4	46	2068	1499	25.2	21.2	77.4	82	2	41	13	2.11	13.	6	24	2.8	4
7.5	90	76	3.00	1421	6.0	10.0	49	2140	1399	23.2	19.5	78.4	88	2	42	12	2.01	13.	7	26	2.9	5
8.0	96	81	3.19	1468	6.2	9.7	51	2203	1312	21.4	18.0	79.3	94	2	43	12	1.91	14.	7	27	3.0	5
8.5	102	86	3.39	1514	6.4	9.4	54	2259	1235	19.9	16.8	80.0	100	2	43	11	1.83	15.	8	29	3.1	5
9.0	108	91	3.59	1558	6.6	9.1	56	2308	1166	18.6	15.7	80.7	106	2	44	11	1.76	16.	8	30	3.2	5
9.5	114	96	3.79	1600	6.8	8.9	58	2352	1105	17.5	14.7	81.3	113	1	45	10	1.70	17.	8	31	3.3	6
10.0	120	101	3.99	1642	7.0	8.7	60	2391	1049	16.5	13.9	81.8	119	1	45	10	1.64	18.	9	33	3.4	6
10.5	126	106	4.19	1683	7.1	8.5	62	2427	999	15.6	13.1	82.2	125	1	46	10	1.59	19.	9	34	3.4	6
11.0	132	111	4.39	1723	7.3	8.3	64	2459	954	14.8	12.4	82.6	131	1	47	9	1.54	19.	9	35	3.5	6
11.5	138	116	4.59	1762	7.5	8.1	66	2488	913	14.1	11.8	83.0	137	1	47	9	1.49	20.	10	36	3.6	6
12.0	144	121	4.79	1800	7.6	7.9	67	2515	874	13.4	11.3	83.3	143	1	48	9	1.45	21.	10	37	3.7	7
13.0	156	131	5.19	1874	7.9	7.6	71	2563	807	12.3	10.3	83.9	155	1	49	8	1.38	23.	11	40	3.8	7
14.0	168	141	5.59	1945	8.2	7.3	74	2603	749	11.3	9.5	84.4	167	1	50	8	1.32	24.	11	42	4.0	8
15.0	180	151	5.99	2014	8.5	7.1	77	2638	699	10.5	8.8	84.8	179	1	51	8	1.27	26.	12	44	4.1	8
16.0	192	161	6.39	2081	8.8	6.8	80	2669	656	9.8	8.2	85.1	191	1	52	7	1.22	27.	13	46	4.2	8
17.0	204	171	6.79	2145	9.1	6.6	83	2696	617	9.1	7.7	85.4	203	1	53	7	1.18	29.	13	48	4.3	9
18.0	216	181	7.19	2208	9.4	6.5	86	2719	583	8.6	7.2	85.7	215	1	54	7	1.14	30.	14	50	4.5	9
19.0	228	192	7.59	2269	9.6	6.3	89	2741	552	8.1	6.8	85.9	227	1	55	7	1.10	32.	15	53	4.6	10
20.0	240	202	7.99	2329	9.9	6.1	91	2760	524	7.7	6.4	86.2	239	1	56	7	1.07	33.	15	55	4.7	10
25.0	300	252	9.98	2607	11.0	5.5	104	2831	419	6.1	5.1	87.0	300	0	61	6	0.95	40.	19	64	5.2	12
30.0	360	302	11.98	2860	12.1	5.0	115	2879	349	5.0	4.2	87.5	360	0	65	5	0.85	48.	22	73	5.7	13
35.0	420	353	13.98	3093	13.0	4.6	125	2912	299	4.3	3.6	87.9	420	0	69	5	0.79	54.	25	82	6.2	
40.0	480	403	15.97	3311	13.9	4.3	134	2937	262	3.7	3.1	88.1	480	0	73	4	0.73	60.	28	91	6.6	
45.0	540	454	17.97	3516	14.8	4.1	142	2956	233	3.3	2.8	88.4	540	0	77	4	0.69	67.	31	99	7.0	
50.0	600	504	19.97	3711	15.6	3.9	151	2971	209	2.9	2.5	88.5	600	0	80	4	0.65	72.	34	107	7.4	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	MeV	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB — BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 55 12 C on 92 Mo

12 C on 92 Mo

12 C on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 42. ZC= 48.(Cd)
NEUTRON NUMBERS: NP= 6. NT= 50. NC= 56.

AP**1/3= 2.289 AT**1/3= 4.514
REDUCED MASS NUMBER= 10.62 AP+AT=AC=104.

INTERACTION RADIUS RINT=10.49 fm RO= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 5.00 CT+CP= 7.13 C= 1.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 5.20

COULOMB RADII [fm]:
RCP= 2.51 RCT= 5.08 RC=RCP+RCT= 7.59

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 64.75 MeV K= .05777 n=2.805
VC(RINT)= 34.5 MeV

FISSION-TKE= 75. MeV
ASYMM. FISSION-TKE= 33. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 17.64 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 18.19 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -87.5
COMPOUND NUCLEUS: -84.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.49 fm V(RB)= 35.6 MeV
Q-VALUE= -3.5 MeV
L-CRITICAL= 46.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	12	11	0.31	518	2.3	39.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	21	0.61	733	3.3	28.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	32	0.92	898	4.0	22.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	42	1.23	1037	4.6	19.8	21	705	457	86.7	79.4	46.6	39	9	30	46	5.51	5.	3	12	1.7	2
4.5	54	48	1.38	1100	4.9	18.7	27	1027	720	69.1	62.5	55.4	47	7	33	36	4.26	6.	4	14	1.8	3
5.0	60	53	1.54	1160	5.2	17.7	32	1282	931	57.8	51.9	61.1	54	6	35	30	3.59	7.	4	16	2.0	3
5.5	66	58	1.69	1216	5.4	16.9	36	1489	1103	49.8	44.5	65.1	61	5	36	26	3.17	7.	5	18	2.1	4
6.0	72	64	1.84	1271	5.7	16.2	40	1661	1247	43.7	39.0	68.1	68	4	37	24	2.87	8.	5	19	2.2	4
6.5	78	69	2.00	1323	5.9	15.6	44	1806	1368	39.1	34.8	70.5	74	4	38	22	2.64	9.	6	21	2.2	4
7.0	84	74	2.15	1373	6.1	15.0	47	1929	1472	35.3	31.4	72.4	81	3	39	20	2.45	9.	6	22	2.3	5
7.5	90	80	2.31	1421	6.4	14.5	50	2036	1563	32.2	28.6	73.9	87	3	40	19	2.30	10.	6	24	2.4	5
8.0	96	85	2.46	1468	6.6	14.0	53	2129	1606	29.6	26.3	75.2	93	3	41	18	2.18	11.	7	25	2.5	5
8.5	102	90	2.61	1514	6.8	13.6	56	2211	1511	27.4	24.3	76.3	100	2	41	17	2.07	11.	7	26	2.6	6
9.0	108	96	2.77	1558	7.0	13.2	58	2284	1427	25.5	22.6	77.2	106	2	42	17	1.98	12.	8	27	2.7	6
9.5	114	101	2.92	1600	7.2	12.9	61	2349	1352	23.9	21.2	78.1	112	2	43	16	1.90	12.	8	29	2.7	6
10.0	120	106	3.07	1642	7.3	12.5	63	2407	1284	22.4	19.9	78.8	118	2	43	15	1.83	13.	8	30	2.8	6
10.5	126	111	3.23	1683	7.5	12.2	66	2460	1223	21.2	18.8	79.4	124	2	44	15	1.76	14.	9	31	2.9	7
11.0	132	117	3.38	1723	7.7	12.0	68	2508	1168	20.0	17.7	80.0	130	2	44	14	1.71	14.	9	32	3.0	7
11.5	138	122	3.54	1762	7.9	11.7	70	2551	1117	19.0	16.8	80.5	136	2	45	14	1.65	15.	9	33	3.0	7
12.0	144	127	3.69	1800	8.0	11.5	72	2591	1070	18.1	16.0	81.0	143	1	45	13	1.60	15.	10	34	3.1	7
13.0	156	138	4.00	1874	8.4	11.0	76	2661	988	16.5	14.6	81.8	155	1	46	13	1.52	17.	10	36	3.2	8
14.0	168	149	4.30	1945	8.7	10.6	80	2722	917	15.1	13.4	82.4	167	1	47	12	1.45	18.	11	38	3.3	8
15.0	180	159	4.61	2014	9.0	10.2	83	2774	856	14.0	12.4	83.0	179	1	47	12	1.38	19.	12	40	3.5	9
16.0	192	170	4.92	2081	9.3	9.9	87	2819	803	13.0	11.5	83.5	191	1	48	11	1.33	20.	12	42	3.6	9
17.0	204	180	5.23	2145	9.6	9.6	90	2859	755	12.2	10.8	83.9	203	1	49	11	1.28	21.	13	44	3.7	10
18.0	216	191	5.53	2208	9.9	9.4	94	2894	713	11.4	10.1	84.3	215	1	50	10	1.24	23.	13	46	3.8	10
19.0	228	202	5.84	2269	10.1	9.1	97	2926	676	10.8	9.5	84.6	227	1	50	10	1.20	24.	14	48	3.9	11
20.0	240	212	6.15	2329	10.4	8.9	100	2955	642	10.2	9.0	84.9	239	1	51	10	1.16	25.	15	50	4.0	11
25.0	300	265	7.69	2607	11.6	7.9	114	3062	513	8.0	7.1	86.0	299	1	54	9	1.02	30.	18	59	4.5	13
30.0	360	318	9.22	2860	12.7	7.2	126	3133	428	6.6	5.8	86.7	360	0	57	8	0.92	36.	21	67	4.9	15
35.0	420	372	10.76	3093	13.7	6.7	137	3184	367	5.6	4.9	87.2	420	0	60	7	0.84	41.	24	76	5.3	
40.0	480	425	12.30	3311	14.7	6.3	148	3221	321	4.9	4.3	87.6	480	0	62	7	0.78	46.	27	83	5.7	
45.0	540	478	13.83	3516	15.6	5.9	157	3250	285	4.3	3.8	87.8	540	0	65	6	0.73	50.	30	91	6.0	
50.0	600	531	15.37	3711	16.4	5.6	167	3273	256	3.9	3.4	88.1	600	0	67	6	0.69	55.	33	99	6.4	

\# 56 12 C on 108 Ag

12 C on 108 Ag

12 C on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 47. ZC= 53.(I)
NEUTRON NUMBERS: NP= 6. NT= 61. NC= 67.

AP**1/3= 2.289 AT**1/3= 4.762
REDUCED MASS NUMBER= 10.80 AP+AT=AC=120.

INTERACTION RADIUS RINT=10.76 fm RO= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 5.32 CT+CP= 7.44 C= 1.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 5.50

COULOMB RADII [fm]:
RCP= 2.51 RCT= 5.34 RC=RCP+RCT= 7.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 69.86 MeV K= .05266 n=2.837
VC(RINT)= 37.7 MeV

FISSION-TKE= 83. MeV
ASYMM. FISSION-TKE= 33. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 17.71 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.88 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -87.6
COMPOUND NUCLEUS: -84.2

FUSION RELATED PARAMETERS:
R-BARRIER= 9.73 fm V(RB)= 38.8 MeV
Q-VALUE= -3.4 MeV
L-CRITICAL= 49.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	12	11	0.29	518	2.4	44.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	22	0.57	733	3.3	31.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	32	0.86	898	4.1	25.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	43	1.15	1037	4.7	22.2	18	513	304	101.6	95.3	39.2	38	10	29	62	6.84	5.	3	11	1.6	3
4.5	54	49	1.29	1100	5.0	20.9	26	879	600	78.7	72.7	50.6	46	8	32	44	4.85	5.	4	13	1.7	3
5.0	60	54	1.43	1160	5.3	19.9	31	1168	838	64.9	59.4	57.5	54	6	34	36	3.96	6.	4	15	1.8	4
5.5	66	59	1.58	1216	5.5	18.9	36	1403	1032	55.5	50.5	62.3	61	5	36	31	3.44	6.	5	17	1.9	4
6.0	72	65	1.72	1271	5.8	18.1	40	1597	1194	48.5	44.1	65.8	68	4	37	28	3.07	7.	5	19	2.0	4
6.5	78	70	1.86	1323	6.0	17.4	44	1761	1331	43.1	39.1	68.4	74	4	38	26	2.81	7.	6	20	2.1	5
7.0	84	76	2.01	1373	6.2	16.8	48	1900	1448	38.8	35.2	70.6	81	3	39	24	2.60	8.	6	21	2.2	5
7.5	90	81	2.15	1421	6.5	16.2	51	2021	1550	35.3	32.0	72.3	87	3	39	22	2.43	9.	6	23	2.3	5
8.0	96	86	2.29	1468	6.7	15.7	54	2127	1639	32.4	29.3	73.8	93	3	40	21	2.29	9.	7	24	2.4	6
8.5	102	92	2.44	1514	6.9	15.2	57	2220	1661	30.0	27.1	75.0	100	2	41	20	2.17	10.	7	25	2.4	6
9.0	108	97	2.58	1558	7.1	14.8	60	2302	1569	27.9	25.2	76.1	106	2	41	19	2.07	10.	7	26	2.5	6
9.5	114	103	2.72	1600	7.3	14.4	62	2375	1486	26.0	23.5	77.0	112	2	42	18	1.99	11.	8	28	2.6	7
10.0	120	108	2.87	1642	7.5	14.0	65	2441	1412	24.4	22.0	77.8	118	2	42	17	1.91	11.	8	29	2.6	7
10.5	126	113	3.01	1683	7.7	13.7	67	2501	1344	23.0	20.8	78.5	124	2	43	17	1.84	12.	8	30	2.7	7
11.0	132	119	3.15	1723	7.8	13.4	70	2555	1283	21.8	19.6	79.1	130	2	43	16	1.78	12.	9	31	2.8	8
11.5	138	124	3.30	1762	8.0	13.1	72	2605	1227	20.6	18.6	79.7	136	2	44	16	1.72	13.	9	32	2.8	8
12.0	144	130	3.44	1800	8.2	12.8	74	2650	1176	19.6	17.7	80.2	142	2	44	15	1.67	13.	9	33	2.9	8
13.0	156	140	3.73	1874	8.5	12.3	78	2729	1086	17.9	16.1	81.1	155	1	45	14	1.58	14.	10	35	3.0	9
14.0	168	151	4.01	1945	8.8	11.9	82	2798	1008	16.4	14.8	81.8	167	1	45	14	1.50	15.	11	37	3.1	10
15.0	180	162	4.30	2014	9.1	11.5	86	2857	941	15.1	13.6	82.4	179	1	46	13	1.43	16.	11	39	3.3	10
16.0	192	173	4.59	2081	9.4	11.1	90	2908	882	14.1	12.7	83.0	191	1	47	13	1.38	17.	12	41	3.4	11
17.0	204	184	4.87	2145	9.7	10.8	93	2953	830	13.2	11.8	83.4	203	1	47	12	1.32	19.	13	43	3.5	11
18.0	216	194	5.16	2208	10.0	10.5	97	2994	784	12.3	11.1	83.8	215	1	48	12	1.28	19.	13	45	3.6	12
19.0	228	205	5.45	2269	10.3	10.2	100	3030	743	11.6	10.5	84.2	227	1	49	11	1.24	21.	14	46	3.7	12
20.0	240	216	5.73	2329	10.6	9.9	103	3062	706	11.0	9.9	84.5	239	1	49	11	1.20	21.	14	48	3.8	13
25.0	300	270	7.17	2607	11.8	8.9	118	3184	564	8.6	7.8	85.7	299	1	52	10	1.05	26.	17	57	4.2	15
30.0	360	324	8.60	2860	12.9	8.1	131	3265	470	7.1	6.4	86.5	360	0	54	9	0.95	31.	20	65	4.6	17
35.0	420	378	10.03	3093	14.0	7.5	143	3322	403	6.0	5.4	87.0	420	0	57	8	0.87	35.	23	73	5.0	
40.0	480	432	11.47	3311	14.9	7.0	154	3365	353	5.2	4.7	87.4	480	0	59	7	0.81	40.	26	80	5.3	
45.0	540	486	12.90	3516	15.8	6.6	164	3398	313	4.6	4.2	87.7	540	0	61	7	0.76	44.	29	88	5.7	
50.0	600	540	14.33	3711	16.7	6.3	173	3424	282	4.1	3.7	87.9	600	0	63	7	0.71	48.	32	95	6.0	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 57 12 C on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 58. ZC= 64.(Gd)
NEUTRON NUMBERS: NP= 6. NT= 82. NC= 88.

AP**1/3= 2.289 AT**1/3= 5.192
REDUCED MASS NUMBER= 11.05 AP+AT=AC=152.

INTERACTION RADIUS RINT=11.23 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 5.87 CT+CP= 8.00 C= 1.56

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.04

COULOMB RADII [fm]:
RCP= 2.51 RCT= 5.82 RC=RCP+RCT= 8.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 80.73 MeV K= .04334 n=2.909
VC(RINT)= 44.6 MeV

FISSION-TKE= 104. MeV
ASYMM. FISSION-TKE= 35. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 17.82 MeV
L-RLD= 90 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -88.2
COMPOUND NUCLEUS: -74.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.15 fm V(RB)= 45.8 MeV
Q-VALUE= -14.0 MeV
L-CRITICAL= 54.

12 C on 140 Ce

12 C on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	11	0.25	518	2.4	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	22	0.50	733	3.4	38.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	33	0.74	898	4.2	31.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	44	0.99	1037	4.8	27.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	54	50	1.12	1100	5.1	25.8	18	452	254	108.9	104.1	35.6	44	10	31	80	7.47	4.	4	12	1.4	3
5.0	60	55	1.24	1160	5.4	24.5	27	821	552	85.2	80.4	47.4	52	8	34	56	5.18	5.	4	14	1.5	4
5.5	66	61	1.36	1216	5.7	23.4	33	1118	796	70.9	66.4	54.6	60	6	35	45	4.20	5.	5	16	1.6	4
6.0	72	66	1.49	1271	5.9	22.4	38	1365	999	60.9	56.8	59.5	67	5	37	39	3.62	5.	5	17	1.7	5
6.5	78	72	1.61	1323	6.2	21.5	43	1572	1171	53.5	49.8	63.2	73	5	38	35	3.24	6.	5	19	1.7	5
7.0	84	77	1.74	1373	6.4	20.7	47	1749	1319	47.8	44.4	66.1	80	4	39	32	2.95	6.	6	20	1.8	6
7.5	90	83	1.86	1421	6.6	20.0	51	1902	1447	43.2	40.1	68.4	86	4	39	29	2.73	7.	6	21	1.9	6
8.0	96	88	1.98	1468	6.8	19.4	54	2035	1598	39.4	36.5	70.3	93	3	40	28	2.55	7.	7	22	2.0	6
8.5	102	94	2.11	1514	7.0	18.8	57	2153	1657	36.3	33.6	71.9	99	3	41	26	2.40	8.	7	24	2.1	7
9.0	108	99	2.23	1558	7.3	18.3	60	2257	1745	33.6	31.1	73.2	105	3	41	25	2.28	8.	7	25	2.1	7
9.5	114	105	2.36	1600	7.5	17.8	63	2350	1710	31.3	28.9	74.3	112	2	42	23	2.17	9.	8	26	2.2	7
10.0	120	111	2.48	1642	7.6	17.3	66	2433	1624	29.3	27.1	75.3	118	2	42	22	2.08	9.	8	27	2.3	8
10.5	126	116	2.60	1683	7.8	16.9	69	2509	1547	27.5	25.4	76.2	124	2	42	22	2.00	9.	8	28	2.3	8
11.0	132	122	2.73	1723	8.0	16.5	72	2578	1477	26.0	24.0	77.0	130	2	43	21	1.92	10.	9	29	2.4	8
11.5	138	127	2.85	1762	8.2	16.2	74	2640	1412	24.6	22.7	77.7	136	2	43	20	1.86	10.	9	30	2.4	9
12.0	144	133	2.98	1800	8.4	15.8	77	2697	1354	23.3	21.5	78.3	142	2	44	19	1.80	11.	9	31	2.5	9
13.0	156	144	3.22	1874	8.7	15.2	81	2798	1249	21.2	19.5	79.4	154	2	44	18	1.70	11.	10	33	2.6	10
14.0	168	155	3.47	1945	9.0	14.6	86	2885	1160	19.4	17.9	80.3	167	1	45	17	1.61	12.	10	35	2.7	10
15.0	180	166	3.72	2014	9.4	14.1	90	2960	1083	17.9	16.5	81.1	179	1	45	17	1.53	13.	11	37	2.8	11
16.0	192	177	3.97	2081	9.7	13.7	94	3025	1015	16.6	15.3	81.7	191	1	46	16	1.47	14.	12	38	2.9	12
17.0	204	188	4.22	2145	10.0	13.3	98	3082	955	15.5	14.3	82.3	203	1	46	15	1.41	15.	12	40	3.0	12
18.0	216	199	4.46	2208	10.3	12.9	101	3133	902	14.5	13.4	82.7	215	1	47	15	1.36	16.	13	42	3.1	13
19.0	228	210	4.71	2269	10.5	12.6	105	3179	855	13.7	12.6	83.2	227	1	47	14	1.31	16.	13	44	3.2	14
20.0	240	221	4.96	2329	10.8	12.3	108	3220	812	12.9	11.9	83.6	239	1	48	14	1.27	17.	14	45	3.3	14
25.0	300	276	6.20	2607	12.1	11.0	124	3375	649	10.1	9.3	85.0	299	1	50	12	1.11	21.	17	53	3.7	17
30.0	360	332	7.44	2860	13.2	10.0	138	3478	541	8.3	7.6	85.9	359	1	52	11	1.00	25.	20	61	4.1	20
35.0	420	387	8.68	3093	14.3	9.3	151	3551	464	7.0	6.5	86.5	420	0	54	10	0.91	28.	23	69	4.4	
40.0	480	442	9.92	3311	15.3	8.7	163	3605	406	6.1	5.6	87.0	480	0	55	9	0.85	32.	26	76	4.7	
45.0	540	497	11.16	3516	16.2	8.2	174	3647	361	5.4	5.0	87.3	540	0	57	9	0.79	35.	29	83	5.0	
50.0	600	553	12.40	3711	17.1	7.7	184	3681	324	4.8	4.4	87.6	600	0	58	8	0.75	39.	31	90	5.3	

 # 58 12 C on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 62. ZC= 68.(Er)
NEUTRON NUMBERS: NP= 6. NT= 92. NC= 98.

AP**1/3= 2.289 AT**1/3= 5.360
REDUCED MASS NUMBER= 11.13 AP+AT=AC=166.

INTERACTION RADIUS RINT=11.41 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 6.09 CT+CP= 8.21 C= 1.57

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.25

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.00 RC=RCP+RCT= 8.51

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 84.32 MeV K= .04049 n=2.930
VC(RINT)= 46.9 MeV

FISSION-TKE= 112. MeV
ASYMM. FISSION-TKE= 36. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 17.73 MeV
L-RLD= 91 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -72.1
COMPOUND NUCLEUS: -63.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.32 fm V(RB)= 48.2 MeV
Q-VALUE= -8.2 MeV
L-CRITICAL= 56.

12 C on 154 Sm

12 C on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	11	0.24	518	2.4	58.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	22	0.47	733	3.4	41.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	33	0.71	898	4.2	33.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	45	0.95	1037	4.9	29.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	54	50	1.07	1100	5.2	27.6	15	293	129	123.7	119.8	28.2	43	11	30	109	9.69	4.	4	12	1.4	4
5.0	60	56	1.19	1160	5.4	26.2	25	694	450	93.6	89.2	43.2	51	9	33	66	5.83	4.	4	14	1.5	4
5.5	66	61	1.31	1216	5.7	25.0	31	1016	713	76.9	72.6	51.6	59	7	35	52	4.55	5.	5	15	1.6	5
6.0	72	67	1.42	1271	6.0	23.9	37	1282	932	65.6	61.7	57.2	66	6	37	44	3.86	5.	5	17	1.7	5
6.5	78	72	1.54	1323	6.2	23.0	42	1506	1117	57.4	53.8	61.3	73	5	38	39	3.41	5.	5	18	1.8	6
7.0	84	78	1.66	1373	6.4	22.1	46	1697	1276	51.1	47.8	64.5	80	4	39	35	3.09	6.	6	19	1.8	6
7.5	90	83	1.78	1421	6.7	21.4	50	1862	1414	46.0	43.0	67.0	86	4	40	32	2.85	6.	6	21	1.9	7
8.0	96	89	1.90	1468	6.9	20.7	54	2006	1535	41.9	39.1	69.0	93	3	40	30	2.65	7.	7	22	2.0	7
8.5	102	95	2.02	1514	7.1	20.1	57	2133	1641	38.5	35.9	70.7	99	3	41	28	2.49	7.	7	23	2.0	7
9.0	108	100	2.14	1558	7.3	19.5	61	2246	1735	35.6	33.2	72.2	105	3	41	27	2.36	7.	7	24	2.1	8
9.5	114	106	2.26	1600	7.5	19.0	64	2346	1794	33.1	30.9	73.4	112	2	42	25	2.24	8.	8	25	2.2	8
10.0	120	111	2.37	1642	7.7	18.5	67	2437	1704	31.0	28.8	74.5	118	2	42	24	2.15	8.	8	26	2.2	9
10.5	126	117	2.49	1683	7.9	18.1	70	2518	1623	29.1	27.1	75.4	124	2	42	23	2.06	9.	8	27	2.3	9
11.0	132	122	2.61	1723	8.1	17.7	72	2592	1549	27.4	25.5	76.3	130	2	43	22	1.98	9.	9	28	2.3	10
11.5	138	128	2.73	1762	8.3	17.3	75	2660	1482	25.9	24.1	77.0	136	2	43	22	1.91	9.	9	29	2.4	10
12.0	144	134	2.85	1800	8.4	16.9	78	2722	1420	24.6	22.9	77.7	142	2	43	21	1.85	10.	9	30	2.5	10
13.0	156	145	3.09	1874	8.8	16.2	82	2831	1311	22.3	20.7	78.8	154	2	44	20	1.74	11.	10	32	2.6	11
14.0	168	156	3.32	1945	9.1	15.7	87	2924	1217	20.4	19.0	79.8	167	1	45	19	1.65	11.	10	34	2.7	12
15.0	180	167	3.56	2014	9.4	15.1	91	3005	1136	18.8	17.5	80.6	179	1	45	18	1.57	12.	11	36	2.8	13
16.0	192	178	3.80	2081	9.7	14.6	95	3075	1065	17.5	16.2	81.3	191	1	46	17	1.50	13.	12	38	2.9	13
17.0	204	189	4.04	2145	10.0	14.2	99	3138	1002	16.3	15.1	81.9	203	1	46	16	1.44	13.	12	39	3.0	14
18.0	216	200	4.27	2208	10.3	13.8	103	3193	947	15.2	14.2	82.4	215	1	47	16	1.39	14.	13	41	3.0	15
19.0	228	212	4.51	2269	10.6	13.4	107	3242	897	14.3	13.3	82.8	227	1	47	15	1.34	15.	13	43	3.1	16
20.0	240	223	4.75	2329	10.9	13.1	110	3286	852	13.5	12.6	83.2	239	1	47	15	1.30	16.	14	44	3.2	16
25.0	300	278	5.94	2607	12.2	11.7	127	3454	681	10.6	9.8	84.7	299	1	49	13	1.13	19.	17	52	3.6	19
30.0	360	334	7.12	2860	13.3	10.7	141	3565	568	8.7	8.0	85.7	359	1	51	12	1.02	23.	20	60	4.0	22
35.0	420	390	8.31	3093	14.4	9.9	154	3644	487	7.4	6.8	86.3	420	0	53	11	0.93	26.	23	67	4.3	
40.0	480	445	9.50	3311	15.4	9.3	166	3703	426	6.4	5.9	86.8	480	0	54	10	0.86	29.	26	74	4.6	
45.0	540	501	10.69	3516	16.3	8.7	177	3749	378	5.6	5.2	87.2	540	0	56	9	0.81	32.	28	81	4.9	
50.0	600	557	11.87	3711	17.2	8.3	188	3785	340	5.0	4.7	87.5	600	0	57	9	0.76	35.	31	88	5.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 59 12 C on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 67. ZC= 73.(Ta)
NEUTRON NUMBERS: NP= 6. NT= 98. NC=104.

AP**1/3= 2.289 AT**1/3= 5.485
REDUCED MASS NUMBER= 11.19 AP+AT=AC=177.

INTERACTION RADIUS RINT=11.54 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 6.25 CT+CP= 8.37 C= 1.58

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.41

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.15 RC=RCP+RCT= 8.67

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 89.21 MeV K= .03734 n=2.964
VC(RINT)= 50.1 MeV

FISSION-TKE= 124. MeV
ASYMM. FISSION-TKE= 37. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.900 MeV/fm**2 PROX-FACTOR= 17.92 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.26 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -63.7
COMPOUND NUCLEUS: -50.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.43 fm V(RB)= 51.5 MeV
Q-VALUE= -13.5 MeV
L-CRITICAL= 57.

12 C on 165 Ho — 12 C on 165 Ho

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-GP	ET-GT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	12	11	0.22	518	2.4	63.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	24	22	0.45	733	3.5	44.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	36	34	0.67	898	4.2	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	48	45	0.89	1037	4.9	31.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	54	50	1.01	1100	5.2	29.8	4	27	0	165.5	164.4	7.3	41	13	29	410	38.80	0.	3	11	1.3	3
5.0	60	56	1.12	1160	5.5	28.3	20	478	273	108.6	104.6	35.7	50	10	33	87	7.25	4.	4	13	1.4	4
5.5	66	62	1.23	1216	5.7	27.0	29	830	559	86.9	82.7	46.6	58	8	35	63	5.17	4.	5	15	1.5	4
6.0	72	67	1.34	1271	6.0	25.8	35	1121	797	73.2	69.3	53.4	66	6	37	51	4.24	5.	5	16	1.6	5
6.5	78	73	1.45	1323	6.2	24.8	40	1366	999	63.5	59.9	58.3	73	5	38	44	3.67	5.	5	18	1.6	5
7.0	84	78	1.56	1373	6.5	23.9	45	1574	1172	56.2	52.9	61.9	79	5	39	40	3.29	5.	6	19	1.7	6
7.5	90	84	1.68	1421	6.7	23.1	49	1754	1322	50.4	47.4	64.8	86	4	40	36	3.00	6.	6	20	1.8	6
8.0	96	89	1.79	1468	6.9	22.4	53	1912	1453	45.8	43.0	67.1	92	4	41	34	2.78	6.	7	21	1.9	7
8.5	102	95	1.90	1514	7.1	21.7	57	2050	1568	42.0	39.3	69.0	99	3	41	32	2.60	7.	7	23	1.9	7
9.0	108	101	2.01	1558	7.3	21.1	60	2173	1671	38.7	36.3	70.6	105	3	42	30	2.46	7.	7	24	2.0	8
9.5	114	106	2.12	1600	7.5	20.5	63	2282	1763	36.0	33.7	72.0	111	3	42	28	2.33	7.	8	25	2.0	8
10.0	120	112	2.23	1642	7.7	20.0	66	2381	1769	33.6	31.4	73.2	117	3	43	27	2.22	8.	8	26	2.1	8
10.5	126	117	2.35	1683	7.9	19.5	69	2470	1684	31.5	29.4	74.3	124	2	43	26	2.13	8.	8	27	2.2	9
11.0	132	123	2.46	1723	8.1	19.1	72	2550	1608	29.6	27.7	75.2	130	2	43	25	2.04	8.	8	28	2.2	9
11.5	138	129	2.57	1762	8.3	18.7	75	2624	1538	28.0	26.2	76.0	136	2	44	24	1.97	9.	9	29	2.3	10
12.0	144	134	2.68	1800	8.5	18.3	77	2691	1474	26.6	24.8	76.7	142	2	44	23	1.90	9.	9	30	2.3	10
13.0	156	145	2.90	1874	8.8	17.6	82	2811	1360	24.0	22.5	78.0	154	2	45	22	1.79	10.	10	32	2.4	11
14.0	168	157	3.13	1945	9.2	16.9	87	2912	1263	22.0	20.5	79.0	166	2	45	21	1.69	11.	10	33	2.5	11
15.0	180	168	3.35	2014	9.5	16.3	92	3001	1179	20.2	18.9	79.9	179	1	46	20	1.61	11.	11	35	2.6	12
16.0	192	179	3.57	2081	9.8	15.8	96	3077	1105	18.7	17.5	80.6	191	1	46	19	1.54	12.	12	37	2.7	13
17.0	204	190	3.80	2145	10.1	15.4	100	3145	1040	17.5	16.3	81.3	203	1	47	18	1.48	13.	12	39	2.8	14
18.0	216	201	4.02	2208	10.4	14.9	104	3205	982	16.4	15.3	81.8	215	1	47	17	1.42	13.	13	40	2.9	14
19.0	228	213	4.24	2269	10.7	14.5	108	3259	931	15.4	14.3	82.3	227	1	48	17	1.37	14.	13	42	3.0	15
20.0	240	224	4.47	2329	10.9	14.2	111	3307	884	14.5	13.5	82.8	239	1	48	16	1.33	15.	14	44	3.1	16
25.0	300	280	5.59	2607	12.2	12.7	128	3490	707	11.3	10.5	84.3	299	1	50	14	1.15	18.	17	52	3.5	19
30.0	360	336	6.70	2860	13.4	11.6	143	3612	589	9.3	8.6	85.4	359	1	51	13	1.03	21.	20	59	3.8	22
35.0	420	392	7.82	3093	14.5	10.7	156	3698	505	7.8	7.3	86.1	420	0	53	11	0.94	25.	23	66	4.1	
40.0	480	447	8.94	3311	15.5	10.0	168	3762	442	6.8	6.3	86.6	480	0	54	11	0.88	28.	25	73	4.4	
45.0	540	503	10.05	3516	16.4	9.4	180	3812	393	6.0	5.6	87.0	540	0	56	10	0.82	31.	28	80	4.7	
50.0	600	559	11.17	3711	17.3	9.0	191	3852	353	5.4	5.0	87.3	600	0	57	9	0.77	34.	31	87	5.0	

 # 60 12 C on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 73. ZC= 79.(Au)
NEUTRON NUMBERS: NP= 6. NT=108. NC=114.

AP**1/3= 2.289 AT**1/3= 5.657
REDUCED MASS NUMBER= 11.25 AP+AT=AC=193.

INTERACTION RADIUS RINT=11.73 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 6.47 CT+CP= 8.59 C= 1.60

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.62

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.35 RC=RCP+RCT= 8.87

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 94.70 MeV K= .03396 n=3.000
VC(RINT)= 53.7 MeV

FISSION-TKE= 138. MeV
ASYMM. FISSION-TKE= 39. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 18.00 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.16 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -46.0
COMPOUND NUCLEUS: -31.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.60 fm V(RB)= 55.2 MeV
Q-VALUE= -14.7 MeV
L-CRITICAL= 59.

12 C on 181 Ta — 12 C on 181 Ta

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-GP	ET-GT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	12	11	0.21	518	2.5	69.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	24	23	0.42	733	3.5	48.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	36	34	0.63	898	4.3	39.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	48	45	0.84	1037	4.9	34.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	54	51	0.94	1100	5.2	32.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	60	56	1.05	1160	5.5	30.8	14	222	69	132.3	129.4	23.8	48	12	33	144	11.23	4.	4	12	1.3	4
5.5	66	62	1.15	1216	5.8	29.4	25	615	384	100.3	96.5	39.9	57	9	35	81	6.24	4.	4	14	1.4	4
6.0	72	68	1.26	1271	6.0	28.2	32	937	646	82.8	79.1	48.6	65	7	37	62	4.80	4.	5	16	1.5	5
6.5	78	73	1.36	1323	6.3	27.1	38	1207	867	71.0	67.5	54.5	72	6	39	52	4.04	5.	5	17	1.6	5
7.0	84	79	1.47	1373	6.5	26.1	43	1437	1057	62.4	59.1	58.8	79	5	40	46	3.56	5.	6	19	1.6	6
7.5	90	84	1.57	1421	6.7	25.2	48	1636	1222	55.7	52.7	62.1	85	5	41	42	3.21	5.	6	20	1.7	6
8.0	96	90	1.68	1468	7.0	24.4	52	1809	1366	50.4	47.6	64.8	92	4	41	38	2.95	6.	6	21	1.8	7
8.5	102	96	1.78	1514	7.2	23.7	56	1962	1493	46.0	43.4	67.0	98	4	42	36	2.75	6.	7	22	1.8	7
9.0	108	101	1.89	1558	7.4	23.0	59	2097	1606	42.4	39.9	68.8	105	3	42	34	2.58	6.	7	23	1.9	8
9.5	114	107	1.99	1600	7.6	22.4	63	2218	1708	39.3	37.0	70.4	111	3	43	32	2.44	7.	7	24	2.0	8
10.0	120	113	2.10	1642	7.8	21.8	66	2327	1799	36.6	34.4	71.7	117	3	43	30	2.32	7.	8	25	2.0	8
10.5	126	118	2.20	1683	8.0	21.3	69	2425	1766	34.3	32.2	72.9	123	3	44	29	2.22	7.	8	26	2.1	9
11.0	132	124	2.31	1723	8.2	20.8	72	2514	1685	32.2	30.3	73.9	130	2	44	28	2.13	8.	8	27	2.1	9
11.5	138	129	2.41	1762	8.3	20.3	75	2595	1612	30.4	28.6	74.8	136	2	44	27	2.05	8.	9	28	2.2	10
12.0	144	135	2.52	1800	8.5	19.9	78	2670	1545	28.8	27.1	75.6	142	2	45	26	1.97	8.	9	29	2.2	10
13.0	156	146	2.72	1874	8.9	19.1	83	2801	1426	26.0	24.4	77.0	154	2	45	24	1.85	9.	10	31	2.3	11
14.0	168	158	2.93	1945	9.2	18.4	88	2913	1324	23.7	22.3	78.1	166	2	46	23	1.75	10.	10	33	2.4	12
15.0	180	169	3.14	2014	9.5	17.8	92	3010	1236	21.8	20.5	79.1	178	2	46	22	1.66	10.	11	34	2.5	12
16.0	192	180	3.35	2081	9.8	17.2	97	3095	1159	20.2	19.0	79.9	191	1	47	21	1.58	11.	11	36	2.6	13
17.0	204	191	3.56	2145	10.1	16.7	101	3170	1090	18.8	17.7	80.6	203	1	47	20	1.52	12.	12	38	2.7	14
18.0	216	203	3.77	2208	10.4	16.3	105	3237	1030	17.6	16.5	81.2	215	1	48	19	1.46	12.	13	39	2.8	15
19.0	228	214	3.98	2269	10.7	15.8	109	3296	976	16.5	15.5	81.7	227	1	48	18	1.41	13.	13	41	2.9	15
20.0	240	225	4.19	2329	11.0	15.4	113	3349	927	15.6	14.6	82.2	239	1	48	18	1.36	14.	14	43	3.0	16
25.0	300	281	5.24	2607	12.3	13.8	130	3551	741	12.1	11.4	83.9	299	1	50	15	1.18	17.	17	50	3.3	19
30.0	360	338	6.29	2860	13.5	12.6	145	3685	618	9.9	9.3	85.0	359	1	52	14	1.06	20.	20	58	3.7	22
35.0	420	394	7.34	3093	14.6	11.7	159	3780	529	8.4	7.9	85.8	419	1	53	13	0.96	23.	22	65	4.0	
40.0	480	450	8.38	3311	15.6	10.9	171	3851	463	7.3	6.8	86.4	480	0	54	12	0.89	25.	25	72	4.2	
45.0	540	506	9.43	3516	16.5	10.3	183	3906	412	6.4	6.0	86.8	540	0	56	11	0.84	28.	28	78	4.5	
50.0	600	563	10.48	3711	17.4	9.8	194	3950	370	5.8	5.4	87.1	600	0	57	10	0.79	31.	31	85	4.8	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM GP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 61 12 C on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 79. ZC= 85.(At)
NEUTRON NUMBERS: NP= 6. NT=118. NC=124.

AP**1/3= 2.289 AT**1/3= 5.819
REDUCED MASS NUMBER= 11.31 AP+AT=AC=209.

INTERACTION RADIUS RINT=11.91 fm R0= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 6.68 CT+CP= 8.80 C= 1.61

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.83

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.55 RC=RCP+RCT= 9.06

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 100.04 MeV K= .03099 n=3.033
VC(RINT)= 57.3 MeV

FISSION-TKE= 153. MeV
ASYMM. FISSION-TKE= 40. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.893 MeV/fm**2 PROX-FACTOR= 18.07 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.07 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -28.6
COMPOUND NUCLEUS: -11.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.75 fm V(RB)= 58.8 MeV
Q-VALUE= -17.0 MeV
L-CRITICAL= 60.

12 C on 197 Au — 12 C on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	12	11	0.20	518	2.5	74.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	23	0.40	733	3.5	52.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	34	0.59	898	4.3	43.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	45	0.79	1037	4.9	37.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	54	51	0.89	1100	5.2	35.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	60	57	0.99	1160	5.5	33.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	66	62	1.09	1216	5.8	31.8	19	387	200	117.4	114.2	31.3	56	10	35	113	8.19	4.	4	14	1.3	4
6.0	72	68	1.19	1271	6.1	30.5	28	741	486	94.0	90.5	43.0	64	8	38	77	5.58	4.	5	15	1.4	4
6.5	78	74	1.28	1323	6.3	29.3	35	1038	728	79.4	76.0	50.3	71	7	39	62	4.50	4.	5	17	1.5	5
7.0	84	79	1.38	1373	6.5	28.2	41	1290	935	69.1	65.9	55.4	78	6	40	54	3.87	5.	6	18	1.5	5
7.5	90	85	1.48	1421	6.8	27.3	46	1508	1115	61.4	58.4	59.3	85	5	41	48	3.45	5.	6	19	1.6	6
8.0	96	90	1.58	1468	7.0	26.4	50	1697	1272	55.2	52.5	62.4	92	4	42	44	3.14	5.	6	20	1.7	6
8.5	102	96	1.68	1514	7.2	25.6	55	1865	1411	50.3	47.7	64.9	98	4	43	40	2.91	6.	7	22	1.7	7
9.0	108	102	1.78	1558	7.4	24.9	58	2013	1535	46.1	43.7	66.9	104	4	43	36	2.71	6.	7	23	1.8	7
9.5	114	107	1.88	1600	7.6	24.2	62	2145	1645	42.7	40.4	68.7	111	3	44	35	2.56	6.	7	24	1.9	8
10.0	120	113	1.98	1642	7.8	23.6	65	2264	1744	39.7	37.6	70.2	117	3	44	34	2.42	7.	8	25	1.9	8
10.5	126	119	2.07	1683	8.0	23.0	69	2371	1834	37.1	35.1	71.5	123	3	44	32	2.31	7.	8	26	2.0	9
11.0	132	124	2.17	1723	8.2	22.5	72	2469	1758	34.8	32.9	72.6	129	3	45	31	2.21	7.	8	27	2.0	9
11.5	138	130	2.27	1762	8.4	22.0	75	2558	1682	32.8	31.0	73.6	136	2	45	29	2.12	8.	9	28	2.1	10
12.0	144	136	2.37	1800	8.6	21.5	78	2639	1611	31.1	29.3	74.5	142	2	45	28	2.04	8.	9	29	2.1	10
13.0	156	147	2.57	1874	8.9	20.7	83	2783	1487	28.0	26.5	76.0	154	2	46	26	1.91	8.	10	30	2.2	11
14.0	168	158	2.77	1945	9.3	19.9	88	2906	1361	25.5	24.1	77.2	166	2	47	25	1.80	9.	10	32	2.3	12
15.0	180	170	2.96	2014	9.6	19.3	93	3012	1289	23.5	22.1	78.3	178	2	47	24	1.71	10.	11	34	2.4	12
16.0	192	181	3.16	2081	9.9	18.7	97	3105	1208	21.7	20.5	79.2	191	1	47	23	1.63	10.	11	35	2.5	13
17.0	204	192	3.36	2145	10.2	18.1	102	3187	1137	20.2	19.0	79.9	203	1	48	22	1.56	11.	12	37	2.6	14
18.0	216	204	3.56	2208	10.5	17.6	106	3260	1074	18.9	17.8	80.6	215	1	48	21	1.50	12.	13	39	2.7	15
19.0	228	215	3.75	2269	10.8	17.1	110	3325	1018	17.7	16.7	81.1	227	1	49	20	1.44	12.	13	40	2.8	15
20.0	240	226	3.95	2329	11.1	16.7	114	3383	967	16.7	15.7	81.7	239	1	49	19	1.39	13.	14	42	2.8	16
25.0	300	283	4.94	2607	12.4	14.9	131	3605	773	13.0	12.2	83.5	299	1	51	17	1.21	16.	17	50	3.2	19
30.0	360	339	5.93	2860	13.6	13.6	147	3751	644	10.6	10.0	84.7	359	1	52	15	1.08	18.	20	57	3.5	23
35.0	420	396	6.91	3093	14.6	12.6	161	3856	552	9.0	8.4	85.5	419	1	53	14	0.98	21.	22	64	3.8	
40.0	480	452	7.90	3311	15.6	11.8	174	3934	483	7.8	7.3	86.1	480	0	55	13	0.91	24.	25	70	4.1	
45.0	540	509	8.89	3516	16.6	11.1	186	3994	429	6.8	6.4	86.6	540	0	56	12	0.85	26.	28	77	4.3	
50.0	600	566	9.88	3711	17.5	10.6	197	4042	386	6.1	5.8	86.9	600	0	57	11	0.80	29.	31	84	4.6	

 # 62 12 C on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 82. ZC= 88.(Ra)
NEUTRON NUMBERS: NP= 6. NT=126. NC=132.

AP**1/3= 2.289 AT**1/3= 5.925
REDUCED MASS NUMBER= 11.35 AP+AT=AC=220.

INTERACTION RADIUS RINT=12.02 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 6.82 CT+CP= 8.94 C= 1.62

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.96

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.66 RC=RCP+RCT= 9.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 102.44 MeV K= .02966 n=3.045
VC(RINT)= 58.9 MeV

FISSION-TKE= 160. MeV
ASYMM. FISSION-TKE= 41. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 17.98 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -19.5
COMPOUND NUCLEUS: 10.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.86 fm V(RB)= 60.4 MeV
Q-VALUE= -30.3 MeV
L-CRITICAL= 61.

12 C on 208 Pb — 12 C on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	12	11	0.19	518	2.5	77.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	23	0.39	733	3.5	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	34	0.58	898	4.3	44.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	45	0.77	1037	5.0	38.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	54	51	0.87	1100	5.3	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	60	57	0.96	1160	5.5	34.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	66	62	1.06	1216	5.8	33.0	16	284	119	126.9	124.2	26.5	55	11	35	139	9.83	4.	4	13	1.1	4
6.0	72	68	1.16	1271	6.1	31.6	27	656	418	99.5	96.2	40.3	63	9	38	86	6.06	4.	5	15	1.2	4
6.5	78	74	1.25	1323	6.3	30.4	34	966	671	83.4	80.2	48.3	71	7	39	68	4.76	4.	5	17	1.3	5
7.0	84	79	1.35	1373	6.6	29.3	40	1230	888	72.3	69.2	53.9	78	6	40	58	4.04	4.	6	18	1.3	6
7.5	90	85	1.45	1421	6.8	28.3	45	1458	1075	64.0	61.1	58.0	85	5	41	51	3.58	5.	6	19	1.4	6
8.0	96	91	1.54	1468	7.0	27.4	50	1656	1240	57.5	54.8	61.3	91	5	42	46	3.25	5.	6	20	1.5	6
8.5	102	96	1.64	1514	7.2	26.6	54	1831	1385	52.2	49.7	63.9	98	4	43	43	2.99	5.	7	21	1.6	7
9.0	108	102	1.73	1558	7.4	25.8	58	1986	1514	47.9	45.5	66.1	104	4	43	40	2.79	6.	7	22	1.6	7
9.5	114	108	1.83	1600	7.6	25.1	62	2125	1629	44.2	42.0	67.9	111	3	44	37	2.62	6.	7	23	1.7	8
10.0	120	113	1.93	1642	7.8	24.5	65	2249	1733	41.1	39.0	69.5	117	3	44	35	2.48	6.	8	24	1.7	8
10.5	126	119	2.02	1683	8.0	23.9	69	2361	1826	38.4	36.4	70.8	123	3	45	34	2.36	7.	8	25	1.8	9
11.0	132	125	2.12	1723	8.2	23.4	72	2463	1802	36.0	34.2	72.0	129	3	45	32	2.26	7.	8	26	1.9	9
11.5	138	130	2.22	1762	8.4	22.8	75	2556	1723	33.9	32.2	73.0	136	2	45	31	2.16	7.	9	27	1.9	10
12.0	144	136	2.31	1800	8.6	22.4	78	2641	1652	32.1	30.4	74.0	142	2	46	30	2.08	7.	9	28	2.0	10
13.0	156	147	2.51	1874	8.9	21.5	83	2792	1525	28.9	27.4	75.5	154	2	46	28	1.95	8.	10	30	2.1	11
14.0	168	159	2.70	1945	9.3	20.7	89	2920	1416	26.3	24.9	76.8	166	2	47	26	1.83	9.	10	32	2.2	12
15.0	180	170	2.89	2014	9.6	20.0	93	3031	1321	24.2	22.9	77.9	178	2	47	25	1.74	9.	11	33	2.3	13
16.0	192	182	3.08	2081	9.9	19.4	98	3129	1239	22.3	21.2	78.8	191	1	48	24	1.65	10.	11	35	2.3	13
17.0	204	193	3.28	2145	10.2	18.8	102	3214	1166	20.8	19.7	79.6	203	1	48	23	1.58	10.	12	37	2.4	14
18.0	216	204	3.47	2208	10.5	18.3	107	3290	1101	19.4	18.4	80.3	215	1	48	22	1.52	11.	13	38	2.5	15
19.0	228	216	3.66	2269	10.8	17.8	111	3358	1043	18.2	17.2	80.9	227	1	49	21	1.46	12.	13	40	2.6	16
20.0	240	227	3.86	2329	11.1	17.3	115	3419	991	17.2	16.2	81.4	239	1	49	20	1.41	12.	14	41	2.7	16
25.0	300	284	4.82	2607	12.4	15.5	133	3651	793	13.3	12.6	83.3	299	1	51	17	1.22	15.	17	49	3.0	20
30.0	360	340	5.78	2860	13.6	14.1	149	3804	660	10.9	10.3	84.6	359	1	52	16	1.09	18.	19	56	3.4	23
35.0	420	397	6.75	3093	14.7	13.1	163	3913	566	9.2	8.7	85.4	419	1	53	14	1.00	20.	22	63	3.7	
40.0	480	454	7.71	3311	15.7	12.2	176	3995	495	8.0	7.5	86.0	480	0	54	13	0.92	23.	25	70	3.9	
45.0	540	511	8.67	3516	16.6	11.5	188	4058	440	7.0	6.6	86.5	540	0	56	12	0.86	25.	28	76	4.2	
50.0	600	567	9.64	3711	17.5	11.0	200	4109	396	6.3	5.9	86.9	600	0	57	12	0.81	28.	31	83	4.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 63 12 C on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 83. ZC= 89.(Ac)
NEUTRON NUMBERS: NP= 6. NT=126. NC=132.

AP**1/3= 2.289 AT**1/3= 5.934
REDUCED MASS NUMBER= 11.35 AP+AT=AC=221.

INTERACTION RADIUS RINT=12.03 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 6.83 CT+CP= 8.95 C= 1.62

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 6.97

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.68 RC=RCP+RCT= 9.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 103.43 MeV K= .02922 n=3.053
VC(RINT)= 59.5 MeV

FISSION-TKE= 163. MeV
ASYMM. FISSION-TKE= 41. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 18.06 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: -16.5
COMPOUND NUCLEUS: 14.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.87 fm V(RB)= 61.1 MeV
Q-VALUE= -31.4 MeV
L-CRITICAL= 61.

12 C on 209 Bi

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCMAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	11	0.19	518	2.5	78.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	23	0.38	733	3.5	55.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	34	0.57	898	4.3	45.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	45	0.76	1037	5.0	39.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	54	51	0.86	1100	5.3	37.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	60	57	0.95	1160	5.6	35.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	66	62	1.05	1216	5.8	33.4	15	234	79	132.0	129.5	24.0	55	11	35	155	10.92	4.	4	13	1.1	3
6.0	72	68	1.14	1271	6.1	32.0	26	612	382	102.2	98.9	38.9	63	9	38	90	6.29	4.	5	15	1.2	4
6.5	78	74	1.24	1323	6.3	30.8	33	926	638	85.3	82.1	47.3	71	7	39	70	4.87	4.	5	16	1.2	5
7.0	84	79	1.33	1373	6.6	29.6	39	1194	857	73.8	70.7	53.1	78	6	41	59	4.11	4.	6	18	1.3	5
7.5	90	85	1.43	1421	6.8	28.6	45	1425	1047	65.2	62.3	57.4	85	5	42	52	3.63	5.	6	19	1.4	6
8.0	96	91	1.53	1468	7.0	27.7	50	1626	1213	58.5	55.8	60.8	91	5	42	47	3.28	5.	6	20	1.5	6
8.5	102	96	1.62	1514	7.2	26.9	54	1803	1360	53.1	50.6	63.4	98	4	43	43	3.02	5.	7	21	1.5	7
9.0	108	102	1.72	1558	7.4	26.1	58	1960	1491	48.7	46.3	65.7	104	4	44	40	2.81	6.	7	22	1.6	7
9.5	114	108	1.81	1600	7.7	25.4	62	2100	1608	44.9	42.7	67.5	111	3	44	38	2.64	6.	7	23	1.7	8
10.0	120	113	1.91	1642	7.8	24.8	65	2226	1713	41.7	39.6	69.1	117	3	45	36	2.50	6.	8	24	1.7	8
10.5	126	119	2.00	1683	8.0	24.2	68	2340	1808	39.0	37.0	70.5	123	3	45	34	2.37	7.	8	25	1.8	8
11.0	132	125	2.10	1723	8.2	23.6	72	2443	1808	36.5	34.7	71.7	129	3	45	33	2.27	7.	8	26	1.8	9
11.5	138	131	2.19	1762	8.4	23.1	75	2537	1730	34.4	32.6	72.8	136	2	46	31	2.18	7.	9	27	1.9	9
12.0	144	136	2.29	1800	8.6	22.6	78	2624	1657	32.5	30.8	73.7	142	2	46	30	2.09	7.	9	28	1.9	10
13.0	156	148	2.48	1874	8.9	21.7	83	2776	1530	29.3	27.8	75.3	154	2	46	28	1.95	8.	10	30	2.1	11
14.0	168	159	2.67	1945	9.3	21.0	88	2906	1421	26.7	25.3	76.7	166	2	47	27	1.84	9.	10	32	2.1	12
15.0	180	170	2.86	2014	9.6	20.2	93	3019	1326	24.5	23.2	77.7	178	2	47	25	1.74	9.	11	33	2.2	12
16.0	192	182	3.05	2081	9.9	19.6	98	3117	1243	22.6	21.4	78.7	190	2	48	24	1.66	10.	11	35	2.3	13
17.0	204	193	3.24	2145	10.2	19.0	102	3204	1170	21.1	19.9	79.5	203	1	48	23	1.59	10.	12	37	2.4	14
18.0	216	204	3.43	2208	10.5	18.5	107	3281	1105	19.7	18.6	80.2	215	1	49	22	1.52	11.	13	38	2.5	15
19.0	228	216	3.62	2269	10.8	18.0	111	3350	1047	18.5	17.5	80.8	227	1	49	21	1.47	12.	13	40	2.6	15
20.0	240	227	3.81	2329	11.1	17.5	115	3412	994	17.4	16.5	81.3	239	1	49	20	1.42	12.	14	41	2.7	16
25.0	300	284	4.77	2607	12.4	15.7	133	3646	795	13.5	12.8	83.3	299	1	51	18	1.22	15.	17	49	3.0	20
30.0	360	340	5.72	2860	13.6	14.3	149	3802	663	11.0	10.4	84.5	359	1	52	16	1.09	18.	19	56	3.3	23
35.0	420	397	6.67	3093	14.7	13.3	163	3913	568	9.3	8.8	85.3	419	1	54	14	1.00	20.	22	63	3.6	
40.0	480	454	7.63	3311	15.7	12.4	176	3995	497	8.1	7.6	86.0	480	0	55	13	0.92	23.	25	70	3.9	
45.0	540	511	8.58	3516	16.7	11.7	188	4059	442	7.1	6.7	86.4	540	0	56	12	0.86	25.	28	76	4.2	
50.0	600	567	9.53	3711	17.6	11.1	200	4111	397	6.4	6.0	86.8	600	0	57	12	0.81	28.	31	82	4.4	

\# 64 12 C on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 6. ZT= 92. ZC= 98.(Cf)
NEUTRON NUMBERS: NP= 6. NT=146. NC=152.

AP**1/3= 2.289 AT**1/3= 6.197
REDUCED MASS NUMBER= 11.42 AP+AT=AC=250.

INTERACTION RADIUS RINT=12.31 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.12 CT= 7.16 CT+CP= 9.29 C= 1.64

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.52 RT= 7.30

COULOMB RADII [fm]:
RCP= 2.51 RCT= 6.98 RC=RCP+RCT= 9.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 110.69 MeV K= .02574 n=3.092
VC(RINT)= 64.5 MeV

FISSION-TKE= 185. MeV
ASYMM. FISSION-TKE= 43. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.873 MeV/fm**2 PROX-FACTOR= 17.96 MeV
L-RLD= 70 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.90 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 0.0 TARGET: 47.2
COMPOUND NUCLEUS: 72.3

FUSION RELATED PARAMETERS:
R-BARRIER=11.14 fm V(RB)= 66.0 MeV
Q-VALUE= -25.0 MeV
L-CRITICAL= 64.

12 C on 238 U

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCMAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	12	11	0.18	518	2.5	86.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	24	23	0.35	733	3.5	61.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	36	34	0.53	898	4.3	50.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	48	46	0.71	1037	5.0	43.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	54	51	0.80	1100	5.3	41.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	60	57	0.89	1160	5.6	38.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	66	63	0.97	1216	5.9	37.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	72	69	1.06	1271	6.1	35.5	18	310	142	125.6	123.2	27.2	62	10	38	145	9.40	3.	5	14	1.2	5
6.5	78	74	1.15	1323	6.4	34.1	28	668	431	100.4	97.6	39.8	70	8	40	94	6.04	4.	5	16	1.3	5
7.0	84	80	1.24	1373	6.6	32.9	36	971	679	85.1	82.3	47.4	77	7	41	75	4.79	4.	6	17	1.3	6
7.5	90	86	1.33	1421	6.8	31.7	42	1232	894	74.3	71.6	52.8	84	6	42	64	4.09	4.	6	18	1.4	6
8.0	96	91	1.42	1468	7.1	30.7	47	1460	1082	66.2	63.6	56.9	91	5	43	57	3.63	4.	6	19	1.5	7
8.5	102	97	1.51	1514	7.3	29.8	52	1660	1247	59.7	57.3	60.2	97	5	44	51	3.30	5.	7	21	1.5	8
9.0	108	103	1.60	1558	7.5	29.0	56	1837	1395	54.4	52.2	62.8	104	4	45	47	3.04	5.	7	22	1.6	8
9.5	114	109	1.68	1600	7.7	28.2	60	1996	1527	50.1	47.9	65.0	110	4	45	44	2.84	5.	7	23	1.6	9
10.0	120	114	1.77	1642	7.9	27.5	64	2138	1645	46.4	44.3	66.8	117	3	45	42	2.67	6.	8	24	1.7	9
10.5	126	120	1.86	1683	8.1	26.8	68	2266	1753	43.2	41.3	68.4	123	3	46	39	2.53	6.	8	25	1.7	10
11.0	132	126	1.95	1723	8.3	26.2	71	2383	1850	40.4	38.6	69.8	129	3	46	38	2.41	6.	8	25	1.8	10
11.5	138	131	2.04	1762	8.5	25.6	74	2489	1833	38.0	36.3	71.0	135	3	47	36	2.30	6.	9	26	1.8	11
12.0	144	137	2.13	1800	8.7	25.1	78	2587	1756	35.9	34.2	72.1	142	2	47	34	2.21	7.	9	27	1.9	11
13.0	156	149	2.30	1874	9.0	24.1	83	2759	1621	32.2	30.8	73.9	154	2	47	32	2.05	7.	10	29	2.0	12
14.0	168	160	2.48	1945	9.3	23.2	89	2906	1505	29.3	27.9	75.4	166	2	48	30	1.93	8.	10	31	2.1	13
15.0	180	171	2.66	2014	9.7	22.4	94	3034	1405	26.8	25.6	76.6	178	2	48	28	1.82	8.	11	32	2.2	14
16.0	192	183	2.84	2081	10.0	21.7	99	3145	1317	24.8	23.6	77.6	190	2	49	27	1.73	9.	11	34	2.2	15
17.0	204	194	3.01	2145	10.3	21.1	104	3243	1240	23.0	21.9	78.5	203	1	49	26	1.65	9.	12	36	2.3	16
18.0	216	206	3.19	2208	10.6	20.5	108	3330	1171	21.5	20.4	79.3	215	1	49	25	1.58	10.	13	37	2.4	17
19.0	228	217	3.37	2269	10.9	19.9	112	3408	1109	20.1	19.2	79.9	227	1	50	24	1.52	10.	13	39	2.5	17
20.0	240	228	3.54	2329	11.2	19.4	117	3478	1054	18.9	18.0	80.5	239	1	50	23	1.47	11.	14	40	2.6	18
25.0	300	286	4.43	2607	12.5	17.4	135	3743	843	14.6	13.9	82.7	299	1	52	20	1.27	13.	17	47	2.9	22
30.0	360	343	5.32	2860	13.7	15.9	152	3918	702	11.9	11.4	84.0	359	1	53	18	1.13	15.	19	54	3.2	26
35.0	420	400	6.20	3093	14.8	14.7	167	4044	602	10.1	9.6	85.0	419	1	54	16	1.03	18.	22	61	3.5	
40.0	480	457	7.09	3311	15.8	13.7	180	4137	527	8.7	8.3	85.6	479	1	55	15	0.95	20.	25	68	3.7	
45.0	540	514	7.98	3516	16.8	13.0	193	4210	468	7.7	7.3	86.2	540	0	56	14	0.89	22.	28	74	4.0	
50.0	600	571	8.86	3711	17.7	12.3	205	4267	421	6.9	6.5	86.6	600	0	57	13	0.84	24.	30	80	4.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 12 C

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 65 14 N on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 6. ZC= 13.(Al)
NEUTRON NUMBERS: NP= 7. NT= 6. NC= 13.

AP**1/3= 2.410 AT**1/3= 2.289 ELSCAT <59 des
REDUCED MASS NUMBER= 6.46 AP+AT=AC= 26.

INTERACTION RADIUS RINT= 8.20 fm RO= 1.74 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 2.12 CT+CP= 4.40 C= 1.10

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 2.52

COULOMB RADII [fm]:
RCP= 2.65 RCT= 2.51 RC=RCP+RCT= 5.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 16.47 MeV K= .08687 n=2.441
VC(RINT)= 7.4 MeV

FISSION-TKE= 28. MeV
ASYMM. FISSION-TKE= 28. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 13.15 MeV
L-RLD= 26 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 29.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: 0.0
COMPOUND NUCLEUS: -15.4

FUSION RELATED PARAMETERS:
R-BARRIER= 7.51 fm V(RB)= 7.3 MeV
Q-VALUE= 18.2 MeV
L-CRITICAL= 18.

14 N on 12 C

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	14	6	0.88	604	1.4	6.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	13	1.75	855	2.0	4.7	11	1084	767	47.1	21.6	66.5	24	4	0	7	4.00	14.	0 0	3.1	1
3.0	42	19	2.63	1047	2.4	3.8	16	1480	1102	27.2	12.5	76.4	40	2	0	5	2.72	22.	0 0	3.4	1
4.0	56	26	3.51	1210	2.8	3.3	20	1668	1270	19.2	8.8	80.4	54	2	0	4	2.19	28.	0 0	3.7	2
4.5	63	29	3.95	1283	3.0	3.1	21	1729	1217	16.7	7.7	81.6	62	1	61	4	2.02	31.	5 12	3.8	2
5.0	70	32	4.39	1353	3.2	3.0	23	1777	1095	14.8	6.8	82.6	69	1	65	3	1.89	35.	5 17	3.9	2
5.5	77	36	4.83	1419	3.3	2.8	24	1815	995	13.3	6.1	83.4	76	1	68	3	1.78	38.	6 21	4.1	2
6.0	84	39	5.26	1483	3.5	2.7	26	1847	912	12.1	5.6	84.0	83	1	72	3	1.68	42.	7 23	4.2	2
6.5	91	42	5.70	1543	3.6	2.6	27	1874	842	11.0	5.1	84.5	90	1	76	3	1.60	45.	7 26	4.3	2
7.0	98	45	6.14	1602	3.7	2.5	28	1896	782	10.2	4.7	84.9	97	1	79	3	1.53	47.	8 28	4.4	3
7.5	105	48	6.58	1658	3.9	2.4	29	1916	730	9.4	4.4	85.3	104	1	83	3	1.47	50.	8 30	4.5	3
8.0	112	52	7.02	1713	4.0	2.3	30	1932	684	8.8	4.1	85.6	111	1	86	3	1.42	53.	9 33	4.6	3
8.5	119	55	7.46	1766	4.1	2.3	31	1947	644	8.3	3.8	85.9	118	1	89	2	1.37	57.	9 35	4.7	3
9.0	126	58	7.90	1817	4.2	2.2	32	1960	608	7.8	3.6	86.1	125	1	93	2	1.32	60.	10 36	4.8	3
9.5	133	61	8.33	1867	4.4	2.1	34	1971	576	7.3	3.4	86.3	132	1	96	2	1.28	63.	10 38	4.9	3
10.0	140	65	8.77	1916	4.5	2.1	34	1981	547	6.9	3.2	86.5	139	1	99	2	1.25	67.	11 40	5.0	3
10.5	147	68	9.21	1964	4.6	2.0	35	1991	521	6.6	3.0	86.7	147	0	102	2	1.21	70.	11 42	5.1	3
11.0	154	71	9.65	2010	4.7	2.0	36	1999	497	6.3	2.9	86.9	154	0	106	2	1.18	73.	12 44	5.2	3
11.5	161	74	10.09	2056	4.8	2.0	37	2006	476	6.0	2.8	87.0	161	0	109	2	1.15	77.	12 45	5.3	3
12.0	168	78	10.53	2100	4.9	1.9	38	2013	456	5.7	2.6	87.1	168	0	112	2	1.13	76.	13 47	5.4	4
13.0	182	84	11.40	2186	5.1	1.8	40	2025	421	5.3	2.4	87.4	182	0	118	2	1.08	83.	13 50	5.6	4
14.0	196	90	12.28	2269	5.3	1.8	42	2035	391	4.9	2.2	87.6	196	0	124	2	1.03	89.	14 53	5.8	4
15.0	210	97	13.16	2350	5.5	1.7	43	2043	365	4.5	2.1	87.7	210	0	130	2	1.00	96.	15 56	6.0	4
16.0	224	103	14.04	2427	5.7	1.7	45	2051	342	4.2	2.0	87.9	224	0	136	2	0.96	102.	16 59	6.1	4
17.0	238	110	14.91	2503	5.8	1.6	46	2057	322	4.0	1.8	88.0	238	0	142	2	0.93	103.	17 62	6.3	5
18.0	252	116	15.79	2576	6.0	1.6	48	2063	304	3.8	1.7	88.1	252	0	148	2	0.90	110.	18 65	6.4	5
19.0	266	123	16.67	2647	6.2	1.5	49	2067	288	3.5	1.6	88.2	266	0	153	2	0.88	116.	19 68	6.6	5
20.0	280	129	17.55	2717	6.3	1.5	50	2072	273	3.4	1.6	88.3	280	0	159	2	0.85	122.	20 70	6.7	5
25.0	350	162	21.93	3042	7.1	1.3	57	2088	219	2.7	1.2	88.7	350	0	187	1	0.76	145.	24 83	7.4	6
30.0	420	194	26.32	3336	7.7	1.2	62	2098	182	2.2	1.0	88.9	420	0	214	1	0.69	165.	28 96	8.1	7
35.0	490	226	30.71	3608	8.4	1.1	67	2105	156	1.9	0.9	89.1	490	0	241	1	0.64	193.	32 108	8.7	
40.0	560	258	35.09	3863	8.9	1.0	72	2109	136	1.7	0.8	89.2	560	0	267	1	0.59	209.	36 119	9.2	
45.0	630	291	39.48	4102	9.5	1.0	77	2113	121	1.5	0.7	89.3	630	0	293	1	0.56	235.	40 130	9.8	
50.0	700	323	43.86	4330	10.0	0.9	81	2116	109	1.3	0.6	89.3	700	0	319	1	0.53	246.	45 141	10.2	

\# 66 14 N on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 8. ZC= 15.(P)
NEUTRON NUMBERS: NP= 7. NT= 8. NC= 15.

AP**1/3= 2.410 AT**1/3= 2.520
REDUCED MASS NUMBER= 7.47 AP+AT=AC= 30.

INTERACTION RADIUS RINT= 8.45 fm RO= 1.71 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 2.42 CT+CP= 4.70 C= 1.17

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 2.78

COULOMB RADII [fm]:
RCP= 2.65 RCT= 2.78 RC=RCP+RCT= 5.44

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 20.88 MeV K= .09741 n=2.440
VC(RINT)= 9.5 MeV

FISSION-TKE= 30. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 14.05 MeV
L-RLD= 30 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 25.74 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -4.7
COMPOUND NUCLEUS: -20.3

FUSION RELATED PARAMETERS:
R-BARRIER= 7.72 fm V(RB)= 9.6 MeV
Q-VALUE= 18.4 MeV
L-CRITICAL= 21.

14 N on 16 O

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	14	7	0.78	604	1.6	8.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	15	1.57	855	2.3	6.2	12	955	673	56.0	30.0	62.0	22	6	0	10	4.50	13.	0 0	3.0	1
3.0	42	22	2.35	1047	2.8	5.1	18	1435	1073	31.4	16.8	74.3	39	3	0	7	2.91	18.	0 0	3.3	2
4.0	56	30	3.14	1210	3.3	4.4	23	1665	1273	21.9	11.7	79.0	54	2	54	5	2.32	24.	4 6	3.6	2
4.5	63	34	3.53	1283	3.5	4.2	25	1740	1293	19.0	10.2	80.5	61	2	58	5	2.13	27.	5 15	3.7	2
5.0	70	37	3.92	1353	3.7	3.9	27	1799	1164	16.8	9.0	81.6	69	1	61	5	1.98	30.	6 19	3.9	2
5.5	77	41	4.31	1419	3.8	3.8	28	1847	1058	15.1	8.1	82.4	76	1	64	4	1.86	34.	6 22	4.0	2
6.0	84	45	4.70	1483	4.0	3.6	30	1887	970	13.7	7.3	83.2	83	1	67	4	1.76	35.	7 24	4.1	3
6.5	91	49	5.09	1543	4.2	3.5	32	1920	895	12.5	6.7	83.7	90	1	70	4	1.67	38.	7 27	4.2	3
7.0	98	52	5.49	1602	4.3	3.3	33	1948	831	11.5	6.1	84.2	97	1	73	4	1.60	41.	8 29	4.3	3
7.5	105	56	5.88	1658	4.5	3.2	34	1972	776	10.7	5.7	84.7	104	1	76	4	1.53	44.	8 31	4.5	3
8.0	112	60	6.27	1713	4.6	3.1	36	1993	727	10.0	5.3	85.0	111	1	79	3	1.47	47.	9 33	4.6	3
8.5	119	63	6.66	1766	4.8	3.0	37	2012	684	9.3	5.0	85.3	118	1	82	3	1.42	50.	9 35	4.7	3
9.0	126	67	7.05	1817	4.9	2.9	38	2028	646	8.8	4.7	85.6	125	1	85	3	1.38	53.	9 37	4.8	3
9.5	133	71	7.45	1867	5.0	2.9	40	2042	612	8.3	4.4	85.9	132	1	87	3	1.33	56.	10 38	4.9	3
10.0	140	75	7.84	1916	5.2	2.8	41	2055	582	7.8	4.2	86.1	139	1	90	3	1.29	57.	10 40	5.0	4
10.5	147	78	8.23	1964	5.3	2.7	42	2067	554	7.4	4.0	86.3	146	1	93	3	1.26	59.	11 42	5.1	4
11.0	154	82	8.62	2010	5.4	2.7	43	2077	529	7.1	3.8	86.5	153	1	95	3	1.23	62.	11 43	5.2	4
11.5	161	86	9.01	2056	5.5	2.6	44	2087	506	6.7	3.6	86.6	160	1	98	3	1.20	65.	12 45	5.3	4
12.0	168	90	9.41	2100	5.7	2.5	45	2096	485	6.4	3.4	86.8	167	1	100	3	1.17	68.	12 47	5.4	4
13.0	182	97	10.19	2186	5.9	2.4	47	2111	447	5.9	3.2	87.0	182	0	105	3	1.12	74.	13 50	5.5	4
14.0	196	105	10.97	2269	6.1	2.4	49	2124	415	5.5	2.9	87.3	196	0	110	2	1.07	76.	14 53	5.7	5
15.0	210	112	11.76	2350	6.3	2.3	51	2135	388	5.1	2.7	87.5	210	0	115	2	1.03	82.	15 56	5.9	5
16.0	224	119	12.54	2427	6.5	2.2	53	2144	363	4.8	2.5	87.6	224	0	120	2	1.00	87.	16 59	6.1	5
17.0	238	127	13.32	2503	6.7	2.1	55	2153	342	4.5	2.4	87.8	238	0	125	2	0.96	92.	16 61	6.2	5
18.0	252	134	14.11	2576	6.9	2.1	56	2160	323	4.2	2.2	87.9	252	0	130	2	0.93	98.	17 64	6.4	5
19.0	266	142	14.89	2647	7.1	2.0	58	2167	306	4.0	2.1	88.0	266	0	134	2	0.91	99.	18 67	6.5	6
20.0	280	149	15.68	2717	7.3	2.0	60	2172	291	3.8	2.0	88.1	280	0	139	2	0.88	104.	19 69	6.7	6
25.0	350	187	19.59	3042	8.2	1.8	67	2194	232	3.0	1.6	88.5	350	0	162	2	0.78	125.	23 82	7.4	7
30.0	420	224	23.51	3336	8.9	1.6	74	2208	194	2.5	1.3	88.8	420	0	184	2	0.71	144.	27 94	8.0	8
35.0	490	261	27.43	3608	9.7	1.5	80	2217	166	2.1	1.1	88.9	490	0	205	2	0.66	168.	31 106	8.6	
40.0	560	299	31.35	3863	10.3	1.4	86	2224	145	1.9	1.0	89.1	560	0	226	1	0.61	183.	35 117	9.2	
45.0	630	336	35.27	4102	11.0	1.3	91	2229	129	1.6	0.9	89.2	630	0	246	1	0.58	196.	39 128	9.7	
50.0	700	373	39.19	4330	11.5	1.2	96	2233	116	1.5	0.8	89.3	700	0	267	1	0.55	218.	43 138	10.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 67 14 N on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 13. ZC= 20.(Ca)
NEUTRON NUMBERS: NP= 7. NT= 14. NC= 21.

AP**1/3= 2.410 AT**1/3= 3.000
REDUCED MASS NUMBER= 9.22 AP+AT=AC= 41.

INTERACTION RADIUS RINT= 8.98 fm RO= 1.66 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 3.05 CT+CP= 5.33 C= 1.30

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 3.35

COULOMB RADII [fm]:
RCP= 2.65 RCT= 3.32 RC=RCP+RCT= 5.98

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 30.73 MeV K= .10563 n=2.476
VC(RINT)= 14.6 MeV

FISSION-TKE= 35. MeV
ASYMM. FISSION-TKE= 32. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 15.58 MeV
L-RLD= 41 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 20.93 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -20.6
COMPOUND NUCLEUS: -34.0

FUSION RELATED PARAMETERS:
R-BARRIER= 8.17 fm V(RB)= 14.8 MeV
Q-VALUE= 16.3 MeV
L-CRITICAL= 29.

14 N on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	9	0.63	604	2.0	14.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	18	1.27	855	2.9	10.1	12	623	412	81.8	56.3	49.1	17	11	0	22	6.29	9.	0 0	2.6	2
3.0	42	28	1.90	1047	3.5	8.3	22	1310	973	42.0	27.9	69.0	37	5	0	12	3.41	14.	0 0	2.9	2
4.0	56	37	2.53	1210	4.0	7.2	28	1641	1254	28.6	18.9	75.7	53	3	48	9	2.61	18.	4 14	3.2	3
4.5	63	41	2.85	1283	4.3	6.8	31	1750	1347	24.6	16.3	77.7	60	3	51	8	2.38	20.	5 17	3.4	3
5.0	70	46	3.16	1353	4.5	6.4	33	1836	1380	21.7	14.3	79.2	68	2	53	8	2.20	22.	5 20	3.5	3
5.5	77	51	3.48	1419	4.7	6.1	36	1906	1255	19.4	12.8	80.3	75	2	55	7	2.05	24.	6 22	3.6	3
6.0	84	55	3.80	1483	4.9	5.8	38	1964	1150	17.5	11.5	81.3	82	2	56	7	1.93	27.	6 25	3.7	3
6.5	91	60	4.11	1543	5.1	5.6	40	2013	1061	15.9	10.5	82.0	89	2	60	6	1.83	29.	7 27	3.9	3
7.0	98	65	4.43	1602	5.3	5.4	42	2054	986	14.6	9.7	82.7	97	1	62	6	1.74	30.	7 29	4.0	4
7.5	105	69	4.74	1658	5.5	5.2	44	2090	920	13.5	8.9	83.2	104	1	64	6	1.67	32.	8 30	4.1	4
8.0	112	74	5.06	1713	5.7	5.1	46	2121	862	12.6	8.3	83.7	111	1	66	6	1.60	34.	8 32	4.2	4
8.5	119	78	5.38	1766	5.9	4.9	48	2149	812	11.8	7.8	84.1	118	1	68	5	1.54	37.	9 34	4.3	4
9.0	126	83	5.69	1817	6.0	4.8	49	2173	766	11.1	7.3	84.5	125	1	70	5	1.49	39.	9 36	4.4	4
9.5	133	88	6.01	1867	6.2	4.6	51	2195	726	10.4	6.9	84.8	132	1	72	5	1.44	40.	9 37	4.5	5
10.0	140	92	6.33	1916	6.4	4.5	53	2214	690	9.9	6.5	85.1	139	1	73	5	1.40	42.	10 39	4.6	5
10.5	147	97	6.64	1964	6.5	4.4	54	2231	657	9.4	6.2	85.3	146	1	75	5	1.36	44.	10 40	4.7	5
11.0	154	101	6.96	2010	6.7	4.3	56	2247	627	8.9	5.9	85.6	153	1	77	5	1.32	46.	11 42	4.8	5
11.5	161	106	7.28	2056	6.8	4.2	57	2262	600	8.5	5.6	85.8	160	1	79	5	1.29	48.	11 43	4.9	5
12.0	168	111	7.59	2100	7.0	4.1	58	2275	575	8.1	5.3	86.0	167	1	80	4	1.26	50.	11 45	5.0	5
13.0	182	120	8.22	2186	7.3	4.0	61	2298	530	7.4	4.9	86.3	181	1	84	4	1.20	53.	12 48	5.2	6
14.0	196	129	8.86	2269	7.5	3.8	64	2318	493	6.9	4.5	86.6	195	1	87	4	1.15	57.	13 50	5.3	6
15.0	210	138	9.49	2350	7.8	3.7	66	2335	460	6.4	4.2	86.8	209	1	90	4	1.11	61.	14 53	5.5	6
16.0	224	148	10.12	2427	8.1	3.6	69	2349	431	6.0	3.9	87.0	223	1	93	4	1.07	63.	15 56	5.7	7
17.0	238	157	10.75	2503	8.3	3.5	71	2362	406	5.6	3.7	87.2	237	1	96	4	1.03	67.	15 58	5.8	7
18.0	252	166	11.39	2576	8.6	3.4	73	2374	383	5.3	3.5	87.4	252	0	99	4	1.00	71.	16 61	6.0	7
19.0	266	175	12.02	2647	8.8	3.3	76	2384	363	5.0	3.3	87.5	266	0	102	3	0.97	75.	17 63	6.1	7
20.0	280	184	12.65	2717	9.0	3.2	78	2393	345	4.7	3.1	87.6	280	0	105	3	0.95	77.	18 66	6.3	8
25.0	350	230	15.82	3042	10.1	2.9	88	2427	276	3.7	2.5	88.1	350	0	120	3	0.84	93.	21 78	6.9	9
30.0	420	277	18.98	3336	11.0	2.6	97	2449	230	3.1	2.0	88.4	420	0	133	3	0.76	108.	25 89	7.6	10
35.0	490	323	22.14	3608	11.9	2.4	105	2465	197	2.7	1.7	88.7	490	0	147	2	0.70	122.	29 100	8.1	
40.0	560	369	25.31	3863	12.8	2.3	112	2476	172	2.3	1.5	88.8	560	0	160	2	0.66	135.	32 110	8.7	
45.0	630	415	28.47	4102	13.5	2.1	119	2485	153	2.1	1.4	89.0	630	0	172	2	0.62	147.	36 120	9.2	
50.0	700	461	31.63	4330	14.3	2.0	126	2492	138	1.8	1.2	89.1	700	0	185	2	0.58	157.	40 130	9.6	

 # 68 14 N on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 20. ZC= 27.(Co)
NEUTRON NUMBERS: NP= 7. NT= 20. NC= 27.

AP**1/3= 2.410 AT**1/3= 3.420
REDUCED MASS NUMBER= 10.37 AP+AT=AC= 54.

INTERACTION RADIUS RINT= 9.44 fm RO= 1.62 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 3.59 CT+CP= 5.87 C= 1.39

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 3.85

COULOMB RADII [fm]:
RCP= 2.65 RCT= 3.84 RC=RCP+RCT= 6.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 43.13 MeV K= .10224 n=2.553
VC(RINT)= 21.3 MeV

FISSION-TKE= 43. MeV
ASYMM. FISSION-TKE= 33. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 16.68 MeV
L-RLD= 52 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 18.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -33.0
COMPOUND NUCLEUS: -51.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.55 fm V(RB)= 21.9 MeV
Q-VALUE= 21.1 MeV
L-CRITICAL= 35.

14 N on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	10	0.49	604	2.3	22.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	21	0.97	855	3.2	15.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	42	31	1.46	1047	3.9	12.7	21	964	677	63.0	48.0	58.5	33	9	0	23	4.40	10.	0 0	2.8	2
4.0	56	41	1.94	1210	4.5	11.0	30	1450	1081	40.6	30.4	69.7	51	5	43	16	3.06	14.	4 14	3.0	3
4.5	63	47	2.19	1283	4.8	10.4	33	1610	1216	34.5	25.8	72.7	59	4	45	14	2.73	15.	5 17	3.2	3
5.0	70	52	2.43	1353	5.1	9.9	37	1736	1324	30.1	22.4	75.0	66	4	48	13	2.49	17.	5 20	3.3	3
5.5	77	57	2.67	1419	5.3	9.4	40	1840	1412	26.6	19.8	76.7	74	3	50	12	2.30	19.	6 22	3.4	3
6.0	84	62	2.92	1483	5.6	9.0	42	1925	1320	23.9	17.8	78.0	81	3	51	11	2.15	20.	6 24	3.5	4
6.5	91	67	3.16	1543	5.8	8.6	45	1997	1219	21.7	16.1	79.1	89	2	53	10	2.03	22.	6 26	3.6	4
7.0	98	73	3.40	1602	6.0	8.3	48	2059	1132	19.9	14.8	80.1	96	2	55	10	1.92	24.	7 27	3.7	4
7.5	105	78	3.65	1658	6.2	8.0	50	2112	1056	18.3	13.6	80.8	103	2	56	9	1.83	25.	7 29	3.8	4
8.0	112	83	3.89	1713	6.4	7.8	52	2158	990	17.0	12.6	81.5	110	2	58	9	1.75	27.	8 31	3.9	4
8.5	119	88	4.13	1766	6.6	7.6	54	2199	932	15.8	11.8	82.1	117	2	59	9	1.68	28.	8 32	4.0	5
9.0	126	93	4.38	1817	6.8	7.3	56	2235	880	14.8	11.0	82.6	124	2	61	8	1.62	30.	9 34	4.1	5
9.5	133	99	4.62	1867	7.0	7.2	58	2267	834	14.0	10.4	83.0	131	2	62	8	1.56	31.	9 35	4.2	5
10.0	140	104	4.86	1916	7.2	7.0	60	2296	792	13.2	9.8	83.4	139	1	63	8	1.51	33.	9 37	4.3	5
10.5	147	109	5.10	1964	7.3	6.8	62	2322	754	12.5	9.3	83.8	146	1	65	8	1.47	35.	10 38	4.4	5
11.0	154	114	5.35	2010	7.5	6.6	64	2346	720	11.9	8.8	84.1	153	1	66	7	1.43	35.	10 39	4.5	6
11.5	161	119	5.59	2056	7.7	6.5	66	2367	689	11.3	8.4	84.4	160	1	67	7	1.39	37.	10 41	4.6	6
12.0	168	124	5.83	2100	7.9	6.4	67	2387	660	10.8	8.0	84.6	167	1	68	7	1.35	39.	11 42	4.6	6
13.0	182	135	6.32	2186	8.2	6.1	71	2422	609	9.9	7.3	85.1	181	1	71	7	1.29	42.	12 45	4.8	6
14.0	196	145	6.81	2269	8.5	5.9	74	2451	566	9.1	6.8	85.4	195	1	73	6	1.23	44.	12 47	5.0	7
15.0	210	156	7.29	2350	8.8	5.7	77	2477	528	8.5	6.3	85.8	209	1	75	6	1.19	47.	13 50	5.1	7
16.0	224	166	7.78	2427	9.1	5.5	80	2499	495	7.9	5.8	86.1	223	1	77	6	1.14	51.	14 52	5.3	7
17.0	238	176	8.26	2503	9.4	5.3	83	2519	466	7.4	5.5	86.3	237	1	80	6	1.10	53.	14 55	5.4	8
18.0	252	187	8.75	2576	9.6	5.2	85	2536	440	7.0	5.2	86.5	251	1	82	6	1.07	56.	15 57	5.5	8
19.0	266	197	9.24	2647	9.9	5.1	88	2552	417	6.6	4.9	86.7	265	1	84	5	1.04	59.	16 59	5.7	8
20.0	280	207	9.72	2717	10.1	4.9	91	2566	396	6.2	4.6	86.9	279	1	86	5	1.01	60.	17 62	5.8	9
25.0	350	259	12.15	3042	11.3	4.4	103	2618	317	4.9	3.6	87.5	350	0	96	5	0.89	74.	20 73	6.4	10
30.0	420	311	14.58	3336	12.4	4.0	113	2652	264	4.1	3.0	88.0	420	0	105	4	0.81	87.	24 83	7.0	11
35.0	490	363	17.02	3608	13.4	3.7	123	2677	226	3.5	2.6	88.3	490	0	114	4	0.74	96.	27 93	7.5	
40.0	560	415	19.45	3863	14.3	3.5	132	2694	198	3.0	2.2	88.5	560	0	123	4	0.69	107.	30 103	8.0	
45.0	630	467	21.88	4102	15.2	3.3	140	2708	176	2.7	2.0	88.7	630	0	131	3	0.65	118.	34 112	8.5	
50.0	700	519	24.31	4330	16.0	3.1	148	2719	158	2.4	1.8	88.8	700	0	139	3	0.62	128.	37 121	8.9	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 69 14 N on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 26. ZC= 33.(As)
NEUTRON NUMBERS: NP= 7. NT= 30. NC= 37.

AP**1/3= 2.410 AT**1/3= 3.826
REDUCED MASS NUMBER= 11.20 AP+AT=AC= 70.

INTERACTION RADIUS RINT= 9.88 fm RO= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 4.12 CT+CP= 6.40 C= 1.47

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 4.35

COULOMB RADII [fm]:
RCP= 2.65 RCT= 4.27 RC=RCP+RCT= 6.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 52.29 MeV K= .09354 n=2.606
VC(RINT)= 26.5 MeV

FISSION-TKE= 50. MeV
ASYMM. FISSION-TKE= 34. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 17.45 MeV
L-RLD= 65 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.28 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -61.4
COMPOUND NUCLEUS: -64.9

FUSION RELATED PARAMETERS:
R-BARRIER= 8.94 fm V(RB)= 27.3 MeV
Q-VALUE= 6.4 MeV
L-CRITICAL= 41.

14 N on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	11	0.42	604	2.4	28.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	22	0.85	855	3.5	20.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	42	34	1.27	1047	4.2	16.5	19	715	473	81.4	68.0	49.3	31	11	0	36	5.62	8.	0 0	2.1	2
4.0	56	45	1.69	1210	4.9	14.3	31	1333	983	49.7	40.4	65.1	50	6	39	22	3.50	11.	4 14	2.4	3
4.5	63	50	1.90	1283	5.2	13.5	35	1536	1152	41.8	33.8	69.1	58	5	42	20	3.06	12.	4 16	2.5	3
5.0	70	56	2.11	1353	5.5	12.8	39	1697	1288	36.2	29.2	71.9	66	4	44	18	2.75	13.	5 19	2.7	4
5.5	77	62	2.33	1419	5.7	12.2	43	1828	1399	31.8	25.6	74.1	73	4	46	16	2.52	15.	5 21	2.8	4
6.0	84	67	2.54	1483	6.0	11.7	46	1937	1492	28.5	22.9	75.8	81	3	47	15	2.34	16.	6 22	2.9	4
6.5	91	73	2.75	1543	6.2	11.2	49	2029	1453	25.7	20.7	77.1	88	3	49	14	2.20	17.	6 24	3.0	4
7.0	98	78	2.96	1602	6.5	10.8	52	2107	1349	23.5	18.9	78.3	95	3	50	13	2.08	18.	7 26	3.1	5
7.5	105	84	3.17	1658	6.7	10.5	55	2175	1259	21.6	17.3	79.2	103	2	51	13	1.97	19.	7 27	3.2	5
8.0	112	90	3.38	1713	6.9	10.1	57	2234	1181	20.0	16.0	80.0	110	2	52	12	1.88	21.	7 29	3.3	5
8.5	119	95	3.59	1766	7.1	9.8	60	2286	1111	18.6	14.9	80.7	117	2	53	12	1.80	22.	8 30	3.4	5
9.0	126	101	3.81	1817	7.3	9.6	62	2332	1049	17.4	14.0	81.3	124	2	54	11	1.73	23.	8 32	3.5	6
9.5	133	106	4.02	1867	7.6	9.3	65	2374	994	16.4	13.1	81.8	131	2	55	11	1.67	24.	9 33	3.6	6
10.0	140	112	4.23	1916	7.7	9.1	67	2411	944	15.4	12.4	82.3	138	2	56	10	1.62	26.	9 34	3.7	6
10.5	147	118	4.44	1964	7.9	8.8	69	2444	899	14.6	11.7	82.7	145	2	57	10	1.57	26.	9 36	3.8	7
11.0	154	123	4.65	2010	8.1	8.6	71	2474	859	13.9	11.1	83.1	153	1	58	10	1.52	28.	10 37	3.8	7
11.5	161	129	4.86	2056	8.3	8.5	73	2502	821	13.2	10.6	83.4	160	1	59	9	1.48	29.	10 38	3.9	7
12.0	168	134	5.07	2100	8.5	8.3	75	2527	787	12.6	10.1	83.7	167	1	60	9	1.44	30.	10 40	4.0	7
13.0	182	146	5.50	2186	8.8	7.9	79	2572	726	11.5	9.2	84.2	181	1	62	9	1.37	32.	11 42	4.2	8
14.0	196	157	5.92	2269	9.2	7.7	83	2610	674	10.6	8.5	84.7	195	1	63	8	1.31	35.	12 44	4.3	8
15.0	210	168	6.34	2350	9.5	7.4	86	2642	629	9.8	7.9	85.1	209	1	65	8	1.26	37.	12 47	4.5	9
16.0	224	179	6.76	2427	9.8	7.2	89	2671	590	9.2	7.3	85.4	223	1	67	8	1.21	39.	13 49	4.6	9
17.0	238	190	7.19	2503	10.1	7.0	93	2696	555	8.6	6.9	85.7	237	1	68	7	1.17	41.	14 51	4.7	9
18.0	252	202	7.61	2576	10.4	6.8	96	2719	524	8.1	6.5	86.0	251	1	70	7	1.13	43.	14 53	4.9	10
19.0	266	213	8.03	2647	10.7	6.6	99	2739	497	7.6	6.1	86.2	265	1	71	7	1.10	46.	15 56	5.0	10
20.0	280	224	8.46	2717	11.0	6.4	102	2757	472	7.2	5.8	86.4	279	1	73	7	1.06	48.	16 58	5.1	10
25.0	350	280	10.57	3042	12.2	5.7	115	2824	377	5.7	4.6	87.2	349	1	80	6	0.94	58.	19 68	5.7	12
30.0	420	336	12.68	3336	13.4	5.2	127	2869	314	4.7	3.8	87.6	420	0	86	5	0.85	67.	23 78	6.3	14
35.0	490	392	14.80	3608	14.5	4.8	138	2900	269	4.0	3.2	88.0	490	0	93	5	0.78	77.	26 87	6.7	
40.0	560	448	16.91	3863	15.5	4.5	148	2924	236	3.5	2.8	88.3	560	0	99	5	0.73	85.	29 96	7.2	
45.0	630	504	19.03	4102	16.4	4.3	158	2942	209	3.1	2.5	88.5	630	0	104	4	0.68	94.	32 105	7.6	
50.0	700	560	21.14	4330	17.3	4.1	167	2956	188	2.8	2.2	88.6	700	0	110	4	0.65	102.	35 113	8.0	

 # 70 14 N on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 29. ZC= 36.(Kr)
NEUTRON NUMBERS: NP= 7. NT= 34. NC= 41.

AP**1/3= 2.410 AT**1/3= 3.979
REDUCED MASS NUMBER= 11.45 AP+AT=AC= 77.

INTERACTION RADIUS RINT=10.05 fm RO= 1.57 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 4.31 CT+CP= 6.59 C= 1.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 4.53

COULOMB RADII [fm]:
RCP= 2.65 RCT= 4.45 RC=RCP+RCT= 7.10

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 56.71 MeV K= .08924 n=2.634
VC(RINT)= 29.1 MeV

FISSION-TKE= 55. MeV
ASYMM. FISSION-TKE= 34. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 17.71 MeV
-RLD= 71 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.90 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -65.2
COMPOUND NUCLEUS: -71.3

FUSION RELATED PARAMETERS:
R-BARRIER= 9.08 fm V(RB)= 29.9 MeV
Q-VALUE= 9.0 MeV
L-CRITICAL= 44.

14 N on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	11	0.39	604	2.5	32.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	23	0.79	855	3.5	22.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	42	34	1.18	1047	4.3	18.5	17	545	334	94.5	81.8	42.8	29	13	29	47	6.70	7.	2 3	2.1	3
4.0	56	46	1.58	1210	5.0	16.0	30	1234	898	55.4	46.2	62.3	49	7	38	26	3.76	10.	4 14	2.4	3
4.5	63	52	1.77	1283	5.3	15.1	35	1460	1086	46.3	38.4	66.8	57	6	41	23	3.24	11.	4 16	2.5	4
5.0	70	57	1.97	1353	5.6	14.3	39	1640	1237	39.8	32.9	70.1	65	5	43	20	2.90	12.	5 18	2.6	4
5.5	77	63	2.17	1419	5.9	13.6	43	1786	1360	34.9	28.8	72.5	73	4	45	19	2.64	13.	5 20	2.7	4
6.0	84	69	2.37	1483	6.1	13.0	47	1907	1463	31.2	25.6	74.4	80	4	46	17	2.44	14.	6 22	2.8	5
6.5	91	74	2.56	1543	6.4	12.5	50	2009	1539	28.1	23.1	75.9	88	3	47	16	2.28	15.	6 24	2.9	5
7.0	98	80	2.76	1602	6.6	12.1	53	2097	1429	25.6	21.0	77.2	95	3	49	15	2.15	17.	6 25	3.0	5
7.5	105	86	2.96	1658	6.9	11.7	56	2172	1334	23.5	19.3	78.2	102	3	50	14	2.04	18.	7 27	3.1	5
8.0	112	92	3.15	1713	7.1	11.3	59	2238	1250	21.8	17.8	79.1	110	2	51	14	1.94	19.	7 28	3.2	6
8.5	119	97	3.35	1766	7.3	11.0	61	2296	1177	20.2	16.6	79.9	117	2	52	13	1.86	20.	8 30	3.3	6
9.0	126	103	3.55	1817	7.5	10.7	64	2347	1111	18.9	15.5	80.5	124	2	53	13	1.79	21.	8 31	3.4	6
9.5	133	109	3.74	1867	7.7	10.4	66	2393	1053	17.8	14.6	81.1	131	2	54	12	1.72	22.	8 32	3.5	6
10.0	140	115	3.94	1916	7.9	10.1	69	2434	1000	16.7	13.7	81.6	138	2	55	12	1.66	23.	9 34	3.6	7
10.5	147	120	4.14	1964	8.1	9.9	71	2472	952	15.8	13.0	82.1	145	2	55	11	1.61	24.	9 35	3.7	7
11.0	154	126	4.34	2010	8.3	9.6	73	2505	909	15.0	12.3	82.5	152	2	56	11	1.56	25.	9 36	3.7	7
11.5	161	132	4.53	2056	8.5	9.4	75	2536	870	14.3	11.7	82.9	160	1	57	11	1.52	27.	10 37	3.8	7
12.0	168	137	4.73	2100	8.7	9.2	77	2564	833	13.6	11.1	83.2	167	1	58	10	1.48	27.	10 39	3.9	8
13.0	182	149	5.12	2186	9.0	8.9	81	2614	769	12.4	10.2	83.8	181	1	60	10	1.40	30.	11 41	4.1	8
14.0	196	160	5.52	2269	9.4	8.5	85	2656	714	11.5	9.4	84.3	195	1	61	9	1.34	31.	12 43	4.2	9
15.0	210	172	5.91	2350	9.7	8.3	89	2693	667	10.6	8.7	84.7	209	1	63	9	1.29	34.	12 46	4.3	9
16.0	224	183	6.31	2427	10.0	8.0	92	2725	625	9.9	8.1	85.1	223	1	64	9	1.24	36.	13 48	4.5	9
17.0	238	195	6.70	2503	10.3	7.8	96	2753	588	9.3	7.6	85.4	237	1	65	8	1.19	38.	14 50	4.6	10
18.0	252	206	7.10	2576	10.6	7.5	99	2778	555	8.7	7.1	85.6	251	1	67	8	1.16	40.	14 52	4.7	10
19.0	266	218	7.49	2647	10.9	7.3	102	2801	526	8.2	6.7	85.9	265	1	68	8	1.12	41.	15 54	4.9	11
20.0	280	229	7.88	2717	11.2	7.1	105	2821	500	7.8	6.4	86.1	279	1	69	8	1.09	44.	16 56	5.0	11
25.0	350	286	9.85	3042	12.5	6.4	119	2896	400	6.1	5.0	86.9	349	1	76	7	0.96	53.	19 66	5.5	13
30.0	420	344	11.83	3336	13.7	5.8	132	2946	333	5.1	4.1	87.5	420	0	81	6	0.87	61.	22 76	6.1	15
35.0	490	401	13.80	3608	14.8	5.4	143	2981	285	4.3	3.5	87.8	490	0	87	6	0.80	71.	25 85	6.5	
40.0	560	458	15.77	3863	15.8	5.1	154	3008	250	3.8	3.1	88.1	560	0	92	5	0.74	78.	29 94	7.0	
45.0	630	515	17.74	4102	16.8	4.8	164	3028	222	3.3	2.7	88.3	630	0	97	5	0.70	86.	32 102	7.4	
50.0	700	573	19.71	4330	17.7	4.5	173	3044	200	3.0	2.4	88.5	700	0	102	5	0.66	94.	35 111	7.8	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

71 14 N on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 42. ZC= 49.(In)
NEUTRON NUMBERS: NP= 7. NT= 50. NC= 57.

AP**1/3= 2.410 AT**1/3= 4.514
REDUCED MASS NUMBER= 12.15 AP+AT=AC=106.

INTERACTION RADIUS RINT=10.63 fm RO= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 5.00 CT+CP= 7.28 C= 1.57

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 5.20

COULOMB RADII [fm]:
RCP= 2.65 RCT= 5.08 RC=RCP+RCT= 7.73

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 74.57 MeV K= .07190 n=2.749
VC(RINT)= 39.8 MeV

FISSION-TKE= 77. MeV
ASYMM. FISSION-TKE= 37. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 18.54 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -87.5
COMPOUND NUCLEUS: -81.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.59 fm V(RB)= 41.1 MeV
Q-VALUE= -3.3 MeV
L-CRITICAL= 51.

14 N on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGNAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	12	0.31	604	2.7	46.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	24	0.61	855	3.8	32.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	36	0.92	1047	4.6	26.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	49	1.22	1210	5.3	23.1	24	695	443	87.9	79.3	46.0	44	12	34	54	5.66	7.	3	12	1.8	3
4.5	63	55	1.37	1283	5.6	21.8	31	1026	714	69.9	62.2	55.0	54	9	38	42	4.35	8.	4	14	2.0	3
5.0	70	61	1.53	1353	5.9	20.7	37	1288	931	58.4	51.5	60.8	62	8	40	35	3.66	9.	4	16	2.1	4
5.5	77	67	1.68	1419	6.2	19.7	42	1502	1109	50.2	44.2	64.9	71	6	42	31	3.22	10.	5	18	2.2	4
6.0	84	73	1.83	1483	6.5	18.9	47	1679	1257	44.2	38.7	67.9	79	5	44	28	2.91	11.	5	20	2.3	5
6.5	91	79	1.99	1543	6.8	18.2	51	1828	1382	39.4	34.5	70.3	86	5	45	26	2.68	11.	6	21	2.4	5
7.0	98	85	2.14	1602	7.0	17.5	54	1956	1490	35.6	31.1	72.2	94	4	46	24	2.49	12.	6	23	2.5	5
7.5	105	91	2.29	1658	7.3	16.9	58	2066	1583	32.5	28.3	73.8	101	4	47	23	2.34	13.	7	24	2.6	6
8.0	112	97	2.44	1713	7.5	16.4	61	2163	1500	29.9	26.0	75.1	109	3	48	21	2.21	14.	7	26	2.7	6
8.5	119	103	2.60	1766	7.7	15.9	65	2247	1412	27.6	24.1	76.2	116	3	49	20	2.10	15.	7	27	2.7	6
9.0	126	109	2.75	1817	8.0	15.4	68	2323	1334	25.7	22.4	77.1	123	3	50	19	2.01	16.	8	28	2.8	7
9.5	133	115	2.90	1867	8.2	15.0	70	2390	1263	24.1	21.0	78.0	130	3	51	19	1.93	16.	8	30	2.9	7
10.0	140	122	3.05	1916	8.4	14.6	73	2450	1200	22.6	19.7	78.7	138	2	51	18	1.85	17.	8	31	3.0	7
10.5	147	128	3.21	1964	8.6	14.3	76	2505	1143	21.3	18.5	79.3	145	2	52	17	1.79	18.	9	32	3.1	7
11.0	154	134	3.36	2010	8.8	14.0	78	2554	1091	20.2	17.5	79.9	152	2	53	17	1.73	19.	9	33	3.1	8
11.5	161	140	3.51	2056	9.0	13.7	81	2599	1044	19.1	16.6	80.4	159	2	53	16	1.68	20.	9	34	3.2	8
12.0	168	146	3.67	2100	9.2	13.4	83	2641	1000	18.2	15.8	80.9	166	2	54	16	1.63	21.	10	35	3.3	8
13.0	182	158	3.97	2186	9.6	12.8	88	2714	923	16.6	14.4	81.7	180	2	55	15	1.54	22.	10	38	3.4	9
14.0	196	170	4.28	2269	9.9	12.4	92	2776	857	15.2	13.2	82.4	194	2	56	14	1.47	24.	11	40	3.5	9
15.0	210	182	4.58	2350	10.3	12.0	97	2830	800	14.1	12.2	83.0	209	1	57	14	1.40	25.	12	42	3.7	10
16.0	224	194	4.89	2427	10.6	11.6	101	2877	750	13.1	11.4	83.4	223	1	58	13	1.35	27.	12	44	3.8	10
17.0	238	207	5.19	2503	11.0	11.2	105	2919	706	12.3	10.6	83.9	237	1	59	12	1.30	28.	13	46	3.9	11
18.0	252	219	5.50	2576	11.3	10.9	108	2955	667	11.5	10.0	84.2	251	1	60	12	1.25	30.	14	48	4.0	11
19.0	266	231	5.80	2647	11.6	10.6	112	2988	631	10.8	9.4	84.6	265	1	61	12	1.21	31.	14	50	4.1	12
20.0	280	243	6.11	2717	11.9	10.4	115	3018	600	10.2	8.9	84.9	279	1	62	11	1.18	33.	15	52	4.3	12
25.0	350	304	7.64	3042	13.3	9.3	132	3129	480	8.0	7.0	86.0	349	1	67	10	1.03	40.	18	61	4.8	15
30.0	420	365	9.16	3336	14.6	8.5	146	3203	400	6.6	5.8	86.7	419	1	71	9	0.93	47.	21	70	5.2	17
35.0	490	425	10.69	3608	15.7	7.8	159	3256	343	5.6	4.9	87.2	489	1	74	8	0.85	54.	24	78	5.6	
40.0	560	486	12.22	3863	16.8	7.3	171	3295	300	4.9	4.3	87.6	560	0	78	8	0.79	60.	27	86	6.0	
45.0	630	547	13.74	4102	17.8	6.9	182	3325	266	4.3	3.8	87.8	630	0	81	7	0.74	66.	30	94	6.4	
50.0	700	608	15.27	4330	18.8	6.5	193	3349	240	3.9	3.4	88.1	700	0	85	7	0.70	71.	33	102	6.8	

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PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 47. ZC= 54.(Xe)
NEUTRON NUMBERS: NP= 7. NT= 61. NC= 68.

AP**1/3= 2.410 AT**1/3= 4.762
REDUCED MASS NUMBER= 12.39 AP+AT=AC=122.

INTERACTION RADIUS RINT=10.90 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 5.32 CT+CP= 7.60 C= 1.60

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 5.50

COULOMB RADII [fm]:
RCP= 2.65 RCT= 5.34 RC=RCP+RCT= 7.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 80.50 MeV K= .06604 n=2.779
VC(RINT)= 43.4 MeV

FISSION-TKE= 85. MeV
ASYMM. FISSION-TKE= 38. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 18.64 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -87.6
COMPOUND NUCLEUS: -84.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.83 fm V(RB)= 44.8 MeV
Q-VALUE= 0.2 MeV
L-CRITICAL= 54.

14 N on 108 As

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGNAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	12	0.29	604	2.7	51.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	25	0.57	855	3.8	36.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	37	0.86	1047	4.7	29.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	50	1.14	1210	5.4	25.9	21	504	289	102.7	95.3	38.6	42	14	33	74	7.02	6.	3	11	1.8	4
4.5	63	56	1.28	1283	5.8	24.4	29	879	594	79.4	72.3	50.3	53	10	37	52	4.95	7.	4	14	1.9	4
5.0	70	62	1.43	1353	6.1	23.2	36	1175	838	65.4	59.0	57.3	62	8	40	42	4.03	8.	4	16	2.0	4
5.5	77	68	1.57	1419	6.4	22.1	42	1416	1038	55.8	50.1	62.1	70	7	42	37	3.49	8.	5	17	2.1	5
6.0	84	74	1.71	1483	6.6	21.1	47	1616	1204	48.8	43.7	65.6	78	6	43	33	3.12	9.	5	19	2.2	5
6.5	91	81	1.86	1543	6.9	20.3	51	1784	1345	43.4	38.7	68.3	86	5	45	30	2.85	10.	6	21	2.3	6
7.0	98	87	2.00	1602	7.2	19.6	55	1928	1466	39.1	34.8	70.5	94	4	46	28	2.64	11.	6	22	2.4	6
7.5	105	93	2.14	1658	7.4	18.9	59	2053	1570	35.5	31.6	72.2	101	4	47	26	2.47	11.	6	23	2.5	6
8.0	112	99	2.28	1713	7.7	18.3	63	2161	1640	32.6	29.0	73.7	108	4	47	24	2.32	12.	7	25	2.6	7
8.5	119	105	2.43	1766	7.9	17.8	66	2257	1544	30.1	26.8	74.9	116	3	48	23	2.21	13.	7	26	2.6	7
9.0	126	112	2.57	1817	8.1	17.3	69	2342	1458	28.0	24.9	76.0	123	3	49	22	2.10	14.	8	27	2.7	7
9.5	133	118	2.71	1867	8.4	16.8	72	2418	1381	26.2	23.2	76.9	130	3	50	21	2.01	14.	8	28	2.8	8
10.0	140	124	2.85	1916	8.6	16.4	75	2486	1312	24.6	21.8	77.7	137	3	50	20	1.93	15.	8	30	2.9	8
10.5	147	130	3.00	1964	8.8	16.0	78	2547	1249	23.1	20.5	78.4	145	2	51	20	1.86	16.	9	31	2.9	8
11.0	154	136	3.14	2010	9.0	15.6	81	2603	1193	21.9	19.4	79.1	152	2	51	19	1.80	16.	9	32	3.0	9
11.5	161	143	3.28	2056	9.2	15.3	83	2654	1141	20.7	18.4	79.6	159	2	52	18	1.74	17.	9	33	3.1	9
12.0	168	149	3.42	2100	9.4	15.0	86	2701	1093	19.7	17.5	80.1	166	2	53	18	1.69	18.	10	34	3.1	10
13.0	182	161	3.71	2186	9.8	14.4	91	2783	1009	17.9	15.9	81.0	180	2	54	17	1.60	19.	10	36	3.3	10
14.0	196	174	4.00	2269	10.1	13.8	96	2853	937	16.5	14.6	81.8	194	2	55	16	1.52	20.	11	38	3.4	11
15.0	210	186	4.28	2350	10.5	13.4	100	2914	874	15.2	13.5	82.4	209	1	56	15	1.45	22.	11	40	3.5	11
16.0	224	198	4.57	2427	10.8	13.0	104	2968	820	14.1	12.5	82.9	223	1	56	15	1.39	23.	12	42	3.6	12
17.0	238	211	4.85	2503	11.2	12.6	108	3014	772	13.2	11.7	83.4	237	1	57	14	1.34	24.	13	44	3.7	13
18.0	252	223	5.14	2576	11.5	12.2	112	3056	729	12.4	11.0	83.8	251	1	58	14	1.29	26.	13	46	3.8	13
19.0	266	235	5.42	2647	11.8	11.9	116	3093	690	11.7	10.3	84.2	265	1	59	13	1.25	27.	14	48	3.9	14
20.0	280	248	5.71	2717	12.1	11.6	120	3127	656	11.0	9.8	84.5	279	1	60	13	1.21	28.	15	50	4.0	14
25.0	350	310	7.14	3042	13.6	10.4	137	3253	524	8.7	7.7	85.7	349	1	63	11	1.06	35.	18	59	4.5	17
30.0	420	372	8.56	3336	14.8	9.5	152	3337	437	7.1	6.3	86.4	419	1	67	10	0.96	41.	21	67	4.9	19
35.0	490	434	9.99	3608	16.0	8.8	166	3396	374	6.0	5.4	87.0	489	1	70	9	0.88	47.	24	75	5.3	
40.0	560	496	11.42	3863	17.1	8.2	178	3440	328	5.3	4.7	87.4	560	0	73	9	0.82	52.	27	83	5.7	
45.0	630	558	12.84	4102	18.2	7.7	190	3475	291	4.6	4.1	87.7	630	0	76	8	0.76	57.	30	91	6.0	
50.0	700	620	14.27	4330	19.2	7.3	201	3502	262	4.2	3.7	87.9	700	0	79	8	0.72	63.	33	98	6.4	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

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14 N on 140 Ce

14 N on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 58. ZC= 65.(Tb)
NEUTRON NUMBERS: NP= 7. NT= 82. NC= 89.

AP**1/3= 2.410 AT**1/3= 5.192
REDUCED MASS NUMBER= 12.73 AP+AT=AC=154.

INTERACTION RADIUS RINT=11.36 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 5.87 CT+CP= 8.16 C= 1.64

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.04

COULOMB RADII [fm]:
RCP= 2.65 RCT= 5.82 RC=RCP+RCT= 8.47

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 93.14 MeV K= .05521 n=2.847
VC(RINT)= 51.4 MeV

FISSION-TKE= 107. MeV
ASYMM. FISSION-TKE= 41. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.910 MeV/fm**2 PROX-FACTOR= 18.80 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -88.2
COMPOUND NUCLEUS: -70.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.25 fm V(RB)= 53.0 MeV
Q-VALUE= -14.8 MeV
L-CRITICAL= 60.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	14	13	0.25	604	2.8	63.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	25	0.50	855	3.9	45.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	38	0.74	1047	4.8	36.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	51	0.99	1210	5.6	32.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	63	57	1.11	1283	5.9	30.1	21	451	245	109.3	103.7	35.4	49	14	35	94	7.60	6.	4	12	1.5	4
5.0	70	64	1.24	1353	6.2	28.6	31	827	551	85.5	79.8	47.3	59	11	39	65	5.25	6.	4	14	1.6	4
5.5	77	70	1.36	1419	6.5	27.3	38	1131	800	71.1	65.8	54.5	68	9	41	53	4.26	7.	5	16	1.7	5
6.0	84	76	1.49	1483	6.8	26.1	44	1383	1008	61.1	56.3	59.5	77	7	43	46	3.67	7.	5	18	1.8	5
6.5	91	83	1.61	1543	7.1	25.1	50	1595	1185	53.7	49.3	63.2	85	6	44	41	3.28	8.	6	19	1.9	6
7.0	98	89	1.73	1602	7.4	24.2	54	1777	1335	47.9	43.9	66.0	93	5	45	37	2.99	9.	6	21	2.0	6
7.5	105	95	1.86	1658	7.6	23.3	59	1933	1466	43.3	39.6	68.3	100	5	46	34	2.76	9.	6	22	2.0	7
8.0	112	102	1.98	1713	7.9	22.6	63	2070	1581	39.5	36.1	70.2	108	4	47	32	2.58	10.	7	23	2.1	7
8.5	119	108	2.11	1766	8.1	21.9	67	2191	1682	36.4	33.2	71.8	115	4	48	30	2.43	10.	7	24	2.2	8
9.0	126	115	2.23	1817	8.4	21.3	70	2297	1659	33.7	30.7	73.2	123	3	49	29	2.31	11.	7	26	2.3	8
9.5	133	121	2.35	1867	8.6	20.7	74	2393	1572	31.4	28.6	74.3	130	3	49	27	2.20	11.	8	27	2.3	8
10.0	140	127	2.48	1916	8.8	20.2	77	2479	1493	29.4	26.8	75.3	137	3	50	26	2.10	12.	8	28	2.4	9
10.5	147	134	2.60	1964	9.0	19.7	80	2556	1422	27.6	25.1	76.2	144	3	50	25	2.02	13.	8	29	2.5	9
11.0	154	140	2.72	2010	9.2	19.3	83	2627	1357	26.0	23.7	77.0	151	3	51	24	1.95	13.	9	30	2.5	10
11.5	161	146	2.85	2056	9.4	18.9	86	2691	1298	24.6	22.4	77.7	159	2	51	23	1.88	14.	9	31	2.6	10
12.0	168	153	2.97	2100	9.6	18.5	89	2750	1244	23.4	21.3	78.3	166	2	52	23	1.82	14.	9	32	2.7	10
13.0	182	165	3.22	2186	10.0	17.7	95	2853	1148	21.2	19.3	79.4	180	2	53	21	1.72	15.	10	34	2.8	11
14.0	196	178	3.47	2269	10.4	17.1	100	2942	1066	19.4	17.7	80.3	194	2	54	20	1.63	16.	11	36	2.9	12
15.0	210	191	3.72	2350	10.8	16.5	105	3019	995	17.9	16.3	81.0	208	2	54	19	1.55	17.	11	38	3.0	13
16.0	224	204	3.96	2427	11.1	16.0	109	3086	933	16.6	15.1	81.7	222	2	55	18	1.49	19.	12	40	3.1	13
17.0	238	216	4.21	2503	11.5	15.5	114	3145	878	15.5	14.1	82.2	237	1	56	18	1.43	20.	12	42	3.2	14
18.0	252	229	4.46	2576	11.8	15.1	118	3198	829	14.5	13.2	82.7	251	1	56	17	1.38	21.	13	43	3.3	15
19.0	266	242	4.71	2647	12.1	14.7	122	3245	786	13.7	12.4	83.2	265	1	57	17	1.33	22.	14	45	3.4	15
20.0	280	255	4.95	2717	12.4	14.3	126	3287	746	12.9	11.7	83.5	279	1	58	16	1.29	23.	14	47	3.5	16
25.0	350	318	6.19	3042	13.9	12.8	145	3446	597	10.1	9.2	85.0	349	1	61	14	1.12	28.	17	55	4.0	19
30.0	420	382	7.43	3336	15.2	11.7	161	3552	497	8.3	7.5	85.9	419	1	63	13	1.01	33.	20	63	4.4	22
35.0	490	445	8.67	3608	16.5	10.8	176	3628	426	7.0	6.4	86.5	489	1	66	11	0.92	38.	23	71	4.7	
40.0	560	509	9.91	3863	17.6	10.1	190	3684	373	6.1	5.5	86.9	559	1	68	11	0.86	42.	26	79	5.1	
45.0	630	573	11.15	4102	18.7	9.5	202	3727	331	5.4	4.9	87.3	630	0	70	10	0.80	46.	29	86	5.4	
50.0	700	636	12.38	4330	19.7	9.0	214	3762	298	4.8	4.4	87.6	700	0	72	9	0.76	51.	32	93	5.7	

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14 N on 154 Sm

14 N on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 62. ZC= 69.(Tm)
NEUTRON NUMBERS: NP= 7. NT= 92. NC= 99.

AP**1/3= 2.410 AT**1/3= 5.360
REDUCED MASS NUMBER= 12.83 AP+AT=AC=168.

INTERACTION RADIUS RINT=11.54 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 6.09 CT+CP= 8.37 C= 1.66

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.25

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.00 RC=RCP+RCT= 8.65

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 97.31 MeV K= .05178 n=2.867
VC(RINT)= 54.1 MeV

FISSION-TKE= 115. MeV
ASYMM. FISSION-TKE= 42. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 18.72 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.10 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -72.1
COMPOUND NUCLEUS: -60.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.41 fm V(RB)= 55.7 MeV
Q-VALUE= -9.1 MeV
L-CRITICAL= 62.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	14	13	0.24	604	2.8	68.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	26	0.47	855	4.0	48.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	39	0.71	1047	4.9	39.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	51	0.95	1210	5.6	34.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	63	58	1.07	1283	6.0	32.2	17	293	120	123.8	119.3	28.1	48	15	34	128	9.84	5.	3	12	1.5	4
5.0	70	64	1.19	1353	6.3	30.6	29	701	448	93.7	88.5	43.1	59	11	38	77	5.90	6.	4	14	1.6	5
5.5	77	71	1.31	1419	6.6	29.1	37	1029	717	76.9	72.0	51.5	68	9	41	60	4.61	6.	5	16	1.7	5
6.0	84	77	1.42	1483	6.9	27.9	43	1301	941	65.7	61.1	57.2	76	8	43	51	3.91	7.	5	17	1.8	6
6.5	91	83	1.54	1543	7.2	26.8	49	1530	1131	57.4	53.2	61.3	85	6	44	45	3.46	7.	5	19	1.9	7
7.0	98	90	1.66	1602	7.4	25.8	54	1725	1293	51.1	47.3	64.5	92	6	45	41	3.13	8.	6	20	2.0	7
7.5	105	96	1.78	1658	7.7	25.0	59	1894	1434	46.1	42.5	67.0	100	5	46	38	2.88	8.	6	21	2.0	7
8.0	112	103	1.90	1713	7.9	24.2	63	2042	1557	42.0	38.7	69.0	108	4	47	35	2.68	9.	7	23	2.1	8
8.5	119	109	2.02	1766	8.2	23.4	67	2172	1666	38.5	35.5	70.7	115	4	48	33	2.52	9.	7	24	2.2	9
9.0	126	116	2.14	1817	8.4	22.8	71	2287	1734	35.6	32.8	72.2	122	4	49	31	2.39	10.	7	25	2.3	9
9.5	133	122	2.25	1867	8.7	22.2	74	2390	1643	33.2	30.5	73.4	130	3	49	30	2.27	10.	8	26	2.3	9
10.0	140	128	2.37	1916	8.9	21.6	78	2482	1561	31.0	28.5	74.5	137	3	50	28	2.17	11.	8	27	2.4	10
10.5	147	135	2.49	1964	9.1	21.1	81	2566	1486	29.1	26.8	75.4	144	3	50	27	2.08	12.	8	28	2.4	10
11.0	154	141	2.61	2010	9.3	20.6	84	2642	1419	27.4	25.2	76.3	151	3	51	26	2.00	12.	9	29	2.5	11
11.5	161	148	2.73	2056	9.5	20.2	87	2711	1357	26.0	23.9	77.0	159	2	51	25	1.93	13.	9	30	2.6	11
12.0	168	154	2.85	2100	9.7	19.7	90	2775	1300	24.6	22.6	77.7	166	2	52	24	1.87	13.	9	31	2.6	12
13.0	182	167	3.09	2186	10.1	19.0	96	2887	1200	22.3	20.5	78.8	180	2	52	23	1.76	14.	10	33	2.7	13
14.0	196	180	3.32	2269	10.5	18.3	101	2982	1115	20.4	18.8	79.8	194	2	53	22	1.67	15.	11	35	2.8	13
15.0	210	193	3.56	2350	10.9	17.6	106	3065	1040	18.8	17.3	80.6	208	2	54	21	1.59	16.	11	37	3.0	14
16.0	224	205	3.80	2427	11.2	17.1	111	3138	975	17.5	16.0	81.3	222	2	55	20	1.52	17.	12	39	3.1	15
17.0	238	218	4.03	2503	11.6	16.6	116	3201	918	16.3	14.9	81.9	237	1	55	19	1.46	18.	12	41	3.2	16
18.0	252	231	4.27	2576	11.9	16.1	120	3258	867	15.3	14.0	82.4	251	1	56	18	1.41	19.	13	42	3.3	17
19.0	266	244	4.51	2647	12.2	15.7	125	3309	821	14.3	13.2	82.8	265	1	56	18	1.36	20.	14	44	3.3	17
20.0	280	257	4.75	2717	12.6	15.3	129	3354	780	13.5	12.4	83.2	279	1	57	17	1.31	21.	14	46	3.4	18
25.0	350	321	5.93	3042	14.0	13.7	148	3527	624	10.6	9.7	84.7	349	1	60	15	1.14	26.	17	54	3.9	21
30.0	420	385	7.12	3336	15.4	12.5	165	3641	520	8.7	8.0	85.7	419	1	62	13	1.03	30.	20	62	4.2	24
35.0	490	449	8.31	3608	16.6	11.6	180	3722	446	7.4	6.7	86.3	489	1	64	12	0.94	34.	23	70	4.6	
40.0	560	513	9.49	3863	17.8	10.8	194	3783	390	6.4	5.9	86.8	559	1	66	11	0.87	39.	26	77	4.9	
45.0	630	578	10.68	4102	18.8	10.2	207	3830	346	5.6	5.2	87.2	630	0	68	11	0.82	43.	29	84	5.2	
50.0	700	642	11.87	4330	19.8	9.7	219	3867	312	5.0	4.6	87.5	700	0	70	10	0.77	46.	32	91	5.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 75 14 N on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 67. ZC= 74.(W)
NEUTRON NUMBERS: NP= 7. NT= 98. NC=105.

AP**1/3= 2.410 AT**1/3= 5.485
REDUCED MASS NUMBER= 12.91 AP+AT=AC=179.

INTERACTION RADIUS RINT=11.68 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 6.25 CT+CP= 8.53 C= 1.67

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.41

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.15 RC=RCP+RCT= 8.81

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 102.99 MeV K= .04810 n=2.900
VC(RINT)= 57.8 MeV

FISSION-TKE= 126. MeV
ASYMM. FISSION-TKE= 43. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 18.91 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -63.7
COMPOUND NUCLEUS: -47.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.53 fm V(RB)= 59.5 MeV
Q-VALUE= -13.5 MeV
L-CRITICAL= 63.

14 N on 165 Ho

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SQMAX	SQFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	13	0.22	604	2.8	73.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	26	0.45	855	4.0	52.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	42	39	0.67	1047	4.9	42.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	56	52	0.89	1210	5.6	36.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	63	58	1.01	1283	6.0	34.8	5	27	0	165.1	163.8	7.4	45	18	33	470	38.35	0.	3 11	1.4	4
5.0	70	65	1.12	1353	6.3	33.0	24	483	269	108.6	103.8	35.7	57	13	38	102	7.33	5.	4 13	1.5	5
5.5	77	71	1.23	1419	6.6	31.5	33	842	561	86.8	82.0	46.6	67	10	41	73	5.23	6.	5 15	1.6	5
6.0	84	77	1.34	1483	6.9	30.1	41	1139	805	73.2	68.6	53.4	75	9	43	60	4.28	6.	5 17	1.7	6
6.5	91	84	1.45	1543	7.2	29.0	47	1388	1011	63.5	59.3	58.3	84	7	45	52	3.72	7.	5 18	1.8	6
7.0	98	90	1.56	1602	7.5	27.9	52	1601	1187	56.2	52.3	61.9	92	6	46	46	3.33	7.	6 20	1.9	7
7.5	105	97	1.68	1658	7.7	27.0	57	1785	1340	50.4	46.9	64.8	100	5	47	42	3.04	8.	6 21	1.9	7
8.0	112	103	1.79	1713	8.0	26.1	62	1946	1474	45.8	42.5	67.1	107	5	48	39	2.81	8.	7 22	2.0	8
8.5	119	110	1.90	1766	8.2	25.3	66	2087	1592	41.9	38.9	69.0	115	4	49	37	2.63	9.	7 23	2.1	8
9.0	126	116	2.01	1817	8.5	24.6	70	2213	1697	38.7	35.9	70.6	122	4	49	35	2.48	9.	7 25	2.1	9
9.5	133	123	2.12	1867	8.7	24.0	74	2325	1697	36.0	33.3	72.0	129	4	50	33	2.36	10.	8 26	2.2	9
10.0	140	129	2.23	1916	8.9	23.4	77	2426	1612	33.6	31.1	73.2	137	3	50	31	2.25	10.	8 27	2.3	10
10.5	147	136	2.35	1964	9.1	22.8	81	2517	1535	31.5	29.1	74.3	144	3	51	30	2.15	11.	8 28	2.3	10
11.0	154	142	2.46	2010	9.4	22.3	84	2599	1465	29.6	27.4	75.2	151	3	51	29	2.07	11.	9 29	2.4	11
11.5	161	148	2.57	2056	9.6	21.8	87	2675	1402	28.0	25.9	76.0	158	3	52	28	1.99	12.	9 30	2.5	11
12.0	168	155	2.68	2100	9.8	21.3	90	2744	1343	26.5	24.5	76.7	165	3	52	27	1.93	12.	9 31	2.5	11
13.0	182	168	2.90	2186	10.2	20.5	96	2866	1240	24.0	22.2	78.0	180	2	53	25	1.81	13.	10 33	2.6	12
14.0	196	181	3.13	2269	10.6	19.7	102	2970	1151	22.0	20.3	79.0	194	2	54	24	1.71	14.	10 35	2.7	13
15.0	210	194	3.35	2350	10.9	19.1	107	3061	1074	20.2	18.7	79.9	208	2	55	23	1.63	15.	11 36	2.8	14
16.0	224	206	3.58	2427	11.3	18.5	112	3140	1007	18.7	17.3	80.6	222	2	55	22	1.56	16.	12 38	2.9	15
17.0	238	219	3.80	2503	11.6	17.9	117	3209	948	17.5	16.1	81.3	236	2	56	21	1.49	17.	12 40	3.0	15
18.0	252	232	4.02	2576	12.0	17.4	121	3271	895	16.3	15.1	81.8	251	1	56	20	1.44	18.	13 42	3.1	16
19.0	266	245	4.25	2647	12.3	16.9	126	3326	848	15.4	14.2	82.3	265	1	57	19	1.39	19.	14 44	3.2	17
20.0	280	258	4.47	2717	12.6	16.5	130	3376	806	14.5	13.4	82.8	279	1	58	19	1.34	20.	14 45	3.3	18
25.0	350	323	5.59	3042	14.1	14.8	149	3563	644	11.3	10.4	84.4	349	1	60	16	1.17	24.	17 53	3.7	21
30.0	420	387	6.70	3336	15.5	13.5	167	3688	537	9.3	8.5	85.4	419	1	62	15	1.05	28.	20 61	4.1	24
35.0	490	452	7.82	3608	16.7	12.5	182	3777	460	7.8	7.2	86.1	489	1	65	13	0.96	33.	23 69	4.4	
40.0	560	516	8.94	3863	17.9	11.7	196	3843	403	6.8	6.3	86.6	559	1	67	12	0.89	37.	26 76	4.7	
45.0	630	581	10.06	4102	18.9	11.0	210	3894	358	6.0	5.5	87.0	630	0	68	12	0.83	40.	29 83	5.0	
50.0	700	645	11.17	4330	20.0	10.4	222	3935	322	5.4	5.0	87.3	700	0	70	11	0.78	44.	31 90	5.3	

 # 76 14 N on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 73. ZC= 80.(Hg)
NEUTRON NUMBERS: NP= 7. NT=108. NC=115.

AP**1/3= 2.410 AT**1/3= 5.657
REDUCED MASS NUMBER= 12.99 AP+AT=AC=195.

INTERACTION RADIUS RINT=11.86 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 6.47 CT+CP= 8.75 C= 1.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.62

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.35 RC=RCP+RCT= 9.01

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 109.38 MeV K= .04406 n=2.933
VC(RINT)= 61.9 MeV

FISSION-TKE= 140. MeV
ASYMM. FISSION-TKE= 45. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 19.01 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.92 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -46.0
COMPOUND NUCLEUS: -29.0

FUSION RELATED PARAMETERS:
R-BARRIER=10.70 fm V(RB)= 63.8 MeV
Q-VALUE= -14.1 MeV
L-CRITICAL= 65.

14 N on 181 Ta

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SQMAX	SQFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	13	0.21	604	2.8	80.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	28	26	0.42	855	4.0	56.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	42	39	0.63	1047	4.9	46.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	56	52	0.84	1210	5.7	40.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	63	58	0.94	1283	6.0	37.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	70	65	1.05	1353	6.4	36.0	16	227	64	131.8	128.4	24.1	54	16	37	167	11.25	5.	4 13	1.4	5
5.5	77	71	1.15	1419	6.7	34.3	29	626	385	100.1	95.6	40.0	65	12	41	94	6.29	5.	4 15	1.5	5
6.0	84	78	1.26	1483	7.0	32.8	37	954	652	82.7	78.3	48.7	74	10	43	72	4.84	6.	5 16	1.6	6
6.5	91	84	1.36	1543	7.2	31.6	44	1229	878	70.9	66.8	54.5	83	8	45	61	4.08	6.	5 18	1.7	6
7.0	98	91	1.47	1602	7.5	30.4	50	1463	1072	62.3	58.5	58.9	91	7	46	54	3.59	7.	6 19	1.8	7
7.5	105	97	1.57	1658	7.8	29.4	56	1666	1240	55.6	52.1	62.2	99	6	48	49	3.25	7.	6 20	1.8	7
8.0	112	104	1.68	1713	8.0	28.4	61	1843	1388	50.3	47.1	64.8	107	5	48	45	2.99	8.	7 22	1.9	8
8.5	119	110	1.78	1766	8.3	27.6	65	1999	1517	45.9	42.9	67.0	114	5	49	42	2.78	8.	7 23	2.0	8
9.0	126	117	1.89	1817	8.5	26.8	69	2137	1633	42.3	39.5	68.8	122	4	50	39	2.61	9.	7 24	2.1	9
9.5	133	123	1.99	1867	8.8	26.1	73	2261	1736	39.2	36.6	70.4	129	4	51	37	2.47	9.	8 25	2.1	9
10.0	140	130	2.10	1916	9.0	25.4	77	2372	1681	36.5	34.0	71.7	136	4	51	35	2.35	10.	8 26	2.2	10
10.5	147	136	2.20	1964	9.2	24.8	81	2472	1601	34.2	31.9	72.9	144	3	52	34	2.24	10.	8 27	2.2	10
11.0	154	143	2.31	2010	9.4	24.3	84	2563	1528	32.2	30.0	73.9	151	3	52	32	2.15	10.	9 28	2.3	11
11.5	161	149	2.41	2056	9.6	23.7	87	2646	1461	30.4	28.3	74.8	158	3	53	31	2.07	11.	9 29	2.4	11
12.0	168	156	2.52	2100	9.8	23.2	91	2722	1400	28.7	26.7	75.6	165	3	53	30	2.00	11.	9 30	2.4	11
13.0	182	169	2.73	2186	10.2	22.3	97	2856	1293	26.0	24.2	77.0	180	2	54	28	1.87	12.	10 32	2.5	12
14.0	196	182	2.94	2269	10.6	21.5	102	2971	1200	23.7	22.1	78.1	194	2	55	26	1.77	13.	10 34	2.6	13
15.0	210	195	3.15	2350	11.0	20.8	108	3071	1120	21.8	20.3	79.1	208	2	55	25	1.68	14.	11 36	2.7	14
16.0	224	208	3.36	2427	11.4	20.1	113	3158	1050	20.2	18.8	79.9	222	2	56	24	1.60	15.	12 37	2.8	15
17.0	238	221	3.57	2503	11.7	19.5	118	3234	988	18.8	17.5	80.6	236	2	56	23	1.53	16.	12 39	2.9	16
18.0	252	234	3.78	2576	12.1	19.0	123	3302	933	17.6	16.3	81.2	250	2	57	22	1.47	17.	13 41	3.0	17
19.0	266	247	3.99	2647	12.4	18.5	127	3363	884	16.5	15.3	81.7	265	1	57	21	1.42	17.	13 43	3.1	17
20.0	280	260	4.20	2717	12.7	18.0	132	3418	840	15.6	14.5	82.2	279	1	58	21	1.37	18.	14 44	3.2	18
25.0	350	325	5.24	3042	14.2	16.1	152	3625	672	12.1	11.3	83.9	349	1	60	18	1.19	22.	17 52	3.6	22
30.0	420	390	6.29	3336	15.6	14.7	169	3762	560	9.9	9.2	85.0	419	1	62	16	1.07	26.	20 60	3.9	25
35.0	490	455	7.34	3608	16.8	13.6	185	3860	480	8.4	7.8	85.8	489	1	64	15	0.98	30.	23 67	4.3	
40.0	560	520	8.39	3863	18.0	12.7	200	3933	420	7.3	6.8	86.4	559	1	66	14	0.90	34.	26 74	4.6	
45.0	630	585	9.44	4102	19.1	12.0	214	3990	373	6.4	6.0	86.8	629	1	68	13	0.85	38.	28 81	4.8	
50.0	700	650	10.49	4330	20.1	11.4	227	4035	336	5.7	5.3	87.1	700	0	70	12	0.80	41.	31 88	5.1	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 77 14 N on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 79. ZC= 86.(Rn)
NEUTRON NUMBERS: NP= 7. NT=118. NC=125.

AP**1/3= 2.410 AT**1/3= 5.819
REDUCED MASS NUMBER= 13.07 AP+AT=AC=211.

INTERACTION RADIUS RINT=12.04 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 6.68 CT+CP= 8.96 C̄= 1.70

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.83

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.55 RC=RCP+RCT= 9.20

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 115.59 MeV K= .04047 n=2.965
VC(RINT)= 66.1 MeV

FISSION-TKE= 155. MeV
ASYMM. FISSION-TKE= 46. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 19.09 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.83 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -28.6
COMPOUND NUCLEUS: -7.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.87 fm V(RB)= 68.0 MeV
Q-VALUE= -18.0 MeV
L-CRITICAL= 66.

14 N on 197 Au

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	13	0.20	604	2.9	87.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	26	0.40	855	4.0	61.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	39	0.59	1047	5.0	50.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	52	0.79	1210	5.7	43.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	63	59	0.89	1283	6.1	41.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	70	65	0.99	1353	6.4	38.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	77	72	1.09	1419	6.7	37.1	23	397	199	116.8	113.1	31.6	63	14	40	130	8.21	5.	4	14	1.4	5
6.0	84	78	1.19	1483	7.0	35.5	33	757	492	93.6	89.5	43.2	73	11	43	90	5.61	5.	5	16	1.5	5
6.5	91	85	1.29	1543	7.3	34.2	41	1058	739	79.2	75.2	50.4	82	9	45	72	4.54	6.	5	17	1.6	6
7.0	98	91	1.39	1602	7.6	32.9	48	1315	951	68.9	65.2	55.5	90	8	47	62	3.91	6.	6	19	1.7	6
7.5	105	98	1.48	1658	7.8	31.8	54	1537	1135	61.2	57.8	59.4	98	7	48	56	3.48	7.	6	20	1.7	7
8.0	112	105	1.58	1713	8.1	30.8	59	1730	1296	55.1	51.9	62.4	106	6	49	51	3.17	7.	6	21	1.8	7
8.5	119	111	1.68	1766	8.3	29.9	64	1901	1438	50.1	47.2	64.9	114	5	50	47	2.93	8.	7	22	1.9	8
9.0	126	118	1.78	1817	8.6	29.0	68	2052	1564	46.0	43.2	67.0	121	5	51	44	2.74	8.	7	23	1.9	9
9.5	133	124	1.88	1867	8.8	28.3	73	2187	1677	42.6	40.0	68.7	129	4	51	41	2.58	8.	8	24	2.0	9
10.0	140	131	1.98	1916	9.0	27.5	76	2308	1744	39.6	37.1	70.2	136	4	52	39	2.45	9.	8	26	2.1	9
10.5	147	137	2.08	1964	9.3	26.9	80	2418	1661	37.0	34.7	71.5	143	4	52	37	2.33	9.	8	27	2.1	10
11.0	154	144	2.18	2010	9.5	26.3	84	2518	1585	34.8	32.6	72.6	151	3	53	36	2.23	10.	8	28	2.2	10
11.5	161	150	2.28	2056	9.7	25.7	87	2608	1516	32.8	30.7	73.6	158	3	53	34	2.15	10.	9	29	2.2	11
12.0	168	157	2.37	2100	9.9	25.1	91	2692	1453	31.0	29.0	74.5	165	3	54	33	2.07	11.	9	30	2.3	11
13.0	182	170	2.57	2186	10.3	24.2	97	2838	1341	28.0	26.2	76.0	179	3	55	31	1.93	11.	10	31	2.4	12
14.0	196	183	2.77	2269	10.7	23.3	103	2964	1246	25.5	23.8	77.3	194	2	55	29	1.82	12.	10	33	2.5	13
15.0	210	196	2.97	2350	11.1	22.5	109	3073	1163	23.4	21.9	78.3	208	2	56	28	1.73	13.	11	35	2.6	14
16.0	224	209	3.17	2427	11.4	21.8	114	3168	1090	21.7	20.2	79.2	222	2	56	26	1.65	14.	12	37	2.7	15
17.0	238	222	3.36	2503	11.8	21.1	119	3252	1026	20.1	18.8	79.9	236	2	57	25	1.58	15.	12	38	2.8	16
18.0	252	235	3.56	2576	12.1	20.5	124	3326	969	18.8	17.6	80.6	250	2	58	24	1.51	15.	13	40	2.9	17
19.0	266	248	3.76	2647	12.5	20.0	128	3393	918	17.7	16.5	81.2	264	2	58	23	1.46	16.	13	42	3.0	17
20.0	280	261	3.96	2717	12.8	19.5	133	3452	872	16.7	15.6	81.7	279	1	59	23	1.41	17.	14	43	3.0	18
25.0	350	327	4.95	3042	14.3	17.4	154	3679	697	12.9	12.1	83.5	349	1	61	19	1.22	21.	17	51	3.4	22
30.0	420	392	5.94	3336	15.7	15.9	172	3829	581	10.6	9.9	84.7	419	1	63	17	1.09	25.	20	59	3.8	25
35.0	490	457	6.93	3608	16.9	14.7	188	3936	498	8.9	8.3	85.5	489	1	65	16	0.99	28.	23	66	4.1	
40.0	560	523	7.92	3863	18.1	13.8	203	4016	436	7.7	7.2	86.1	559	1	66	15	0.92	32.	25	73	4.4	
45.0	630	588	8.90	4102	19.2	13.0	218	4078	387	6.8	6.4	86.6	629	1	68	14	0.86	35.	28	80	4.6	
50.0	700	654	9.89	4330	20.2	12.3	231	4128	348	6.1	5.7	86.9	700	0	69	13	0.81	38.	31	86	4.9	

\# 78 14 N on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 82. ZC= 89.(Ac)
NEUTRON NUMBERS: NP= 7. NT=126. NC=133.

AP**1/3= 2.410 AT**1/3= 5.925
REDUCED MASS NUMBER= 13.12 AP+AT=AC=222.

INTERACTION RADIUS RINT=12.15 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 6.82 CT+CP= 9.10 C̄= 1.71

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.96

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.66 RC=RCP+RCT= 9.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 118.37 MeV K= .03880 n=2.977
VC(RINT)= 67.9 MeV

FISSION-TKE= 162. MeV
ASYMM. FISSION-TKE= 47. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.885 MeV/fm**2 PROX-FACTOR= 19.00 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.78 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -19.5
COMPOUND NUCLEUS: 17.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.98 fm V(RB)= 69.9 MeV
Q-VALUE= -34.2 MeV
L-CRITICAL= 67.

14 N on 208 Pb

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	13	0.19	604	2.9	90.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	26	0.39	855	4.1	63.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	39	0.58	1047	5.0	52.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	52	0.77	1210	5.7	45.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	63	59	0.87	1283	6.1	42.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	70	66	0.97	1353	6.4	40.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	77	72	1.06	1419	6.7	38.5	20	294	118	126.1	122.9	26.9	63	14	40	159	9.78	5.	4	14	1.2	4
6.0	84	79	1.16	1483	7.0	36.9	31	672	424	99.0	95.2	40.5	73	11	43	100	6.08	5.	5	15	1.3	5
6.5	91	85	1.26	1543	7.3	35.5	40	987	683	83.1	79.3	48.4	82	9	45	79	4.79	6.	5	17	1.4	6
7.0	98	92	1.35	1602	7.6	34.2	47	1255	904	72.0	68.5	54.0	90	8	47	67	4.08	6.	6	18	1.4	6
7.5	105	98	1.45	1658	7.9	33.0	53	1487	1096	63.8	60.4	58.1	98	7	48	59	3.61	6.	6	20	1.5	7
8.0	112	105	1.55	1713	8.1	32.0	59	1690	1264	57.3	54.2	61.4	106	6	49	54	3.27	7.	6	21	1.6	7
8.5	119	111	1.64	1766	8.4	31.0	63	1868	1413	52.0	49.1	64.0	114	5	50	50	3.02	7.	7	22	1.7	8
9.0	126	118	1.74	1817	8.6	30.1	68	2026	1544	47.7	45.0	66.1	121	5	51	46	2.81	8.	7	23	1.7	9
9.5	133	125	1.83	1867	8.8	29.3	72	2167	1662	44.1	41.5	68.0	129	4	52	43	2.65	8.	7	24	1.8	9
10.0	140	131	1.93	1916	9.1	28.6	77	2293	1769	41.0	38.6	69.5	136	4	52	41	2.50	8.	8	25	1.9	9
10.5	147	138	2.03	1964	9.3	27.9	80	2408	1698	38.3	36.0	70.9	143	4	53	39	2.38	9.	8	26	1.9	10
11.0	154	144	2.12	2010	9.5	27.3	84	2512	1621	35.9	33.8	72.0	151	3	53	37	2.28	9.	8	27	2.0	11
11.5	161	151	2.22	2056	9.7	26.7	88	2607	1550	33.8	31.8	73.1	158	3	54	36	2.19	10.	9	28	2.0	11
12.0	168	157	2.32	2100	9.9	26.1	91	2694	1486	32.0	30.1	74.0	165	3	54	35	2.10	10.	9	29	2.1	11
13.0	182	171	2.51	2186	10.3	25.1	97	2847	1371	28.8	27.1	75.6	179	3	55	32	1.97	11.	10	31	2.2	12
14.0	196	184	2.70	2269	10.7	24.2	104	2979	1273	26.3	24.7	76.9	194	2	55	30	1.85	12.	10	33	2.3	13
15.0	210	197	2.90	2350	11.1	23.3	109	3092	1189	24.1	22.6	77.9	208	2	56	29	1.75	12.	11	35	2.4	14
16.0	224	210	3.09	2427	11.5	22.6	115	3192	1114	22.3	20.9	78.9	222	2	57	27	1.67	13.	12	36	2.5	15
17.0	238	223	3.28	2503	11.8	21.9	120	3279	1049	20.7	19.4	79.6	236	2	57	26	1.60	14.	12	38	2.6	16
18.0	252	236	3.48	2576	12.2	21.3	125	3357	990	19.4	18.2	80.3	250	2	58	25	1.54	15.	13	40	2.7	17
19.0	266	249	3.67	2647	12.5	20.7	130	3426	938	18.2	17.0	80.9	264	2	58	24	1.48	15.	13	41	2.8	18
20.0	280	262	3.86	2717	12.8	20.2	134	3489	891	17.1	16.1	81.4	279	1	59	23	1.43	16.	14	43	2.9	18
25.0	350	328	4.83	3042	14.3	18.1	155	3726	713	13.3	12.5	83.4	349	1	61	20	1.23	20.	17	51	3.3	22
30.0	420	394	5.79	3336	15.7	16.5	174	3883	594	10.9	10.2	84.6	419	1	63	18	1.10	23.	20	58	3.6	26
35.0	490	459	6.76	3608	17.0	15.3	190	3995	509	9.2	8.6	85.4	489	1	64	17	1.01	27.	23	65	3.9	
40.0	560	525	7.73	3863	18.1	14.3	206	4078	445	7.9	7.4	86.0	559	1	66	15	0.93	30.	25	72	4.2	
45.0	630	590	8.69	4102	19.2	13.5	220	4143	396	7.0	6.6	86.5	629	1	67	14	0.87	33.	28	79	4.5	
50.0	700	656	9.66	4330	20.3	12.8	233	4195	356	6.3	5.9	86.9	700	0	69	14	0.82	37.	31	85	4.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 79 14 N on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 83. ZC= 90.(Th)
NEUTRON NUMBERS: NP= 7. NT=126. NC=133.

AP**1/3= 2.410 AT**1/3= 5.934
REDUCED MASS NUMBER= 13.12 AP+AT=AC=223.

1NTERACTION RADIUS RINT=12.16 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 6.83 CT+CP= 9.11 C= 1.71

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 6.97

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.68 RC=RCP+RCT= 9.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 119.53 MeV K= .03829 n=2.984
VC(RINT)= 68.7 MeV

FISSION-TKE= 165. MeV
ASYMM. FISSION-TKE= 47. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 19.09 MeV
L-RLD= 76 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: -16.5
COMPOUND NUCLEUS: 20.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.99 fm V(RB)= 70.7 MeV
Q-VALUE= -33.9 MeV
L-CRITICAL= 67.

14 N on 209 Bi — 14 N on 209 Bi

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	13	0.19	604	2.9	91.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	26	0.38	855	4.1	64.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	39	0.57	1047	5.0	52.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	52	0.76	1210	5.7	45.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	63	59	0.86	1283	6.1	43.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	70	66	0.96	1353	6.4	40.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	77	72	1.05	1419	6.7	39.0	18	244	77	131.1	128.0	24.5	62	15	40	178	10.82	5.	4	14	1.2	4
6.0	84	79	1.15	1483	7.0	37.3	30	627	387	101.7	97.9	39.1	72	12	43	105	6.32	5.	5	15	1.3	5
6.5	91	85	1.24	1543	7.3	35.9	39	947	649	85.0	81.2	47.5	81	10	45	81	4.90	6.	5	17	1.4	6
7.0	98	92	1.34	1602	7.6	34.6	46	1219	873	73.5	69.9	53.2	90	8	47	69	4.15	6.	6	18	1.4	6
7.5	105	98	1.43	1658	7.9	33.4	52	1454	1068	65.0	61.6	57.5	98	7	48	61	3.66	6.	6	20	1.5	7
8.0	112	105	1.53	1713	8.1	32.3	58	1659	1238	58.3	55.2	60.8	106	6	50	55	3.31	7.	6	21	1.6	7
8.5	119	112	1.62	1766	8.4	31.4	63	1839	1388	52.9	50.0	63.5	113	6	50	51	3.05	7.	7	22	1.7	8
9.0	126	118	1.72	1817	8.6	30.5	68	1999	1522	48.5	45.8	65.7	121	5	51	47	2.84	8.	7	23	1.7	8
9.5	133	125	1.81	1867	8.8	29.7	72	2142	1641	44.8	42.2	67.6	128	5	52	44	2.67	8.	7	24	1.8	9
10.0	140	131	1.91	1916	9.1	28.9	76	2270	1749	41.6	39.2	69.2	136	4	52	42	2.52	8.	8	25	1.9	9
10.5	147	138	2.01	1964	9.3	28.2	80	2386	1703	38.9	36.6	70.6	143	4	53	40	2.40	9.	8	26	1.9	10
11.0	154	144	2.10	2010	9.5	27.6	84	2492	1625	36.5	34.3	71.8	150	4	53	38	2.29	9.	8	27	2.0	10
11.5	161	151	2.20	2056	9.7	27.0	87	2588	1555	34.3	32.3	72.8	158	3	54	37	2.20	10.	9	28	2.0	11
12.0	168	157	2.29	2100	9.9	26.4	91	2676	1490	32.5	30.5	73.8	165	3	54	35	2.12	10.	9	29	2.1	11
13.0	182	171	2.48	2186	10.3	25.4	97	2831	1375	29.3	27.5	75.4	179	3	55	33	1.97	11.	10	31	2.2	12
14.0	196	184	2.67	2269	10.7	24.5	103	2964	1277	26.6	25.0	76.7	194	2	56	31	1.86	12.	10	33	2.3	13
15.0	210	197	2.87	2350	11.1	23.6	109	3080	1192	24.4	22.9	77.8	208	2	56	29	1.76	12.	11	35	2.4	14
16.0	224	210	3.06	2427	11.5	22.9	114	3180	1117	22.6	21.2	78.7	222	2	57	28	1.68	13.	12	36	2.5	15
17.0	238	223	3.25	2503	11.8	22.2	120	3269	1051	21.0	19.7	79.5	236	2	57	27	1.60	14.	12	38	2.6	16
18.0	252	236	3.44	2576	12.2	21.6	125	3348	993	19.6	18.4	80.2	250	2	58	26	1.54	15.	13	40	2.7	17
19.0	266	249	3.63	2647	12.5	21.0	129	3418	941	18.4	17.3	80.8	264	2	58	25	1.48	15.	13	41	2.8	17
20.0	280	262	3.82	2717	12.8	20.5	134	3481	894	17.3	16.3	81.3	279	1	59	24	1.43	16.	14	43	2.9	18
25.0	350	328	4.78	3042	14.3	18.3	155	3721	715	13.5	12.6	83.3	349	1	61	21	1.24	20.	17	51	3.2	22
30.0	420	394	5.73	3336	15.7	16.7	174	3880	596	11.0	10.3	84.5	419	1	63	18	1.11	23.	20	58	3.6	26
35.0	490	459	6.69	3608	17.0	15.5	190	3994	510	9.3	8.7	85.4	489	1	65	17	1.01	27.	23	65	3.9	
40.0	560	525	7.64	3863	18.2	14.5	206	4078	447	8.0	7.5	86.0	559	1	66	16	0.93	30.	25	72	4.2	
45.0	630	590	8.60	4102	19.3	13.6	220	4144	397	7.1	6.6	86.5	629	1	68	15	0.87	33.	28	79	4.5	
50.0	700	656	9.55	4330	20.3	12.9	234	4197	357	6.3	5.9	86.8	699	1	69	14	0.82	36.	31	85	4.7	

 # 80 14 N on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 7. ZT= 92. ZC= 99.(Es)
NEUTRON NUMBERS: NP= 7. NT=146. NC=153.

AP**1/3= 2.410 AT**1/3= 6.197
REDUCED MASS NUMBER= 13.22 AP+AT=AC=252.

INTERACTION RADIUS RINT=12.45 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.28 CT= 7.16 CT+CP= 9.45 C= 1.73

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.66 RT= 7.30

COULOMB RADII [fm]:
RCP= 2.65 RCT= 6.98 RC=RCP+RCT= 9.63

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 127.98 MeV K= .03394 n=3.021
VC(RINT)= 74.4 MeV

FISSION-TKE= 188. MeV
ASYMM. FISSION-TKE= 50. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.874 MeV/fm**2 PROX-FACTOR= 19.00 MeV
L-RLD= 68 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 2.9 TARGET: 47.2
COMPOUND NUCLEUS: 78.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.26 fm V(RB)= 76.4 MeV
Q-VALUE= -28.4 MeV
L-CRITICAL= 70.

14 N on 238 U — 14 N on 238 U

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	14	13	0.18	604	2.9	101.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	28	26	0.36	855	4.1	71.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	42	40	0.53	1047	5.0	58.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	56	53	0.71	1210	5.8	50.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	63	60	0.80	1283	6.1	47.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	70	66	0.89	1353	6.5	45.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	77	73	0.98	1419	6.8	43.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	84	79	1.07	1483	7.1	41.4	22	325	145	124.5	121.6	27.8	70	14	43	166	9.30	5.	5	15	1.3	6
6.5	91	86	1.16	1543	7.4	39.8	34	688	440	99.8	96.4	40.1	80	11	46	109	6.05	5.	5	16	1.4	6
7.0	98	93	1.24	1602	7.7	38.3	42	996	693	84.7	81.3	47.7	89	9	48	87	4.82	5.	6	18	1.4	7
7.5	105	99	1.33	1658	7.9	37.0	49	1261	913	74.0	70.8	53.0	97	8	49	74	4.12	6.	6	19	1.5	8
8.0	112	106	1.42	1713	8.2	35.9	55	1492	1105	65.8	62.8	57.1	105	7	50	66	3.66	6.	6	20	1.6	8
8.5	119	112	1.51	1766	8.4	34.8	61	1696	1274	59.4	56.6	60.3	113	6	51	60	3.32	6.	7	21	1.6	9
9.0	126	119	1.60	1817	8.7	33.8	66	1876	1425	54.2	51.6	62.9	121	5	52	55	3.07	7.	7	22	1.7	9
9.5	133	126	1.69	1867	8.9	32.9	71	2037	1559	49.9	47.4	65.1	128	5	53	52	2.86	7.	7	23	1.8	10
10.0	140	132	1.78	1916	9.1	32.1	75	2182	1681	46.2	43.8	66.9	135	5	53	48	2.69	7.	8	24	1.8	11
10.5	147	139	1.87	1964	9.4	31.3	79	2313	1790	43.0	40.8	68.5	143	4	54	46	2.55	8.	8	25	1.9	11
11.0	154	145	1.95	2010	9.6	30.6	83	2432	1709	40.3	38.2	69.9	150	4	54	44	2.43	8.	8	26	1.9	12
11.5	161	152	2.04	2056	9.8	29.9	87	2540	1635	37.9	35.9	71.1	157	4	55	42	2.32	9.	9	27	2.0	12
12.0	168	159	2.13	2100	10.0	29.3	91	2640	1567	35.7	33.8	72.1	165	3	55	40	2.23	9.	9	28	2.0	13
13.0	182	172	2.31	2186	10.4	28.1	98	2815	1446	32.1	30.4	73.9	179	3	56	37	2.07	10.	10	30	2.1	14
14.0	196	185	2.49	2269	10.8	27.1	104	2965	1343	29.2	27.6	75.4	193	3	57	35	1.95	10.	10	32	2.2	15
15.0	210	198	2.67	2350	11.2	26.2	110	3095	1253	26.7	25.3	76.6	208	2	57	33	1.84	11.	11	33	2.3	16
16.0	224	212	2.84	2427	11.6	25.4	116	3208	1175	24.7	23.3	77.7	222	2	58	31	1.75	12.	11	35	2.4	17
17.0	238	225	3.02	2503	11.9	24.6	121	3308	1106	22.9	21.7	78.5	236	2	58	30	1.67	12.	12	37	2.5	18
18.0	252	238	3.20	2576	12.3	23.9	127	3397	1044	21.4	20.2	79.3	250	2	59	29	1.60	13.	13	38	2.6	19
19.0	266	251	3.38	2647	12.6	23.3	132	3477	989	20.0	19.0	80.0	264	2	59	28	1.54	14.	13	40	2.7	19
20.0	280	264	3.55	2717	12.9	22.7	136	3548	940	18.9	17.8	80.6	278	2	60	27	1.48	14.	14	42	2.7	20
25.0	350	331	4.44	3042	14.5	20.3	158	3818	752	14.6	13.8	82.7	349	1	62	23	1.28	18.	17	49	3.1	25
30.0	420	397	5.33	3336	15.8	18.5	178	3998	626	11.9	11.2	84.1	419	1	63	21	1.14	21.	20	56	3.4	29
35.0	490	463	6.22	3608	17.1	17.1	195	4126	537	10.0	9.5	85.0	489	1	65	19	1.04	24.	22	63	3.7	
40.0	560	529	7.11	3863	18.3	16.0	211	4222	470	8.7	8.2	85.7	559	1	66	17	0.96	27.	25	70	4.0	
45.0	630	595	8.00	4102	19.4	15.1	226	4296	417	7.7	7.2	86.2	629	1	68	16	0.90	30.	28	77	4.2	
50.0	700	661	8.89	4330	20.4	14.3	240	4355	376	6.8	6.5	86.6	699	1	69	15	0.85	33.	31	83	4.5	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	ops	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 14 N

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 81 16 O on 12 C — 16 O on 12 C — 16 O on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 6. ZC= 14.(Si)
NEUTRON NUMBERS: NP= 8. NT= 6. NC= 14.

AP**1/3= 2.520 AT**1/3= 2.289 ELSCAT <48 deg
REDUCED MASS NUMBER= 6.86 AP+AT=AC= 28.

INTERACTION RADIUS RINT= 8.32 fm RO= 1.73 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 2.12 CT+CP= 4.55 C= 1.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 2.52

COULOMB RADII [fm]:
RCP= 2.78 RCT= 2.51 RC=RCP+RCT= 5.30

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 18.36 MeV K= .09011 n=2.447
VC(RINT)= 8.3 MeV

FISSION-TKE= 29. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 13.53 MeV
L-RLD= 28 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 27.98 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: 0.0
COMPOUND NUCLEUS: -25.1

FUSION RELATED PARAMETERS:
R-BARRIER= 7.61 fm V(RB)= 8.3 MeV
Q-VALUE= 20.4 MeV
L-CRITICAL= 19.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	16	7	0.83	691	1.5	7.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	32	14	1.65	977	2.1	5.3	11	1019	720	51.5	21.8	64.3	26	6	0	9	4.24	18.	0 0	3.1	1
3.0	48	21	2.48	1197	2.6	4.4	17	1457	1086	29.3	12.5	75.3	45	3	0	6	2.81	25.	0 0	3.4	2
4.0	64	27	3.31	1383	3.0	3.8	21	1665	1270	20.6	8.8	79.7	62	2	0	5	2.25	34.	0 0	3.7	2
4.5	72	31	3.72	1467	3.2	3.6	23	1733	1264	17.9	7.7	81.1	70	2	68	4	2.07	38.	5 14	3.8	2
5.0	80	34	4.13	1546	3.4	3.4	24	1787	1137	15.8	6.8	82.1	79	1	73	4	1.93	42.	6 18	4.0	2
5.5	88	38	4.55	1622	3.5	3.2	26	1830	1034	14.2	6.1	82.9	87	1	77	4	1.82	47.	6 21	4.1	2
6.0	96	41	4.96	1694	3.7	3.1	27	1865	948	12.9	5.5	83.6	95	1	82	3	1.72	51.	7 24	4.2	2
6.5	104	45	5.37	1764	3.8	3.0	29	1895	875	11.8	5.1	84.1	103	1	86	3	1.64	55.	7 26	4.3	2
7.0	112	48	5.79	1831	4.0	2.9	30	1920	812	10.9	4.7	84.6	111	1	90	3	1.56	59.	8 29	4.4	2
7.5	120	51	6.20	1895	4.1	2.8	31	1942	758	10.1	4.3	85.0	119	1	94	3	1.50	61.	8 31	4.5	3
8.0	128	55	6.61	1958	4.2	2.7	33	1961	711	9.4	4.0	85.3	127	1	99	3	1.44	65.	9 33	4.6	3
8.5	136	58	7.03	2018	4.4	2.6	34	1977	669	8.8	3.8	85.6	135	1	103	3	1.39	69.	9 35	4.7	3
9.0	144	62	7.44	2077	4.5	2.5	35	1992	632	8.3	3.5	85.9	143	1	107	3	1.35	73.	10 37	4.8	3
9.5	152	65	7.85	2134	4.6	2.5	36	2005	598	7.8	3.3	86.1	151	1	111	3	1.31	78.	10 39	4.9	3
10.0	160	69	8.27	2190	4.7	2.4	37	2016	568	7.4	3.2	86.3	159	1	115	3	1.27	82.	11 40	5.0	3
10.5	168	72	8.68	2244	4.9	2.3	38	2027	541	7.0	3.0	86.5	167	1	118	2	1.23	86.	11 42	5.1	3
11.0	176	75	9.09	2297	5.0	2.3	39	2036	517	6.7	2.9	86.7	175	1	122	2	1.20	86.	12 44	5.2	4
11.5	184	79	9.51	2349	5.1	2.2	40	2044	494	6.4	2.7	86.8	183	1	126	2	1.17	90.	12 45	5.3	4
12.0	192	82	9.92	2400	5.2	2.2	41	2052	474	6.1	2.6	87.0	191	1	130	2	1.15	94.	13 47	5.4	4
13.0	208	89	10.75	2499	5.4	2.1	43	2065	437	5.6	2.4	87.2	208	0	137	2	1.10	102.	14 50	5.6	4
14.0	224	96	11.57	2594	5.6	2.0	45	2077	406	5.2	2.2	87.4	224	0	145	2	1.05	110.	14 53	5.8	4
15.0	240	103	12.40	2685	5.8	2.0	46	2087	379	4.8	2.1	87.6	240	0	152	2	1.01	117.	15 56	5.9	4
16.0	256	110	13.23	2774	6.0	1.9	48	2095	355	4.5	1.9	87.7	256	0	160	2	0.98	120.	16 59	6.1	5
17.0	272	117	14.05	2860	6.2	1.8	50	2102	334	4.2	1.8	87.9	272	0	167	2	0.95	128.	17 62	6.3	5
18.0	288	123	14.88	2944	6.4	1.8	51	2109	316	4.0	1.7	88.0	288	0	174	2	0.92	135.	18 65	6.4	5
19.0	304	130	15.71	3026	6.5	1.7	53	2114	299	3.8	1.6	88.1	304	0	181	2	0.89	143.	19 68	6.6	5
20.0	320	137	16.53	3105	6.7	1.7	54	2120	284	3.6	1.5	88.2	320	0	188	2	0.87	150.	20 71	6.7	5
25.0	400	171	20.67	3476	7.5	1.5	61	2138	227	2.8	1.2	88.6	400	0	222	2	0.77	179.	24 84	7.4	6
30.0	480	206	24.80	3813	8.2	1.4	67	2150	189	2.4	1.0	88.8	480	0	256	1	0.70	206.	28 96	8.0	7
35.0	560	240	28.93	4124	8.9	1.3	73	2158	162	2.0	0.9	89.0	560	0	290	1	0.65	228.	33 108	8.6	
40.0	640	274	33.06	4414	9.5	1.2	78	2164	142	1.8	0.8	89.1	640	0	322	1	0.60	261.	37 120	9.2	
45.0	720	309	37.20	4688	10.1	1.1	83	2168	126	1.6	0.7	89.2	720	0	354	1	0.57	279.	41 131	9.7	
50.0	800	343	41.33	4948	10.6	1.1	87	2171	113	1.4	0.6	89.3	800	0	386	1	0.54	294.	45 142	10.2	

 # 82 16 O on 16 O — 16 O on 16 O — 16 O on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 8. ZC= 16.(S)
NEUTRON NUMBERS: NP= 8. NT= 8. NC= 16.

INTERACTION RADIUS RINT= 9.57 fm RO= 1.70 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 2.42 CT+CP= 4.85 C= 1.21

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 2.78

COULOMB RADII [fm]:
RCP= 2.78 RCT= 2.78 RC=RCP+RCT= 5.57

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 23.32 MeV K= .10315 n=2.438
VC(RINT)= 10.7 MeV

FISSION-TKE= 31. MeV
ASYMM. FISSION-TKE= 31. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 14.49 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 24.05 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -4.7
COMPOUND NUCLEUS: -25.6

FUSION RELATED PARAMETERS:
R-BARRIER= 7.82 fm V(RB)= 10.8 MeV
Q-VALUE= 16.1 MeV
L-CRITICAL= 23.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	16	8	0.75	691	1.7	10.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	32	16	1.49	977	2.5	7.1	12	888	621	60.8	30.4	59.6	24	8	0	12	4.78	15.	0 0	2.8	1
3.0	48	24	2.24	1197	3.0	5.8	19	1411	1054	33.5	16.8	73.2	44	4	0	8	3.01	22.	0 0	3.2	2
4.0	64	32	2.98	1383	3.5	5.0	24	1662	1271	23.3	11.6	78.4	61	3	60	6	2.38	30.	4 11	3.5	2
4.5	72	36	3.35	1467	3.7	4.8	27	1744	1324	20.2	10.1	79.9	70	2	65	6	2.18	34.	5 16	3.6	2
5.0	80	40	3.73	1546	3.9	4.5	29	1809	1192	17.9	8.9	81.1	78	2	69	5	2.03	37.	6 19	3.7	2
5.5	88	44	4.10	1622	4.1	4.3	31	1861	1084	16.0	8.0	82.0	86	2	73	5	1.90	41.	6 22	3.9	2
6.0	96	48	4.47	1694	4.3	4.1	32	1905	993	14.5	7.2	82.8	94	2	77	5	1.80	43.	7 25	4.0	3
6.5	104	52	4.84	1764	4.5	4.0	34	1941	917	13.2	6.6	83.4	103	1	80	4	1.71	47.	7 27	4.1	3
7.0	112	56	5.22	1831	4.6	3.8	36	1972	851	12.2	6.1	83.9	111	1	84	4	1.63	51.	8 29	4.2	3
7.5	120	60	5.59	1895	4.8	3.7	37	1999	794	11.3	5.6	84.4	119	1	88	4	1.56	54.	8 31	4.4	3
8.0	128	64	5.96	1958	4.9	3.6	39	2022	745	10.5	5.3	84.7	127	1	91	4	1.50	58.	9 33	4.5	3
8.5	136	68	6.33	2018	5.1	3.5	40	2042	701	9.8	4.9	85.1	135	1	95	4	1.45	62.	9 35	4.6	3
9.0	144	72	6.71	2077	5.2	3.4	42	2060	662	9.3	4.6	85.4	143	1	98	4	1.40	63.	10 37	4.7	4
9.5	152	76	7.08	2134	5.4	3.3	43	2076	627	8.7	4.4	85.6	151	1	101	4	1.36	66.	10 39	4.8	4
10.0	160	80	7.45	2190	5.5	3.2	44	2091	596	8.3	4.1	85.9	159	1	105	3	1.32	70.	10 41	4.9	4
10.5	168	84	7.83	2244	5.7	3.1	45	2104	567	7.8	3.9	86.1	167	1	108	3	1.28	73.	11 42	5.0	4
11.0	176	88	8.20	2297	5.8	3.0	47	2115	542	7.5	3.7	86.3	175	1	111	3	1.25	77.	11 44	5.1	4
11.5	184	92	8.57	2349	5.9	3.0	48	2126	518	7.1	3.6	86.4	183	1	114	3	1.22	80.	12 46	5.2	4
12.0	192	96	8.94	2400	6.1	2.9	49	2135	496	6.8	3.4	86.6	191	1	117	3	1.19	84.	12 47	5.3	4
13.0	208	104	9.69	2499	6.3	2.8	51	2152	458	6.2	3.1	86.9	207	1	124	3	1.14	91.	13 50	5.5	4
14.0	224	112	10.43	2594	6.5	2.7	53	2167	425	5.8	2.9	87.1	223	1	130	3	1.09	94.	14 53	5.7	5
15.0	240	120	11.18	2685	6.8	2.6	55	2179	397	5.4	2.7	87.3	239	1	136	3	1.05	101.	15 56	5.8	5
16.0	256	128	11.92	2774	7.0	2.5	57	2190	372	5.0	2.5	87.5	256	0	142	3	1.01	108.	16 59	6.0	5
17.0	272	136	12.67	2860	7.2	2.4	59	2199	350	4.7	2.4	87.6	272	0	148	3	0.98	110.	17 62	6.2	6
18.0	288	144	13.42	2944	7.4	2.4	61	2207	331	4.4	2.2	87.8	288	0	154	2	0.95	117.	17 65	6.3	6
19.0	304	152	14.16	3026	7.6	2.3	63	2215	313	4.2	2.1	87.9	304	0	160	2	0.92	123.	18 67	6.5	6
20.0	320	160	14.91	3105	7.8	2.3	65	2221	298	4.0	2.0	88.0	320	0	165	2	0.90	130.	19 70	6.6	6
25.0	400	200	18.63	3476	8.7	2.0	73	2246	238	3.2	1.6	88.4	400	0	194	2	0.80	156.	23 83	7.4	7
30.0	480	240	22.36	3813	9.6	1.8	80	2261	198	2.6	1.3	88.7	480	0	221	2	0.72	180.	27 95	8.0	8
35.0	560	280	26.08	4124	10.4	1.7	87	2272	170	2.2	1.1	88.9	560	0	248	2	0.67	201.	32 107	8.6	
40.0	640	320	29.81	4414	11.1	1.6	93	2280	149	2.0	1.0	89.0	640	0	275	2	0.62	220.	36 118	9.2	
45.0	720	360	33.54	4688	11.7	1.5	99	2286	132	1.7	0.9	89.1	720	0	301	2	0.59	247.	40 129	9.7	
50.0	800	400	37.26	4948	12.4	1.4	105	2290	119	1.6	0.8	89.2	800	0	326	1	0.56	262.	44 140	10.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB — BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 83 16 O on 27 Al — 16 O on 27 Al — 16 O on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 13. ZC= 21.(Sc)
NEUTRON NUMBERS: NP= 8. NT= 14. NC= 22.

AP**1/3= 2.520 AT**1/3= 3.000
REDUCED MASS NUMBER= 10.05 AP+AT=AC= 43.

INTERACTION RADIUS RINT= 9.10 fm R0= 1.65 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 3.05 CT+CP= 5.47 C̄= 1.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 3.35

COULOMB RADII [fm]:
RCP= 2.78 RCT= 3.32 RC=RCP+RCT= 6.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 34.45 MeV K= .11585 n=2.461
VC(RINT)= 16.4 MeV

FISSION-TKE= 36. MeV
ASYMM. FISSION-TKE= 34. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 16.13 MeV
L-RLD= 43 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 19.24 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -20.6
COMPOUND NUCLEUS: -36.9

FUSION RELATED PARAMETERS:
R-BARRIER= 8.26 fm V(RB)= 16.8 MeV
Q-VALUE= 11.5 MeV
L-CRITICAL= 32.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	10	0.61	691	2.2	16.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	32	20	1.22	977	3.1	11.6	12	552	356	87.8	57.7	46.1	18	14	0	27	6.84	12.	0 0	2.4	1
3.0	48	30	1.83	1197	3.8	9.5	23	1284	952	44.1	28.0	67.9	42	6	0	14	3.53	17.	0 0	2.8	2
4.0	64	40	2.45	1383	4.4	8.2	31	1638	1251	29.8	18.8	75.1	60	4	54	11	2.68	23.	4 15	3.1	2
4.5	72	45	2.75	1467	4.7	7.7	34	1754	1350	25.7	16.2	77.1	69	3	57	10	2.43	25.	5 18	3.2	3
5.0	80	50	3.06	1546	4.9	7.3	37	1846	1378	22.6	14.2	78.7	77	3	60	9	2.24	28.	5 21	3.4	3
5.5	88	55	3.36	1622	5.2	7.0	39	1921	1253	20.2	12.7	79.9	85	3	63	8	2.09	30.	6 23	3.5	3
6.0	96	60	3.67	1694	5.4	6.7	42	1983	1149	18.2	11.4	80.9	94	2	66	8	1.97	33.	6 25	3.7	3
6.5	104	65	3.97	1764	5.6	6.4	44	2035	1060	16.6	10.4	81.7	102	2	69	7	1.87	35.	7 27	3.8	4
7.0	112	70	4.28	1831	5.8	6.2	46	2080	984	15.2	9.6	82.4	110	2	72	7	1.78	38.	7 29	3.9	4
7.5	120	75	4.58	1895	6.0	6.0	48	2118	919	14.1	8.9	83.0	118	2	74	7	1.70	40.	8 31	4.0	4
8.0	128	80	4.89	1958	6.2	5.8	50	2152	861	13.1	8.2	83.5	126	2	77	6	1.63	43.	8 33	4.1	4
8.5	136	85	5.20	2018	6.4	5.6	52	2181	811	12.2	7.7	83.9	135	1	79	6	1.57	46.	9 35	4.2	4
9.0	144	90	5.50	2077	6.6	5.5	54	2207	766	11.5	7.2	84.3	143	1	81	6	1.52	49.	9 36	4.4	4
9.5	152	95	5.81	2134	6.8	5.3	56	2230	725	10.8	6.8	84.6	151	1	84	6	1.47	50.	9 38	4.5	5
10.0	160	100	6.11	2190	6.9	5.2	58	2251	689	10.2	6.4	84.9	159	1	86	6	1.42	53.	10 39	4.6	5
10.5	168	105	6.42	2244	7.1	5.1	60	2270	656	9.7	6.1	85.1	167	1	88	6	1.38	55.	10 41	4.7	5
11.0	176	111	6.72	2297	7.3	4.9	61	2287	626	9.2	5.8	85.4	175	1	90	5	1.34	58.	11 43	4.8	5
11.5	184	116	7.03	2349	7.5	4.8	63	2303	599	8.8	5.5	85.6	183	1	92	5	1.31	60.	11 44	4.9	5
12.0	192	121	7.34	2400	7.6	4.7	64	2317	574	8.4	5.3	85.8	191	1	95	5	1.28	61.	12 46	5.0	6
13.0	208	131	7.95	2499	7.9	4.5	67	2342	530	7.7	4.8	86.1	207	1	99	5	1.22	67.	12 48	5.1	6
14.0	224	141	8.56	2594	8.2	4.4	70	2363	492	7.1	4.5	86.4	223	1	103	5	1.17	72.	13 51	5.3	6
15.0	240	151	9.17	2685	8.5	4.2	73	2381	459	6.6	4.2	86.7	239	1	107	4	1.13	75.	14 54	5.5	7
16.0	256	161	9.78	2774	8.8	4.1	76	2397	430	6.2	3.9	86.9	255	1	111	4	1.09	80.	15 57	5.7	7
17.0	272	171	10.39	2860	9.1	4.0	78	2411	405	5.8	3.6	87.1	271	1	115	4	1.05	85.	16 59	5.8	7
18.0	288	181	11.00	2944	9.3	3.9	81	2424	383	5.5	3.4	87.3	287	1	119	4	1.02	87.	16 62	6.0	8
19.0	304	191	11.61	3026	9.6	3.8	83	2435	362	5.2	3.2	87.4	303	1	123	4	0.99	92.	17 65	6.1	8
20.0	320	201	12.23	3105	9.8	3.7	86	2444	344	4.9	3.1	87.6	319	1	126	4	0.96	97.	18 67	6.3	8
25.0	400	251	15.28	3476	11.0	3.3	97	2482	275	3.9	2.4	88.1	400	0	145	3	0.85	118.	22 79	7.0	9
30.0	480	301	18.34	3813	12.0	3.0	106	2506	229	3.2	2.0	88.4	480	0	162	3	0.77	137.	26 91	7.6	10
35.0	560	352	21.40	4124	13.0	2.8	115	2523	196	2.7	1.7	88.6	560	0	180	3	0.71	150.	29 101	8.2	
40.0	640	402	24.45	4414	13.9	2.6	124	2535	172	2.4	1.5	88.8	640	0	196	3	0.66	166.	33 112	8.8	
45.0	720	452	27.51	4688	14.7	2.4	132	2545	153	2.1	1.3	88.9	720	0	213	2	0.62	181.	37 122	9.3	
50.0	800	502	30.56	4948	15.5	2.3	139	2553	137	1.9	1.2	89.0	800	0	229	2	0.59	201.	40 132	9.8	

 # 84 16 O on 40 Ca — 16 O on 40 Ca — 16 O on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 20. ZC= 28.(Ni)
NEUTRON NUMBERS: NP= 8. NT= 20. NC= 28.

AP**1/3= 2.520 AT**1/3= 3.420
REDUCED MASS NUMBER= 11.43 AP+AT=AC= 56.

INTERACTION RADIUS RINT= 9.56 fm R0= 1.61 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 3.59 CT+CP= 6.02 C̄= 1.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 3.85

COULOMB RADII [fm]:
RCP= 2.78 RCT= 3.84 RC=RCP+RCT= 6.62

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 48.49 MeV K= .11598 n=2.526
VC(RINT)= 24.1 MeV

FISSION-TKE= 44. MeV
ASYMM. FISSION-TKE= 36. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 17.31 MeV
L-RLD= 53 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -33.0
COMPOUND NUCLEUS: -58.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.64 fm V(RB)= 24.8 MeV
Q-VALUE= 20.5 MeV
L-CRITICAL= 38.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	11	0.47	691	2.5	25.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	32	23	0.95	977	3.5	17.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	48	34	1.42	1197	4.3	14.5	23	930	647	65.6	48.3	57.2	36	12	0	27	4.58	13.	0 0	2.8	2
4.0	64	46	1.90	1383	5.0	12.6	33	1441	1072	42.0	30.3	69.0	57	7	48	18	3.14	17.	4 15	3.1	3
4.5	72	51	2.14	1467	5.3	11.9	37	1609	1213	35.6	25.7	72.2	66	6	52	16	2.80	19.	5 17	3.2	3
5.0	80	57	2.37	1546	5.6	11.3	41	1742	1327	31.0	22.3	74.5	75	5	54	15	2.54	22.	5 20	3.3	3
5.5	88	63	2.61	1622	5.9	10.7	44	1851	1408	27.4	19.7	76.3	84	4	57	14	2.35	23.	6 22	3.5	4
6.0	96	69	2.85	1694	6.1	10.3	47	1941	1291	24.6	17.7	77.7	92	4	59	13	2.19	25.	6 24	3.6	4
6.5	104	74	3.09	1764	6.4	9.9	50	2017	1192	22.3	16.0	78.8	101	3	62	12	2.06	28.	7 26	3.7	4
7.0	112	80	3.32	1831	6.6	9.5	53	2082	1107	20.4	14.6	79.8	109	3	64	11	1.95	30.	7 28	3.8	4
7.5	120	86	3.56	1895	6.8	9.2	55	2138	1033	18.8	13.5	80.6	117	3	66	11	1.86	32.	7 30	3.9	4
8.0	128	91	3.80	1958	7.1	8.9	58	2187	968	17.5	12.5	81.3	126	2	67	10	1.78	33.	8 31	4.0	5
8.5	136	97	4.04	2018	7.3	8.6	60	2230	911	16.3	11.7	81.9	134	2	69	10	1.71	35.	8 33	4.1	5
9.0	144	103	4.27	2077	7.5	8.4	63	2268	861	15.3	10.9	82.4	142	2	71	10	1.65	37.	9 34	4.2	5
9.5	152	109	4.51	2134	7.7	8.2	65	2302	815	14.3	10.3	82.8	150	2	73	9	1.59	40.	9 36	4.3	5
10.0	160	114	4.75	2190	7.9	8.0	67	2333	774	13.5	9.7	83.2	158	2	74	9	1.54	41.	9 37	4.4	6
10.5	168	120	4.99	2244	8.1	7.8	69	2360	738	12.8	9.2	83.6	166	2	76	9	1.49	43.	10 39	4.5	6
11.0	176	126	5.22	2297	8.3	7.6	71	2385	704	12.2	8.7	83.9	174	2	78	8	1.45	45.	10 40	4.6	6
11.5	184	131	5.46	2349	8.5	7.4	73	2408	673	11.6	8.3	84.2	182	2	79	8	1.41	47.	11 42	4.7	6
12.0	192	137	5.70	2400	8.7	7.3	75	2429	645	11.1	7.9	84.5	191	1	81	8	1.37	49.	11 43	4.7	6
13.0	208	149	6.17	2499	9.0	7.0	79	2466	596	10.1	7.2	84.9	207	1	84	8	1.31	52.	12 46	4.9	7
14.0	224	160	6.65	2594	9.4	6.7	82	2497	553	9.3	6.7	85.3	223	1	87	7	1.25	56.	13 48	5.1	7
15.0	240	171	7.12	2685	9.7	6.5	86	2524	516	8.7	6.2	85.7	239	1	90	7	1.20	59.	13 51	5.2	8
16.0	256	183	7.60	2774	10.0	6.3	89	2548	484	8.1	5.8	86.0	255	1	93	7	1.16	63.	14 54	5.4	8
17.0	272	194	8.07	2860	10.3	6.1	92	2569	455	7.6	5.4	86.2	271	1	95	7	1.12	67.	15 56	5.5	8
18.0	288	206	8.55	2944	10.6	5.9	95	2587	430	7.1	5.1	86.4	287	1	98	6	1.08	70.	15 58	5.7	8
19.0	304	217	9.02	3026	10.9	5.8	98	2604	407	6.7	4.8	86.6	303	1	101	6	1.05	73.	16 61	5.8	9
20.0	320	229	9.50	3105	11.2	5.6	101	2618	387	6.4	4.6	86.8	319	1	103	6	1.02	77.	17 63	6.0	9
25.0	400	286	11.87	3476	12.5	5.0	114	2674	309	5.0	3.6	87.5	399	1	116	5	0.90	92.	21 74	6.6	11
30.0	480	343	14.24	3813	13.7	4.6	126	2711	258	4.2	3.0	87.9	479	1	128	5	0.82	108.	24 85	7.2	12
35.0	560	400	16.62	4124	14.8	4.3	137	2737	221	3.6	2.5	88.2	560	0	140	4	0.75	120.	28 95	7.8	
40.0	640	457	18.99	4414	15.8	4.0	147	2756	193	3.1	2.2	88.4	640	0	151	4	0.70	134.	31 105	8.3	
45.0	720	514	21.36	4688	16.8	3.8	156	2771	172	2.7	2.0	88.6	720	0	162	4	0.66	147.	35 115	8.7	
50.0	800	571	23.74	4948	17.7	3.6	165	2782	154	2.5	1.8	88.8	800	0	173	4	0.62	159.	38 124	9.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB — BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 85 16 O on 56 Fe — 16 O on 56 Fe — 16 O on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 26. ZC= 34.(Se)
NEUTRON NUMBERS: NP= 8. NT= 30. NC= 38.

AP**1/3= 2.520 AT**1/3= 3.826
REDUCED MASS NUMBER= 12.44 AP+AT=AC= 72.

INTERACTION RADIUS RINT=10.00 fm RO= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 4.12 CT+CP= 6.54 C= 1.53

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 4.35

COULOMB RADII [fm]:
RCP= 2.78 RCT= 4.27 RC=RCP+RCT= 7.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 58.88 MeV K= .10805 n=2.573
VC(RINT)= 29.9 MeV

FISSION-TKE= 52. MeV
ASYMM. FISSION-TKE= 37. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 18.14 MeV
L-RLD= 67 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.60 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -61.4
COMPOUND NUCLEUS: -68.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.03 fm V(RB)= 30.9 MeV
Q-VALUE= 2.4 MeV
L-CRITICAL= 45.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	12	0.42	691	2.7	32.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	25	0.83	977	3.8	23.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	37	1.25	1197	4.7	18.9	21	682	443	84.1	68.7	48.0	33	15	0	42	5.87	10.	0	0	2.1	2
4.0	64	50	1.66	1383	5.4	16.4	34	1325	973	51.0	40.3	64.5	56	8	44	26	3.58	14.	4	14	2.4	3
4.5	72	56	1.87	1467	5.8	15.4	39	1537	1150	42.8	33.7	68.6	65	7	48	23	3.13	15.	4	17	2.5	3
5.0	80	62	2.08	1546	6.1	14.6	44	1705	1291	37.0	29.0	71.5	74	6	50	20	2.81	17.	5	19	2.7	4
5.5	88	68	2.29	1622	6.4	14.0	48	1841	1407	32.5	25.5	73.7	83	5	52	19	2.57	18.	5	21	2.8	4
6.0	96	75	2.50	1694	6.7	13.4	52	1955	1503	29.1	22.7	75.5	92	4	54	17	2.39	20.	6	23	2.9	4
6.5	104	81	2.70	1764	6.9	12.8	55	2051	1402	26.3	20.5	76.9	100	4	56	16	2.23	22.	6	25	3.0	4
7.0	112	87	2.91	1831	7.2	12.4	58	2133	1302	24.0	18.7	78.0	109	3	58	15	2.11	23.	7	26	3.2	5
7.5	120	93	3.12	1895	7.5	12.0	61	2203	1215	22.0	17.2	79.0	117	3	59	15	2.00	25.	7	28	3.3	5
8.0	128	100	3.33	1958	7.7	11.6	64	2265	1139	20.4	15.9	79.8	125	3	61	14	1.91	26.	7	30	3.4	5
8.5	136	106	3.54	2018	7.9	11.2	67	2320	1072	19.0	14.8	80.5	133	3	62	13	1.83	28.	8	31	3.5	6
9.0	144	112	3.74	2077	8.2	10.9	70	2368	1012	17.8	13.8	81.1	142	2	64	13	1.76	29.	8	33	3.6	6
9.5	152	118	3.95	2134	8.4	10.6	72	2411	959	16.7	13.0	81.7	150	2	65	12	1.70	31.	9	34	3.7	6
10.0	160	124	4.16	2190	8.6	10.4	75	2449	911	15.7	12.2	82.1	158	2	66	12	1.64	33.	9	35	3.8	6
10.5	168	131	4.37	2244	8.8	10.1	77	2484	868	14.9	11.6	82.6	166	2	67	12	1.59	34.	9	37	3.8	7
11.0	176	137	4.58	2297	9.0	9.9	80	2516	828	14.1	11.0	82.9	174	2	69	11	1.54	35.	10	38	3.9	7
11.5	184	143	4.78	2349	9.2	9.7	82	2545	792	13.4	10.5	83.3	182	2	70	11	1.50	37.	10	39	4.0	7
12.0	192	149	4.99	2400	9.4	9.5	84	2571	759	12.8	10.0	83.6	190	2	71	11	1.46	38.	10	41	4.1	8
13.0	208	162	5.41	2499	9.8	9.1	89	2618	701	11.7	9.1	84.1	207	1	73	10	1.39	41.	11	43	4.3	8
14.0	224	174	5.82	2594	10.2	8.8	93	2658	651	10.8	8.4	84.6	223	1	75	10	1.33	44.	12	46	4.4	9
15.0	240	187	6.24	2685	10.5	8.5	97	2692	607	10.0	7.8	85.0	239	1	78	9	1.27	47.	13	48	4.6	9
16.0	256	199	6.66	2774	10.9	8.2	100	2722	569	9.3	7.3	85.3	255	1	80	9	1.23	49.	13	50	4.7	10
17.0	272	212	7.07	2860	11.2	7.9	104	2749	536	8.7	6.8	85.6	271	1	82	9	1.18	52.	14	53	4.9	10
18.0	288	224	7.49	2944	11.5	7.7	107	2772	506	8.2	6.4	85.9	287	1	84	8	1.15	55.	15	55	5.0	10
19.0	304	236	7.90	3026	11.9	7.5	111	2793	479	7.8	6.0	86.1	303	1	86	8	1.11	57.	15	57	5.2	11
20.0	320	249	8.32	3105	12.2	7.3	114	2812	455	7.3	5.7	86.3	319	1	87	8	1.08	60.	16	59	5.3	11
25.0	400	311	10.40	3476	13.6	6.6	129	2883	364	5.8	4.5	87.1	399	1	97	7	0.95	73.	20	70	5.9	13
30.0	480	373	12.48	3813	14.9	6.0	143	2930	303	4.8	3.7	87.6	479	1	105	6	0.86	84.	23	80	6.5	15
35.0	560	436	14.56	4124	16.1	5.5	155	2963	260	4.1	3.2	88.0	560	0	113	6	0.79	97.	26	90	7.0	
40.0	640	498	16.64	4414	17.2	5.2	167	2988	227	3.6	2.8	88.2	640	0	121	5	0.74	107.	30	99	7.5	
45.0	720	560	18.72	4688	18.3	4.9	178	3007	202	3.1	2.4	88.4	720	0	129	5	0.69	118.	33	108	7.9	
50.0	800	622	20.80	4948	19.2	4.6	188	3022	182	2.8	2.2	88.6	800	0	136	5	0.66	126.	36	117	8.3	

 # 86 16 O on 63 Cu — 16 O on 63 Cu — 16 O on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 29. ZC= 37.(Rb)
NEUTRON NUMBERS: NP= 8. NT= 34. NC= 42.

AP**1/3= 2.520 AT**1/3= 3.979
REDUCED MASS NUMBER= 12.76 AP+AT=AC= 79.

INTERACTION RADIUS RINT=10.17 fm RO= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 4.31 CT+CP= 6.74 C= 1.55

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 4.53

COULOMB RADII [fm]:
RCP= 2.78 RCT= 4.45 RC=RCP+RCT= 7.23

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 63.90 MeV K= .10393 n=2.599
VC(RINT)= 32.8 MeV

FISSION-TKE= 56. MeV
ASYMM. FISSION-TKE= 38. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 18.43 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -65.2
COMPOUND NUCLEUS: -72.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.18 fm V(RB)= 33.9 MeV
Q-VALUE= 2.2 MeV
L-CRITICAL= 48.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	13	0.39	691	2.8	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	26	0.78	977	3.9	25.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	38	1.17	1197	4.8	21.1	18	511	302	97.5	82.9	41.2	30	18	30	56	7.05	9.	2	4	2.0	2
4.0	64	51	1.56	1383	5.6	18.3	34	1226	887	56.7	46.1	61.7	55	9	43	31	3.85	12.	4	14	2.3	3
4.5	72	57	1.75	1467	5.9	17.2	39	1460	1083	47.3	38.2	66.4	65	7	46	26	3.31	14.	4	16	2.5	3
5.0	80	64	1.94	1546	6.2	16.3	44	1647	1239	40.6	32.7	69.7	74	6	49	23	2.95	15.	5	19	2.6	4
5.5	88	70	2.14	1622	6.5	15.6	49	1799	1367	35.6	28.6	72.2	83	5	51	21	2.69	17.	5	21	2.7	4
6.0	96	77	2.33	1694	6.8	14.9	53	1925	1473	31.7	25.4	74.1	91	5	53	20	2.48	18.	6	22	2.8	4
6.5	104	83	2.53	1764	7.1	14.3	56	2031	1476	28.6	22.9	75.7	100	4	55	18	2.32	20.	6	24	2.9	5
7.0	112	89	2.72	1831	7.4	13.8	60	2122	1371	26.1	20.9	77.0	108	4	56	17	2.19	21.	7	26	3.0	5
7.5	120	96	2.92	1895	7.6	13.3	63	2200	1279	23.9	19.1	78.0	117	3	58	16	2.07	23.	7	27	3.1	5
8.0	128	102	3.11	1958	7.9	12.9	66	2269	1199	22.1	17.7	78.9	125	3	59	16	1.97	24.	7	29	3.2	6
8.5	136	108	3.30	2018	8.1	12.5	69	2329	1129	20.6	16.4	79.7	133	3	60	15	1.89	25.	8	30	3.3	6
9.0	144	115	3.50	2077	8.4	12.2	72	2383	1066	19.2	15.4	80.4	141	3	62	14	1.81	27.	8	32	3.4	6
9.5	152	121	3.69	2134	8.6	11.9	75	2431	1010	18.0	14.4	81.0	150	2	63	14	1.75	28.	8	33	3.5	7
10.0	160	128	3.89	2190	8.8	11.6	77	2474	959	17.0	13.6	81.5	158	2	64	13	1.69	30.	9	35	3.6	7
10.5	168	134	4.08	2244	9.0	11.3	80	2512	914	16.1	12.8	82.0	166	2	65	13	1.63	31.	9	36	3.7	7
11.0	176	140	4.28	2297	9.3	11.0	82	2548	872	15.2	12.2	82.4	174	2	66	13	1.58	32.	10	37	3.8	7
11.5	184	147	4.47	2349	9.5	10.8	85	2580	834	14.5	11.6	82.8	182	2	67	12	1.54	33.	10	38	3.9	8
12.0	192	153	4.67	2400	9.7	10.5	87	2609	799	13.8	11.0	83.1	190	2	68	12	1.50	35.	10	40	4.0	8
13.0	208	166	5.05	2499	10.1	10.1	92	2661	738	12.6	10.1	83.7	206	2	70	11	1.42	38.	11	42	4.1	8
14.0	224	179	5.44	2594	10.4	9.8	96	2705	685	11.6	9.3	84.2	223	1	72	11	1.36	40.	12	45	4.3	9
15.0	240	191	5.83	2685	10.8	9.4	100	2744	639	10.8	8.6	84.6	239	1	74	10	1.30	43.	12	47	4.4	9
16.0	256	204	6.22	2774	11.2	9.1	104	2777	599	10.0	8.0	85.0	255	1	76	10	1.25	45.	13	49	4.6	10
17.0	272	217	6.61	2860	11.5	8.9	108	2806	564	9.4	7.5	85.3	271	1	78	10	1.21	48.	14	51	4.7	10
18.0	288	230	7.00	2944	11.8	8.6	111	2833	533	8.8	7.1	85.6	287	1	80	9	1.17	50.	15	54	4.8	11
19.0	304	242	7.39	3026	12.2	8.4	115	2856	505	8.3	6.7	85.8	303	1	82	9	1.13	53.	15	56	5.0	11
20.0	320	255	7.78	3105	12.5	8.2	118	2877	479	7.9	6.3	86.1	319	1	83	9	1.10	55.	16	58	5.1	12
25.0	400	319	9.72	3476	14.0	7.3	134	2956	383	6.2	5.0	86.9	399	1	91	8	0.97	67.	19	68	5.7	14
30.0	480	383	11.66	3813	15.3	6.7	149	3008	319	5.1	4.1	87.4	479	1	99	7	0.88	77.	23	78	6.2	16
35.0	560	447	13.61	4124	16.5	6.2	162	3045	274	4.4	3.5	87.8	559	1	106	6	0.81	89.	26	87	6.7	
40.0	640	510	15.55	4414	17.7	5.8	174	3073	239	3.8	3.0	88.1	640	0	113	6	0.75	98.	29	96	7.2	
45.0	720	574	17.50	4688	18.7	5.4	185	3094	213	3.4	2.7	88.3	720	0	120	6	0.71	109.	32	105	7.6	
50.0	800	638	19.44	4948	19.7	5.2	195	3111	191	3.0	2.4	88.5	800	0	126	5	0.67	117.	36	114	8.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB — BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

87 16 O on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 42. ZC= 50.(Sn)
NEUTRON NUMBERS: NP= 8. NT= 50. NC= 58.

AP**1/3= 2.520 AT**1/3= 4.514
REDUCED MASS NUMBER= 13.63 AP+AT=AC=108.

INTERACTION RADIUS RINT=10.75 fm R0= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 5.00 CT+CP= 7.43 C̄= 1.63

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 5.20

COULOMB RADII [fm]:
RCP= 2.78 RCT= 5.08 RC=RCP+RCT= 7.86

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 84.20 MeV K= .08616 n=2.704
VC(RINT)= 45.0 MeV

FISSION-TKE= 78. MeV
ASYMM. FISSION-TKE= 42. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 19.33 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.26 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -87.5
COMPOUND NUCLEUS: -83.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.68 fm V(RB)= 46.6 MeV
Q-VALUE= -9.3 MeV
L-CRITICAL= 56.

16 O on 92 Mo

16 O on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	16	14	0.30	691	3.0	52.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	27	0.61	977	4.2	37.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	41	0.91	1197	5.2	30.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	55	1.21	1383	6.0	26.5	27	681	425	89.4	79.5	45.3	48	16	37	63	5.82	9.	3	12	1.8	3
4.5	72	61	1.36	1467	6.3	24.9	35	1021	705	70.9	62.0	54.6	60	12	42	48	4.44	10.	4	14	2.0	3
5.0	80	68	1.52	1546	6.7	23.7	42	1291	929	59.1	51.3	60.5	70	10	46	41	3.73	11.	4	17	2.1	4
5.5	88	75	1.67	1622	7.0	22.6	47	1511	1111	50.8	43.9	64.6	80	8	48	36	3.28	13.	5	19	2.2	4
6.0	96	82	1.82	1694	7.3	21.6	53	1694	1264	44.6	38.4	67.7	89	7	50	32	2.96	14.	5	20	2.3	5
6.5	104	89	1.97	1764	7.6	20.8	57	1848	1393	39.8	34.2	70.1	98	6	52	30	2.72	15.	6	22	2.4	5
7.0	112	95	2.12	1831	7.9	20.0	62	1979	1503	36.0	30.9	72.0	107	5	54	27	2.53	16.	6	24	2.5	5
7.5	120	102	2.27	1895	8.2	19.3	66	2093	1507	32.8	28.1	73.6	115	5	55	26	2.37	17.	7	25	2.6	6
8.0	128	109	2.43	1958	8.4	18.7	69	2192	1413	30.2	25.8	74.9	124	4	56	24	2.24	18.	7	26	2.7	6
8.5	136	116	2.58	2018	8.7	18.1	73	2280	1329	27.9	23.9	76.0	132	4	57	23	2.13	19.	7	28	2.8	7
9.0	144	123	2.73	2077	8.9	17.6	76	2357	1256	26.0	22.2	77.0	140	4	58	22	2.04	20.	8	29	2.9	7
9.5	152	129	2.88	2134	9.2	17.2	80	2427	1189	24.3	20.8	77.9	149	3	59	21	1.95	21.	8	30	3.0	7
10.0	160	136	3.03	2190	9.4	16.7	83	2489	1130	22.8	19.5	78.6	157	3	60	20	1.88	22.	8	32	3.1	8
10.5	168	143	3.18	2244	9.7	16.3	86	2545	1076	21.5	18.4	79.2	165	3	61	20	1.81	23.	9	33	3.1	8
11.0	176	150	3.33	2297	9.9	16.0	89	2597	1027	20.3	17.4	79.8	173	3	62	19	1.75	24.	9	34	3.2	8
11.5	184	157	3.49	2349	10.1	15.6	92	2643	983	19.3	16.5	80.3	181	3	63	18	1.70	25.	10	35	3.3	9
12.0	192	164	3.64	2400	10.3	15.3	94	2686	942	18.4	15.7	80.8	190	2	63	18	1.65	26.	10	36	3.4	9
13.0	208	177	3.94	2499	10.7	14.7	100	2761	869	16.7	14.3	81.6	206	2	65	17	1.56	28.	11	39	3.5	9
14.0	224	191	4.24	2594	11.2	14.1	105	2826	807	15.4	13.1	82.3	222	2	66	16	1.49	30.	11	41	3.7	10
15.0	240	204	4.55	2685	11.5	13.7	110	2881	753	14.2	12.1	82.9	238	2	68	15	1.42	32.	12	43	3.8	11
16.0	256	218	4.85	2774	11.9	13.2	114	2930	706	13.2	11.3	83.4	254	2	69	15	1.36	34.	13	45	3.9	11
17.0	272	232	5.15	2860	12.3	12.8	119	2973	664	12.4	10.5	83.8	270	2	70	14	1.31	36.	13	47	4.1	12
18.0	288	245	5.46	2944	12.6	12.5	123	3011	628	11.6	9.9	84.2	287	1	72	14	1.27	38.	14	49	4.2	12
19.0	304	259	5.76	3026	13.0	12.1	127	3045	594	10.9	9.3	84.5	303	1	73	13	1.23	40.	14	51	4.3	13
20.0	320	273	6.06	3105	13.3	11.8	131	3076	565	10.3	8.8	84.8	319	1	74	13	1.19	42.	15	53	4.4	13
25.0	400	341	7.58	3476	14.9	10.6	149	3192	452	8.1	6.9	85.9	399	1	80	11	1.04	50.	18	63	5.0	16
30.0	480	409	9.09	3813	16.3	9.7	166	3268	376	6.7	5.7	86.7	479	1	85	10	0.94	59.	21	72	5.4	18
35.0	560	477	10.61	4124	17.6	8.9	180	3323	322	5.7	4.8	87.2	559	1	90	9	0.86	68.	25	81	5.9	
40.0	640	545	12.13	4414	18.9	8.4	194	3363	282	4.9	4.2	87.5	639	1	95	9	0.80	75.	28	89	6.3	
45.0	720	613	13.64	4688	20.0	7.9	207	3395	251	4.4	3.7	87.8	719	1	99	8	0.75	83.	31	97	6.7	
50.0	800	681	15.16	4948	21.1	7.5	219	3420	226	3.9	3.3	88.0	800	0	104	8	0.71	91.	34	105	7.1	

88 16 O on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 47. ZC= 55.(Cs)
NEUTRON NUMBERS: NP= 8. NT= 61. NC= 69.

AP**1/3= 2.520 AT**1/3= 4.762
REDUCED MASS NUMBER= 13.94 AP+AT=AC=124.

INTERACTION RADIUS RINT=11.02 fm R0= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 5.32 CT+CP= 7.75 C̄= 1.67

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 5.50

COULOMB RADII [fm]:
RCP= 2.78 RCT= 5.34 RC=RCP+RCT= 8.12

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 90.95 MeV K= .07967 n=2.733
VC(RINT)= 49.1 MeV

FISSION-TKE= 87. MeV
ASYMM. FISSION-TKE= 43. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.930 MeV/fm**2 PROX-FACTOR= 19.46 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -87.6
COMPOUND NUCLEUS: -81.6

FUSION RELATED PARAMETERS:
R-BARRIER= 9.92 fm V(RB)= 50.8 MeV
Q-VALUE= -10.7 MeV
L-CRITICAL= 59.

16 O on 108 Ag

16 O on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	16	14	0.28	691	3.0	59.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	28	0.57	977	4.3	41.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	42	0.85	1197	5.3	34.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	56	1.14	1383	6.1	29.6	23	491	272	104.1	95.6	38.0	46	18	36	86	7.24	8.	3	11	1.7	3
4.5	72	63	1.28	1467	6.5	27.9	33	875	585	80.2	72.1	49.9	59	13	41	60	5.05	9.	4	14	1.8	4
5.0	80	70	1.42	1546	6.8	26.5	41	1179	836	66.0	58.7	57.0	69	11	45	49	4.10	10.	4	16	2.0	4
5.5	88	77	1.56	1622	7.1	25.2	47	1426	1041	56.3	49.8	61.8	79	9	47	42	3.55	11.	5	18	2.1	5
6.0	96	84	1.70	1694	7.5	24.2	53	1632	1212	49.2	43.4	65.4	89	7	49	38	3.17	12.	5	20	2.2	5
6.5	104	91	1.85	1764	7.8	23.2	58	1805	1356	43.7	38.4	68.1	98	6	51	34	2.89	13.	6	21	2.3	5
7.0	112	98	1.99	1831	8.1	22.4	63	1953	1480	39.4	34.5	70.3	106	6	53	32	2.67	14.	6	23	2.4	6
7.5	120	105	2.13	1895	8.3	21.6	67	2080	1587	35.8	31.4	72.1	115	5	54	30	2.50	15.	7	24	2.5	6
8.0	128	111	2.27	1958	8.6	20.9	71	2192	1536	32.8	28.8	73.6	123	5	55	28	2.36	16.	7	25	2.6	7
8.5	136	118	2.41	2018	8.9	20.3	75	2290	1445	30.3	26.6	74.8	132	4	56	27	2.23	17.	7	27	2.6	7
9.0	144	125	2.56	2077	9.1	19.7	79	2378	1365	28.2	24.7	75.9	140	4	57	25	2.13	17.	8	28	2.7	8
9.5	152	132	2.70	2134	9.4	19.2	82	2456	1293	26.3	23.0	76.8	148	4	58	24	2.04	18.	8	29	2.8	8
10.0	160	139	2.84	2190	9.6	18.7	85	2526	1229	24.7	21.6	77.6	157	3	59	23	1.96	19.	8	31	2.9	8
10.5	168	146	2.98	2244	9.9	18.3	89	2589	1170	23.3	20.3	78.4	165	3	59	22	1.89	20.	9	32	3.0	9
11.0	176	153	3.12	2297	10.1	17.9	92	2647	1117	22.0	19.2	79.0	173	3	60	22	1.82	21.	9	33	3.0	9
11.5	184	160	3.27	2349	10.3	17.5	95	2699	1068	20.9	18.2	79.6	181	3	61	21	1.76	22.	9	34	3.1	9
12.0	192	167	3.41	2400	10.6	17.1	98	2747	1024	19.8	17.3	80.1	189	3	62	20	1.71	23.	10	35	3.2	10
13.0	208	181	3.69	2499	11.0	16.4	103	2832	945	18.1	15.8	81.0	206	2	63	19	1.62	24.	10	37	3.3	11
14.0	224	195	3.97	2594	11.4	15.8	109	2905	877	16.6	14.5	81.7	222	2	64	18	1.54	26.	11	39	3.4	11
15.0	240	209	4.26	2685	11.8	15.3	114	2967	819	15.3	13.4	82.3	238	2	65	17	1.47	28.	12	42	3.6	12
16.0	256	223	4.54	2774	12.2	14.8	119	3022	768	14.2	12.4	82.9	254	2	67	17	1.41	30.	12	44	3.7	13
17.0	272	237	4.83	2860	12.6	14.4	123	3071	722	13.3	11.6	83.4	270	2	68	16	1.36	31.	13	46	3.8	13
18.0	288	251	5.11	2944	12.9	14.0	128	3113	682	12.5	10.9	83.8	286	2	69	16	1.31	33.	14	48	3.9	14
19.0	304	265	5.39	3026	13.3	13.6	132	3152	646	11.7	10.2	84.1	303	1	70	15	1.27	34.	14	50	4.0	15
20.0	320	279	5.68	3105	13.6	13.2	136	3186	614	11.1	9.7	84.5	319	1	71	15	1.23	36.	15	51	4.2	15
25.0	400	348	7.10	3476	15.2	11.8	156	3317	491	8.7	7.6	85.6	399	1	76	13	1.07	44.	18	61	4.7	18
30.0	480	418	8.52	3813	16.7	10.8	173	3403	409	7.2	6.2	86.4	479	1	80	12	0.97	52.	21	69	5.1	20
35.0	560	488	9.94	4124	18.0	10.0	188	3465	351	6.1	5.3	87.0	559	1	84	11	0.89	59.	24	78	5.5	
40.0	640	557	11.36	4414	19.3	9.4	203	3510	307	5.3	4.6	87.4	639	1	88	10	0.82	66.	27	86	5.9	
45.0	720	627	12.78	4688	20.4	8.8	216	3546	273	4.7	4.1	87.7	719	1	92	9	0.77	73.	30	94	6.3	
50.0	800	697	14.20	4948	21.6	8.4	229	3574	245	4.2	3.6	87.9	800	0	96	9	0.73	79.	33	101	6.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 89 16 O on 140 Ce

16 O on 140 Ce

16 O on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 58. ZC= 66.(Dy)
NEUTRON NUMBERS: NP= 8. NT= 82. NC= 90.

AP**1/3= 2.520 AT**1/3= 5.192
REDUCED MASS NUMBER= 14.36 AP+AT=AC=156.

INTERACTION RADIUS RINT=11.48 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 5.87 CT+CP= 8.30 C= 1.72

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.04

COULOMB RADII [fm]:
RCP= 2.78 RCT= 5.82 RC=RCP+RCT= 8.60

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 105.34 MeV K= .06753 n=2.797
VC(RINT)= 58.1 MeV

FISSION-TKE= 109. MeV
ASYMM. FISSION-TKE= 46. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.912 MeV/fm**2 PROX-FACTOR= 19.65 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.54 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -88.2
COMPOUND NUCLEUS: -70.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.33 fm V(RB)= 60.1 MeV
Q-VALUE= -22.6 MeV
L-CRITICAL= 65.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	16	14	0.25	691	3.1	73.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	32	29	0.49	977	4.4	51.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	48	43	0.74	1197	5.4	42.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	64	57	0.99	1383	6.3	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	72	65	1.11	1467	6.7	34.4	24	447	234	110.0	103.6	35.0	54	18	39	109	7.76	7.	3 12	1.5	4
5.0	80	72	1.24	1546	7.0	32.7	35	830	547	85.9	79.4	47.1	66	14	43	75	5.33	8.	4 15	1.6	4
5.5	88	79	1.36	1622	7.4	31.2	43	1141	802	71.4	65.4	54.3	77	11	47	61	4.31	9.	5 17	1.7	5
6.0	96	86	1.48	1694	7.7	29.8	50	1398	1015	61.3	55.9	59.3	87	9	49	52	3.72	10.	5 18	1.8	5
6.5	104	93	1.61	1764	8.0	28.7	56	1615	1195	53.9	48.9	63.1	96	8	51	47	3.32	10.	6 20	1.9	6
7.0	112	101	1.73	1831	8.3	27.6	62	1801	1349	48.1	43.6	66.0	105	7	52	43	3.02	11.	6 21	2.0	6
7.5	120	108	1.85	1895	8.6	26.7	67	1961	1483	43.5	39.3	68.3	114	6	53	39	2.80	12.	6 23	2.1	7
8.0	128	115	1.98	1958	8.9	25.8	72	2101	1600	39.7	35.8	70.2	123	5	55	37	2.61	12.	7 24	2.2	8
8.5	136	122	2.10	2018	9.2	25.1	76	2224	1627	36.5	32.9	71.8	131	5	55	35	2.46	13.	7 25	2.3	8
9.0	144	129	2.22	2077	9.4	24.4	80	2334	1537	33.8	30.5	73.1	140	4	56	33	2.33	14.	7 26	2.3	9
9.5	152	136	2.35	2134	9.7	23.7	84	2432	1456	31.5	28.3	74.3	148	4	57	31	2.22	15.	8 28	2.4	9
10.0	160	144	2.47	2190	9.9	23.1	88	2520	1383	29.4	26.5	75.3	156	4	58	30	2.13	15.	8 29	2.5	9
10.5	168	151	2.59	2244	10.2	22.5	92	2599	1317	27.7	24.9	76.2	164	4	59	29	2.04	16.	8 30	2.6	10
11.0	176	158	2.72	2297	10.4	22.0	95	2671	1257	26.1	23.5	77.0	173	3	59	28	1.97	17.	9 31	2.6	10
11.5	184	165	2.84	2349	10.7	21.5	98	2737	1202	24.7	22.2	77.7	181	3	60	27	1.90	18.	9 32	2.7	11
12.0	192	172	2.97	2400	10.9	21.1	102	2797	1152	23.4	21.1	78.3	189	3	60	26	1.84	18.	9 33	2.8	11
13.0	208	187	3.21	2499	11.3	20.3	108	2904	1064	21.3	19.1	79.4	205	3	62	24	1.74	20.	10 35	2.9	12
14.0	224	201	3.46	2594	11.8	19.5	114	2995	988	19.5	17.5	80.3	222	2	63	23	1.65	21.	11 37	3.0	13
15.0	240	215	3.71	2685	12.2	18.9	119	3074	922	18.0	16.1	81.0	238	2	64	22	1.57	23.	11 39	3.1	13
16.0	256	230	3.95	2774	12.6	18.3	125	3142	864	16.7	15.0	81.7	254	2	65	21	1.50	24.	12 41	3.3	14
17.0	272	244	4.20	2860	12.9	17.7	130	3203	813	15.6	14.0	82.2	270	2	66	20	1.44	25.	13 43	3.4	15
18.0	288	258	4.45	2944	13.3	17.2	135	3257	768	14.6	13.1	82.7	286	2	66	20	1.39	26.	13 45	3.5	16
19.0	304	273	4.69	3026	13.7	16.8	139	3305	728	13.7	12.3	83.1	302	2	67	19	1.34	28.	14 47	3.6	16
20.0	320	287	4.94	3105	14.0	16.3	144	3348	691	12.9	11.6	83.5	319	1	68	18	1.30	29.	14 48	3.7	17
25.0	400	359	6.18	3476	15.7	14.6	165	3512	553	10.1	9.1	84.9	399	1	72	16	1.13	36.	18 57	4.2	20
30.0	480	431	7.41	3813	17.2	13.3	184	3621	461	8.3	7.5	85.8	479	1	75	14	1.02	42.	21 65	4.6	24
35.0	560	503	8.65	4124	18.6	12.3	201	3699	395	7.0	6.3	86.5	559	1	79	13	0.93	48.	24 73	5.0	
40.0	640	574	9.88	4414	19.9	11.6	216	3756	345	6.1	5.5	86.9	639	1	82	12	0.87	53.	26 81	5.3	
45.0	720	646	11.12	4688	21.1	10.9	231	3801	307	5.4	4.9	87.3	719	1	85	11	0.81	59.	29 89	5.7	
50.0	800	718	12.35	4948	22.2	10.3	244	3837	276	4.8	4.3	87.6	799	1	87	11	0.77	65.	32 96	6.0	

\# 90 16 O on 154 Sm

16 O on 154 Sm

16 O on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 62. ZC= 70.(Yb)
NEUTRON NUMBERS: NP= 8. NT= 92. NC=100.

AP**1/3= 2.520 AT**1/3= 5.360
REDUCED MASS NUMBER= 14.49 AP+AT=AC=170.

INTERACTION RADIUS RINT=11.66 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 6.09 CT+CP= 8.51 C= 1.73

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.25

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.00 RC=RCP+RCT= 8.78

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 110.11 MeV K= .06356 n=2.816
VC(RINT)= 61.2 MeV

FISSION-TKE= 117. MeV
ASYMM. FISSION-TKE= 47. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 19.58 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.42 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -72.1
COMPOUND NUCLEUS: -59.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.50 fm V(RB)= 63.2 MeV
Q-VALUE= -17.2 MeV
L-CRITICAL= 67.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	16	14	0.24	691	3.2	78.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	32	29	0.47	977	4.5	55.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	48	43	0.71	1197	5.5	45.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	64	58	0.95	1383	6.3	39.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	72	65	1.07	1467	6.7	36.8	19	289	109	124.4	119.2	27.8	53	19	38	147	10.05	7.	3 12	1.5	4
5.0	80	72	1.19	1546	7.1	34.9	33	704	444	94.0	88.1	43.0	65	15	43	88	5.99	7.	4 14	1.6	5
5.5	88	80	1.30	1622	7.4	33.3	42	1039	719	77.1	71.5	51.4	76	12	46	69	4.67	8.	5 16	1.7	6
6.0	96	87	1.42	1694	7.8	31.9	49	1316	947	65.8	60.6	57.1	86	10	49	59	3.96	9.	5 18	1.8	6
6.5	104	94	1.54	1764	8.1	30.6	56	1550	1141	57.6	52.8	61.2	96	8	51	52	3.50	9.	5 19	1.9	7
7.0	112	101	1.66	1831	8.4	29.5	62	1750	1307	51.2	46.9	64.4	105	7	52	47	3.17	10.	6 21	2.0	7
7.5	120	109	1.78	1895	8.7	28.5	67	1922	1450	46.2	42.2	66.9	114	6	53	43	2.91	11.	6 22	2.1	8
8.0	128	116	1.90	1958	9.0	27.6	72	2073	1576	42.0	38.4	69.0	122	6	54	40	2.71	11.	7 23	2.2	8
8.5	136	123	2.01	2018	9.2	26.8	76	2206	1687	38.6	35.2	70.7	131	5	55	38	2.55	12.	7 25	2.2	9
9.0	144	130	2.13	2077	9.5	26.0	81	2324	1600	35.7	32.5	72.1	139	5	56	36	2.41	13.	7 26	2.3	9
9.5	152	138	2.25	2134	9.8	25.3	85	2429	1516	33.2	30.2	73.4	148	4	57	34	2.30	13.	8 27	2.4	10
10.0	160	145	2.37	2190	10.0	24.7	89	2524	1440	31.1	28.2	74.5	156	4	58	32	2.19	14.	8 28	2.5	10
10.5	168	152	2.49	2244	10.3	24.1	93	2609	1372	29.2	26.5	75.4	164	4	58	31	2.11	15.	8 29	2.5	11
11.0	176	159	2.61	2297	10.5	23.5	96	2687	1309	27.5	25.0	76.3	173	3	59	30	2.03	15.	9 30	2.6	11
11.5	184	167	2.73	2349	10.8	23.0	100	2758	1252	26.0	23.6	77.0	181	3	60	29	1.96	16.	9 31	2.7	12
12.0	192	174	2.84	2400	11.0	22.5	103	2823	1200	24.7	22.4	77.7	189	3	60	28	1.89	17.	9 32	2.7	12
13.0	208	188	3.08	2499	11.4	21.7	110	2938	1108	22.4	20.3	78.8	205	3	61	26	1.78	18.	10 34	2.8	13
14.0	224	203	3.32	2594	11.9	20.9	116	3036	1029	20.5	18.6	79.8	222	2	62	25	1.69	19.	11 36	3.0	14
15.0	240	217	3.56	2685	12.3	20.2	121	3121	960	18.9	17.1	80.6	238	2	63	24	1.61	21.	11 38	3.1	15
16.0	256	232	3.79	2774	12.7	19.5	127	3195	900	17.5	15.9	81.3	254	2	64	23	1.54	22.	12 40	3.2	16
17.0	272	246	4.03	2860	13.1	18.9	132	3260	847	16.3	14.8	81.8	270	2	65	22	1.48	23.	13 42	3.3	17
18.0	288	261	4.27	2944	13.4	18.4	137	3318	800	15.3	13.9	82.4	286	2	66	21	1.42	24.	13 44	3.4	18
19.0	304	275	4.50	3026	13.8	17.9	142	3370	758	14.4	13.0	82.8	302	2	66	20	1.37	26.	14 46	3.5	18
20.0	320	290	4.74	3105	14.2	17.5	147	3417	720	13.6	12.3	83.2	318	2	67	20	1.33	27.	14 47	3.6	19
25.0	400	362	5.93	3476	15.9	15.6	169	3593	576	10.6	9.6	84.7	399	1	71	17	1.16	33.	17 56	4.0	22
30.0	480	435	7.11	3813	17.4	14.3	188	3711	480	8.7	7.9	85.7	479	1	74	15	1.04	38.	20 64	4.4	26
35.0	560	507	8.30	4124	18.8	13.2	205	3794	411	7.4	6.7	86.3	559	1	77	14	0.95	44.	23 72	4.8	
40.0	640	580	9.48	4414	20.0	12.3	221	3857	360	6.4	5.8	86.8	639	1	80	13	0.88	49.	26 79	5.1	
45.0	720	652	10.67	4688	21.3	11.6	236	3905	320	5.6	5.1	87.2	719	1	82	12	0.83	54.	29 87	5.5	
50.0	800	725	11.85	4948	22.4	11.0	250	3944	288	5.1	4.6	87.5	799	1	85	12	0.78	59.	32 94	5.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	-fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 91 16 O on 165 Ho — 16 O on 165 Ho — 16 O on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 67. ZC= 75.(Re)
NEUTRON NUMBERS: NP= 8. NT= 98. NC=106.

AP**1/3= 2.520 AT**1/3= 5.485
REDUCED MASS NUMBER= 14.59 AP+AT=AC=181.

INTERACTION RADIUS RINT=11.80 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 6.25 CT+CP= 8.67 C= 1.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.41

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.15 RC=RCP+RCT= 8.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 116.57 MeV K= .05942 n=2.847
VC(RINT)= 65.3 MeV

FISSION-TKE= 129. MeV
ASYMM. FISSION-TKE= 49. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 19.79 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.33 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -63.7
COMPOUND NUCLEUS: -44.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.63 fm V(RB)= 67.5 MeV
Q-VALUE= -24.1 MeV
L-CRITICAL= 68.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	15	0.22	691	3.2	84.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	29	0.45	977	4.5	59.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	44	0.67	1197	5.5	48.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	58	0.89	1383	6.4	42.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	72	66	1.00	1467	6.8	39.8	5	22	0	166.7	165.3	6.6	49	23	36	584	43.32	0.	3	11	1.4	4
5.0	80	73	1.12	1546	7.1	37.7	27	485	264	108.8	103.4	35.6	63	17	42	117	7.43	7.	4	14	1.5	4
5.5	88	80	1.23	1622	7.5	36.0	38	850	562	87.0	81.5	46.5	75	13	46	84	5.29	8.	4	15	1.6	5
6.0	96	88	1.34	1694	7.8	34.5	46	1152	811	73.3	68.1	53.4	85	11	49	68	4.33	8.	5	17	1.7	6
6.5	104	95	1.45	1764	8.1	33.1	53	1407	1022	63.6	58.8	58.2	95	9	51	59	3.76	9.	5	19	1.8	6
7.0	112	102	1.56	1831	8.4	31.9	60	1624	1202	56.2	51.9	61.9	104	8	53	53	3.36	10.	6	20	1.9	7
7.5	120	109	1.67	1895	8.7	30.8	65	1812	1358	50.5	46.5	64.8	113	7	54	49	3.07	10.	6	22	1.9	7
8.0	128	117	1.79	1958	9.0	29.8	71	1976	1495	45.8	42.1	67.1	122	6	55	45	2.85	11.	7	23	2.0	8
8.5	136	124	1.90	2018	9.3	28.9	75	2121	1616	42.0	38.5	69.0	130	6	56	42	2.66	11.	7	24	2.1	8
9.0	144	131	2.01	2077	9.6	28.1	80	2249	1645	38.8	35.5	70.6	139	5	57	40	2.51	12.	7	25	2.2	9
9.5	152	139	2.12	2134	9.8	27.4	84	2364	1559	36.0	33.0	72.0	147	5	58	38	2.38	13.	8	26	2.2	9
10.0	160	146	2.23	2190	10.1	26.7	88	2467	1481	33.6	30.8	73.2	156	4	58	36	2.27	13.	8	28	2.3	10
10.5	168	153	2.34	2244	10.3	26.0	92	2560	1410	31.5	28.8	74.2	164	4	59	34	2.18	14.	8	29	2.4	10
11.0	176	160	2.46	2297	10.6	25.4	96	2644	1346	29.7	27.1	75.2	172	4	60	33	2.09	15.	9	30	2.5	11
11.5	184	168	2.57	2349	10.8	24.9	100	2721	1287	28.0	25.6	76.0	181	3	60	32	2.01	15.	9	31	2.5	11
12.0	192	175	2.68	2400	11.1	24.4	103	2792	1234	26.6	24.3	76.7	189	3	61	31	1.95	16.	9	32	2.6	12
13.0	208	190	2.90	2499	11.5	23.4	110	2917	1139	24.1	22.0	78.0	205	3	62	29	1.83	17.	10	34	2.7	13
14.0	224	204	3.13	2594	11.9	22.6	116	3023	1057	22.0	20.1	79.0	221	3	63	27	1.73	18.	11	36	2.8	14
15.0	240	219	3.35	2685	12.4	21.8	122	3116	987	20.2	18.5	79.9	238	2	64	26	1.65	19.	11	38	2.9	15
16.0	256	233	3.57	2774	12.8	21.1	128	3197	925	18.8	17.1	80.6	254	2	65	25	1.57	21.	12	39	3.0	16
17.0	272	248	3.80	2860	13.2	20.5	133	3268	871	17.5	16.0	81.3	270	2	65	24	1.51	22.	12	41	3.1	16
18.0	288	263	4.02	2944	13.5	19.9	138	3331	822	16.4	14.9	81.8	286	2	66	23	1.45	23.	13	43	3.2	17
19.0	304	277	4.24	3026	13.9	19.4	143	3387	779	15.4	14.0	82.3	302	2	67	22	1.40	24.	14	45	3.3	18
20.0	320	292	4.47	3105	14.3	18.9	148	3438	740	14.5	13.2	82.7	318	2	68	21	1.35	25.	14	47	3.4	19
25.0	400	365	5.58	3476	16.0	16.9	170	3631	592	11.3	10.3	84.3	399	1	71	19	1.18	31.	17	55	3.9	23
30.0	480	438	6.70	3813	17.5	15.4	190	3758	493	9.3	8.5	85.4	479	1	74	17	1.06	36.	20	63	4.3	26
35.0	560	510	7.81	4124	18.9	14.3	208	3849	423	7.9	7.2	86.1	559	1	77	15	0.97	42.	23	71	4.6	
40.0	640	583	8.93	4414	20.2	13.3	224	3917	370	6.8	6.2	86.6	639	1	79	14	0.90	47.	26	78	5.0	
45.0	720	656	10.05	4688	21.4	12.6	240	3970	329	6.0	5.5	87.0	719	1	82	13	0.84	52.	29	85	5.3	
50.0	800	729	11.16	4948	22.6	11.9	254	4012	296	5.4	4.9	87.3	799	1	84	13	0.79	57.	32	92	5.6	

 # 92 16 O on 181 Ta — 16 O on 181 Ta — 16 O on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 73. ZC= 81.(Tl)
NEUTRON NUMBERS: NP= 8. NT=108. NC=116.

AP**1/3= 2.520 AT**1/3= 5.657
REDUCED MASS NUMBER= 14.70 AP+AT=AC=197.

INTERACTION RADIUS RINT=11.98 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 6.47 CT+CP= 8.89 C= 1.76

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.62

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.35 RC=RCP+RCT= 9.14

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 123.85 MeV K= .05476 n=2.879
VC(RINT)= 70.1 MeV

FISSION-TKE= 143. MeV
ASYMM. FISSION-TKE= 51. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 19.90 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -46.0
COMPOUND NUCLEUS: -26.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.81 fm V(RB)= 72.4 MeV
Q-VALUE= -24.0 MeV
L-CRITICAL= 70.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	15	0.21	691	3.2	92.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	29	0.42	977	4.5	65.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	44	0.63	1197	5.6	53.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	59	0.84	1383	6.4	46.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	72	66	0.94	1467	6.8	43.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	80	74	1.05	1546	7.2	41.1	18	228	56	131.9	127.9	24.1	60	20	41	191	11.38	6.	4	13	1.4	4
5.5	88	81	1.15	1622	7.5	39.2	33	633	365	100.1	95.0	40.0	73	15	46	107	6.36	7.	4	15	1.5	5
6.0	96	88	1.26	1694	7.9	37.5	43	966	658	82.7	77.7	48.7	84	12	49	83	4.89	8.	5	17	1.6	6
6.5	104	96	1.36	1764	8.2	36.1	51	1246	890	70.9	66.3	54.5	94	10	51	70	4.12	8.	5	18	1.7	6
7.0	112	103	1.47	1831	8.5	34.8	57	1486	1088	62.3	58.0	58.8	103	9	53	62	3.63	9.	6	20	1.8	7
7.5	120	110	1.57	1895	8.8	33.6	64	1692	1260	55.6	51.7	62.2	112	8	54	56	3.28	9.	6	21	1.9	7
8.0	128	118	1.68	1958	9.1	32.5	69	1873	1411	50.3	46.6	64.8	121	7	56	51	3.02	10.	7	22	1.9	8
8.5	136	125	1.78	2018	9.4	31.5	74	2032	1543	46.0	42.5	67.0	130	6	57	48	2.81	11.	7	23	2.0	8
9.0	144	132	1.89	2077	9.6	30.7	79	2173	1662	42.3	39.1	68.8	138	6	58	45	2.64	11.	7	25	2.1	9
9.5	152	140	1.99	2134	9.9	29.8	84	2299	1616	39.2	36.2	70.4	147	5	58	42	2.49	12.	8	26	2.2	10
10.0	160	147	2.10	2190	10.2	29.1	88	2412	1535	36.5	33.7	71.7	155	5	59	40	2.37	12.	8	27	2.2	10
10.5	168	154	2.20	2244	10.4	28.4	92	2514	1462	34.2	31.6	72.9	164	4	60	38	2.26	13.	8	28	2.3	11
11.0	176	162	2.31	2297	10.7	27.7	96	2607	1396	32.2	29.7	73.9	172	4	60	37	2.17	13.	9	29	2.4	11
11.5	184	169	2.41	2349	10.9	27.1	100	2692	1335	30.4	28.0	74.8	180	4	o1	35	2.09	14.	9	30	2.4	12
12.0	192	176	2.52	2400	11.1	26.5	104	2770	1279	28.7	26.5	75.6	188	4	62	34	2.02	15.	9	31	2.5	12
13.0	208	191	2.73	2499	11.6	25.5	111	2907	1181	26.0	23.9	77.0	205	3	63	32	1.89	16.	10	33	2.6	13
14.0	224	206	2.94	2594	12.0	24.6	117	3025	1096	23.7	21.8	78.1	221	3	63	30	1.78	17.	11	35	2.7	14
15.0	240	221	3.15	2685	12.5	23.7	123	3126	1023	21.8	20.1	79.1	237	3	64	29	1.69	18.	11	37	2.8	15
16.0	256	235	3.36	2774	12.9	23.0	129	3215	959	20.2	18.6	79.9	254	2	65	27	1.62	19.	12	39	2.9	16
17.0	272	250	3.57	2860	13.3	22.3	135	3293	903	18.8	17.3	80.6	270	2	66	26	1.55	20.	12	40	3.0	17
18.0	288	265	3.78	2944	13.6	21.7	140	3363	853	17.6	16.2	81.2	286	2	67	25	1.49	21.	13	42	3.1	18
19.0	304	279	3.99	3026	14.0	21.1	145	3425	808	16.5	15.2	81.7	302	2	67	24	1.44	22.	14	44	3.2	18
20.0	320	294	4.20	3105	14.4	20.6	150	3481	767	15.6	14.3	82.2	318	2	68	24	1.39	23.	14	46	3.3	19
25.0	400	368	5.24	3476	16.1	18.4	173	3693	614	12.1	11.1	83.9	399	1	71	20	1.20	29.	17	54	3.7	23
30.0	480	441	6.29	3813	17.6	16.8	194	3833	511	9.9	9.1	85.0	479	1	74	18	1.08	34.	20	62	4.1	27
35.0	560	515	7.34	4124	19.0	15.5	212	3933	438	8.4	7.7	85.8	559	1	76	17	0.99	39.	23	69	4.5	
40.0	640	588	8.39	4414	20.3	14.5	229	4008	383	7.3	6.7	86.4	639	1	79	15	0.91	43.	26	77	4.8	
45.0	720	662	9.44	4688	21.6	13.7	244	4066	341	6.4	5.9	86.8	719	1	81	14	0.85	48.	29	84	5.1	
50.0	800	735	10.49	4948	22.7	13.0	259	4113	307	5.7	5.3	87.1	799	1	83	14	0.81	52.	32	91	5.4	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB — BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 93 16 O on 197 Au — 16 O on 197 Au — 16 O on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 79. ZC= 87.(Fr)
NEUTRON NUMBERS: NP= 8. NT=118. NC=126.

AP**1/3= 2.520 AT**1/3= 5.819
REDUCED MASS NUMBER= 14.80 AP+AT=AC=213.

INTERACTION RADIUS RINT=12.16 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 6.68 CT+CP= 9.10 C= 1.78

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.83

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.55 RC=RCP+RCT= 9.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 130.92 MeV K= .05058 n=2.909
VC(RINT)= 74.7 MeV

FISSION-TKE= 158. MeV
ASYMM. FISSION-TKE= 53. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 20.00 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.14 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -28.6
COMPOUND NUCLEUS: -3.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.98 fm V(RB)= 77.1 MeV
Q-VALUE= -29.6 MeV
L-CRITICAL= 72.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	15	0.20	691	3.2	99.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	30	0.40	977	4.6	70.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	44	0.59	1197	5.6	57.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	59	0.79	1383	6.5	49.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	72	67	0.89	1467	6.9	46.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	80	74	0.99	1546	7.2	44.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	88	81	1.09	1622	7.6	42.4	26	403	197	116.6	112.3	31.7	70	18	45	149	8.26	6.	4	14	1.4	4
6.0	96	89	1.19	1694	7.9	40.6	38	768	496	93.5	88.9	43.2	82	14	49	102	5.66	7.	5	16	1.5	5
6.5	104	96	1.29	1764	8.3	39.0	47	1075	749	79.1	74.6	50.5	92	12	51	83	4.58	8.	5	18	1.6	6
7.0	112	104	1.39	1831	8.6	37.6	55	1336	965	68.9	64.7	55.6	102	10	53	71	3.94	8.	6	19	1.7	6
7.5	120	111	1.48	1895	8.9	36.3	62	1562	1153	61.1	57.2	59.4	111	9	55	64	3.52	9.	6	20	1.7	7
8.0	128	118	1.58	1958	9.2	35.2	68	1759	1318	55.1	51.4	62.5	120	8	56	58	3.21	9.	7	22	1.8	8
8.5	136	126	1.68	2018	9.4	34.1	73	1933	1463	50.1	46.7	64.9	129	7	57	54	2.96	10.	7	23	1.9	8
9.0	144	133	1.78	2077	9.7	33.2	78	2087	1592	46.0	42.8	67.0	138	6	58	50	2.77	10.	7	24	2.0	9
9.5	152	141	1.88	2134	10.0	32.3	83	2225	1668	42.5	39.6	68.7	146	6	59	47	2.61	11.	8	25	2.0	9
10.0	160	148	1.98	2190	10.2	31.5	87	2348	1585	39.6	36.8	70.2	155	5	60	45	2.47	11.	8	26	2.1	10
10.5	168	155	2.08	2244	10.5	30.7	92	2460	1509	37.0	34.4	71.5	163	5	61	43	2.36	12.	8	27	2.2	10
11.0	176	163	2.18	2297	10.7	30.0	96	2562	1441	34.7	32.3	72.6	172	4	61	41	2.26	13.	9	28	2.2	11
11.5	184	170	2.28	2349	11.0	29.3	100	2654	1378	32.7	30.4	73.6	180	4	62	39	2.17	13.	9	29	2.3	11
12.0	192	178	2.38	2400	11.2	28.7	104	2739	1321	31.0	28.7	74.5	188	4	62	38	2.09	14.	9	30	2.4	12
13.0	208	192	2.57	2499	11.7	27.6	111	2889	1219	27.9	25.9	76.0	205	3	63	35	1.95	15.	10	32	2.5	13
14.0	224	207	2.77	2594	12.1	26.6	118	3017	1132	25.5	23.6	77.3	221	3	64	33	1.84	16.	10	34	2.6	14
15.0	240	222	2.97	2685	12.5	25.7	124	3128	1056	23.4	21.7	78.3	237	3	65	32	1.74	17.	11	36	2.7	15
16.0	256	237	3.17	2774	12.9	24.9	130	3225	990	21.6	20.0	79.2	253	3	66	30	1.66	18.	12	38	2.8	16
17.0	272	252	3.37	2860	13.3	24.1	136	3311	932	20.1	18.6	79.9	270	2	67	29	1.59	19.	12	40	2.9	17
18.0	288	266	3.56	2944	13.7	23.5	142	3387	880	18.8	17.4	80.6	286	2	67	28	1.53	20.	13	41	3.0	18
19.0	304	281	3.76	3026	14.1	22.8	147	3455	834	17.7	16.4	81.2	302	2	68	27	1.47	21.	14	43	3.1	18
20.0	320	296	3.96	3105	14.5	22.3	152	3516	792	16.6	15.4	81.7	318	2	69	26	1.42	22.	14	45	3.2	19
25.0	400	370	4.95	3476	16.2	19.9	176	3747	634	12.9	12.0	83.5	399	1	72	22	1.23	27.	17	53	3.6	23
30.0	480	444	5.94	3813	17.7	18.2	197	3901	528	10.6	9.8	84.7	479	1	74	20	1.10	31.	20	61	3.9	27
35.0	560	518	6.93	4124	19.1	16.8	215	4010	452	8.9	8.3	85.5	559	1	76	18	1.00	36.	23	68	4.3	
40.0	640	592	7.92	4414	20.5	15.7	233	4092	396	7.7	7.2	86.1	639	1	79	17	0.93	40.	26	75	4.6	
45.0	720	666	8.91	4688	21.7	14.8	249	4156	352	6.8	6.3	86.6	719	1	81	16	0.87	45.	29	82	4.9	
50.0	800	740	9.90	4948	22.9	14.1	264	4206	317	6.1	5.6	86.9	799	1	83	15	0.82	49.	31	89	5.2	

 # 94 16 O on 208 Pb — 16 O on 208 Pb — 16 O on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 82. ZC= 90.(Th)
NEUTRON NUMBERS: NP= 8. NT=126. NC=134.

AP**1/3= 2.520 AT**1/3= 5.925
REDUCED MASS NUMBER= 14.86 AP+AT=AC=224.

INTERACTION RADIUS RINT=12.27 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 6.82 CT+CP= 9.24 C= 1.79

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.96

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.66 RC=RCP+RCT= 9.44

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 134.10 MeV K= .04858 n=2.920
VC(RINT)= 76.9 MeV

FISSION-TKE= 165. MeV
ASYMM. FISSION-TKE= 53. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 19.91 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.09 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -19.5
COMPOUND NUCLEUS: 21.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.09 fm V(RB)= 79.3 MeV
Q-VALUE= -45.7 MeV
L-CRITICAL= 73.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	16	15	0.19	691	3.2	103.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	30	0.39	977	4.6	73.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	45	0.58	1197	5.6	59.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	59	0.77	1383	6.5	51.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	72	67	0.87	1467	6.9	48.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	80	74	0.97	1546	7.3	46.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	88	82	1.06	1622	7.6	44.0	23	301	115	125.7	122.0	27.1	70	18	45	181	9.81	6.	4	14	1.1	4
6.0	96	89	1.16	1694	8.0	42.2	36	683	428	98.8	94.4	40.6	81	15	49	114	6.13	7.	5	16	1.2	5
6.5	104	97	1.26	1764	8.3	40.5	46	1004	692	83.0	78.6	48.5	92	12	51	90	4.83	7.	5	17	1.3	6
7.0	112	104	1.35	1831	8.6	39.0	54	1277	918	71.9	67.8	54.0	102	10	54	76	4.11	8.	6	19	1.4	6
7.5	120	111	1.45	1895	8.9	37.7	61	1513	1114	63.7	59.9	58.2	111	9	55	68	3.64	8.	6	20	1.5	7
8.0	128	119	1.55	1958	9.2	36.5	67	1719	1286	57.2	53.6	61.4	120	8	56	61	3.30	9.	6	21	1.6	8
8.5	136	126	1.64	2018	9.5	35.4	73	1900	1437	52.0	48.7	64.0	129	7	58	57	3.05	9.	7	23	1.7	8
9.0	144	134	1.74	2077	9.7	34.4	78	2061	1572	47.7	44.6	66.2	138	6	59	53	2.84	10.	7	24	1.8	9
9.5	152	141	1.84	2134	10.0	33.5	83	2205	1692	44.0	41.1	68.0	146	6	59	50	2.67	10.	8	25	1.8	9
10.0	160	149	1.93	2190	10.3	32.7	88	2334	1616	40.9	38.2	69.5	155	5	60	47	2.53	11.	8	26	1.9	10
10.5	168	156	2.03	2244	10.5	31.9	92	2451	1539	38.2	35.7	70.9	163	5	61	45	2.41	11.	8	27	2.0	10
11.0	176	163	2.13	2297	10.8	31.1	96	2557	1469	35.9	33.4	72.1	172	4	61	43	2.30	12.	9	28	2.1	11
11.5	184	171	2.22	2349	11.0	30.5	100	2653	1405	33.8	31.5	73.1	180	4	62	41	2.21	12.	9	29	2.1	12
12.0	192	178	2.32	2400	11.3	29.8	104	2742	1347	31.9	29.8	74.0	188	4	62	40	2.13	13.	9	30	2.2	12
13.0	208	193	2.51	2499	11.7	28.6	112	2898	1243	28.8	26.8	75.6	205	3	63	37	1.98	14.	10	32	2.3	13
14.0	224	208	2.71	2594	12.2	27.6	118	3032	1154	26.2	24.4	76.9	221	3	64	35	1.87	15.	10	34	2.4	14
15.0	240	223	2.90	2685	12.6	26.7	125	3148	1077	24.1	22.4	78.0	237	3	65	33	1.77	16.	11	36	2.5	15
16.0	256	238	3.09	2774	13.0	25.8	131	3250	1010	22.3	20.7	78.9	253	3	66	31	1.69	17.	12	37	2.6	16
17.0	272	253	3.29	2860	13.4	25.1	137	3339	951	20.7	19.3	79.6	270	2	67	30	1.61	18.	12	39	2.7	17
18.0	288	267	3.48	2944	13.8	24.3	143	3418	898	19.3	18.0	80.3	286	2	67	29	1.55	19.	13	41	2.8	18
19.0	304	282	3.67	3026	14.2	23.7	148	3489	850	18.2	16.9	80.9	302	2	68	28	1.49	20.	13	43	2.9	19
20.0	320	297	3.87	3105	14.5	23.1	154	3553	808	17.1	15.9	81.4	318	2	68	27	1.44	21.	14	44	3.0	20
25.0	400	371	4.83	3476	16.2	20.7	178	3795	646	13.3	12.3	83.4	399	1	71	23	1.25	25.	17	52	3.4	24
30.0	480	446	5.80	3813	17.8	18.9	199	3955	538	10.8	10.1	84.6	479	1	74	21	1.11	30.	20	60	3.8	28
35.0	560	520	6.77	4124	19.2	17.5	218	4069	461	9.2	8.5	85.4	559	1	76	19	1.02	34.	23	67	4.1	
40.0	640	594	7.73	4414	20.6	16.3	235	4155	404	7.9	7.4	86.0	639	1	78	18	0.94	39.	26	74	4.4	
45.0	720	669	8.70	4688	21.8	15.4	252	4221	359	7.0	6.5	86.5	719	1	80	16	0.88	43.	28	81	4.7	
50.0	800	743	9.67	4948	23.0	14.6	267	4274	323	6.3	5.8	86.9	799	1	82	15	0.83	47.	31	88	5.0	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nns	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

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95 16 O on 209 Bi

16 O on 209 Bi

16 O on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 83. ZC= 91.(Pa)
NEUTRON NUMBERS: NP= 8. NT=126. NC=134.

AP**1/3= 2.520 AT**1/3= 5.934
REDUCED MASS NUMBER= 14.86 AP+AT=AC=225.

INTERACTION RADIUS RINT=12.28 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 6.83 CT+CP= 9.25 C= 1.79

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 6.97

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.68 RC=RCP+RCT= 9.46

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 135.41 MeV K= .04801 n=2.927
VC(RINT)= 77.7 MeV

FISSION-TKE= 168. MeV
ASYMM. FISSION-TKE= 54. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.890 MeV/fm**2 PROX-FACTOR= 20.00 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.09 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: -16.5
COMPOUND NUCLEUS: 25.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.10 fm V(RB)= 80.2 MeV
Q-VALUE= -47.0 MeV
L-CRITICAL= 73.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGWAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	16	15	0.19	691	3.3	104.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	30	0.38	977	4.6	73.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	45	0.57	1197	5.6	60.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	59	0.76	1383	6.5	52.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	72	67	0.86	1467	6.9	49.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	80	74	0.96	1546	7.3	46.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	88	82	1.05	1622	7.6	44.6	20	250	73	130.6	127.1	24.7	69	19	44	201	10.82	6.	4	14	1.1	4
6.0	96	89	1.15	1694	8.0	42.7	35	638	390	101.5	97.1	39.3	81	15	49	119	6.36	7.	5	16	1.2	4
6.5	104	97	1.24	1764	8.3	41.0	45	963	657	84.8	80.5	47.6	91	13	52	93	4.94	7.	5	17	1.3	5
7.0	112	104	1.34	1831	8.6	39.5	53	1240	886	73.4	69.3	53.3	101	11	54	79	4.18	8.	6	19	1.4	6
7.5	120	111	1.43	1895	8.9	38.2	60	1479	1085	64.9	61.0	57.6	111	9	55	69	3.69	8.	6	20	1.5	7
8.0	128	119	1.53	1958	9.2	37.0	66	1687	1259	58.2	54.6	60.9	120	8	57	63	3.34	9.	6	21	1.6	8
8.5	136	126	1.63	2018	9.5	35.9	72	1871	1412	52.9	49.5	63.6	129	7	58	58	3.07	9.	7	23	1.7	8
9.0	144	134	1.72	2077	9.8	34.9	77	2034	1549	48.4	45.3	65.8	138	6	59	54	2.86	10.	7	24	1.8	9
9.5	152	141	1.82	2134	10.0	33.9	82	2179	1671	44.7	41.8	67.6	146	6	60	51	2.69	10.	8	25	1.8	9
10.0	160	149	1.91	2190	10.3	33.1	87	2310	1619	41.6	38.8	69.2	155	5	60	48	2.55	11.	8	26	1.9	10
10.5	168	156	2.01	2244	10.5	32.3	92	2429	1542	38.8	36.2	70.6	163	5	61	46	2.42	11.	8	27	2.0	10
11.0	176	163	2.10	2297	10.8	31.5	96	2536	1472	36.4	34.0	71.8	171	5	62	44	2.31	12.	9	28	2.0	11
11.5	184	171	2.20	2349	11.0	30.8	100	2634	1408	34.3	32.0	72.9	180	4	62	42	2.22	12.	9	29	2.1	11
12.0	192	178	2.29	2400	11.3	30.2	104	2724	1349	32.4	30.2	73.8	188	4	63	40	2.14	13.	9	30	2.2	12
13.0	208	193	2.49	2499	11.7	29.0	111	2882	1245	29.2	27.2	75.4	205	3	64	38	1.99	14.	10	32	2.3	13
14.0	224	208	2.68	2594	12.2	27.9	118	3018	1156	26.6	24.8	76.7	221	3	65	35	1.88	15.	10	34	2.4	14
15.0	240	223	2.87	2685	12.6	27.0	125	3135	1079	24.4	22.7	77.8	237	3	65	33	1.78	16.	11	36	2.5	15
16.0	256	238	3.06	2774	13.0	26.1	131	3238	1012	22.6	21.0	78.7	253	3	66	32	1.69	17.	12	37	2.6	16
17.0	272	253	3.25	2860	13.4	25.4	137	3328	952	21.0	19.5	79.5	270	2	67	30	1.62	18.	12	39	2.7	17
18.0	288	268	3.44	2944	13.8	24.6	143	3409	899	19.6	18.2	80.2	286	2	68	29	1.55	19.	13	41	2.8	18
19.0	304	282	3.63	3026	14.2	24.0	148	3481	852	18.4	17.1	80.8	302	2	68	28	1.50	20.	13	43	2.9	19
20.0	320	297	3.82	3105	14.5	23.4	153	3545	809	17.3	16.1	81.3	318	2	69	27	1.45	21.	14	44	3.0	20
25.0	400	372	4.78	3476	16.3	20.9	178	3790	647	13.4	12.5	83.3	399	1	72	24	1.25	25.	17	52	3.4	24
30.0	480	446	5.74	3813	17.8	19.1	199	3953	539	11.0	10.2	84.5	479	1	74	21	1.12	30.	20	60	3.8	28
35.0	560	520	6.69	4124	19.2	17.7	218	4068	462	9.3	8.6	85.4	559	1	76	19	1.02	34.	23	67	4.1	
40.0	640	594	7.65	4414	20.6	16.5	235	4155	404	8.0	7.5	86.0	639	1	78	18	0.94	39.	26	74	4.4	
45.0	720	669	8.60	4688	21.8	15.6	252	4222	359	7.1	6.6	86.5	719	1	80	17	0.88	43.	28	81	4.7	
50.0	800	743	9.56	4948	23.0	14.8	267	4276	323	6.3	5.9	86.8	799	1	82	16	0.83	47.	31	88	5.0	

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96 16 O on 238 U

16 O on 238 U

16 O on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 8. ZT= 92. ZC=100.(Fm)
NEUTRON NUMBERS: NP= 8. NT=146. NC=154.

AP**1/3= 2.520 AT**1/3= 6.197
REDUCED MASS NUMBER= 14.99 AP+AT=AC=254.

INTERACTION RADIUS RINT=12.57 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.42 CT= 7.16 CT+CP= 9.59 C= 1.81

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.78 RT= 7.30

COULOMB RADII [fm]:
RCP= 2.78 RCT= 6.98 RC=RCP+RCT= 9.76

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 145.05 MeV K= .04281 n=2.963
VC(RINT)= 84.2 MeV

FISSION-TKE= 191. MeV
ASYMM. FISSION-TKE= 56. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.875 MeV/fm**2 PROX-FACTOR= 19.91 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.97 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7 TARGET: 47.2
COMPOUND NUCLEUS: 82.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.37 fm V(RB)= 86.7 MeV
Q-VALUE= -39.5 MeV
L-CRITICAL= 75.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGWAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	16	15	0.18	691	3.3	115.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	32	30	0.36	977	4.6	81.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	48	45	0.53	1197	5.7	66.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	64	60	0.71	1383	6.6	57.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	72	67	0.80	1467	7.0	54.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	80	75	0.89	1546	7.3	51.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	88	82	0.98	1622	7.7	49.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	96	90	1.07	1694	8.0	47.3	25	336	145	123.8	120.5	28.1	78	18	48	187	9.27	6.	5	15	1.3	5
6.5	104	97	1.16	1764	8.4	45.5	39	704	446	99.4	95.5	40.3	90	14	52	123	6.07	6.	5	16	1.4	6
7.0	112	105	1.25	1831	8.7	43.8	48	1016	705	84.4	80.6	47.8	100	12	54	99	4.84	7.	6	18	1.4	7
7.5	120	112	1.34	1895	9.0	42.3	56	1286	928	73.7	70.1	53.1	110	10	56	84	4.15	7.	6	19	1.5	8
8.0	128	120	1.42	1958	9.3	41.0	64	1520	1124	65.6	62.2	57.2	119	9	58	75	3.69	8.	6	21	1.6	8
8.5	136	127	1.51	2018	9.6	39.8	70	1727	1297	59.3	56.1	60.4	128	8	59	68	3.35	8.	7	22	1.7	9
9.0	144	135	1.60	2077	9.8	38.6	76	1911	1450	54.1	51.1	63.0	137	7	60	63	3.09	9.	7	23	1.7	10
9.5	152	142	1.69	2134	10.1	37.6	81	2075	1598	49.7	46.9	65.1	146	6	61	59	2.89	9.	7	24	1.8	10
10.0	160	150	1.78	2190	10.4	36.6	86	2222	1690	46.1	43.4	67.0	154	6	61	55	2.72	10.	8	25	1.9	11
10.5	168	157	1.87	2244	10.6	35.8	91	2355	1609	42.9	40.4	68.5	163	5	62	52	2.57	10.	8	26	1.9	12
11.0	176	165	1.96	2297	10.9	34.9	96	2476	1536	40.2	37.8	69.9	171	5	63	50	2.45	11.	8	27	2.0	12
11.5	184	172	2.05	2349	11.1	34.2	100	2587	1469	37.8	35.5	71.1	179	5	63	48	2.34	11.	9	28	2.0	13
12.0	192	180	2.14	2400	11.4	33.5	104	2688	1408	35.6	33.5	72.2	188	4	64	46	2.25	11.	9	29	2.1	14
13.0	208	195	2.31	2499	11.8	32.1	112	2866	1300	32.0	30.1	74.0	204	4	65	43	2.09	12.	10	31	2.2	15
14.0	224	210	2.49	2594	12.3	31.0	119	3019	1207	29.1	27.3	75.4	221	3	66	40	1.96	13.	10	33	2.3	16
15.0	240	225	2.67	2685	12.7	29.9	126	3151	1126	26.7	25.0	76.7	237	3	66	38	1.86	14.	11	35	2.4	17
16.0	256	240	2.85	2774	13.1	29.0	133	3267	1056	24.6	23.1	77.7	253	3	67	36	1.76	15.	12	36	2.5	18
17.0	272	255	3.03	2860	13.5	28.1	139	3369	994	22.9	21.5	78.6	269	3	68	34	1.68	16.	12	38	2.6	19
18.0	288	270	3.20	2944	13.9	27.3	145	3459	939	21.3	20.0	79.3	286	2	68	33	1.62	17.	13	40	2.7	20
19.0	304	285	3.38	3026	14.3	26.6	151	3540	889	20.0	18.8	80.0	302	2	69	32	1.55	18.	13	41	2.8	21
20.0	320	300	3.56	3105	14.7	25.9	156	3613	845	18.8	17.7	80.6	318	2	70	31	1.50	18.	14	43	2.9	22
25.0	400	375	4.45	3476	16.4	23.2	181	3889	676	14.6	13.7	82.7	398	2	72	26	1.29	23.	17	51	3.2	27
30.0	480	450	5.34	3813	18.0	21.2	203	4072	563	11.9	11.1	84.1	479	1	74	23	1.15	27.	20	58	3.6	31
35.0	560	525	6.23	4124	19.4	19.6	223	4202	482	10.0	9.4	85.0	559	1	76	21	1.05	31.	23	65	3.9	
40.0	640	600	7.12	4414	20.7	18.3	242	4300	422	8.7	8.1	85.7	639	1	78	20	0.97	34.	25	72	4.2	
45.0	720	675	8.01	4688	22.0	17.3	259	4376	375	7.6	7.2	86.2	719	1	80	18	0.91	38.	28	79	4.5	
50.0	800	750	8.90	4948	23.2	16.4	275	4436	338	6.8	6.4	86.6	799	1	82	17	0.85	41.	31	85	4.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 16 O

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

 # 97 19 F on 12 C — 19 F on 12 C — 19 F on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 6. ZC= 15.(P)
NEUTRON NUMBERS: NP= 10. NT= 6. NC= 16.

AP**1/3= 2.668 AT**1/3= 2.289 ELSCAT <39 deg
REDUCED MASS NUMBER= 7.35 AP+AT=AC= 31.

INTERACTION RADIUS RINT= 8.48 fm RO= 1.71 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 2.12 CT+CP= 4.74 C= 1.17

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 2.52

COULOMB RADII [fm]:
RCP= 2.93 RCT= 2.51 RC=RCP+RCT= 5.44

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 20.09 MeV K= .09109 n=2.454
VC(RINT)= 9.2 MeV

FISSION-TKE= 30. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.950 MeV/fm**2 PROX-FACTOR= 13.99 MeV
L-RLD= 31 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 26.12 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: 0.0
COMPOUND NUCLEUS: -23.8

FUSION RELATED PARAMETERS:
R-BARRIER= 7.76 fm V(RB)= 9.1 MeV
Q-VALUE= 22.3 MeV
L-CRITICAL= 21.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	7	0.80	820	1.6	8.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	38	15	1.61	1160	2.3	6.0	12	1002	714	53.8	20.4	63.1	31	7	0	10	4.42	22.	0 0	3.1	2
3.0	57	22	2.41	1422	2.8	4.9	18	1472	1106	30.4	11.7	74.8	53	4	0	6	2.90	33.	0 0	3.4	2
4.0	76	29	3.21	1642	3.2	4.3	23	1697	1302	21.3	8.2	79.4	74	2	73	5	2.31	44.	4 10	3.7	2
4.5	86	33	3.62	1742	3.4	4.0	25	1770	1353	18.5	7.1	80.8	83	2	79	5	2.13	49.	5 16	3.8	2
5.0	95	37	4.02	1836	3.6	3.8	26	1828	1218	16.4	6.3	81.8	93	2	85	4	1.98	53.	6 19	3.9	3
5.5	105	40	4.42	1926	3.8	3.6	28	1875	1107	14.7	5.7	82.7	103	2	91	4	1.86	58.	6 22	4.0	3
6.0	114	44	4.82	2012	3.9	3.5	30	1914	1015	13.3	5.1	83.3	113	1	96	4	1.76	63.	7 25	4.1	3
6.5	124	48	5.22	2094	4.1	3.3	31	1946	937	12.2	4.7	83.9	122	1	102	4	1.67	68.	7 27	4.3	3
7.0	133	51	5.62	2174	4.3	3.2	33	1974	870	11.2	4.3	84.4	132	1	107	4	1.60	74.	8 29	4.4	3
7.5	143	55	6.03	2250	4.4	3.1	34	1997	812	10.4	4.0	84.8	141	1	113	3	1.53	79.	8 31	4.5	3
8.0	152	59	6.43	2325	4.5	3.0	35	2018	761	9.7	3.7	85.2	151	1	118	3	1.48	81.	9 33	4.6	4
8.5	162	63	6.83	2396	4.7	2.9	37	2036	716	9.1	3.5	85.5	161	1	123	3	1.42	86.	9 35	4.7	4
9.0	171	66	7.23	2466	4.8	2.8	38	2052	676	8.5	3.3	85.7	170	1	128	3	1.38	91.	10 37	4.8	4
9.5	181	70	7.63	2534	5.0	2.8	39	2066	641	8.0	3.1	86.0	180	1	133	3	1.34	96.	10 39	4.9	4
10.0	190	74	8.04	2600	5.1	2.7	40	2079	609	7.6	2.9	86.2	189	1	138	3	1.30	101.	11 41	5.0	4
10.5	200	77	8.44	2665	5.2	2.6	42	2090	580	7.2	2.8	86.4	199	1	143	3	1.26	106.	11 42	5.1	4
11.0	209	81	8.84	2728	5.3	2.6	43	2100	553	6.9	2.7	86.6	208	1	148	3	1.23	111.	12 44	5.2	4
11.5	219	85	9.24	2790	5.5	2.5	44	2109	529	6.6	2.5	86.7	218	1	153	3	1.20	117.	12 46	5.3	4
12.0	228	88	9.64	2850	5.6	2.5	45	2118	507	6.3	2.4	86.9	227	1	158	3	1.17	122.	13 47	5.3	4
13.0	247	96	10.45	2967	5.8	2.4	47	2133	468	5.8	2.2	87.1	246	1	168	2	1.12	127.	14 51	5.5	5
14.0	266	103	11.25	3080	6.0	2.3	49	2145	435	5.3	2.1	87.3	265	1	177	2	1.07	137.	15 54	5.7	5
15.0	285	110	12.05	3189	6.2	2.2	51	2156	406	5.0	1.9	87.5	284	1	187	2	1.03	146.	16 57	5.9	5
16.0	304	118	12.86	3294	6.4	2.1	52	2165	380	4.6	1.8	87.7	304	0	196	2	1.00	156.	16 60	6.0	5
17.0	323	125	13.66	3397	6.6	2.1	54	2173	358	4.4	1.7	87.8	323	0	206	2	0.97	160.	17 63	6.2	6
18.0	342	132	14.46	3496	6.8	2.0	56	2181	338	4.1	1.6	87.9	342	0	215	2	0.94	169.	18 65	6.3	6
19.0	361	140	15.27	3593	7.0	2.0	58	2187	320	3.9	1.5	88.1	361	0	224	2	0.91	178.	19 68	6.5	6
20.0	380	147	16.07	3687	7.2	1.9	59	2193	304	3.7	1.4	88.2	380	0	233	2	0.89	188.	20 71	6.6	6
25.0	475	184	20.09	4128	8.0	1.7	67	2213	243	2.9	1.1	88.5	475	0	278	2	0.79	225.	24 84	7.3	7
30.0	570	221	24.11	4528	8.8	1.6	73	2227	203	2.4	0.9	88.8	570	0	323	2	0.72	259.	29 97	7.9	8
35.0	665	257	28.12	4897	9.5	1.4	79	2236	174	2.1	0.8	89.0	665	0	366	1	0.66	289.	33 109	8.5	
40.0	760	294	32.14	5242	10.2	1.3	85	2242	152	1.8	0.7	89.1	760	0	409	1	0.62	330.	38 121	9.0	
45.0	855	331	36.16	5567	10.8	1.3	90	2247	135	1.6	0.6	89.2	855	0	452	1	0.58	355.	42 132	9.5	
50.0	950	368	40.18	5876	11.4	1.2	95	2251	121	1.4	0.6	89.3	950	0	494	1	0.55	375.	46 143	10.0	

 # 98 19 F on 16 O — 19 F on 16 O — 19 F on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 8. ZC= 17.(Cl)
NEUTRON NUMBERS: NP= 10. NT= 8. NC= 18.

AP**1/3= 2.668 AT**1/3= 2.520 ELSCAT <57 deg
REDUCED MASS NUMBER= 8.69 AP+AT=AC= 35.

INTERACTION RADIUS RINT= 8.74 fm RO= 1.68 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 2.42 CT+CP= 5.04 C= 1.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 2.78

COULOMB RADII [fm]:
RCP= 2.93 RCT= 2.78 RC=RCP+RCT= 5.71

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 25.57 MeV K= .10595 n=2.440
VC(RINT)= 11.9 MeV

FISSION-TKE= 32. MeV
ASYMM. FISSION-TKE= 32. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.950 MeV/fm**2 PROX-FACTOR= 15.03 MeV
L-RLD= 35 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.19 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -4.7
COMPOUND NUCLEUS: -26.6

FUSION RELATED PARAMETERS:
R-BARRIER= 7.96 fm V(RB)= 12.0 MeV
Q-VALUE= 20.4 MeV
L-CRITICAL= 26.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	9	0.73	820	1.9	11.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	38	17	1.47	1160	2.7	8.0	13	979	621	62.5	28.3	59.8	28	10	0	14	4.96	19.	0 0	2.9	2
3.0	57	26	2.20	1422	3.3	6.5	21	1432	1078	34.3	15.6	72.9	52	5	0	9	3.09	29.	0 0	3.3	2
4.0	76	35	2.93	1642	3.8	5.7	27	1698	1307	23.8	10.9	78.1	73	3	70	7	2.43	38.	4 13	3.6	3
4.5	86	39	3.30	1742	4.0	5.3	29	1786	1383	20.6	9.4	79.7	83	3	75	6	2.23	42.	5 17	3.7	3
5.0	95	43	3.66	1836	4.2	5.1	32	1855	1257	18.2	8.3	80.9	93	2	81	6	2.07	47.	6 20	3.8	3
5.5	105	48	4.03	1926	4.5	4.8	34	1911	1143	16.3	7.4	81.8	102	2	86	6	1.94	52.	6 23	3.9	3
6.0	114	52	4.40	2012	4.7	4.6	36	1957	1047	14.8	6.7	82.6	112	2	91	5	1.84	57.	7 25	4.1	3
6.5	124	56	4.76	2094	4.8	4.4	38	1996	967	13.5	6.2	83.3	122	2	95	5	1.74	59.	7 28	4.2	4
7.0	133	61	5.13	2174	5.0	4.3	39	2029	898	12.4	5.7	83.8	131	2	100	5	1.66	64.	8 30	4.3	4
7.5	143	65	5.50	2250	5.2	4.1	41	2058	838	11.5	5.3	84.2	141	1	105	5	1.60	68.	8 32	4.4	4
8.0	152	69	5.86	2325	5.4	4.0	43	2083	785	10.7	4.9	84.6	151	1	109	4	1.53	73.	9 34	4.5	4
8.5	162	74	6.23	2396	5.5	3.9	44	2104	739	10.0	4.6	85.0	160	1	114	4	1.48	78.	9 36	4.6	4
9.0	171	78	6.60	2466	5.7	3.8	46	2124	698	9.4	4.3	85.3	170	1	118	4	1.43	82.	10 38	4.7	4
9.5	181	83	6.96	2534	5.9	3.7	47	2141	661	8.9	4.1	85.6	179	1	122	4	1.39	87.	10 39	4.9	4
10.0	190	87	7.33	2600	6.0	3.6	49	2156	628	8.4	3.8	85.8	189	1	127	4	1.34	88.	11 41	5.0	5
10.5	200	91	7.70	2665	6.2	3.5	50	2170	598	8.0	3.6	86.0	199	1	131	4	1.31	93.	11 43	5.1	5
11.0	209	96	8.06	2728	6.3	3.4	52	2183	571	7.6	3.5	86.2	208	1	135	4	1.27	97.	12 44	5.1	5
11.5	219	100	8.43	2790	6.4	3.3	53	2194	546	7.2	3.3	86.4	218	1	139	4	1.24	102.	12 46	5.2	5
12.0	228	104	8.80	2850	6.6	3.3	54	2204	523	6.9	3.2	86.5	227	1	143	3	1.21	106.	12 48	5.3	5
13.0	247	113	9.53	2967	6.8	3.1	57	2222	483	6.4	2.9	86.8	246	1	152	3	1.16	115.	13 51	5.5	5
14.0	266	122	10.26	3080	7.1	3.0	59	2238	449	5.9	2.7	87.1	265	1	160	3	1.11	120.	14 54	5.7	6
15.0	285	130	10.99	3189	7.4	2.9	61	2251	419	5.5	2.5	87.3	284	1	168	3	1.07	128.	15 57	5.9	6
16.0	304	139	11.73	3294	7.6	2.8	63	2263	392	5.1	2.3	87.4	303	1	176	3	1.03	137.	16 60	6.0	6
17.0	323	148	12.46	3397	7.8	2.7	66	2273	369	4.8	2.2	87.6	322	1	183	3	1.00	145.	17 63	6.2	6
18.0	342	156	13.19	3496	8.1	2.7	68	2282	349	4.5	2.1	87.7	341	1	191	3	0.97	148.	18 65	6.4	7
19.0	361	165	13.93	3593	8.3	2.6	70	2290	330	4.3	2.0	87.9	361	0	199	3	0.94	157.	19 68	6.5	7
20.0	380	174	14.66	3687	8.5	2.5	72	2297	314	4.1	1.9	88.0	380	0	207	3	0.92	165.	19 71	6.7	7
25.0	475	217	18.32	4128	9.5	2.3	81	2324	251	3.2	1.5	88.4	475	0	244	2	0.81	199.	24 84	7.4	8
30.0	570	261	21.99	4528	10.4	2.1	89	2341	209	2.7	1.2	88.7	570	0	281	2	0.74	230.	28 96	8.0	9
35.0	665	304	25.65	4897	11.2	1.9	96	2353	179	2.3	1.0	88.9	665	0	317	2	0.68	258.	32 108	8.6	
40.0	760	347	29.32	5242	12.0	1.8	103	2361	157	2.0	0.9	89.0	760	0	352	2	0.64	283.	36 120	9.2	
45.0	855	391	32.98	5567	12.7	1.7	110	2368	139	1.8	0.8	89.1	855	0	387	2	0.60	305.	40 131	9.7	
50.0	950	434	36.65	5876	13.4	1.6	116	2373	125	1.6	0.7	89.2	950	0	421	2	0.57	339.	45 142	10.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 19 F

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

\# 99 19 F on 27 Al

19 F on 27 Al

19 F on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 13. ZC= 22.(Ti)
NEUTRON NUMBERS: NP= 10. NT= 14. NC= 24.

AP**1/3= 2.668 AT**1/3= 3.000
REDUCED MASS NUMBER= 11.15 AP+AT=AC= 46.

INTERACTION RADIUS RINT= 9.26 fm RO= 1.63 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 3.05 CT+CP= 5.66 C= 1.41

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 3.35

COULOMB RADII [fm]:
RCP= 2.93 RCT= 3.32 RC=RCP+RCT= 6.25

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 37.89 MeV K= .12246 n=2.453
VC(RINT)= 18.2 MeV

FISSION-TKE= 37. MeV
ASYMM. FISSION-TKE= 35. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.948 MeV/fm**2 PROX-FACTOR= 16.78 MeV
L-RLD= 46 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.38 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -20.6
COMPOUND NUCLEUS: -44.8

FUSION RELATED PARAMETERS:
R-BARRIER= 8.41 fm V(RB)= 18.5 MeV
Q-VALUE= 22.7 MeV
L-CRITICAL= 36.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	11	0.61	820	2.4	18.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	38	22	1.23	1160	3.4	13.0	14	573	376	87.0	52.9	46.5	21	17	0	30	6.89	15.	0 0	2.8	2
3.0	57	33	1.84	1422	4.2	10.6	26	1325	990	43.8	25.9	68.1	49	8	0	16	3.58	22.	0 0	3.1	3
4.0	76	45	2.46	1642	4.9	9.2	35	1690	1298	29.7	17.5	75.2	71	5	62	12	2.72	29.	4 16	3.4	3
4.5	86	50	2.76	1742	5.2	8.7	38	1810	1400	25.6	15.0	77.2	81	4	67	11	2.47	32.	5 19	3.6	4
5.0	95	56	3.07	1836	5.5	8.2	41	1905	1409	22.5	13.2	78.8	92	3	71	10	2.28	36.	5 21	3.7	4
5.5	105	61	3.38	1926	5.7	7.9	44	1983	1281	20.0	11.8	80.0	101	3	75	9	2.13	39.	6 24	3.8	4
6.0	114	67	3.68	2012	6.0	7.5	47	2047	1174	18.1	10.6	81.0	111	3	79	9	2.00	43.	6 26	3.9	4
6.5	124	72	3.99	2094	6.2	7.2	50	2101	1084	16.5	9.7	81.8	121	2	82	8	1.90	47.	7 28	4.1	4
7.0	133	78	4.30	2174	6.5	7.0	52	2147	1007	15.2	8.9	82.4	131	2	85	8	1.81	49.	7 30	4.2	5
7.5	143	84	4.60	2250	6.7	6.7	55	2187	939	14.0	8.2	83.0	140	2	89	8	1.73	52.	8 32	4.3	5
8.0	152	89	4.91	2325	6.9	6.5	57	2222	881	13.0	7.7	83.5	150	2	92	7	1.66	56.	8 34	4.4	5
8.5	162	95	5.22	2396	7.1	6.3	59	2252	829	12.2	7.2	83.9	160	2	95	7	1.60	59.	9 35	4.5	5
9.0	171	100	5.53	2466	7.3	6.1	61	2280	783	11.4	6.7	84.3	169	2	98	7	1.54	61.	9 37	4.6	6
9.5	181	106	5.83	2534	7.5	6.0	63	2304	742	10.8	6.3	84.6	179	2	101	7	1.49	65.	10 39	4.7	6
10.0	190	112	6.14	2600	7.7	5.8	65	2325	704	10.2	6.0	84.9	189	1	104	6	1.45	68.	10 40	4.8	6
10.5	200	117	6.45	2665	7.9	5.7	67	2345	671	9.7	5.7	85.2	198	1	107	6	1.41	72.	10 42	4.9	6
11.0	209	123	6.75	2728	8.1	5.6	69	2363	640	9.2	5.4	85.4	208	1	110	6	1.37	75.	11 43	5.0	6
11.5	219	128	7.06	2790	8.3	5.4	71	2379	613	8.8	5.1	85.6	217	1	113	6	1.33	78.	11 45	5.1	6
12.0	228	134	7.37	2850	8.4	5.3	73	2394	587	8.4	4.9	85.8	227	1	116	6	1.30	80.	12 47	5.2	7
13.0	247	145	7.98	2967	8.8	5.1	76	2420	542	7.7	4.5	86.2	246	1	122	5	1.24	86.	13 50	5.4	7
14.0	266	156	8.60	3080	9.1	4.9	79	2442	503	7.1	4.2	86.5	265	1	127	5	1.19	93.	13 52	5.6	7
15.0	285	167	9.21	3189	9.4	4.8	83	2461	469	6.6	3.9	86.7	284	1	133	5	1.15	97.	14 55	5.7	8
16.0	304	178	9.82	3294	9.8	4.6	86	2478	440	6.2	3.6	86.9	303	1	138	5	1.10	104.	15 58	5.9	8
17.0	323	190	10.44	3397	10.1	4.5	89	2492	414	5.8	3.4	87.1	322	1	143	5	1.07	110.	16 61	6.1	8
18.0	342	201	11.05	3496	10.3	4.3	91	2505	391	5.4	3.2	87.3	341	1	149	5	1.04	114.	17 63	6.2	9
19.0	361	212	11.67	3593	10.6	4.2	94	2517	371	5.1	3.0	87.4	360	1	154	4	1.00	120.	17 66	6.4	9
20.0	380	223	12.28	3687	10.9	4.1	97	2527	352	4.9	2.9	87.6	379	1	159	4	0.98	126.	18 68	6.5	9
25.0	475	279	15.35	4128	12.2	3.7	109	2566	281	3.9	2.3	88.1	474	1	184	4	0.87	149.	22 81	7.2	11
30.0	570	335	18.42	4528	13.4	3.4	120	2591	234	3.2	1.9	88.4	570	0	208	3	0.79	174.	26 93	7.9	12
35.0	665	390	21.49	4897	14.4	3.1	131	2609	201	2.7	1.6	88.6	665	0	231	3	0.73	197.	30 104	8.5	
40.0	760	446	24.56	5242	15.4	2.9	140	2623	176	2.4	1.4	88.8	760	0	254	3	0.68	218.	34 115	9.0	
45.0	855	502	27.63	5567	16.4	2.7	149	2633	156	2.1	1.2	88.9	855	0	277	3	0.64	238.	38 125	9.6	
50.0	950	558	30.70	5876	17.2	2.6	157	2641	140	1.9	1.1	89.1	950	0	299	3	0.60	256.	41 135	10.0	

\#100 19 F on 40 Ca

19 F on 40 Ca

19 F on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 20. ZC= 29.(Cu)
NEUTRON NUMBERS: NP= 10. NT= 20. NC= 30.

AP**1/3= 2.668 AT**1/3= 3.420
REDUCED MASS NUMBER= 12.88 AP+AT=AC= 59.

INTERACTION RADIUS RINT= 9.72 fm RO= 1.60 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 3.59 CT+CP= 6.21 C= 1.51

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 3.85

COULOMB RADII [fm]:
RCP= 2.93 RCT= 3.84 RC=RCP+RCT= 6.77

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 53.48 MeV K= .12534 n=2.510
VC(RINT)= 26.6 MeV

FISSION-TKE= 45. MeV
ASYMM. FISSION-TKE= 39. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 18.10 MeV
L-RLD= 56 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.09 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -33.0
COMPOUND NUCLEUS: -58.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.78 fm V(RB)= 27.5 MeV
Q-VALUE= 23.7 MeV
L-CRITICAL= 43.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	13	0.48	820	2.8	28.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	38	26	0.97	1160	4.0	20.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	57	39	1.45	1422	4.9	16.4	26	992	701	63.6	44.2	58.2	43	14	0	29	4.56	17.	0 0	2.9	3
4.0	76	52	1.94	1642	5.6	14.2	38	1509	1131	40.9	28.0	69.6	68	8	56	20	3.16	23.	4 15	3.2	4
4.5	86	58	2.18	1742	6.0	13.4	43	1679	1275	34.8	23.7	72.6	79	7	60	18	2.82	26.	5 18	3.3	4
5.0	95	64	2.42	1836	6.3	12.7	47	1815	1390	30.3	20.6	74.9	89	6	64	17	2.57	29.	5 21	3.5	4
5.5	105	71	2.66	1926	6.6	12.1	51	1925	1412	26.8	18.2	76.6	100	5	67	15	2.37	31.	6 23	3.6	4
6.0	114	77	2.90	2012	6.9	11.6	54	2017	1294	24.1	16.4	78.0	110	4	70	14	2.22	34.	6 25	3.7	5
6.5	124	84	3.14	2094	7.2	11.1	58	2094	1195	21.8	14.8	79.1	120	4	73	13	2.09	36.	7 27	3.8	5
7.0	133	90	3.39	2174	7.5	10.7	61	2160	1109	20.0	13.6	80.0	130	3	76	13	1.98	39.	7 29	3.9	5
7.5	143	97	3.63	2250	7.7	10.3	64	2217	1035	18.4	12.5	80.8	139	3	79	12	1.89	42.	7 30	4.0	5
8.0	152	103	3.87	2325	8.0	10.0	67	2267	971	17.1	11.6	81.5	149	3	81	12	1.81	44.	8 32	4.1	6
8.5	162	109	4.11	2396	8.2	9.7	69	2311	914	15.9	10.8	82.0	159	3	83	11	1.73	47.	8 34	4.2	6
9.0	171	116	4.35	2466	8.5	9.4	72	2350	863	14.9	10.1	82.5	168	3	86	11	1.67	49.	9 35	4.4	6
9.5	181	122	4.60	2534	8.7	9.2	75	2385	817	14.0	9.5	83.0	178	2	88	10	1.61	52.	9 37	4.5	6
10.0	190	129	4.84	2600	8.9	9.0	77	2416	776	13.3	9.0	83.4	188	2	90	10	1.56	54.	10 39	4.5	7
10.5	200	135	5.08	2665	9.1	8.7	80	2444	739	12.6	8.5	83.7	197	2	93	10	1.51	57.	10 40	4.6	7
11.0	209	142	5.32	2728	9.3	8.5	82	2469	706	11.9	8.1	84.0	207	2	95	9	1.47	59.	10 42	4.7	7
11.5	219	148	5.56	2790	9.6	8.4	84	2493	675	11.4	7.7	84.3	217	2	97	9	1.43	62.	11 43	4.8	7
12.0	228	155	5.81	2850	9.8	8.2	86	2514	647	10.8	7.3	84.6	226	2	99	9	1.39	65.	11 44	4.9	7
13.0	247	167	6.29	2967	10.2	7.9	91	2552	597	9.9	6.7	85.0	245	2	103	9	1.33	69.	12 47	5.1	8
14.0	266	180	6.77	3080	10.5	7.6	95	2584	554	9.2	6.2	85.4	265	1	107	8	1.27	74.	13 50	5.3	8
15.0	285	193	7.26	3189	10.9	7.3	98	2611	517	8.5	5.8	85.8	284	1	111	8	1.22	78.	14 53	5.4	9
16.0	304	206	7.74	3294	11.3	7.1	102	2636	485	7.9	5.4	86.0	303	1	115	8	1.18	83.	14 55	5.6	9
17.0	323	219	8.22	3397	11.6	6.9	106	2657	457	7.4	5.0	86.3	322	1	119	7	1.14	88.	15 58	5.7	9
18.0	342	232	8.71	3496	12.0	6.7	109	2676	431	7.0	4.7	86.5	341	1	122	7	1.10	91.	16 60	5.9	10
19.0	361	245	9.19	3593	12.3	6.5	113	2693	408	6.6	4.5	86.7	360	1	126	7	1.07	96.	17 63	6.0	10
20.0	380	258	9.68	3687	12.6	6.3	116	2708	388	6.3	4.2	86.9	379	1	130	7	1.04	99.	17 65	6.2	11
25.0	475	322	12.09	4128	14.1	5.7	131	2765	310	4.9	3.4	87.5	474	1	147	6	0.92	122.	21 77	6.8	12
30.0	570	386	14.51	4528	15.4	5.2	145	2802	258	4.1	2.8	88.0	569	1	164	5	0.83	140.	25 88	7.5	14
35.0	665	451	16.93	4897	16.7	4.8	157	2829	221	3.5	2.4	88.3	664	1	180	5	0.77	160.	28 98	8.0	
40.0	760	515	19.35	5242	17.8	4.5	169	2849	194	3.0	2.1	88.5	760	0	196	5	0.71	174.	32 108	8.5	
45.0	855	580	21.77	5567	18.9	4.2	179	2864	172	2.7	1.8	88.7	855	0	211	4	0.67	191.	35 118	9.0	
50.0	950	644	24.19	5876	19.9	4.0	190	2876	155	2.4	1.6	88.8	950	0	227	4	0.63	207.	39 128	9.5	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 19 F

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#101 19 F on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 26. ZC= 35.(Br)
NEUTRON NUMBERS: NP= 10. NT= 30. NC= 40.

AP**1/3= 2.668 AT**1/3= 3.826
REDUCED MASS NUMBER= 14.19 AP+AT=AC= 75.

INTERACTION RADIUS RINT=10.16 fm RO= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 4.12 CT+CP= 6.73 C= 1.60

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 4.35

COULOMB RADII [fm]:
RCP= 2.93 RCT= 4.27 RC=RCP+RCT= 7.20

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 65.06 MeV K= .11888 n=2.552
VC(RINT)= 33.1 MeV

FISSION-TKE= 53. MeV
ASYMM. FISSION-TKE= 41. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 18.98 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.73 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -61.4
COMPOUND NUCLEUS: -70.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.17 fm V(RB)= 34.2 MeV
Q-VALUE= 7.6 MeV
L-CRITICAL= 51.

19 F on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	14	0.43	820	3.1	36.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	38	28	0.86	1160	4.4	26.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	57	43	1.29	1422	5.4	21.3	26	774	521	79.3	61.9	50.4	39	18	38	45	5.64	14.	2	2.3	3
4.0	76	57	1.71	1642	6.2	18.4	41	1416	1051	48.7	37.0	45.6	66	10	51	29	3.56	18.	4	2.6	4
4.5	86	64	1.93	1742	6.6	17.4	46	1628	1228	41.1	31.0	69.5	78	8	55	25	3.12	20.	4	2.8	4
5.0	95	71	2.14	1836	6.9	16.5	51	1796	1369	35.5	26.7	72.2	88	7	59	23	2.82	23.	5	2.9	4
5.5	105	78	2.36	1926	7.3	15.7	56	1933	1485	31.3	23.5	74.4	99	6	62	21	2.58	25.	5	3.0	5
6.0	114	85	2.57	2012	7.6	15.0	60	2047	1493	28.0	21.0	76.0	109	5	64	19	2.40	27.	6	3.1	5
6.5	124	92	2.79	2094	7.9	14.5	64	2143	1378	25.3	19.0	77.3	119	4	66	18	2.25	29.	6	3.3	6
7.0	133	99	3.00	2174	8.2	13.9	68	2225	1280	23.1	17.3	78.4	129	4	69	17	2.13	31.	7	3.4	6
7.5	143	106	3.21	2250	8.5	13.5	72	2296	1194	21.3	15.9	79.4	139	4	71	16	2.02	33.	7	3.5	6
8.0	152	113	3.43	2325	8.8	13.0	75	2359	1120	19.7	14.7	80.2	149	3	73	15	1.93	35.	8	3.6	6
8.5	162	121	3.64	2396	9.0	12.6	78	2413	1054	18.3	13.7	80.8	158	3	74	15	1.85	37.	8	3.7	7
9.0	171	128	3.86	2466	9.3	12.3	81	2462	995	17.2	12.8	81.4	168	3	76	14	1.78	39.	8	3.8	7
9.5	181	135	4.07	2534	9.6	12.0	84	2505	943	16.1	12.1	81.9	178	3	78	14	1.72	41.	9	3.9	7
10.0	190	142	4.28	2600	9.8	11.7	87	2544	896	15.2	11.4	82.4	187	3	80	13	1.66	43.	9	4.0	8
10.5	200	149	4.50	2665	10.1	11.4	90	2579	853	14.4	10.8	82.8	197	2	81	13	1.61	45.	10	4.1	8
11.0	209	156	4.71	2728	10.3	11.1	93	2611	814	13.7	10.2	83.2	207	2	83	13	1.56	47.	10	4.2	8
11.5	219	163	4.93	2790	10.5	10.9	95	2640	779	13.0	9.7	83.5	216	2	85	12	1.52	49.	10	4.3	9
12.0	228	170	5.14	2850	10.7	10.6	98	2666	746	12.4	9.3	83.8	226	2	86	12	1.48	51.	11	4.4	9
13.0	247	184	5.57	2967	11.2	10.2	103	2713	689	11.3	8.5	84.3	245	2	89	11	1.41	55.	11	4.5	9
14.0	266	199	6.00	3080	11.6	9.8	108	2754	640	10.4	7.8	84.8	264	2	92	11	1.35	58.	12	4.7	10
15.0	285	213	6.43	3189	12.0	9.5	112	2788	597	9.7	7.2	85.2	283	2	95	10	1.29	63.	13	5.0	10
16.0	304	227	6.86	3294	12.4	9.2	117	2819	560	9.0	6.8	85.5	303	1	98	10	1.24	66.	14	5.0	11
17.0	323	241	7.28	3397	12.8	8.9	121	2845	527	8.5	6.3	85.8	322	1	101	10	1.20	69.	14	5.2	12
18.0	342	255	7.71	3496	13.2	8.7	125	2869	497	8.0	5.9	86.0	341	1	104	9	1.16	73.	15	5.3	12
19.0	361	270	8.14	3593	13.5	8.5	129	2890	471	7.5	5.6	86.2	360	1	106	9	1.13	77.	16	5.4	12
20.0	380	284	8.57	3687	13.9	8.2	133	2909	448	7.1	5.3	86.4	379	1	109	9	1.09	80.	16	5.6	13
25.0	475	355	10.71	4128	15.5	7.4	150	2981	358	5.6	4.2	87.2	474	1	122	8	0.97	96.	20	6.2	15
30.0	570	426	12.85	4528	17.0	6.7	166	3028	298	4.6	3.5	87.7	569	1	133	7	0.87	112.	23	6.8	17
35.0	665	497	15.00	4897	18.4	6.2	180	3062	256	4.0	3.0	88.0	664	1	145	6	0.80	128.	27	7.3	
40.0	760	567	17.14	5242	19.6	5.8	194	3087	224	3.4	2.6	88.3	759	1	156	6	0.75	141.	30	7.8	
45.0	855	638	19.28	5567	20.8	5.5	206	3106	199	3.1	2.3	88.5	855	0	167	6	0.70	153.	34	8.3	
50.0	950	709	21.42	5876	21.9	5.2	218	3122	179	2.7	2.0	88.6	950	0	177	5	0.67	167.	37	8.7	

#102 19 F on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 29. ZC= 38.(Sr)
NEUTRON NUMBERS: NP= 10. NT= 34. NC= 44.

AP**1/3= 2.668 AT**1/3= 3.979
REDUCED MASS NUMBER= 14.60 AP+AT=AC= 82.

INTERACTION RADIUS RINT=10.33 fm RO= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 4.31 CT+CP= 6.93 C= 1.63

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 4.53

COULOMB RADII [fm]:
RCP= 2.93 RCT= 4.45 RC=RCP+RCT= 7.37

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 70.66 MeV K= .11507 n=2.576
VC(RINT)= 36.3 MeV

FISSION-TKE= 58. MeV
ASYMM. FISSION-TKE= 42. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.943 MeV/fm**2 PROX-FACTOR= 19.29 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -65.2
COMPOUND NUCLEUS: -76.6

FUSION RELATED PARAMETERS:
R-BARRIER= 9.31 fm V(RB)= 37.5 MeV
Q-VALUE= 10.0 MeV
L-CRITICAL= 54.

19 F on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	15	0.40	820	3.2	41.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	38	29	0.80	1160	4.5	29.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	57	44	1.21	1422	5.5	23.7	23	617	389	90.6	73.7	44.7	37	20	35	57	6.56	13.	2	2.3	3
4.0	76	58	1.61	1642	6.4	20.5	40	1327	973	53.8	42.1	63.1	65	11	50	33	3.80	17.	4	2.6	4
4.5	86	66	1.81	1742	6.8	19.4	47	1560	1168	45.0	35.1	67.5	77	9	54	29	3.30	19.	4	2.7	4
5.0	95	73	2.01	1836	7.1	18.4	52	1746	1323	38.8	30.1	70.6	88	7	57	26	2.95	21.	5	2.8	5
5.5	105	80	2.21	1926	7.5	17.5	57	1898	1451	34.1	26.4	73.0	98	6	60	24	2.69	23.	5	3.0	5
6.0	114	88	2.41	2012	7.8	16.8	62	2024	1557	30.4	23.5	74.8	108	6	62	22	2.49	24.	6	3.1	6
6.5	124	95	2.61	2094	8.1	16.1	66	2130	1443	27.4	21.2	76.3	119	5	65	21	2.33	27.	6	3.2	6
7.0	133	102	2.81	2174	8.4	15.5	70	2221	1340	25.0	19.3	77.5	129	4	67	19	2.20	29.	7	3.3	6
7.5	143	109	3.01	2250	8.7	15.0	74	2299	1250	23.0	17.7	78.5	138	4	69	18	2.09	30.	7	3.4	7
8.0	152	117	3.21	2325	9.0	14.5	77	2368	1172	21.3	16.4	79.4	148	4	70	18	1.99	32.	7	3.5	7
8.5	162	124	3.41	2396	9.3	14.1	81	2428	1103	19.8	15.2	80.1	158	3	72	17	1.91	34.	8	3.6	7
9.0	171	131	3.62	2466	9.6	13.7	84	2482	1042	18.5	14.2	80.8	168	3	74	16	1.83	36.	8	3.7	8
9.5	181	139	3.82	2534	9.8	13.3	87	2529	987	17.4	13.4	81.3	178	3	75	16	1.76	38.	9	3.8	8
10.0	190	146	4.02	2600	10.1	13.0	90	2572	938	16.4	12.6	81.8	187	3	77	15	1.70	40.	9	3.9	8
10.5	200	153	4.22	2665	10.3	12.7	93	2611	893	15.5	11.9	82.3	197	3	79	15	1.65	42.	9	4.0	8
11.0	209	161	4.42	2728	10.6	12.4	96	2647	852	14.7	11.3	82.7	207	2	80	14	1.60	43.	10	4.1	9
11.5	219	168	4.62	2790	10.8	12.1	99	2679	815	14.0	10.7	83.0	216	2	82	14	1.56	45.	10	4.2	9
12.0	228	175	4.82	2850	11.1	11.9	102	2708	781	13.3	10.2	83.3	226	2	83	13	1.51	47.	10	4.2	9
13.0	247	190	5.22	2967	11.5	11.4	107	2760	721	12.2	9.4	83.9	245	2	86	13	1.44	50.	11	4.4	10
14.0	266	204	5.62	3080	11.9	11.0	112	2805	670	11.2	8.6	84.4	264	2	88	12	1.38	54.	12	4.6	10
15.0	285	219	6.03	3189	12.4	10.6	117	2843	625	10.4	8.0	84.8	283	2	91	12	1.32	57.	13	4.7	11
16.0	304	234	6.43	3294	12.8	10.3	121	2877	586	9.7	7.4	85.2	302	2	94	11	1.27	60.	13	4.9	12
17.0	323	248	6.83	3397	13.2	10.0	126	2906	551	9.1	7.0	85.5	322	1	96	11	1.23	64.	14	5.0	12
18.0	342	263	7.23	3496	13.5	9.7	130	2932	521	8.5	6.6	85.7	341	1	98	10	1.19	67.	15	5.2	13
19.0	361	277	7.63	3593	13.9	9.4	134	2956	493	8.0	6.2	86.0	360	1	101	10	1.15	70.	15	5.3	13
20.0	380	292	8.03	3687	14.3	9.2	138	2977	469	7.6	5.9	86.2	379	1	103	10	1.12	73.	16	5.4	14
25.0	475	365	10.04	4128	16.0	8.2	156	3056	375	6.0	4.6	87.0	474	1	115	9	0.98	89.	20	6.0	16
30.0	570	438	12.05	4528	17.5	7.5	173	3109	312	5.0	3.8	87.5	569	1	125	8	0.89	103.	23	6.6	18
35.0	665	511	14.06	4897	18.9	6.9	188	3146	268	4.2	3.3	87.9	664	1	135	7	0.82	116.	26	7.1	
40.0	760	584	16.07	5242	20.2	6.5	202	3174	234	3.7	2.8	88.2	759	1	145	7	0.76	131.	30	7.6	
45.0	855	657	18.08	5567	21.4	6.1	215	3196	208	3.3	2.5	88.4	855	0	155	6	0.72	142.	33	8.1	
50.0	950	730	20.09	5876	22.6	5.8	227	3213	187	2.9	2.3	88.5	950	0	164	6	0.68	156.	36	8.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 19 F

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#103 19 F on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 42. ZC= 51.(Sb)
NEUTRON NUMBERS: NP= 10. NT= 50. NC= 60.

AP**1/3= 2.668 AT**1/3= 4.514
REDUCED MASS NUMBER= 15.75 AP+AT=AC=111.

INTERACTION RADIUS RINT=10.91 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 5.00 CT+CP= 7.62 C= 1.72

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 5.20

COULOMB RADII [fm]:
RCP= 2.93 RCT= 5.08 RC=RCP+RCT= 8.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 93.30 MeV K= .09732 n=2.675
VC(RINT)= 49.8 MeV

FISSION-TKE= 80. MeV
ASYMM. FISSION-TKE= 47. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.941 MeV/fm**2 PROX-FACTOR= 20.31 MeV
L-RLD= 83 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.40 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -87.5
COMPOUND NUCLEUS: -81.3

FUSION RELATED PARAMETERS:
R-BARRIER= 9.81 fm V(RB)= 51.6 MeV
Q-VALUE= -7.7 MeV
L-CRITICAL= 63.

19 F on 92 Mo — 19 F on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	16	0.32	820	3.4	59.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	31	0.63	1160	4.9	42.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	47	0.95	1422	6.0	34.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	63	1.26	1642	6.9	29.8	34	824	544	81.9	70.7	49.0	57	19	43	65	5.41	13.	3	13	2.0	4
4.5	86	71	1.42	1742	7.3	28.1	43	1159	820	65.8	55.9	57.1	71	14	49	51	4.27	14.	4	15	2.1	4
5.0	95	79	1.58	1836	7.7	26.6	51	1425	1040	55.2	46.6	62.4	83	12	53	44	3.64	16.	5	18	2.3	5
5.5	105	87	1.74	1926	8.1	25.4	57	1641	1221	47.7	40.1	66.1	95	10	56	39	3.23	17.	5	19	2.4	5
6.0	114	94	1.90	2012	8.4	24.3	63	1821	1371	42.0	35.2	69.0	106	8	59	35	2.93	18.	5	21	2.5	6
6.5	124	102	2.05	2094	8.8	23.3	69	1973	1498	37.6	31.4	71.2	116	7	61	33	2.70	20.	6	23	2.6	6
7.0	133	110	2.21	2174	9.1	22.5	74	2103	1550	34.0	28.4	73.0	127	6	63	30	2.52	22.	6	25	2.7	6
7.5	143	118	2.37	2250	9.4	21.7	78	2216	1447	31.1	25.9	74.5	137	6	65	29	2.37	23.	7	26	2.8	7
8.0	152	126	2.53	2325	9.7	21.0	83	2314	1357	28.6	23.8	75.7	147	5	66	27	2.24	24.	7	28	2.9	7
8.5	162	134	2.69	2396	10.0	20.4	87	2400	1277	26.5	22.0	76.8	157	5	68	26	2.14	26.	7	29	3.0	8
9.0	171	142	2.84	2466	10.3	19.8	91	2477	1206	24.7	20.5	77.7	167	4	69	25	2.04	27.	8	30	3.1	8
9.5	181	150	3.00	2534	10.6	19.3	95	2546	1142	23.1	19.2	78.5	176	4	70	24	1.96	28.	8	32	3.2	9
10.0	190	157	3.16	2600	10.9	18.8	98	2607	1065	21.7	18.0	79.2	186	4	71	23	1.89	30.	9	33	3.3	9
10.5	200	165	3.32	2665	11.2	18.4	102	2663	1033	20.5	17.0	79.8	196	4	73	22	1.82	31.	9	34	3.4	9
11.0	209	173	3.48	2728	11.4	17.9	105	2713	986	19.4	16.1	80.3	206	3	74	21	1.76	33.	9	35	3.5	10
11.5	219	181	3.63	2790	11.7	17.6	108	2760	944	18.4	15.3	80.8	215	3	75	21	1.71	34.	10	37	3.5	10
12.0	228	189	3.79	2850	11.9	17.2	112	2802	904	17.5	14.5	81.3	225	3	76	20	1.66	35.	10	38	3.6	10
13.0	247	205	4.11	2967	12.4	16.5	118	2876	835	16.0	13.2	82.0	244	3	78	19	1.57	38.	11	40	3.8	11
14.0	266	220	4.43	3080	12.9	15.9	124	2940	775	14.7	12.2	82.7	264	2	80	18	1.50	41.	11	43	3.9	12
15.0	285	236	4.74	3189	13.3	15.4	129	2996	723	13.6	11.3	83.2	283	2	82	17	1.43	43.	12	45	4.1	12
16.0	304	252	5.06	3294	13.8	14.9	135	3044	678	12.6	10.5	83.7	302	2	84	17	1.38	46.	13	47	4.2	13
17.0	323	268	5.37	3397	14.2	14.4	140	3086	638	11.8	9.8	84.1	321	2	86	16	1.33	49.	13	49	4.3	13
18.0	342	283	5.69	3496	14.6	14.0	145	3124	603	11.1	9.2	84.5	340	2	87	15	1.28	51.	14	51	4.5	14
19.0	361	299	6.01	3593	15.0	13.7	150	3158	571	10.4	8.7	84.8	359	2	89	15	1.24	53.	15	53	4.6	15
20.0	380	315	6.32	3687	15.4	13.3	154	3188	542	9.9	8.2	85.1	378	2	91	15	1.20	56.	15	55	4.7	15
25.0	475	394	7.90	4128	17.2	11.9	176	3303	434	7.8	6.4	86.1	474	1	98	13	1.06	68.	19	65	5.3	18
30.0	570	472	9.48	4528	18.9	10.9	195	3379	361	6.4	5.3	86.8	569	1	106	11	0.95	80.	22	75	5.8	20
35.0	665	551	11.06	4897	20.4	10.1	212	3433	310	5.4	4.5	87.3	664	1	113	11	0.87	91.	25	84	6.3	
40.0	760	630	12.64	5242	21.8	9.4	228	3474	271	4.7	3.9	87.6	759	1	119	10	0.81	101.	28	92	6.7	
45.0	855	709	14.22	5567	23.1	8.9	243	3505	241	4.2	3.5	87.9	854	1	126	9	0.76	111.	31	101	7.1	
50.0	950	787	15.80	5876	24.4	8.4	257	3530	217	3.7	3.1	88.1	949	1	132	9	0.72	120.	35	109	7.5	

#104 19 F on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 47. ZC= 56.(Ba)
NEUTRON NUMBERS: NP= 10. NT= 61. NC= 71.

AP**1/3= 2.668 AT**1/3= 4.762
REDUCED MASS NUMBER= 16.16 AP+AT=AC=127.

INTERACTION RADIUS RINT=11.18 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 5.32 CT+CP= 7.94 C= 1.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 5.50

COULOMB RADII [fm]:
RCP= 2.93 RCT= 5.34 RC=RCP+RCT= 8.26

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 100.85 MeV K= .09074 n=2.701
VC(RINT)= 54.4 MeV

FISSION-TKE= 89. MeV
ASYMM. FISSION-TKE= 48. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.928 MeV/fm**2 PROX-FACTOR= 20.46 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.09 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -87.6
COMPOUND NUCLEUS: -82.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.05 fm V(RB)= 56.3 MeV
Q-VALUE= -6.7 MeV
L-CRITICAL= 67.

19 F on 108 Ag — 19 F on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	16	0.30	820	3.5	66.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	32	0.59	1160	5.0	47.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	48	0.89	1422	6.1	38.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	65	1.19	1642	7.1	33.3	31	656	408	93.5	83.5	43.2	55	21	42	84	6.38	11.	3	12	1.9	4
4.5	86	73	1.34	1742	7.5	31.4	42	1032	716	73.6	64.5	53.2	70	16	48	63	4.76	12.	4	15	2.0	5
5.0	95	81	1.48	1836	7.9	29.8	50	1329	962	61.2	53.1	59.4	82	13	52	52	3.96	14.	4	17	2.2	5
5.5	105	89	1.63	1926	8.3	28.4	58	1572	1163	52.5	45.3	63.8	94	10	55	46	3.47	15.	5	19	2.3	6
6.0	114	97	1.78	2012	8.7	27.2	64	1774	1331	46.0	39.6	67.0	105	9	58	41	3.12	16.	5	20	2.4	6
6.5	124	105	1.93	2094	9.0	26.1	70	1944	1472	41.0	35.2	69.5	116	8	60	38	2.86	17.	6	22	2.5	7
7.0	133	113	2.08	2174	9.3	25.2	75	2089	1594	37.0	31.7	71.5	126	7	61	35	2.65	19.	6	24	2.6	7
7.5	143	121	2.23	2250	9.7	24.3	80	2215	1562	33.7	28.8	73.1	136	6	63	33	2.49	20.	7	25	2.7	8
8.0	152	129	2.38	2325	10.0	23.5	85	2325	1465	31.0	26.5	74.5	146	6	64	31	2.35	21.	7	27	2.8	8
8.5	162	137	2.52	2396	10.3	22.8	89	2422	1379	28.7	24.5	75.7	156	5	66	29	2.23	22.	7	28	2.9	9
9.0	171	145	2.67	2466	10.6	22.2	94	2508	1302	26.7	22.8	76.7	166	5	67	28	2.13	24.	8	29	3.0	9
9.5	181	153	2.82	2534	10.9	21.6	98	2584	1233	24.9	21.3	77.5	176	4	68	27	2.04	25.	8	31	3.0	9
10.0	190	162	2.97	2600	11.2	21.1	102	2653	1172	23.4	20.0	78.3	186	4	69	26	1.96	26.	8	32	3.1	10
10.5	200	170	3.12	2665	11.5	20.6	105	2716	1116	22.1	18.8	79.0	196	4	70	25	1.89	27.	9	33	3.2	10
11.0	209	178	3.27	2728	11.7	20.1	109	2773	1065	20.9	17.8	79.6	206	3	71	24	1.83	29.	9	34	3.3	11
11.5	219	186	3.41	2790	12.0	19.6	113	2824	1019	19.8	16.9	80.1	215	3	72	23	1.77	30.	9	35	3.4	11
12.0	228	194	3.56	2850	12.2	19.2	116	2872	976	18.8	16.0	80.6	225	3	73	23	1.72	31.	10	37	3.4	12
13.0	247	210	3.86	2967	12.7	18.5	123	2955	901	17.1	14.6	81.4	244	3	75	21	1.63	33.	11	39	3.6	12
14.0	266	226	4.16	3080	13.2	17.8	129	3027	837	15.7	13.4	82.1	263	3	77	20	1.55	36.	11	41	3.7	13
15.0	285	242	4.45	3189	13.7	17.2	135	3089	781	14.6	12.4	82.7	283	2	78	20	1.48	38.	12	43	3.9	14
16.0	304	259	4.75	3294	14.1	16.7	140	3143	732	13.5	11.5	83.2	302	2	80	19	1.42	40.	13	45	4.0	15
17.0	323	275	5.05	3397	14.6	16.2	146	3190	689	12.6	10.8	83.7	321	2	82	18	1.37	43.	13	47	4.1	15
18.0	342	291	5.34	3496	15.0	15.7	151	3233	651	11.9	10.1	84.1	340	2	83	17	1.32	45.	14	50	4.2	16
19.0	361	307	5.64	3593	15.4	15.3	156	3271	616	11.2	9.5	84.4	359	2	85	17	1.28	47.	14	52	4.3	17
20.0	380	323	5.94	3687	15.8	14.9	161	3305	586	10.6	9.0	84.7	378	2	86	16	1.24	49.	15	53	4.5	17
25.0	475	404	7.42	4128	17.7	13.3	184	3433	468	8.3	7.1	85.9	474	1	93	14	1.09	59.	18	63	5.0	21
30.0	570	485	8.91	4528	19.4	12.2	204	3519	390	6.8	5.8	86.6	569	1	99	13	0.98	70.	21	72	5.5	23
35.0	665	566	10.39	4897	20.9	11.3	222	3580	334	5.8	4.9	87.1	664	1	105	12	0.90	80.	25	81	5.9	
40.0	760	646	11.88	5242	22.4	10.5	239	3625	293	5.0	4.3	87.5	759	1	110	11	0.84	89.	28	89	6.3	
45.0	855	727	13.36	5567	23.7	9.9	255	3660	260	4.5	3.8	87.8	854	1	116	10	0.78	98.	31	97	6.7	
50.0	950	808	14.85	5876	25.0	9.4	270	3688	234	4.0	3.4	88.0	949	1	121	10	0.74	106.	34	105	7.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 19 F

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#105 19 F on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 58. ZC= 67.(Ho)
NEUTRON NUMBERS: NP= 10. NT= 82. NC= 92.

AP**1/3= 2.668 AT**1/3= 5.192
REDUCED MASS NUMBER= 16.73 AP+AT=AC=159.

INTERACTION RADIUS RINT=11.64 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 5.87 CT+CP= 8.49 C= 1.81

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.04

COULOMB RADII [fm]:
RCP= 2.93 RCT= 5.82 RC=RCP+RCT= 8.74

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 116.95 MeV K= .07792 n=2.762
VC(RINT)= 64.5 MeV

FISSION-TKE= 111. MeV
ASYMM. FISSION-TKE= 52. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.910 MeV/fm**2 PROX-FACTOR= 20.70 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.68 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -88.2
COMPOUND NUCLEUS: -67.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.48 fm V(RB)= 66.6 MeV
Q-VALUE= -22.4 MeV
L-CRITICAL= 74.

19 F on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	19	17	0.26	820	3.7	82.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	33	0.52	1160	5.2	58.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	50	0.78	1422	6.3	47.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	67	1.04	1642	7.3	41.1	16	171	16	137.3	131.5	21.3	48	28	36	215	13.98	9.	3	10	1.5	4
4.5	86	75	1.17	1742	7.8	38.7	34	644	397	97.2	89.4	41.4	65	20	45	102	6.57	10.	4	13	1.6	4
5.0	95	84	1.30	1836	8.2	36.8	46	1016	702	77.8	70.5	51.1	79	16	50	77	4.93	11.	4	15	1.8	5
5.5	105	92	1.43	1926	8.6	35.0	55	1319	952	65.4	58.7	57.3	92	13	54	64	4.11	12.	5	17	1.9	6
6.0	114	100	1.56	2012	9.0	33.6	62	1570	1160	56.6	50.6	61.7	103	11	57	56	3.60	13.	5	19	2.0	6
6.5	124	109	1.69	2094	9.3	32.2	69	1782	1336	49.9	44.5	65.0	114	9	59	51	3.24	14.	6	21	2.1	7
7.0	133	117	1.82	2174	9.7	31.1	76	1963	1486	44.7	39.7	67.6	125	8	61	46	2.97	15.	6	22	2.2	8
7.5	143	125	1.95	2250	10.0	30.0	81	2120	1617	40.5	35.9	69.7	135	7	62	43	2.76	16.	6	24	2.3	8
8.0	152	134	2.08	2325	10.3	29.1	87	2257	1631	37.1	32.8	71.5	146	6	63	40	2.59	17.	7	25	2.4	9
8.5	162	142	2.21	2396	10.7	28.2	92	2377	1535	34.1	30.2	72.9	156	6	65	38	2.44	18.	7	26	2.5	10
9.0	171	151	2.34	2466	11.0	27.4	97	2484	1450	31.7	28.0	74.2	166	5	66	36	2.32	19.	7	27	2.5	10
9.5	181	159	2.47	2534	11.3	26.7	101	2580	1374	29.5	26.1	75.2	176	5	67	35	2.22	20.	8	29	2.6	10
10.0	190	167	2.60	2600	11.6	26.0	106	2666	1305	27.7	24.4	76.2	185	5	68	33	2.12	21.	8	30	2.7	11
10.5	200	176	2.73	2665	11.9	25.4	110	2744	1243	26.0	23.0	77.0	195	4	69	32	2.04	22.	9	31	2.8	11
11.0	209	184	2.85	2728	12.1	24.8	114	2815	1186	24.6	21.7	77.7	205	4	70	31	1.97	23.	9	32	2.9	12
11.5	219	192	2.98	2790	12.4	24.2	118	2879	1135	23.3	20.5	78.4	215	4	70	30	1.90	24.	9	33	2.9	12
12.0	228	201	3.11	2850	12.7	23.7	122	2938	1087	22.1	19.5	79.0	224	4	71	29	1.85	25.	10	34	3.0	13
13.0	247	217	3.37	2967	13.2	22.8	129	3042	1004	20.1	17.7	80.0	244	3	73	27	1.74	27.	10	37	3.1	14
14.0	266	234	3.63	3080	13.7	22.0	136	3132	932	18.4	16.2	80.8	263	3	74	26	1.65	29.	11	39	3.3	15
15.0	285	251	3.89	3189	14.2	21.2	142	3209	870	17.0	15.0	81.5	282	3	76	25	1.58	31.	12	41	3.4	15
16.0	304	268	4.15	3294	14.6	20.5	148	3276	815	15.8	13.9	82.1	302	2	77	24	1.51	33.	12	43	3.5	16
17.0	323	284	4.41	3397	15.1	19.9	154	3336	767	14.7	13.0	82.6	321	2	78	23	1.45	34.	13	45	3.6	17
18.0	342	301	4.67	3496	15.5	19.4	160	3389	725	13.8	12.2	83.1	340	2	79	22	1.40	36.	13	47	3.7	18
19.0	361	318	4.93	3593	15.9	18.9	166	3436	687	13.0	11.4	83.5	359	2	80	21	1.35	38.	14	49	3.9	19
20.0	380	335	5.19	3687	16.4	18.4	171	3478	652	12.3	10.8	83.9	378	2	82	20	1.31	40.	15	50	4.0	20
25.0	475	418	6.49	4128	18.3	16.4	196	3639	522	9.6	8.4	85.2	474	1	87	18	1.15	49.	18	59	4.5	23
30.0	570	502	7.79	4528	20.0	15.0	218	3746	435	7.9	6.9	86.1	569	1	92	16	1.03	57.	21	68	4.9	26
35.0	665	586	9.08	4897	21.6	13.9	238	3822	372	6.7	5.9	86.7	664	1	96	15	0.94	64.	24	76	5.3	
40.0	760	669	10.38	5242	23.1	13.0	256	3879	326	5.8	5.1	87.1	759	1	100	14	0.88	72.	27	84	5.7	
45.0	855	753	11.68	5567	24.5	12.3	273	3923	290	5.1	4.5	87.4	854	1	105	13	0.82	80.	30	92	6.1	
50.0	950	836	12.98	5876	25.9	11.6	289	3958	261	4.6	4.1	87.7	949	1	108	12	0.78	87.	33	99	6.4	

#106 19 F on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 62. ZC= 71.(Lu)
NEUTRON NUMBERS: NP= 10. NT= 92. NC=102.

AP**1/3= 2.668 AT**1/3= 5.360
REDUCED MASS NUMBER= 16.91 AP+AT=AC=173.

INTERACTION RADIUS RINT=11.83 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 6.09 CT+CP= 8.71 C= 1.83

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.25

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.00 RC=RCP+RCT= 8.92

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 122.28 MeV K= .07368 n=2.780
VC(RINT)= 67.9 MeV

FISSION-TKE= 119. MeV
ASYMM. FISSION-TKE= 53. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 20.64 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.55 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -72.1
COMPOUND NUCLEUS: -55.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.65 fm V(RB)= 70.0 MeV
Q-VALUE= -18.1 MeV
L-CRITICAL= 76.

19 F on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	19	17	0.25	820	3.7	87.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	34	0.50	1160	5.2	62.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	51	0.75	1422	6.4	50.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	68	1.00	1642	7.4	43.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	76	1.12	1742	7.8	41.4	30	503	285	107.4	100.5	36.3	64	22	44	126	7.69	9.	3	13	1.6	5
5.0	95	85	1.25	1836	8.3	39.3	43	904	613	84.3	77.4	47.8	78	17	50	88	5.39	10.	4	15	1.8	6
5.5	105	93	1.37	1926	8.7	37.5	53	1230	881	70.2	63.9	54.9	91	14	53	72	4.39	11.	5	17	1.9	7
6.0	114	101	1.50	2012	9.1	35.9	62	1500	1105	60.4	54.6	59.8	103	11	56	62	3.80	12.	5	19	2.0	7
6.5	124	110	1.62	2094	9.4	34.5	69	1728	1294	53.1	47.9	63.4	114	10	58	56	3.39	13.	6	20	2.1	8
7.0	133	118	1.74	2174	9.8	33.2	76	1922	1456	47.5	42.7	66.3	125	8	60	51	3.10	14.	6	22	2.2	8
7.5	143	127	1.87	2250	10.1	32.1	82	2091	1596	42.9	38.5	68.5	135	7	62	47	2.87	15.	6	23	2.2	9
8.0	152	135	1.99	2325	10.5	31.1	87	2238	1693	39.2	35.1	70.4	145	7	63	44	2.68	16.	7	24	2.3	10
8.5	162	144	2.12	2396	10.8	30.1	93	2368	1594	36.0	32.3	72.0	155	6	64	41	2.53	17.	7	26	2.4	10
9.0	171	152	2.24	2466	11.1	29.3	98	2483	1505	33.4	29.9	73.3	165	6	65	39	2.40	18.	7	27	2.5	11
9.5	181	161	2.37	2534	11.4	28.5	102	2586	1426	31.1	27.8	74.4	175	5	66	38	2.28	19.	8	28	2.6	11
10.0	190	169	2.49	2600	11.7	27.8	107	2678	1354	29.1	26.0	75.4	185	5	67	36	2.19	19.	8	29	2.6	12
10.5	200	178	2.62	2665	12.0	27.1	111	2762	1290	27.4	24.4	76.3	195	4	68	34	2.10	20.	8	30	2.7	13
11.0	209	186	2.74	2728	12.3	26.5	116	2838	1231	25.8	23.0	77.1	205	4	69	33	2.02	21.	9	31	2.8	13
11.5	219	195	2.87	2790	12.5	25.9	120	2907	1178	24.4	21.8	77.8	215	4	70	32	1.95	22.	9	33	2.9	14
12.0	228	203	2.99	2850	12.8	25.4	124	2970	1129	23.2	20.7	78.4	224	4	71	31	1.89	23.	9	34	2.9	14
13.0	247	220	3.24	2967	13.3	24.4	131	3083	1042	21.1	18.8	79.5	244	3	72	29	1.78	25.	10	36	3.1	15
14.0	266	237	3.49	3080	13.8	23.5	138	3179	967	19.3	17.2	80.4	263	3	73	28	1.69	26.	11	38	3.2	16
15.0	285	254	3.74	3189	14.3	22.7	145	3262	903	17.8	15.9	81.1	282	3	75	27	1.61	28.	11	40	3.3	17
16.0	304	271	3.99	3294	14.8	22.0	151	3334	846	16.5	14.7	81.7	302	2	76	25	1.54	30.	12	42	3.4	18
17.0	323	288	4.24	3397	15.3	21.3	158	3398	797	15.4	13.7	82.3	321	2	77	24	1.48	32.	13	44	3.5	19
18.0	342	304	4.49	3496	15.7	20.7	164	3455	752	14.4	12.9	82.8	340	2	78	23	1.43	33.	13	46	3.6	20
19.0	361	321	4.74	3593	16.1	20.2	169	3506	713	13.6	12.1	83.2	359	2	79	23	1.38	35.	14	47	3.7	21
20.0	380	338	4.99	3687	16.5	19.6	175	3551	677	12.8	11.4	83.6	378	2	80	22	1.34	36.	15	49	3.8	22
25.0	475	423	6.23	4128	18.5	17.6	200	3725	541	10.0	8.9	85.0	474	1	85	19	1.17	45.	18	58	4.3	25
30.0	570	507	7.48	4528	20.3	16.0	223	3840	451	8.2	7.3	85.9	569	1	89	17	1.05	52.	21	67	4.8	29
35.0	665	592	8.72	4897	21.9	14.9	244	3921	387	7.0	6.2	86.5	664	1	93	16	0.96	59.	24	75	5.2	
40.0	760	677	9.97	5242	23.4	13.9	262	3983	338	6.1	5.4	87.0	759	1	97	15	0.89	67.	27	82	5.5	
45.0	855	761	11.22	5567	24.8	13.1	280	4030	301	5.4	4.8	87.3	854	1	101	14	0.84	73.	30	90	5.9	
50.0	950	846	12.46	5876	26.2	12.4	297	4068	270	4.8	4.3	87.6	949	1	105	13	0.79	80.	33	97	6.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	K	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	aps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 19 F

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#107 19 F on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 67. ZC= 76.(Os)
NEUTRON NUMBERS: NP= 10. NT= 98. NC=108.

AP**1/3= 2.668 AT**1/3= 5.485
REDUCED MASS NUMBER= 17.04 AP+AT=AC=184.

INTERACTION RADIUS RINT=11.96 fm R0= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 6.25 CT+CP= 8.87 C̄= 1.84

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.41

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.15 RC=RCP+RCT= 9.08

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 129.51 MeV K= .06912 n=2.810
VC(RINT)= 72.5 MeV

FISSION-TKE= 131. MeV
ASYMM. FISSION-TKE= 55. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.900 MeV/fm**2 PROX-FACTOR= 20.87 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -63.7
COMPOUND NUCLEUS: -41.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.78 fm V(RB)= 74.8 MeV
Q-VALUE= -23.8 MeV
L-CRITICAL= 77.

19 F on 165 Ho — 19 F on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	17	0.24	820	3.7	94.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	34	0.47	1160	5.3	67.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	51	0.71	1422	6.5	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	68	0.94	1642	7.5	47.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	77	1.06	1742	7.9	44.8	22	262	87	128.0	122.4	26.0	60	26	42	192	11.05	9.	3	12	1.5	5
5.0	95	85	1.18	1836	8.3	42.5	38	700	443	95.9	89.2	42.1	76	19	49	110	6.29	10.	4	14	1.6	5
5.5	105	94	1.29	1926	8.7	40.5	50	1054	735	78.4	72.1	50.8	89	15	53	85	4.86	10.	5	16	1.7	6
6.0	114	102	1.41	2012	9.1	38.8	59	1348	978	66.8	61.0	56.6	101	13	56	72	4.10	11.	5	18	1.8	7
6.5	124	111	1.53	2094	9.5	37.2	67	1595	1183	58.3	53.1	60.8	113	11	59	63	3.61	12.	5	20	1.9	8
7.0	133	119	1.65	2174	9.9	35.9	74	1807	1360	51.9	47.0	64.1	124	9	61	57	3.27	13.	6	21	2.0	8
7.5	143	128	1.76	2250	10.2	34.7	80	1990	1512	46.7	42.3	66.6	134	8	62	53	3.00	14.	6	22	2.1	9
8.0	152	136	1.88	2325	10.5	33.6	86	2150	1646	42.6	38.5	68.7	145	7	64	49	2.80	15.	7	24	2.2	9
8.5	162	145	2.00	2396	10.9	32.6	92	2291	1633	39.1	35.3	70.5	155	7	65	46	2.63	16.	7	25	2.3	10
9.0	171	153	2.12	2466	11.2	31.6	97	2416	1542	36.1	32.6	71.9	165	6	66	44	2.48	17.	7	26	2.4	11
9.5	181	162	2.23	2534	11.5	30.8	102	2528	1461	33.6	30.3	73.2	175	6	67	41	2.36	18.	8	28	2.5	11
10.0	190	170	2.35	2600	11.8	30.0	107	2628	1388	31.4	28.3	74.3	185	5	68	40	2.26	18.	8	29	2.5	12
10.5	200	179	2.47	2665	12.1	29.3	111	2719	1322	29.5	26.5	75.3	195	5	69	38	2.17	19.	8	30	2.6	12
11.0	209	187	2.59	2728	12.4	28.6	116	2802	1262	27.8	25.0	76.1	205	4	70	37	2.08	20.	9	31	2.7	13
11.5	219	196	2.70	2790	12.6	28.0	120	2877	1207	26.3	23.6	76.9	214	4	71	35	2.01	21.	9	32	2.7	13
12.0	228	204	2.82	2850	12.9	27.4	124	2946	1156	24.9	22.4	77.5	224	4	71	34	1.94	22.	9	33	2.8	14
13.0	247	221	3.06	2967	13.4	26.3	132	3068	1067	22.6	20.3	78.7	243	4	73	32	1.83	23.	10	35	2.9	15
14.0	266	239	3.29	3080	13.9	25.4	139	3172	991	20.7	18.6	79.7	263	3	74	30	1.73	25.	11	37	3.1	16
15.0	285	256	3.53	3189	14.4	24.5	146	3262	925	19.1	17.1	80.5	282	3	75	29	1.65	27.	11	39	3.2	17
16.0	304	273	3.76	3294	14.9	23.7	153	3341	867	17.7	15.9	81.2	301	3	76	28	1.58	28.	12	41	3.3	18
17.0	323	290	4.00	3397	15.4	23.0	159	3411	816	16.5	14.8	81.8	321	2	77	27	1.52	30.	13	43	3.4	19
18.0	342	307	4.23	3496	15.8	22.4	165	3472	771	15.4	13.8	82.3	340	2	78	26	1.46	31.	13	45	3.5	20
19.0	361	324	4.47	3593	16.2	21.8	171	3528	730	14.5	13.0	82.7	359	2	79	25	1.41	33.	14	47	3.6	21
20.0	380	341	4.70	3687	16.7	21.2	177	3577	694	13.7	12.3	83.2	378	2	80	24	1.36	35.	14	49	3.7	22
25.0	475	426	5.88	4128	18.6	19.0	203	3765	555	10.7	9.6	84.7	473	2	85	21	1.19	42.	18	57	4.2	26
30.0	570	511	7.05	4528	20.4	17.3	226	3890	462	8.8	7.9	85.6	569	1	89	19	1.07	50.	21	65	4.6	29
35.0	665	596	8.23	4897	22.0	16.0	247	3979	396	7.4	6.7	86.3	664	1	93	17	0.98	57.	24	73	5.0	
40.0	760	682	9.40	5242	23.6	15.0	266	4046	347	6.4	5.8	86.8	759	1	97	16	0.90	64.	26	81	5.3	
45.0	855	767	10.58	5567	25.0	14.2	284	4098	308	5.7	5.1	87.2	854	1	100	15	0.85	70.	29	89	5.7	
50.0	950	852	11.75	5876	26.4	13.4	301	4139	277	5.1	4.6	87.4	949	1	104	14	0.80	76.	32	96	6.0	

#108 19 F on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 73. ZC= 82.(Pb)
NEUTRON NUMBERS: NP= 10. NT=108. NC=118.

AP**1/3= 2.668 AT**1/3= 5.657
REDUCED MASS NUMBER= 17.19 AP+AT=AC=200.

INTERACTION RADIUS RINT=12.15 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 6.47 CT+CP= 9.09 C̄= 1.86

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.62

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.35 RC=RCP+RCT= 9.28

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 137.64 MeV K= .06398 n=2.840
VC(RINT)= 77.8 MeV

FISSION-TKE= 145. MeV
ASYMM. FISSION-TKE= 57. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 21.00 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.36 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -46.0
COMPOUND NUCLEUS: -24.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.96 fm V(RB)= 80.3 MeV
Q-VALUE= -22.5 MeV
L-CRITICAL= 79.

19 F on 181 Ta — 19 F on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	17	0.22	820	3.8	103.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	34	0.44	1160	5.3	73.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	52	0.66	1422	6.5	59.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	69	0.88	1642	7.5	51.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	77	0.99	1742	8.0	48.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	95	86	1.11	1836	8.4	46.3	31	465	251	111.8	106.0	34.1	73	22	47	150	8.00	9.	4	14	1.6	6
5.5	105	95	1.22	1926	8.8	44.1	45	855	571	88.8	82.9	45.6	87	18	53	105	5.57	10.	4	16	1.7	6
6.0	114	103	1.33	2012	9.2	42.2	55	1178	938	74.6	69.0	52.7	100	14	56	85	4.53	10.	5	17	1.8	7
6.5	124	112	1.44	2094	9.6	40.6	64	1450	1063	64.6	59.5	57.7	111	12	59	74	3.91	11.	5	19	1.9	8
7.0	133	120	1.55	2174	10.0	39.1	72	1682	1257	57.1	52.4	61.4	123	10	61	66	3.49	12.	6	21	2.0	8
7.5	143	129	1.66	2250	10.3	37.8	79	1883	1425	51.3	46.9	64.4	133	9	63	60	3.19	13.	6	22	2.1	9
8.0	152	138	1.77	2325	10.6	36.6	85	2059	1571	46.5	42.4	66.7	144	8	64	55	2.95	14.	7	23	2.1	10
8.5	162	146	1.88	2396	11.0	35.5	91	2213	1686	42.6	38.8	68.7	154	7	66	52	2.76	15.	7	24	2.2	10
9.0	171	155	1.99	2466	11.3	34.5	97	2351	1593	39.3	35.8	70.4	164	7	67	49	2.60	15.	7	26	2.3	11
9.5	181	163	2.10	2534	11.6	33.6	102	2473	1509	36.5	33.2	71.8	174	6	68	46	2.46	16.	8	27	2.4	11
10.0	190	172	2.21	2600	11.9	32.7	107	2584	1433	34.0	31.0	73.0	184	6	69	44	2.35	17.	8	28	2.4	12
10.5	200	181	2.32	2665	12.2	31.9	112	2683	1365	31.9	29.0	74.0	194	5	70	42	2.25	18.	8	29	2.5	12
11.0	209	189	2.43	2728	12.5	31.2	116	2774	1303	30.0	27.3	75.0	204	5	70	41	2.16	19.	9	30	2.6	13
11.5	219	198	2.54	2790	12.8	30.5	121	2856	1246	28.4	25.8	75.8	214	5	71	39	2.08	19.	9	31	2.6	14
12.0	228	206	2.65	2850	13.0	29.9	125	2932	1194	26.9	24.4	76.5	224	4	72	38	2.01	20.	9	32	2.7	14
13.0	247	224	2.87	2967	13.6	28.7	133	3066	1102	24.4	22.1	77.8	243	4	73	36	1.89	22.	10	34	2.8	15
14.0	266	241	3.10	3080	14.1	27.6	141	3180	1024	22.3	20.2	78.9	263	3	74	34	1.78	23.	11	36	3.0	16
15.0	285	258	3.32	3189	14.6	26.7	148	3280	955	20.5	18.6	79.8	282	3	76	32	1.70	25.	11	38	3.1	17
16.0	304	275	3.54	3294	15.0	25.9	155	3366	896	19.0	17.2	80.5	301	3	77	31	1.62	26.	12	40	3.2	18
17.0	323	292	3.76	3397	15.5	25.1	161	3443	843	17.7	16.0	81.2	320	3	78	29	1.56	28.	13	42	3.3	19
18.0	342	310	3.98	3496	16.0	24.4	168	3510	796	16.5	15.0	81.7	340	2	79	28	1.50	29.	13	44	3.4	20
19.0	361	327	4.20	3593	16.4	23.7	174	3571	754	15.6	14.1	82.2	359	2	80	27	1.44	31.	14	46	3.5	21
20.0	380	344	4.42	3687	16.8	23.1	180	3626	716	14.7	13.3	82.7	378	2	81	26	1.40	32.	14	47	3.6	22
25.0	475	430	5.53	4128	18.8	20.7	207	3832	573	11.4	10.4	84.3	473	2	85	23	1.21	39.	17	56	4.0	26
30.0	570	516	6.63	4528	20.6	18.9	231	3970	477	9.4	8.5	85.3	569	1	89	20	1.09	46.	20	64	4.4	30
35.0	665	602	7.74	4897	22.2	17.5	252	4067	409	7.9	7.2	86.0	664	1	92	19	1.00	52.	23	72	4.8	
40.0	760	688	8.84	5242	23.8	16.4	272	4141	358	6.9	6.2	86.6	759	1	96	17	0.92	59.	26	80	5.2	
45.0	855	774	9.95	5567	25.2	15.4	291	4197	318	6.1	5.5	87.0	854	1	99	16	0.86	65.	29	87	5.5	
50.0	950	860	11.05	5876	26.6	14.6	308	4243	286	5.4	4.9	87.3	949	1	102	15	0.81	71.	32	94	5.8	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#109 19 F on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 79. ZC= 88.(Ra)
NEUTRON NUMBERS: NP= 10. NT=118. NC=128.

AP**1/3= 2.668 AT**1/3= 5.819
REDUCED MASS NUMBER= 17.33 AP+AT=AC=216.

INTERACTION RADIUS RINT=12.32 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 6.68 CT+CP= 9.30 C= 1.88

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.83

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.55 RC=RCP+RCT= 9.47

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 145.56 MeV K= .05933 n=2.870
VC(RINT)= 83.0 MeV

FISSION-TKE= 160. MeV
ASYMM. FISSION-TKE= 59. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 21.11 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.28 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -28.6
COMPOUND NUCLEUS: 2.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.13 fm V(RB)= 85.6 MeV
Q-VALUE= -33.0 MeV
L-CRITICAL= 81.

19 F on 197 Au — 19 F on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	17	0.21	820	3.8	112.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	35	0.42	1160	5.4	79.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	52	0.63	1422	6.6	64.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	69	0.84	1642	7.6	56.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	78	0.94	1742	8.0	52.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	95	87	1.04	1836	8.5	50.1	21	215	48	134.2	129.9	22.9	69	26	46	243	12.29	8.	4	13	1.4	5
5.5	105	95	1.15	1926	8.9	47.7	39	644	397	101.2	95.7	39.4	84	20	52	133	6.63	9.	4	15	1.5	6
6.0	114	104	1.25	2012	9.3	45.7	51	996	688	83.4	78.0	48.3	98	16	56	102	5.07	10.	5	17	1.6	6
6.5	124	113	1.36	2094	9.7	43.9	61	1293	934	71.5	66.4	54.2	110	14	59	86	4.27	11.	5	18	1.7	7
7.0	133	121	1.46	2174	10.0	42.3	69	1547	1145	62.8	58.1	58.6	121	12	62	75	3.75	11.	6	20	1.8	8
7.5	143	130	1.57	2250	10.4	40.9	77	1766	1328	56.0	51.7	62.0	132	10	63	68	3.39	12.	6	21	1.9	8
8.0	152	139	1.67	2325	10.7	39.6	84	1957	1488	50.7	46.6	64.7	143	9	65	62	3.11	13.	7	23	2.0	9
8.5	162	147	1.78	2396	11.1	38.4	90	2126	1629	46.3	42.5	66.9	154	8	66	58	2.89	14.	7	24	2.1	10
9.0	171	156	1.88	2466	11.4	37.3	96	2276	1638	42.6	39.1	68.7	164	7	67	55	2.72	14.	7	25	2.1	10
9.5	181	165	1.98	2534	11.7	36.3	101	2410	1551	39.4	36.2	70.3	174	7	69	52	2.57	15.	8	26	2.2	11
10.0	190	173	2.09	2600	12.0	35.4	107	2530	1474	36.8	33.7	71.6	184	6	69	49	2.44	16.	8	27	2.3	12
10.5	200	182	2.19	2665	12.3	34.5	112	2639	1404	34.4	31.5	72.8	194	6	70	47	2.33	17.	8	28	2.3	12
11.0	209	191	2.30	2728	12.6	33.8	116	2737	1340	32.4	29.6	73.8	204	5	71	45	2.24	17.	9	30	2.4	13
11.5	219	199	2.40	2790	12.9	33.0	121	2827	1282	30.5	27.9	74.7	214	5	72	43	2.15	18.	9	31	2.5	13
12.0	228	208	2.51	2850	13.1	32.3	125	2910	1228	28.9	26.4	75.5	223	5	73	42	2.08	19.	9	32	2.5	14
13.0	247	225	2.71	2967	13.7	31.1	134	3056	1134	26.1	23.9	76.9	243	4	74	39	1.95	20.	10	34	2.7	15
14.0	266	243	2.92	3080	14.2	29.9	142	3181	1053	23.8	21.8	78.1	262	4	75	37	1.84	22.	11	36	2.8	16
15.0	285	260	3.13	3189	14.7	28.9	149	3289	982	21.9	20.0	79.0	282	3	76	35	1.74	23.	11	38	2.9	17
16.0	304	277	3.34	3294	15.2	28.0	156	3383	921	20.3	18.5	79.8	301	3	77	33	1.66	24.	12	39	3.0	18
17.0	323	295	3.55	3397	15.6	27.2	163	3467	867	18.9	17.3	80.6	320	3	78	32	1.59	26.	12	41	3.1	19
18.0	342	312	3.76	3496	16.1	26.4	170	3541	819	17.7	16.1	81.2	339	3	79	31	1.53	27.	13	43	3.2	20
19.0	361	329	3.97	3593	16.5	25.7	176	3607	775	16.6	15.2	81.7	359	2	80	30	1.48	29.	14	45	3.3	21
20.0	380	347	4.18	3687	16.9	25.0	182	3666	737	15.7	14.3	82.2	378	2	81	29	1.43	30.	14	47	3.4	22
25.0	475	433	5.22	4128	19.0	22.4	210	3892	589	12.2	11.1	83.9	473	2	85	25	1.24	37.	17	55	3.8	27
30.0	570	520	6.27	4528	20.8	20.4	234	4042	491	10.0	9.1	85.0	569	1	88	22	1.11	43.	20	63	4.2	31
35.0	665	607	7.31	4897	22.4	18.9	257	4149	421	8.4	7.7	85.8	664	1	92	20	1.01	49.	23	71	4.6	
40.0	760	693	8.35	5242	24.0	17.7	277	4229	368	7.3	6.7	86.3	759	1	95	19	0.94	55.	26	78	4.9	
45.0	855	780	9.40	5567	25.4	16.7	296	4291	327	6.5	5.9	86.8	854	1	98	18	0.88	61.	29	85	5.3	
50.0	950	866	10.44	5876	26.8	15.8	314	4340	294	5.8	5.3	87.1	949	1	101	17	0.83	67.	32	92	5.6	

#110 19 F on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 82. ZC= 91.(Pa)
NEUTRON NUMBERS: NP= 10. NT=126. NC=136.

AP**1/3= 2.668 AT**1/3= 5.925
REDUCED MASS NUMBER= 17.41 AP+AT=AC=227.

INTERACTION RADIUS RINT=12.44 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 6.82 CT+CP= 9.43 C= 1.89

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.96

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.66 RC=RCP+RCT= 9.59

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 149.12 MeV K= .05714 n=2.880
VC(RINT)= 85.3 MeV

FISSION-TKE= 168. MeV
ASYMM. FISSION-TKE= 60. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.885 MeV/fm**2 PROX-FACTOR= 21.03 MeV
L-RLD= 76 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -19.5
COMPOUND NUCLEUS: 28.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.24 fm V(RB)= 87.9 MeV
Q-VALUE= -49.4 MeV
L-CRITICAL= 82.

19 F on 208 Pb — 19 F on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	19	17	0.20	820	3.8	116.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	35	0.41	1160	5.4	82.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	52	0.61	1422	6.6	67.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	70	0.82	1642	7.6	58.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	78	0.92	1742	8.1	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	95	87	1.02	1836	8.5	52.0	14	103	0	149.0	146.1	15.5	68	27	45	370	18.50	0.	4	13	1.2	4
5.5	105	96	1.12	1926	8.9	49.6	36	553	324	107.3	102.2	36.3	84	21	52	150	7.31	9.	4	15	1.3	5
6.0	114	104	1.22	2012	9.3	47.4	49	921	627	87.6	82.4	46.2	97	17	56	111	5.38	9.	5	17	1.4	6
6.5	124	113	1.33	2094	9.7	45.6	60	1231	884	74.7	69.7	52.7	110	14	59	92	4.46	10.	5	18	1.5	7
7.0	133	122	1.43	2174	10.1	43.9	69	1495	1105	65.3	60.8	57.3	121	12	62	80	3.89	11.	6	20	1.6	8
7.5	143	131	1.53	2250	10.4	42.4	76	1724	1295	58.2	54.0	60.9	132	10	64	72	3.49	11.	6	21	1.7	8
8.0	152	139	1.63	2325	10.8	41.1	83	1924	1462	52.5	48.6	63.7	143	9	65	66	3.20	12.	7	22	1.8	9
8.5	162	148	1.73	2396	11.1	39.9	90	2100	1610	47.9	44.2	66.1	153	8	66	61	2.97	13.	7	24	1.9	10
9.0	171	157	1.84	2466	11.4	38.7	96	2256	1667	44.0	40.6	68.0	164	7	68	57	2.78	14.	7	25	1.9	11
9.5	181	165	1.94	2534	11.7	37.7	101	2396	1579	40.8	37.6	69.6	174	7	69	54	2.62	14.	8	26	2.0	11
10.0	190	174	2.04	2600	12.0	36.7	107	2521	1500	38.0	35.0	71.0	184	6	70	51	2.49	15.	8	27	2.1	12
10.5	200	183	2.14	2665	12.3	35.9	112	2635	1429	35.5	32.7	72.2	194	6	70	49	2.38	16.	8	28	2.2	12
11.0	209	192	2.24	2728	12.6	35.0	117	2738	1364	33.4	30.7	73.3	204	5	71	47	2.28	16.	9	29	2.2	13
11.5	219	200	2.35	2790	12.9	34.3	122	2832	1304	31.5	28.9	74.3	214	5	72	45	2.19	17.	9	30	2.3	14
12.0	228	209	2.45	2850	13.2	33.5	126	2918	1250	29.8	27.4	75.1	223	5	73	44	2.11	18.	9	31	2.4	14
13.0	247	226	2.65	2967	13.7	32.2	135	3070	1154	26.9	24.7	76.5	243	4	74	41	1.98	19.	10	33	2.5	15
14.0	266	244	2.86	3080	14.2	31.1	143	3200	1071	24.5	22.5	77.7	262	4	75	39	1.87	21.	11	35	2.6	16
15.0	285	261	3.06	3189	14.7	30.0	150	3313	1000	22.6	20.7	78.7	282	3	76	37	1.77	22.	11	37	2.7	18
16.0	304	279	3.26	3294	15.2	29.1	158	3412	937	20.9	19.2	79.6	301	3	77	35	1.69	23.	12	39	2.8	19
17.0	323	296	3.47	3397	15.7	28.2	165	3499	882	19.4	17.8	80.3	320	3	78	33	1.62	25.	12	41	2.9	20
18.0	342	313	3.67	3496	16.2	27.4	171	3576	833	18.2	16.7	80.9	339	3	79	32	1.55	26.	13	42	3.0	21
19.0	361	331	3.88	3593	16.6	26.7	178	3645	789	17.1	15.6	81.5	359	2	80	31	1.50	27.	14	44	3.1	22
20.0	380	348	4.08	3687	17.0	26.0	184	3707	750	16.1	14.7	82.0	378	2	81	30	1.45	29.	14	46	3.2	23
25.0	475	435	5.10	4128	19.0	23.2	212	3942	600	12.5	11.5	83.8	473	2	84	26	1.25	35.	17	54	3.7	28
30.0	570	522	6.12	4528	20.9	21.2	237	4099	500	10.2	9.4	84.9	569	1	88	23	1.12	41.	20	62	4.1	32
35.0	665	609	7.14	4897	22.5	19.6	260	4210	428	8.6	7.9	85.7	664	1	91	21	1.03	47.	23	70	4.4	
40.0	760	696	8.16	5242	24.1	18.4	281	4294	375	7.5	6.9	86.3	759	1	94	20	0.95	53.	26	77	4.8	
45.0	855	783	9.18	5567	25.5	17.3	300	4358	333	6.6	6.1	86.7	854	1	97	18	0.89	58.	29	84	5.1	
50.0	950	870	10.20	5876	26.9	16.4	318	4410	300	5.9	5.4	87.0	949	1	99	17	0.84	63.	32	91	5.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#111 19 F on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 83. ZC= 92.(U)
NEUTRON NUMBERS: NP= 10. NT=126. NC=136.

AP**1/3= 2.668 AT**1/3= 5.934
REDUCED MASS NUMBER= 17.42 AP+AT=AC=228.

INTERACTION RADIUS RINT=12.45 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 6.83 CT+CP= 9.44 C̄= 1.89

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 6.97

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.68 RC=RCP+RCT= 9.60

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 150.58 MeV K= .05647 n=2.887
VC(RINT)= 86.3 MeV

FISSION-TKE= 171. MeV
ASYMM. FISSION-TKE= 60. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 21.12 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: -16.5
COMPOUND NUCLEUS: 30.7

FUSION RELATED PARAMETERS:
R-BARRIER=11.25 fm V(RB)= 88.9 MeV
Q-VALUE= -46.7 MeV
L-CRITICAL= 82.

19 F on 209 Bi — 19 F on 209 Bi

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	19	17	0.20	820	3.8	117.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	35	0.40	1160	5.4	83.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	52	0.61	1422	6.6	67.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	70	0.81	1642	7.6	58.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	78	0.91	1742	8.1	55.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	95	87	1.01	1836	8.5	52.6	9	46	0	159.9	157.9	10.1	67	28	45	555	28.62	0.	4	12	1.2	4
5.5	105	96	1.11	1926	8.9	50.2	35	505	284	110.5	105.5	34.8	83	22	51	159	7.67	9.	4	15	1.3	5
6.0	114	105	1.21	2012	9.3	48.0	48	878	591	89.6	84.4	45.2	97	17	56	115	5.52	9.	5	16	1.4	6
6.5	124	113	1.31	2094	9.7	46.1	59	1192	851	76.2	71.3	51.9	109	14	59	95	4.54	10.	5	18	1.5	7
7.0	133	122	1.41	2174	10.1	44.5	68	1460	1074	66.6	62.0	56.7	121	12	62	82	3.94	11.	6	20	1.6	7
7.5	143	131	1.51	2250	10.4	42.9	76	1691	1268	59.2	55.0	60.4	132	11	64	74	3.53	11.	6	21	1.7	8
8.0	152	139	1.61	2325	10.8	41.6	83	1894	1437	53.4	49.5	63.3	143	9	65	67	3.23	12.	7	22	1.8	9
8.5	162	148	1.72	2396	11.1	40.3	89	2072	1586	48.7	45.0	65.7	153	8	67	62	2.99	13.	7	24	1.9	10
9.0	171	157	1.82	2466	11.4	39.2	95	2230	1669	44.7	41.3	67.6	163	8	68	58	2.80	14.	7	25	1.9	10
9.5	181	165	1.92	2534	11.7	38.2	101	2372	1581	41.4	38.2	69.3	174	7	69	55	2.64	14.	8	26	2.0	11
10.0	190	174	2.02	2600	12.0	37.2	106	2499	1502	38.5	35.5	70.7	184	6	70	52	2.51	15.	8	27	2.1	12
10.5	200	183	2.12	2665	12.3	36.3	112	2614	1430	36.0	33.2	72.0	194	6	71	50	2.39	16.	8	28	2.2	12
11.0	209	192	2.22	2728	12.6	35.5	117	2718	1365	33.9	31.2	73.1	204	5	72	48	2.29	16.	9	29	2.2	13
11.5	219	200	2.32	2790	12.9	34.7	121	2813	1306	31.9	29.4	74.0	213	5	72	46	2.20	17.	9	30	2.3	13
12.0	228	209	2.42	2850	13.2	34.0	126	2901	1251	30.2	27.8	74.9	223	5	73	44	2.12	18.	9	31	2.4	14
13.0	247	226	2.62	2967	13.7	32.6	134	3055	1155	27.3	25.1	76.4	243	4	74	41	1.99	19.	10	33	2.5	15
14.0	266	244	2.83	3080	14.3	31.4	143	3187	1073	24.9	22.8	77.6	262	4	75	39	1.87	21.	11	35	2.6	16
15.0	285	261	3.03	3189	14.8	30.4	150	3301	1001	22.9	21.0	78.6	282	3	76	37	1.78	22.	11	37	2.7	17
16.0	304	279	3.23	3294	15.2	29.4	158	3401	938	21.1	19.4	79.4	301	3	77	35	1.69	23.	12	39	2.8	18
17.0	323	296	3.43	3397	15.7	28.5	165	3489	883	19.7	18.1	80.2	320	3	78	34	1.62	25.	12	41	2.9	20
18.0	342	314	3.63	3496	16.2	27.7	171	3567	834	18.4	16.9	80.8	339	3	79	33	1.56	26.	13	42	3.0	21
19.0	361	331	3.83	3593	16.6	27.0	178	3637	790	17.3	15.9	81.4	359	2	80	31	1.50	27.	14	44	3.1	22
20.0	380	348	4.04	3687	17.0	26.3	184	3700	751	16.3	14.9	81.9	378	2	81	30	1.45	28.	14	46	3.2	23
25.0	475	435	5.05	4128	19.0	23.5	212	3938	600	12.6	11.6	83.7	473	2	85	26	1.26	35.	17	54	3.7	27
30.0	570	523	6.05	4528	20.9	21.5	237	4097	500	10.3	9.5	84.8	569	1	88	24	1.12	41.	20	62	4.1	32
35.0	665	610	7.06	4897	22.5	19.9	260	4210	429	8.7	8.0	85.6	664	1	91	21	1.03	47.	23	70	4.4	
40.0	760	697	8.07	5242	24.1	18.6	281	4294	375	7.6	7.0	86.2	759	1	94	20	0.95	52.	26	77	4.8	
45.0	855	784	9.08	5567	25.6	17.5	300	4360	333	6.7	6.1	86.7	854	1	97	19	0.89	58.	29	84	5.1	
50.0	950	871	10.09	5876	26.9	16.6	318	4412	300	6.0	5.5	87.0	949	1	100	18	0.84	64.	32	91	5.4	

#112 19 F on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 9. ZT= 92. ZC=101.(Md)
NEUTRON NUMBERS: NP= 10. NT=146. NC=156.

AP**1/3= 2.668 AT**1/3= 6.197
REDUCED MASS NUMBER= 17.60 AP+AT=AC=257.

INTERACTION RADIUS RINT=12.73 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.62 CT= 7.16 CT+CP= 9.78 C̄= 1.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 2.96 RT= 7.30

COULOMB RADII [fm]:
RCP= 2.93 RCT= 6.98 RC=RCP+RCT= 9.90

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 161.38 MeV K= .05066 n=2.922
VC(RINT)= 93.5 MeV

FISSION-TKE= 194. MeV
ASYMM. FISSION-TKE= 63. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.874 MeV/fm**2 PROX-FACTOR= 21.05 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -1.5 TARGET: 47.2
COMPOUND NUCLEUS: 89.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.52 fm V(RB)= 96.2 MeV
Q-VALUE= -44.0 MeV
L-CRITICAL= 85.

19 F on 238 U — 19 F on 238 U

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	19	18	0.19	820	3.8	130.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	38	35	0.38	1160	5.4	92.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	57	53	0.56	1422	6.7	75.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	76	70	0.75	1642	7.7	65.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	86	79	0.85	1742	8.2	61.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	95	88	0.94	1836	8.6	58.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	105	97	1.03	1926	9.0	55.6	21	181	23	139.2	136.0	20.4	79	25	50	303	13.65	8.	4	14	1.3	6
6.0	114	106	1.13	2012	9.4	53.2	40	604	368	105.7	101.2	37.2	94	20	56	158	6.99	8.	5	16	1.4	7
6.5	124	114	1.22	2094	9.8	51.1	53	958	661	87.8	83.2	46.1	107	16	60	120	5.30	9.	5	17	1.5	8
7.0	133	123	1.32	2174	10.2	49.3	63	1259	911	75.7	71.3	52.2	119	14	62	100	4.44	10.	6	19	1.6	8
7.5	143	132	1.41	2250	10.5	47.6	72	1520	1128	66.7	62.7	56.6	131	12	64	88	3.90	10.	6	20	1.7	9
8.0	152	141	1.51	2325	10.9	46.1	80	1747	1318	59.8	56.0	60.1	142	10	66	80	3.52	11.	6	21	1.7	10
8.5	162	150	1.60	2396	11.2	44.7	87	1948	1486	54.2	50.7	62.9	152	9	68	73	3.23	11.	7	23	1.8	11
9.0	171	158	1.69	2466	11.5	43.5	94	2125	1635	49.6	46.3	65.2	163	8	69	68	3.00	12.	7	24	1.9	11
9.5	181	167	1.79	2534	11.9	42.3	100	2284	1641	45.8	42.7	67.1	173	7	70	64	2.82	13.	8	25	2.0	12
10.0	190	176	1.88	2600	12.2	41.2	106	2427	1559	42.5	39.6	68.7	183	7	71	60	2.66	13.	8	26	2.0	13
10.5	200	185	1.98	2665	12.5	40.2	111	2556	1485	39.7	36.9	70.2	193	6	72	57	2.53	14.	8	27	2.1	14
11.0	209	194	2.07	2728	12.8	39.3	117	2674	1417	37.2	34.6	71.4	203	6	72	55	2.42	15.	9	28	2.2	14
11.5	219	202	2.16	2790	13.1	38.4	122	2781	1355	35.0	32.6	72.5	213	5	73	52	2.32	15.	9	29	2.2	15
12.0	228	211	2.26	2850	13.3	37.6	127	2879	1299	33.1	30.8	73.4	223	5	74	50	2.23	16.	9	30	2.3	16
13.0	247	229	2.45	2967	13.9	36.2	136	3052	1199	29.8	27.7	75.1	243	4	75	47	2.08	17.	10	32	2.4	17
14.0	266	246	2.63	3080	14.4	34.8	144	3200	1113	27.1	25.2	76.4	262	4	76	44	1.95	18.	10	34	2.5	18
15.0	285	264	2.82	3189	14.9	33.7	152	3329	1039	24.9	23.1	77.5	281	4	77	42	1.85	20.	11	36	2.6	19
16.0	304	282	3.01	3294	15.4	32.6	160	3441	974	23.0	21.3	78.5	301	3	78	40	1.76	21.	12	38	2.7	21
17.0	323	299	3.20	3397	15.9	31.6	167	3540	917	21.4	19.8	79.3	320	3	79	38	1.68	22.	12	39	2.8	22
18.0	342	317	3.39	3496	16.3	30.7	174	3628	866	20.0	18.5	80.0	339	3	80	37	1.62	23.	13	41	2.9	23
19.0	361	334	3.57	3593	16.8	29.9	181	3706	820	18.7	17.4	80.6	358	3	81	35	1.56	24.	13	43	3.0	24
20.0	380	352	3.76	3687	17.2	29.2	188	3777	779	17.7	16.4	81.2	378	2	81	34	1.50	25.	14	45	3.1	25
25.0	475	440	4.70	4128	19.2	26.1	217	4045	623	13.7	12.7	83.2	473	2	85	29	1.30	31.	17	53	3.5	30
30.0	570	528	5.64	4528	21.1	23.8	243	4223	519	11.2	10.3	84.4	569	1	88	26	1.16	36.	20	60	3.9	35
35.0	665	616	6.58	4897	22.8	22.0	267	4350	445	9.4	8.7	85.3	664	1	91	24	1.06	42.	23	68	4.2	
40.0	760	704	7.53	5242	24.3	20.6	289	4445	389	8.2	7.6	85.9	759	1	93	22	0.98	47.	26	75	4.5	
45.0	855	792	8.47	5567	25.8	19.4	309	4519	346	7.2	6.7	86.4	854	1	96	21	0.91	52.	29	82	4.8	
50.0	950	880	9.41	5876	27.2	18.4	327	4578	311	6.4	6.0	86.8	949	1	98	20	0.86	57.	31	89	5.1	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	Å	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	aps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CH=CENTER OF MASS L=LAB

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#113 20 Ne on 12 C

20 Ne on 12 C

20 Ne on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 6. ZC= 16.(S)
NEUTRON NUMBERS: NP= 10. NT= 6. NC= 16.

AP**1/3= 2.714 AT**1/3= 2.289 ELSCAT <36 deg
REDUCED MASS NUMBER= 7.50 AP+AT=AC= 32.

INTERACTION RADIUS RINT= 8.53 fm RO= 1.71 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 2.12 CT+CP= 4.80 $\overline{C}$= 1.18

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.01 RCT= 2.51 RC=RCP+RCT= 5.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 21.95 MeV K= .09369 n=2.465
VC(RINT)= 10.1 MeV

FISSION-TKE= 31. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 14.16 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 25.62 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: 0.0
COMPOUND NUCLEUS: -25.6

FUSION RELATED PARAMETERS:
R-BARRIER= 7.79 fm V(RB)= 10.2 MeV
Q-VALUE= 16.2 MeV
L-CRITICAL= 22.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	20	8	0.74	863	1.6	9.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	40	15	1.48	1221	2.3	6.7	11	882	613	61.2	22.2	59.4	30	10	0	12	4.79	24.	0 0	2.8	1
3.0	60	23	2.23	1496	2.8	5.5	18	1402	1044	33.7	12.5	73.1	55	5	0	7	3.00	35.	0 0	3.1	2
4.0	80	30	2.97	1728	3.3	4.7	23	1652	1260	23.4	8.7	78.3	77	3	76	6	2.37	47.	4 11	3.4	2
4.5	90	34	3.34	1833	3.5	4.5	25	1733	1332	20.3	7.6	79.8	87	3	83	5	2.17	53.	5 16	3.5	2
5.0	100	38	3.71	1933	3.7	4.2	27	1798	1223	18.0	6.7	81.0	98	2	89	5	2.02	59.	6 19	3.7	2
5.5	110	41	4.08	2027	3.8	4.0	29	1850	1112	16.1	6.0	82.0	108	2	95	5	1.89	64.	6 22	3.8	2
6.0	120	45	4.45	2118	4.0	3.9	30	1893	1019	14.6	5.5	82.7	118	2	101	4	1.79	70.	7 25	3.9	2
6.5	130	49	4.82	2205	4.2	3.7	32	1929	941	13.3	5.0	83.3	128	2	107	4	1.70	74.	7 27	4.0	3
7.0	140	53	5.19	2288	4.3	3.6	33	1960	874	12.2	4.6	83.9	139	1	113	4	1.62	79.	8 29	4.1	3
7.5	150	56	5.56	2369	4.5	3.4	35	1986	815	11.3	4.3	84.3	149	1	119	4	1.56	85.	8 31	4.3	3
8.0	160	60	5.93	2447	4.6	3.3	36	2009	764	10.6	4.0	84.7	159	1	125	4	1.50	91.	9 33	4.4	3
8.5	170	64	6.31	2523	4.8	3.2	37	2029	719	9.9	3.7	85.1	169	1	130	4	1.44	96.	9 35	4.5	3
9.0	180	68	6.68	2596	4.9	3.1	39	2047	679	9.3	3.5	85.4	179	1	136	3	1.40	102.	10 37	4.6	3
9.5	190	71	7.05	2667	5.1	3.1	40	2062	644	8.8	3.3	85.6	189	1	141	3	1.35	104.	10 39	4.7	4
10.0	200	75	7.42	2737	5.2	3.0	41	2076	611	8.3	3.1	85.8	199	1	147	3	1.31	109.	11 41	4.8	4
10.5	210	79	7.79	2805	5.3	2.9	42	2089	582	7.9	3.0	86.1	209	1	152	3	1.28	115.	11 42	4.9	4
11.0	220	83	8.16	2872	5.4	2.8	43	2101	556	7.5	2.8	86.3	219	1	157	3	1.24	120.	12 44	5.0	4
11.5	230	86	8.53	2936	5.6	2.8	45	2111	532	7.1	2.7	86.4	229	1	163	3	1.21	126.	12 46	5.1	4
12.0	240	90	8.90	3000	5.7	2.7	46	2121	509	6.8	2.6	86.6	239	1	168	3	1.18	131.	13 47	5.2	4
13.0	260	98	9.64	3123	5.9	2.6	48	2137	470	6.3	2.4	86.9	259	1	178	3	1.13	142.	14 51	5.3	4
14.0	280	105	10.39	3242	6.1	2.5	50	2151	437	5.8	2.2	87.1	279	1	189	3	1.08	148.	15 54	5.5	5
15.0	300	113	11.13	3357	6.4	2.4	52	2163	407	5.4	2.0	87.3	299	1	199	3	1.04	158.	16 57	5.7	5
16.0	320	120	11.87	3468	6.6	2.4	54	2174	382	5.0	1.9	87.5	319	1	209	2	1.01	169.	16 60	5.8	5
17.0	340	128	12.61	3575	6.8	2.3	55	2183	359	4.7	1.8	87.6	339	1	219	2	0.98	179.	17 63	6.0	5
18.0	360	135	13.35	3680	7.0	2.2	57	2191	339	4.5	1.7	87.8	359	1	229	2	0.95	190.	18 65	6.1	5
19.0	380	143	14.09	3782	7.2	2.2	59	2198	322	4.2	1.6	87.9	380	0	239	2	0.92	193.	19 68	6.3	6
20.0	400	150	14.84	3881	7.3	2.1	60	2205	305	4.0	1.5	88.0	400	0	249	2	0.89	203.	20 71	6.4	6
25.0	500	188	18.55	4345	8.2	1.9	68	2229	244	3.2	1.2	88.4	500	0	298	2	0.79	244.	25 84	7.1	7
30.0	600	225	22.25	4766	9.0	1.7	75	2244	203	2.6	1.0	88.7	600	0	346	2	0.72	281.	29 97	7.8	8
35.0	700	263	25.96	5155	9.7	1.6	81	2254	174	2.3	0.8	88.9	700	0	393	2	0.67	328.	33 109	8.3	
40.0	800	300	29.67	5518	10.4	1.5	87	2262	152	2.0	0.7	89.0	800	0	440	2	0.62	359.	38 121	8.9	
45.0	900	338	33.38	5860	11.0	1.4	92	2268	135	1.7	0.7	89.1	900	0	486	1	0.58	386.	42 132	9.4	
50.0	1000	375	37.09	6185	11.6	1.3	98	2272	122	1.6	0.6	89.2	1000	0	532	1	0.55	429.	46 143	9.9	

#114 20 Ne on 16 O

20 Ne on 16 O

20 Ne on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 8. ZC= 18.(Ar)
NEUTRON NUMBERS: NP= 10. NT= 8. NC= 18.

AP**1/3= 2.714 AT**1/3= 2.520 ELSCAT <53 deg
REDUCED MASS NUMBER= 8.89 AP+AT=AC= 36.

INTERACTION RADIUS RINT= 8.79 fm RO= 1.68 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 2.42 CT+CP= 5.10 $\overline{C}$= 1.27

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.01 RCT= 2.78 RC=RCP+RCT= 5.79

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 27.99 MeV K= .11108 n=2.444
VC(RINT)= 13.1 MeV

FISSION-TKE= 33. MeV
ASYMM. FISSION-TKE= 32. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 15.21 MeV
L-RLD= 36 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 21.69 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -4.7
COMPOUND NUCLEUS: -28.4

FUSION RELATED PARAMETERS:
R-BARRIER= 8.00 fm V(RB)= 13.3 MeV
Q-VALUE= 14.2 MeV
L-CRITICAL= 26.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	20	9	0.68	863	1.9	12.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	40	18	1.36	1221	2.7	8.9	12	744	507	71.5	31.2	54.3	27	13	0	17	5.48	22.	0 0	2.7	1
3.0	60	27	2.04	1496	3.4	7.3	21	1353	1008	38.0	16.8	71.0	54	6	0	10	3.22	31.	0 0	3.0	2
4.0	80	36	2.72	1728	3.9	6.3	27	1646	1258	26.1	11.6	76.9	76	4	73	8	2.50	42.	4 13	3.3	2
4.5	90	40	3.06	1833	4.1	5.9	30	1742	1341	22.6	10.0	78.7	87	3	79	7	2.28	47.	5 17	3.5	2
5.0	100	44	3.39	1933	4.3	5.6	32	1819	1252	19.9	8.8	80.0	97	3	85	7	2.12	52.	6 20	3.6	2
5.5	110	49	3.73	2027	4.6	5.4	34	1880	1138	17.8	7.9	81.1	107	3	90	6	1.98	56.	6 23	3.7	3
6.0	120	53	4.07	2118	4.8	5.1	36	1932	1043	16.1	7.2	81.9	118	2	96	6	1.87	61.	7 25	3.9	3
6.5	130	58	4.41	2205	5.0	4.9	38	1975	963	14.7	6.5	82.6	128	2	101	6	1.77	66.	7 28	4.0	3
7.0	140	62	4.75	2288	5.1	4.8	40	2011	894	13.5	6.0	83.2	138	2	106	5	1.69	71.	8 30	4.1	3
7.5	150	67	5.09	2369	5.3	4.6	42	2043	835	12.5	5.6	83.7	148	2	111	5	1.62	74.	8 32	4.2	4
8.0	160	71	5.43	2447	5.5	4.5	44	2070	782	11.7	5.2	84.2	158	2	116	5	1.56	79.	9 34	4.4	4
8.5	170	76	5.77	2523	5.7	4.3	45	2094	736	10.9	4.8	84.5	168	2	121	5	1.50	84.	9 36	4.5	4
9.0	180	80	6.11	2596	5.8	4.2	47	2116	695	10.2	4.5	84.9	179	1	125	5	1.45	89.	10 38	4.6	4
9.5	190	84	6.45	2667	6.0	4.1	48	2135	659	9.7	4.3	85.2	189	1	130	4	1.40	94.	10 39	4.7	4
10.0	200	89	6.79	2737	6.1	4.0	50	2152	626	9.1	4.1	85.4	199	1	135	4	1.36	99.	11 41	4.8	4
10.5	210	93	7.13	2805	6.3	3.9	51	2167	596	8.7	3.8	85.7	209	1	139	4	1.32	104.	11 43	4.9	4
11.0	220	98	7.47	2872	6.4	3.8	53	2181	569	8.2	3.7	85.9	219	1	144	4	1.29	109.	12 44	5.0	4
11.5	230	102	7.81	2936	6.6	3.7	54	2194	544	7.9	3.5	86.1	229	1	149	4	1.25	110.	12 46	5.1	5
12.0	240	107	8.15	3000	6.7	3.6	55	2205	521	7.5	3.3	86.2	239	1	153	4	1.22	115.	12 48	5.2	5
13.0	260	116	8.83	3123	7.0	3.5	58	2225	481	6.9	3.1	86.6	259	1	162	4	1.17	124.	13 51	5.4	5
14.0	280	124	9.51	3242	7.3	3.4	60	2243	447	6.4	2.8	86.8	279	1	171	4	1.12	134.	14 54	5.6	5
15.0	300	133	10.18	3357	7.5	3.3	63	2257	417	5.9	2.6	87.0	299	1	179	3	1.08	139.	15 57	5.7	6
16.0	320	142	10.86	3468	7.8	3.1	65	2270	391	5.5	2.5	87.2	319	1	188	3	1.04	148.	16 60	5.9	6
17.0	340	151	11.54	3575	8.0	3.1	67	2282	368	5.2	2.3	87.4	339	1	197	3	1.01	157.	17 63	6.1	6
18.0	360	160	12.22	3680	8.2	3.0	69	2292	347	4.9	2.2	87.6	359	1	205	3	0.98	167.	18 65	6.2	6
19.0	380	169	12.90	3782	8.5	2.9	72	2300	329	4.6	2.1	87.7	379	1	213	3	0.95	170.	19 68	6.4	7
20.0	400	178	13.58	3881	8.7	2.8	74	2308	313	4.4	1.9	87.8	399	1	222	3	0.92	179.	20 71	6.5	7
25.0	500	222	16.97	4345	9.7	2.5	83	2338	250	3.5	1.5	88.3	500	0	263	3	0.82	216.	24 84	7.2	8
30.0	600	267	20.37	4766	10.6	2.3	91	2357	208	2.9	1.3	88.6	600	0	303	2	0.74	250.	28 97	7.9	9
35.0	700	311	23.76	5155	11.5	2.1	99	2371	178	2.5	1.1	88.8	700	0	342	2	0.69	281.	32 108	8.5	
40.0	800	356	27.16	5518	12.3	2.0	106	2381	156	2.2	1.0	88.9	800	0	380	2	0.64	308.	37 120	9.1	
45.0	900	400	30.55	5860	13.0	1.9	113	2388	139	1.9	0.8	89.0	900	0	418	2	0.60	347.	41 131	9.6	
50.0	1000	444	33.95	6185	13.7	1.8	119	2394	125	1.7	0.8	89.1	1000	0	456	2	0.57	370.	45 142	10.1	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#115 20 Ne on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 13. ZC= 23.(V)
NEUTRON NUMBERS: NP= 10. NT= 14. NC= 24.

AP**1/3= 2.714 AT**1/3= 3.000
REDUCED MASS NUMBER= 11.49 AP+AT=AC= 47.

INTERACTION RADIUS RINT= 9.31 fm RO= 1.63 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 3.05 CT+CP= 5.72 C= 1.43

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.01 RCT= 3.32 RC=RCP+RCT= 6.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 41.59 MeV K= .13238 n=2.445
VC(RINT)= 20.1 MeV

FISSION-TKE= 38. MeV
ASYMM. FISSION-TKE= 37. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 17.03 MeV
L-RLD= 47 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.88 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -20.6
COMPOUND NUCLEUS: -43.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.44 fm V(RB)= 20.6 MeV
Q-VALUE= 13.2 MeV
L-CRITICAL= 36.

20 Ne on 27 Al

20 Ne on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	11	0.57	863	2.5	20.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	40	23	1.14	1221	3.6	14.5	12	402	233	102.0	61.4	39.0	16	24	0	41	8.41	16.	0	2.5	2
3.0	60	34	1.72	1496	4.4	11.8	26	1224	900	48.6	28.1	65.7	50	10	0	18	3.77	24.	0	2.8	2
4.0	80	46	2.29	1728	5.0	10.2	35	1622	1234	32.5	18.7	73.7	74	6	66	14	2.81	32.	4	15	3.2	3
4.5	90	52	2.58	1833	5.3	9.6	39	1753	1346	27.9	16.1	76.0	85	5	71	12	2.54	36.	5	18	3.3	3
5.0	100	57	2.86	1933	5.6	9.2	42	1857	1385	24.5	14.1	77.8	96	4	75	11	2.34	40.	5	21	3.5	3
5.5	110	63	3.15	2027	5.9	8.7	45	1941	1259	21.8	12.5	79.1	106	4	80	11	2.17	44.	6	24	3.6	3
6.0	120	69	3.43	2118	6.2	8.4	48	2011	1154	19.7	11.3	80.2	117	3	84	10	2.04	47.	6	26	3.7	4
6.5	130	75	3.72	2205	6.4	8.0	51	2070	1066	17.9	10.3	81.1	127	3	88	9	1.93	51.	7	28	3.9	4
7.0	140	80	4.01	2288	6.6	7.7	54	2121	989	16.4	9.4	81.8	137	3	91	9	1.84	54.	7	30	4.0	4
7.5	150	86	4.29	2369	6.9	7.5	56	2164	923	15.2	8.7	82.4	147	3	95	9	1.76	58.	8	32	4.1	4
8.0	160	92	4.58	2447	7.1	7.2	59	2202	866	14.1	8.1	82.9	156	2	99	8	1.68	61.	8	34	4.2	5
8.5	170	98	4.87	2523	7.3	7.0	61	2236	815	13.2	7.6	83.4	168	2	102	8	1.62	65.	9	35	4.3	5
9.0	180	103	5.15	2596	7.5	6.8	63	2265	769	12.4	7.1	83.8	178	2	106	8	1.56	68.	9	37	4.5	5
9.5	190	109	5.44	2667	7.7	6.6	65	2292	729	11.6	6.7	84.2	188	2	109	7	1.51	72.	10	39	4.6	5
10.0	200	115	5.72	2737	7.9	6.5	67	2316	692	11.0	6.3	84.5	198	2	112	7	1.47	76.	10	40	4.7	5
10.5	210	121	6.01	2805	8.1	6.3	69	2337	659	10.4	6.0	84.8	208	2	116	7	1.42	78.	11	42	4.8	6
11.0	220	126	6.30	2872	8.3	6.2	71	2356	629	9.9	5.7	85.0	218	2	119	7	1.38	82.	11	44	4.9	6
11.5	230	132	6.58	2936	8.5	6.0	73	2374	602	9.4	5.4	85.3	228	2	122	7	1.35	85.	11	45	5.0	6
12.0	240	138	6.87	3000	8.7	5.9	75	2390	577	9.0	5.2	85.5	239	1	125	6	1.32	89.	12	47	5.1	6
13.0	260	149	7.44	3123	9.1	5.7	79	2419	533	8.3	4.8	85.9	259	1	131	6	1.26	94.	13	50	5.3	7
14.0	280	161	8.01	3242	9.4	5.5	82	2443	494	7.6	4.4	86.2	279	1	137	6	1.20	101.	14	53	5.4	7
15.0	300	172	8.59	3357	9.7	5.3	85	2464	461	7.1	4.1	86.4	299	1	143	6	1.16	109.	14	55	5.6	7
16.0	320	184	9.16	3468	10.1	5.1	88	2482	433	6.6	3.8	86.7	319	1	149	5	1.12	113.	15	58	5.8	8
17.0	340	195	9.73	3575	10.4	5.0	91	2498	407	6.2	3.6	86.9	339	1	155	5	1.08	120.	16	61	6.0	8
18.0	360	207	10.30	3680	10.7	4.8	94	2512	384	5.9	3.4	87.1	359	1	161	5	1.04	127.	17	64	6.1	8
19.0	380	218	10.88	3782	11.0	4.7	97	2525	364	5.5	3.2	87.2	379	1	167	5	1.01	131.	18	66	6.3	9
20.0	400	230	11.45	3881	11.2	4.6	100	2537	346	5.2	3.0	87.4	399	1	172	5	0.99	138.	18	69	6.4	9
25.0	500	287	14.31	4345	12.6	4.1	113	2579	277	4.2	2.4	87.9	499	1	200	4	0.87	163.	22	81	7.2	11
30.0	600	345	17.17	4766	13.8	3.7	124	2607	230	3.4	2.0	88.3	599	1	226	4	0.79	190.	26	93	7.8	12
35.0	700	402	20.03	5155	14.9	3.5	135	2627	197	2.9	1.7	88.5	700	0	252	4	0.73	215.	30	104	8.4	
40.0	800	460	22.90	5518	15.9	3.2	145	2642	173	2.6	1.5	88.7	800	0	278	3	0.68	239.	34	115	9.0	
45.0	900	517	25.76	5860	16.9	3.1	154	2653	153	2.3	1.3	88.9	900	0	302	3	0.64	261.	38	126	9.5	
50.0	1000	574	28.62	6185	17.8	2.9	163	2662	138	2.0	1.2	89.0	1000	0	327	3	0.61	280.	42	136	10.0	

#116 20 Ne on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 20. ZC= 30.(Zn)
NEUTRON NUMBERS: NP= 10. NT= 20. NC= 30.

AP**1/3= 2.714 AT**1/3= 3.420
REDUCED MASS NUMBER= 13.33 AP+AT=AC= 60.

INTERACTION RADIUS RINT= 9.77 fm RO= 1.59 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 3.59 CT+CP= 6.27 C= 1.53

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.01 RCT= 3.84 RC=RCP+RCT= 6.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 58.84 MeV K= .14031 n=2.489
VC(RINT)= 29.4 MeV

FISSION-TKE= 47. MeV
ASYMM. FISSION-TKE= 42. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 18.34 MeV
L-RLD= 56 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.60 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -33.0
COMPOUND NUCLEUS: -56.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.81 fm V(RB)= 30.5 MeV
Q-VALUE= 13.8 MeV
L-CRITICAL= 44.

20 Ne on 40 Ca

20 Ne on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	13	0.45	863	2.9	31.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	40	27	0.91	1221	4.1	22.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	60	40	1.36	1496	5.1	18.2	25	853	578	71.4	49.1	54.3	42	18	0	35	4.97	19.	0	2.7	2
4.0	80	53	1.81	1728	5.8	15.7	38	1413	1043	44.9	30.3	67.6	70	10	59	24	3.30	25.	4	15	3.0	3
4.5	90	60	2.04	1833	6.2	14.8	43	1598	1198	38.0	25.5	71.0	82	8	64	21	2.92	28.	5	18	3.1	3
5.0	100	67	2.27	1933	6.5	14.1	48	1745	1322	33.0	22.1	73.5	93	7	68	19	2.65	31.	5	20	3.3	4
5.5	110	73	2.49	2027	6.8	13.4	52	1864	1362	29.1	19.5	75.4	104	6	72	17	2.44	34.	6	23	3.4	4
6.0	120	80	2.72	2118	7.1	12.9	55	1964	1248	26.1	17.5	77.0	115	5	76	16	2.27	37.	6	25	3.5	4
6.5	130	87	2.94	2205	7.4	12.4	59	2047	1152	23.6	15.8	78.2	125	5	79	15	2.13	40.	7	27	3.7	4
7.0	140	93	3.17	2288	7.7	11.9	62	2119	1070	21.6	14.4	79.2	136	4	82	14	2.02	43.	7	29	3.8	5
7.5	150	100	3.40	2369	8.0	11.5	66	2181	998	19.9	13.3	80.0	146	4	85	14	1.92	46.	8	31	3.9	5
8.0	160	107	3.62	2447	8.2	11.1	69	2235	936	18.4	12.3	80.8	156	4	88	13	1.84	49.	8	32	4.0	5
8.5	170	113	3.85	2523	8.5	10.8	71	2282	881	17.2	11.5	81.4	167	3	90	13	1.76	52.	8	34	4.1	5
9.0	180	120	4.08	2596	8.7	10.5	74	2324	832	16.1	10.7	82.0	177	3	93	12	1.70	54.	9	36	4.2	6
9.5	190	127	4.30	2667	9.0	10.2	77	2362	788	15.1	10.1	82.4	187	3	96	12	1.64	57.	9	37	4.3	6
10.0	200	133	4.53	2737	9.2	10.0	80	2396	749	14.3	9.5	82.9	197	3	98	11	1.58	60.	10	39	4.4	6
10.5	210	140	4.76	2805	9.4	9.7	82	2426	713	13.5	9.0	83.2	207	3	101	11	1.53	63.	10	40	4.5	6
11.0	220	147	4.98	2872	9.7	9.5	84	2454	681	12.8	8.6	83.6	218	2	103	11	1.49	65.	10	42	4.6	7
11.5	230	153	5.21	2936	9.9	9.3	87	2479	651	12.2	8.1	83.9	228	2	105	10	1.45	68.	11	43	4.7	7
12.0	240	160	5.44	3000	10.1	9.1	89	2502	624	11.6	7.8	84.2	238	2	108	10	1.41	71.	11	45	4.8	7
13.0	260	173	5.89	3123	10.5	8.7	94	2543	576	10.7	7.1	84.7	258	2	112	10	1.35	75.	12	47	5.0	8
14.0	280	187	6.34	3242	10.9	8.4	98	2578	535	9.8	6.6	85.1	278	2	117	9	1.29	81.	13	50	5.2	8
15.0	300	200	6.80	3357	11.3	8.1	102	2608	499	9.1	6.1	85.4	298	2	121	9	1.24	87.	14	53	5.3	8
16.0	320	213	7.25	3468	11.7	7.9	106	2634	468	8.5	5.7	85.7	318	2	125	8	1.19	91.	14	55	5.5	9
17.0	340	227	7.70	3575	12.0	7.6	110	2657	440	8.0	5.3	86.0	339	1	130	8	1.15	96.	15	58	5.7	9
18.0	360	240	8.15	3680	12.4	7.4	113	2678	416	7.5	5.0	86.2	359	1	134	8	1.11	100.	16	61	5.8	10
19.0	380	253	8.61	3782	12.7	7.2	117	2696	394	7.1	4.7	86.5	379	1	138	8	1.08	105.	17	63	6.0	10
20.0	400	267	9.06	3881	13.0	7.0	120	2713	374	6.7	4.5	86.6	399	1	142	7	1.05	111.	17	66	6.1	10
25.0	500	333	11.33	4345	14.6	6.3	136	2775	299	5.3	3.5	87.3	499	1	161	7	0.93	133.	21	77	6.8	12
30.0	600	400	13.59	4766	16.0	5.7	150	2816	249	4.4	2.9	87.8	599	1	180	6	0.84	153.	25	88	7.4	14
35.0	700	467	15.86	5155	17.3	5.3	163	2845	214	3.7	2.5	88.1	699	1	198	5	0.77	175.	28	99	8.0	
40.0	800	533	18.12	5518	18.4	5.0	175	2866	187	3.3	2.2	88.4	799	1	216	5	0.72	191.	32	109	8.5	
45.0	900	600	20.39	5860	19.6	4.7	186	2883	166	2.9	1.9	88.6	899	1	233	5	0.68	210.	36	119	9.0	
50.0	1000	667	22.65	6185	20.6	4.5	197	2896	149	2.6	1.7	88.7	1000	0	250	5	0.64	228.	39	129	9.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	K	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#117 20 Ne on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 26. ZC= 36.(Kr)
NEUTRON NUMBERS: NP= 10. NT= 30. NC= 40.

AP**1/3= 2.714 AT**1/3= 3.826
REDUCED MASS NUMBER= 14.74 AP+AT=AC= 76.

INTERACTION RADIUS RINT=10.21 fm RO= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 4.12 CT+CP= 6.79 C= 1.62

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.01 RCT= 4.27 RC=RCP+RCT= 7.28

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 71.67 MeV K= .13479 n=2.526
VC(RINT)= 36.6 MeV

FISSION-TKE= 55. MeV
ASYMM. FISSION-TKE= 44. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 19.30 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.24 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -61.4
COMPOUND NUCLEUS: -70.2

FUSION RELATED PARAMETERS:
R-BARRIER= 9.20 fm V(RB)= 38.0 MeV
Q-VALUE= -0.6 MeV
L-CRITICAL= 52.

20 Ne on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	15	0.40	863	3.2	40.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	40	29	0.81	1221	4.6	28.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	60	44	1.21	1496	5.6	23.6	24	609	375	90.2	70.5	44.9	37	23	37	57	6.45	15. 2	4	2.1	2
4.0	80	59	1.61	1728	6.4	20.5	40	1301	946	53.6	40.3	63.2	67	13	54	33	3.75	20. 4	15	2.5	3
4.5	90	66	1.81	1833	6.8	19.3	47	1529	1136	44.9	33.5	67.5	80	10	59	29	3.26	22. 4	17	2.6	4
5.0	100	74	2.01	1933	7.2	18.3	52	1711	1288	38.7	28.8	70.7	91	9	63	26	2.91	25. 5	20	2.8	4
5.5	110	81	2.21	2027	7.6	17.5	57	1858	1413	34.0	25.2	73.0	103	7	66	24	2.66	27. 5	22	2.9	4
6.0	120	88	2.42	2118	7.9	16.7	62	1981	1432	30.3	22.5	74.8	114	6	69	22	2.46	29. 6	24	3.0	5
6.5	130	96	2.62	2205	8.2	16.1	66	2085	1322	27.4	20.3	76.3	124	6	72	20	2.31	32. 6	26	3.2	5
7.0	140	103	2.82	2288	8.5	15.5	70	2173	1227	25.0	18.5	77.5	135	5	74	19	2.17	34. 7	27	3.3	5
7.5	150	111	3.02	2369	8.8	14.9	74	2250	1145	22.9	17.0	78.5	145	5	77	18	2.06	36. 7	29	3.4	6
8.0	160	118	3.22	2447	9.1	14.5	77	2317	1074	21.2	15.7	79.4	156	4	79	17	1.97	39. 8	31	3.5	6
8.5	170	125	3.42	2523	9.4	14.0	81	2376	1011	19.7	14.6	80.1	166	4	81	17	1.88	41. 8	32	3.6	6
9.0	180	133	3.62	2596	9.7	13.6	84	2428	954	18.5	13.6	80.8	176	4	83	16	1.81	43. 8	34	3.7	7
9.5	190	140	3.82	2667	9.9	13.3	87	2475	904	17.3	12.8	81.3	187	3	85	15	1.74	45. 9	35	3.8	7
10.0	200	147	4.03	2737	10.2	12.9	90	2517	859	16.3	12.1	81.8	197	3	87	15	1.68	48. 9	37	3.9	7
10.5	210	155	4.23	2805	10.4	12.6	93	2555	818	15.4	11.4	82.3	207	3	89	14	1.63	49. 10	38	4.0	8
11.0	220	162	4.43	2872	10.7	12.3	96	2589	781	14.6	10.8	82.7	217	3	91	14	1.58	52. 10	40	4.1	8
11.5	230	169	4.63	2936	10.9	12.1	99	2620	747	13.9	10.3	83.0	227	3	93	14	1.54	54. 10	41	4.2	8
12.0	240	177	4.83	3000	11.2	11.8	102	2649	716	13.3	9.8	83.4	238	2	94	13	1.50	56. 11	42	4.3	8
13.0	260	192	5.23	3123	11.6	11.4	107	2700	661	12.1	9.0	83.9	258	2	98	13	1.42	60. 12	45	4.5	9
14.0	280	206	5.64	3242	12.1	10.9	112	2743	613	11.2	8.3	84.4	278	2	101	12	1.36	64. 12	48	4.7	10
15.0	300	221	6.04	3357	12.5	10.6	116	2781	572	10.4	7.6	84.8	298	2	104	12	1.31	69. 13	50	4.8	10
16.0	320	236	6.44	3468	12.9	10.2	121	2814	537	9.7	7.1	85.2	318	2	108	11	1.26	72. 14	53	5.0	11
17.0	340	251	6.84	3575	13.3	9.9	125	2842	505	9.1	6.7	85.5	338	2	111	11	1.21	76. 14	55	5.1	11
18.0	360	265	7.25	3680	13.7	9.6	130	2868	477	8.5	6.3	85.7	358	2	114	10	1.17	80. 15	57	5.3	12
19.0	380	280	7.65	3782	14.0	9.4	134	2891	452	8.0	5.9	86.0	379	1	117	10	1.14	84. 16	60	5.4	12
20.0	400	295	8.05	3881	14.4	9.2	138	2911	429	7.6	5.6	86.2	399	1	120	10	1.10	87. 17	62	5.6	13
25.0	500	368	10.06	4345	16.1	8.2	156	2989	343	6.0	4.4	87.0	499	1	134	9	0.97	106. 20	73	6.2	15
30.0	600	442	12.08	4766	17.7	7.5	173	3040	286	5.0	3.7	87.5	599	1	147	8	0.88	123. 24	83	6.8	17
35.0	700	516	14.09	5155	19.1	6.9	188	3077	245	4.2	3.1	87.9	699	1	160	7	0.81	140. 27	93	7.4	
40.0	800	589	16.10	5518	20.4	6.5	202	3104	214	3.7	2.7	88.2	799	1	173	7	0.75	155. 30	103	7.9	
45.0	900	663	18.12	5860	21.6	6.1	215	3125	190	3.3	2.4	88.4	899	1	185	6	0.71	168. 34	113	8.4	
50.0	1000	737	20.13	6185	22.8	5.8	227	3141	171	2.9	2.2	88.5	999	1	197	6	0.67	183. 37	122	8.8	

#118 20 Ne on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 29. ZC= 39.(Y)
NEUTRON NUMBERS: NP= 10. NT= 34. NC= 44.

AP**1/3= 2.714 AT**1/3= 3.979
REDUCED MASS NUMBER= 15.18 AP+AT=AC= 83.

INTERACTION RADIUS RINT=10.38 fm RO= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 4.31 CT+CP= 6.99 C= 1.65

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.01 RCT= 4.45 RC=RCP+RCT= 7.46

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 77.87 MeV K= .13146 n=2.547
VC(RINT)= 40.2 MeV

FISSION-TKE= 60. MeV
ASYMM. FISSION-TKE= 45. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 19.63 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -65.2
COMPOUND NUCLEUS: -73.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.34 fm V(RB)= 41.7 MeV
Q-VALUE= -1.1 MeV
L-CRITICAL= 55.

20 Ne on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	15	0.38	863	3.3	45.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	40	30	0.76	1221	4.7	32.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	60	46	1.13	1496	5.8	26.4	20	435	230	104.6	86.1	37.7	33	27	32	77	7.93	14. 2	3	2.1	2
4.0	80	61	1.51	1728	6.6	22.8	40	1200	658	59.4	46.1	60.3	66	14	52	39	4.04	19. 4	14	2.4	3
4.5	90	68	1.70	1833	7.0	21.5	47	1452	1067	49.3	38.0	65.3	79	11	57	34	3.45	21. 4	17	2.5	4
5.0	100	76	1.89	1933	7.4	20.4	53	1652	1235	42.3	32.5	68.9	90	10	61	30	3.06	23. 5	19	2.7	4
5.5	110	83	2.08	2027	7.8	19.5	58	1815	1372	37.0	28.3	71.5	102	8	65	27	2.78	25. 5	21	2.8	5
6.0	120	91	2.27	2118	8.1	18.6	63	1950	1486	32.9	25.2	73.5	113	7	67	25	2.56	27. 6	23	2.9	5
6.5	130	99	2.46	2205	8.5	17.9	68	2065	1378	29.7	22.6	75.2	124	6	70	23	2.39	29. 6	25	3.1	5
7.0	140	106	2.64	2288	8.8	17.3	72	2162	1279	27.0	20.6	76.5	134	6	72	22	2.25	31. 7	27	3.2	6
7.5	150	114	2.83	2369	9.1	16.7	76	2247	1194	24.8	18.9	77.6	145	5	75	21	2.13	34. 7	28	3.3	6
8.0	160	121	3.02	2447	9.4	16.1	80	2321	1119	22.9	17.4	78.6	155	5	77	20	2.03	36. 7	30	3.4	6
8.5	170	129	3.21	2523	9.7	15.7	83	2386	1053	21.3	16.2	79.4	166	4	79	19	1.94	37. 8	32	3.5	7
9.0	180	137	3.40	2596	10.0	15.2	87	2443	995	19.9	15.1	80.1	176	4	81	18	1.86	40. 8	33	3.6	7
9.5	190	144	3.59	2667	10.2	14.8	90	2495	943	18.7	14.2	80.7	186	4	82	17	1.79	42. 9	35	3.7	7
10.0	200	152	3.78	2737	10.5	14.4	93	2541	895	17.6	13.4	81.2	197	3	84	17	1.73	44. 9	36	3.8	8
10.5	210	159	3.97	2805	10.8	14.1	97	2583	853	16.6	12.6	81.7	207	3	86	16	1.68	46. 9	37	3.9	8
11.0	220	167	4.16	2872	11.0	13.8	100	2621	814	15.7	12.0	82.1	217	3	88	16	1.62	48. 10	39	4.0	8
11.5	230	175	4.35	2936	11.3	13.5	103	2656	779	15.0	11.4	82.5	227	3	89	15	1.58	49. 10	40	4.1	9
12.0	240	182	4.53	3000	11.5	13.2	105	2688	746	14.3	10.8	82.9	237	3	91	15	1.53	52. 11	41	4.2	9
13.0	260	197	4.91	3123	12.0	12.7	111	2744	689	13.0	9.9	83.5	258	2	94	14	1.46	55. 11	44	4.3	10
14.0	280	213	5.29	3242	12.4	12.2	116	2792	639	12.0	9.1	84.0	278	2	97	14	1.39	59. 12	47	4.5	10
15.0	300	228	5.67	3357	12.9	11.8	121	2833	597	11.1	8.4	84.4	298	2	100	13	1.34	63. 13	49	4.7	11
16.0	320	243	6.05	3468	13.3	11.4	126	2869	559	10.4	7.9	84.8	318	2	103	12	1.28	67. 14	51	4.8	11
17.0	340	258	6.42	3575	13.7	11.1	131	2901	526	9.7	7.4	85.2	338	2	106	12	1.24	70. 14	54	5.0	12
18.0	360	273	6.80	3680	14.1	10.8	135	2929	497	9.1	6.9	85.4	358	2	108	12	1.20	74. 15	56	5.1	12
19.0	380	288	7.18	3782	14.5	10.5	139	2955	471	8.6	6.5	85.7	378	2	111	11	1.16	77. 16	58	5.3	13
20.0	400	304	7.56	3881	14.8	10.2	144	2977	447	8.1	6.2	85.9	399	1	114	11	1.13	81. 16	61	5.4	13
25.0	500	380	9.45	4345	16.6	9.1	163	3063	358	6.4	4.9	86.8	499	1	126	10	0.99	97. 20	71	6.0	16
30.0	600	455	11.34	4766	18.2	8.3	180	3120	298	5.3	4.0	87.4	599	1	138	9	0.90	113. 23	82	6.6	18
35.0	700	531	13.22	5155	19.6	7.7	196	3160	255	4.5	3.4	87.7	699	1	150	8	0.83	128. 27	91	7.1	
40.0	800	607	15.11	5518	21.0	7.2	211	3191	223	3.9	3.0	88.0	799	1	161	7	0.77	144. 30	101	7.6	
45.0	900	683	17.00	5860	22.3	6.8	224	3214	199	3.5	2.6	88.3	899	1	171	7	0.72	157. 33	110	8.1	
50.0	1000	759	18.89	6185	23.5	6.5	237	3232	179	3.1	2.4	88.4	999	1	182	7	0.68	171. 37	119	8.5	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#119 20 Ne on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 42. ZC= 52.(Te)
NEUTRON NUMBERS: NP= 10. NT= 50. NC= 60.

AP**1/3= 2.714 AT**1/3= 4.514
REDUCED MASS NUMBER= 16.43 AP+AT=AC=112.

INTERACTION RADIUS RINT=10.96 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 5.00 CT+CP= 7.68 C= 1.74

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.01 RCT= 5.08 RC=RCP+RCT= 8.09

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 102.99 MeV K= .11440 n=2.637
VC(RINT)= 55.1 MeV

FISSION-TKE= 82. MeV
ASYMM. FISSION-TKE= 51. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.943 MeV/fm**2 PROX-FACTOR= 20.67 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.90 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -87.5
COMPOUND NUCLEUS: -78.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.84 fm V(RB)= 57.4 MeV
Q-VALUE= -19.0 MeV
L-CRITICAL= 64.

20 Ne on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPMAX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	16	0.30	863	3.6	66.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	40	33	0.60	1221	5.1	46.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	60	49	0.89	1496	6.2	38.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	80	66	1.19	1728	7.2	33.1	32	644	384	92.7	80.3	43.7	55	25	44	82	6.19	14.	3	12	1.8
4.5	90	74	1.34	1833	7.6	31.2	42	1004	680	73.1	62.0	53.5	71	19	51	62	4.64	16.	4	15	2.0
5.0	100	82	1.49	1933	8.0	29.6	50	1289	916	60.7	51.0	59.6	85	15	56	52	3.87	17.	4	17	2.1
5.5	110	90	1.64	2027	8.4	28.2	58	1521	1109	52.1	43.5	63.9	98	12	60	45	3.39	19.	5	19	2.3
6.0	120	99	1.79	2118	8.8	27.0	64	1714	1270	45.7	38.0	67.1	109	11	64	41	3.05	20.	5	21	2.4
6.5	130	107	1.94	2205	9.2	25.9	70	1877	1406	40.8	33.8	69.6	121	9	66	37	2.80	22.	6	23	2.5
7.0	140	115	2.09	2288	9.5	25.0	75	2016	1453	36.8	30.5	71.6	132	8	68	35	2.60	24.	6	25	2.6
7.5	150	123	2.24	2369	9.8	24.1	80	2136	1356	33.5	27.7	73.2	143	7	70	32	2.44	25.	7	26	2.7
8.0	160	131	2.39	2447	10.2	23.4	85	2242	1271	30.8	25.5	74.6	153	7	72	31	2.30	27.	7	28	2.8
8.5	170	140	2.53	2523	10.5	22.7	89	2334	1196	28.5	23.5	75.7	164	6	74	29	2.19	28.	8	29	2.9
9.0	180	148	2.68	2596	10.8	22.0	94	2417	1130	26.5	21.9	76.7	174	6	76	28	2.09	30.	8	30	3.0
9.5	190	156	2.83	2667	11.1	21.5	98	2490	1070	24.8	20.4	77.6	185	5	77	27	2.00	31.	8	32	3.1
10.0	200	164	2.98	2737	11.4	20.9	101	2556	1017	23.3	19.2	78.4	195	5	78	26	1.92	33.	9	33	3.2
10.5	210	173	3.13	2805	11.6	20.4	105	2616	968	21.9	18.1	79.0	206	4	80	25	1.85	34.	9	34	3.3
11.0	220	181	3.28	2872	11.9	19.9	109	2670	924	20.8	17.1	79.6	216	4	81	24	1.79	36.	9	36	3.4
11.5	230	189	3.43	2936	12.2	19.5	112	2720	884	19.7	16.2	80.2	226	4	82	23	1.74	37.	10	37	3.5
12.0	240	197	3.58	3000	12.4	19.1	116	2765	847	18.7	15.4	80.6	236	4	84	22	1.69	39.	10	38	3.6
13.0	260	214	3.88	3123	13.0	18.3	122	2845	782	17.1	14.0	81.5	257	3	86	21	1.60	42.	11	41	3.7
14.0	280	230	4.17	3242	13.4	17.7	128	2914	726	15.7	12.9	82.2	277	3	88	20	1.52	45.	11	43	3.9
15.0	300	246	4.47	3357	13.9	17.1	134	2973	678	14.5	11.9	82.8	297	3	90	19	1.45	48.	12	45	4.0
16.0	320	263	4.77	3468	14.4	16.5	140	3025	635	13.5	11.1	83.3	317	3	92	19	1.39	50.	13	47	4.2
17.0	340	279	5.07	3575	14.8	16.0	145	3070	598	12.6	10.3	83.7	338	2	94	18	1.34	54.	14	50	4.3
18.0	360	296	5.37	3680	15.2	15.6	151	3111	565	11.8	9.7	84.1	358	2	96	17	1.30	56.	14	52	4.4
19.0	380	312	5.66	3782	15.7	15.2	156	3147	535	11.1	9.1	84.4	378	2	98	17	1.25	59.	15	54	4.6
20.0	400	329	5.96	3881	16.1	14.8	161	3180	508	10.5	8.6	84.7	398	2	100	16	1.21	62.	16	56	4.7
25.0	500	411	7.45	4345	18.0	13.2	183	3303	406	8.3	6.8	85.9	498	2	109	14	1.07	75.	19	66	5.3
30.0	600	493	8.94	4766	19.7	12.1	203	3385	339	6.8	5.6	86.6	599	1	117	13	0.96	88.	22	75	5.8
35.0	700	575	10.43	5155	21.3	11.2	222	3443	290	5.8	4.7	87.1	699	1	125	12	0.88	99.	25	85	6.3
40.0	800	657	11.93	5518	22.7	10.5	238	3486	254	5.0	4.1	87.5	799	1	133	11	0.82	111.	29	93	6.8
45.0	900	739	13.42	5860	24.1	9.9	254	3520	226	4.4	3.6	87.8	899	1	140	10	0.77	122.	32	102	7.2
50.0	1000	821	14.91	6185	25.4	9.4	269	3547	203	4.0	3.3	88.0	999	1	147	10	0.73	132.	35	110	7.6

#120 20 Ne on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 47. ZC= 57.(La)
NEUTRON NUMBERS: NP= 10. NT= 61. NC= 71.

AP**1/3= 2.714 AT**1/3= 4.762
REDUCED MASS NUMBER= 16.88 AP+AT=AC=128.

INTERACTION RADIUS RINT=11.23 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 5.32 CT+CP= 8.00 C= 1.78

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.01 RCT= 5.34 RC=RCP+RCT= 8.35

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 111.37 MeV K= .10701 n=2.662
VC(RINT)= 60.2 MeV

FISSION-TKE= 91. MeV
ASYMM. FISSION-TKE= 53. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.931 MeV/fm**2 PROX-FACTOR= 20.85 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.59 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -87.6
COMPOUND NUCLEUS: -78.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.08 fm V(RB)= 62.6 MeV
Q-VALUE= -18.2 MeV
L-CRITICAL= 68.

20 Ne on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPMAX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	17	0.28	863	3.7	74.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	40	34	0.56	1221	5.2	52.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	60	51	0.84	1496	6.4	42.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	80	68	1.12	1728	7.4	37.0	27	456	232	107.5	96.9	36.3	53	27	41	112	7.75	12.	3	11	1.8
4.5	90	76	1.26	1833	7.8	34.9	40	859	561	82.3	72.1	48.9	69	21	49	77	5.27	14.	4	14	1.9
5.0	100	84	1.40	1933	8.3	33.1	50	1178	824	67.5	58.4	56.3	84	16	55	62	4.25	15.	4	16	2.0
5.5	110	93	1.54	2027	8.7	31.6	58	1438	1039	57.5	49.4	61.3	97	13	59	53	3.66	17.	5	19	2.2
6.0	120	101	1.68	2118	9.0	30.2	65	1654	1218	50.1	42.9	64.9	109	11	62	47	3.26	18.	5	20	2.3
6.5	130	110	1.82	2205	9.4	29.0	71	1836	1370	44.5	38.0	67.7	120	10	65	43	2.97	19.	6	22	2.4
7.0	140	118	1.96	2288	9.8	28.0	77	1991	1500	40.1	34.1	70.0	131	9	67	40	2.74	21.	6	24	2.5
7.5	150	127	2.10	2369	10.1	27.0	82	2126	1460	36.4	31.0	71.8	142	8	69	37	2.56	22.	7	25	2.6
8.0	160	135	2.24	2447	10.4	26.2	87	2244	1368	33.4	28.4	73.3	153	7	70	35	2.41	23.	7	27	2.7
8.5	170	143	2.38	2523	10.8	25.4	92	2347	1288	30.8	26.2	74.6	164	6	72	33	2.29	25.	7	28	2.8
9.0	180	152	2.52	2596	11.1	24.7	97	2439	1216	28.7	24.3	75.7	174	6	73	32	2.18	26.	8	29	2.9
9.5	190	160	2.66	2667	11.4	24.0	101	2521	1152	26.8	22.7	76.6	185	5	75	30	2.09	28.	8	31	3.0
10.0	200	169	2.80	2737	11.7	23.4	105	2595	1095	25.1	21.3	77.4	195	5	76	29	2.00	29.	8	32	3.1
10.5	210	177	2.94	2805	12.0	22.8	109	2662	1042	23.6	20.0	78.2	205	5	77	28	1.93	30.	9	33	3.2
11.0	220	186	3.08	2872	12.2	22.3	113	2723	995	22.3	18.9	78.8	216	4	79	27	1.86	32.	9	35	3.2
11.5	230	194	3.22	2936	12.5	21.8	117	2778	952	21.2	17.9	79.4	226	4	80	26	1.80	33.	10	36	3.3
12.0	240	203	3.36	3000	12.8	21.4	120	2829	912	20.1	17.0	79.9	236	4	81	25	1.75	34.	10	37	3.4
13.0	260	219	3.64	3123	13.3	20.5	127	2918	842	18.3	15.5	80.8	257	3	83	24	1.65	37.	11	39	3.5
14.0	280	236	3.93	3242	13.8	19.8	134	2995	782	16.8	14.2	81.6	277	3	85	23	1.57	39.	11	41	3.7
15.0	300	253	4.21	3357	14.3	19.1	140	3061	730	15.5	13.1	82.2	297	3	87	22	1.50	42.	12	44	3.8
16.0	320	270	4.49	3468	14.8	18.5	146	3119	684	14.4	12.2	82.8	317	3	88	21	1.44	45.	13	46	4.0
17.0	340	287	4.77	3575	15.2	17.9	152	3171	644	13.5	11.4	83.3	338	2	90	20	1.39	47.	13	48	4.1
18.0	360	304	5.05	3680	15.7	17.4	157	3216	608	12.6	10.7	83.7	358	2	92	19	1.34	49.	14	50	4.2
19.0	380	321	5.33	3782	16.1	17.0	163	3256	576	11.9	10.1	84.0	378	2	94	19	1.29	52.	15	52	4.3
20.0	400	338	5.61	3881	16.5	16.5	168	3293	547	11.3	9.5	84.4	398	2	95	18	1.25	54.	15	54	4.5
25.0	500	422	7.01	4345	18.5	14.8	192	3431	438	8.8	7.4	85.6	498	2	103	16	1.10	66.	18	64	5.0
30.0	600	506	8.41	4766	20.2	13.5	213	3523	365	7.3	6.1	86.4	599	1	110	14	0.99	77.	22	73	5.5
35.0	700	591	9.81	5155	21.8	12.5	232	3588	312	6.2	5.2	86.9	699	1	117	13	0.91	87.	25	82	6.0
40.0	800	675	11.21	5518	23.3	11.7	250	3637	273	5.4	4.5	87.3	799	1	123	12	0.84	98.	28	90	6.4
45.0	900	759	12.62	5860	24.8	11.0	267	3674	243	4.7	4.0	87.6	899	1	129	11	0.79	108.	31	98	6.8
50.0	1000	844	14.02	6185	26.1	10.5	282	3704	219	4.2	3.6	87.9	999	1	135	11	0.75	117.	34	107	7.2

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#121 20 Ne on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 58. ZC= 68.(Er)
NEUTRON NUMBERS: NP= 10. NT= 82. NC= 92.

AP**1/3= 2.714 AT**1/3= 5.192
REDUCED MASS NUMBER= 17.50 AP+AT=AC=160.

INTERACTION RADIUS RINT=11.70 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 5.87 CT+CP= 8.55 C= 1.84

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.01 RCT= 5.82 RC=RCP+RCT= 8.83

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 129.23 MeV K= .09287 n=2.720
VC(RINT)= 71.3 MeV

FISSION-TKE= 113. MeV
ASYMM. FISSION-TKE= 57. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.914 MeV/fm**2 PROX-FACTOR= 21.11 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.18 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -88.2
COMPOUND NUCLEUS: -65.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.52 fm V(RB)= 74.0 MeV
Q-VALUE= -31.7 MeV
L-CRITICAL= 74.

20 Ne on 140 Ce — 20 Ne on 140 Ce

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQXX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.25	863	3.8	91.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	40	35	0.49	1221	5.4	64.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	60	53	0.74	1496	6.6	52.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	80	70	0.98	1728	7.7	45.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	90	79	1.10	1833	8.1	43.1	29	429	208	112.1	104.1	34.0	63	27	45	140	8.16	11.	3	12	1.5	4
5.0	100	88	1.23	1933	8.6	40.8	43	828	535	87.1	79.1	46.4	79	21	52	95	5.51	12.	4	15	1.7	4
5.5	110	96	1.35	2027	9.0	38.9	53	1151	802	72.3	64.8	53.9	93	17	57	77	4.44	13.	5	17	1.8	5
6.0	120	105	1.47	2118	9.4	37.3	62	1419	1025	62.0	55.3	59.0	106	14	61	66	3.82	14.	5	19	1.9	6
6.5	130	114	1.60	2205	9.8	35.8	70	1646	1213	54.4	48.3	62.8	118	12	64	59	3.40	16.	6	21	2.0	7
7.0	140	123	1.72	2288	10.1	34.5	76	1839	1375	48.6	43.0	65.7	130	10	66	53	3.09	17.	6	22	2.1	7
7.5	150	131	1.84	2369	10.5	33.3	83	2007	1515	43.9	38.8	68.1	141	9	68	49	2.86	18.	6	24	2.2	8
8.0	160	140	1.96	2447	10.8	32.3	89	2153	1507	40.0	35.3	70.0	152	8	69	46	2.67	19.	7	25	2.3	8
8.5	170	149	2.09	2523	11.2	31.3	94	2282	1418	36.8	32.4	71.6	163	7	71	43	2.52	20.	7	26	2.4	9
9.0	180	158	2.21	2596	11.5	30.4	99	2396	1340	34.1	30.0	73.0	173	7	72	41	2.38	21.	8	28	2.5	10
9.5	190	166	2.33	2667	11.8	29.6	104	2499	1269	31.7	27.9	74.1	184	6	73	39	2.27	22.	8	29	2.6	10
10.0	200	175	2.45	2737	12.1	28.9	109	2591	1206	29.7	26.1	75.1	194	6	75	38	2.17	23.	8	30	2.7	11
10.5	210	184	2.58	2805	12.4	28.2	113	2674	1148	27.9	24.5	76.0	205	5	76	36	2.09	24.	9	31	2.8	11
11.0	220	193	2.70	2872	12.7	27.5	118	2749	1096	26.3	23.1	76.8	215	5	77	35	2.01	25.	9	32	2.8	12
11.5	230	201	2.82	2936	13.0	26.9	122	2818	1048	24.9	21.9	77.5	225	5	78	34	1.94	27.	9	34	2.9	12
12.0	240	210	2.94	3000	13.3	26.4	126	2881	1005	23.6	20.7	78.2	236	4	79	32	1.88	28.	10	35	3.0	13
13.0	260	228	3.19	3123	13.8	25.3	134	2992	927	21.5	18.8	79.3	256	4	80	31	1.77	30.	10	37	3.1	14
14.0	280	245	3.44	3242	14.3	24.4	141	3088	861	19.6	17.2	80.2	276	4	82	29	1.68	32.	11	39	3.3	14
15.0	300	263	3.68	3357	14.8	23.6	148	3170	804	18.1	15.9	80.9	297	3	84	28	1.60	34.	12	41	3.4	15
16.0	320	280	3.93	3468	15.3	22.8	155	3243	753	16.8	14.7	81.6	317	3	85	26	1.53	36.	12	43	3.5	16
17.0	340	298	4.17	3575	15.8	22.2	161	3306	709	15.7	13.7	82.2	337	3	86	25	1.47	38.	13	45	3.6	17
18.0	360	315	4.42	3680	16.2	21.5	167	3363	670	14.7	12.9	82.7	357	3	88	24	1.42	40.	14	47	3.8	18
19.0	380	333	4.66	3782	16.7	21.0	173	3413	634	13.8	12.1	83.1	378	2	89	24	1.37	42.	14	49	3.9	19
20.0	400	350	4.91	3881	17.1	20.4	179	3459	603	13.0	11.4	83.5	398	2	90	23	1.33	44.	15	51	4.0	20
25.0	500	438	6.13	4345	19.1	18.3	205	3631	482	10.2	8.9	84.9	498	2	96	20	1.16	53.	18	60	4.5	23
30.0	600	525	7.36	4766	21.0	16.7	228	3745	402	8.4	7.3	85.8	599	1	102	18	1.04	62.	21	69	5.0	27
35.0	700	613	8.59	5155	22.6	15.4	249	3826	344	7.1	6.2	86.5	699	1	107	16	0.95	71.	24	77	5.4	
40.0	800	700	9.82	5518	24.2	14.4	268	3887	301	6.2	5.4	86.9	799	1	112	15	0.88	79.	27	85	5.8	
45.0	900	788	11.04	5860	25.7	13.6	286	3935	268	5.4	4.8	87.3	899	1	117	14	0.83	88.	30	93	6.1	
50.0	1000	875	12.27	6185	27.1	12.9	303	3972	241	4.9	4.3	87.6	999	1	121	13	0.78	95.	33	101	6.5	

#122 20 Ne on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 62. ZC= 72.(Hf)
NEUTRON NUMBERS: NP= 10. NT= 92. NC=102.

AP**1/3= 2.714 AT**1/3= 5.360
REDUCED MASS NUMBER= 17.70 AP+AT=AC=174.

INTERACTION RADIUS RINT=11.88 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 6.09 CT+CP= 8.77 C= 1.86

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.00 RC=RCP+RCT= 9.01

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 135.15 MeV K= .08795 n=2.738
VC(RINT)= 75.1 MeV

FISSION-TKE= 122. MeV
ASYMM. FISSION-TKE= 58. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 21.06 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.05 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -72.1
COMPOUND NUCLEUS: -54.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.69 fm V(RB)= 77.8 MeV
Q-VALUE= -26.9 MeV
L-CRITICAL= 76.

20 Ne on 154 Sm — 20 Ne on 154 Sm

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQXX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.24	863	3.9	97.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	40	35	0.47	1221	5.5	69.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	60	53	0.71	1496	6.7	56.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	80	71	0.94	1728	7.7	48.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	90	80	1.06	1833	8.2	46.0	23	272	82	126.6	120.1	26.7	61	29	43	192	10.66	10.	3	12	1.6	5
5.0	100	89	1.18	1933	8.7	43.7	40	702	433	95.1	87.7	42.4	78	22	51	112	6.19	11.	4	14	1.7	5
5.5	110	97	1.30	2027	9.1	41.6	51	1050	720	77.9	70.9	51.0	92	18	57	87	4.80	12.	5	17	1.8	6
6.0	120	106	1.41	2118	9.5	39.9	61	1338	960	66.4	60.0	56.8	105	15	60	74	4.06	13.	5	18	1.9	7
6.5	130	115	1.53	2205	9.9	38.3	69	1581	1162	58.0	52.2	61.0	118	12	63	65	3.58	14.	6	20	2.0	7
7.0	140	124	1.65	2288	10.2	36.9	76	1789	1336	51.6	46.2	64.2	129	11	65	59	3.24	15.	6	22	2.1	8
7.5	150	133	1.77	2369	10.6	35.6	83	1969	1486	46.5	41.6	66.7	140	10	67	54	2.98	16.	6	23	2.2	9
8.0	160	142	1.89	2447	11.0	34.5	89	2126	1559	42.4	37.8	68.8	152	8	69	50	2.77	17.	7	24	2.3	9
8.5	170	150	2.00	2523	11.3	33.5	95	2265	1467	38.9	34.7	70.6	162	8	70	47	2.60	18.	7	26	2.4	10
9.0	180	159	2.12	2596	11.6	32.5	100	2387	1386	36.0	32.0	72.0	173	7	72	45	2.46	19.	7	27	2.5	11
9.5	190	168	2.24	2667	11.9	31.7	105	2497	1313	33.5	29.8	73.3	184	6	73	43	2.34	20.	8	28	2.5	11
10.0	200	177	2.36	2737	12.2	30.9	110	2596	1247	31.3	27.8	74.4	194	6	74	41	2.24	21.	8	29	2.6	12
10.5	210	186	2.48	2805	12.5	30.1	115	2685	1188	29.4	26.1	75.3	205	5	75	39	2.15	22.	9	31	2.7	12
11.0	220	195	2.59	2872	12.8	29.4	119	2766	1134	27.7	24.6	76.2	215	5	76	38	2.07	23.	9	32	2.8	13
11.5	230	204	2.71	2936	13.1	28.8	124	2840	1084	26.2	23.2	76.9	225	5	77	36	1.99	24.	9	33	2.9	13
12.0	240	212	2.83	3000	13.4	28.2	128	2908	1039	24.8	22.0	77.6	235	5	78	35	1.93	25.	10	34	2.9	14
13.0	260	230	3.07	3123	14.0	27.1	136	3028	959	22.5	20.0	78.7	256	4	80	33	1.82	27.	10	36	3.1	15
14.0	280	248	3.30	3242	14.5	26.1	144	3130	891	20.6	18.3	79.7	276	4	81	31	1.72	29.	11	38	3.2	16
15.0	300	266	3.54	3357	15.0	25.2	151	3219	831	19.0	16.8	80.5	297	3	82	30	1.64	31.	12	40	3.3	17
16.0	320	283	3.77	3468	15.5	24.4	158	3297	779	17.6	15.6	81.2	317	3	84	28	1.57	33.	12	42	3.4	18
17.0	340	301	4.01	3575	16.0	23.7	164	3365	733	16.4	14.5	81.8	337	3	85	27	1.50	35.	13	44	3.5	19
18.0	360	319	4.24	3680	16.4	23.0	171	3426	693	15.4	13.6	82.3	357	3	86	26	1.45	37.	13	46	3.7	20
19.0	380	336	4.48	3782	16.9	22.4	177	3480	656	14.5	12.8	82.8	378	2	88	25	1.40	38.	14	48	3.8	21
20.0	400	354	4.72	3881	17.3	21.8	183	3529	623	13.6	12.1	83.2	398	2	89	25	1.35	40.	15	50	3.9	22
25.0	500	443	5.89	4345	19.4	19.5	209	3714	498	10.7	9.4	84.7	498	2	94	21	1.18	49.	18	59	4.4	25
30.0	600	531	7.07	4766	21.2	17.8	233	3837	415	8.7	7.7	85.6	599	1	99	19	1.06	57.	21	67	4.8	29
35.0	700	620	8.25	5155	22.9	16.5	255	3924	356	7.4	6.6	86.3	699	1	104	18	0.97	66.	24	75	5.2	
40.0	800	708	9.43	5518	24.5	15.4	275	3990	311	6.4	5.7	86.8	799	1	108	16	0.90	73.	27	83	5.6	
45.0	900	797	10.61	5860	26.0	14.6	294	4040	277	5.7	5.0	87.2	899	1	113	15	0.84	81.	30	91	5.9	
50.0	1000	885	11.79	6185	27.4	13.8	311	4081	249	5.1	4.5	87.5	999	1	117	14	0.79	88.	33	99	6.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#123 20 Ne on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 67. ZC= 77.(Ir)
NEUTRON NUMBERS: NP= 10. NT= 98. NC=108.

AP**1/3= 2.714 AT**1/3= 5.485
REDUCED MASS NUMBER= 17.84 AP+AT=AC=185.

INTERACTION RADIUS RINT=12.01 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 6.25 CT+CP= 8.93 C= 1.87

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.15 RC=RCP+RCT= 9.16

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 143.18 MeV K= .08312 n=2.765
VC(RINT)= 80.2 MeV

FISSION-TKE= 134. MeV
ASYMM. FISSION-TKE= 60. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.904 MeV/fm**2 PROX-FACTOR= 21.29 MeV
L-RLD= 83 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.97 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -63.7
COMPOUND NUCLEUS: -37.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.82 fm V(RB)= 83.2 MeV
Q-VALUE= -35.2 MeV
L-CRITICAL= 77.

20 Ne on 165 Ho — 20 Ne on 165 Ho

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCWAR	SCFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.22	863	3.9	105.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	40	36	0.44	1221	5.5	74.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	60	54	0.67	1496	6.8	60.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	80	71	0.89	1728	7.8	52.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.5	90	80	1.00	1833	8.3	49.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
5.0	100	89	1.11	1933	8.7	47.2	33	479	248	110.0	103.2	35.0	74	26	50	149	7.70	11.	4	14	1.5	5
5.5	110	98	1.22	2027	9.1	45.0	47	858	559	87.7	80.9	46.1	90	20	56	105	5.44	12.	4	16	1.6	5
6.0	120	107	1.33	2118	9.6	43.1	57	1171	819	73.8	67.4	53.1	103	17	60	86	4.44	13.	5	18	1.8	6
6.5	130	116	1.45	2205	9.9	41.4	66	1435	1039	64.0	58.1	58.0	116	14	63	75	3.84	14.	5	19	1.9	7
7.0	140	125	1.56	2288	10.3	39.9	74	1661	1228	56.6	51.2	61.7	128	12	66	67	3.44	14.	6	21	2.0	8
7.5	150	134	1.67	2369	10.7	38.5	81	1856	1391	50.8	45.8	64.6	139	11	68	61	3.14	16.	6	22	2.1	8
8.0	160	143	1.78	2447	11.0	37.3	88	2027	1534	46.1	41.5	66.9	151	9	70	56	2.90	16.	7	24	2.2	9
8.5	170	152	1.89	2523	11.4	36.2	94	2177	1493	42.2	38.0	68.9	161	9	71	53	2.72	17.	7	25	2.2	9
9.0	180	161	2.00	2596	11.7	35.2	99	2311	1410	39.0	35.0	70.5	172	8	73	50	2.56	18.	7	26	2.3	10
9.5	190	169	2.11	2667	12.0	34.2	105	2430	1336	36.2	32.5	71.9	183	7	74	47	2.43	19.	8	28	2.4	11
10.0	200	178	2.22	2737	12.3	33.4	110	2537	1269	33.8	30.3	73.1	193	7	75	45	2.32	20.	8	29	2.5	11
10.5	210	187	2.34	2805	12.6	32.6	115	2634	1208	31.7	28.4	74.2	204	6	76	43	2.22	21.	8	30	2.6	12
11.0	220	196	2.45	2872	12.9	31.8	119	2722	1154	29.8	26.7	75.1	214	6	77	41	2.13	22.	9	31	2.6	12
11.5	230	205	2.56	2936	13.2	31.1	124	2803	1103	28.2	25.2	75.9	225	5	78	40	2.05	23.	9	32	2.7	13
12.0	240	214	2.67	3000	13.5	30.5	128	2876	1057	26.7	23.9	76.6	235	5	79	39	1.98	24.	10	33	2.8	14
13.0	260	232	2.89	3123	14.1	29.3	137	3006	976	24.2	21.6	77.9	256	4	80	36	1.86	26.	10	36	2.9	15
14.0	280	250	3.11	3242	14.6	28.2	144	3117	906	22.1	19.7	79.0	276	4	82	34	1.76	28.	11	38	3.0	16
15.0	300	268	3.34	3357	15.1	27.2	152	3214	846	20.3	18.2	79.8	296	4	83	33	1.68	29.	11	40	3.2	17
16.0	320	285	3.56	3468	15.6	26.4	159	3298	793	18.8	16.8	80.6	317	3	84	31	1.60	31.	12	42	3.3	18
17.0	340	303	3.78	3575	16.1	25.6	166	3372	746	17.6	15.7	81.2	337	3	86	30	1.54	33.	13	43	3.4	19
18.0	360	321	4.00	3680	16.6	24.9	172	3438	705	16.4	14.7	81.8	357	3	87	29	1.48	35.	13	45	3.5	20
19.0	380	339	4.23	3782	17.0	24.2	178	3497	668	15.4	13.8	82.3	377	3	88	28	1.43	36.	14	47	3.6	21
20.0	400	357	4.45	3881	17.4	23.6	184	3550	634	14.6	13.0	82.7	398	2	89	27	1.38	38.	15	49	3.7	22
25.0	500	446	5.56	4345	19.5	21.1	212	3751	507	11.4	10.1	84.3	498	2	95	23	1.20	46.	18	58	4.2	26
30.0	600	535	6.67	4766	21.4	19.3	237	3985	423	9.3	8.3	85.3	598	2	99	21	1.08	55.	21	66	4.6	29
35.0	700	624	7.78	5155	23.1	17.8	259	3980	362	7.9	7.0	86.1	699	1	104	19	0.98	62.	24	74	5.0	
40.0	800	714	8.90	5518	24.7	16.7	279	4051	317	6.8	6.1	86.6	799	1	108	18	0.91	70.	27	82	5.4	
45.0	900	803	10.01	5860	26.2	15.7	298	4106	282	6.0	5.4	87.0	899	1	112	17	0.85	77.	30	90	5.8	
50.0	1000	892	11.12	6185	27.6	14.9	316	4150	253	5.4	4.8	87.3	999	1	116	16	0.81	84.	33	97	6.1	

#124 20 Ne on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 73. ZC= 83.(Bi)
NEUTRON NUMBERS: NP= 10. NT=108. NC=118.

AP**1/3= 2.714 AT**1/3= 5.657
REDUCED MASS NUMBER= 18.01 AP+AT=AC=201.

INTERACTION RADIUS RINT=12.20 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 6.47 CT+CP= 9.15 C= 1.89

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.35 RC=RCP+RCT= 9.36

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 152.22 MeV K= .07740 n=2.794
VC(RINT)= 86.1 MeV

FISSION-TKE= 148. MeV
ASYMM. FISSION-TKE= 63. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.900 MeV/fm**2 PROX-FACTOR= 21.42 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.87 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -46.0
COMPOUND NUCLEUS: -20.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.00 fm V(RB)= 89.2 MeV
Q-VALUE= -35.2 MeV
L-CRITICAL= 79.

20 Ne on 181 Ta — 20 Ne on 181 Ta

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCWAR	SCFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.21	863	3.9	114.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	40	36	0.42	1221	5.6	81.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	60	54	0.63	1496	6.8	66.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	80	72	0.84	1728	7.9	57.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.5	90	81	0.94	1833	8.4	54.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
5.0	100	90	1.05	1933	8.8	51.4	22	220	35	133.1	128.1	23.4	70	30	47	244	11.89	10.	4	13	1.5	5
5.5	110	99	1.15	2027	9.2	49.0	41	638	378	100.7	94.4	39.7	87	23	55	135	6.52	11.	4	15	1.6	5
6.0	120	108	1.26	2118	9.6	46.9	53	983	663	83.1	76.9	48.5	101	19	60	104	5.00	12.	5	17	1.7	6
6.5	130	117	1.36	2205	10.0	45.1	63	1273	904	71.2	65.5	54.4	114	16	63	88	4.21	12.	5	19	1.8	7
7.0	140	126	1.46	2288	10.4	43.4	72	1521	1111	62.6	57.2	58.7	126	14	66	77	3.71	13.	6	20	1.9	8
7.5	150	135	1.57	2369	10.8	42.0	79	1735	1290	55.9	50.9	62.1	138	12	68	70	3.35	14.	6	22	2.0	8
8.0	160	144	1.67	2447	11.1	40.6	86	1922	1447	50.5	46.0	64.7	150	10	70	64	3.06	15.	7	23	2.1	9
8.5	170	153	1.78	2523	11.5	39.4	93	2087	1531	46.1	41.9	66.9	161	9	72	60	2.86	16.	7	25	2.2	10
9.0	180	162	1.88	2596	11.8	38.3	99	2234	1446	42.5	38.5	68.8	172	8	73	56	2.69	17.	7	26	2.2	10
9.5	190	171	1.99	2667	12.1	37.3	104	2364	1370	39.3	35.6	70.3	182	8	74	53	2.54	18.	8	27	2.3	11
10.0	200	180	2.09	2737	12.5	36.3	110	2482	1301	36.7	33.2	71.7	193	7	76	50	2.42	19.	8	28	2.4	11
10.5	210	189	2.20	2805	12.8	35.5	115	2588	1239	34.3	31.1	72.8	203	7	77	48	2.31	20.	8	29	2.5	12
11.0	220	198	2.30	2872	13.1	34.7	120	2685	1183	32.3	29.2	73.9	214	6	77	46	2.21	20.	9	30	2.5	13
11.5	230	207	2.41	2936	13.4	33.9	125	2773	1131	30.5	27.5	74.8	224	6	78	44	2.13	21.	9	32	2.6	13
12.0	240	216	2.51	3000	13.6	33.2	129	2854	1084	28.8	26.1	75.6	235	5	79	43	2.05	22.	9	33	2.7	14
13.0	260	234	2.72	3123	14.2	31.9	138	2997	1001	26.1	23.5	77.0	255	5	81	40	1.92	24.	10	35	2.8	15
14.0	280	252	2.93	3242	14.7	30.7	146	3119	929	23.8	21.5	78.1	276	4	82	38	1.82	26.	11	37	2.9	16
15.0	300	270	3.14	3357	15.3	29.7	154	3225	867	21.9	19.7	79.1	296	4	84	36	1.73	27.	11	39	3.1	17
16.0	320	288	3.35	3468	15.8	28.7	161	3317	813	20.3	18.3	79.9	316	4	85	34	1.65	29.	12	41	3.2	18
17.0	340	306	3.56	3575	16.2	27.9	168	3398	765	18.9	17.0	80.6	337	3	86	33	1.58	31.	13	43	3.3	19
18.0	360	324	3.77	3680	16.7	27.1	175	3471	723	17.6	15.9	81.2	357	3	87	32	1.52	32.	13	44	3.4	20
19.0	380	342	3.98	3782	17.2	26.4	181	3536	685	16.6	14.9	81.7	377	3	88	30	1.46	34.	14	46	3.5	21
20.0	400	360	4.19	3881	17.6	25.7	187	3594	650	15.6	14.1	82.2	397	3	89	29	1.41	35.	15	48	3.6	22
25.0	500	450	5.23	4345	19.7	23.0	216	3814	520	12.1	10.9	83.9	498	2	94	26	1.23	43.	18	57	4.1	26
30.0	600	540	6.28	4766	21.6	21.0	241	3961	433	9.9	9.0	85.0	598	2	99	23	1.10	50.	21	65	4.5	31
35.0	700	630	7.32	5155	23.3	19.4	264	4065	371	8.4	7.6	85.8	699	1	103	21	1.00	58.	24	73	4.9	
40.0	800	720	8.37	5518	24.9	18.2	285	4144	325	7.3	6.6	86.4	799	1	106	19	0.93	65.	26	80	5.2	
45.0	900	810	9.42	5860	26.4	17.1	305	4204	289	6.4	5.8	86.8	899	1	110	18	0.87	72.	29	88	5.6	
50.0	1000	900	10.46	6185	27.9	16.3	323	4253	260	5.8	5.2	87.1	999	1	114	17	0.82	78.	32	95	5.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#125 20 Ne on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 79. ZC= 89.(Ac)
NEUTRON NUMBERS: NP= 10. NT=118. NC=128.

AP**1/3= 2.714 AT**1/3= 5.819
REDUCED MASS NUMBER= 18.16 AP+AT=AC=217.

INTERACTION RADIUS RINT=12.37 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 6.68 CT+CP= 9.36 C= 1.91

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.55 RC=RCP+RCT= 9.56

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 161.01 MeV K= .07219 n=2.822
VC(RINT)= 91.8 MeV

FISSION-TKE= 163. MeV
ASYMM. FISSION-TKE= 65. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 21.54 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.78 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -28.6
COMPOUND NUCLEUS: 7.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.17 fm V(RB)= 95.1 MeV
Q-VALUE= -45.9 MeV
L-CRITICAL= 81.

20 Ne on 197 Au

20 Ne on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.20	863	4.0	124.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	40	36	0.40	1221	5.6	88.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	60	54	0.59	1496	6.9	71.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	80	73	0.79	1728	7.9	62.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	90	82	0.89	1833	8.4	58.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	100	91	0.99	1933	8.9	55.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	110	100	1.09	2027	9.3	53.0	32	406	186	117.1	111.7	31.5	83	27	53	187	8.47	10.	4	15	1.4	5
6.0	120	109	1.19	2118	9.7	50.8	48	783	497	93.8	87.9	43.1	99	21	59	128	5.78	11.	5	17	1.5	6
6.5	130	118	1.29	2205	10.1	48.8	59	1099	760	79.3	73.7	50.4	112	18	63	104	4.67	12.	5	18	1.6	6
7.0	140	127	1.38	2288	10.5	47.0	68	1370	985	69.0	63.8	55.5	125	15	66	89	4.02	12.	6	20	1.7	7
7.5	150	136	1.48	2369	10.9	45.4	77	1603	1181	61.3	56.4	59.4	137	13	69	80	3.58	13.	6	21	1.8	8
8.0	160	145	1.58	2447	11.2	44.0	84	1807	1352	55.2	50.7	62.4	149	11	71	73	3.26	14.	7	23	1.9	8
8.5	170	154	1.68	2523	11.6	42.7	91	1987	1503	50.2	46.0	64.9	160	10	72	67	3.02	15.	7	24	2.0	9
9.0	180	163	1.78	2596	11.9	41.5	97	2147	1476	46.1	42.2	67.0	171	9	74	63	2.82	16.	7	25	2.1	10
9.5	190	172	1.88	2667	12.2	40.4	103	2289	1398	42.6	38.9	68.7	182	8	75	59	2.66	17.	8	26	2.2	10
10.0	200	182	1.98	2737	12.6	39.3	109	2418	1328	39.6	36.2	70.2	192	8	76	56	2.52	17.	8	28	2.2	11
10.5	210	191	2.08	2805	12.9	38.4	115	2534	1265	37.1	33.8	71.5	203	7	77	53	2.40	18.	8	29	2.3	12
11.0	220	200	2.18	2872	13.2	37.5	120	2639	1207	34.8	31.7	72.6	213	7	78	51	2.30	19.	9	30	2.4	12
11.5	230	209	2.27	2936	13.5	36.7	125	2735	1155	32.8	29.9	73.6	224	6	79	49	2.21	20.	9	31	2.5	13
12.0	240	218	2.37	3000	13.8	35.9	129	2823	1107	31.0	28.3	74.5	234	6	80	47	2.12	21.	9	32	2.5	14
13.0	260	236	2.57	3123	14.3	34.5	138	2978	1022	28.0	25.5	76.0	255	5	82	44	1.99	22.	10	34	2.6	15
14.0	280	254	2.77	3242	14.9	33.2	147	3112	949	25.5	23.2	77.2	275	5	83	42	1.87	24.	11	36	2.8	16
15.0	300	272	2.97	3357	15.4	32.1	155	3227	885	23.4	21.3	78.3	296	4	84	39	1.77	25.	11	38	2.9	17
16.0	320	291	3.16	3468	15.9	31.1	162	3328	830	21.7	19.7	79.2	316	4	85	38	1.69	27.	12	40	3.0	18
17.0	340	309	3.36	3575	16.4	30.2	170	3417	781	20.2	18.3	79.9	337	3	87	36	1.62	29.	13	42	3.1	19
18.0	360	327	3.56	3680	16.8	29.3	177	3495	738	18.8	17.1	80.6	357	3	88	35	1.56	30.	13	44	3.2	20
19.0	380	345	3.76	3782	17.3	28.5	183	3566	699	17.7	16.1	81.2	377	3	89	33	1.50	32.	14	45	3.3	21
20.0	400	363	3.95	3881	17.8	27.8	190	3629	664	16.7	15.1	81.7	397	3	90	32	1.45	33.	14	47	3.4	22
25.0	500	454	4.94	4345	19.9	24.9	219	3870	531	12.9	11.8	83.5	498	2	94	28	1.25	40.	17	56	3.9	27
30.0	600	545	5.93	4766	21.8	22.7	245	4030	442	10.6	9.6	84.7	598	2	98	25	1.12	47.	20	64	4.3	31
35.0	700	635	6.92	5155	23.5	21.0	269	4144	379	8.9	8.1	85.5	699	1	102	23	1.02	54.	23	71	4.7	
40.0	800	726	7.91	5518	25.1	19.7	290	4229	332	7.7	7.0	86.1	799	1	106	21	0.95	61.	26	79	5.0	
45.0	900	817	8.90	5860	26.6	18.5	311	4295	295	6.8	6.2	86.6	899	1	109	20	0.89	67.	29	86	5.3	
50.0	1000	908	9.89	6185	28.1	17.6	329	4348	265	6.1	5.6	86.9	999	1	112	19	0.83	73.	32	93	5.6	

#126 20 Ne on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 82. ZC= 92.(U)
NEUTRON NUMBERS: NP= 10. NT=126. NC=136.

AP**1/3= 2.714 AT**1/3= 5.925
REDUCED MASS NUMBER= 18.25 AP+AT=AC=228.

INTERACTION RADIUS RINT=12.49 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 6.82 CT+CP= 9.49 C= 1.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.66 RC=RCP+RCT= 9.67

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 164.96 MeV K= .06955 n=2.833
VC(RINT)= 94.4 MeV

FISSION-TKE= 171. MeV
ASYMM. FISSION-TKE= 66. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 21.46 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.73 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -19.5
COMPOUND NUCLEUS: 30.7

FUSION RELATED PARAMETERS:
R-BARRIER=11.28 fm V(RB)= 97.7 MeV
Q-VALUE= -59.6 MeV
L-CRITICAL= 82.

20 Ne on 208 Pb

20 Ne on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.19	863	4.0	129.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	40	36	0.39	1221	5.6	91.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	60	55	0.58	1496	6.9	74.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	80	73	0.77	1728	8.0	64.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	90	82	0.87	1833	8.5	60.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	100	91	0.97	1933	8.9	57.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	110	100	1.06	2027	9.4	55.1	28	304	104	125.9	121.2	27.0	82	28	53	227	10.01	9.	4	14	1.2	4
6.0	120	109	1.16	2118	9.8	52.7	45	698	428	98.9	93.4	40.5	98	22	59	142	6.24	10.	5	16	1.3	5
6.5	130	119	1.26	2205	10.2	50.6	57	1028	702	83.0	77.6	48.5	112	18	63	112	4.92	11.	5	18	1.4	6
7.0	140	128	1.35	2288	10.6	48.8	67	1310	937	72.0	66.9	54.0	125	15	66	96	4.19	12.	6	20	1.5	7
7.5	150	137	1.45	2369	10.9	47.1	76	1554	1141	63.7	59.0	58.1	137	13	69	85	3.71	13.	6	21	1.6	8
8.0	160	146	1.55	2447	11.3	45.6	84	1767	1320	57.2	52.8	61.4	148	12	71	77	3.36	13.	7	22	1.7	9
8.5	170	155	1.64	2523	11.6	44.3	91	1955	1477	52.0	47.9	64.0	160	10	73	71	3.10	14.	7	24	1.8	10
9.0	180	164	1.74	2596	12.0	43.0	97	2121	1497	47.7	43.9	66.2	171	9	74	66	2.89	15.	7	25	1.9	10
9.5	190	173	1.84	2667	12.3	41.9	104	2270	1419	44.1	40.5	68.0	181	9	75	62	2.72	16.	8	26	2.0	11
10.0	200	182	1.93	2737	12.6	40.8	109	2404	1348	40.9	37.6	69.5	192	8	76	59	2.57	17.	8	27	2.1	11
10.5	210	192	2.03	2805	12.9	39.8	115	2524	1283	38.2	35.1	70.9	203	7	77	56	2.45	17.	8	28	2.2	12
11.0	220	201	2.13	2872	13.2	38.9	120	2634	1225	35.9	32.9	72.1	213	7	78	53	2.34	18.	9	29	2.2	13
11.5	230	210	2.22	2936	13.5	38.1	125	2735	1172	33.8	31.0	73.1	224	6	79	51	2.25	19.	9	30	2.3	13
12.0	240	219	2.32	3000	13.8	37.3	130	2826	1123	32.0	29.3	74.0	234	6	80	49	2.16	20.	9	32	2.4	14
13.0	260	237	2.51	3123	14.4	35.8	139	2989	1036	28.8	26.4	75.6	255	5	82	46	2.02	21.	10	34	2.5	15
14.0	280	255	2.71	3242	14.9	34.5	148	3127	962	26.3	24.0	76.9	275	5	83	43	1.90	23.	11	36	2.6	16
15.0	300	274	2.90	3357	15.5	33.3	156	3248	898	24.1	22.0	77.9	296	4	84	41	1.80	24.	11	37	2.7	17
16.0	320	292	3.09	3468	16.0	32.3	164	3353	842	22.3	20.4	78.9	316	4	85	39	1.72	26.	12	39	2.9	19
17.0	340	310	3.28	3575	16.5	31.3	171	3445	792	20.7	18.9	79.6	336	4	86	38	1.64	27.	13	41	3.0	20
18.0	360	328	3.48	3680	16.9	30.4	178	3528	748	19.4	17.7	80.3	357	3	87	36	1.58	29.	13	43	3.1	21
19.0	380	347	3.67	3782	17.4	29.6	185	3601	709	18.2	16.6	80.9	377	3	88	35	1.52	30.	14	45	3.2	22
20.0	400	365	3.86	3881	17.8	28.9	192	3667	674	17.1	15.6	81.4	397	3	89	34	1.47	32.	14	47	3.3	23
25.0	500	456	4.83	4345	20.0	25.8	222	3918	539	13.3	12.1	83.4	498	2	94	29	1.27	38.	17	55	3.7	28
30.0	600	547	5.80	4766	21.9	23.6	248	4085	449	10.8	9.9	84.6	598	2	98	26	1.13	45.	20	63	4.1	32
35.0	700	639	6.76	5155	23.6	21.8	272	4204	385	9.2	8.4	85.4	699	1	101	24	1.03	52.	23	71	4.5	
40.0	800	730	7.73	5518	25.2	20.4	294	4293	337	7.9	7.2	86.0	799	1	105	22	0.96	58.	26	78	4.8	
45.0	900	821	8.69	5860	26.8	19.2	314	4362	299	7.0	6.4	86.5	899	1	108	20	0.89	64.	29	85	5.2	
50.0	1000	912	9.66	6185	28.2	18.3	334	4417	269	6.3	5.7	86.9	999	1	111	19	0.84	70.	32	92	5.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#127 20 Ne on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 83. ZC= 93.(Np)
NEUTRON NUMBERS: NP= 10. NT=126. NC=136.

AP**1/3= 2.714 AT**1/3= 5.934
REDUCED MASS NUMBER= 18.25 AP+AT=AC=229.

INTERACTION RADIUS RINT=12.50 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 6.83 CT+CP= 9.50 C= 1.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.68 RC=RCP+RCT= 9.69

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 166.59 MeV K= .06888 n=2.838
VC(RINT)= 95.5 MeV

FISSION-TKE= 174. MeV
ASYMM. FISSION-TKE= 67. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 21.55 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.72 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: -16.5
COMPOUND NUCLEUS: 35.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.29 fm V(RB)= 98.9 MeV
Q-VALUE= -60.8 MeV
L-CRITICAL= 82.

20 Ne on 209 Bi — 20 Ne on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.19	863	4.0	130.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	40	37	0.38	1221	5.6	92.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	60	55	0.57	1496	6.9	75.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	80	73	0.76	1728	8.0	65.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	90	82	0.86	1833	8.5	61.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	100	91	0.96	1933	8.9	58.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	110	100	1.05	2027	9.4	55.7	26	252	60	130.8	126.4	24.6	81	29	52	252	11.05	9.	4	14	1.2	4
6.0	120	110	1.15	2118	9.8	53.4	44	652	389	101.6	96.1	39.2	97	23	59	149	6.48	10.	5	16	1.3	5
6.5	130	119	1.24	2205	10.2	51.3	56	986	667	84.9	79.5	47.5	111	19	63	116	5.03	11.	5	18	1.4	6
7.0	140	128	1.34	2288	10.6	49.4	66	1272	905	73.4	68.3	53.3	124	16	66	98	4.26	12.	6	19	1.5	7
7.5	150	137	1.43	2369	10.9	47.7	75	1519	1111	64.9	60.2	57.5	136	14	69	87	3.76	13.	6	21	1.6	8
8.0	160	146	1.53	2447	11.3	46.2	83	1735	1292	58.3	53.8	60.9	148	12	71	79	3.40	13.	7	22	1.7	8
8.5	170	155	1.62	2523	11.6	44.8	90	1925	1451	52.9	48.8	63.5	159	11	73	72	3.13	14.	7	24	1.8	9
9.0	180	164	1.72	2596	12.0	43.6	97	2093	1497	48.5	44.6	65.8	170	10	74	67	2.91	15.	7	25	1.9	10
9.5	190	173	1.82	2667	12.3	42.4	103	2244	1418	44.8	41.1	67.6	181	9	76	63	2.74	16.	8	26	2.0	10
10.0	200	183	1.91	2737	12.6	41.3	109	2379	1347	41.6	38.2	69.2	192	8	77	60	2.59	17.	8	27	2.1	11
10.5	210	192	2.01	2805	12.9	40.3	114	2502	1283	38.8	35.6	70.6	203	7	78	57	2.46	17.	8	28	2.1	12
11.0	220	201	2.10	2872	13.2	39.4	120	2613	1225	36.4	33.4	71.8	213	7	79	54	2.35	18.	9	29	2.2	12
11.5	230	210	2.20	2936	13.5	38.5	125	2715	1171	34.3	31.4	72.8	224	6	80	52	2.26	19.	9	30	2.3	13
12.0	240	219	2.29	3000	13.8	37.7	130	2808	1122	32.4	29.7	73.8	234	6	80	50	2.17	20.	9	31	2.4	14
13.0	260	237	2.48	3123	14.4	36.2	139	2972	1036	29.2	26.8	75.4	255	5	82	47	2.03	21.	10	34	2.5	15
14.0	280	256	2.68	3242	14.9	34.9	148	3112	962	26.6	24.4	76.7	275	5	83	44	1.91	23.	11	35	2.6	16
15.0	300	274	2.87	3357	15.5	33.7	156	3234	898	24.4	22.3	77.8	296	4	85	42	1.81	24.	11	37	2.7	17
16.0	320	292	3.06	3468	16.0	32.7	164	3341	842	22.6	20.6	78.7	316	4	86	40	1.72	26.	12	39	2.8	18
17.0	340	310	3.25	3575	16.5	31.7	171	3435	792	21.0	19.2	79.5	336	4	87	38	1.65	27.	13	41	3.0	19
18.0	360	329	3.44	3680	16.9	30.8	178	3518	748	19.6	17.9	80.2	357	3	88	37	1.58	29.	13	43	3.1	20
19.0	380	347	3.63	3782	17.4	30.0	185	3592	709	18.4	16.8	80.8	377	3	89	35	1.52	30.	14	45	3.2	22
20.0	400	365	3.82	3881	17.9	29.2	192	3659	673	17.3	15.8	81.3	397	3	90	34	1.47	31.	14	46	3.3	23
25.0	500	456	4.78	4345	20.0	26.1	222	3914	539	13.4	12.3	83.3	498	2	94	29	1.27	38.	17	55	3.7	27
30.0	600	548	5.73	4766	21.9	23.9	248	4083	449	11.0	10.0	84.5	598	2	98	26	1.14	45.	20	63	4.1	32
35.0	700	639	6.69	5155	23.6	22.1	272	4203	385	9.3	8.5	85.4	699	1	102	24	1.04	51.	23	71	4.5	
40.0	800	730	7.65	5518	25.2	20.7	294	4293	336	8.0	7.3	86.0	799	1	105	22	0.96	58.	26	78	4.8	
45.0	900	821	8.60	5860	26.8	19.5	315	4383	299	7.1	6.5	86.5	899	1	108	21	0.90	64.	29	85	5.2	
50.0	1000	913	9.56	6185	28.2	18.5	334	4419	269	6.3	5.8	86.8	999	1	111	20	0.84	70.	32	92	5.5	

#128 20 Ne on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 10. ZT= 92. ZC=102.(No)
NEUTRON NUMBERS: NP= 10. NT=146. NC=156.

AP**1/3= 2.714 AT**1/3= 6.197
REDUCED MASS NUMBER= 18.45 AP+AT=AC=258.

INTERACTION RADIUS RINT=12.78 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.68 CT= 7.16 CT+CP= 9.84 C= 1.95

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.01 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.01 RCT= 6.98 RC=RCP+RCT= 9.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 178.59 MeV K= .06206 n=2.873
VC(RINT)= 103.5 MeV

FISSION-TKE= 197. MeV
ASYMM. FISSION-TKE= 70. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.877 MeV/fm**2 PROX-FACTOR= 21.49 MeV
L-RLD= 61 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -9.4 TARGET: 47.2
COMPOUND NUCLEUS: 92.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.56 fm V(RB)= 107.0 MeV
Q-VALUE= -54.7 MeV
L-CRITICAL= 84.

20 Ne on 238 U — 20 Ne on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	20	18	0.18	863	4.0	144.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	40	37	0.36	1221	5.7	102.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	60	55	0.53	1496	7.0	83.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	80	74	0.71	1728	8.1	72.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	90	83	0.80	1833	8.6	68.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	100	92	0.89	1933	9.0	64.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	110	101	0.98	2027	9.5	61.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	120	111	1.07	2118	9.9	59.1	32	348	141	123.3	119.1	28.3	93	27	58	232	9.34	9.	4	15	1.3	6
6.5	130	120	1.16	2205	10.3	56.8	48	726	453	99.1	94.3	40.5	108	22	63	154	6.15	10.	5	17	1.4	7
7.0	140	129	1.25	2288	10.7	54.8	61	1047	720	84.2	79.4	47.9	122	18	67	123	4.92	11.	6	19	1.5	8
7.5	150	138	1.34	2369	11.1	52.9	71	1325	952	73.6	69.1	53.2	135	15	70	105	4.21	11.	6	20	1.6	9
8.0	160	148	1.43	2447	11.4	51.2	80	1567	1154	65.5	61.3	57.2	147	13	72	94	3.74	12.	6	21	1.7	9
8.5	170	157	1.52	2523	11.8	49.7	88	1781	1333	59.1	55.2	60.4	158	12	74	85	3.40	13.	7	23	1.8	10
9.0	180	166	1.60	2596	12.1	48.3	95	1970	1492	54.0	50.3	63.0	169	11	75	79	3.14	13.	7	24	1.9	11
9.5	190	175	1.69	2667	12.4	47.0	102	2139	1456	49.6	46.2	65.2	180	10	77	73	2.93	14.	8	25	1.9	12
10.0	200	184	1.78	2737	12.8	45.8	108	2291	1383	46.0	42.7	67.0	191	9	78	69	2.76	15.	8	26	2.0	12
10.5	210	194	1.87	2805	13.1	44.7	114	2429	1317	42.8	39.8	68.6	202	8	79	66	2.62	15.	8	27	2.1	13
11.0	220	203	1.96	2872	13.4	43.7	120	2554	1257	40.1	37.2	69.9	213	7	80	62	2.49	16.	9	28	2.1	14
11.5	230	212	2.05	2936	13.7	42.7	125	2668	1203	37.7	34.9	71.1	223	7	81	60	2.38	17.	9	29	2.2	15
12.0	240	221	2.14	3000	14.0	41.8	130	2772	1153	35.6	33.0	72.2	234	6	81	57	2.29	18.	9	30	2.3	15
13.0	260	240	2.32	3123	14.5	40.2	140	2956	1064	32.0	29.6	74.0	254	6	83	53	2.13	19.	10	32	2.4	17
14.0	280	258	2.50	3242	15.1	38.7	149	3114	988	29.1	26.9	75.5	275	5	84	50	2.00	20.	11	34	2.5	18
15.0	300	277	2.67	3357	15.6	37.4	158	3251	922	26.6	24.6	76.7	295	5	85	47	1.89	22.	11	36	2.6	19
16.0	320	295	2.85	3468	16.1	36.2	166	3371	864	24.6	22.7	77.7	316	4	87	45	1.79	23.	12	38	2.7	20
17.0	340	314	3.03	3575	16.6	35.1	174	3476	813	22.8	21.1	78.6	336	4	88	43	1.71	24.	12	40	2.8	22
18.0	360	332	3.21	3680	17.1	34.1	181	3570	768	21.3	19.7	79.3	356	4	89	41	1.64	25.	13	42	2.9	23
19.0	380	351	3.39	3782	17.6	33.2	189	3653	728	20.0	18.5	80.0	377	3	89	40	1.58	27.	14	43	3.0	24
20.0	400	369	3.56	3881	18.0	32.4	196	3729	691	18.8	17.4	80.6	397	3	90	38	1.52	28.	14	45	3.1	25
25.0	500	461	4.46	4345	20.2	29.0	227	4014	553	14.5	13.4	82.7	498	2	94	33	1.31	34.	17	53	3.6	30
30.0	600	553	5.35	4766	22.1	26.4	255	4204	461	11.9	10.9	84.1	598	2	98	29	1.17	40.	20	61	3.9	35
35.0	700	646	6.24	5155	23.9	24.5	280	4340	395	10.0	9.2	85.0	698	2	101	27	1.07	46.	23	69	4.3	
40.0	800	738	7.13	5518	25.5	22.9	302	4441	345	8.7	8.0	85.7	799	1	104	25	0.99	52.	26	76	4.6	
45.0	900	830	8.02	5860	27.1	21.6	324	4519	307	7.6	7.0	86.2	899	1	107	23	0.92	57.	29	83	4.9	
50.0	1000	922	8.91	6185	28.5	20.5	344	4582	276	6.8	6.3	86.6	999	1	109	22	0.87	62.	32	90	5.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 20 Ne

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#129 24 Mg on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 6. ZC= 18.(Ar)
NEUTRON NUMBERS: NP= 12. NT= 6. NC= 18.

AP**1/3= 2.884 AT**1/3= 2.289 ELSCAT <30 deg
REDUCED MASS NUMBER= 8.00 AP+AT=AC= 36.

INTERACTION RADIUS RINT= 8.72 fm RO= 1.69 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 2.12 CT+CP= 5.02 C= 1.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.21 RCT= 2.51 RC=RCP+RCT= 5.72

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 25.36 MeV K= .09468 n=2.488
VC(RINT)= 11.9 MeV

FISSION-TKE= 33. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 14.65 MeV
L-RLD= 36 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 24.05 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: 0.0
COMPOUND NUCLEUS: -28.4

FUSION RELATED PARAMETERS:
R-BARRIER= 7.95 fm V(RB)= 12.0 MeV
Q-VALUE= 12.2 MeV
L-CRITICAL= 24.

24 Mg on 12 C

24 Mg on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	24	8	0.67	1036	1.7	11.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	48	16	1.35	1466	2.5	8.0	11	731	494	72.5	22.5	53.8	33	15	0	16	5.50	31.	0 0	2.5	1
3.0	72	24	2.02	1796	3.0	6.5	19	1337	991	38.4	12.6	70.8	65	7	0	9	3.20	45.	0 0	2.8	2
4.0	96	32	2.70	2074	3.5	5.7	24	1628	1239	26.4	8.7	76.8	92	4	89	7	2.49	60.	4 13	3.1	2
4.5	108	36	3.03	2200	3.7	5.3	26	1723	1322	22.8	7.6	78.6	104	4	97	7	2.27	68.	5 17	3.3	2
5.0	120	40	3.37	2319	3.9	5.1	29	1798	1308	20.1	6.7	79.9	117	3	106	6	2.10	76.	6 20	3.4	2
5.5	132	44	3.71	2433	4.1	4.8	31	1859	1189	18.0	6.0	81.0	129	3	114	6	1.97	83.	6 23	3.5	2
6.0	144	48	4.04	2542	4.3	4.6	32	1910	1090	16.3	5.4	81.9	141	3	122	5	1.86	88.	7 25	3.7	3
6.5	156	52	4.38	2646	4.5	4.4	34	1952	1006	14.8	4.9	82.6	154	2	129	5	1.76	95.	7 27	3.8	3
7.0	168	56	4.72	2746	4.6	4.3	36	1988	934	13.6	4.5	83.2	166	2	137	5	1.68	103.	8 29	3.9	3
7.5	180	60	5.05	2843	4.8	4.1	37	2019	872	12.6	4.2	83.7	178	2	144	5	1.61	110.	8 31	4.0	3
8.0	192	64	5.39	2936	4.9	4.0	39	2046	818	11.8	3.9	84.1	190	2	151	4	1.54	117.	9 33	4.1	3
8.5	204	68	5.73	3027	5.1	3.9	40	2070	769	11.0	3.7	84.5	202	2	159	4	1.49	125.	9 35	4.2	3
9.0	216	72	6.06	3115	5.2	3.8	42	2091	727	10.3	3.4	84.8	214	2	166	4	1.44	128.	10 37	4.3	4
9.5	228	76	6.40	3201	5.4	3.7	43	2110	688	9.7	3.2	85.1	227	1	173	4	1.39	135.	10 39	4.4	4
10.0	240	80	6.74	3285	5.5	3.6	45	2126	654	9.2	3.1	85.4	239	1	180	4	1.35	142.	11 41	4.5	4
10.5	252	84	7.07	3366	5.7	3.5	46	2141	623	8.7	2.9	85.6	251	1	187	4	1.31	149.	11 42	4.6	4
11.0	264	88	7.41	3446	5.8	3.4	47	2155	594	8.3	2.8	85.8	263	1	194	4	1.28	156.	12 44	4.7	4
11.5	276	92	7.75	3524	5.9	3.3	48	2167	569	7.9	2.6	86.0	275	1	201	4	1.25	163.	12 46	4.8	4
12.0	288	96	8.09	3600	6.1	3.3	49	2179	545	7.6	2.5	86.2	287	1	208	3	1.22	171.	13 47	4.9	4
13.0	312	104	8.76	3748	6.3	3.1	52	2198	503	7.0	2.3	86.5	311	1	221	3	1.16	179.	14 50	5.1	5
14.0	336	112	9.43	3891	6.5	3.0	54	2215	467	6.4	2.1	86.8	335	1	235	3	1.11	193.	15 54	5.3	5
15.0	360	120	10.11	4028	6.8	2.9	56	2230	436	6.0	2.0	87.0	359	1	248	3	1.07	207.	16 57	5.4	5
16.0	384	128	10.78	4161	7.0	2.8	58	2242	409	5.6	1.9	87.2	383	1	261	3	1.04	220.	17 59	5.6	5
17.0	408	136	11.45	4291	7.2	2.7	60	2253	384	5.2	1.7	87.4	407	1	275	3	1.00	227.	18 62	5.7	6
18.0	432	144	12.13	4416	7.4	2.7	62	2263	363	4.9	1.6	87.5	431	1	288	3	0.97	240.	19 65	5.9	6
19.0	456	152	12.80	4538	7.6	2.6	64	2272	344	4.7	1.6	87.7	455	1	301	3	0.94	253.	19 68	6.0	6
20.0	480	160	13.48	4657	7.8	2.5	66	2279	327	4.4	1.5	87.8	479	1	314	3	0.92	267.	20 71	6.2	6
25.0	600	200	16.84	5214	8.7	2.3	74	2308	261	3.5	1.2	88.2	599	1	378	2	0.81	322.	25 84	6.9	7
30.0	720	240	20.21	5719	9.6	2.1	81	2327	218	2.9	1.0	88.5	720	0	441	2	0.74	373.	29 97	7.5	8
35.0	840	280	23.58	6186	10.4	1.9	88	2340	186	2.5	0.8	88.8	840	0	503	2	0.68	420.	34 109	8.1	
40.0	960	320	26.95	6622	11.1	1.8	95	2349	163	2.2	0.7	88.9	960	0	565	2	0.64	462.	38 121	8.6	
45.0	1080	360	30.32	7032	11.7	1.7	101	2356	145	1.9	0.6	89.0	1080	0	626	2	0.60	500.	43 132	9.1	
50.0	1200	400	33.69	7423	12.4	1.6	106	2362	130	1.7	0.6	89.1	1200	0	687	2	0.57	535.	47 143	9.6	

#130 24 Mg on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 8. ZC= 20.(Ca)
NEUTRON NUMBERS: NP= 12. NT= 8. NC= 20.

AP**1/3= 2.884 AT**1/3= 2.520 ELSCAT <41 deg
REDUCED MASS NUMBER= 9.60 AP+AT=AC= 40.

INTERACTION RADIUS RINT= 8.97 fm RO= 1.66 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 2.42 CT+CP= 5.32 C= 1.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.21 RCT= 2.78 RC=RCP+RCT= 5.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 32.42 MeV K= .11555 n=2.456
VC(RINT)= 15.4 MeV

FISSION-TKE= 35. MeV
ASYMM. FISSION-TKE= 33. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 15.78 MeV
L-RLD= 40 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 20.12 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -4.7
COMPOUND NUCLEUS: -33.0

FUSION RELATED PARAMETERS:
R-BARRIER= 8.15 fm V(RB)= 15.7 MeV
Q-VALUE= 12.1 MeV
L-CRITICAL= 29.

24 Mg on 16 O

24 Mg on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	24	10	0.62	1036	2.1	15.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	48	19	1.25	1466	3.0	10.7	12	588	381	84.1	31.8	47.9	27	21	0	24	6.45	28.	0 0	2.5	1
3.0	72	29	1.87	1796	3.6	8.7	22	1285	950	42.8	16.9	68.6	63	9	0	13	3.43	41.	0 0	2.9	2
4.0	96	38	2.50	2074	4.2	7.6	29	1621	1234	29.1	11.6	75.5	90	6	85	10	2.62	55.	4 14	3.2	2
4.5	108	43	2.81	2200	4.5	7.1	32	1731	1329	25.1	10.0	77.5	103	5	93	9	2.38	62.	5 18	3.3	2
5.0	120	48	3.12	2319	4.7	6.8	35	1818	1313	22.0	8.8	79.0	116	4	101	8	2.20	68.	6 21	3.5	2
5.5	132	53	3.43	2433	4.9	6.4	37	1889	1194	19.7	7.8	80.2	128	4	108	8	2.06	73.	6 23	3.6	3
6.0	144	58	3.74	2542	5.1	6.2	40	1948	1094	17.8	7.1	81.1	141	3	115	7	1.94	80.	7 26	3.7	3
6.5	156	62	4.06	2646	5.4	5.9	42	1998	1010	16.2	6.5	81.9	153	3	122	7	1.83	87.	7 28	3.9	3
7.0	168	67	4.37	2746	5.6	5.7	44	2040	938	14.9	5.9	82.6	165	3	129	7	1.75	93.	8 30	4.0	3
7.5	180	72	4.68	2843	5.8	5.5	46	2076	875	13.8	5.5	83.1	178	2	135	6	1.67	97.	8 32	4.1	4
8.0	192	77	4.99	2936	5.9	5.3	48	2108	821	12.8	5.1	83.6	190	2	142	6	1.60	104.	9 34	4.2	4
8.5	204	82	5.30	3027	6.1	5.2	49	2136	772	12.0	4.8	84.0	202	2	148	6	1.55	110.	9 36	4.3	4
9.0	216	86	5.62	3115	6.3	5.0	51	2161	729	11.2	4.5	84.4	214	2	154	6	1.49	117.	10 38	4.4	4
9.5	228	91	5.93	3201	6.5	4.9	53	2183	691	10.6	4.2	84.7	226	2	160	5	1.44	123.	10 39	4.5	4
10.0	240	96	6.24	3285	6.6	4.8	55	2202	656	10.0	4.0	85.0	238	2	167	5	1.40	130.	11 41	4.6	4
10.5	252	101	6.55	3366	6.8	4.7	56	2220	625	9.5	3.8	85.3	250	2	173	5	1.36	132.	11 43	4.8	5
11.0	264	106	6.86	3446	7.0	4.6	58	2236	597	9.0	3.6	85.5	262	2	179	5	1.32	139.	12 45	4.9	5
11.5	276	110	7.18	3524	7.1	4.5	59	2251	571	8.6	3.4	85.7	275	1	185	5	1.29	145.	12 46	4.9	5
12.0	288	115	7.49	3600	7.3	4.4	61	2264	547	8.2	3.3	85.9	287	1	191	5	1.26	151.	13 48	5.0	5
13.0	312	125	8.11	3748	7.6	4.2	64	2288	505	7.5	3.0	86.2	311	1	202	4	1.20	159.	14 51	5.2	6
14.0	336	134	8.74	3891	7.9	4.0	66	2308	469	7.0	2.8	86.5	335	1	214	4	1.15	171.	14 54	5.4	6
15.0	360	144	9.36	4028	8.1	3.9	69	2325	437	6.5	2.6	86.8	359	1	226	4	1.11	183.	15 57	5.6	6
16.0	384	154	9.98	4161	8.4	3.8	71	2340	410	6.1	2.4	87.0	383	1	237	4	1.07	196.	16 60	5.8	6
17.0	408	163	10.61	4291	8.7	3.7	74	2353	386	5.7	2.3	87.2	407	1	248	4	1.03	202.	17 63	5.9	7
18.0	432	173	11.23	4416	8.9	3.6	76	2365	364	5.3	2.1	87.3	431	1	260	4	1.00	214.	18 66	6.1	7
19.0	456	182	11.86	4538	9.2	3.5	79	2375	345	5.1	2.0	87.5	455	1	271	4	0.97	226.	19 69	6.2	7
20.0	480	192	12.48	4657	9.4	3.4	81	2385	328	4.8	1.9	87.6	479	1	282	4	0.95	237.	20 71	6.4	7
25.0	600	240	15.60	5214	10.5	3.0	91	2420	262	3.8	1.5	88.1	599	1	336	3	0.84	279.	24 84	7.1	9
30.0	720	288	18.72	5719	11.5	2.8	100	2442	218	3.1	1.3	88.4	719	1	390	3	0.76	324.	29 97	7.7	10
35.0	840	336	21.84	6186	12.4	2.6	109	2458	187	2.7	1.1	88.7	840	0	443	3	0.70	365.	33 109	8.3	
40.0	960	384	24.96	6622	13.3	2.4	117	2470	164	2.3	0.9	88.8	960	0	495	2	0.65	403.	37 121	8.9	
45.0	1080	432	28.08	7032	14.1	2.3	124	2479	145	2.1	0.8	89.0	1080	0	546	2	0.62	453.	42 132	9.4	
50.0	1200	480	31.20	7423	14.8	2.1	131	2486	131	1.9	0.7	89.1	1200	0	597	2	0.58	486.	46 143	9.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#131 24 Mg on 27 Al

24 Mg on 27 Al

24 Mg on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 13. ZC= 25.(Mn)
NEUTRON NUMBERS: NP= 12. NT= 14. NC= 26.

AP**1/3= 2.884 AT**1/3= 3.000
REDUCED MASS NUMBER= 12.71 AP+AT=AC= 51.

INTERACTION RADIUS RINT= 9.50 fm RO= 1.61 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 3.05 CT+CP= 5.95 C= 1.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.21 RCT= 3.32 RC=RCP+RCT= 6.53

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 48.41 MeV K= .14464 n=2.439
VC(RINT)= 23.6 MeV

FISSION-TKE= 40. MeV
ASYMM. FISSION-TKE= 40. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 17.75 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.30 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -20.6
COMPOUND NUCLEUS: -50.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.59 fm V(RB)= 24.3 MeV
Q-VALUE= 13.5 MeV
L-CRITICAL= 40.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EM-EN	TEMP	MULT
1.0	24	13	0.54	1036	2.8	24.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	48	25	1.08	1466	3.9	17.4	10	239	99	120.9	66.4	29.5	12	36	0	65	11.52	22. 0	0	2.5	2
3.0	72	38	1.61	1796	4.8	14.2	28	1154	838	53.4	28.4	63.3	57	15	0	23	4.02	33. 0	0	2.8	2
4.0	96	51	2.15	2074	5.6	12.3	39	1596	1208	35.3	18.7	72.4	87	9	77	17	2.94	42. 4	16	3.2	3
4.5	108	57	2.42	2200	5.9	11.6	43	1741	1331	30.2	16.0	74.9	101	7	84	15	2.64	48. 5	19	3.3	3
5.0	120	64	2.69	2319	6.2	11.0	47	1857	1400	26.4	14.0	76.8	114	6	90	14	2.42	53. 5	21	3.5	3
5.5	132	70	2.96	2433	6.5	10.5	50	1951	1272	23.5	12.4	78.3	127	5	96	13	2.25	57. 6	24	3.6	4
6.0	144	76	3.23	2542	6.8	10.0	54	2029	1166	21.2	11.2	79.4	139	5	102	12	2.11	62. 6	26	3.8	4
6.5	156	83	3.50	2646	7.1	9.6	57	2095	1077	19.2	10.2	80.4	152	4	107	11	1.99	68. 7	28	3.9	4
7.0	168	89	3.77	2746	7.4	9.3	60	2151	1000	17.6	9.3	81.2	164	4	112	11	1.89	73. 7	30	4.0	4
7.5	180	95	4.04	2843	7.6	9.0	63	2200	933	16.3	8.6	81.9	176	4	117	10	1.81	76. 8	32	4.1	5
8.0	192	102	4.30	2936	7.9	8.7	65	2243	875	15.1	8.0	82.4	189	3	122	10	1.73	81. 8	34	4.2	5
8.5	204	108	4.57	3027	8.1	8.4	68	2280	823	14.1	7.5	82.9	201	3	127	10	1.67	87. 9	36	4.4	5
9.0	216	114	4.84	3115	8.3	8.2	71	2313	777	13.2	7.0	83.4	213	3	131	9	1.61	92. 9	38	4.5	5
9.5	228	121	5.11	3201	8.6	8.0	73	2343	736	12.5	6.6	83.8	225	3	136	9	1.55	95. 10	39	4.6	6
10.0	240	127	5.38	3285	8.8	7.8	75	2369	700	11.8	6.2	84.1	237	3	140	9	1.51	100. 10	41	4.7	6
10.5	252	133	5.65	3366	9.0	7.6	78	2393	666	11.2	5.9	84.4	250	2	145	8	1.46	105. 11	43	4.8	6
11.0	264	140	5.92	3446	9.2	7.4	80	2415	636	10.6	5.6	84.7	262	2	149	8	1.42	110. 11	44	4.9	6
11.5	276	146	6.19	3524	9.4	7.2	82	2435	608	10.1	5.3	84.9	274	2	153	8	1.38	112. 12	46	5.0	7
12.0	288	152	6.46	3600	9.6	7.1	84	2453	583	9.6	5.1	85.2	286	2	158	8	1.35	117. 12	47	5.1	7
13.0	312	165	6.99	3748	10.0	6.8	88	2485	538	8.8	4.7	85.6	310	2	166	7	1.29	127. 13	50	5.3	7
14.0	336	178	7.53	3891	10.4	6.6	92	2512	500	8.2	4.3	85.9	334	2	174	7	1.23	133. 14	53	5.5	8
15.0	360	191	8.07	4028	10.8	6.3	96	2535	466	7.6	4.0	86.2	358	2	183	7	1.19	143. 15	56	5.7	8
16.0	384	203	8.61	4161	11.1	6.1	99	2556	437	7.1	3.7	86.5	383	1	191	7	1.14	152. 15	59	5.8	8
17.0	408	216	9.15	4291	11.5	6.0	103	2574	411	6.6	3.5	86.7	407	1	199	6	1.10	158. 16	62	6.0	9
18.0	432	229	9.68	4416	11.8	5.8	106	2590	388	6.2	3.3	86.9	431	1	207	6	1.07	167. 17	65	6.2	9
19.0	456	241	10.22	4538	12.1	5.6	109	2604	368	5.9	3.1	87.0	455	1	214	6	1.04	172. 18	67	6.3	10
20.0	480	254	10.76	4657	12.4	5.5	112	2617	350	5.6	3.0	87.2	479	1	222	6	1.01	181. 19	70	6.5	10
25.0	600	318	13.45	5214	13.9	4.9	127	2665	280	4.4	2.3	87.8	599	1	260	5	0.89	216. 23	83	7.2	12
30.0	720	381	16.14	5719	15.2	4.5	140	2697	233	3.7	1.9	88.2	719	1	297	5	0.81	252. 27	95	7.9	13
35.0	840	445	18.83	6186	16.4	4.2	152	2720	200	3.1	1.7	88.4	839	1	333	4	0.75	287. 31	106	8.5	
40.0	960	508	21.52	6622	17.6	3.9	163	2736	175	2.7	1.4	88.6	959	1	368	4	0.70	319. 35	117	9.0	
45.0	1080	572	24.21	7032	18.6	3.7	173	2749	155	2.4	1.3	88.8	1080	0	403	4	0.65	339. 39	128	9.6	
50.0	1200	635	26.90	7423	19.7	3.5	183	2759	140	2.2	1.2	88.9	1200	0	437	4	0.62	365. 43	139	10.1	

#132 24 Mg on 40 Ca

24 Mg on 40 Ca

24 Mg on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 20. ZC= 32.(Ge)
NEUTRON NUMBERS: NP= 12. NT= 20. NC= 32.

AP**1/3= 2.884 AT**1/3= 3.420
REDUCED MASS NUMBER= 15.00 AP+AT=AC= 64.

INTERACTION RADIUS RINT= 9.96 fm RO= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 3.59 CT+CP= 6.49 C= 1.60

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.21 RCT= 3.84 RC=RCP+RCT= 7.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 68.79 MeV K= .16074 n=2.466
VC(RINT)= 34.7 MeV

FISSION-TKE= 50. MeV
ASYMM. FISSION-TKE= 47. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 19.18 MeV
L-RLD= 59 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -33.0
COMPOUND NUCLEUS: -55.0

FUSION RELATED PARAMETERS:
R-BARRIER= 8.96 fm V(RB)= 36.1 MeV
Q-VALUE= 5.8 MeV
L-CRITICAL= 49.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EM-EN	TEMP	MULT
1.0	24	15	0.43	1036	3.3	37.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	48	30	0.87	1466	4.6	26.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	72	45	1.30	1796	5.7	21.8	27	766	500	77.7	50.3	51.1	45	27	0	46	5.43	26. 0	0	2.5	2
4.0	96	60	1.73	2074	6.6	18.9	42	1376	1005	48.0	30.4	66.0	81	15	69	29	3.47	34. 4	15	2.9	3
4.5	108	68	1.95	2200	7.0	17.8	48	1577	1174	40.5	25.5	69.8	96	12	76	26	3.05	38. 5	18	3.0	4
5.0	120	75	2.16	2319	7.3	16.9	54	1737	1309	35.0	22.0	72.5	110	10	82	23	2.75	42. 5	21	3.2	4
5.5	132	83	2.38	2433	7.7	16.1	58	1867	1329	30.9	19.4	74.6	123	9	88	21	2.52	46. 6	23	3.3	4
6.0	144	90	2.60	2542	8.0	15.4	63	1975	1218	27.6	17.3	76.2	136	8	92	20	2.35	51. 6	25	3.5	4
6.5	156	98	2.81	2646	8.4	14.8	67	2067	1124	25.0	15.7	77.5	149	7	97	18	2.20	54. 7	27	3.6	5
7.0	168	105	3.03	2746	8.7	14.3	71	2145	1044	22.8	14.3	78.6	162	6	101	17	2.08	58. 7	29	3.7	5
7.5	180	113	3.25	2843	9.0	13.8	74	2212	974	21.0	13.2	79.5	174	6	105	17	1.98	62. 8	31	3.8	5
8.0	192	120	3.46	2936	9.3	13.4	78	2271	913	19.5	12.2	80.3	187	5	109	16	1.89	65. 8	33	4.0	6
8.5	204	128	3.68	3027	9.6	13.0	81	2323	860	18.1	11.3	80.9	199	5	113	15	1.81	69. 8	35	4.1	6
9.0	216	135	3.90	3115	9.8	12.6	84	2369	812	17.0	10.6	81.5	212	4	116	15	1.74	73. 9	36	4.2	6
9.5	228	143	4.11	3201	10.1	12.3	88	2411	769	15.9	10.0	82.0	224	4	120	14	1.68	77. 9	38	4.3	6
10.0	240	150	4.33	3285	10.4	12.0	91	2448	731	15.0	9.4	82.5	236	4	123	14	1.62	80. 10	40	4.4	7
10.5	252	158	4.54	3366	10.6	11.7	93	2481	696	14.2	8.9	82.9	248	4	127	13	1.57	84. 10	41	4.5	7
11.0	264	165	4.76	3446	10.9	11.4	96	2511	664	13.5	8.4	83.3	261	3	130	13	1.53	88. 11	43	4.6	7
11.5	276	173	4.98	3524	11.1	11.1	99	2539	635	12.8	8.0	83.6	273	3	133	12	1.49	92. 11	44	4.7	7
12.0	288	180	5.19	3600	11.4	10.9	102	2564	609	12.2	7.7	83.9	285	3	137	12	1.45	94. 11	46	4.8	8
13.0	312	195	5.63	3748	11.8	10.5	107	2609	562	11.2	7.0	84.4	309	3	143	12	1.38	102. 12	49	5.0	8
14.0	336	210	6.06	3891	12.3	10.1	112	2647	522	10.3	6.5	84.8	333	3	149	11	1.32	108. 13	51	5.2	9
15.0	360	225	6.49	4028	12.7	9.8	116	2680	487	9.6	6.0	85.2	358	2	155	11	1.26	116. 14	54	5.4	9
16.0	384	240	6.92	4161	13.1	9.4	121	2709	456	8.9	5.6	85.5	382	2	161	10	1.22	121. 15	57	5.5	10
17.0	408	255	7.36	4291	13.5	9.2	125	2734	430	8.4	5.2	85.8	406	2	167	10	1.17	129. 15	60	5.7	10
18.0	432	270	7.79	4416	13.9	8.9	129	2757	406	7.9	4.9	86.1	430	2	173	10	1.14	137. 16	62	5.9	10
19.0	456	285	8.22	4538	14.3	8.7	133	2777	384	7.4	4.6	86.3	454	2	179	9	1.10	142. 17	65	6.0	11
20.0	480	300	8.66	4657	14.7	8.5	137	2795	365	7.0	4.4	86.5	478	2	185	9	1.07	149. 18	67	6.2	11
25.0	600	375	10.82	5214	16.4	7.6	156	2863	292	5.6	3.5	87.2	599	1	212	8	0.95	179. 22	79	6.9	13
30.0	720	450	12.98	5719	18.0	6.9	172	2908	243	4.6	2.9	87.7	719	1	238	7	0.86	207. 25	91	7.5	15
35.0	840	525	15.15	6186	19.4	6.4	187	2940	208	3.9	2.4	88.0	839	1	264	7	0.79	231. 29	102	8.1	
40.0	960	600	17.31	6622	20.7	6.0	201	2964	182	3.4	2.1	88.3	959	1	289	6	0.73	259. 33	112	8.7	
45.0	1080	675	19.48	7032	22.0	5.6	213	2983	162	3.0	1.9	88.5	1079	1	314	6	0.69	285. 37	122	9.2	
50.0	1200	750	21.64	7423	23.2	5.3	226	2997	146	2.7	1.7	88.6	1199	1	338	5	0.65	302. 40	132	9.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#133 24 Mg on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 26. ZC= 38.(Sr)
NEUTRON NUMBERS: NP= 12. NT= 30. NC= 42.

AP**1/3= 2.884 AT**1/3= 3.826
REDUCED MASS NUMBER= 16.80 AP+AT=AC= 80.

INTERACTION RADIUS RINT=10.40 fm R0= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 4.12 CT+CP= 7.01 C̄= 1.70

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.21 RCT= 4.27 RC=RCP+RCT= 7.48

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 84.00 MeV K= .15841 n=2.495
VC(RINT)= 43.1 MeV

FISSION-TKE= 58. MeV
ASYMM. FISSION-TKE= 50. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 20.25 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -61.4
COMPOUND NUCLEUS: -71.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.35 fm V(RB)= 44.9 MeV
Q-VALUE= -6.2 MeV
L-CRITICAL= 58.

24 Mg on 56 Fe

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	24	17	0.39	1036	3.7	49.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	48	34	0.78	1466	5.2	34.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	72	50	1.17	1796	6.4	28.4	25	525	299	97.2	73.0	41.4	38	34	38	75	7.18	21.	2	4	2.1
4.0	96	67	1.56	2074	7.3	24.6	46	1267	910	56.5	40.4	61.7	78	18	63	41	3.93	28.	4	15	2.5
4.5	108	76	1.75	2200	7.8	23.2	53	1512	1114	47.2	33.5	66.4	93	15	70	35	3.39	31.	4	18	2.6
5.0	120	84	1.95	2319	8.2	22.0	60	1706	1277	40.5	28.6	69.7	108	12	76	32	3.02	34.	5	20	2.8
5.5	132	92	2.14	2433	8.6	20.9	65	1865	1410	35.5	25.1	72.2	122	10	80	29	2.75	37.	5	22	2.9
6.0	144	101	2.34	2542	9.0	20.1	71	1997	1366	31.7	22.3	74.2	135	9	84	27	2.54	40.	6	26	3.1
6.5	156	109	2.53	2646	9.4	19.3	76	2108	1261	28.5	20.1	75.7	148	8	88	25	2.37	44.	6	26	3.2
7.0	168	118	2.73	2746	9.7	18.6	80	2203	1171	26.0	18.3	77.0	161	7	92	23	2.23	47.	7	28	3.3
7.5	180	126	2.92	2843	10.1	17.9	85	2286	1093	23.9	16.8	78.1	174	6	95	22	2.12	50.	7	30	3.5
8.0	192	134	3.12	2936	10.4	17.4	89	2358	1024	22.1	15.5	79.0	186	6	98	21	2.02	53.	8	32	3.6
8.5	204	143	3.31	3027	10.7	16.9	93	2421	964	20.5	14.4	79.7	199	5	101	20	1.93	56.	8	33	3.7
9.0	216	151	3.50	3115	11.0	16.4	97	2477	910	19.2	13.5	80.4	211	5	104	19	1.85	59.	9	35	3.8
9.5	228	160	3.70	3201	11.3	15.9	101	2528	862	18.0	12.6	81.0	223	5	107	19	1.79	62.	9	36	3.9
10.0	240	168	3.89	3285	11.6	15.5	104	2573	819	17.0	11.9	81.5	236	4	109	18	1.73	65.	9	38	4.0
10.5	252	176	4.09	3366	11.9	15.2	108	2614	780	16.0	11.2	82.0	248	4	112	17	1.67	68.	10	39	4.1
11.0	264	185	4.28	3446	12.2	14.8	111	2651	745	15.2	10.7	82.4	260	4	115	17	1.62	70.	10	41	4.2
11.5	276	193	4.48	3524	12.5	14.5	114	2684	712	14.5	10.1	82.8	272	4	117	16	1.57	73.	11	42	4.3
12.0	288	202	4.67	3600	12.7	14.2	117	2715	683	13.8	9.7	83.1	285	3	120	16	1.53	77.	11	44	4.4
13.0	312	218	5.06	3748	13.2	13.6	123	2770	630	12.6	8.8	83.7	309	3	125	15	1.46	82.	12	46	4.6
14.0	336	235	5.45	3891	13.7	13.1	129	2817	585	11.6	8.1	84.2	333	3	129	15	1.39	88.	13	49	4.8
15.0	360	252	5.84	4028	14.2	12.7	135	2857	546	10.8	7.5	84.6	357	3	134	14	1.33	93.	13	52	5.0
16.0	384	269	6.23	4161	14.7	12.3	140	2892	512	10.0	7.0	85.0	382	2	138	13	1.28	98.	14	54	5.1
17.0	408	286	6.62	4291	15.2	11.9	145	2924	482	9.4	6.6	85.3	406	2	143	13	1.24	104.	15	57	5.3
18.0	432	302	7.01	4416	15.6	11.6	150	2951	455	8.8	6.2	85.6	430	2	147	13	1.20	108.	16	59	5.4
19.0	456	319	7.40	4538	16.0	11.3	155	2976	431	8.3	5.8	85.8	454	2	151	12	1.16	114.	16	62	5.6
20.0	480	336	7.79	4657	16.4	11.0	160	2998	409	7.9	5.5	86.1	478	2	156	12	1.13	119.	17	64	5.7
25.0	600	420	9.74	5214	18.4	9.8	181	3082	327	6.2	4.4	86.9	599	1	176	10	0.99	144.	21	75	6.4
30.0	720	504	11.68	5719	20.1	9.0	200	3138	273	5.1	3.6	87.4	719	1	195	9	0.90	167.	24	86	7.1
35.0	840	588	13.63	6186	21.7	8.3	218	3177	234	4.4	3.1	87.8	839	1	214	9	0.83	189.	28	97	7.6
40.0	960	672	15.58	6622	23.2	7.8	234	3206	204	3.8	2.7	88.1	959	1	232	8	0.77	209.	31	107	8.2
45.0	1080	756	17.52	7032	24.6	7.3	249	3229	182	3.4	2.4	88.3	1079	1	249	8	0.72	227.	35	116	8.7
50.0	1200	840	19.47	7423	26.0	6.9	263	3247	163	3.0	2.1	88.5	1199	1	266	7	0.68	247.	38	126	9.1

#134 24 Mg on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 29. ZC= 41.(Nb)
NEUTRON NUMBERS: NP= 12. NT= 34. NC= 46.

AP**1/3= 2.884 AT**1/3= 3.979
REDUCED MASS NUMBER= 17.38 AP+AT=AC= 87.

INTERACTION RADIUS RINT=10.57 fm R0= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 4.31 CT+CP= 7.21 C̄= 1.73

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.21 RCT= 4.45 RC=RCP+RCT= 7.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 91.37 MeV K= .15629 n=2.513
VC(RINT)= 47.4 MeV

FISSION-TKE= 63. MeV
ASYMM. FISSION-TKE= 52. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 20.61 MeV
L-RLD= 76 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.28 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -65.2
COMPOUND NUCLEUS: -75.6

FUSION RELATED PARAMETERS:
R-BARRIER= 9.49 fm V(RB)= 49.3 MeV
Q-VALUE= -5.8 MeV
L-CRITICAL= 61.

24 Mg on 63 Cu

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	24	17	0.37	1036	3.8	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	48	35	0.73	1466	5.4	38.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	72	52	1.10	1796	6.6	31.6	21	348	151	113.0	90.7	33.5	32	40	32	105	9.17	19.	1	3	2.1
4.0	96	70	1.47	2074	7.6	27.4	45	1164	820	62.3	46.3	58.8	75	21	60	49	4.24	25.	4	14	2.4
4.5	108	78	1.65	2200	8.1	25.8	53	1433	1043	51.6	38.0	64.2	92	16	68	41	3.59	28.	4	17	2.6
5.0	120	87	1.83	2319	8.5	24.5	61	1646	1222	44.1	32.3	68.0	106	14	73	36	3.17	32.	5	20	2.7
5.5	132	96	2.02	2433	8.9	23.4	67	1820	1367	38.5	28.2	70.7	121	11	78	33	2.87	34.	5	22	2.9
6.0	144	104	2.20	2542	9.3	22.4	73	1965	1410	34.2	25.0	72.9	134	10	82	30	2.64	37.	6	24	3.0
6.5	156	113	2.39	2646	9.7	21.5	78	2087	1302	30.8	22.4	74.6	147	9	86	28	2.46	40.	6	26	3.1
7.0	168	122	2.57	2746	10.1	20.7	83	2192	1209	28.0	20.4	76.0	160	8	89	27	2.31	43.	7	28	3.3
7.5	180	130	2.75	2843	10.4	20.0	88	2282	1128	25.7	18.7	77.2	173	7	92	25	2.19	46.	7	29	3.4
8.0	192	139	2.94	2936	10.8	19.4	92	2361	1058	23.7	17.2	78.1	186	6	95	24	2.08	49.	8	31	3.5
8.5	204	148	3.12	3027	11.1	18.8	96	2431	995	22.0	16.0	79.0	198	6	98	23	1.99	52.	8	33	3.6
9.0	216	156	3.30	3115	11.4	18.3	101	2493	940	20.6	14.9	79.7	210	6	101	22	1.91	54.	8	34	3.7
9.5	228	165	3.49	3201	11.7	17.8	105	2548	891	19.3	14.0	80.3	223	5	103	21	1.84	57.	9	36	3.8
10.0	240	174	3.67	3285	12.0	17.3	108	2598	846	18.2	13.2	80.9	235	5	106	20	1.77	60.	9	37	3.9
10.5	252	182	3.85	3366	12.3	16.9	112	2642	806	17.2	12.5	81.4	248	4	108	20	1.71	62.	10	39	4.0
11.0	264	191	4.04	3446	12.6	16.5	116	2683	769	16.3	11.8	81.9	260	4	111	19	1.66	65.	10	40	4.1
11.5	276	200	4.22	3524	12.9	16.2	119	2720	736	15.5	11.2	82.3	272	4	113	18	1.61	68.	10	41	4.2
12.0	288	209	4.40	3600	13.2	15.8	122	2754	705	14.7	10.7	82.6	284	4	115	18	1.57	70.	11	43	4.3
13.0	312	226	4.77	3748	13.7	15.2	129	2814	651	13.5	9.8	83.3	309	3	120	17	1.49	76.	12	45	4.5
14.0	336	243	5.14	3891	14.2	14.6	135	2866	604	12.4	9.0	83.8	333	3	124	16	1.42	81.	12	48	4.7
15.0	360	261	5.50	4028	14.7	14.1	141	2910	564	11.5	8.3	84.3	357	3	128	16	1.36	86.	13	51	4.8
16.0	384	278	5.87	4161	15.2	13.7	146	2949	529	10.7	7.8	84.7	381	3	132	15	1.31	91.	14	53	5.0
17.0	408	295	6.24	4291	15.7	13.3	152	2983	497	10.0	7.3	85.0	406	2	136	15	1.26	96.	15	56	5.2
18.0	432	313	6.61	4416	16.1	12.9	157	3014	470	9.4	6.8	85.3	430	2	140	14	1.22	101.	15	58	5.3
19.0	456	330	6.97	4538	16.6	12.6	162	3041	445	8.9	6.4	85.6	454	2	144	14	1.18	105.	16	60	5.5
20.0	480	348	7.34	4657	17.0	12.3	167	3065	423	8.4	6.1	85.8	478	2	148	13	1.15	110.	17	63	5.6
25.0	600	434	9.17	5214	19.0	11.0	190	3157	338	6.6	4.8	86.7	598	2	166	12	1.01	133.	20	74	6.3
30.0	720	521	11.01	5719	20.8	10.0	210	3219	282	5.5	4.0	87.3	719	1	183	10	0.91	155.	24	84	6.9
35.0	840	608	12.84	6186	22.5	9.3	228	3262	241	4.6	3.4	87.7	839	1	199	10	0.84	176.	27	95	7.4
40.0	960	695	14.68	6622	24.0	8.7	245	3295	211	4.0	2.9	88.0	959	1	215	9	0.78	195.	31	104	8.0
45.0	1080	782	16.51	7032	25.5	8.2	261	3320	188	3.6	2.6	88.2	1079	1	231	8	0.73	212.	34	114	8.4
50.0	1200	869	18.35	7423	26.9	7.7	276	3340	169	3.2	2.3	88.4	1199	1	246	8	0.69	228.	38	123	8.9
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#135 24 Mg on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 42. ZC= 54.(Xe)
NEUTRON NUMBERS: NP= 12. NT= 50. NC= 62.

AP**1/3= 2.884 AT**1/3= 4.514
REDUCED MASS NUMBER= 19.03 AP+AT=AC=116.

INTERACTION RADIUS RINT=11.15 fm RO= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 5.00 CT+CP= 7.90 $\bar{C}$= 1.84

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.21 RCT= 5.08 RC=RCP+RCT= 8.29

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 121.23 MeV K= .14159 n=2.589
VC(RINT)= 65.0 MeV

FISSION-TKE= 86. MeV
ASYMM. FISSION-TKE= 60. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 21.76 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.32 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -87.5
COMPOUND NUCLEUS: -73.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.98 fm V(RB)= 67.9 MeV
Q-VALUE= -30.2 MeV
L-CRITICAL= 71.

24 Mg on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	19	0.29	1036	4.2	79.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	48	38	0.59	1466	5.9	56.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	72	57	0.88	1796	7.2	45.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	96	76	1.17	2074	8.3	39.7	35	598	336	96.6	81.7	41.7	61	35	48	104	6.62	19.	3 12	1.8	3
4.5	108	86	1.32	2200	8.8	37.4	48	976	647	75.6	62.3	52.2	81	27	59	76	4.85	22.	4 15	2.0	3
5.0	120	95	1.46	2319	9.3	35.5	58	1276	895	62.6	50.9	58.7	99	21	67	63	4.01	24.	4 17	2.1	4
5.5	132	105	1.61	2433	9.8	33.8	67	1521	1098	53.6	43.3	63.2	114	18	72	55	3.49	26.	5 20	2.3	5
6.0	144	114	1.76	2542	10.2	32.4	75	1724	1267	47.0	37.8	66.5	129	15	77	49	3.14	28.	5 22	2.4	5
6.5	156	124	1.90	2646	10.6	31.1	81	1895	1410	41.8	33.5	69.1	143	13	80	45	2.87	31.	6 24	2.5	6
7.0	168	133	2.05	2746	11.0	30.0	88	2042	1325	37.7	30.2	71.1	156	12	84	42	2.66	33.	6 25	2.7	6
7.5	180	143	2.20	2843	11.4	29.0	94	2169	1237	34.4	27.5	72.8	170	10	87	39	2.50	35.	7 27	2.8	7
8.0	192	152	2.34	2936	11.8	28.1	99	2280	1160	31.6	25.2	74.2	183	9	89	37	2.36	37.	7 29	2.9	7
8.5	204	162	2.49	3027	12.1	27.2	105	2378	1091	29.2	23.3	75.4	196	8	92	35	2.24	39.	8 30	3.0	8
9.0	216	171	2.63	3115	12.5	26.5	110	2464	1031	27.1	21.6	76.4	208	8	94	34	2.13	42.	8 32	3.1	8
9.5	228	181	2.78	3201	12.8	25.7	114	2542	976	25.4	20.2	77.3	221	7	96	32	2.04	43.	8 33	3.2	9
10.0	240	190	2.93	3285	13.2	25.1	119	2612	928	23.8	19.0	78.1	233	7	98	31	1.96	46.	9 34	3.3	9
10.5	252	200	3.07	3366	13.5	24.5	123	2675	883	22.4	17.9	78.8	246	6	100	30	1.89	48.	9 36	3.4	10
11.0	264	209	3.22	3446	13.8	23.9	128	2732	843	21.2	16.9	79.4	258	6	102	29	1.83	50.	10 37	3.5	10
11.5	276	219	3.37	3524	14.1	23.4	132	2784	807	20.1	16.0	79.9	270	6	103	28	1.77	52.	10 38	3.6	10
12.0	288	228	3.51	3600	14.4	22.9	136	2832	773	19.1	15.2	80.4	283	5	105	27	1.72	54.	10 40	3.7	11
13.0	312	247	3.81	3748	15.0	22.0	144	2917	713	17.4	13.8	81.3	307	5	109	26	1.63	58.	11 42	3.9	12
14.0	336	266	4.10	3891	15.6	21.2	151	2989	662	16.0	12.7	82.0	332	4	112	24	1.55	62.	12 45	4.0	12
15.0	360	286	4.39	4028	16.1	20.5	158	3052	618	14.8	11.7	82.6	356	4	115	23	1.48	66.	12 47	4.2	13
16.0	384	305	4.68	4161	16.7	19.8	165	3106	580	13.7	10.9	83.1	380	4	118	22	1.42	70.	13 49	4.3	14
17.0	408	324	4.98	4291	17.2	19.2	171	3155	545	12.8	10.2	83.6	405	3	121	22	1.37	74.	14 52	4.5	14
18.0	432	343	5.27	4416	17.7	18.7	177	3198	515	12.1	9.6	84.0	429	3	124	21	1.32	78.	15 54	4.6	15
19.0	456	362	5.56	4538	18.1	18.2	183	3236	488	11.4	9.0	84.3	453	3	126	20	1.28	81.	15 56	4.8	16
20.0	480	381	5.86	4657	18.6	17.7	189	3270	464	10.7	8.5	84.6	477	3	129	19	1.24	86.	16 58	4.9	16
25.0	600	476	7.32	5214	20.8	15.9	216	3401	371	8.4	6.7	85.8	598	2	142	17	1.09	104.	19 69	5.5	19
30.0	720	571	8.78	5719	22.8	14.5	239	3487	309	6.9	5.5	86.5	718	2	154	15	0.98	121.	23 78	6.1	22
35.0	840	666	10.25	6186	24.6	13.4	261	3549	265	5.9	4.7	87.1	839	1	165	14	0.90	136.	26 88	6.6	
40.0	960	761	11.71	6622	26.3	12.5	281	3595	232	5.1	4.1	87.4	959	1	176	13	0.83	152.	29 97	7.1	
45.0	1080	857	13.17	7032	27.9	11.8	299	3631	206	4.5	3.6	87.7	1079	1	187	12	0.78	166.	32 106	7.5	
50.0	1200	952	14.64	7423	29.4	11.2	317	3659	185	4.1	3.2	88.0	1199	1	197	12	0.74	180.	36 114	8.0	

#136 24 Mg on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 47. ZC= 59.(Pr)
NEUTRON NUMBERS: NP= 12. NT= 61. NC= 73.

AP**1/3= 2.884 AT**1/3= 4.762
REDUCED MASS NUMBER= 19.64 AP+AT=AC=132.

INTERACTION RADIUS RINT=11.42 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 5.32 CT+CP= 8.22 $\bar{C}$= 1.88

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.21 RCT= 5.34 RC=RCP+RCT= 8.55

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 131.21 MeV K= .13373 n=2.612
VC(RINT)= 71.0 MeV

FISSION-TKE= 95. MeV
ASYMM. FISSION-TKE= 62. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.933 MeV/fm**2 PROX-FACTOR= 21.99 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.01 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -87.6
COMPOUND NUCLEUS: -75.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.24 fm V(RB)= 74.1 MeV
Q-VALUE= -28.4 MeV
L-CRITICAL= 75.

24 Mg on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	20	0.28	1036	4.3	88.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	48	39	0.55	1466	6.1	62.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	72	59	0.83	1796	7.4	51.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	96	79	1.11	2074	8.6	44.4	30	412	186	111.7	99.0	34.1	57	39	44	144	8.40	17.	3 11	1.7	3
4.5	108	88	1.24	2200	9.1	41.9	46	833	532	84.7	72.5	47.6	79	29	57	95	5.51	19.	4 14	1.9	4
5.0	120	98	1.38	2319	9.6	39.7	58	1167	808	69.2	58.3	55.4	97	23	65	76	4.40	21.	4 17	2.1	5
5.5	132	108	1.52	2433	10.1	37.9	67	1439	1034	58.8	49.1	60.6	113	19	70	65	3.77	23.	5 19	2.2	5
6.0	144	118	1.66	2542	10.5	36.3	76	1665	1222	51.2	42.6	64.4	128	16	75	58	3.35	25.	5 21	2.3	6
6.5	156	128	1.80	2646	10.9	34.8	83	1856	1382	45.5	37.7	67.3	142	14	78	52	3.04	27.	6 23	2.5	7
7.0	168	137	1.93	2746	11.4	33.6	90	2019	1413	40.9	33.8	69.6	156	12	82	48	2.81	29.	6 24	2.6	7
7.5	180	147	2.07	2843	11.8	32.4	97	2160	1319	37.1	30.6	71.4	169	11	84	45	2.62	31.	7 26	2.7	8
8.0	192	157	2.21	2936	12.1	31.4	103	2284	1236	34.0	28.0	73.0	182	10	87	42	2.47	33.	7 28	2.8	8
8.5	204	167	2.35	3027	12.5	30.5	108	2393	1163	31.4	25.9	74.3	195	9	89	40	2.34	35.	7 29	2.9	9
9.0	216	177	2.49	3115	12.9	29.6	114	2489	1099	29.2	24.0	75.4	208	8	91	38	2.23	37.	8 30	3.0	9
9.5	228	187	2.63	3201	13.2	28.8	119	2575	1041	27.3	22.4	76.4	220	8	93	37	2.13	38.	8 32	3.1	10
10.0	240	196	2.76	3285	13.6	28.1	124	2653	989	25.6	21.0	77.2	233	7	95	35	2.04	40.	9 33	3.2	10
10.5	252	206	2.90	3366	13.9	27.4	129	2723	942	24.1	19.8	78.0	245	7	96	34	1.97	42.	9 35	3.3	11
11.0	264	216	3.04	3446	14.2	26.8	133	2787	899	22.7	18.7	78.6	258	6	98	33	1.90	44.	9 36	3.4	11
11.5	276	226	3.18	3524	14.6	26.2	138	2845	860	21.6	17.7	79.2	270	6	100	32	1.84	46.	10 37	3.5	12
12.0	288	236	3.32	3600	14.9	25.6	142	2898	824	20.5	16.8	79.8	283	5	101	31	1.78	48.	10 38	3.5	12
13.0	312	255	3.59	3748	15.5	24.6	150	2992	760	18.6	15.3	80.7	307	5	104	29	1.69	51.	11 41	3.7	13
14.0	336	275	3.87	3891	16.1	23.7	158	3073	706	17.1	14.0	81.5	332	4	107	28	1.60	55.	12 43	3.9	14
15.0	360	295	4.15	4028	16.6	22.9	165	3143	659	15.8	12.9	82.1	356	4	110	26	1.53	58.	12 45	4.0	15
16.0	384	314	4.42	4161	17.2	22.2	172	3204	618	14.7	12.0	82.7	380	4	112	25	1.47	61.	13 48	4.2	16
17.0	408	334	4.70	4291	17.7	21.5	179	3257	581	13.7	11.2	83.2	405	3	115	24	1.41	65.	14 50	4.3	17
18.0	432	353	4.97	4416	18.2	20.9	186	3305	549	12.8	10.5	83.6	429	3	117	23	1.36	68.	14 52	4.4	17
19.0	456	373	5.25	4538	18.7	20.4	192	3348	520	12.1	9.9	84.0	453	3	120	23	1.32	72.	15 54	4.6	18
20.0	480	393	5.53	4657	19.2	19.9	198	3386	494	11.4	9.4	84.3	477	3	122	22	1.28	75.	16 56	4.7	19
25.0	600	491	6.91	5214	21.5	17.8	227	3532	395	9.0	7.3	85.5	598	2	133	19	1.12	91.	19 66	5.3	22
30.0	720	589	8.29	5719	23.5	16.2	252	3628	329	7.4	6.0	86.3	718	2	143	17	1.01	106.	22 76	5.8	25
35.0	840	687	9.67	6186	25.4	15.0	275	3697	282	6.3	5.1	86.9	839	1	153	16	0.92	120.	25 85	6.3	
40.0	960	785	11.06	6622	27.2	14.0	296	3748	247	5.4	4.4	87.3	959	1	162	15	0.86	133.	29 94	6.8	
45.0	1080	884	12.44	7032	28.8	13.2	315	3788	219	4.8	3.9	87.6	1079	1	171	14	0.80	147.	32 102	7.2	
50.0	1200	982	13.82	7423	30.4	12.6	334	3820	197	4.3	3.5	87.8	1199	1	180	13	0.76	159.	35 111	7.6	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEN QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#137 24 Mg on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 58. ZC= 70.(Yb)
NEUTRON NUMBERS: NP= 12. NT= 82. NC= 94.

AP**1/3= 2.884 AT**1/3= 5.192
REDUCED MASS NUMBER= 20.49 AP+AT=AC=164.

INTERACTION RADIUS RINT=11.88 fm R0= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 5.87 CT+CP= 8.77 C= 1.94

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.21 RCT= 5.82 RC=RCP+RCT= 9.03

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 152.50 MeV K= .11838 n=2.665
VC(RINT)= 84.2 MeV

FISSION-TKE= 118. MeV
ASYMM. FISSION-TKE= 67. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.915 MeV/fm**2 PROX-FACTOR= 22.32 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.60 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -88.2
COMPOUND NUCLEUS: -60.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.69 fm V(RB)= 87.7 MeV
Q-VALUE= -43.5 MeV
L-CRITICAL= 82.

24 Mg on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	20	0.24	1036	4.5	109.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	48	41	0.49	1466	6.3	77.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	72	61	0.73	1796	7.8	63.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	96	82	0.97	2074	9.0	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	108	92	1.09	2200	9.5	51.7	33	401	176	114.9	105.4	32.5	70	38	50	176	8.68	15.	3	12	1.5	4
5.0	120	102	1.22	2319	10.0	49.0	50	815	517	88.8	79.1	45.6	91	29	60	116	5.72	17.	4	15	1.7	5
5.5	132	113	1.34	2433	10.5	46.7	63	1151	796	73.5	64.6	53.3	108	24	67	93	4.57	19.	5	17	1.8	5
6.0	144	123	1.46	2542	11.0	44.7	73	1430	1029	63.0	54.9	58.5	124	20	72	80	3.91	20.	5	19	2.0	6
6.5	156	133	1.58	2646	11.4	43.0	82	1666	1226	55.2	47.9	62.4	139	17	76	71	3.48	22.	6	21	2.1	7
7.0	168	143	1.70	2746	11.9	41.4	90	1867	1394	49.2	42.6	65.4	153	15	80	64	3.16	23.	6	23	2.2	8
7.5	180	154	1.82	2843	12.3	40.0	98	2042	1421	44.5	38.3	67.8	167	13	82	60	2.92	25.	6	24	2.3	8
8.0	192	164	1.95	2936	12.7	38.7	105	2194	1332	40.5	34.9	69.7	180	12	85	56	2.73	27.	7	26	2.4	9
8.5	204	174	2.07	3027	13.1	37.6	111	2328	1254	37.3	32.1	71.4	194	10	87	52	2.57	28.	7	27	2.5	10
9.0	216	184	2.19	3115	13.4	36.5	118	2447	1184	34.5	29.6	72.8	207	9	89	50	2.43	29.	8	29	2.6	11
9.5	228	195	2.31	3201	13.8	35.6	124	2554	1122	32.1	27.6	73.9	219	9	90	47	2.32	31.	8	30	2.7	11
10.0	240	205	2.43	3285	14.2	34.7	129	2650	1066	30.0	25.8	75.0	232	8	92	45	2.21	33.	8	31	2.8	12
10.5	252	215	2.55	3366	14.5	33.8	135	2736	1015	28.2	24.2	75.9	245	7	94	43	2.13	34.	9	33	2.9	12
11.0	264	225	2.68	3446	14.9	33.0	140	2815	969	26.6	22.8	76.7	257	7	95	42	2.05	36.	9	34	3.0	13
11.5	276	236	2.80	3524	15.2	32.3	145	2887	927	25.2	21.6	77.4	269	7	96	40	1.98	37.	9	35	3.1	13
12.0	288	246	2.92	3600	15.5	31.6	149	2952	888	23.9	20.5	78.1	282	6	98	39	1.91	39.	10	36	3.1	14
13.0	312	266	3.16	3748	16.2	30.4	159	3069	820	21.7	18.6	79.2	306	6	100	37	1.80	41.	11	38	3.3	15
14.0	336	287	3.41	3891	16.8	29.3	167	3168	761	19.9	17.0	80.1	331	5	103	35	1.71	44.	11	41	3.4	16
15.0	360	307	3.65	4028	17.4	28.3	176	3254	710	18.3	15.7	80.8	355	5	105	33	1.63	47.	12	43	3.6	17
16.0	384	328	3.89	4161	17.9	27.4	184	3330	666	17.0	14.5	81.5	380	4	107	32	1.56	50.	13	45	3.7	18
17.0	408	348	4.13	4291	18.5	26.6	191	3396	627	15.8	13.5	82.1	404	4	109	31	1.50	53.	13	47	3.9	19
18.0	432	369	4.38	4416	19.0	25.8	198	3455	592	14.8	12.7	82.6	428	4	111	29	1.44	55.	14	49	4.0	20
19.0	456	389	4.62	4538	19.5	25.1	205	3508	561	14.0	11.9	83.0	453	3	113	28	1.39	58.	14	51	4.1	21
20.0	480	410	4.86	4657	20.0	24.5	212	3555	533	13.2	11.3	83.4	477	3	115	27	1.35	61.	15	53	4.2	22
25.0	600	512	6.08	5214	22.4	21.9	243	3735	426	10.3	8.8	84.9	598	2	123	24	1.18	74.	18	63	4.8	26
30.0	720	615	7.30	5719	24.5	20.0	271	3855	355	8.4	7.2	85.8	718	2	131	22	1.06	87.	22	72	5.3	29
35.0	840	717	8.51	6186	26.5	18.5	296	3940	304	7.2	6.1	86.4	838	2	139	20	0.97	98.	25	80	5.7	
40.0	960	820	9.73	6622	28.3	17.3	319	4003	266	6.2	5.3	86.9	959	1	146	18	0.90	110.	28	89	6.2	
45.0	1080	922	10.94	7032	30.1	16.3	340	4053	236	5.5	4.7	87.3	1079	1	153	17	0.84	120.	31	97	6.5	
50.0	1200	1024	12.16	7423	31.7	15.5	361	4092	213	4.9	4.2	87.5	1199	1	159	16	0.79	131.	34	105	6.9	

#138 24 Mg on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 62. ZC= 74.(W)
NEUTRON NUMBERS: NP= 12. NT= 92. NC=104.

AP**1/3= 2.884 AT**1/3= 5.360
REDUCED MASS NUMBER= 20.76 AP+AT=AC=178.

INTERACTION RADIUS RINT=12.06 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 6.09 CT+CP= 8.99 C= 1.96

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.00 RC=RCP+RCT= 9.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 159.57 MeV K= .11269 n=2.681
VC(RINT)= 88.7 MeV

FISSION-TKE= 126. MeV
ASYMM. FISSION-TKE= 69. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.904 MeV/fm**2 PROX-FACTOR= 22.29 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -72.1
COMPOUND NUCLEUS: -48.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.86 fm V(RB)= 92.2 MeV
Q-VALUE= -39.4 MeV
L-CRITICAL= 84.

24 Mg on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	21	0.23	1036	4.5	117.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	48	42	0.47	1466	6.4	82.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	72	62	0.70	1796	7.9	67.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	96	83	0.94	2074	9.1	58.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	108	93	1.05	2200	9.6	55.2	26	244	49	129.8	122.2	25.1	67	41	48	245	11.55	14.	3	12	1.6	5
5.0	120	104	1.17	2319	10.2	52.4	47	690	415	96.7	87.8	41.6	89	31	59	137	6.41	16.	4	15	1.7	6
5.5	132	114	1.29	2433	10.7	50.0	61	1050	714	79.0	70.6	50.5	107	25	66	106	4.93	17.	4	17	1.8	6
6.0	144	125	1.40	2542	11.1	47.8	72	1350	963	67.3	59.5	56.4	123	21	72	89	4.16	19.	5	19	2.0	7
6.5	156	135	1.52	2646	11.6	46.0	82	1602	1174	58.7	51.7	60.6	139	17	76	78	3.66	20.	6	21	2.1	8
7.0	168	145	1.64	2746	12.0	44.3	90	1818	1355	52.2	45.8	63.9	153	15	79	71	3.31	21.	6	22	2.2	9
7.5	180	156	1.76	2843	12.4	42.8	98	2005	1460	47.0	41.1	66.5	167	13	82	65	3.04	23.	6	24	2.3	9
8.0	192	166	1.87	2936	12.8	41.4	106	2168	1368	42.8	37.4	68.6	180	12	84	61	2.83	24.	7	25	2.4	10
8.5	204	176	1.99	3027	13.2	40.2	113	2312	1288	39.3	34.3	70.4	193	11	86	57	2.65	26.	7	27	2.5	11
9.0	216	187	2.11	3115	13.6	39.1	119	2439	1216	36.3	31.6	71.8	206	10	88	54	2.51	27.	8	28	2.6	12
9.5	228	197	2.22	3201	14.0	38.0	125	2554	1152	33.8	29.4	73.1	219	9	90	51	2.39	29.	8	29	2.7	12
10.0	240	208	2.34	3285	14.4	37.0	131	2656	1095	31.6	27.4	74.2	232	8	91	49	2.28	30.	8	31	2.7	13
10.5	252	218	2.46	3366	14.7	36.2	137	2749	1042	29.6	25.8	75.2	244	8	93	47	2.19	31.	9	32	2.8	14
11.0	264	228	2.58	3446	15.1	35.3	142	2833	995	27.9	24.3	76.0	257	7	94	45	2.10	33.	9	33	2.9	14
11.5	276	239	2.69	3524	15.4	34.5	147	2910	952	26.4	22.9	76.8	269	7	95	44	2.03	34.	9	34	3.0	15
12.0	288	249	2.81	3600	15.7	33.8	152	2981	912	25.0	21.7	77.5	282	6	97	42	1.96	36.	10	35	3.1	15
13.0	312	270	3.04	3748	16.4	32.5	162	3105	842	22.7	19.7	78.6	306	6	99	40	1.85	38.	10	38	3.2	17
14.0	336	291	3.28	3891	17.0	31.3	171	3212	782	20.8	18.0	79.6	331	5	101	38	1.75	41.	11	40	3.4	18
15.0	360	311	3.51	4028	17.6	30.2	179	3304	730	19.1	16.6	80.4	355	5	103	36	1.67	43.	12	42	3.5	19
16.0	384	332	3.75	4161	18.2	29.3	188	3385	684	17.7	15.4	81.1	380	4	105	34	1.59	46.	12	44	3.6	20
17.0	408	353	3.98	4291	18.7	28.4	195	3456	644	16.5	14.3	81.7	404	4	107	33	1.53	48.	13	46	3.8	21
18.0	432	374	4.21	4416	19.3	27.6	203	3520	608	15.5	13.4	82.3	428	4	109	32	1.47	51.	14	48	3.9	22
19.0	456	395	4.45	4538	19.8	26.9	210	3576	576	14.6	12.6	82.7	453	3	111	31	1.42	54.	14	50	4.0	23
20.0	480	415	4.68	4657	20.3	26.2	217	3627	547	13.8	11.9	83.1	477	3	112	30	1.38	56.	15	52	4.1	24
25.0	600	519	5.85	5214	22.7	23.4	249	3820	438	10.7	9.3	84.6	598	2	120	26	1.20	68.	18	61	4.6	28
30.0	720	623	7.02	5719	24.9	21.4	278	3948	365	8.8	7.6	85.6	718	2	128	23	1.08	80.	21	70	5.1	32
35.0	840	727	8.19	6186	26.9	19.8	304	4039	312	7.5	6.5	86.3	838	2	134	21	0.98	90.	24	79	5.6	
40.0	960	831	9.36	6622	28.7	18.5	327	4107	273	6.5	5.6	86.8	959	1	141	20	0.91	101.	27	87	6.0	
45.0	1080	934	10.54	7032	30.5	17.5	350	4161	243	5.7	4.9	87.1	1079	1	147	18	0.85	111.	30	95	6.3	
50.0	1200	1038	11.71	7423	32.1	16.6	370	4203	219	5.1	4.4	87.4	1199	1	153	17	0.81	121.	33	103	6.7	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM GP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#139 24 Mg on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 67. ZC= 79.(Au)
NEUTRON NUMBERS: NP= 12. NT= 98. NC=110.

AP**1/3= 2.884 AT**1/3= 5.485
REDUCED MASS NUMBER= 20.95 AP+AT=AC=189.

INTERACTION RADIUS RINT=12.20 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 6.25 CT+CP= 9.15 C= 1.98

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.15 RC=RCP+RCT= 9.36

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 169.14 MeV K= .10746 n=2.706
VC(RINT)= 94.8 MeV

FISSION-TKE= 139. MeV
ASYMM. FISSION-TKE= 71. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 22.54 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.39 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -63.7
COMPOUND NUCLEUS: -32.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.99 fm V(RB)= 98.6 MeV
Q-VALUE= -47.8 MeV
L-CRITICAL= 85.

24 Mg on 165 Ho — 24 Mg on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	21	0.22	1036	4.6	126.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	48	42	0.44	1466	6.5	89.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	72	63	0.66	1796	7.9	73.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	96	84	0.88	2074	9.2	63.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	108	94	0.99	2200	9.7	59.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	120	105	1.11	2319	10.2	56.6	38	463	224	111.8	103.7	34.1	84	36	56	183	8.04	15.	4 14	1.6	5
5.5	132	115	1.22	2433	10.7	54.0	55	855	549	88.9	80.6	45.6	103	29	65	128	5.60	16.	4 16	1.7	6
6.0	144	126	1.33	2542	11.2	51.7	68	1180	819	74.7	67.0	52.7	121	23	71	104	4.55	18.	5 18	1.8	6
6.5	156	136	1.44	2646	11.7	49.7	78	1453	1048	64.7	57.6	57.7	136	20	76	90	3.93	19.	5 20	1.9	7
7.0	168	147	1.55	2746	12.1	47.8	88	1687	1244	57.1	50.7	61.4	151	17	79	80	3.51	20.	6 22	2.0	8
7.5	180	157	1.66	2843	12.6	46.2	96	1890	1414	51.3	45.3	64.4	165	15	82	73	3.20	22.	6 23	2.2	9
8.0	192	168	1.77	2936	13.0	44.8	104	2067	1378	46.5	41.0	66.7	179	13	85	68	2.96	23.	7 25	2.3	10
8.5	204	178	1.88	3027	13.4	43.4	111	2223	1297	42.6	37.5	68.7	192	12	87	63	2.77	25.	7 26	2.3	10
9.0	216	189	1.99	3115	13.7	42.2	118	2361	1225	39.3	34.6	70.4	205	11	89	60	2.61	26.	8 27	2.4	11
9.5	228	199	2.10	3201	14.1	41.1	125	2485	1160	36.5	32.1	71.8	218	10	90	57	2.47	27.	8 29	2.5	12
10.0	240	210	2.21	3285	14.5	40.0	131	2596	1102	34.1	29.9	73.0	231	9	92	54	2.36	29.	8 30	2.6	12
10.5	252	220	2.32	3366	14.8	39.1	137	2697	1050	31.9	28.0	74.0	244	8	93	52	2.26	30.	9 31	2.7	13
11.0	264	230	2.43	3446	15.2	38.2	142	2788	1002	30.1	26.4	75.0	256	8	95	50	2.17	31.	9 32	2.8	14
11.5	276	241	2.54	3524	15.5	37.3	148	2872	958	28.4	24.9	75.8	269	7	96	48	2.09	32.	9 34	2.9	14
12.0	288	251	2.65	3600	15.9	36.5	153	2948	918	26.9	23.6	76.5	281	7	97	46	2.02	34.	10 35	2.9	15
13.0	312	272	2.87	3748	16.5	35.1	163	3083	848	24.4	21.3	77.8	306	6	100	43	1.90	36.	10 37	3.1	16
14.0	336	293	3.09	3891	17.1	33.8	172	3199	787	22.3	19.5	78.9	330	6	102	41	1.79	39.	11 39	3.2	17
15.0	360	314	3.32	4028	17.7	32.7	181	3299	735	20.5	17.9	79.8	355	5	104	39	1.70	41.	12 41	3.4	18
16.0	384	335	3.54	4161	18.3	31.6	189	3386	689	19.0	16.6	80.5	379	5	106	37	1.63	44.	12 43	3.5	20
17.0	408	356	3.76	4291	18.9	30.7	197	3464	648	17.7	15.5	81.2	404	4	108	36	1.56	46.	13 45	3.6	21
18.0	432	377	3.98	4416	19.4	29.8	205	3532	612	16.6	14.5	81.7	428	4	109	34	1.50	48.	14 47	3.7	22
19.0	456	398	4.20	4538	20.0	29.0	213	3593	580	15.6	13.6	82.2	452	4	111	33	1.45	51.	14 49	3.9	23
20.0	480	419	4.42	4657	20.5	28.3	220	3648	551	14.7	12.8	82.7	477	3	113	32	1.40	53.	15 51	4.0	24
25.0	600	524	5.53	5214	22.9	25.3	253	3858	441	11.4	10.0	84.3	597	3	120	28	1.22	65.	18 60	4.5	28
30.0	720	629	6.63	5719	25.1	23.1	282	3997	367	9.4	8.2	85.3	718	2	127	25	1.09	76.	21 69	5.0	32
35.0	840	733	7.74	6186	27.1	21.4	309	4096	315	7.9	6.9	86.0	838	2	134	23	1.00	86.	24 77	5.4	
40.0	960	838	8.84	6622	29.0	20.0	333	4170	275	6.9	6.0	86.6	958	2	140	21	0.93	97.	27 86	5.8	
45.0	1080	943	9.95	7032	30.7	18.9	356	4227	245	6.1	5.3	87.0	1079	1	145	20	0.87	107.	30 93	6.2	
50.0	1200	1048	11.05	7423	32.4	17.9	377	4273	220	5.4	4.7	87.3	1199	1	151	19	0.82	116.	33 101	6.5	

#140 24 Mg on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 73. ZC= 85.(At)
NEUTRON NUMBERS: NP= 12. NT=108. NC=120.

AP**1/3= 2.884 AT**1/3= 5.657
REDUCED MASS NUMBER= 21.19 AP+AT=AC=205.

INTERACTION RADIUS RINT=12.38 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 6.47 CT+CP= 9.37 C= 2.00

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.35 RC=RCP+RCT= 9.56

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 179.92 MeV K= .10095 n=2.732
VC(RINT)= 101.7 MeV

FISSION-TKE= 153. MeV
ASYMM. FISSION-TKE= 74. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 22.69 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.29 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -46.0
COMPOUND NUCLEUS: -11.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.17 fm V(RB)= 105.7 MeV
Q-VALUE= -50.4 MeV
L-CRITICAL= 86.

24 Mg on 181 Ta — 24 Mg on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	21	0.21	1036	4.6	137.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	48	42	0.42	1466	6.6	97.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	72	64	0.62	1796	8.0	79.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	96	85	0.83	2074	9.3	69.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	108	95	0.94	2200	9.8	65.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	120	106	1.04	2319	10.4	61.7	25	201	8	135.5	129.6	22.3	77	43	53	309	12.73	14.	3 13	1.5	5
5.5	132	117	1.15	2433	10.9	58.8	48	633	364	101.8	94.2	39.1	99	33	63	165	6.72	15.	4 15	1.6	6
6.0	144	127	1.25	2542	11.4	56.3	63	989	660	83.9	76.4	48.1	117	27	70	126	5.13	16.	5 18	1.7	6
6.5	156	138	1.35	2646	11.8	54.1	75	1289	910	71.8	64.9	54.1	134	22	75	106	4.30	18.	5 19	1.8	7
7.0	168	148	1.46	2746	12.3	52.1	85	1545	1125	63.0	56.7	58.5	149	19	79	93	3.78	19.	6 21	2.0	8
7.5	180	159	1.56	2843	12.7	50.4	94	1767	1311	56.3	50.4	61.9	163	17	82	84	3.41	20.	6 23	2.1	9
8.0	192	170	1.67	2936	13.1	48.8	103	1961	1396	50.9	45.4	64.6	177	15	85	77	3.13	21.	7 24	2.2	10
8.5	204	180	1.77	3027	13.5	47.3	110	2131	1314	46.4	41.4	66.8	191	13	87	72	2.91	23.	7 25	2.3	10
9.0	216	191	1.87	3115	13.9	46.0	118	2283	1241	42.7	38.0	68.6	204	12	89	67	2.73	24.	7 27	2.3	11
9.5	228	201	1.98	3201	14.3	44.8	124	2419	1175	39.6	35.2	70.2	217	11	91	64	2.58	25.	8 28	2.4	12
10.0	240	212	2.08	3285	14.7	43.6	131	2540	1116	36.9	32.8	71.6	230	10	93	60	2.46	26.	8 29	2.5	12
10.5	252	222	2.19	3366	15.0	42.6	137	2651	1063	34.5	30.7	72.7	243	9	94	58	2.35	28.	9 31	2.6	13
11.0	264	233	2.29	3446	15.4	41.6	143	2751	1015	32.5	28.8	73.8	255	9	95	55	2.25	29.	9 32	2.7	14
11.5	276	244	2.40	3524	15.7	40.7	148	2842	971	30.6	27.2	74.7	268	8	97	53	2.16	30.	9 33	2.7	14
12.0	288	254	2.50	3600	16.1	39.8	154	2926	930	29.0	25.7	75.5	281	7	98	51	2.09	31.	10 34	2.8	15
13.0	312	275	2.71	3748	16.7	38.3	164	3073	859	26.2	23.2	76.9	305	7	100	48	1.96	34.	10 36	3.0	16
14.0	336	297	2.92	3891	17.3	36.9	174	3200	797	23.9	21.2	78.0	330	6	102	45	1.85	36.	11 38	3.1	18
15.0	360	318	3.12	4028	18.0	35.6	183	3310	744	22.0	19.5	79.0	355	5	104	43	1.75	38.	12 40	3.2	19
16.0	384	339	3.33	4161	18.5	34.5	192	3406	698	20.4	18.0	79.8	379	5	106	41	1.67	41.	12 42	3.4	20
17.0	408	360	3.54	4291	19.1	33.5	200	3490	657	19.0	16.8	80.5	403	5	108	39	1.60	43.	13 44	3.5	21
18.0	432	381	3.75	4416	19.7	32.5	208	3565	620	17.7	15.7	81.1	428	4	109	38	1.54	45.	14 46	3.6	22
19.0	456	403	3.96	4538	20.2	31.6	216	3632	587	16.7	14.7	81.7	452	4	111	37	1.49	47.	14 48	3.7	23
20.0	480	424	4.17	4657	20.7	30.8	224	3693	558	15.7	13.9	82.2	476	4	112	35	1.44	50.	15 50	3.8	24
25.0	600	530	5.21	5214	23.2	27.6	258	3922	446	12.2	10.8	83.9	597	3	119	31	1.25	60.	18 59	4.3	29
30.0	720	636	6.25	5719	25.4	25.2	288	4074	372	10.0	8.8	85.0	718	2	126	27	1.12	70.	21 68	4.8	34
35.0	840	742	7.29	6186	27.4	23.3	315	4182	319	8.5	7.5	85.8	838	2	132	25	1.02	80.	24 76	5.2	
40.0	960	848	8.33	6622	29.3	21.8	340	4264	279	7.3	6.5	86.3	958	2	137	23	0.94	90.	27 84	5.6	
45.0	1080	954	9.37	7032	31.1	20.6	364	4327	248	6.5	5.7	86.8	1079	1	142	22	0.88	99.	30 92	5.9	
50.0	1200	1060	10.42	7423	32.8	19.5	386	4377	223	5.8	5.1	87.1	1199	1	148	21	0.83	108.	33 99	6.3	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#141 24 Mg on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 79. ZC= 91.(Pa)
NEUTRON NUMBERS: NP= 12. NT=118. NC=130.

AP**1/3= 2.884 AT**1/3= 5.819
REDUCED MASS NUMBER= 21.39 AP+AT=AC=221.

INTERACTION RADIUS RINT=12.56 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 6.68 CT+CP= 9.58 C= 2.02

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.55 RC=RCP+RCT= 9.76

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 190.42 MeV K= .09491 n=2.757
VC(RINT)= 108.5 MeV

FISSION-TKE= 169. MeV
ASYMM. FISSION-TKE= 77. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 22.83 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.20 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -28.6
COMPOUND NUCLEUS: 19.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.33 fm V(RB)= 112.7 MeV
Q-VALUE= -64.5 MeV
L-CRITICAL= 88.

24 Mg on 197 Au — 24 Mg on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	21	0.20	1036	4.7	149.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	48	43	0.39	1466	6.6	105.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	72	64	0.59	1796	8.1	86.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	96	86	0.79	2074	9.4	74.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	108	96	0.89	2200	9.9	70.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	120	107	0.99	2319	10.5	66.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	132	118	1.08	2433	11.0	63.6	38	398	168	118.2	111.7	30.9	94	38	61	229	8.77	14.	4	15	1.4	5
6.0	144	128	1.18	2542	11.5	60.9	56	787	490	94.5	87.5	42.8	114	30	69	155	5.92	15.	5	17	1.5	6
6.5	156	139	1.28	2646	11.9	58.5	70	1113	763	79.8	73.1	50.1	131	25	75	125	4.77	16.	5	19	1.6	7
7.0	168	150	1.38	2746	12.4	56.4	81	1392	996	69.4	63.2	55.3	147	21	79	108	4.10	18.	6	20	1.8	8
7.5	180	160	1.48	2843	12.8	54.5	91	1634	1199	61.6	55.8	59.2	162	18	83	96	3.65	19.	6	22	1.9	8
8.0	192	171	1.58	2936	13.2	52.8	100	1845	1376	55.5	50.1	62.3	176	16	85	87	3.32	20.	7	23	2.0	9
8.5	204	182	1.68	3027	13.6	51.2	109	2030	1325	50.5	45.5	64.8	190	14	88	81	3.07	21.	7	25	2.1	10
9.0	216	193	1.77	3115	14.0	49.8	116	2195	1251	46.3	41.7	66.8	203	13	90	75	2.87	22.	7	26	2.2	11
9.5	228	203	1.87	3201	14.4	48.4	124	2343	1185	42.8	38.5	68.6	216	12	92	71	2.70	24.	8	27	2.2	11
10.0	240	214	1.97	3285	14.8	47.2	130	2475	1126	39.8	35.7	70.1	229	11	93	67	2.56	25.	8	29	2.3	12
10.5	252	225	2.07	3366	15.2	46.1	137	2595	1072	37.2	33.4	71.4	242	10	95	64	2.44	26.	8	30	2.4	13
11.0	264	235	2.17	3446	15.5	45.0	143	2704	1023	34.9	31.3	72.5	255	9	96	61	2.33	27.	9	31	2.5	14
11.5	276	246	2.27	3524	15.9	44.0	149	2803	979	32.9	29.5	73.5	267	9	97	59	2.24	28.	9	32	2.6	14
12.0	288	257	2.37	3600	16.2	43.1	155	2894	938	31.2	27.9	74.4	280	8	99	57	2.16	29.	10	33	2.6	15
13.0	312	278	2.56	3748	16.9	41.4	165	3055	866	28.1	25.1	75.9	305	7	101	53	2.02	31.	10	35	2.8	16
14.0	336	300	2.76	3891	17.5	39.9	176	3193	804	25.6	22.9	77.2	330	6	103	50	1.90	33.	11	37	2.9	18
15.0	360	321	2.96	4028	18.1	38.5	185	3312	750	23.5	21.0	78.2	354	6	105	47	1.80	36.	12	40	3.0	19
16.0	384	342	3.15	4161	18.7	37.3	194	3417	703	21.8	19.4	79.1	379	5	106	45	1.72	38.	12	42	3.2	20
17.0	408	364	3.35	4291	19.3	36.2	203	3508	662	20.2	18.1	79.9	403	5	108	43	1.64	40.	13	43	3.3	21
18.0	432	385	3.55	4416	19.9	35.2	211	3590	625	18.9	16.9	80.5	427	5	109	42	1.58	42.	13	45	3.4	22
19.0	456	406	3.74	4538	20.4	34.2	219	3663	592	17.8	15.8	81.1	452	4	111	40	1.52	44.	14	47	3.5	24
20.0	480	428	3.94	4657	20.9	33.4	227	3729	563	16.7	14.9	81.6	476	4	112	39	1.47	46.	15	49	3.6	25
25.0	600	535	4.93	5214	23.4	29.9	262	3978	450	13.0	11.6	83.5	597	3	119	33	1.27	56.	18	58	4.1	30
30.0	720	642	5.91	5719	25.6	27.3	293	4144	375	10.6	9.5	84.7	718	2	125	30	1.14	66.	21	66	4.6	34
35.0	840	749	6.90	6186	27.7	25.2	321	4262	321	9.0	8.0	85.5	838	2	130	27	1.04	75.	24	74	5.0	
40.0	960	856	7.88	6622	29.6	23.6	347	4351	281	7.8	6.9	86.1	958	2	136	25	0.96	84.	27	82	5.4	
45.0	1080	963	8.87	7032	31.4	22.3	371	4419	250	6.9	6.1	86.6	1079	1	141	24	0.90	93.	30	90	5.7	
50.0	1200	1070	9.85	7423	33.1	21.1	394	4474	225	6.1	5.5	86.9	1199	1	145	22	0.85	101.	33	97	6.0	

#142 24 Mg on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 82. ZC= 94.(Pu)
NEUTRON NUMBERS: NP= 12. NT=126. NC=138.

AP**1/3= 2.884 AT**1/3= 5.925
REDUCED MASS NUMBER= 21.52 AP+AT=AC=232.

INTERACTION RADIUS RINT=12.67 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 6.82 CT+CP= 9.71 C= 2.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.66 RC=RCP+RCT= 9.87

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 195.14 MeV K= .09167 n=2.768
VC(RINT)= 111.6 MeV

FISSION-TKE= 176. MeV
ASYMM. FISSION-TKE= 78. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 22.76 MeV
L-RLD= 71 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -19.5
COMPOUND NUCLEUS: 39.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.44 fm V(RB)= 115.9 MeV
Q-VALUE= -75.2 MeV
L-CRITICAL= 89.

24 Mg on 208 Pb — 24 Mg on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	22	0.19	1036	4.7	154.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	48	43	0.39	1466	6.7	109.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	72	65	0.58	1796	8.2	89.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	96	86	0.77	2074	9.4	77.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	108	97	0.87	2200	10.0	73.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	120	108	0.96	2319	10.5	69.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	132	118	1.06	2433	11.0	66.1	33	297	86	127.0	121.4	26.5	93	39	60	278	10.38	13.	4	14	1.2	4
6.0	144	129	1.16	2542	11.5	63.3	54	702	421	99.6	92.9	40.2	113	31	68	172	6.39	15.	5	17	1.4	5
6.5	156	140	1.25	2646	12.0	60.8	68	1043	705	83.5	77.0	48.3	130	26	75	135	5.02	16.	5	18	1.5	6
7.0	168	151	1.35	2746	12.5	58.6	80	1334	948	72.3	66.3	53.8	146	22	79	115	4.27	17.	6	20	1.6	7
7.5	180	161	1.45	2843	12.9	56.6	91	1585	1159	64.0	58.4	58.0	161	19	83	102	3.77	18.	6	22	1.7	8
8.0	192	172	1.54	2936	13.3	54.8	100	1805	1344	57.5	52.2	61.3	176	16	85	92	3.42	19.	7	23	1.8	9
8.5	204	183	1.64	3027	13.7	53.1	108	1998	1337	52.2	47.4	63.9	189	15	88	85	3.15	20.	7	24	1.9	10
9.0	216	194	1.73	3115	14.1	51.6	116	2170	1262	47.9	43.3	66.1	203	13	90	79	2.94	21.	7	26	2.0	11
9.5	228	204	1.83	3201	14.5	50.3	124	2324	1196	44.2	40.0	67.9	216	12	92	75	2.76	22.	8	27	2.1	12
10.0	240	215	1.93	3285	14.9	49.0	131	2462	1136	41.1	37.1	69.5	229	11	93	71	2.61	23.	8	28	2.2	13
10.5	252	226	2.02	3366	15.2	47.8	137	2586	1082	38.4	34.6	70.8	242	10	95	67	2.49	25.	8	29	2.3	13
11.0	264	237	2.12	3446	15.6	46.7	144	2700	1033	36.0	32.5	72.0	255	9	96	64	2.38	26.	9	31	2.4	14
11.5	276	247	2.22	3524	16.0	45.7	150	2803	988	33.9	30.6	73.0	267	9	97	62	2.28	27.	9	32	2.4	15
12.0	288	258	2.31	3600	16.3	44.7	156	2898	947	32.1	28.9	74.0	280	8	98	59	2.20	28.	9	33	2.5	15
13.0	312	280	2.51	3748	17.0	43.0	167	3066	874	28.9	26.0	75.5	305	7	101	55	2.05	30.	10	35	2.7	17
14.0	336	301	2.70	3891	17.6	41.4	177	3209	811	26.3	23.7	76.8	330	6	102	52	1.93	32.	11	37	2.8	18
15.0	360	323	2.89	4028	18.2	40.0	187	3334	757	24.2	21.7	77.9	354	6	104	49	1.83	34.	11	39	2.9	19
16.0	384	344	3.08	4161	18.8	38.7	196	3442	710	22.4	20.1	78.8	379	5	106	47	1.74	36.	12	41	3.0	21
17.0	408	366	3.28	4291	19.4	37.6	205	3538	668	20.8	18.7	79.6	403	5	108	45	1.67	38.	13	43	3.2	22
18.0	432	387	3.47	4416	20.0	36.5	213	3623	631	19.4	17.4	80.3	427	5	109	43	1.60	40.	13	45	3.3	23
19.0	456	409	3.66	4538	20.5	35.5	222	3699	598	18.2	16.4	80.9	452	4	110	42	1.54	42.	14	47	3.4	24
20.0	480	430	3.85	4657	21.0	34.6	229	3768	568	17.2	15.4	81.4	476	4	112	40	1.49	44.	15	49	3.5	26
25.0	600	538	4.82	5214	23.5	31.0	265	4028	454	13.3	11.9	83.3	597	3	118	35	1.29	54.	18	57	4.0	31
30.0	720	646	5.78	5719	25.8	28.3	297	4200	378	10.9	9.8	84.6	718	2	124	31	1.15	63.	21	66	4.4	36
35.0	840	753	6.75	6186	27.8	26.2	326	4323	324	9.2	8.2	85.4	838	2	129	28	1.05	72.	24	74	4.8	
40.0	960	861	7.71	6622	29.8	24.5	352	4416	284	8.0	7.1	86.0	958	2	134	26	0.97	80.	27	81	5.2	
45.0	1080	968	8.67	7032	31.6	23.1	376	4487	252	7.0	6.3	86.5	1078	2	139	25	0.91	89.	30	89	5.5	
50.0	1200	1076	9.64	7423	33.3	21.9	399	4544	227	6.3	5.6	86.9	1199	1	143	23	0.86	97.	33	96	5.9	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#143 24 Mg on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 83. ZC= 95.(Am)
NEUTRON NUMBERS: NP= 12. NT=126. NC=138.

AP**1/3= 2.884 AT**1/3= 5.934
REDUCED MASS NUMBER= 21.53 AP+AT=AC=233.

INTERACTION RADIUS RINT=12.68 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 6.83 CT+CP= 9.73 C= 2.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.68 RC=RCP+RCT= 9.89

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 197.08 MeV K= .09097 n=2.773
VC(RINT)= 112.9 MeV

FISSION-TKE= 179. MeV
ASYMM. FISSION-TKE= 79. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 22.85 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.14 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: -16.5
COMPOUND NUCLEUS: 44.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.45 fm V(RB)= 117.2 MeV
Q-VALUE= -76.8 MeV
L-CRITICAL= 88.

24 Mg on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	22	0.19	1036	4.7	156.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	48	43	0.38	1466	6.7	110.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	72	65	0.57	1796	8.2	90.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	96	86	0.76	2074	9.4	78.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	108	97	0.86	2200	10.0	73.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	120	108	0.95	2319	10.5	70.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	132	118	1.05	2433	11.0	66.9	30	244	41	132.0	126.8	24.0	91	41	59	311	11.52	13.	4	14	1.2	4
6.0	144	129	1.14	2542	11.5	64.0	52	655	381	102.2	95.6	38.9	112	32	68	181	6.63	15.	5	16	1.3	5
6.5	156	140	1.24	2646	12.0	61.5	67	1000	668	85.3	78.9	47.3	130	26	74	140	5.13	16.	5	18	1.5	6
7.0	168	151	1.33	2746	12.5	59.3	79	1294	915	73.8	67.7	53.1	146	22	79	118	4.34	17.	6	20	1.6	7
7.5	180	161	1.43	2843	12.9	57.3	90	1549	1128	65.2	59.5	57.4	161	19	83	104	3.83	18.	6	22	1.7	8
8.0	192	172	1.53	2936	13.3	55.4	99	1771	1315	58.5	53.2	60.7	175	17	86	94	3.46	19.	7	23	1.8	9
8.5	204	183	1.62	3027	13.7	53.8	108	1967	1333	53.1	48.2	63.4	189	15	88	87	3.18	20.	7	24	1.9	10
9.0	216	194	1.72	3115	14.1	52.3	116	2141	1259	48.7	44.1	65.7	202	14	90	81	2.96	21.	7	26	2.0	11
9.5	228	205	1.81	3201	14.5	50.9	123	2297	1192	44.9	40.6	67.5	216	12	92	76	2.78	22.	8	27	2.1	12
10.0	240	215	1.91	3285	14.9	49.6	130	2437	1133	41.7	37.7	69.1	229	11	94	72	2.63	23.	8	28	2.2	12
10.5	252	226	2.00	3366	15.3	48.4	137	2563	1079	39.0	35.2	70.5	242	10	95	68	2.50	24.	8	29	2.3	13
11.0	264	237	2.10	3446	15.6	47.3	143	2678	1030	36.6	33.0	71.7	254	10	96	65	2.39	26.	9	31	2.3	14
11.5	276	248	2.19	3524	16.0	46.2	149	2783	985	34.4	31.0	72.8	267	9	98	63	2.29	27.	9	32	2.4	14
12.0	288	258	2.29	3600	16.3	45.3	155	2879	944	32.5	29.3	73.7	280	8	99	60	2.21	28.	9	33	2.5	15
13.0	312	280	2.48	3748	17.0	43.5	166	3049	871	29.3	26.4	75.3	305	7	101	56	2.06	30.	10	35	2.6	16
14.0	336	301	2.67	3891	17.6	41.9	177	3194	809	26.7	24.0	76.7	329	7	103	53	1.94	32.	11	37	2.8	18
15.0	360	323	2.86	4028	18.2	40.5	186	3320	755	24.5	22.0	77.7	354	6	105	50	1.84	34.	11	39	2.9	19
16.0	384	344	3.05	4161	18.8	39.2	196	3430	708	22.6	20.4	78.7	379	5	106	48	1.75	36.	12	41	3.0	20
17.0	408	366	3.24	4291	19.4	38.0	205	3527	666	21.1	18.9	79.5	403	5	108	46	1.67	38.	13	43	3.2	22
18.0	432	388	3.43	4416	20.0	37.0	213	3613	629	19.7	17.7	80.2	427	5	110	44	1.61	40.	13	45	3.3	23
19.0	456	409	3.62	4538	20.5	36.0	221	3690	596	18.5	16.6	80.8	452	4	111	42	1.55	42.	14	47	3.4	24
20.0	480	431	3.81	4657	21.1	35.1	229	3760	566	17.4	15.6	81.3	476	4	112	41	1.49	44.	15	48	3.5	25
25.0	600	538	4.77	5214	23.5	31.4	265	4023	453	13.5	12.1	83.3	597	3	119	35	1.29	54.	18	57	4.0	30
30.0	720	646	5.72	5719	25.8	28.6	297	4197	377	11.0	9.9	84.5	718	2	124	32	1.15	63.	21	66	4.4	35
35.0	840	753	6.67	6186	27.9	26.5	326	4322	323	9.3	8.3	85.3	838	2	130	29	1.05	72.	24	73	4.8	
40.0	960	861	7.63	6622	29.8	24.8	352	4416	283	8.1	7.2	86.0	958	2	134	27	0.97	80.	27	81	5.2	
45.0	1080	969	8.58	7032	31.6	23.4	377	4488	251	7.1	6.4	86.4	1078	2	139	25	0.91	89.	30	89	5.5	
50.0	1200	1076	9.53	7423	33.3	22.2	400	4546	226	6.4	5.7	86.8	1199	1	143	23	0.86	96.	33	96	5.9	

#144 24 Mg on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 12. ZT= 92. ZC=104.( )
NEUTRON NUMBERS: NP= 12. NT=146. NC=158.

AP**1/3= 2.884 AT**1/3= 6.197
REDUCED MASS NUMBER= 21.80 AP+AT=AC=262.

INTERACTION RADIUS RINT=12.97 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 2.90 CT= 7.16 CT+CP=10.06 C= 2.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.21 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.21 RCT= 6.98 RC=RCP+RCT=10.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 211.42 MeV K= .08268 n=2.805
VC(RINT)= 122.4 MeV

FISSION-TKE= 203. MeV
ASYMM. FISSION-TKE= 83. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.880 MeV/fm**2 PROX-FACTOR= 22.81 MeV
L-RLD= 55 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.03 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -16.2 TARGET: 47.2
COMPOUND NUCLEUS: 103.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.72 fm V(RB)= 126.9 MeV
Q-VALUE= -72.6 MeV
L-CRITICAL= 90.

24 Mg on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	24	22	0.18	1036	4.8	173.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	48	44	0.36	1466	6.7	122.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	72	65	0.53	1796	8.3	100.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	96	87	0.71	2074	9.5	86.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	108	98	0.80	2200	10.1	81.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	120	109	0.89	2319	10.7	77.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	132	120	0.98	2433	11.2	74.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	144	131	1.07	2542	11.7	71.0	38	350	130	123.7	118.6	28.2	107	37	66	280	9.54	13.	4	15	1.3	6
6.5	156	142	1.16	2646	12.2	68.2	58	738	452	99.3	93.5	40.3	126	30	73	185	6.26	14.	5	17	1.5	7
7.0	168	153	1.25	2746	12.6	65.7	73	1068	727	84.3	78.6	47.8	143	25	79	148	5.00	15.	6	19	1.6	8
7.5	180	164	1.34	2843	13.1	63.5	85	1354	967	73.7	68.3	53.2	158	22	83	127	4.28	16.	6	21	1.7	9
8.0	192	174	1.42	2936	13.5	61.5	95	1603	1176	65.6	60.6	57.2	173	19	86	113	3.80	17.	6	22	1.8	10
8.5	204	185	1.51	3027	13.9	59.6	105	1823	1344	59.2	54.5	60.4	187	17	89	102	3.46	18.	7	24	1.9	11
9.0	216	196	1.60	3115	14.3	57.9	114	2018	1269	54.0	49.6	63.0	201	15	91	94	3.19	19.	7	25	1.9	12
9.5	228	207	1.69	3201	14.7	56.4	122	2192	1202	49.7	45.6	65.1	215	13	93	88	2.98	20.	8	26	2.0	13
10.0	240	218	1.78	3285	15.1	55.0	129	2349	1142	46.0	42.2	67.0	228	12	94	83	2.80	21.	8	27	2.1	14
10.5	252	229	1.87	3366	15.5	53.6	137	2490	1088	42.9	39.2	68.6	241	11	96	79	2.66	22.	8	28	2.2	14
11.0	264	240	1.96	3446	15.8	52.4	143	2619	1038	40.2	36.7	69.9	254	10	97	75	2.53	23.	9	30	2.3	15
11.5	276	251	2.05	3524	16.2	51.3	150	2736	993	37.8	34.5	71.1	266	10	99	72	2.42	24.	9	31	2.3	16
12.0	288	262	2.14	3600	16.5	50.2	156	2844	952	35.6	32.5	72.2	279	9	100	69	2.32	25.	9	32	2.4	17
13.0	312	283	2.32	3748	17.2	48.2	168	3034	878	32.0	29.2	74.0	304	8	102	64	2.16	27.	10	34	2.5	18
14.0	336	305	2.49	3891	17.8	46.5	179	3197	816	29.1	26.5	75.4	329	7	104	60	2.03	28.	11	36	2.7	20
15.0	360	327	2.67	4028	18.5	44.9	189	3338	761	26.7	24.3	76.7	354	6	105	57	1.91	30.	11	38	2.8	21
16.0	384	349	2.85	4161	19.1	43.5	199	3461	714	24.6	22.4	77.7	378	6	107	54	1.82	32.	12	40	2.9	23
17.0	408	371	3.03	4291	19.7	42.2	209	3570	672	22.9	20.8	78.6	403	5	108	52	1.74	34.	13	42	3.0	24
18.0	432	392	3.21	4416	20.2	41.0	218	3666	634	21.3	19.4	79.3	427	5	110	49	1.67	36.	13	43	3.1	25
19.0	456	414	3.38	4538	20.8	39.9	226	3753	601	20.0	18.2	80.0	451	5	111	48	1.60	38.	14	45	3.2	26
20.0	480	436	3.56	4657	21.3	38.9	234	3830	571	18.8	17.1	80.6	476	4	112	46	1.55	39.	14	47	3.3	28
25.0	600	545	4.45	5214	23.8	34.8	272	4125	456	14.6	13.2	82.7	597	3	118	39	1.33	48.	17	56	3.8	34
30.0	720	654	5.34	5719	26.1	31.7	305	4321	380	11.9	10.8	84.1	717	3	123	35	1.19	56.	20	64	4.2	39
35.0	840	763	6.23	6186	28.2	29.4	335	4461	326	10.0	9.1	85.0	838	2	128	32	1.08	64.	23	71	4.6	
40.0	960	872	7.12	6622	30.2	27.5	363	4566	285	8.7	7.9	85.7	958	2	132	30	1.00	72.	26	79	4.9	
45.0	1080	981	8.01	7032	32.0	25.9	388	4647	253	7.6	6.9	86.2	1078	2	136	28	0.93	79.	29	86	5.3	
50.0	1200	1090	8.90	7423	33.7	24.6	412	4712	228	6.8	6.2	86.6	1199	1	140	26	0.88	86.	32	93	5.6	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 24 Mg

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#145 28 Si on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 6. ZC= 20.(Ca)
NEUTRON NUMBERS: NP= 14. NT= 6. NC= 20.

AP**1/3= 3.037 AT**1/3= 2.289 ELSCAT <25 deg
REDUCED MASS NUMBER= 8.40 AP+AT=AC= 40.

INTERACTION RADIUS RINT= 8.89 fm R0= 1.67 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 2.12 CT+CP= 5.22 C= 1.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.39 RCT= 2.51 RC=RCP+RCT= 5.90

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 28.61 MeV K= .09404 n=2.513
VC(RINT)= 13.6 MeV

FISSION-TKE= 35. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 15.06 MeV
L-RLD= 40 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.92 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: 0.0
COMPOUND NUCLEUS: -33.0

FUSION RELATED PARAMETERS:
R-BARRIER= 8.09 fm V(RB)= 13.8 MeV
Q-VALUE= 7.9 MeV
L-CRITICAL= 26.

28 Si on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	8	0.62	1209	1.8	13.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	56	17	1.24	1710	2.6	9.4	10	569	366	85.8	22.5	47.1	34	22	0	21	6.52	38.	0 0	2.2	1
3.0	84	25	1.85	2095	3.2	7.6	19	1263	929	43.4	12.7	68.3	74	10	0	11	3.42	57.	0 0	2.6	1
4.0	112	34	2.47	2420	3.7	6.6	25	1596	1210	29.4	8.7	75.3	106	6	102	9	2.60	74.	4 14	2.9	2
4.5	126	38	2.78	2567	3.9	6.2	28	1704	1304	25.4	7.5	77.3	121	5	112	8	2.37	84.	5 17	3.0	2
5.0	140	42	3.09	2706	4.1	5.9	30	1791	1379	22.3	6.6	78.9	136	4	123	7	2.19	93.	6 20	3.2	2
5.5	154	46	3.40	2838	4.3	5.6	32	1861	1265	19.9	5.9	80.1	150	4	133	7	2.04	102.	6 23	3.3	2
6.0	168	50	3.71	2965	4.5	5.4	34	1919	1160	18.0	5.4	81.0	165	3	142	6	1.92	112.	7 25	3.4	2
6.5	182	55	4.02	3087	4.7	5.2	36	1967	1071	16.4	4.9	81.8	179	3	152	6	1.82	118.	7 27	3.5	3
7.0	196	59	4.33	3204	4.9	5.0	38	2009	994	15.0	4.5	82.5	193	3	161	6	1.73	127.	8 29	3.7	3
7.5	210	63	4.63	3316	5.0	4.8	40	2044	928	13.9	4.2	83.0	207	3	170	5	1.66	136.	8 31	3.8	3
8.0	224	67	4.94	3426	5.2	4.7	41	2076	870	12.9	3.9	83.5	222	2	179	5	1.59	145.	9 33	3.9	3
8.5	238	71	5.25	3532	5.4	4.5	43	2103	819	12.1	3.6	84.0	236	2	188	5	1.53	154.	9 35	4.0	3
9.0	252	76	5.56	3634	5.5	4.4	44	2127	773	11.4	3.4	84.3	250	2	197	5	1.48	159.	10 37	4.1	4
9.5	266	80	5.87	3734	5.7	4.3	46	2149	732	10.7	3.2	84.7	264	2	205	5	1.43	167.	10 39	4.2	4
10.0	280	84	6.18	3832	5.8	4.2	47	2168	696	10.1	3.0	84.9	278	2	214	5	1.39	176.	11 40	4.3	4
10.5	294	88	6.49	3927	6.0	4.1	49	2185	663	9.6	2.9	85.2	292	2	223	4	1.35	185.	11 42	4.4	4
11.0	308	92	6.80	4020	6.1	4.0	50	2201	632	9.1	2.7	85.4	306	2	231	4	1.31	194.	12 44	4.5	4
11.5	322	97	7.11	4111	6.2	3.9	51	2215	605	8.7	2.6	85.7	320	2	240	4	1.28	203.	12 45	4.6	4
12.0	336	101	7.42	4200	6.4	3.8	53	2228	580	8.3	2.5	85.8	335	1	249	4	1.25	212.	13 47	4.7	4
13.0	364	109	8.03	4373	6.6	3.7	55	2251	535	7.6	2.3	86.2	363	1	265	4	1.19	223.	14 50	4.8	5
14.0	392	118	8.65	4539	6.9	3.5	57	2271	497	7.0	2.1	86.5	391	1	282	4	1.14	240.	15 53	5.0	5
15.0	420	126	9.27	4699	7.1	3.4	60	2288	464	6.5	2.0	86.7	419	1	299	4	1.10	257.	16 56	5.2	5
16.0	448	134	9.89	4855	7.3	3.3	62	2302	435	6.1	1.8	86.9	447	1	315	3	1.06	266.	17 59	5.3	6
17.0	476	143	10.51	5006	7.6	3.2	64	2315	409	5.7	1.7	87.1	475	1	332	3	1.02	283.	18 62	5.5	6
18.0	504	151	11.12	5152	7.8	3.1	66	2326	386	5.4	1.6	87.3	503	1	348	3	0.99	300.	19 65	5.6	6
19.0	532	160	11.74	5295	8.0	3.0	68	2337	366	5.1	1.5	87.4	531	1	365	3	0.96	316.	20 68	5.8	6
20.0	560	168	12.36	5434	8.2	3.0	70	2346	348	4.8	1.5	87.6	559	1	381	3	0.94	323.	21 70	5.9	7
25.0	700	210	15.45	6083	9.2	2.6	79	2379	278	3.8	1.2	88.1	699	1	461	3	0.83	392.	25 84	6.6	8
30.0	840	252	18.54	6673	10.1	2.4	87	2401	232	3.2	1.0	88.4	839	1	540	2	0.75	455.	30 96	7.2	9
35.0	980	294	21.63	7217	10.9	2.2	94	2417	198	2.7	0.8	88.6	980	0	618	2	0.70	514.	34 108	7.8	
40.0	1120	336	24.72	7725	11.6	2.1	101	2428	174	2.4	0.7	88.8	1120	0	696	2	0.65	568.	39 120	8.3	
45.0	1260	378	27.81	8205	12.3	2.0	108	2436	154	2.1	0.6	88.9	1260	0	773	2	0.61	639.	43 132	8.8	
50.0	1400	420	30.90	8660	13.0	1.9	114	2443	139	1.9	0.6	89.1	1400	0	850	2	0.58	686.	48 143	9.3	

#146 28 Si on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 8. ZC= 22.(Ti)
NEUTRON NUMBERS: NP= 14. NT= 8. NC= 22.

AP**1/3= 3.037 AT**1/3= 2.520 ELSCAT <34 deg
REDUCED MASS NUMBER= 10.18 AP+AT=AC= 44.

INTERACTION RADIUS RINT= 9.14 fm R0= 1.64 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 2.42 CT+CP= 5.52 C= 1.36

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.39 RCT= 2.78 RC=RCP+RCT= 6.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 36.66 MeV K= .11766 n=2.471
VC(RINT)= 17.6 MeV

FISSION-TKE= 37. MeV
ASYMM. FISSION-TKE= 34. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 16.26 MeV
L-RLD= 43 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 18.99 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -4.7
COMPOUND NUCLEUS: -38.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.29 fm V(RB)= 18.0 MeV
Q-VALUE= 8.4 MeV
L-CRITICAL= 32.

28 Si on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	10	0.58	1209	2.2	17.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	56	20	1.16	1710	3.1	12.5	11	420	246	99.7	31.9	40.2	26	30	0	34	8.00	35.	0 0	2.3	1
3.0	84	31	1.73	2095	3.9	10.2	23	1207	884	47.9	17.0	66.0	71	13	0	16	3.67	51.	0 0	2.7	2
4.0	112	41	2.31	2420	4.5	8.8	31	1586	1203	32.1	11.6	73.9	104	8	98	12	2.74	68.	4 15	3.0	2
4.5	126	46	2.60	2567	4.7	8.3	34	1710	1309	27.6	10.0	76.2	119	7	108	11	2.48	76.	5 18	3.1	2
5.0	140	51	2.89	2706	5.0	7.9	37	1809	1374	24.2	8.8	77.9	134	6	118	10	2.29	85.	6 21	3.3	2
5.5	154	56	3.18	2838	5.2	7.5	40	1890	1249	21.6	7.8	79.2	149	5	127	9	2.13	91.	6 23	3.4	3
6.0	168	61	3.47	2965	5.5	7.2	42	1956	1145	19.4	7.0	80.3	164	4	135	9	2.00	100.	7 26	3.6	3
6.5	182	66	3.76	3087	5.7	6.9	44	2012	1057	17.7	6.4	81.2	178	4	144	8	1.89	108.	7 28	3.7	3
7.0	196	71	4.04	3204	5.9	6.7	47	2060	982	16.2	5.9	81.9	192	4	152	8	1.80	116.	8 30	3.8	3
7.5	210	76	4.33	3316	6.1	6.4	49	2101	916	15.0	5.4	82.5	207	3	160	7	1.72	121.	8 32	3.9	4
8.0	224	81	4.62	3426	6.3	6.2	51	2137	859	14.0	5.1	83.0	221	3	168	7	1.65	130.	9 34	4.0	4
8.5	238	87	4.91	3532	6.5	6.0	53	2169	808	13.0	4.7	83.5	235	3	176	7	1.59	138.	9 36	4.2	4
9.0	252	92	5.20	3634	6.7	5.9	55	2197	763	12.2	4.4	83.9	249	3	184	7	1.53	146.	10 38	4.3	4
9.5	266	97	5.49	3734	6.9	5.7	57	2222	723	11.5	4.2	84.2	264	2	192	6	1.48	154.	10 39	4.4	4
10.0	280	102	5.78	3832	7.0	5.6	59	2244	687	10.9	4.0	84.6	278	2	199	6	1.44	158.	11 41	4.5	5
10.5	294	107	6.07	3927	7.2	5.4	60	2265	654	10.3	3.7	84.8	292	2	207	6	1.40	166.	11 43	4.6	5
11.0	308	112	6.36	4020	7.4	5.3	62	2283	624	9.8	3.6	85.1	306	2	215	6	1.36	174.	12 45	4.7	5
11.5	322	117	6.64	4111	7.6	5.2	64	2300	597	9.3	3.4	85.3	320	2	222	6	1.32	182.	12 46	4.8	5
12.0	336	122	6.93	4200	7.7	5.1	65	2315	572	8.9	3.2	85.5	334	2	230	6	1.29	189.	13 48	4.9	5
13.0	364	132	7.51	4373	8.0	4.9	68	2342	528	8.2	3.0	85.9	362	2	245	5	1.23	200.	14 51	5.1	6
14.0	392	143	8.09	4539	8.3	4.7	71	2364	491	7.6	2.7	86.2	390	2	259	5	1.18	215.	15 54	5.2	6
15.0	420	153	8.67	4699	8.6	4.6	74	2384	458	7.0	2.6	86.5	419	1	274	5	1.13	231.	16 57	5.4	6
16.0	448	163	9.24	4855	8.9	4.4	77	2401	429	6.6	2.4	86.7	447	1	288	5	1.09	240.	16 60	5.6	7
17.0	476	173	9.82	5006	9.2	4.3	80	2416	404	6.2	2.2	86.9	475	1	302	5	1.06	255.	17 63	5.7	7
18.0	504	183	10.40	5152	9.4	4.2	82	2430	381	5.8	2.1	87.1	503	1	317	4	1.02	270.	18 66	5.9	7
19.0	532	193	10.98	5295	9.7	4.0	85	2442	361	5.5	2.0	87.3	531	1	331	4	0.99	277.	19 68	6.1	8
20.0	560	204	11.56	5434	10.0	3.9	87	2452	343	5.2	1.9	87.4	559	1	345	4	0.97	291.	20 71	6.2	8
25.0	700	255	14.45	6083	11.1	3.5	98	2492	274	4.1	1.5	87.9	699	1	414	4	0.86	354.	25 84	6.9	9
30.0	840	305	17.33	6673	12.2	3.2	108	2519	229	3.4	1.2	88.3	839	1	482	3	0.78	413.	29 97	7.6	10
35.0	980	356	20.22	7217	13.2	3.0	117	2537	196	2.9	1.1	88.5	979	1	549	3	0.72	467.	33 109	8.1	
40.0	1120	407	23.11	7725	14.1	2.8	126	2551	171	2.5	0.9	88.7	1119	1	616	3	0.67	518.	38 121	8.7	
45.0	1260	458	26.00	8205	14.9	2.6	134	2561	152	2.2	0.8	88.9	1260	0	682	3	0.63	565.	42 132	9.2	
50.0	1400	509	28.89	8660	15.7	2.5	141	2569	137	2.0	0.7	89.0	1400	0	747	3	0.59	607.	46 143	9.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-h	ab	ab	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#147 28 Si on 27 Al

28 Si on 27 Al

28 Si on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 13. ZC= 27.(Co)
NEUTRON NUMBERS: NP= 14. NT= 14. NC= 28.

AP**1/3= 3.037 AT**1/3= 3.000 ELSCAT <74 deg
REDUCED MASS NUMBER= 13.75 AP+AT=AC= 55.

INTERACTION RADIUS RINT= 9.67 fm RO= 1.60 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 3.05 CT+CP= 6.14 C= 1.54

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.39 RCT= 3.32 RC=RCP+RCT= 6.71

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 54.98 MeV K= .15358 n=2.440
VC(RINT)= 27.1 MeV

FISSION-TKE= 43. MeV
ASYMM. FISSION-TKE= 43. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 18.36 MeV
L-RLD= 53 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.18 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -20.6
COMPOUND NUCLEUS: -57.7

FUSION RELATED PARAMETERS:
R-BARRIER= 8.73 fm V(RB)= 28.0 MeV
Q-VALUE= 12.0 MeV
L-CRITICAL= 44.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPMAX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	28	14	0.51	1209	3.0	28.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	56	27	1.02	1710	4.3	20.3	5	59	0	153.2	72.2	13.4	3	53	0	165	26.29	0.	0 0	2.4	2
3.0	84	41	1.52	2095	5.2	16.5	29	1075	769	58.6	28.7	60.7	64	20	0	28	4.31	41.	0 0	2.8	2
4.0	112	55	2.03	2420	6.0	14.3	41	1561	1174	38.2	18.7	70.9	100	12	89	20	3.07	54.	4 16	3.1	3
4.5	126	62	2.28	2567	6.4	13.5	46	1721	1309	32.6	16.0	73.7	116	10	98	18	2.75	61.	5 19	3.3	3
5.0	140	69	2.54	2706	6.7	12.8	51	1848	1418	28.4	14.0	75.8	132	8	106	16	2.51	66.	5 22	3.4	4
5.5	154	76	2.79	2838	7.1	12.2	55	1952	1289	25.2	12.4	77.4	147	7	113	15	2.33	73.	6 24	3.6	4
6.0	168	82	3.05	2965	7.4	11.7	58	2038	1181	22.7	11.1	78.7	162	6	120	14	2.18	79.	6 26	3.7	4
6.5	182	89	3.30	3087	7.7	11.2	62	2111	1090	20.6	10.1	79.7	176	6	127	13	2.05	86.	7 28	3.8	4
7.0	196	96	3.55	3204	8.0	10.8	65	2173	1013	18.9	9.3	80.6	191	5	133	13	1.95	91.	8 31	4.0	5
7.5	210	103	3.81	3316	8.2	10.5	68	2227	945	17.4	8.5	81.3	205	5	140	12	1.86	97.	8 32	4.1	5
8.0	224	110	4.06	3426	8.5	10.1	71	2274	886	16.2	7.9	81.9	220	4	146	12	1.78	104.	8 34	4.2	5
8.5	238	117	4.32	3532	8.8	9.8	74	2315	834	15.1	7.4	82.5	234	4	152	11	1.71	108.	9 36	4.3	6
9.0	252	124	4.57	3634	9.0	9.6	77	2352	787	14.1	6.9	82.9	248	4	158	11	1.65	114.	9 38	4.4	6
9.5	266	131	4.82	3734	9.3	9.3	80	2384	746	13.3	6.5	83.3	262	4	164	10	1.59	121.	10 40	4.6	6
10.0	280	137	5.08	3832	9.5	9.1	82	2414	709	12.6	6.2	83.7	277	3	170	10	1.54	127.	10 41	4.7	6
10.5	294	144	5.33	3927	9.7	8.8	85	2440	675	11.9	5.8	84.1	291	3	175	10	1.50	133.	11 43	4.8	6
11.0	308	151	5.58	4020	10.0	8.6	87	2464	644	11.3	5.5	84.3	305	3	181	10	1.45	137.	11 45	4.9	7
11.5	322	158	5.84	4111	10.2	8.5	90	2486	616	10.8	5.3	84.6	319	3	187	9	1.42	143.	12 46	5.0	7
12.0	336	165	6.09	4200	10.4	8.3	92	2506	590	10.3	5.0	84.9	333	3	192	9	1.38	149.	12 48	5.1	7
13.0	364	179	6.60	4373	10.8	7.9	96	2542	545	9.4	4.6	85.3	362	2	203	9	1.32	158.	13 51	5.3	8
14.0	392	192	7.11	4539	11.2	7.7	101	2572	506	8.7	4.3	85.7	390	2	214	8	1.26	170.	14 54	5.5	8
15.0	420	206	7.61	4699	11.6	7.4	105	2598	472	8.1	4.0	86.0	418	2	224	8	1.21	183.	15 57	5.6	8
16.0	448	220	8.12	4855	12.0	7.2	109	2621	443	7.5	3.7	86.2	446	2	235	8	1.17	191.	16 60	5.8	9
17.0	476	234	8.63	5006	12.4	7.0	113	2641	417	7.1	3.5	86.5	474	2	245	7	1.13	203.	17 63	6.0	9
18.0	504	247	9.14	5152	12.8	6.8	116	2659	393	6.6	3.3	86.7	502	2	255	7	1.09	210.	17 65	6.1	10
19.0	532	261	9.65	5295	13.1	6.6	120	2674	373	6.3	3.1	86.9	530	2	266	7	1.06	221.	18 68	6.3	10
20.0	560	275	10.15	5434	13.4	6.4	123	2689	354	5.9	2.9	87.0	558	2	276	7	1.03	233.	19 71	6.5	10
25.0	700	344	12.69	6083	15.0	5.7	139	2742	283	4.7	2.3	87.6	699	1	325	6	0.91	278.	23 84	7.2	12
30.0	840	412	15.23	6673	16.5	5.2	154	2778	236	3.9	1.9	88.1	839	1	373	5	0.83	319.	27 96	7.9	14
35.0	980	481	17.77	7217	17.8	4.8	167	2803	202	3.3	1.6	88.3	979	1	421	5	0.76	363.	32 107	8.5	
40.0	1120	550	20.31	7725	19.0	4.5	179	2822	177	2.9	1.4	88.6	1119	1	467	5	0.71	394.	36 119	9.0	
45.0	1260	619	22.84	8205	20.2	4.3	191	2836	157	2.6	1.3	88.7	1259	1	513	4	0.67	431.	40 130	9.6	
50.0	1400	687	25.38	8660	21.3	4.1	201	2847	141	2.3	1.1	88.8	1399	1	558	4	0.63	466.	44 140	10.1	

#148 28 Si on 40 Ca

28 Si on 40 Ca

28 Si on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 20. ZC= 34.(Se)
NEUTRON NUMBERS: NP= 14. NT= 20. NC= 34.

AP**1/3= 3.037 AT**1/3= 3.420
REDUCED MASS NUMBER= 16.47 AP+AT=AC= 68.

INTERACTION RADIUS RINT=10.12 fm RO= 1.57 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 3.59 CT+CP= 6.69 C= 1.66

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.39 RCT= 3.84 RC=RCP+RCT= 7.23

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 78.40 MeV K= .17775 n=2.452
VC(RINT)= 39.8 MeV

FISSION-TKE= 53. MeV
ASYMM. FISSION-TKE= 51. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 19.88 MeV
L-RLD= 61 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.89 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -33.0
COMPOUND NUCLEUS: -55.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.09 fm V(RB)= 41.5 MeV
Q-VALUE= -3.0 MeV
L-CRITICAL= 53.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPMAX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	28	16	0.41	1209	3.6	44.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	56	33	0.83	1710	5.1	31.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	84	49	1.24	2095	6.2	25.5	28	671	415	84.9	51.6	47.6	47	37	0	58	6.00	34.	0 0	2.3	2
4.0	112	66	1.66	2420	7.2	22.0	46	1330	960	51.3	30.5	64.3	92	20	79	35	3.64	44.	4 15	2.7	3
4.5	126	74	1.86	2567	7.6	20.8	53	1547	1142	43.1	25.5	68.5	110	16	88	31	3.17	50.	5 18	2.9	3
5.0	140	82	2.07	2706	8.1	19.7	59	1720	1288	37.2	22.0	71.4	126	14	96	27	2.85	54.	5 21	3.1	4
5.5	154	91	2.28	2838	8.4	18.8	64	1861	1304	32.7	19.3	73.6	142	12	103	25	2.61	60.	6 23	3.2	4
6.0	168	99	2.48	2965	8.8	18.0	69	1979	1195	29.2	17.2	75.4	158	10	109	23	2.42	65.	6 26	3.4	4
6.5	182	107	2.69	3087	9.2	17.3	74	2078	1103	26.4	15.6	76.8	173	9	115	22	2.27	69.	7 28	3.5	5
7.0	196	115	2.90	3204	9.5	16.7	78	2162	1024	24.1	14.2	78.0	188	8	121	21	2.14	75.	7 30	3.6	5
7.5	210	124	3.11	3316	9.9	16.1	82	2235	956	22.2	13.1	78.9	202	8	126	20	2.03	79.	8 32	3.8	6
8.0	224	132	3.31	3426	10.2	15.6	86	2299	896	20.5	12.1	79.7	217	7	131	19	1.94	84.	8 33	3.9	6
8.5	238	140	3.52	3532	10.5	15.1	90	2356	843	19.1	11.2	80.5	232	6	136	18	1.86	89.	9 35	4.0	6
9.0	252	148	3.73	3634	10.8	14.7	94	2406	797	17.9	10.5	81.1	246	6	141	17	1.78	95.	9 37	4.1	6
9.5	266	156	3.93	3734	11.1	14.3	97	2450	755	16.8	9.9	81.6	261	5	145	17	1.72	98.	9 39	4.2	7
10.0	280	165	4.14	3832	11.4	13.9	100	2490	717	15.8	9.3	82.1	275	5	150	16	1.66	103.	10 40	4.4	7
10.5	294	173	4.35	3927	11.7	13.6	104	2527	683	15.0	8.8	82.5	289	5	154	16	1.61	109.	10 42	4.5	7
11.0	308	181	4.56	4020	11.9	13.3	107	2560	652	14.2	8.3	82.9	303	5	159	15	1.56	112.	11 43	4.6	8
11.5	322	189	4.76	4111	12.2	13.0	110	2590	623	13.5	7.9	83.3	318	4	163	15	1.52	117.	11 45	4.7	8
12.0	336	198	4.97	4200	12.5	12.7	113	2617	597	12.9	7.6	83.6	332	4	167	14	1.48	122.	12 46	4.8	8
13.0	364	214	5.38	4373	13.0	12.2	119	2666	551	11.8	6.9	84.1	360	4	176	14	1.41	130.	12 49	5.0	9
14.0	392	231	5.80	4539	13.5	11.8	124	2707	512	10.8	6.4	84.6	389	3	184	13	1.35	140.	13 52	5.2	9
15.0	420	247	6.21	4699	14.0	11.4	129	2743	478	10.1	5.9	85.0	417	3	192	12	1.29	147.	14 55	5.4	10
16.0	448	264	6.63	4855	14.4	11.0	134	2774	448	9.4	5.5	85.3	445	3	200	12	1.24	157.	15 58	5.5	10
17.0	476	280	7.04	5006	14.9	10.7	139	2802	421	8.8	5.2	85.6	473	3	208	12	1.20	164.	16 61	5.7	11
18.0	504	296	7.45	5152	15.3	10.4	144	2826	398	8.3	4.9	85.9	501	3	216	11	1.16	174.	17 63	5.9	11
19.0	532	313	7.87	5295	15.7	10.1	149	2848	377	7.8	4.6	86.1	530	2	223	11	1.12	180.	17 66	6.0	12
20.0	560	329	8.28	5434	16.1	9.9	153	2868	358	7.4	4.3	86.3	558	2	231	11	1.09	190.	18 68	6.2	12
25.0	700	412	10.35	6083	18.0	8.8	173	2942	286	5.8	3.4	87.1	698	2	267	9	0.96	229.	22 81	6.9	14
30.0	840	494	12.42	6673	19.7	8.0	192	2992	239	4.8	2.8	87.6	839	1	302	8	0.87	264.	26 92	7.6	16
35.0	980	576	14.49	7217	21.3	7.5	208	3026	204	4.1	2.4	87.9	979	1	337	8	0.80	297.	30 104	8.2	
40.0	1120	659	16.57	7725	22.8	7.0	224	3053	179	3.6	2.1	88.2	1119	1	370	7	0.75	332.	34 114	8.8	
45.0	1260	741	18.64	8205	24.2	6.6	238	3073	159	3.2	1.9	88.4	1259	1	403	7	0.70	358.	37 125	9.3	
50.0	1400	824	20.71	8660	25.5	6.2	252	3089	143	2.8	1.7	88.6	1399	1	436	6	0.66	390.	41 135	9.8	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#149 28 Si on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 26. ZC= 40.(Zr)
NEUTRON NUMBERS: NP= 14. NT= 30. NC= 44.

AP**1/3= 3.037 AT**1/3= 3.826
REDUCED MASS NUMBER= 18.67 AP+AT=AC= 84.

INTERACTION RADIUS RINT=10.57 fm R0= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 4.12 CT+CP= 7.21 C= 1.77

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.39 RCT= 4.27 RC=RCP+RCT= 7.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 95.94 MeV K= .17904 n=2.475
VC(RINT)= 49.5 MeV

FISSION-TKE= 61. MeV
ASYMM. FISSION-TKE= 56. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.948 MeV/fm**2 PROX-FACTOR= 21.04 MeV
L-RLD= 73 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -61.4
COMPOUND NUCLEUS: -72.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.48 fm V(RB)= 51.7 MeV
Q-VALUE= -14.1 MeV
L-CRITICAL= 64.

28 Si on 56 Fe

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	28	19	0.38	1209	4.1	57.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	37	0.75	1710	5.8	40.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	56	1.13	2095	7.1	33.1	25	433	216	105.3	76.2	37.3	37	47	37	97	8.16	27.	1	3	2.0	2
4.0	112	75	1.51	2420	8.2	28.7	50	1225	867	59.7	40.6	60.2	87	25	71	49	4.12	36.	4	15	2.4	3
4.5	126	84	1.70	2567	8.7	27.0	59	1486	1084	49.5	33.5	65.2	106	20	81	42	3.52	40.	4	18	2.6	4
5.0	140	93	1.88	2706	9.1	25.6	66	1693	1258	42.4	28.6	68.8	124	16	88	37	3.12	44.	5	20	2.7	4
5.5	154	103	2.07	2838	9.6	24.4	73	1863	1400	37.1	25.0	71.4	140	14	95	34	2.83	48.	5	23	2.9	5
6.0	168	112	2.26	2965	10.0	23.4	79	2004	1313	33.0	22.2	73.5	156	12	100	31	2.61	53.	6	25	3.1	5
6.5	182	121	2.45	3087	10.4	22.5	85	2123	1212	29.8	20.0	75.1	171	11	105	29	2.44	56.	6	27	3.2	6
7.0	196	131	2.64	3204	10.8	21.7	90	2224	1125	27.1	18.1	76.5	186	10	110	27	2.29	61.	7	29	3.3	6
7.5	210	140	2.83	3316	11.2	20.9	95	2312	1050	24.9	16.6	77.6	201	9	114	26	2.17	65.	7	30	3.5	6
8.0	224	149	3.01	3426	11.5	20.3	100	2389	984	23.0	15.4	78.5	216	8	118	25	2.07	68.	8	32	3.6	7
8.5	238	159	3.20	3532	11.9	19.7	104	2457	926	21.4	14.3	79.3	231	7	122	24	1.98	73.	8	34	3.7	7
9.0	252	168	3.39	3634	12.2	19.1	109	2517	875	19.9	13.3	80.0	245	7	126	23	1.90	76.	9	36	3.8	8
9.5	266	177	3.58	3734	12.6	18.6	113	2571	829	18.7	12.5	80.6	260	6	130	22	1.83	80.	9	37	3.9	8
10.0	280	187	3.77	3832	12.9	18.1	117	2619	787	17.6	11.8	81.2	274	6	133	21	1.76	84.	10	39	4.1	8
10.5	294	196	3.96	3927	13.2	17.7	121	2663	750	16.7	11.1	81.7	289	5	137	20	1.71	87.	10	40	4.2	9
11.0	308	205	4.14	4020	13.5	17.3	125	2703	716	15.8	10.5	82.1	303	5	140	20	1.65	92.	10	42	4.3	9
11.5	322	215	4.33	4111	13.8	16.9	128	2739	685	15.0	10.0	82.5	317	5	143	19	1.61	94.	11	43	4.4	10
12.0	336	224	4.52	4200	14.1	16.5	132	2772	656	14.3	9.5	82.8	331	5	147	19	1.56	99.	11	45	4.5	10
13.0	364	243	4.90	4373	14.7	15.9	139	2831	606	13.1	8.7	83.5	360	4	153	18	1.49	107.	12	47	4.7	10
14.0	392	261	5.28	4539	15.3	15.3	145	2881	562	12.0	8.0	84.0	388	4	160	17	1.42	113.	13	50	4.9	11
15.0	420	280	5.65	4699	15.8	14.8	152	2924	525	11.2	7.4	84.4	416	4	166	16	1.36	120.	14	53	5.0	12
16.0	448	299	6.03	4855	16.3	14.3	158	2962	492	10.4	6.9	84.8	445	3	172	16	1.31	128.	14	55	5.2	12
17.0	476	317	6.41	5006	16.8	13.9	163	2995	463	9.7	6.5	85.1	473	3	178	15	1.26	134.	15	58	5.4	13
18.0	504	336	6.78	5152	17.3	13.5	169	3025	437	9.1	6.1	85.4	501	3	183	15	1.22	140.	16	61	5.5	14
19.0	532	355	7.16	5295	17.8	13.1	174	3051	414	8.6	5.8	85.7	529	3	189	14	1.18	148.	17	63	5.7	14
20.0	560	373	7.54	5434	18.3	12.8	180	3075	393	8.2	5.4	85.9	557	3	195	14	1.15	153.	17	65	5.8	15
25.0	700	467	9.42	6083	20.4	11.5	204	3165	315	6.4	4.3	86.8	698	2	222	12	1.01	186.	21	77	6.6	17
30.0	840	560	11.30	6673	22.4	10.5	226	3225	262	5.3	3.5	87.3	838	2	248	11	0.91	213.	25	88	7.2	20
35.0	980	653	13.19	7217	24.2	9.7	245	3267	225	4.5	3.0	87.7	979	1	273	10	0.84	241.	28	99	7.8	
40.0	1120	747	15.07	7725	25.8	9.1	264	3299	196	3.9	2.6	88.0	1119	1	297	9	0.78	267.	32	109	8.4	
45.0	1260	840	16.96	8205	27.4	8.5	281	3324	175	3.5	2.3	88.3	1259	1	321	9	0.73	290.	36	119	8.9	
50.0	1400	933	18.84	8660	28.9	8.1	297	3343	157	3.1	2.1	88.4	1399	1	345	8	0.69	316.	39	129	9.4	

#150 28 Si on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 29. ZC= 43.(Tc)
NEUTRON NUMBERS: NP= 14. NT= 34. NC= 48.

AP**1/3= 3.037 AT**1/3= 3.979
REDUCED MASS NUMBER= 19.38 AP+AT=AC= 91.

INTERACTION RADIUS RINT=10.73 fm R0= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 4.31 CT+CP= 7.41 C= 1.80

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.39 RCT= 4.45 RC=RCP+RCT= 7.84

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 104.45 MeV K= .17839 n=2.488
VC(RINT)= 54.4 MeV

FISSION-TKE= 66. MeV
ASYMM. FISSION-TKE= 58. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 21.44 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -65.2
COMPOUND NUCLEUS: -77.8

FUSION RELATED PARAMETERS:
R-BARRIER= 9.62 fm V(RB)= 56.8 MeV
Q-VALUE= -12.5 MeV
L-CRITICAL= 67.

28 Si on 63 Cu

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	28	19	0.36	1209	4.2	63.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	39	0.71	1710	6.0	45.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	58	1.07	2095	7.3	36.9	20	253	66	123.5	97.3	28.3	28	56	0	145	11.13	25.	0	0	2.0	2
4.0	112	78	1.43	2420	8.5	32.0	50	1120	776	65.6	46.7	57.2	84	28	68	59	4.45	33.	3	14	2.4	4
4.5	126	87	1.60	2567	9.0	30.1	59	1405	1012	54.0	38.1	63.0	104	22	78	49	3.73	37.	4	17	2.6	4
5.0	140	97	1.78	2706	9.5	28.6	67	1632	1202	46.0	32.3	67.0	122	18	86	43	3.28	41.	5	20	2.7	4
5.5	154	107	1.96	2838	9.9	27.3	75	1818	1356	40.1	28.1	69.9	139	15	92	39	2.96	45.	5	22	2.9	5
6.0	168	116	2.14	2965	10.4	26.1	81	1972	1343	35.6	24.8	72.2	155	13	97	36	2.72	48.	6	24	3.0	6
6.5	182	126	2.32	3087	10.8	25.1	87	2102	1240	32.0	22.3	74.0	170	12	102	33	2.53	52.	6	26	3.2	6
7.0	196	136	2.49	3204	11.2	24.2	93	2213	1151	29.1	20.2	75.5	185	11	107	31	2.37	56.	7	28	3.3	6
7.5	210	145	2.67	3316	11.6	23.3	99	2309	1074	26.7	18.5	76.7	200	10	111	30	2.24	60.	7	30	3.4	7
8.0	224	155	2.85	3426	12.0	22.6	104	2393	1007	24.6	17.1	77.7	215	9	115	28	2.13	64.	8	32	3.5	7
8.5	238	165	3.03	3532	12.4	21.9	109	2467	948	22.8	15.9	78.6	230	8	118	27	2.03	67.	8	33	3.7	8
9.0	252	174	3.21	3634	12.7	21.3	113	2533	895	21.3	14.8	79.3	245	7	122	26	1.95	71.	9	35	3.8	8
9.5	266	184	3.39	3734	13.1	20.7	118	2592	848	20.0	13.9	80.0	259	7	125	25	1.88	75.	9	36	3.9	8
10.0	280	194	3.56	3832	13.4	20.2	122	2645	806	18.8	13.1	80.6	274	6	129	24	1.81	78.	9	38	4.0	9
10.5	294	204	3.74	3927	13.7	19.7	126	2692	767	17.8	12.3	81.1	288	6	132	23	1.75	81.	10	39	4.1	9
11.0	308	213	3.92	4020	14.1	19.3	130	2736	732	16.8	11.7	81.6	302	6	135	22	1.70	84.	10	41	4.2	10
11.5	322	223	4.10	4111	14.4	18.9	134	2775	701	16.0	11.1	82.0	317	5	138	22	1.65	88.	11	42	4.3	10
12.0	336	233	4.28	4200	14.7	18.5	138	2812	671	15.2	10.6	82.4	331	5	141	21	1.60	92.	11	44	4.4	10
13.0	364	252	4.63	4373	15.3	17.7	145	2876	620	13.9	9.6	83.0	359	5	147	20	1.52	98.	12	47	4.6	11
14.0	392	271	4.99	4539	15.9	17.1	152	2930	575	12.8	8.9	83.6	388	4	153	19	1.45	105.	13	49	4.8	12
15.0	420	291	5.35	4699	16.4	16.5	159	2978	537	11.9	8.2	84.1	416	4	158	18	1.39	112.	13	52	4.9	12
16.0	448	310	5.70	4855	17.0	16.0	165	3019	503	11.0	7.7	84.5	444	4	164	18	1.34	118.	14	54	5.1	13
17.0	476	330	6.06	5006	17.5	15.5	171	3056	474	10.3	7.2	84.8	473	3	169	17	1.29	124.	15	57	5.3	14
18.0	504	349	6.41	5152	18.0	15.1	177	3088	447	9.7	6.7	85.1	501	3	174	16	1.25	131.	16	59	5.4	14
19.0	532	368	6.77	5295	18.5	14.7	183	3117	424	9.2	6.3	85.4	529	3	180	16	1.21	137.	16	62	5.6	15
20.0	560	388	7.13	5434	19.0	14.3	189	3143	403	8.7	6.0	85.7	557	3	185	15	1.17	142.	17	64	5.7	16
25.0	700	485	8.91	6083	21.2	12.8	214	3242	322	6.8	4.7	86.6	698	2	209	14	1.03	173.	21	76	6.4	18
30.0	840	582	10.69	6673	23.2	11.7	237	3307	268	5.6	3.9	87.2	838	2	232	12	0.93	199.	24	87	7.1	21
35.0	980	678	12.47	7217	25.1	10.8	258	3354	230	4.8	3.3	87.6	979	1	255	11	0.86	225.	28	97	7.7	
40.0	1120	775	14.25	7725	26.8	10.1	277	3389	201	4.2	2.9	87.9	1119	1	277	10	0.80	250.	31	107	8.2	
45.0	1260	872	16.04	8205	28.4	9.5	296	3416	179	3.7	2.6	88.2	1259	1	298	10	0.75	272.	35	117	8.7	
50.0	1400	969	17.82	8660	30.0	9.0	313	3437	161	3.3	2.3	88.3	1399	1	319	9	0.71	293.	38	126	9.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#151 28 Si on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 42. ZC= 56.(Ba)
NEUTRON NUMBERS: NP= 14. NT= 50. NC= 64.

AP**1/3= 3.037 AT**1/3= 4.514
REDUCED MASS NUMBER= 21.47 AP+AT=AC=120.

INTERACTION RADIUS RINT=11.31 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 5.00 CT+CP= 8.10 C= 1.91

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.39 RCT= 5.08 RC=RCP+RCT= 8.47

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 138.98 MeV K= .16728 n=2.553
VC(RINT)= 74.7 MeV

FISSION-TKE= 90. MeV
ASYMM. FISSION-TKE= 68. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 22.69 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.19 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -87.5
COMPOUND NUCLEUS: -70.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.14 fm V(RB)= 78.3 MeV
Q-VALUE= -42.5 MeV
L-CRITICAL= 76.

28 Si on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	21	0.29	1209	4.7	92.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	43	0.57	1710	6.6	65.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	64	0.86	2095	8.1	53.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	86	1.15	2420	9.4	46.3	38	544	285	101.1	83.5	39.4	64	48	51	129	7.14	25.	3	11	1.7	3
4.5	126	97	1.29	2567	10.0	43.6	53	940	612	78.4	62.7	50.8	90	36	66	92	5.08	29.	4	15	1.9	3
5.0	140	107	1.44	2706	10.5	41.4	65	1255	873	64.7	51.0	57.6	111	29	77	75	4.16	32.	4	18	2.1	4
5.5	154	118	1.58	2838	11.0	39.5	75	1512	1087	55.3	43.2	62.4	130	24	84	65	3.60	35.	5	20	2.2	4
6.0	168	129	1.72	2965	11.5	37.8	84	1725	1266	48.3	37.6	65.8	148	20	90	58	3.23	38.	5	22	2.4	5
6.5	182	140	1.87	3087	12.0	36.3	92	1905	1313	43.0	33.4	68.5	165	17	95	53	2.95	40.	6	24	2.5	6
7.0	196	150	2.01	3204	12.4	35.0	100	2059	1219	38.7	30.0	70.6	181	15	99	49	2.73	43.	6	26	2.7	6
7.5	210	161	2.15	3316	12.9	33.8	106	2193	1138	35.2	27.2	72.4	196	14	103	46	2.55	46.	7	28	2.8	7
8.0	224	172	2.30	3426	13.3	32.7	113	2309	1067	32.4	25.0	73.8	212	12	107	44	2.41	49.	7	29	2.9	7
8.5	238	182	2.44	3532	13.7	31.8	119	2412	1004	29.9	23.1	75.1	227	11	110	41	2.28	52.	8	31	3.1	8
9.0	252	193	2.58	3634	14.1	30.9	125	2503	948	27.8	21.4	76.1	242	10	113	39	2.18	55.	8	32	3.2	8
9.5	266	204	2.73	3734	14.5	30.0	130	2585	898	26.0	20.0	77.0	256	10	116	38	2.09	57.	9	34	3.3	9
10.0	280	215	2.87	3832	14.8	29.3	136	2658	853	24.4	18.8	77.8	271	9	118	36	2.00	60.	9	35	3.4	10
10.5	294	225	3.02	3927	15.2	28.6	141	2724	813	23.0	17.7	78.5	286	8	121	35	1.93	63.	9	37	3.5	10
11.0	308	236	3.16	4020	15.6	27.9	146	2784	776	21.7	16.7	79.1	300	8	124	34	1.87	66.	10	38	3.6	10
11.5	322	247	3.30	4111	15.9	27.3	150	2839	742	20.6	15.8	79.7	315	7	126	33	1.81	68.	10	39	3.7	11
12.0	336	258	3.45	4200	16.3	26.7	155	2890	711	19.6	15.0	80.2	329	7	128	32	1.75	71.	10	41	3.8	11
13.0	364	279	3.73	4373	16.9	25.7	164	2979	656	17.8	13.7	81.1	358	6	133	30	1.66	76.	11	43	4.0	12
14.0	392	301	4.02	4539	17.6	24.7	172	3055	609	16.4	12.6	81.8	386	6	137	29	1.58	82.	12	46	4.1	13
15.0	420	322	4.31	4699	18.2	23.9	180	3121	569	15.1	11.6	82.4	415	5	141	27	1.51	87.	13	48	4.3	14
16.0	448	343	4.60	4855	18.8	23.1	188	3178	533	14.0	10.8	83.0	443	5	145	26	1.45	91.	13	51	4.5	15
17.0	476	365	4.88	5006	19.4	22.5	195	3229	502	13.1	10.1	83.4	472	4	149	25	1.39	96.	14	53	4.6	16
18.0	504	386	5.17	5152	19.9	21.8	202	3274	474	12.3	9.4	83.8	500	4	153	24	1.34	102.	15	55	4.8	16
19.0	532	408	5.46	5295	20.5	21.2	209	3315	449	11.6	8.9	84.2	528	4	157	24	1.30	106.	16	58	4.9	17
20.0	560	429	5.74	5434	21.0	20.7	216	3351	426	11.0	8.4	84.5	556	4	161	23	1.26	111.	16	60	5.1	18
25.0	700	537	7.18	6083	23.5	18.5	246	3488	341	8.6	6.6	85.7	697	3	178	20	1.10	135.	20	71	5.7	21
30.0	840	644	8.62	6673	25.7	16.9	274	3580	284	7.1	5.4	86.5	838	2	194	18	0.99	157.	23	81	6.3	24
35.0	980	751	10.05	7217	27.8	15.6	298	3645	243	6.0	4.6	87.0	978	2	210	16	0.91	177.	26	91	6.9	
40.0	1120	859	11.49	7725	29.7	14.6	321	3693	213	5.2	4.0	87.4	1118	2	225	15	0.85	198.	30	100	7.4	
45.0	1260	966	12.92	8205	31.5	13.8	342	3731	189	4.6	3.5	87.7	1259	1	239	14	0.79	215.	33	109	7.8	
50.0	1400	1073	14.36	8660	33.2	13.1	362	3761	170	4.1	3.2	87.9	1399	1	254	14	0.75	234.	36	118	8.3	

#152 28 Si on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 47. ZC= 61.(Pm)
NEUTRON NUMBERS: NP= 14. NT= 61. NC= 75.

AP**1/3= 3.037 AT**1/3= 4.762
REDUCED MASS NUMBER= 22.24 AP+AT=AC=136.

INTERACTION RADIUS RINT=11.58 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 5.32 CT+CP= 8.42 C= 1.96

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.39 RCT= 5.34 RC=RCP+RCT= 8.73

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 150.55 MeV K= .15932 n=2.574
VC(RINT)= 81.7 MeV

FISSION-TKE= 100. MeV
ASYMM. FISSION-TKE= 71. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.934 MeV/fm**2 PROX-FACTOR= 22.96 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.88 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -87.6
COMPOUND NUCLEUS: -71.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.39 fm V(RB)= 85.4 MeV
Q-VALUE= -41.1 MeV
L-CRITICAL= 81.

28 Si on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	22	0.27	1209	4.9	103.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	44	0.54	1710	6.9	73.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	67	0.82	2095	8.4	59.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	89	1.09	2420	9.7	51.8	32	360	136	116.7	102.0	31.6	59	53	46	182	9.24	23.	2	11	1.7	3
4.5	126	100	1.22	2567	10.3	48.8	51	799	498	87.5	73.1	46.3	87	39	63	114	5.78	25.	3	14	1.9	4
5.0	140	111	1.36	2706	10.9	46.3	65	1148	787	71.2	58.4	54.4	109	31	74	90	4.56	28.	4	17	2.0	5
5.5	154	122	1.50	2838	11.4	44.2	76	1432	1024	60.3	49.0	59.8	129	25	81	77	3.88	31.	5	19	2.2	5
6.0	168	133	1.63	2965	11.9	42.3	86	1668	1222	52.5	42.4	63.8	147	21	87	68	3.44	33.	5	21	2.3	6
6.5	182	145	1.77	3087	12.4	40.6	95	1868	1387	46.5	37.4	66.8	163	19	92	62	3.12	36.	6	23	2.5	7
7.0	196	156	1.91	3204	12.9	39.2	103	2038	1288	41.8	33.5	69.1	180	16	96	57	2.87	38.	6	25	2.6	7
7.5	210	167	2.04	3316	13.3	37.8	110	2186	1202	37.9	30.4	71.0	195	15	100	53	2.68	41.	7	27	2.7	8
8.0	224	178	2.18	3426	13.8	36.6	117	2315	1127	34.7	27.8	72.6	211	13	103	50	2.52	43.	7	28	2.8	9
8.5	238	189	2.31	3532	14.2	35.5	124	2429	1060	32.1	25.6	74.0	226	12	106	47	2.39	46.	8	30	2.9	9
9.0	252	200	2.45	3634	14.6	34.5	130	2530	1001	29.8	23.8	75.1	241	11	109	45	2.27	48.	8	31	3.1	10
9.5	266	211	2.59	3734	15.0	33.6	136	2620	949	27.8	22.2	76.1	256	10	112	43	2.17	50.	8	33	3.2	11
10.0	280	222	2.72	3832	15.4	32.8	142	2701	901	26.1	20.8	77.0	271	9	114	41	2.08	53.	9	34	3.3	11
10.5	294	233	2.86	3927	15.8	32.0	147	2775	858	24.5	19.5	77.7	285	9	117	40	2.01	55.	9	36	3.4	12
11.0	308	245	2.99	4020	16.1	31.2	152	2842	819	23.2	18.5	78.4	300	8	119	38	1.94	58.	10	37	3.5	12
11.5	322	256	3.13	4111	16.5	30.6	158	2902	784	22.0	17.5	79.0	314	8	121	37	1.87	60.	10	38	3.6	13
12.0	336	267	3.27	4200	16.8	29.9	162	2958	751	20.9	16.6	79.6	329	7	123	36	1.82	63.	10	40	3.6	13
13.0	364	289	3.54	4373	17.5	28.7	172	3057	693	19.0	15.1	80.5	358	6	127	34	1.72	67.	11	42	3.8	14
14.0	392	311	3.81	4539	18.2	27.7	181	3141	644	17.4	13.8	81.3	386	6	131	32	1.63	72.	12	44	4.0	15
15.0	420	334	4.08	4699	18.8	26.8	190	3214	601	16.1	12.8	82.0	415	5	134	31	1.56	76.	12	47	4.1	16
16.0	448	356	4.35	4855	19.5	25.9	198	3278	563	14.9	11.9	82.5	443	5	138	30	1.49	81.	13	49	4.3	17
17.0	476	378	4.63	5006	20.1	25.1	206	3334	530	13.9	11.1	83.0	471	5	141	28	1.43	85.	14	51	4.5	18
18.0	504	400	4.90	5152	20.6	24.4	213	3384	500	13.1	10.4	83.5	500	4	145	27	1.38	89.	15	54	4.6	19
19.0	532	422	5.17	5295	21.2	23.8	220	3429	474	12.3	9.8	83.8	528	4	148	26	1.34	94.	15	56	4.7	19
20.0	560	445	5.44	5434	21.7	23.2	228	3469	450	11.6	9.2	84.2	556	4	151	26	1.30	98.	16	58	4.9	20
25.0	700	556	6.80	6083	24.3	20.7	260	3622	360	9.1	7.2	85.4	697	3	166	22	1.13	119.	19	68	5.5	24
30.0	840	667	8.16	6673	26.6	18.9	289	3723	300	7.5	6.0	86.3	838	2	180	20	1.02	139.	23	78	6.1	27
35.0	980	778	9.53	7217	28.8	17.5	315	3795	257	6.4	5.1	86.8	978	2	193	19	0.94	157.	26	88	6.6	
40.0	1120	889	10.89	7725	30.8	16.4	339	3849	225	5.5	4.4	87.2	1118	2	206	17	0.87	175.	29	97	7.1	
45.0	1260	1001	12.25	8205	32.6	15.4	362	3891	200	4.9	3.9	87.6	1259	1	218	16	0.81	191.	32	106	7.5	
50.0	1400	1112	13.61	8660	34.4	14.7	383	3924	180	4.4	3.5	87.8	1399	1	230	15	0.77	208.	36	114	7.9	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#153 28 Si on 140 Ce

28 Si on 140 Ce

28 Si on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 58. ZC= 72.(Hf)
NEUTRON NUMBERS: NP= 14. NT= 82. NC= 96.

AP**1/3= 3.037 AT**1/3= 5.192
REDUCED MASS NUMBER= 23.33 AP+AT=AC=168.

INTERACTION RADIUS RINT=12.05 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 5.87 CT+CP= 8.97 C= 2.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.39 RCT= 5.82 RC=RCP+RCT= 9.20

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 175.23 MeV K= .14346 n=2.622
VC(RINT)= 96.9 MeV

FISSION-TKE= 123. MeV
ASYMM. FISSION-TKE= 77. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.917 MeV/fm**2 PROX-FACTOR= 23.36 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -88.2
COMPOUND NUCLEUS: -55.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.84 fm V(RB)= 101.1 MeV
Q-VALUE= -58.1 MeV
L-CRITICAL= 88.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGNAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	23	0.24	1209	5.1	127.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	47	0.48	1710	7.2	90.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	70	0.72	2095	8.8	73.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	93	0.96	2420	10.2	63.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	126	105	1.08	2567	10.8	60.3	36	365	137	118.4	107.4	30.8	74	52	53	217	9.33	20.	3	12	1.5	4
5.0	140	117	1.20	2706	11.4	57.2	56	794	493	90.8	79.5	44.6	101	39	68	139	5.94	23.	4	15	1.7	5
5.5	154	128	1.32	2838	12.0	54.5	71	1143	783	74.9	64.5	52.6	122	32	77	110	4.70	25.	4	18	1.8	5
6.0	168	140	1.44	2965	12.5	52.2	83	1433	1025	64.1	54.7	58.0	142	26	84	94	4.01	27.	5	20	2.0	6
6.5	182	152	1.56	3087	13.0	50.1	94	1677	1230	56.1	47.6	61.9	160	22	89	83	3.56	29.	6	22	2.1	7
7.0	196	163	1.69	3204	13.5	48.3	104	1887	1358	50.0	42.3	65.0	177	19	94	76	3.23	31.	6	23	2.2	8
7.5	210	175	1.81	3316	14.0	46.7	112	2068	1267	45.1	38.0	67.4	193	17	97	70	2.98	33.	7	25	2.4	9
8.0	224	187	1.93	3426	14.4	45.2	121	2226	1188	41.1	34.6	69.4	209	15	100	65	2.78	35.	7	27	2.5	10
8.5	238	198	2.05	3532	14.9	43.9	128	2365	1118	37.8	31.8	71.1	224	14	103	61	2.61	37.	7	28	2.6	10
9.0	252	210	2.17	3634	15.3	42.6	135	2489	1056	35.0	29.3	72.5	239	13	106	58	2.48	39.	8	30	2.7	11
9.5	266	222	2.29	3734	15.7	41.5	142	2600	1000	32.5	27.3	73.7	254	12	108	55	2.36	41.	8	31	2.8	12
10.0	280	233	2.41	3832	16.1	40.4	149	2699	950	30.4	25.5	74.8	269	11	110	53	2.25	43.	9	32	2.9	12
10.5	294	245	2.53	3927	16.5	39.5	155	2789	905	28.6	23.9	75.7	284	10	112	51	2.16	45.	9	34	3.0	13
11.0	308	257	2.65	4020	16.9	38.6	161	2871	864	27.0	22.6	76.5	299	9	114	49	2.08	47.	9	35	3.1	14
11.5	322	268	2.77	4111	17.3	37.7	167	2946	826	25.5	21.3	77.2	313	9	116	47	2.01	49.	10	36	3.2	14
12.0	336	280	2.89	4200	17.7	36.9	172	3014	792	24.2	20.2	77.9	328	8	118	46	1.95	51.	10	37	3.3	15
13.0	364	303	3.13	4373	18.4	35.5	183	3135	731	22.0	18.3	79.0	357	7	121	43	1.83	55.	11	40	3.4	16
14.0	392	327	3.37	4539	19.1	34.2	193	3239	679	20.1	16.8	80.0	385	7	125	41	1.74	59.	11	42	3.6	17
15.0	420	350	3.61	4699	19.8	33.0	202	3328	633	18.5	15.5	80.7	414	6	128	39	1.65	62.	12	44	3.7	18
16.0	448	373	3.85	4855	20.4	32.0	212	3407	594	17.2	14.3	81.4	442	6	131	37	1.58	66.	13	46	3.9	19
17.0	476	397	4.09	5006	21.0	31.0	220	3476	559	16.0	13.4	82.0	471	5	133	36	1.52	70.	13	49	4.0	20
18.0	504	420	4.33	5152	21.7	30.1	229	3537	528	15.0	12.5	82.5	499	5	136	34	1.46	73.	14	51	4.2	21
19.0	532	443	4.57	5295	22.2	29.3	237	3592	500	14.1	11.8	82.9	528	4	139	33	1.41	77.	15	53	4.3	22
20.0	560	467	4.81	5434	22.8	28.6	245	3641	475	13.3	11.1	83.3	556	4	141	32	1.37	81.	15	55	4.4	23
25.0	700	583	6.02	6083	25.5	25.6	281	3828	380	10.4	8.7	84.8	697	3	153	28	1.19	97.	19	65	5.0	28
30.0	840	700	7.22	6673	28.0	23.3	313	3953	316	8.5	7.1	85.7	837	3	164	25	1.07	113.	22	74	5.5	32
35.0	980	817	8.43	7217	30.2	21.6	341	4042	271	7.2	6.0	86.4	978	2	174	23	0.98	129.	25	83	6.0	
40.0	1120	933	9.63	7725	32.3	20.2	368	4108	237	6.3	5.2	86.9	1118	2	184	21	0.91	143.	28	92	6.5	
45.0	1260	1050	10.83	8205	34.2	19.1	393	4160	211	5.6	4.6	87.2	1258	2	193	20	0.85	157.	31	100	6.9	
50.0	1400	1167	12.04	8660	36.1	18.1	416	4201	190	5.0	4.1	87.5	1399	1	203	19	0.80	171.	35	108	7.3	

#154 28 Si on 154 Sm

28 Si on 154 Sm

28 Si on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 62. ZC= 76.(Os)
NEUTRON NUMBERS: NP= 14. NT= 92. NC=106.

AP**1/3= 3.037 AT**1/3= 5.360
REDUCED MASS NUMBER= 23.69 AP+AT=AC=182.

INTERACTION RADIUS RINT=12.23 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 6.09 CT+CP= 9.19 C= 2.05

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.00 RC=RCP+RCT= 9.38

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 183.43 MeV K= .13718 n=2.638
VC(RINT)= 102.1 MeV

FISSION-TKE= 131. MeV
ASYMM. FISSION-TKE= 79. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 23.36 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -72.1
COMPOUND NUCLEUS: -42.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.01 fm V(RB)= 106.3 MeV
Q-VALUE= -54.7 MeV
L-CRITICAL= 90.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGNAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	24	0.23	1209	5.2	136.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	47	0.46	1710	7.3	96.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	71	0.70	2095	9.0	78.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	95	0.93	2420	10.4	68.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	126	107	1.04	2567	11.0	64.4	27	209	10	134.0	125.5	23.0	70	56	50	312	12.81	19.	3	12	1.5	4
5.0	140	118	1.16	2706	11.6	61.1	53	670	390	98.7	88.2	40.7	98	42	66	164	6.67	21.	4	15	1.7	5
5.5	154	130	1.28	2838	12.2	58.3	69	1043	701	80.3	70.5	49.8	121	33	76	125	5.08	23.	4	17	1.8	6
6.0	168	142	1.39	2965	12.7	55.8	82	1353	960	68.3	59.3	55.9	140	28	83	105	4.26	25.	5	19	2.0	7
6.5	182	154	1.51	3087	13.2	53.6	94	1614	1179	59.5	51.4	60.2	159	23	88	92	3.74	27.	6	21	2.1	8
7.0	196	166	1.62	3204	13.7	51.7	104	1838	1367	52.9	45.4	63.6	176	20	93	83	3.37	29.	6	23	2.2	9
7.5	210	178	1.74	3316	14.2	49.9	113	2032	1292	47.6	40.8	66.2	192	18	96	77	3.10	31.	6	24	2.3	10
8.0	224	190	1.86	3426	14.7	48.3	122	2201	1211	43.3	37.0	68.3	208	16	100	71	2.88	32.	7	26	2.4	11
8.5	238	201	1.97	3532	15.1	46.9	130	2350	1140	39.8	33.9	70.1	224	14	102	67	2.70	34.	7	27	2.5	11
9.0	252	213	2.09	3634	15.5	45.6	137	2482	1076	36.7	31.3	71.6	239	13	105	63	2.55	36.	8	29	2.6	12
9.5	266	225	2.21	3734	16.0	44.3	144	2601	1020	34.2	29.1	72.9	254	12	107	60	2.43	38.	8	30	2.7	13
10.0	280	237	2.32	3832	16.4	43.2	151	2707	969	31.9	27.2	74.0	269	11	109	57	2.32	40.	8	32	2.8	14
10.5	294	249	2.44	3927	16.8	42.2	158	2803	923	30.0	25.5	75.0	284	10	111	55	2.22	42.	9	33	2.9	14
11.0	308	261	2.55	4020	17.2	41.2	164	2891	881	28.2	24.0	75.9	298	10	113	53	2.14	43.	9	34	3.0	15
11.5	322	272	2.67	4111	17.6	40.3	170	2971	842	26.7	22.7	76.7	313	9	115	51	2.06	45.	10	35	3.1	16
12.0	336	284	2.79	4200	18.0	39.5	176	3044	807	25.3	21.5	77.3	328	8	116	49	1.99	47.	10	37	3.2	16
13.0	364	308	3.02	4373	18.7	37.9	187	3173	745	22.9	19.5	78.5	357	7	120	46	1.88	50.	11	39	3.3	18
14.0	392	332	3.25	4539	19.4	36.5	197	3284	692	21.0	17.8	79.5	385	7	123	44	1.78	54.	11	41	3.5	19
15.0	420	355	3.48	4699	20.1	35.3	207	3380	646	19.3	16.4	80.3	414	6	125	42	1.69	57.	12	43	3.6	20
16.0	448	379	3.71	4855	20.7	34.2	217	3463	605	17.9	15.2	81.0	442	6	128	40	1.62	61.	13	46	3.8	22
17.0	476	403	3.95	5006	21.4	33.1	226	3537	570	16.7	14.2	81.6	471	5	131	38	1.55	64.	13	48	3.9	23
18.0	504	426	4.18	5152	22.0	32.2	234	3603	538	15.6	13.3	82.2	499	5	133	37	1.49	67.	14	50	4.0	24
19.0	532	450	4.41	5295	22.6	31.4	243	3662	510	14.7	12.5	82.6	527	5	136	36	1.44	71.	15	52	4.2	25
20.0	560	474	4.64	5434	23.2	30.6	251	3714	484	13.9	11.8	83.1	556	4	138	35	1.40	74.	15	54	4.3	26
25.0	700	592	5.80	6083	25.9	27.3	288	3915	387	10.8	9.2	84.6	697	3	149	30	1.22	90.	18	63	4.9	30
30.0	840	711	6.96	6673	28.4	25.0	321	4048	323	8.9	7.5	85.6	837	3	159	27	1.09	105.	22	73	5.4	34
35.0	980	829	8.12	7217	30.7	23.1	351	4143	276	7.5	6.4	86.2	978	2	168	25	1.00	119.	25	81	5.8	
40.0	1120	948	9.28	7725	32.8	21.6	379	4214	242	6.5	5.5	86.7	1118	2	177	23	0.93	132.	28	90	6.3	
45.0	1260	1066	10.45	8205	34.8	20.4	404	4269	215	5.8	4.9	87.1	1258	2	185	21	0.87	146.	31	98	6.7	
50.0	1400	1185	11.61	8660	36.6	19.3	428	4313	193	5.2	4.4	87.4	1399	1	194	20	0.82	158.	34	106	7.0	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM GP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#155 28 Si on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 67. ZC= 81.(Tl)
NEUTRON NUMBERS: NP= 14. NT= 98. NC=112.

AP**1/3= 3.037 AT**1/3= 5.485
REDUCED MASS NUMBER= 23.94 AP+AT=AC=193.

INTERACTION RADIUS RINT=12.36 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 6.25 CT+CP= 9.35 C̄= 2.07

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.15 RC=RCP+RCT= 9.54

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 194.53 MeV K= .13183 n=2.660
VC(RINT)= 109.1 MeV

FISSION-TKE= 144. MeV
ASYMM. FISSION-TKE= 82. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.908 MeV/fm**2 PROX-FACTOR= 23.62 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.26 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -63.7
COMPOUND NUCLEUS: -26.7

FUSION RELATED PARAMETERS:
R-BARRIER=11.14 fm V(RB)= 113.7 MeV
Q-VALUE= -62.1 MeV
L-CRITICAL= 91.

28 Si on 165 Ho — 28 Si on 165 Ho

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	24	0.22	1209	5.2	147.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	56	48	0.44	1710	7.4	104.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	84	72	0.66	2095	9.1	85.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	112	96	0.88	2420	10.5	73.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	126	108	0.99	2567	11.1	69.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	140	120	1.10	2706	11.7	66.1	43	439	196	114.1	104.7	32.9	91	49	61	222	8.46	20.	3 14	1.5	5
5.5	154	132	1.21	2838	12.3	63.0	63	844	532	90.3	80.7	44.9	116	38	73	152	5.78	22.	4 16	1.7	6
6.0	168	144	1.32	2965	12.8	60.3	78	1180	812	75.7	66.7	52.1	137	31	82	123	4.66	23.	5 19	1.8	7
6.5	182	156	1.43	3087	13.3	57.9	90	1463	1050	65.5	57.3	57.3	156	26	88	106	4.02	25.	5 21	2.0	8
7.0	196	168	1.54	3204	13.9	55.8	101	1705	1253	57.8	50.3	61.1	173	23	93	95	3.58	27.	6 22	2.1	8
7.5	210	180	1.65	3316	14.3	53.9	111	1915	1286	51.9	45.0	64.1	190	20	96	86	3.26	29.	6 24	2.2	9
8.0	224	192	1.76	3426	14.8	52.2	120	2098	1205	47.0	40.7	66.5	206	18	100	80	3.02	31.	7 25	2.3	10
8.5	238	203	1.87	3532	15.3	50.7	128	2259	1134	43.1	37.2	68.5	222	16	103	74	2.82	33.	7 27	2.4	11
9.0	252	215	1.97	3634	15.7	49.2	136	2402	1071	39.7	34.2	70.1	238	14	105	70	2.65	34.	8 28	2.5	12
9.5	266	227	2.08	3734	16.1	47.9	144	2530	1015	36.9	31.7	71.6	253	13	108	66	2.52	36.	8 30	2.6	12
10.0	280	239	2.19	3832	16.6	46.7	151	2646	964	34.4	29.6	72.8	268	12	110	63	2.40	38.	8 31	2.7	13
10.5	294	251	2.30	3927	17.0	45.6	158	2750	918	32.2	27.7	73.9	283	11	112	61	2.29	40.	9 32	2.8	14
11.0	308	263	2.41	4020	17.4	44.5	164	2845	876	30.3	26.1	74.8	298	10	114	58	2.20	41.	9 33	2.9	15
11.5	322	275	2.52	4111	17.8	43.6	170	2931	838	28.7	24.6	75.7	312	10	115	56	2.12	43.	9 35	3.0	15
12.0	336	287	2.63	4200	18.1	42.6	177	3010	803	27.2	23.3	76.4	327	9	117	54	2.05	45.	10 36	3.1	16
13.0	364	311	2.85	4373	18.9	41.0	188	3150	742	24.6	21.1	77.7	356	8	120	51	1.92	48.	10 38	3.2	17
14.0	392	335	3.07	4539	19.6	39.5	199	3270	689	22.5	19.2	78.8	385	7	123	48	1.82	51.	11 40	3.4	19
15.0	420	359	3.29	4699	20.3	38.1	209	3373	643	20.7	17.7	79.7	413	7	126	46	1.73	55.	12 43	3.5	20
16.0	448	383	3.51	4855	20.9	36.9	219	3464	602	19.1	16.4	80.4	442	6	128	44	1.65	58.	13 45	3.6	21
17.0	476	407	3.73	5006	21.6	35.8	228	3544	567	17.8	15.3	81.1	470	6	131	42	1.59	61.	13 47	3.8	22
18.0	504	431	3.95	5152	22.2	34.8	237	3615	535	16.7	14.3	81.7	499	5	133	40	1.53	64.	14 49	3.9	24
19.0	532	455	4.17	5295	22.8	33.9	246	3679	507	15.7	13.4	82.2	527	5	136	39	1.47	67.	15 51	4.0	25
20.0	560	479	4.39	5434	23.4	33.0	254	3736	482	14.8	12.7	82.6	555	5	138	38	1.42	70.	15 53	4.2	26
25.0	700	598	5.49	6083	26.2	29.5	293	3953	385	11.5	9.9	84.2	696	4	148	33	1.24	85.	18 62	4.7	31
30.0	840	718	6.58	6673	28.7	27.0	326	4097	321	9.4	8.1	85.3	837	3	158	29	1.11	100.	22 71	5.2	35
35.0	980	838	7.68	7217	31.0	25.0	357	4200	275	8.0	6.8	86.0	978	2	166	27	1.01	113.	25 80	5.7	
40.0	1120	958	8.78	7725	33.1	23.4	385	4277	241	6.9	5.9	86.5	1118	2	175	25	0.94	127.	28 89	6.1	
45.0	1260	1077	9.87	8205	35.1	22.0	412	4336	214	6.1	5.2	86.9	1258	2	183	23	0.88	139.	31 97	6.5	
50.0	1400	1197	10.97	8660	37.0	20.9	436	4384	192	5.5	4.7	87.3	1398	2	190	22	0.83	151.	34 105	6.9	

#156 28 Si on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 73. ZC= 87.(Fr)
NEUTRON NUMBERS: NP= 14. NT=108. NC=122.

AP**1/3= 3.037 AT**1/3= 5.657
REDUCED MASS NUMBER= 24.25 AP+AT=AC=209.

INTERACTION RADIUS RINT=12.55 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 6.47 CT+CP= 9.57 C̄= 2.09

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.35 RC=RCP+RCT= 9.74

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 207.05 MeV K= .12478 n=2.684
VC(RINT)= 117.1 MeV

FISSION-TKE= 159. MeV
ASYMM. FISSION-TKE= 86. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.904 MeV/fm**2 PROX-FACTOR= 23.79 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.16 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -46.0
COMPOUND NUCLEUS: -3.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.31 fm V(RB)= 121.9 MeV
Q-VALUE= -67.9 MeV
L-CRITICAL= 92.

28 Si on 181 Ta — 28 Si on 181 Ta

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	24	0.21	1209	5.3	160.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	56	48	0.41	1710	7.5	113.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	84	73	0.62	2095	9.2	92.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	112	97	0.83	2420	10.6	80.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	126	109	0.93	2567	11.3	75.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	140	121	1.04	2706	11.9	72.0	27	175	0	138.9	132.3	20.6	83	57	56	389	13.99	0.	3 13	1.4	4
5.5	154	133	1.14	2838	12.4	68.6	54	620	344	103.3	94.5	38.3	110	44	70	196	6.96	20.	4 16	1.6	5
6.0	168	145	1.24	2965	13.0	65.7	72	987	650	84.9	76.3	47.6	132	36	90	149	5.26	22.	5 18	1.7	6
6.5	182	158	1.35	3087	13.5	63.1	86	1297	909	72.6	64.6	53.7	152	30	97	125	4.40	24.	5 20	1.9	7
7.0	196	170	1.45	3204	14.0	60.8	98	1561	1131	63.7	56.3	58.2	171	25	92	109	3.86	25.	6 22	2.0	8
7.5	210	182	1.55	3316	14.5	58.8	109	1790	1285	56.8	50.0	61.6	188	22	96	98	3.48	27.	6 23	2.1	9
8.0	224	194	1.66	3426	15.0	56.9	118	1990	1205	51.3	45.0	64.3	204	20	100	90	3.19	29.	7 25	2.2	10
8.5	238	206	1.76	3532	15.5	55.2	127	2167	1134	46.8	41.0	66.6	221	17	103	84	2.96	30.	7 26	2.3	11
9.0	252	218	1.86	3634	15.9	53.6	136	2323	1071	43.1	37.7	68.5	236	16	106	79	2.78	32.	8 28	2.4	12
9.5	266	230	1.97	3734	16.3	52.2	144	2463	1015	39.9	34.9	70.0	252	14	108	74	2.63	34.	8 29	2.5	12
10.0	280	242	2.07	3832	16.8	50.9	151	2589	964	37.2	32.4	71.4	267	13	110	71	2.50	35.	8 30	2.6	13
10.5	294	255	2.17	3927	17.2	49.7	158	2703	918	34.8	30.3	72.6	282	12	112	68	2.38	37.	9 31	2.7	14
11.0	308	267	2.28	4020	17.6	48.5	165	2807	876	32.7	28.5	73.6	297	11	114	65	2.29	38.	9 33	2.8	15
11.5	322	279	2.38	4111	18.0	47.5	172	2901	838	30.9	26.9	74.6	311	11	116	62	2.20	40.	9 34	2.8	15
12.0	336	291	2.48	4200	18.4	46.5	178	2987	803	29.2	25.4	75.4	326	10	117	60	2.12	42.	10 35	2.9	16
13.0	364	315	2.69	4373	19.1	44.6	190	3140	741	26.4	23.0	76.8	355	9	120	56	1.99	45.	10 37	3.1	18
14.0	392	339	2.90	4539	19.8	43.0	201	3271	688	24.1	20.9	78.0	384	8	123	53	1.87	48.	11 40	3.2	19
15.0	420	364	3.11	4699	20.5	41.6	212	3385	642	22.2	19.2	78.9	413	7	126	50	1.78	51.	12 42	3.4	20
16.0	448	388	3.31	4855	21.2	40.2	222	3484	602	20.5	17.8	79.7	441	7	128	48	1.70	54.	12 44	3.5	22
17.0	476	412	3.52	5006	21.9	39.0	232	3571	567	19.1	16.6	80.5	470	6	130	46	1.63	57.	13 46	3.6	23
18.0	504	436	3.73	5152	22.5	37.9	242	3649	535	17.9	15.5	81.1	498	6	133	44	1.56	60.	14 48	3.8	24
19.0	532	461	3.93	5295	23.1	36.9	251	3718	507	16.8	14.5	81.6	527	5	135	43	1.51	63.	14 50	3.9	25
20.0	560	485	4.14	5434	23.7	36.0	259	3781	482	15.8	13.7	82.1	555	5	137	41	1.46	66.	15 52	4.0	26
25.0	700	606	5.18	6083	26.5	32.2	299	4018	385	12.3	10.7	83.9	696	4	147	36	1.26	79.	18 61	4.5	32
30.0	840	727	6.21	6673	29.0	29.4	334	4175	321	10.1	8.7	85.0	837	3	155	32	1.13	93.	21 70	5.0	36
35.0	980	849	7.25	7217	31.4	27.2	366	4288	275	8.5	7.4	85.7	977	3	163	29	1.03	105.	24 79	5.5	
40.0	1120	970	8.28	7725	33.5	25.4	395	4372	241	7.4	6.4	86.3	1118	2	171	27	0.96	118.	27 87	5.9	
45.0	1260	1091	9.32	8205	35.6	24.0	422	4437	214	6.5	5.6	86.7	1258	2	178	25	0.90	130.	31 95	6.3	
50.0	1400	1212	10.35	8660	37.5	22.8	447	4489	192	5.8	5.0	87.1	1398	2	185	24	0.84	142.	34 102	6.6	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	h	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nes	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#157 28 Si on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 79. ZC= 93.(Np)
NEUTRON NUMBERS: NP= 14. NT=118. NC=132.

AP**1/3= 3.037 AT**1/3= 5.819
REDUCED MASS NUMBER= 24.52 AP+AT=AC=225.

INTERACTION RADIUS RINT=12.72 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 6.68 CT+CP= 9.77 C= 2.12

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.55 RC=RCP+RCT= 9.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 219.23 MeV K= .11813 n=2.707
VC(RINT)= 125.0 MeV

FISSION-TKE= 174. MeV
ASYMM. FISSION-TKE= 89. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 23.94 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.07 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -28.6
COMPOUND NUCLEUS: 31.7

FUSION RELATED PARAMETERS:
R-BARRIER=11.48 fm V(RB)= 130.1 MeV
Q-VALUE= -85.4 MeV
L-CRITICAL= 93.

28 Si on 197 Au

28 Si on 197 Au

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	25	0.20	1209	5.4	174.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	49	0.39	1710	7.6	123.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	74	0.59	2095	9.3	100.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	98	0.78	2420	10.7	87.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	126	110	0.88	2567	11.4	82.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	140	123	0.98	2706	12.0	77.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	154	135	1.08	2838	12.6	74.3	43	383	145	120.0	112.4	30.0	104	50	67	275	9.15	19.	4	15	1.3	5
6.0	168	147	1.18	2965	13.1	71.1	65	783	478	95.5	87.4	42.2	128	40	78	183	6.08	20.	5	17	1.5	6
6.5	182	159	1.27	3087	13.7	68.3	81	1119	759	80.6	72.8	49.7	149	33	86	147	4.87	22.	5	19	1.6	7
7.0	196	172	1.37	3204	14.2	65.8	94	1407	1001	70.0	62.8	55.0	168	28	92	126	4.18	24.	6	21	1.8	8
7.5	210	184	1.47	3316	14.7	63.6	106	1656	1210	62.1	55.4	58.9	186	24	96	112	3.72	25.	6	23	1.9	9
8.0	224	196	1.57	3426	15.2	61.6	116	1873	1199	55.9	49.7	62.1	203	21	100	102	3.38	27.	7	24	2.0	10
8.5	238	208	1.67	3532	15.6	59.7	126	2064	1128	50.8	45.1	64.6	219	19	103	94	3.12	28.	7	26	2.1	10
9.0	252	221	1.77	3634	16.1	58.1	135	2235	1065	46.6	41.3	66.7	235	17	106	88	2.92	30.	7	27	2.2	11
9.5	266	233	1.86	3734	16.5	56.5	143	2367	1009	43.1	38.1	68.4	250	16	108	83	2.74	31.	8	28	2.3	12
10.0	280	245	1.96	3832	17.0	55.1	151	2523	959	40.1	35.4	70.0	266	14	111	79	2.60	33.	8	30	2.4	13
10.5	294	257	2.06	3927	17.4	53.7	158	2647	913	37.5	33.0	71.3	281	13	113	75	2.48	34.	9	31	2.5	14
11.0	308	270	2.16	4020	17.8	52.5	166	2759	872	35.2	31.0	72.4	296	12	114	72	2.37	36.	9	32	2.6	14
11.5	322	282	2.26	4111	18.2	51.4	173	2862	834	33.1	29.2	73.4	311	11	116	69	2.28	37.	9	33	2.6	15
12.0	336	294	2.35	4200	18.6	50.3	179	2956	799	31.3	27.6	74.3	325	11	118	66	2.19	39.	10	34	2.7	16
13.0	364	319	2.55	4373	19.3	48.3	192	3122	737	28.3	24.9	75.9	355	9	121	62	2.05	42.	10	37	2.9	18
14.0	392	343	2.75	4539	20.1	46.5	204	3264	685	25.8	22.6	77.1	384	8	123	58	1.93	45.	11	39	3.0	19
15.0	420	368	2.94	4699	20.8	45.0	215	3387	639	23.7	20.8	78.2	412	8	126	55	1.83	48.	12	41	3.2	20
16.0	448	392	3.14	4855	21.4	43.5	225	3495	599	21.9	19.2	79.1	441	7	128	53	1.74	50.	12	43	3.3	22
17.0	476	417	3.33	5006	22.1	42.2	235	3590	564	20.4	17.9	79.8	470	6	131	50	1.67	53.	13	45	3.4	23
18.0	504	441	3.53	5152	22.7	41.0	245	3674	532	19.0	16.7	80.5	498	6	133	48	1.60	56.	14	47	3.6	24
19.0	532	466	3.73	5295	23.4	40.0	254	3750	504	17.9	15.7	81.1	526	6	135	47	1.54	59.	14	49	3.7	26
20.0	560	490	3.92	5434	24.0	38.9	263	3817	479	16.8	14.7	81.6	555	5	137	45	1.49	61.	15	51	3.8	27
25.0	700	613	4.90	6083	26.8	34.8	304	4075	383	13.1	11.4	83.5	696	4	146	39	1.29	75.	18	60	4.3	32
30.0	840	735	5.88	6673	29.4	31.8	340	4246	319	10.7	9.3	84.7	837	3	154	35	1.15	87.	21	69	4.8	37
35.0	980	858	6.87	7217	31.7	29.4	373	4368	274	9.0	7.9	85.5	977	3	161	32	1.05	99.	24	77	5.2	
40.0	1120	981	7.85	7725	33.9	27.5	403	4460	239	7.8	6.8	86.1	1118	2	168	29	0.97	111.	27	85	5.6	
45.0	1260	1103	8.83	8205	36.0	26.0	431	4531	213	6.9	6.0	86.6	1258	2	175	28	0.91	122.	30	93	6.0	
50.0	1400	1226	9.81	8660	37.9	24.6	457	4588	191	6.2	5.4	86.9	1398	2	182	26	0.86	133.	33	101	6.4	

#158 28 Si on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 82. ZC= 96.(Cm)
NEUTRON NUMBERS: NP= 14. NT=126. NC=140.

AP**1/3= 3.037 AT**1/3= 5.925
REDUCED MASS NUMBER= 24.68 AP+AT=AC=236.

INTERACTION RADIUS RINT=12.84 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 6.82 CT+CP= 9.91 C= 2.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.66 RC=RCP+RCT=10.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 224.72 MeV K= .11436 n=2.717
VC(RINT)= 128.6 MeV

FISSION-TKE= 182. MeV
ASYMM. FISSION-TKE= 91. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.893 MeV/fm**2 PROX-FACTOR= 23.88 MeV
L-RLD= 68 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -19.5
COMPOUND NUCLEUS: 48.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.58 fm V(RB)= 133.7 MeV
Q-VALUE= -93.5 MeV
L-CRITICAL= 93.

28 Si on 208 Pb

28 Si on 208 Pb

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	25	0.19	1209	5.4	180.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	49	0.38	1710	7.6	127.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	74	0.58	2095	9.3	104.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	99	0.77	2420	10.8	90.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	126	111	0.86	2567	11.4	85.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	140	123	0.96	2706	12.1	80.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	154	136	1.06	2838	12.7	77.1	37	282	63	128.8	122.3	25.6	102	52	66	336	10.90	18.	4	14	1.2	4
6.0	168	148	1.15	2965	13.2	73.8	61	699	409	100.5	92.8	39.7	126	42	77	203	6.56	19.	4	17	1.4	5
6.5	182	160	1.25	3087	13.8	70.9	79	1049	702	84.2	76.6	47.9	148	34	85	159	5.12	21.	5	19	1.5	6
7.0	196	173	1.34	3204	14.3	68.3	93	1348	953	72.9	65.8	53.6	167	29	91	135	4.35	23.	6	21	1.6	7
7.5	210	185	1.44	3316	14.8	66.0	105	1607	1170	64.4	57.9	57.8	185	25	96	119	3.84	24.	6	22	1.8	8
8.0	224	197	1.54	3426	15.3	63.9	116	1833	1202	57.9	51.8	61.1	202	22	100	108	3.48	26.	7	24	1.9	9
8.5	238	210	1.63	3532	15.7	62.0	126	2033	1131	52.6	46.9	63.7	218	20	103	100	3.20	27.	7	25	2.0	10
9.0	252	222	1.73	3634	16.2	60.3	135	2210	1068	48.2	42.9	65.9	234	18	106	93	2.98	28.	7	27	2.1	12
9.5	266	234	1.82	3734	16.6	58.6	143	2368	1012	44.5	39.6	67.8	250	16	108	87	2.81	30.	8	28	2.2	12
10.0	280	247	1.92	3832	17.1	57.2	152	2510	961	41.3	36.7	69.3	265	15	110	83	2.65	31.	8	29	2.3	13
10.5	294	259	2.02	3927	17.5	55.8	159	2639	916	38.6	34.3	70.7	281	13	112	79	2.53	33.	9	30	2.4	14
11.0	308	271	2.11	4020	17.9	54.5	167	2756	874	36.2	32.1	71.9	296	12	114	75	2.41	34.	9	32	2.5	15
11.5	322	284	2.21	4111	18.3	53.3	174	2863	836	34.1	30.2	72.9	310	12	116	72	2.32	36.	9	33	2.5	16
12.0	336	296	2.30	4200	18.7	52.2	181	2960	801	32.2	28.6	73.9	325	11	117	69	2.23	37.	10	34	2.6	17
13.0	364	321	2.50	4373	19.5	50.1	193	3133	739	29.1	25.7	75.5	354	10	120	65	2.08	40.	10	36	2.8	18
14.0	392	345	2.69	4539	20.2	48.3	205	3281	687	26.5	23.4	76.8	383	9	123	61	1.96	43.	11	38	2.9	20
15.0	420	370	2.88	4699	20.9	46.7	217	3409	641	24.3	21.5	77.8	412	8	125	58	1.86	45.	12	40	3.1	21
16.0	448	395	3.07	4855	21.6	45.2	228	3521	601	22.5	19.8	78.8	441	7	128	55	1.77	48.	12	42	3.2	22
17.0	476	420	3.26	5006	22.3	43.8	238	3620	565	20.9	18.4	79.6	469	7	130	53	1.69	51.	13	44	3.3	24
18.0	504	444	3.45	5152	22.9	42.6	248	3708	534	19.5	17.2	80.2	498	6	132	51	1.62	53.	14	46	3.4	25
19.0	532	469	3.65	5295	23.5	41.5	257	3787	506	18.3	16.2	80.8	526	6	134	49	1.56	56.	14	48	3.6	26
20.0	560	494	3.84	5434	24.1	40.4	266	3857	480	17.3	15.2	81.4	555	5	136	47	1.51	59.	15	50	3.7	28
25.0	700	617	4.80	6083	27.0	36.2	308	4125	384	13.4	11.8	83.3	696	4	144	41	1.31	71.	18	59	4.2	34
30.0	840	740	5.76	6673	29.6	33.0	345	4304	320	10.9	9.6	84.5	837	3	152	36	1.17	83.	21	68	4.7	39
35.0	980	864	6.72	7217	31.9	30.6	378	4431	274	9.2	8.1	85.4	977	3	159	33	1.06	95.	24	76	5.1	
40.0	1120	987	7.68	7725	34.1	28.6	409	4526	240	8.0	7.1	86.0	1118	2	166	31	0.98	106.	27	84	5.5	
45.0	1260	1111	8.64	8205	36.2	26.9	437	4600	213	7.1	6.2	86.5	1258	2	172	29	0.92	116.	30	92	5.9	
50.0	1400	1234	9.60	8660	38.2	25.6	464	4659	192	6.3	5.6	86.8	1398	2	178	27	0.87	127.	33	99	6.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#159 28 Si on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 83. ZC= 97.(Bk)
NEUTRON NUMBERS: NP= 14. NT=126. NC=140.

AP**1/3= 3.037 AT**1/3= 5.934
REDUCED MASS NUMBER= 24.69 AP+AT=AC=237.

INTERACTION RADIUS RINT=12.85 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 6.83 CT+CP= 9.92 C̄= 2.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.68 RC=RCP+RCT=10.07

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 226.97 MeV K= .11367 n=2.722
VC(RINT)= 130.0 MeV

FISSION-TKE= 185. MeV
ASYMM. FISSION-TKE= 91. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 23.98 MeV
L-RLD= 65 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.01 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: -16.5
COMPOUND NUCLEUS: 54.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.59 fm V(RB)= 135.2 MeV
Q-VALUE= -95.6 MeV
L-CRITICAL= 93.

28 Si on 209 Bi

28 Si on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	25	0.19	1209	5.4	163.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	49	0.38	1710	7.6	129.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	74	0.57	2095	9.4	105.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	99	0.76	2420	10.8	91.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	126	111	0.85	2567	11.5	86.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	140	123	0.95	2706	12.1	81.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	154	136	1.04	2838	12.7	78.0	33	227	17	134.1	128.0	23.0	100	54	64	378	12.19	18.	4	14	1.2	4
6.0	168	148	1.14	2965	13.2	74.7	59	650	367	103.2	95.6	38.4	125	43	77	214	6.81	19.	4	17	1.3	5
6.5	182	160	1.23	3087	13.8	71.8	77	1005	664	86.1	78.5	47.0	147	35	85	165	5.25	21.	5	19	1.5	6
7.0	196	173	1.33	3204	14.3	69.2	91	1308	918	74.3	67.2	52.8	166	30	91	139	4.42	22.	6	20	1.6	7
7.5	210	185	1.42	3316	14.8	66.8	104	1570	1138	65.7	59.1	57.2	184	26	96	122	3.89	24.	6	22	1.7	8
8.0	224	198	1.52	3426	15.3	64.7	115	1799	1195	58.9	52.8	60.6	201	23	100	111	3.52	25.	7	24	1.9	9
8.5	238	210	1.61	3532	15.7	62.8	125	2001	1125	53.4	47.7	63.3	218	20	103	102	3.23	27.	7	25	2.0	10
9.0	252	222	1.71	3634	16.2	61.0	134	2180	1062	49.0	43.6	65.5	234	18	106	95	3.01	28.	7	26	2.1	11
9.5	266	235	1.80	3734	16.6	59.4	143	2341	1006	45.2	40.2	67.4	250	16	109	89	2.83	30.	8	28	2.2	12
10.0	280	247	1.90	3832	17.1	57.9	151	2485	956	42.0	37.3	69.0	265	15	111	84	2.67	31.	8	29	2.3	13
10.5	294	259	1.99	3927	17.5	56.5	159	2615	910	39.2	34.8	70.4	280	14	113	80	2.54	33.	9	30	2.4	14
11.0	308	272	2.09	4020	17.9	55.2	166	2734	869	36.7	32.6	71.6	295	13	115	76	2.43	34.	9	32	2.4	15
11.5	322	284	2.18	4111	18.3	54.0	173	2842	831	34.6	30.7	72.7	310	12	116	73	2.33	36.	9	33	2.5	15
12.0	336	296	2.28	4200	18.7	52.8	180	2941	797	32.7	29.0	73.6	325	11	118	71	2.24	37.	10	34	2.6	16
13.0	364	321	2.47	4373	19.5	50.7	193	3116	735	29.5	26.1	75.3	354	10	121	66	2.09	40.	10	36	2.8	18
14.0	392	346	2.66	4539	20.2	48.9	205	3265	683	26.8	23.7	76.6	383	9	124	62	1.97	43.	11	38	2.9	19
15.0	420	370	2.85	4699	20.9	47.2	216	3395	637	24.6	21.8	77.7	412	8	126	59	1.86	45.	12	40	3.0	21
16.0	448	395	3.04	4855	21.6	45.7	227	3509	597	22.8	20.1	78.6	441	7	128	56	1.77	48.	12	42	3.2	22
17.0	476	420	3.23	5006	22.3	44.4	238	3609	562	21.2	18.7	79.4	469	7	130	53	1.70	51.	13	44	3.3	23
18.0	504	444	3.42	5152	22.9	43.1	248	3698	531	19.8	17.5	80.1	498	6	132	51	1.63	53.	14	46	3.4	25
19.0	532	469	3.61	5295	23.5	42.0	257	3777	503	18.5	16.4	80.7	526	6	134	49	1.57	56.	14	48	3.6	26
20.0	560	494	3.80	5434	24.2	40.9	266	3849	478	17.5	15.4	81.3	555	5	136	48	1.51	59.	15	50	3.7	27
25.0	700	617	4.75	6083	27.0	36.6	308	4120	382	13.5	12.0	83.2	696	4	145	41	1.31	71.	18	59	4.2	33
30.0	840	741	5.70	6673	29.6	33.4	345	4301	318	11.1	9.8	84.5	837	3	153	37	1.17	83.	21	68	4.7	38
35.0	980	864	6.65	7217	32.0	30.9	378	4429	273	9.3	8.2	85.3	977	3	160	34	1.07	95.	24	76	5.1	
40.0	1120	988	7.60	7725	34.2	28.9	409	4526	239	8.1	7.1	86.0	1118	2	167	31	0.99	106.	27	84	5.5	
45.0	1260	1111	8.54	8205	36.2	27.3	437	4601	212	7.1	6.3	86.4	1258	2	173	29	0.92	117.	30	92	5.9	
50.0	1400	1235	9.49	8660	38.2	25.9	464	4661	191	6.4	5.6	86.8	1398	2	179	27	0.87	127.	33	99	6.2	

#160 28 Si on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 14. ZT= 92. ZC=106.( )
NEUTRON NUMBERS: NP= 14. NT=146. NC=160.

AP**1/3= 3.037 AT**1/3= 6.197
REDUCED MASS NUMBER= 25.05 AP+AT=AC=266.

INTERACTION RADIUS RINT=13.13 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.10 CT= 7.16 CT+CP=10.26 C̄= 2.16

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.39 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.39 RCT= 6.98 RC=RCP+RCT=10.37

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 243.62 MeV K= .10409 n=2.752
VC(RINT)= 141.0 MeV

FISSION-TKE= 209. MeV
ASYMM. FISSION-TKE= 96. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.882 MeV/fm**2 PROX-FACTOR= 23.95 MeV
L-RLD= 49 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.90 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.1 TARGET: 47.2
COMPOUND NUCLEUS: 115.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.86 fm V(RB)= 146.4 MeV
Q-VALUE= -93.3 MeV
L-CRITICAL= 94.

28 Si on 238 U

28 Si on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	28	25	0.18	1209	5.5	202.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	56	50	0.36	1710	7.7	143.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	84	75	0.53	2095	9.5	117.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	112	100	0.71	2420	11.0	101.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	126	113	0.80	2567	11.6	95.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	140	125	0.89	2706	12.3	90.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	154	138	0.98	2838	12.9	86.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	168	150	1.07	2965	13.4	82.8	43	344	114	124.7	118.7	27.7	118	50	73	333	9.84	17.	4	16	1.3	6
6.5	182	163	1.15	3087	14.0	79.5	67	742	445	99.9	93.1	40.1	142	40	83	217	6.39	19.	5	18	1.4	7
7.0	196	175	1.24	3204	14.5	76.7	84	1081	729	84.7	78.1	47.6	162	34	91	173	5.09	20.	5	20	1.6	8
7.5	210	188	1.33	3316	15.0	74.1	98	1374	975	74.0	67.8	53.0	181	29	96	148	4.35	21.	6	21	1.7	9
8.0	224	200	1.42	3426	15.5	71.7	111	1630	1179	65.9	60.0	57.1	199	25	100	132	3.86	23.	6	23	1.8	10
8.5	238	213	1.51	3532	16.0	69.6	122	1856	1110	59.5	54.0	60.3	216	22	104	120	3.51	24.	7	24	1.9	12
9.0	252	225	1.60	3634	16.4	67.6	132	2056	1048	54.2	49.1	62.9	232	20	107	110	3.24	25.	7	26	2.0	13
9.5	266	238	1.69	3734	16.9	65.8	141	2236	993	49.9	45.1	65.1	248	18	109	103	3.02	27.	8	27	2.1	14
10.0	280	251	1.78	3832	17.3	64.1	150	2397	943	46.2	41.7	66.9	264	16	112	97	2.84	28.	8	28	2.2	14
10.5	294	263	1.87	3927	17.8	62.6	159	2542	898	43.0	38.8	68.5	279	15	114	92	2.69	29.	8	29	2.3	15
11.0	308	276	1.95	4020	18.2	61.1	167	2674	857	40.3	36.3	69.9	294	14	115	88	2.56	30.	9	31	2.3	16
11.5	322	288	2.04	4111	18.6	59.8	174	2795	820	37.9	34.1	71.1	309	13	117	84	2.45	32.	9	32	2.4	17
12.0	336	301	2.13	4200	19.0	58.5	182	2906	786	35.7	32.2	72.1	324	12	119	80	2.35	33.	9	33	2.5	18
13.0	364	326	2.31	4373	19.8	56.2	195	3101	725	32.1	28.9	73.9	353	11	121	75	2.19	35.	10	35	2.6	20
14.0	392	351	2.49	4539	20.5	54.2	208	3269	673	29.2	26.2	75.4	383	9	124	70	2.05	38.	11	37	2.8	21
15.0	420	376	2.66	4699	21.2	52.4	220	3414	629	26.8	24.0	76.6	412	8	126	66	1.94	40.	11	39	2.9	23
16.0	448	401	2.84	4855	21.9	50.7	232	3541	589	24.7	22.1	77.7	440	8	128	63	1.84	43.	12	41	3.0	24
17.0	476	426	3.02	5006	22.6	49.2	243	3653	555	22.9	20.6	78.5	469	7	130	60	1.76	45.	13	43	3.2	26
18.0	504	451	3.20	5152	23.2	47.8	253	3752	524	21.4	19.2	79.3	497	7	132	58	1.69	48.	13	45	3.3	27
19.0	532	476	3.38	5295	23.9	46.5	263	3841	496	20.1	18.0	80.0	526	6	134	55	1.62	50.	14	47	3.4	29
20.0	560	501	3.55	5434	24.5	45.3	273	3921	471	18.9	16.9	80.6	554	6	136	53	1.57	52.	15	49	3.5	30
25.0	700	626	4.44	6083	27.4	40.6	317	4224	377	14.6	13.1	82.7	696	4	144	46	1.35	64.	18	58	4.0	36
30.0	840	752	5.33	6673	30.0	37.0	355	4426	314	11.9	10.7	84.0	837	3	151	41	1.20	74.	21	66	4.4	42
35.0	980	877	6.22	7217	32.4	34.3	390	4570	269	10.0	9.0	85.0	977	3	157	37	1.10	85.	24	74	4.9	
40.0	1120	1002	7.11	7725	34.7	32.1	422	4678	235	8.7	7.8	85.7	1118	2	163	35	1.01	95.	27	82	5.2	
45.0	1260	1127	7.99	8205	36.8	30.2	452	4762	209	7.7	6.9	86.2	1258	2	168	32	0.95	105.	30	89	5.6	
50.0	1400	1253	8.88	8660	38.7	28.7	479	4829	188	6.8	6.1	86.6	1398	2	174	30	0.89	114.	33	97	5.9	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 28 Si

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#161 32 S on 12 C — 32 S on 12 C — 32 S on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 6. ZC= 22.(Ti)
NEUTRON NUMBERS: NP= 16. NT= 6. NC= 22.

AP**1/3= 3.175 AT**1/3= 2.289 ELSCAT <22 deg
REDUCED MASS NUMBER= 8.73 AP+AT=AC= 44.

INTERACTION RADIUS RINT= 9.04 fm RO= 1.65 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 2.12 CT+CP= 5.40 C= 1.29

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.55 RCT= 2.51 RC=RCP+RCT= 6.07

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 31.73 MeV K= .09239 n=2.538
VC(RINT)= 15.3 MeV

FISSION-TKE= 37. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 15.40 MeV
L-RLD= 43 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 22.07 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: 0.0
COMPOUND NUCLEUS: -38.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.22 fm V(RB)= 15.6 MeV
Q-VALUE= 12.6 MeV
L-CRITICAL= 28.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	32	9	0.57	1382	1.9	15.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	64	17	1.14	1954	2.7	10.7	9	396	229	102.5	21.7	38.8	33	31	0	30	8.21	45.	0	0	2.3	1
3.0	96	26	1.71	2394	3.3	8.7	19	1181	859	48.7	12.7	65.6	83	13	0	14	3.66	67.	0	0	2.7	2
4.0	128	35	2.29	2765	3.8	7.6	26	1555	1175	32.6	8.7	73.7	120	8	115	10	2.73	89.	4	14	2.9	2
4.5	144	39	2.57	2934	4.0	7.1	29	1678	1280	28.0	7.5	76.0	137	7	128	9	2.47	100.	5	17	3.1	2
5.0	160	44	2.86	3093	4.3	6.8	31	1776	1364	24.5	6.6	77.7	154	6	140	8	2.27	111.	6	20	3.2	2
5.5	176	48	3.14	3244	4.5	6.4	33	1855	1339	21.8	5.9	79.1	171	5	152	8	2.11	119.	6	23	3.3	3
6.0	192	52	3.43	3389	4.7	6.2	36	1920	1228	19.7	5.3	80.2	188	4	163	7	1.98	130.	7	25	3.4	3
6.5	208	57	3.71	3528	4.9	5.9	38	1975	1133	17.9	4.9	81.0	204	4	174	7	1.88	141.	7	27	3.6	3
7.0	224	61	4.00	3661	5.1	5.7	40	2022	1052	16.5	4.5	81.8	220	4	185	7	1.78	152.	8	29	3.7	3
7.5	240	65	4.29	3790	5.2	5.5	41	2063	982	15.2	4.1	82.4	237	3	196	6	1.70	163.	8	31	3.8	3
8.0	256	70	4.57	3915	5.4	5.3	43	2098	921	14.1	3.8	82.9	253	3	207	6	1.63	169.	9	33	3.9	4
8.5	272	74	4.86	4036	5.6	5.2	45	2129	866	13.2	3.6	83.4	269	3	218	6	1.57	180.	9	35	4.0	4
9.0	288	79	5.14	4154	5.7	5.0	46	2156	818	12.4	3.4	83.8	285	3	228	6	1.52	190.	10	37	4.1	4
9.5	304	83	5.43	4268	5.9	4.9	48	2181	775	11.7	3.2	84.2	302	2	239	5	1.47	201.	10	38	4.2	4
10.0	320	87	5.71	4379	6.0	4.8	50	2203	736	11.0	3.0	84.5	318	2	249	5	1.42	211.	11	40	4.3	4
10.5	336	92	6.00	4488	6.2	4.7	51	2222	701	10.4	2.8	84.8	334	2	260	5	1.38	222.	11	42	4.4	4
11.0	352	96	6.28	4594	6.3	4.6	52	2240	669	9.9	2.7	85.0	350	2	270	5	1.34	233.	12	43	4.4	4
11.5	368	100	6.57	4698	6.5	4.5	54	2256	640	9.5	2.6	85.3	366	2	280	5	1.31	237.	12	45	4.5	5
12.0	384	105	6.86	4800	6.6	4.4	55	2271	614	9.0	2.5	85.5	382	2	291	5	1.28	247.	13	47	4.6	5
13.0	416	113	7.43	4997	6.9	4.2	58	2297	566	8.3	2.3	85.9	414	2	311	5	1.22	268.	14	50	4.8	5
14.0	448	122	8.00	5187	7.1	4.0	60	2320	526	7.7	2.1	86.2	446	2	331	4	1.17	289.	15	53	5.0	5
15.0	480	131	8.57	5371	7.4	3.9	63	2339	491	7.1	1.9	86.4	479	1	351	4	1.12	301.	16	56	5.1	6
16.0	512	140	9.14	5548	7.6	3.8	65	2356	460	6.6	1.8	86.7	511	1	371	4	1.08	321.	17	59	5.3	6
17.0	544	148	9.71	5721	7.9	3.7	67	2370	433	6.2	1.7	86.9	543	1	391	4	1.05	341.	18	62	5.4	6
18.0	576	157	10.28	5888	8.1	3.6	70	2383	409	5.9	1.6	87.1	575	1	411	4	1.01	352.	19	64	5.6	7
19.0	608	166	10.86	6051	8.3	3.5	72	2395	387	5.5	1.5	87.2	607	1	430	4	0.98	372.	20	67	5.7	7
20.0	640	175	11.43	6210	8.5	3.4	74	2405	368	5.3	1.4	87.4	639	1	450	4	0.96	391.	21	70	5.8	7
25.0	800	218	14.28	6952	9.5	3.0	83	2444	294	4.2	1.1	87.9	799	1	547	3	0.85	476.	25	83	6.5	8
30.0	960	262	17.14	7626	10.5	2.8	92	2469	245	3.4	0.9	88.3	959	1	643	3	0.77	555.	30	96	7.1	9
35.0	1120	305	20.00	8248	11.3	2.6	99	2487	210	2.9	0.8	88.5	1119	1	738	3	0.71	629.	35	108	7.6	
40.0	1280	349	22.85	8829	12.1	2.4	107	2500	184	2.6	0.7	88.7	1279	1	832	2	0.66	698.	39	120	8.1	
45.0	1440	393	25.71	9377	12.8	2.3	113	2510	163	2.3	0.6	88.9	1440	0	925	2	0.62	761.	44	131	8.6	
50.0	1600	436	28.57	9897	13.5	2.1	120	2518	147	2.0	0.6	89.0	1600	0	1019	2	0.59	819.	48	142	9.0	

#162 32 S on 16 O — 32 S on 16 O — 32 S on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 8. ZC= 24.(Cr)
NEUTRON NUMBERS: NP= 16. NT= 8. NC= 24.

AP**1/3= 3.175 AT**1/3= 2.520 ELSCAT <30 deg
REDUCED MASS NUMBER= 10.67 AP+AT=AC= 48.

INTERACTION RADIUS RINT= 9.29 fm RO= 1.63 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 2.42 CT+CP= 5.70 C= 1.39

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.55 RCT= 2.78 RC=RCP+RCT= 6.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 40.74 MeV K= .11813 n=2.488
VC(RINT)= 19.8 MeV

FISSION-TKE= 39. MeV
ASYMM. FISSION-TKE= 35. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 16.66 MeV
L-RLD= 47 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 18.14 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -4.7
COMPOUND NUCLEUS: -44.5

FUSION RELATED PARAMETERS:
R-BARRIER= 8.42 fm V(RB)= 20.3 MeV
Q-VALUE= 14.1 MeV
L-CRITICAL= >4.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	32	11	0.54	1382	2.3	20.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	64	21	1.08	1954	3.3	14.3	8	240	103	120.7	30.0	29.7	21	43	0	53	11.22	42.	0	0	2.4	1
3.0	96	32	1.62	2394	4.0	11.6	23	1122	811	53.4	17.2	63.3	79	17	0	19	3.93	61.	0	0	2.8	2
4.0	128	43	2.15	2765	4.7	10.1	32	1544	1164	35.3	11.6	72.4	118	10	110	14	2.87	82.	4	15	3.1	2
4.5	144	48	2.42	2934	4.9	9.5	35	1683	1282	30.2	10.0	74.9	135	9	123	12	2.59	90.	5	18	3.2	3
5.0	160	53	2.69	3093	5.2	9.0	38	1793	1377	26.4	8.7	76.8	153	7	134	11	2.37	100.	6	21	3.4	3
5.5	176	59	2.96	3244	5.5	8.6	41	1883	1304	23.5	7.8	78.3	170	6	145	11	2.20	110.	6	23	3.5	3
6.0	192	64	3.23	3389	5.7	8.2	44	1957	1195	21.1	7.0	79.4	186	6	156	10	2.06	120.	7	26	3.6	3
6.5	208	69	3.50	3528	5.9	7.9	47	2020	1103	19.2	6.4	80.4	203	5	166	9	1.95	127.	7	28	3.7	4
7.0	224	75	3.77	3661	6.2	7.6	49	2073	1024	17.6	5.9	81.2	219	5	176	9	1.85	137.	8	30	3.8	4
7.5	240	80	4.04	3790	6.4	7.4	51	2119	956	16.3	5.4	81.9	236	4	186	8	1.77	147.	8	32	4.0	4
8.0	256	85	4.31	3915	6.6	7.1	54	2160	896	15.1	5.0	82.4	252	4	196	8	1.70	156.	9	34	4.1	4
8.5	272	91	4.58	4036	6.8	6.9	56	2195	844	14.1	4.7	82.9	268	4	205	8	1.63	166.	9	36	4.2	4
9.0	288	96	4.85	4154	7.0	6.7	58	2226	797	13.2	4.4	83.4	285	3	215	8	1.57	172.	10	37	4.3	5
9.5	304	101	5.11	4268	7.2	6.5	60	2254	755	12.5	4.1	83.8	301	3	224	7	1.52	181.	10	39	4.4	5
10.0	320	107	5.38	4379	7.4	6.4	62	2279	717	11.8	3.9	84.1	317	3	233	7	1.47	191.	11	41	4.5	5
10.5	336	112	5.65	4488	7.6	6.2	64	2302	683	11.2	3.7	84.4	333	3	243	7	1.43	201.	11	43	4.6	5
11.0	352	117	5.92	4594	7.7	6.1	66	2323	652	10.6	3.5	84.7	349	3	252	7	1.39	210.	12	44	4.7	5
11.5	368	123	6.19	4698	7.9	5.9	67	2341	623	10.1	3.4	85.0	365	3	261	6	1.35	215.	12	46	4.8	6
12.0	384	128	6.46	4800	8.1	5.8	69	2358	597	9.6	3.2	85.2	382	2	270	6	1.32	224.	13	48	4.9	6
13.0	416	139	7.00	4997	8.4	5.6	72	2388	551	8.8	2.9	85.6	414	2	288	6	1.26	243.	14	51	5.0	6
14.0	448	149	7.54	5187	8.7	5.4	76	2414	512	8.2	2.7	85.9	446	2	306	6	1.21	261.	15	54	5.2	6
15.0	480	160	8.08	5371	9.0	5.2	79	2436	478	7.6	2.5	86.2	478	2	324	6	1.16	273.	16	57	5.4	7
16.0	512	171	8.61	5548	9.3	5.0	82	2456	448	7.1	2.4	86.5	510	2	341	5	1.12	291.	17	60	5.5	7
17.0	544	181	9.15	5721	9.6	4.9	84	2473	422	6.6	2.2	86.7	542	2	359	5	1.08	310.	18	63	5.7	7
18.0	576	192	9.69	5888	9.9	4.8	87	2488	398	6.2	2.1	86.9	574	2	376	5	1.05	320.	18	65	5.9	8
19.0	608	203	10.23	6051	10.2	4.6	90	2501	377	5.9	2.0	87.1	607	1	393	5	1.01	338.	19	68	6.0	8
20.0	640	213	10.77	6210	10.4	4.5	92	2513	358	5.6	1.9	87.2	639	1	410	5	0.99	355.	20	71	6.2	8
25.0	800	267	13.46	6952	11.7	4.0	104	2558	286	4.4	1.5	87.8	799	1	495	4	0.87	422.	25	84	6.8	10
30.0	960	320	16.15	7626	12.8	3.7	115	2588	239	3.7	1.2	88.2	959	1	579	4	0.79	493.	29	97	7.5	11
35.0	1120	373	18.84	8248	13.8	3.4	125	2609	204	3.1	1.0	88.4	1119	1	661	4	0.73	560.	34	109	8.0	
40.0	1280	427	21.54	8829	14.8	3.2	134	2624	179	2.7	0.9	88.6	1279	1	743	3	0.68	622.	38	121	8.6	
45.0	1440	480	24.23	9377	15.7	3.0	142	2636	159	2.4	0.8	88.8	1439	1	824	3	0.64	680.	43	132	9.1	
50.0	1600	533	26.92	9897	16.5	2.9	150	2646	143	2.2	0.7	88.9	1599	1	904	3	0.61	733.	47	143	9.6	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB — BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#163 32 S on 27 Al

32 S on 27 Al

32 S on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 13. ZC= 29.(Cu)
NEUTRON NUMBERS: NP= 16. NT= 14. NC= 30.

AP**1/3= 3.175 AT**1/3= 3.000 ELSCAT <57 deg
REDUCED MASS NUMBER= 14.64 AP+AT=AC= 59.

INTERACTION RADIUS RINT= 9.82 fm R0= 1.59 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 3.05 CT+CP= 6.32 C= 1.58

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.55 RCT= 3.32 RC=RCP+RCT= 6.87

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 61.31 MeV K= .15994 n=2.444
VC(RINT)= 30.5 MeV

FISSION-TKE= 45. MeV
ASYMM. FISSION-TKE= 45. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 18.87 MeV
L-RLD= 56 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.33 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -20.6
COMPOUND NUCLEUS: -58.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.85 fm V(RB)= 31.6 MeV
Q-VALUE= 11.9 MeV
L-CRITICAL= 47.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-GP	ET-GT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	15	0.48	1382	3.2	32.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	64	29	0.96	1954	4.5	23.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	96	44	1.44	2394	5.5	18.9	30	900	692	64.3	29.1	57.9	69	27	0	34	4.64	49.	0 0	2.8	3
4.0	128	59	1.92	2765	6.4	16.4	44	1518	1134	41.2	18.8	69.4	112	16	100	24	3.21	66.	4 16	3.1	3
4.5	144	66	2.16	2934	6.8	15.4	49	1693	1281	35.1	16.0	72.5	131	13	111	21	2.86	73.	5 19	3.2	4
5.0	160	73	2.40	3093	7.2	14.6	54	1832	1399	30.5	13.9	74.7	149	11	121	19	2.60	81.	5 22	3.4	4
5.5	176	81	2.64	3244	7.5	14.0	58	1946	1307	27.0	12.3	76.5	166	10	130	18	2.40	89.	6 24	3.5	4
6.0	192	88	2.88	3389	7.8	13.4	62	2040	1198	24.3	11.1	77.9	184	8	139	17	2.24	95.	7 26	3.7	5
6.5	208	95	3.12	3528	8.2	12.8	66	2120	1106	22.0	10.1	79.0	200	8	147	16	2.11	103.	7 29	3.8	5
7.0	224	103	3.36	3661	8.5	12.4	70	2188	1027	20.1	9.2	79.9	217	7	155	15	2.00	111.	8 31	3.9	5
7.5	240	110	3.60	3790	8.8	12.0	73	2247	958	18.6	8.5	80.7	234	6	163	14	1.91	119.	8 33	4.1	5
8.0	256	117	3.84	3915	9.1	11.6	76	2298	898	17.2	7.9	81.4	250	6	171	13	1.82	125.	9 34	4.2	6
8.5	272	124	4.09	4036	9.3	11.2	80	2343	845	16.1	7.3	82.0	267	5	178	13	1.75	132.	9 36	4.3	6
9.0	288	132	4.33	4154	9.6	10.9	83	2383	798	15.0	6.9	82.5	283	5	186	12	1.69	140.	10 38	4.4	6
9.5	304	139	4.57	4268	9.9	10.6	86	2419	756	14.1	6.5	82.9	299	5	193	12	1.63	148.	10 40	4.5	6
10.0	320	146	4.81	4379	10.1	10.4	88	2451	718	13.4	6.1	83.3	316	4	200	12	1.58	153.	10 42	4.6	7
10.5	336	154	5.05	4488	10.4	10.1	91	2480	684	12.6	5.8	83.7	332	4	207	11	1.53	161.	11 43	4.7	7
11.0	352	161	5.29	4594	10.6	9.9	94	2507	653	12.0	5.5	84.0	348	4	214	11	1.49	168.	11 45	4.8	7
11.5	368	168	5.53	4698	10.9	9.7	96	2531	625	11.4	5.2	84.3	364	4	221	11	1.45	172.	12 46	4.9	8
12.0	384	176	5.77	4800	11.1	9.5	99	2553	599	10.9	5.0	84.5	381	3	228	10	1.41	180.	12 48	5.0	8
13.0	416	190	6.25	4997	11.5	9.1	104	2592	553	10.0	4.6	85.0	413	3	242	10	1.34	195.	13 51	5.2	8
14.0	448	205	6.73	5187	12.0	8.8	109	2625	513	9.2	4.2	85.4	445	3	255	9	1.29	206.	14 54	5.4	9
15.0	480	220	7.21	5371	12.4	8.5	113	2653	479	8.6	3.9	85.7	477	3	268	9	1.24	220.	15 57	5.6	9
16.0	512	234	7.69	5548	12.8	8.2	117	2678	449	8.0	3.7	86.0	510	2	281	9	1.19	230.	16 60	5.8	10
17.0	544	249	8.17	5721	13.2	7.9	121	2700	422	7.5	3.4	86.3	542	2	294	8	1.15	245.	17 63	5.9	10
18.0	576	264	8.65	5888	13.6	7.7	125	2720	399	7.0	3.2	86.5	574	2	307	8	1.11	259.	18 66	6.1	10
19.0	608	278	9.13	6051	14.0	7.5	129	2737	378	6.7	3.0	86.7	606	2	320	8	1.08	268.	18 68	6.3	11
20.0	640	293	9.61	6210	14.3	7.3	133	2753	359	6.3	2.9	86.9	638	2	332	8	1.05	282.	19 71	6.4	11
25.0	800	366	12.02	6952	16.0	6.6	151	2812	287	5.0	2.3	87.5	798	2	394	7	0.93	338.	24 84	7.2	13
30.0	960	439	14.42	7626	17.5	6.0	166	2851	239	4.1	1.9	87.9	959	1	455	6	0.84	388.	28 97	7.8	15
35.0	1120	513	16.82	8248	18.9	5.5	180	2879	205	3.5	1.6	88.2	1119	1	514	6	0.77	442.	32 108	8.4	
40.0	1280	586	19.22	8829	20.3	5.2	194	2900	179	3.1	1.4	88.5	1279	1	573	5	0.72	482.	36 120	9.0	
45.0	1440	659	21.63	9377	21.5	4.9	206	2915	159	2.7	1.2	88.6	1439	1	630	5	0.68	529.	40 131	9.5	
50.0	1600	732	24.03	9897	22.6	4.6	218	2928	143	2.4	1.1	88.8	1599	1	688	5	0.64	573.	44 142	10.0	

#164 32 S on 40 Ca

32 S on 40 Ca

32 S on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 20. ZC= 36.(Kr)
NEUTRON NUMBERS: NP= 16. NT= 20. NC= 36.

AP**1/3= 3.175 AT**1/3= 3.420
REDUCED MASS NUMBER= 17.78 AP+AT=AC= 72.

INTERACTION RADIUS RINT=10.28 fm R0= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 3.59 CT+CP= 6.87 C= 1.71

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.55 RCT= 3.84 RC=RCP+RCT= 7.39

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 87.71 MeV K= .19180 n=2.444
VC(RINT)= 44.8 MeV

FISSION-TKE= 56. MeV
ASYMM. FISSION-TKE= 55. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 20.49 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.04 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -33.0
COMPOUND NUCLEUS: -56.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.21 fm V(RB)= 46.9 MeV
Q-VALUE= -2.5 MeV
L-CRITICAL= 57.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-GP	ET-GT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	18	0.40	1382	3.9	50.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	64	36	0.79	1954	5.5	35.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	96	53	1.19	2394	6.7	29.1	28	567	323	93.0	53.2	43.5	46	50	0	73	6.72	41.	0 0	2.4	2
4.0	128	71	1.59	2765	7.8	25.2	49	1276	909	54.8	30.7	62.6	101	27	88	41	3.82	54.	4 15	2.8	3
4.5	144	80	1.79	2934	8.2	23.8	56	1510	1104	45.8	25.6	67.1	122	22	100	36	3.30	60.	4 18	2.9	4
5.0	160	89	1.98	3093	8.7	22.5	63	1696	1261	39.4	22.0	70.3	142	18	110	32	2.95	67.	5 21	3.1	4
5.5	176	98	2.18	3244	9.1	21.5	69	1848	1284	34.6	19.3	72.7	161	15	119	29	2.69	74.	6 23	3.3	4
6.0	192	107	2.38	3389	9.5	20.6	75	1974	1177	30.9	17.2	74.6	179	13	127	27	2.49	79.	6 26	3.4	5
6.5	208	116	2.58	3528	9.9	19.8	80	2081	1086	27.9	15.5	76.1	196	12	134	25	2.33	86.	7 28	3.5	5
7.0	224	124	2.78	3661	10.3	19.0	85	2172	1009	25.4	14.1	77.3	213	11	141	24	2.20	91.	7 30	3.7	6
7.5	240	133	2.98	3790	10.6	18.4	89	2251	941	23.3	13.0	78.3	230	10	148	23	2.08	98.	8 32	3.8	6
8.0	256	142	3.18	3915	11.0	17.8	94	2320	882	21.6	12.0	79.2	247	9	154	22	1.99	104.	8 34	3.9	6
8.5	272	151	3.37	4036	11.3	17.3	98	2381	831	20.1	11.2	80.0	264	8	160	21	1.90	109.	9 35	4.1	7
9.0	288	160	3.57	4154	11.7	16.8	102	2434	784	18.8	10.4	80.6	280	8	166	20	1.83	115.	9 37	4.2	7
9.5	304	169	3.77	4268	12.0	16.3	106	2483	743	17.6	9.8	81.2	297	7	172	19	1.76	122.	10 39	4.3	7
10.0	320	178	3.97	4379	12.3	15.9	109	2526	706	16.6	9.2	81.7	313	7	178	18	1.70	126.	10 41	4.4	8
10.5	336	187	4.17	4488	12.6	15.5	113	2565	672	15.7	8.7	82.2	330	6	183	18	1.64	133.	10 42	4.5	8
11.0	352	196	4.37	4594	12.9	15.2	116	2600	642	14.9	8.3	82.6	346	6	189	17	1.60	139.	11 44	4.6	8
11.5	368	204	4.57	4698	13.2	14.9	120	2633	614	14.2	7.9	82.9	362	6	194	17	1.55	145.	11 45	4.7	8
12.0	384	213	4.76	4800	13.5	14.5	123	2662	588	13.5	7.5	83.3	379	5	200	16	1.51	149.	12 47	4.8	9
13.0	416	231	5.16	4997	14.0	14.0	129	2715	543	12.3	6.9	83.8	411	5	210	16	1.44	162.	13 50	5.0	9
14.0	448	249	5.56	5187	14.5	13.5	135	2760	504	11.4	6.3	84.3	444	4	221	15	1.37	171.	14 53	5.2	10
15.0	480	267	5.95	5371	15.1	13.0	141	2798	470	10.5	5.9	84.7	476	4	231	14	1.32	184.	14 56	5.4	10
16.0	512	284	6.35	5548	15.6	12.6	147	2832	441	9.8	5.5	85.1	508	4	241	14	1.27	193.	15 59	5.6	11
17.0	544	302	6.75	5721	16.0	12.2	152	2862	415	9.2	5.1	85.4	541	3	251	13	1.22	205.	16 61	5.8	11
18.0	576	320	7.15	5888	16.5	11.9	157	2888	392	8.6	4.8	85.7	573	3	261	13	1.18	213.	17 64	5.9	12
19.0	608	338	7.54	6051	16.9	11.6	162	2912	371	8.2	4.5	85.9	605	3	270	12	1.14	225.	18 67	6.1	12
20.0	640	356	7.94	6210	17.4	11.3	167	2933	353	7.7	4.3	86.1	637	3	280	12	1.11	233.	18 69	6.3	13
25.0	800	444	9.92	6952	19.4	10.1	189	3014	282	6.1	3.4	87.0	798	2	327	11	0.98	281.	23 82	7.0	15
30.0	960	533	11.91	7626	21.3	9.2	209	3067	235	5.0	2.8	87.5	958	2	372	10	0.89	326.	26 94	7.7	17
35.0	1120	622	13.89	8248	23.0	8.5	228	3105	201	4.3	2.4	87.9	1118	2	416	9	0.82	366.	30 105	8.3	
40.0	1280	711	15.88	8829	24.6	8.0	245	3133	176	3.7	2.1	88.1	1279	1	459	8	0.76	403.	34 116	8.9	
45.0	1440	800	17.86	9377	26.1	7.5	260	3155	156	3.3	1.8	88.3	1439	1	501	8	0.71	444.	38 127	9.4	
50.0	1600	889	19.85	9897	27.5	7.1	275	3172	141	3.0	1.6	88.5	1599	1	543	7	0.67	474.	42 137	9.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#165 32 S on 56 Fe

32 S on 56 Fe

32 S on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 26. ZC= 42.(Mo)
NEUTRON NUMBERS: NP= 16. NT= 30. NC= 46.

AP**1/3= 3.175 AT**1/3= 3.826
REDUCED MASS NUMBER= 20.36 AP+AT=AC= 88.

INTERACTION RADIUS RINT=10.72 fm RO= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 4.12 CT+CP= 7.39 C= 1.82

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.55 RCT= 4.27 RC=RCP+RCT= 7.82

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 107.54 MeV K= .19692 n=2.460
VC(RINT)= 55.8 MeV

FISSION-TKE= 65. MeV
ASYMM. FISSION-TKE= 61. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.948 MeV/fm**2 PROX-FACTOR= 21.73 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.68 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -61.4
COMPOUND NUCLEUS: -74.2

FUSION RELATED PARAMETERS:
R-BARRIER= 9.60 fm V(RB)= 58.4 MeV
Q-VALUE= -12.8 MeV
L-CRITICAL= 68.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	32	20	0.36	1382	4.5	65.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	64	41	0.73	1954	6.3	46.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	96	61	1.09	2394	7.7	37.8	24	333	127	114.9	80.6	32.5	33	63	33	129	9.59	34.	1 2	2.1	2
4.0	128	81	1.46	2765	8.9	32.8	53	1175	819	63.0	41.0	58.5	96	32	79	58	4.33	44.	4 15	2.5	4
4.5	144	92	1.64	2934	9.4	30.9	63	1452	1049	52.1	33.6	64.0	118	26	91	49	3.66	50.	4 18	2.7	4
5.0	160	102	1.82	3093	10.0	29.3	72	1673	1233	44.5	28.6	67.8	139	21	101	44	3.23	55.	5 20	2.8	5
5.5	176	112	2.01	3244	10.4	27.9	79	1853	1383	38.8	24.9	70.6	158	18	109	39	2.92	60.	5 23	3.0	5
6.0	192	122	2.19	3389	10.9	26.7	86	2003	1268	34.5	22.1	72.7	176	16	116	36	2.69	65.	6 25	3.2	6
6.5	208	132	2.37	3528	11.4	25.7	92	2130	1170	31.0	19.9	74.5	194	14	122	34	2.50	70.	6 27	3.3	6
7.0	224	143	2.55	3661	11.8	24.8	98	2238	1086	28.2	18.0	75.9	212	12	128	32	2.35	75.	7 29	3.4	7
7.5	240	153	2.74	3790	12.2	23.9	104	2332	1014	25.9	16.5	77.1	229	11	134	30	2.22	80.	7 31	3.6	7
8.0	256	163	2.92	3915	12.6	23.2	109	2414	951	23.9	15.3	78.0	246	10	139	29	2.11	86.	8 33	3.7	7
8.5	272	173	3.10	4036	13.0	22.5	115	2486	895	22.2	14.2	78.9	263	9	144	27	2.02	90.	8 34	3.8	8
9.0	288	183	3.28	4154	13.4	21.8	119	2550	845	20.7	13.2	79.6	279	9	149	26	1.94	95.	9 36	3.9	8
9.5	304	193	3.47	4268	13.7	21.3	124	2607	800	19.4	12.4	80.3	296	8	154	25	1.86	99.	9 38	4.1	9
10.0	320	204	3.65	4379	14.1	20.7	129	2659	760	18.3	11.7	80.8	313	7	158	24	1.80	104.	10 39	4.2	9
10.5	336	214	3.83	4488	14.4	20.2	133	2705	724	17.3	11.0	81.4	329	7	163	24	1.74	108.	10 41	4.3	10
11.0	352	224	4.01	4594	14.8	19.8	137	2747	691	16.4	10.4	81.8	345	7	167	23	1.69	113.	10 42	4.4	10
11.5	368	234	4.20	4698	15.1	19.3	141	2786	661	15.6	9.9	82.2	362	6	171	22	1.64	119.	11 44	4.5	10
12.0	384	244	4.38	4800	15.4	18.9	145	2821	634	14.8	9.5	82.6	378	6	175	22	1.59	122.	11 45	4.6	11
13.0	416	265	4.74	4997	16.1	18.2	153	2884	585	13.6	8.6	83.2	411	5	184	20	1.51	132.	12 48	4.8	11
14.0	448	285	5.11	5187	16.7	17.5	160	2937	543	12.5	7.9	83.8	443	5	192	20	1.44	141.	13 51	5.0	12
15.0	480	305	5.47	5371	17.3	16.9	167	2983	507	11.6	7.4	84.2	475	5	200	19	1.38	149.	14 54	5.2	13
16.0	512	326	5.84	5548	17.8	16.4	174	3024	475	10.8	6.9	84.6	508	4	207	18	1.33	159.	15 56	5.3	13
17.0	544	346	6.20	5721	18.4	15.9	180	3059	447	10.1	6.4	85.0	540	4	215	17	1.28	166.	15 59	5.5	14
18.0	576	367	6.57	5888	18.9	15.4	186	3091	422	9.5	6.0	85.3	572	4	222	17	1.24	174.	16 62	5.7	15
19.0	608	387	6.93	6051	19.4	15.0	192	3119	400	8.9	5.7	85.5	605	3	230	16	1.20	183.	17 64	5.8	15
20.0	640	407	7.30	6210	19.9	14.6	198	3144	380	8.4	5.4	85.8	637	3	237	16	1.17	190.	18 67	6.0	16
25.0	800	509	9.12	6952	22.3	13.1	225	3241	304	6.7	4.2	86.7	798	2	272	14	1.03	228.	21 79	6.7	19
30.0	960	611	10.94	7626	24.4	12.0	249	3304	253	5.5	3.5	87.3	958	2	306	13	0.93	266.	25 90	7.4	21
35.0	1120	713	12.77	8248	26.3	11.1	271	3350	217	4.7	3.0	87.7	1118	2	338	12	0.85	301.	29 101	8.0	
40.0	1280	815	14.59	8829	28.2	10.4	291	3384	190	4.1	2.6	88.0	1279	1	370	11	0.79	333.	33 111	8.5	
45.0	1440	916	16.42	9377	29.9	9.8	310	3410	169	3.6	2.3	88.2	1439	1	401	10	0.75	363.	36 122	9.1	
50.0	1600	1018	18.24	9897	31.5	9.3	328	3431	152	3.2	2.1	88.4	1599	1	431	10	0.70	390.	40 132	9.6	

#166 32 S on 63 Cu

32 S on 63 Cu

32 S on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 29. ZC= 45.(Rh)
NEUTRON NUMBERS: NP= 16. NT= 34. NC= 50.

AP**1/3= 3.175 AT**1/3= 3.979
REDUCED MASS NUMBER= 21.22 AP+AT=AC= 95.

INTERACTION RADIUS RINT=10.88 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 4.31 CT+CP= 7.59 C= 1.86

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.55 RCT= 4.45 RC=RCP+RCT= 8.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 117.17 MeV K= .19791 n=2.472
VC(RINT)= 61.3 MeV

FISSION-TKE= 70. MeV
ASYMM. FISSION-TKE= 64. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 22.15 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.30 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -65.2
COMPOUND NUCLEUS: -80.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.74 fm V(RB)= 64.2 MeV
Q-VALUE= -10.8 MeV
L-CRITICAL= 72.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	32	21	0.35	1382	4.6	73.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	64	42	0.69	1954	6.6	51.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	96	64	1.04	2394	8.0	42.2	17	150	0	137.2	108.3	21.4	22	74	0	219	15.02	0.	0 0	2.1	3
4.0	128	85	1.38	2765	9.3	36.5	53	1069	726	69.0	47.1	55.5	91	37	75	69	4.68	41.	3 14	2.5	4
4.5	144	95	1.56	2934	9.8	34.4	64	1371	976	56.5	38.2	61.7	115	29	88	58	3.88	46.	4 17	2.7	4
5.0	160	106	1.73	3093	10.4	32.7	73	1611	1176	48.0	32.3	66.0	136	24	98	50	3.39	51.	5 20	2.8	5
5.5	176	117	1.90	3244	10.9	31.2	82	1807	1340	41.8	28.0	69.1	156	20	106	45	3.05	56.	5 22	3.0	6
6.0	192	127	2.08	3389	11.4	29.8	89	1971	1286	37.0	24.8	71.5	175	17	113	41	2.79	61.	6 24	3.1	6
6.5	208	138	2.25	3528	11.8	28.7	96	2108	1187	33.3	22.2	73.4	193	15	119	38	2.59	66.	6 27	3.3	6
7.0	224	149	2.42	3661	12.3	27.6	102	2226	1102	30.2	20.1	74.9	210	14	125	36	2.43	70.	7 28	3.4	7
7.5	240	159	2.60	3790	12.7	26.7	108	2328	1029	27.6	18.4	76.2	228	12	130	34	2.29	75.	7 30	3.5	7
8.0	256	170	2.77	3915	13.1	25.8	114	2417	964	25.5	17.0	77.3	245	11	135	32	2.18	79.	8 32	3.7	8
8.5	272	180	2.94	4036	13.5	25.1	120	2496	908	23.7	15.7	78.2	262	10	139	31	2.08	84.	8 34	3.8	8
9.0	288	191	3.12	4154	13.9	24.4	125	2566	857	22.1	14.7	79.0	279	9	144	30	1.99	88.	9 35	3.9	9
9.5	304	202	3.29	4268	14.3	23.7	130	2628	812	20.7	13.8	79.7	295	9	148	28	1.91	93.	9 37	4.0	9
10.0	320	212	3.46	4379	14.7	23.1	135	2684	771	19.5	12.9	80.3	312	8	153	27	1.85	96.	10 39	4.1	10
10.5	336	223	3.63	4488	15.0	22.5	139	2735	735	18.4	12.2	80.8	328	8	157	26	1.78	101.	10 40	4.2	10
11.0	352	233	3.81	4594	15.4	22.0	144	2781	701	17.4	11.6	81.3	345	7	161	26	1.73	106.	10 42	4.3	10
11.5	368	244	3.98	4698	15.7	21.5	148	2823	671	16.5	11.0	81.7	361	7	165	25	1.68	110.	11 43	4.4	11
12.0	384	255	4.15	4800	16.1	21.1	152	2861	643	15.8	10.5	82.1	378	6	169	24	1.63	114.	11 45	4.5	11
13.0	416	276	4.50	4997	16.7	20.3	161	2929	593	14.4	9.5	82.8	410	6	176	23	1.55	122.	12 47	4.7	12
14.0	448	297	4.85	5187	17.4	19.5	168	2987	551	13.2	8.8	83.4	443	5	184	22	1.48	130.	13 50	4.9	13
15.0	480	318	5.19	5371	18.0	18.9	176	3038	514	12.3	8.1	83.9	475	5	191	21	1.41	139.	14 53	5.1	13
16.0	512	340	5.54	5548	18.6	18.3	183	3082	482	11.4	7.6	84.3	507	5	198	20	1.36	147.	14 56	5.3	14
17.0	544	361	5.88	5721	19.1	17.7	190	3120	454	10.7	7.1	84.7	540	4	205	19	1.31	154.	15 58	5.4	15
18.0	576	382	6.23	5888	19.7	17.2	196	3155	428	10.0	6.7	85.0	572	4	211	19	1.27	161.	16 61	5.6	16
19.0	608	403	6.58	6051	20.2	16.8	203	3186	406	9.5	6.3	85.3	604	4	218	18	1.23	170.	17 63	5.7	16
20.0	640	424	6.92	6210	20.8	16.3	209	3213	385	8.9	5.9	85.5	637	3	225	18	1.19	177.	17 66	5.9	17
25.0	800	531	8.65	6952	23.2	14.6	238	3318	308	7.0	4.7	86.5	797	3	256	16	1.05	213.	21 77	6.6	20
30.0	960	637	10.38	7626	25.4	13.3	263	3388	257	5.8	3.9	87.1	958	2	287	14	0.95	248.	25 89	7.3	22
35.0	1120	743	12.11	8248	27.5	12.3	286	3437	220	4.9	3.3	87.5	1118	2	316	13	0.87	278.	28 99	7.9	
40.0	1280	849	13.85	8829	29.4	11.6	308	3474	192	4.3	2.9	87.9	1278	2	344	12	0.81	308.	32 110	8.4	
45.0	1440	955	15.58	9377	31.1	10.9	328	3503	171	3.8	2.5	88.1	1439	1	372	11	0.76	337.	36 120	8.9	
50.0	1600	1061	17.31	9897	32.8	10.3	347	3526	154	3.4	2.3	88.3	1599	1	399	11	0.72	363.	39 129	9.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fr	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#167 32 S on 92 Mo

32 S on 92 Mo

32 S on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 42. ZC= 58.(Ce)
NEUTRON NUMBERS: NP= 16. NT= 50. NC= 66.

AP**1/3= 3.175 AT**1/3= 4.514
REDUCED MASS NUMBER= 23.74 AP+AT=AC=124.

INTERACTION RADIUS RINT=11.46 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 5.00 CT+CP= 8.28 C= 1.98

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.55 RCT= 5.08 RC=RCP+RCT= 8.63

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 156.30 MeV K= .19129 n=2.527
VC(RINT)= 84.3 MeV

FISSION-TKE= 94. MeV
ASYMM. FISSION-TKE= 75. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 23.49 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.34 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -87.5
COMPOUND NUCLEUS: -66.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.27 fm V(RB)= 88.4 MeV
Q-VALUE= -46.8 MeV
L-CRITICAL= 81.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPOMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	24	0.28	1382	5.2	105.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	64	47	0.56	1954	7.3	74.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	96	71	0.84	2394	9.0	61.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	128	95	1.13	2765	10.4	52.9	40	483	228	106.2	85.9	36.9	65	63	52	158	7.77	32.	2	11	1.8	3
4.5	144	107	1.27	2934	11.0	49.9	58	897	571	81.5	63.4	49.2	97	47	72	109	5.33	36.	3	15	2.0	4
5.0	160	119	1.41	3093	11.6	47.3	72	1227	846	66.9	51.2	56.5	123	37	86	88	4.31	40.	4	18	2.2	4
5.5	176	131	1.55	3244	12.2	45.1	83	1496	1070	57.0	43.3	61.5	145	31	96	76	3.72	44.	5	20	2.3	5
6.0	192	142	1.69	3389	12.7	43.2	93	1719	1257	49.8	37.5	65.1	166	26	103	68	3.32	47.	5	22	2.5	6
6.5	208	154	1.83	3528	13.2	41.5	102	1908	1215	44.2	33.2	67.9	185	23	110	62	3.02	51.	6	24	2.6	6
7.0	224	166	1.97	3661	13.7	40.0	110	2069	1128	39.8	29.8	70.1	204	20	115	57	2.79	55.	6	26	2.8	7
7.5	240	178	2.11	3790	14.2	38.6	118	2209	1053	36.2	27.1	71.9	222	18	120	53	2.61	58.	7	28	2.9	8
8.0	256	190	2.25	3915	14.7	37.4	126	2331	987	33.2	24.8	73.4	240	16	125	50	2.46	62.	7	30	3.0	8
8.5	272	202	2.39	4036	15.1	36.3	132	2436	929	30.7	22.9	74.7	257	15	129	48	2.33	65.	8	31	3.2	9
9.0	288	214	2.53	4154	15.6	35.3	139	2534	877	28.5	21.3	75.8	275	13	133	45	2.22	69.	8	33	3.3	9
9.5	304	226	2.68	4268	16.0	34.3	145	2620	831	26.6	19.8	76.7	292	12	136	43	2.13	72.	9	35	3.4	10
10.0	320	237	2.82	4379	16.4	33.5	151	2696	790	25.0	18.6	77.5	309	11	140	42	2.04	76.	9	36	3.5	10
10.5	336	249	2.96	4488	16.8	32.7	157	2766	752	23.5	17.5	78.2	325	11	143	40	1.97	79.	9	38	3.6	11
11.0	352	261	3.10	4594	17.2	31.9	162	2829	718	22.2	16.5	78.9	342	10	147	39	1.90	83.	10	39	3.7	11
11.5	368	273	3.24	4698	17.6	31.2	168	2887	686	21.1	15.7	79.5	359	9	150	38	1.84	86.	10	40	3.8	12
12.0	384	285	3.38	4800	18.0	30.5	173	2939	658	20.0	14.9	80.0	375	9	153	36	1.78	89.	11	42	3.9	12
13.0	416	309	3.66	4997	18.7	29.3	183	3033	607	18.2	13.6	80.9	406	8	159	34	1.69	96.	11	44	4.1	13
14.0	448	332	3.94	5187	19.4	28.3	192	3113	564	16.7	12.4	81.6	441	7	164	33	1.60	102.	12	47	4.3	14
15.0	480	356	4.22	5371	20.1	27.3	201	3182	526	15.5	11.5	82.3	473	7	170	31	1.53	109.	13	50	4.5	15
16.0	512	380	4.51	5548	20.8	26.5	210	3242	493	14.4	10.7	82.8	506	6	175	30	1.47	115.	14	52	4.6	16
17.0	544	404	4.79	5721	21.4	25.7	218	3295	464	13.4	10.0	83.3	538	6	180	29	1.41	121.	14	54	4.8	17
18.0	576	427	5.07	5888	22.0	24.9	226	3343	438	12.6	9.3	83.7	571	5	185	28	1.36	127.	15	57	5.0	18
19.0	608	451	5.35	6051	22.6	24.3	234	3385	415	11.8	8.8	84.1	603	5	190	27	1.32	134.	16	59	5.1	18
20.0	640	475	5.63	6210	23.2	23.7	241	3423	395	11.2	8.3	84.4	635	5	194	26	1.28	140.	17	61	5.3	19
25.0	800	594	7.04	6952	26.0	21.2	276	3567	316	8.8	6.5	85.6	796	4	217	23	1.12	168.	20	73	5.9	23
30.0	960	712	8.45	7626	28.4	19.3	306	3663	263	7.2	5.4	86.4	957	3	239	21	1.01	196.	24	83	6.6	26
35.0	1120	831	9.86	8248	30.7	17.9	334	3732	225	6.1	4.6	86.9	1118	2	259	19	0.92	221.	27	93	7.1	
40.0	1280	950	11.27	8829	32.8	16.7	359	3783	197	5.3	4.0	87.3	1278	2	279	18	0.86	245.	30	103	7.6	
45.0	1440	1068	12.67	9377	34.8	15.8	383	3823	175	4.7	3.5	87.6	1438	2	298	16	0.81	270.	34	112	8.1	
50.0	1600	1187	14.08	9897	36.7	15.0	406	3854	158	4.2	3.1	87.9	1598	2	317	16	0.76	290.	37	121	8.6	

#168 32 S on 108 Ag

32 S on 108 Ag

32 S on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 47. ZC= 63.(Eu)
NEUTRON NUMBERS: NP= 16. NT= 61. NC= 77.

AP**1/3= 3.175 AT**1/3= 4.762
REDUCED MASS NUMBER= 24.69 AP+AT=AC=140.

INTERACTION RADIUS RINT=11.73 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 5.32 CT+CP= 8.60 C= 2.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.55 RCT= 5.34 RC=RCP+RCT= 8.89

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 169.43 MeV K= .18352 n=2.546
VC(RINT)= 92.2 MeV

FISSION-TKE= 104. MeV
ASYMM. FISSION-TKE= 79. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.935 MeV/fm**2 PROX-FACTOR= 23.81 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.03 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -87.6
COMPOUND NUCLEUS: -67.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.53 fm V(RB)= 96.5 MeV
Q-VALUE= -45.7 MeV
L-CRITICAL= 87.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPOMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	25	0.27	1382	5.4	118.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	64	49	0.54	1954	7.6	83.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	96	74	0.80	2394	9.4	68.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	128	99	1.07	2765	10.8	59.2	32	301	79	122.6	106.1	28.7	59	69	46	229	10.37	28.	2	10	1.7	4
4.5	144	111	1.21	2934	11.5	55.8	55	759	458	90.6	74.0	44.7	93	51	68	135	6.08	32.	3	14	1.9	4
5.0	160	123	1.34	3093	12.1	53.0	71	1122	760	73.3	58.7	53.3	120	40	82	105	4.72	35.	4	17	2.1	5
5.5	176	136	1.47	3244	12.7	50.5	84	1418	1008	62.0	49.0	59.0	143	33	92	89	4.00	38.	5	19	2.3	6
6.0	192	148	1.61	3389	13.2	48.3	95	1664	1214	53.8	42.3	63.1	164	28	100	79	3.53	42.	5	22	2.4	7
6.5	208	160	1.74	3528	13.8	46.4	105	1872	1271	47.6	37.3	66.2	184	24	106	71	3.19	45.	6	24	2.6	7
7.0	224	173	1.87	3661	14.3	44.8	114	2050	1180	42.7	33.4	68.6	203	21	112	66	2.94	48.	6	26	2.7	8
7.5	240	185	2.01	3790	14.8	43.2	123	2204	1101	38.8	30.2	70.6	221	19	116	61	2.74	51.	7	27	2.8	9
8.0	256	197	2.14	3915	15.3	41.9	131	2339	1032	35.5	27.6	72.2	239	17	121	57	2.57	55.	7	29	2.9	9
8.5	272	210	2.28	4036	15.7	40.6	138	2458	972	32.7	25.4	73.6	257	15	125	54	2.43	58.	8	31	3.1	10
9.0	288	222	2.41	4154	16.2	39.5	145	2563	918	30.4	23.6	74.8	274	14	128	52	2.31	61.	8	32	3.2	11
9.5	304	235	2.54	4268	16.6	38.4	152	2657	869	28.4	22.0	75.8	291	13	131	49	2.21	64.	8	34	3.3	11
10.0	320	247	2.68	4379	17.1	37.4	159	2742	826	26.6	20.6	76.7	308	12	135	47	2.12	67.	9	35	3.4	12
10.5	336	259	2.81	4488	17.5	36.5	165	2819	787	25.0	19.4	77.5	325	11	138	46	2.04	70.	9	36	3.5	13
11.0	352	272	2.95	4594	17.9	35.7	171	2888	751	23.6	18.3	78.2	342	10	141	44	1.97	73.	10	38	3.6	13
11.5	368	284	3.08	4698	18.3	34.9	176	2952	718	22.4	17.3	78.8	358	10	143	42	1.90	76.	10	39	3.7	14
12.0	384	296	3.21	4800	18.7	34.2	182	3010	688	21.3	16.5	79.4	375	9	146	41	1.85	79.	10	40	3.8	14
13.0	416	321	3.48	4997	19.5	32.8	193	3113	635	19.3	15.0	80.3	408	8	151	39	1.74	85.	11	43	4.0	15
14.0	448	346	3.75	5187	20.2	31.6	203	3201	590	17.7	13.7	81.1	440	8	156	37	1.66	91.	12	46	4.1	16
15.0	480	370	4.02	5371	20.9	30.6	213	3277	550	16.4	12.6	81.8	473	7	161	35	1.58	96.	13	48	4.3	17
16.0	512	395	4.29	5548	21.6	29.6	222	3344	516	15.2	11.7	82.4	506	6	165	34	1.52	102.	13	50	4.5	18
17.0	544	420	4.55	5721	22.3	28.7	231	3403	486	14.2	11.0	82.9	538	6	170	33	1.46	107.	14	53	4.6	19
18.0	576	444	4.82	5888	22.9	27.9	239	3455	459	13.3	10.3	83.3	571	5	174	31	1.40	113.	15	55	4.8	20
19.0	608	469	5.09	6051	23.5	27.2	247	3502	434	12.5	9.7	83.7	603	5	178	30	1.36	118.	15	57	4.9	21
20.0	640	494	5.36	6210	24.1	26.5	255	3544	413	11.8	9.1	84.1	635	5	183	29	1.32	123.	16	60	5.1	22
25.0	800	617	6.70	6952	27.0	23.7	292	3703	330	9.3	7.2	85.4	796	4	202	26	1.15	149.	20	70	5.7	26
30.0	960	741	8.04	7626	29.6	21.6	325	3809	275	7.6	5.9	86.2	957	3	221	23	1.04	174.	23	80	6.3	29
35.0	1120	864	9.37	8248	31.9	20.0	354	3884	236	6.5	5.0	86.8	1117	3	238	21	0.95	196.	26	90	6.8	
40.0	1280	987	10.71	8829	34.1	18.7	381	3941	206	5.6	4.3	87.2	1278	2	255	20	0.88	217.	30	99	7.3	
45.0	1440	1111	12.05	9377	36.2	17.7	407	3985	183	5.0	3.8	87.5	1438	2	271	18	0.83	237.	33	109	7.8	
50.0	1600	1234	13.39	9897	38.2	16.7	431	4020	165	4.5	3.4	87.8	1598	2	287	17	0.78	258.	36	117	8.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nes	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#169 32 S on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 58. ZC= 74.(W)
NEUTRON NUMBERS: NP= 16. NT= 82. NC= 98.

AP**1/3= 3.175 AT**1/3= 5.192
REDUCED MASS NUMBER= 26.05 AP+AT=AC=172.

INTERACTION RADIUS RINT=12.20 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 5.87 CT+CP= 9.15 C̄= 2.10

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.55 RCT= 5.82 RC=RCP+RCT= 9.37

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 197.47 MeV K= .16775 n=2.589
VC(RINT)= 109.4 MeV

FISSION-TKE= 128. MeV
ASYMM. FISSION-TKE= 87. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.919 MeV/fm**2 PROX-FACTOR= 24.27 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.62 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -88.2
COMPOUND NUCLEUS: -48.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.97 fm V(RB)= 114.3 MeV
Q-VALUE= -65.1 MeV
L-CRITICAL= 93.

32 S on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	26	0.24	1382	5.7	146.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	64	52	0.48	1954	8.1	103.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	96	78	0.71	2394	9.9	84.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	128	104	0.95	2765	11.4	73.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	144	117	1.07	2934	12.1	68.9	38	323	94	122.6	110.2	28.7	77	67	55	267	10.16	26.	3	12	1.6	4
5.0	160	130	1.19	3093	12.7	65.3	62	767	463	93.1	80.0	43.5	109	51	74	163	6.19	29.	4	15	1.7	5
5.5	176	143	1.31	3244	13.4	62.3	79	1128	765	76.5	64.6	51.8	135	41	86	128	4.85	32.	4	18	1.9	6
6.0	192	156	1.43	3389	14.0	59.7	93	1428	1016	65.3	54.6	57.3	158	34	95	109	4.12	34.	5	20	2.1	7
6.5	208	169	1.55	3528	14.5	57.3	105	1682	1229	57.1	47.4	61.4	179	29	102	96	3.64	37.	6	22	2.2	8
7.0	224	182	1.67	3661	15.1	55.2	116	1899	1216	50.9	42.0	64.6	199	25	108	87	3.30	39.	6	24	2.3	9
7.5	240	195	1.79	3790	15.6	53.4	126	2086	1135	45.9	37.8	67.1	218	22	112	80	3.04	42.	7	26	2.5	10
8.0	256	208	1.90	3915	16.1	51.7	135	2250	1064	41.8	34.4	69.1	236	20	117	75	2.83	45.	7	27	2.6	10
8.5	272	221	2.02	4036	16.6	50.1	144	2395	1001	38.4	31.5	70.8	254	18	120	70	2.66	47.	7	29	2.7	11
9.0	288	234	2.14	4154	17.1	48.7	152	2523	946	35.5	29.1	72.3	272	16	124	67	2.52	50.	8	30	2.8	12
9.5	304	247	2.26	4268	17.6	47.4	160	2638	896	33.0	27.1	73.5	289	15	127	63	2.40	52.	8	32	2.9	13
10.0	320	260	2.38	4379	18.0	46.2	167	2741	851	30.9	25.3	74.6	306	14	129	61	2.29	55.	9	33	3.0	14
10.5	336	273	2.50	4488	18.5	45.1	174	2835	811	29.0	23.7	75.5	323	13	132	58	2.20	57.	9	34	3.1	14
11.0	352	287	2.62	4594	18.9	44.1	181	2920	774	27.3	22.4	76.3	340	12	135	56	2.12	60.	9	36	3.2	15
11.5	368	300	2.74	4698	19.3	43.1	188	2997	740	25.9	21.1	77.1	357	11	137	54	2.04	62.	10	37	3.3	16
12.0	384	313	2.86	4800	19.7	42.2	194	3068	709	24.5	20.0	77.7	374	10	139	52	1.98	65.	10	38	3.4	16
13.0	416	339	3.10	4997	20.5	40.5	206	3193	655	22.3	18.2	78.9	407	9	144	49	1.86	69.	11	41	3.6	18
14.0	448	365	3.33	5187	21.3	39.1	217	3301	608	20.4	16.6	79.8	440	8	148	47	1.76	74.	12	43	3.7	19
15.0	480	391	3.57	5371	22.1	37.7	228	3394	567	18.8	15.3	80.6	472	8	152	44	1.68	79.	12	46	3.9	20
16.0	512	417	3.81	5548	22.8	36.5	239	3475	532	17.4	14.2	81.3	505	7	156	43	1.61	84.	13	48	4.0	21
17.0	544	443	4.05	5721	23.5	35.4	249	3547	500	16.2	13.2	81.9	537	7	159	41	1.54	88.	14	50	4.2	22
18.0	576	469	4.29	5888	24.2	34.4	258	3610	473	15.2	12.4	82.4	570	6	163	39	1.49	93.	14	52	4.3	23
19.0	608	495	4.52	6051	24.8	33.5	267	3667	448	14.3	11.7	82.9	602	6	166	38	1.43	97.	15	54	4.5	24
20.0	640	521	4.76	6210	25.5	32.7	276	3719	425	13.5	11.0	83.3	635	5	169	37	1.39	102.	16	56	4.6	25
25.0	800	651	5.95	6952	28.5	29.2	317	3913	340	10.5	8.6	84.7	796	4	185	32	1.21	123.	19	67	5.2	30
30.0	960	781	7.14	7626	31.2	26.7	353	4042	283	8.6	7.0	85.7	957	3	199	29	1.09	143.	22	76	5.8	34
35.0	1120	912	8.33	8248	33.7	24.7	386	4135	243	7.3	6.0	86.3	1117	3	213	26	0.99	162.	26	85	6.3	
40.0	1280	1042	9.52	8829	36.0	23.1	416	4204	212	6.4	5.2	86.8	1278	2	226	24	0.92	180.	29	94	6.7	
45.0	1440	1172	10.71	9377	38.2	21.8	444	4257	189	5.6	4.6	87.2	1438	2	238	23	0.86	198.	32	103	7.2	
50.0	1600	1302	11.90	9897	40.3	20.7	470	4300	170	5.0	4.1	87.5	1598	2	250	22	0.82	214.	35	111	7.6	

#170 32 S on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 62. ZC= 78.(Pt)
NEUTRON NUMBERS: NP= 16. NT= 92. NC=108.

AP**1/3= 3.175 AT**1/3= 5.360
REDUCED MASS NUMBER= 26.49 AP+AT=AC=186.

INTERACTION RADIUS RINT=12.38 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 6.09 CT+CP= 9.36 C̄= 2.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.00 RC=RCP+RCT= 9.55

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 206.79 MeV K= .16105 n=2.604
VC(RINT)= 115.2 MeV

FISSION-TKE= 136. MeV
ASYMM. FISSION-TKE= 89. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.908 MeV/fm**2 PROX-FACTOR= 24.29 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.50 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -72.1
COMPOUND NUCLEUS: -35.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.15 fm V(RB)= 120.2 MeV
Q-VALUE= -61.9 MeV
L-CRITICAL= 95.

32 S on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	26	0.23	1382	5.8	156.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	64	53	0.46	1954	8.2	110.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	96	79	0.69	2394	10.0	90.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	128	106	0.92	2765	11.6	78.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	144	119	1.03	2934	12.3	73.6	27	167	0	139.2	130.1	20.4	72	72	51	402	14.68	0.	3	11	1.6	5
5.0	160	132	1.15	3093	13.0	69.9	58	643	361	101.0	89.0	39.5	106	54	71	194	6.97	27.	4	15	1.7	6
5.5	176	146	1.26	3244	13.6	66.6	77	1029	683	81.9	70.6	49.1	133	43	84	146	5.23	29.	4	17	1.9	7
6.0	192	159	1.38	3389	14.2	63.8	92	1349	951	69.4	59.2	55.3	157	35	94	122	4.36	32.	5	20	2.0	8
6.5	208	172	1.49	3528	14.8	61.3	105	1620	1178	60.5	51.2	59.8	178	30	101	107	3.82	34.	5	22	2.2	9
7.0	224	185	1.61	3661	15.3	59.0	117	1851	1230	53.7	45.2	63.2	198	26	106	96	3.44	36.	6	23	2.3	10
7.5	240	199	1.72	3790	15.9	57.0	127	2051	1148	48.3	40.5	65.9	217	23	111	88	3.16	39.	6	25	2.4	11
8.0	256	212	1.84	3915	16.4	55.2	137	2226	1077	43.9	36.8	68.0	236	20	115	82	2.93	41.	7	27	2.5	12
8.5	272	225	1.95	4036	16.9	53.6	146	2380	1013	40.3	33.7	69.9	254	18	119	77	2.75	44.	7	28	2.7	12
9.0	288	238	2.07	4154	17.4	52.1	155	2517	957	37.2	31.1	71.4	271	17	122	72	2.60	46.	8	30	2.8	13
9.5	304	252	2.18	4268	17.9	50.7	163	2640	907	34.6	28.8	72.7	289	15	125	69	2.47	48.	8	31	2.9	14
10.0	320	265	2.30	4379	18.3	49.4	170	2750	861	32.3	26.9	73.8	306	14	128	66	2.36	51.	9	32	3.0	15
10.5	336	278	2.41	4488	18.8	48.2	178	2850	820	30.3	25.2	74.8	323	13	130	63	2.26	53.	9	34	3.1	16
11.0	352	291	2.53	4594	19.2	47.1	185	2940	783	28.6	23.8	75.7	340	12	133	61	2.17	55.	9	35	3.1	16
11.5	368	305	2.64	4698	19.7	46.1	192	3023	749	27.0	22.5	76.5	357	11	135	58	2.09	57.	10	36	3.2	17
12.0	384	318	2.76	4800	20.1	45.1	198	3099	718	25.6	21.3	77.2	373	11	137	56	2.02	60.	10	38	3.3	18
13.0	416	344	2.99	4997	20.9	43.3	211	3232	662	23.2	19.3	78.4	406	10	141	53	1.90	64.	11	40	3.5	19
14.0	448	371	3.22	5187	21.7	41.7	223	3347	615	21.2	17.6	79.4	439	9	145	50	1.80	68.	11	42	3.6	21
15.0	480	397	3.45	5371	22.4	40.3	234	3446	574	19.6	16.2	80.2	472	8	149	48	1.72	73.	12	45	3.8	22
16.0	512	424	3.68	5548	23.2	39.1	245	3533	538	18.1	15.0	80.9	505	7	152	46	1.64	77.	13	47	3.9	23
17.0	544	450	3.91	5721	23.9	37.9	255	3610	506	16.9	14.0	81.6	537	7	156	44	1.57	81.	13	49	4.1	25
18.0	576	477	4.14	5888	24.6	36.8	265	3678	478	15.8	13.1	82.1	570	6	159	42	1.52	85.	14	51	4.2	26
19.0	608	503	4.37	6051	25.3	35.8	275	3738	453	14.9	12.3	82.6	602	6	162	41	1.46	89.	15	53	4.4	27
20.0	640	530	4.60	6210	25.9	34.9	284	3793	430	14.0	11.6	83.0	635	5	165	39	1.42	93.	16	55	4.5	28
25.0	800	662	5.75	6952	29.0	31.2	326	4001	344	10.9	9.1	84.5	796	4	179	34	1.23	113.	19	65	5.1	33
30.0	960	795	6.90	7626	31.7	28.5	363	4139	287	9.0	7.4	85.5	957	3	192	31	1.11	132.	22	75	5.6	37
35.0	1120	927	8.05	8248	34.3	26.4	397	4237	246	7.6	6.3	86.2	1117	3	205	28	1.01	150.	25	84	6.1	
40.0	1280	1060	9.20	8829	36.7	24.7	428	4311	215	6.6	5.5	86.7	1278	2	216	26	0.94	167.	28	92	6.6	
45.0	1440	1192	10.35	9377	38.9	23.3	457	4368	191	5.8	4.8	87.1	1438	2	228	24	0.88	184.	32	101	7.0	
50.0	1600	1325	11.50	9897	41.0	22.1	485	4414	172	5.2	4.3	87.4	1598	2	239	23	0.83	198.	35	109	7.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	ans	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#171 32 S on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 67. ZC= 83.(Bi)
NEUTRON NUMBERS: NP= 16. NT= 98. NC=114.

AP**1/3= 3.175 AT**1/3= 5.485
REDUCED MASS NUMBER= 26.90 AP+AT=AC=197.

INTERACTION RADIUS RINT=12.51 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 6.25 CT+CP= 9.52 C= 2.15

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.15 RC=RCP+RCT= 9.70

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 219.41 MeV K= .15582 n=2.624
VC(RINT)= 123.2 MeV

FISSION-TKE= 149. MeV
ASYMM. FISSION-TKE= 93. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.910 MeV/fm**2 PROX-FACTOR= 24.56 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.41 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -63.7
COMPOUND NUCLEUS: -19.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.27 fm V(RB)= 128.5 MeV
Q-VALUE= -70.0 MeV
L-CRITICAL= 95.

32 S on 165 Ho — 32 S on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	32	27	0.22	1382	5.9	168.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	64	54	0.44	1954	8.3	119.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	96	80	0.65	2394	10.2	97.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	128	107	0.87	2765	11.7	84.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	144	121	0.98	2934	12.4	79.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	160	134	1.09	3093	13.1	75.5	46	409	162	117.0	106.2	31.5	97	63	65	265	8.97	25.	3 14	1.6	5
5.5	176	147	1.20	3244	13.7	72.0	70	827	510	92.0	80.9	44.0	126	50	81	178	5.97	28.	4 17	1.8	6
6.0	192	161	1.31	3389	14.4	68.9	87	1173	800	76.9	66.7	51.5	152	40	92	142	4.79	30.	5 19	1.9	7
6.5	208	174	1.41	3528	14.9	66.2	101	1466	1045	66.4	57.1	56.8	174	34	100	122	4.11	32.	5 21	2.1	8
7.0	224	188	1.52	3661	15.5	63.8	114	1716	1209	58.6	50.1	60.7	195	29	106	109	3.65	35.	6 23	2.2	9
7.5	240	201	1.63	3790	16.1	61.6	125	1932	1128	52.5	44.7	63.7	214	26	111	99	3.32	37.	6 24	2.3	10
8.0	256	214	1.74	3915	16.6	59.7	135	2121	1058	47.6	40.4	66.2	233	23	115	91	3.07	39.	7 26	2.4	11
8.5	272	228	1.85	4036	17.1	57.9	145	2288	996	43.6	36.9	68.2	252	20	119	85	2.87	41.	7 28	2.5	12
9.0	288	241	1.96	4154	17.6	56.3	154	2436	940	40.2	34.0	69.9	270	18	122	80	2.70	44.	8 29	2.6	13
9.5	304	255	2.07	4268	18.1	54.8	162	2568	891	37.3	31.5	71.4	287	17	125	76	2.56	46.	8 30	2.7	14
10.0	320	268	2.18	4379	18.5	53.4	170	2687	846	34.8	29.3	72.6	304	16	128	73	2.44	48.	8 32	2.8	14
10.5	336	281	2.28	4488	19.0	52.1	178	2795	806	32.6	27.5	73.7	322	14	131	69	2.33	50.	9 33	2.9	15
11.0	352	295	2.39	4594	19.4	50.9	186	2893	769	30.7	25.8	74.7	339	13	133	67	2.24	53.	9 34	3.0	16
11.5	368	308	2.50	4698	19.9	49.8	193	2982	736	29.0	24.4	75.5	355	13	135	64	2.15	55.	10 36	3.1	17
12.0	384	322	2.61	4800	20.3	48.7	200	3064	705	27.4	23.1	76.3	372	12	138	62	2.08	57.	10 37	3.2	17
13.0	416	348	2.83	4997	21.1	46.8	213	3209	651	24.8	20.9	77.6	406	10	142	58	1.95	61.	11 39	3.4	19
14.0	448	375	3.05	5187	21.9	45.1	225	3333	604	22.7	19.1	78.7	439	9	145	55	1.85	65.	11 42	3.5	20
15.0	480	402	3.26	5371	22.7	43.6	237	3440	564	20.9	17.5	79.6	471	9	149	52	1.75	69.	12 44	3.7	22
16.0	512	429	3.48	5548	23.4	42.2	248	3534	529	19.3	16.2	80.3	504	8	152	50	1.68	73.	13 46	3.8	23
17.0	544	456	3.70	5721	24.2	40.9	258	3616	498	18.0	15.1	81.0	537	7	156	48	1.61	78.	13 48	4.0	24
18.0	576	482	3.92	5888	24.9	39.8	269	3690	470	16.9	14.1	81.6	569	7	159	46	1.55	82.	14 50	4.1	25
19.0	608	509	4.13	6051	25.6	38.7	278	3756	445	15.8	13.3	82.1	602	6	162	44	1.49	85.	15 52	4.2	27
20.0	640	536	4.35	6210	26.2	37.7	288	3815	423	14.9	12.5	82.5	634	6	165	43	1.44	89.	15 55	4.4	28
25.0	800	670	5.44	6952	29.3	33.8	331	4039	338	11.6	9.8	84.2	796	4	178	37	1.25	108.	19 64	4.9	33
30.0	960	804	6.53	7626	32.1	30.8	370	4188	282	9.5	8.0	85.2	956	4	191	33	1.12	126.	22 74	5.5	38
35.0	1120	938	7.62	8248	34.7	28.5	404	4295	241	8.1	6.8	86.0	1117	3	202	31	1.03	143.	25 83	5.9	
40.0	1280	1072	8.70	8829	37.1	26.7	436	4374	211	7.0	5.9	86.5	1277	3	213	28	0.95	159.	28 91	6.4	
45.0	1440	1206	9.79	9377	39.3	25.2	466	4436	188	6.2	5.2	86.9	1438	2	224	27	0.89	176.	31 99	6.8	
50.0	1600	1340	10.88	9897	41.5	23.9	494	4486	169	5.5	4.6	87.2	1598	2	234	25	0.84	190.	34 108	7.2	

#172 32 S on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 73. ZC= 89.(Ac)
NEUTRON NUMBERS: NP= 16. NT=108. NC=124.

AP**1/3= 3.175 AT**1/3= 5.657
REDUCED MASS NUMBER= 27.19 AP+AT=AC=213.

INTERACTION RADIUS RINT=12.70 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 6.47 CT+CP= 9.75 C= 2.17

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.35 RC=RCP+RCT= 9.91

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 233.64 MeV K= .14846 n=2.646
VC(RINT)= 132.2 MeV

FISSION-TKE= 164. MeV
ASYMM. FISSION-TKE= 97. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 24.75 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.31 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -46.0
COMPOUND NUCLEUS: 5.7

FUSION RELATED PARAMETERS:
R-BARRIER=11.44 fm V(RB)= 137.9 MeV
Q-VALUE= -77.3 MeV
L-CRITICAL= 96.

32 S on 181 Ta — 32 S on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	32	27	0.21	1382	5.9	183.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	64	54	0.41	1954	8.4	130.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	96	82	0.62	2394	10.3	106.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	128	109	0.82	2765	11.9	92.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	144	122	0.93	2934	12.6	86.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	160	136	1.03	3093	13.3	82.2	27	142	0	143.3	136.3	18.4	86	74	58	497	15.89	0.	3	1.5	5
5.5	176	150	1.13	3244	13.9	78.4	60	601	319	105.2	95.0	37.4	119	57	77	230	7.23	26.	4 16	1.6	6
6.0	192	163	1.23	3389	14.6	75.1	80	979	635	86.1	76.3	46.9	146	46	89	172	5.40	28.	5 18	1.8	7
6.5	208	177	1.34	3528	15.2	72.1	96	1298	903	73.6	64.4	53.2	170	38	98	144	4.50	30.	5 20	1.9	8
7.0	224	190	1.44	3661	15.7	69.5	110	1571	1132	64.5	56.0	57.8	191	33	105	126	3.93	32.	6 22	2.1	9
7.5	240	204	1.54	3790	16.3	67.2	123	1807	1111	57.5	49.7	61.3	212	28	110	113	3.54	34.	6 24	2.2	10
8.0	256	218	1.64	3915	16.8	65.0	134	2013	1042	51.9	44.7	64.1	231	25	115	104	3.25	36.	7 25	2.3	11
8.5	272	231	1.75	4036	17.3	63.1	144	2195	981	47.3	40.7	66.3	250	22	119	96	3.01	39.	7 27	2.4	12
9.0	288	245	1.85	4154	17.8	61.3	154	2356	926	43.5	37.4	68.2	268	20	122	90	2.83	41.	8 28	2.5	13
9.5	304	258	1.95	4268	18.3	59.7	163	2501	877	40.3	34.6	69.8	286	18	125	85	2.67	43.	8 30	2.6	14
10.0	320	272	2.06	4379	18.8	58.2	171	2630	833	37.5	32.1	71.2	303	17	128	81	2.54	45.	8 31	2.7	14
10.5	336	286	2.16	4488	19.3	56.8	179	2748	794	35.1	30.1	72.4	320	16	131	77	2.42	47.	9 32	2.8	15
11.0	352	299	2.26	4594	19.7	55.5	187	2855	758	33.0	28.2	73.5	337	15	133	74	2.32	49.	9 34	2.9	16
11.5	368	313	2.36	4698	20.2	54.2	195	2952	725	31.2	26.6	74.4	354	14	135	71	2.23	51.	9 35	3.0	17
12.0	384	326	2.47	4800	20.6	53.1	202	3041	694	29.5	25.2	75.3	371	13	137	69	2.15	53.	10 36	3.1	18
13.0	416	354	2.67	4997	21.4	51.0	215	3199	641	26.6	22.7	76.7	405	11	141	64	2.01	57.	11 38	3.2	19
14.0	448	381	2.88	5187	22.3	49.2	228	3334	595	24.3	20.7	77.8	438	10	145	61	1.90	61.	11 41	3.4	21
15.0	480	408	3.08	5371	23.0	47.5	240	3451	555	22.3	19.0	78.8	471	9	148	58	1.80	65.	12 43	3.5	22
16.0	512	435	3.29	5548	23.8	46.0	252	3553	521	20.7	17.6	79.7	504	8	152	55	1.72	69.	13 45	3.7	23
17.0	544	462	3.50	5721	24.5	44.6	263	3644	490	19.2	16.4	80.4	536	8	155	53	1.65	72.	13 47	3.8	25
18.0	576	489	3.70	5888	25.2	43.3	274	3724	463	18.0	15.3	81.0	569	7	158	51	1.58	76.	14 49	3.9	26
19.0	608	517	3.91	6051	25.9	42.2	284	3795	438	16.9	14.4	81.5	601	7	160	49	1.53	80.	15 51	4.1	27
20.0	640	544	4.11	6210	26.6	41.1	294	3860	416	15.9	13.6	82.0	634	6	163	47	1.48	83.	15 53	4.2	28
25.0	800	680	5.14	6952	29.7	36.8	339	4105	333	12.4	10.5	83.8	795	5	176	41	1.28	101.	18 63	4.8	34
30.0	960	816	6.17	7626	32.6	33.6	379	4268	277	10.1	8.6	84.9	956	4	187	37	1.15	118.	22 72	5.3	39
35.0	1120	952	7.20	8248	35.2	31.1	415	4384	238	8.6	7.3	85.7	1117	3	198	34	1.05	133.	25 81	5.7	
40.0	1280	1088	8.22	8829	37.6	29.1	448	4471	208	7.4	6.3	86.3	1277	3	208	31	0.97	149.	28 89	6.2	
45.0	1440	1224	9.25	9377	39.9	27.4	479	4538	185	6.6	5.6	86.7	1438	2	218	29	0.91	164.	31 98	6.6	
50.0	1600	1360	10.28	9897	42.1	26.0	507	4592	166	5.9	5.0	87.1	1598	2	227	27	0.85	178.	34 106	6.9	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#173 32 S on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 79. ZC= 95.(Am)
NEUTRON NUMBERS: NP= 16. NT=118. NC=134.

AP**1/3= 3.175 AT**1/3= 5.819
REDUCED MASS NUMBER= 27.53 AP+AT=AC=229.

INTERACTION RADIUS RINT=12.88 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 6.68 CT+CP= 9.95 C= 2.20

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.55 RC=RCP+RCT=10.10

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 247.50 MeV K= .14141 n=2.668
VC(RINT)= 141.2 MeV

FISSION-TKE= 180. MeV
ASYMM. FISSION-TKE= 101. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 24.92 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -28.6
COMPOUND NUCLEUS: 42.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.60 fm V(RB)= 147.2 MeV
Q-VALUE= -96.8 MeV
L-CRITICAL= 96.

32 S on 197 Au

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	28	0.20	1382	6.0	199.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	64	55	0.39	1954	8.5	140.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	96	83	0.59	2394	10.4	114.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	128	110	0.78	2765	12.0	99.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	144	124	0.88	2934	12.8	93.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	160	138	0.98	3093	13.5	89.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	176	151	1.07	3244	14.1	84.9	47	361	118	122.2	113.6	28.9	111	65	72	326	9.63	24.	4	15	1.4	5
6.0	192	165	1.17	3389	14.7	81.3	72	772	461	96.8	87.5	41.6	140	52	86	213	6.26	26.	4	17	1.5	6
6.5	208	179	1.27	3528	15.4	78.1	91	1118	751	81.5	72.6	49.2	165	43	96	170	4.98	28.	5	19	1.7	8
7.0	224	193	1.37	3661	15.9	75.2	106	1414	999	70.8	62.5	54.6	188	36	104	145	4.26	30.	6	21	1.8	9
7.5	240	206	1.46	3790	16.5	72.7	119	1670	1088	62.7	55.1	58.6	209	31	110	129	3.79	32.	6	23	2.0	10
8.0	256	220	1.56	3915	17.0	70.4	131	1894	1020	56.4	49.3	61.8	229	27	115	117	3.44	34.	7	25	2.1	10
8.5	272	234	1.66	4036	17.6	68.3	142	2091	960	51.3	44.7	64.4	248	24	119	108	3.17	36.	7	26	2.2	11
9.0	288	248	1.76	4154	18.1	66.3	152	2266	907	47.0	40.9	66.5	266	22	123	101	2.96	38.	7	28	2.3	12
9.5	304	262	1.85	4268	18.6	64.6	162	2423	859	43.5	37.8	68.3	284	20	126	95	2.79	40.	8	29	2.4	13
10.0	320	275	1.95	4379	19.0	62.9	171	2564	816	40.4	35.1	69.8	302	18	129	90	2.64	42.	8	30	2.5	14
10.5	336	289	2.05	4488	19.5	61.4	180	2691	777	37.8	32.7	71.1	319	17	131	86	2.51	44.	9	32	2.6	15
11.0	352	303	2.15	4594	20.0	60.0	188	2807	742	35.4	30.7	72.3	336	16	134	82	2.40	46.	9	33	2.7	16
11.5	368	317	2.24	4698	20.4	58.7	196	2912	709	33.4	28.9	73.3	353	15	136	79	2.31	48.	9	34	2.8	17
12.0	384	330	2.34	4800	20.9	57.5	203	3009	680	31.6	27.3	74.2	370	14	138	76	2.22	49.	10	35	2.9	18
13.0	416	358	2.54	4997	21.7	55.2	217	3180	628	28.5	24.6	75.8	404	12	142	71	2.08	53.	10	38	3.0	19
14.0	448	385	2.73	5187	22.5	53.2	231	3327	583	26.0	22.4	77.0	437	11	145	67	1.96	57.	11	40	3.2	21
15.0	480	413	2.93	5371	23.3	51.4	244	3454	544	23.8	20.6	78.1	470	10	148	63	1.85	61.	12	42	3.3	22
16.0	512	440	3.12	5548	24.1	49.8	256	3565	510	22.0	19.0	79.0	503	9	151	60	1.77	64.	13	44	3.5	24
17.0	544	468	3.32	5721	24.8	48.3	267	3663	480	20.5	17.7	79.8	536	8	154	58	1.69	68.	13	46	3.6	25
18.0	576	496	3.51	5888	25.5	46.9	278	3750	453	19.2	16.5	80.4	568	8	157	55	1.62	71.	14	48	3.7	26
19.0	608	523	3.71	6051	26.2	45.7	289	3827	429	18.0	15.5	81.0	601	7	160	53	1.56	75.	14	50	3.9	28
20.0	640	551	3.90	6210	26.9	44.5	299	3897	408	16.9	14.6	81.5	633	7	162	52	1.51	78.	15	52	4.0	29
25.0	800	688	4.88	6952	30.1	39.8	346	4163	326	13.1	11.3	83.4	795	5	174	45	1.31	95.	18	62	4.5	35
30.0	960	826	5.85	7626	33.0	36.3	387	4339	272	10.7	9.2	84.6	956	4	185	40	1.17	111.	21	71	5.0	40
35.0	1120	963	6.83	8248	35.6	33.6	424	4465	233	9.1	7.8	85.5	1117	3	195	36	1.07	126.	25	79	5.5	
40.0	1280	1101	7.80	8829	38.1	31.5	458	4560	204	7.9	6.8	86.1	1277	3	204	34	0.99	141.	28	88	5.9	
45.0	1440	1239	8.78	9377	40.4	29.7	489	4633	181	6.9	6.0	86.5	1437	3	213	32	0.92	155.	31	96	6.3	
50.0	1600	1376	9.75	9897	42.6	28.1	519	4692	163	6.2	5.3	86.9	1598	2	222	30	0.87	168.	34	104	6.7	

#174 32 S on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 82. ZC= 98.(Cf)
NEUTRON NUMBERS: NP= 16. NT=126. NC=142.

AP**1/3= 3.175 AT**1/3= 5.925
REDUCED MASS NUMBER= 27.73 AP+AT=AC=240.

INTERACTION RADIUS RINT=12.99 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 6.82 CT+CP=10.09 C= 2.21

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.66 RC=RCP+RCT=10.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 253.74 MeV K= .13718 n=2.677
VC(RINT)= 145.2 MeV

FISSION-TKE= 188. MeV
ASYMM. FISSION-TKE= 103. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 24.87 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.17 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -19.5
COMPOUND NUCLEUS: 59.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.71 fm V(RB)= 151.3 MeV
Q-VALUE= -104.1 MeV
L-CRITICAL= 97.

32 S on 208 Pb

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	28	0.19	1382	6.1	206.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	64	55	0.38	1954	8.6	146.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	96	83	0.57	2394	10.5	119.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	128	111	0.76	2765	12.1	103.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	144	125	0.86	2934	12.9	97.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	160	139	0.95	3093	13.6	92.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	176	153	1.05	3244	14.2	88.1	40	260	35	131.2	123.9	24.4	109	67	70	403	11.59	23.	4	14	1.3	4
6.0	192	166	1.15	3389	14.9	84.3	69	688	392	101.8	93.0	39.1	139	53	85	236	6.75	25.	4	17	1.4	6
6.5	208	180	1.24	3528	15.5	81.0	88	1048	693	85.1	76.5	47.5	164	44	96	184	5.24	27.	5	19	1.6	7
7.0	224	194	1.34	3661	16.0	78.1	104	1356	951	73.6	65.5	53.2	187	37	104	156	4.43	29.	6	21	1.7	8
7.5	240	208	1.43	3790	16.6	75.4	118	1622	1083	65.0	57.6	57.5	208	32	110	137	3.91	31.	6	23	1.9	9
8.0	256	222	1.53	3915	17.2	73.0	131	1855	1016	58.3	51.4	60.8	228	28	115	124	3.54	33.	7	24	2.0	10
8.5	272	236	1.62	4036	17.7	70.9	142	2060	956	53.0	46.6	63.5	247	25	119	114	3.26	35.	7	26	2.1	11
9.0	288	250	1.72	4154	18.2	68.9	153	2242	903	48.5	42.6	65.7	266	22	122	106	3.03	36.	7	27	2.2	12
9.5	304	263	1.81	4268	18.7	67.0	163	2405	855	44.8	39.2	67.6	284	20	125	100	2.85	38.	8	29	2.3	14
10.0	320	277	1.91	4379	19.2	65.3	172	2551	812	41.6	36.4	69.2	301	19	128	95	2.69	40.	8	30	2.4	15
10.5	336	291	2.01	4488	19.7	63.8	181	2684	774	38.9	33.9	70.6	319	17	131	90	2.56	42.	9	31	2.5	16
11.0	352	305	2.10	4594	20.1	62.3	189	2804	738	36.5	31.8	71.8	336	16	133	86	2.45	44.	9	32	2.6	16
11.5	368	319	2.20	4698	20.6	60.9	197	2914	706	34.3	29.9	72.8	353	15	135	83	2.35	46.	9	34	2.7	17
12.0	384	333	2.29	4800	21.0	59.6	205	3014	677	32.5	28.3	73.8	370	14	137	79	2.26	47.	10	35	2.8	18
13.0	416	361	2.48	4997	21.9	57.3	219	3192	625	29.3	25.5	75.4	404	12	141	74	2.11	51.	10	37	2.9	20
14.0	448	388	2.67	5187	22.7	55.2	233	3345	580	26.6	23.2	76.7	437	11	144	70	1.99	54.	11	39	3.1	21
15.0	480	416	2.86	5371	23.5	53.3	246	3477	541	24.5	21.3	77.8	470	10	148	66	1.88	58.	12	42	3.2	23
16.0	512	444	3.06	5548	24.3	51.6	258	3592	508	22.6	19.6	78.7	503	9	151	63	1.79	61.	12	44	3.4	24
17.0	544	471	3.25	5721	25.0	50.1	270	3694	478	21.0	18.2	79.5	536	8	153	60	1.71	65.	13	46	3.5	26
18.0	576	499	3.44	5888	25.7	48.7	281	3784	451	19.6	17.0	80.2	568	8	156	58	1.64	68.	14	48	3.6	27
19.0	608	527	3.63	6051	26.4	47.4	292	3865	427	18.4	16.0	80.8	601	7	159	56	1.58	71.	14	50	3.8	29
20.0	640	555	3.82	6210	27.1	46.2	303	3938	406	17.4	15.1	81.3	633	7	161	54	1.53	75.	15	52	3.9	30
25.0	800	693	4.77	6952	30.3	41.3	350	4214	325	13.5	11.7	83.3	795	5	172	46	1.32	91.	18	61	4.4	36
30.0	960	832	5.73	7626	33.2	37.7	392	4398	270	11.0	9.5	84.5	956	4	182	42	1.18	106.	21	70	4.9	42
35.0	1120	971	6.68	8248	35.9	34.9	430	4529	232	9.3	8.1	85.4	1117	3	192	38	1.08	120.	24	78	5.4	
40.0	1280	1109	7.64	8829	38.4	32.7	465	4627	203	8.0	7.0	86.0	1277	3	201	35	1.00	134.	28	87	5.8	
45.0	1440	1248	8.59	9377	40.7	30.8	497	4703	180	7.1	6.1	86.5	1437	3	209	33	0.93	148.	31	95	6.2	
50.0	1600	1387	9.55	9897	42.9	29.2	527	4764	162	6.3	5.5	86.8	1598	2	217	31	0.88	160.	34	102	6.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#175 32 S on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 83. ZC= 99.(Es)
NEUTRON NUMBERS: NP= 16. NT=126. NC=142.

AP**1/3= 3.175 AT**1/3= 5.934
REDUCED MASS NUMBER= 27.75 AP+AT=AC=241.

INTERACTION RADIUS RINT=13.00 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 6.83 CT+CP=10.10 C= 2.21

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.68 RC=RCP+RCT=10.23

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 256.30 MeV K= .13654 n=2.681
VC(RINT)= 146.9 MeV

FISSION-TKE= 191. MeV
ASYMM. FISSION-TKE= 103. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 24.97 MeV
L-RLD= 61 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.16 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: -16.5
COMPOUND NUCLEUS: 64.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.72 fm V(RB)= 153.0 MeV
Q-VALUE= -106.6 MeV
L-CRITICAL= 96.

32 S on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	28	0.19	1382	6.1	209.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	64	56	0.38	1954	8.6	147.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	96	83	0.57	2394	10.5	120.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	128	111	0.76	2765	12.1	104.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	144	125	0.85	2934	12.9	98.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	160	139	0.94	3093	13.6	93.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	176	153	1.04	3244	14.2	89.2	35	205	0	136.8	130.1	21.6	106	70	69	460	13.14	0.	3	14	1.2	4
6.0	192	167	1.13	3389	14.9	85.4	66	639	349	104.6	95.8	37.7	137	55	84	249	7.02	25.	4	17	1.4	5
6.5	208	180	1.23	3528	15.5	82.0	86	1003	654	87.0	78.4	46.5	163	45	95	190	5.37	27.	5	19	1.6	7
7.0	224	194	1.32	3661	16.1	79.0	103	1315	916	75.1	67.0	52.5	186	38	103	160	4.51	29.	6	21	1.7	8
7.5	240	208	1.42	3790	16.6	76.4	117	1585	1073	66.2	58.7	56.9	207	33	110	141	3.96	31.	6	23	1.8	9
8.0	256	222	1.51	3915	17.2	73.9	130	1820	1006	59.4	52.4	60.3	227	29	115	127	3.58	33.	7	24	2.0	10
8.5	272	236	1.61	4036	17.7	71.7	141	2028	947	53.9	47.4	63.1	246	26	119	117	3.29	34.	7	26	2.1	11
9.0	288	250	1.70	4154	18.2	69.7	152	2212	894	49.3	43.3	65.3	265	23	123	109	3.06	36.	7	27	2.2	12
9.5	304	264	1.79	4268	18.7	67.8	162	2377	847	45.5	39.9	67.2	283	21	126	102	2.87	38.	8	29	2.3	13
10.0	320	278	1.89	4379	19.2	66.1	171	2525	805	42.3	37.0	68.9	301	19	129	96	2.71	40.	8	30	2.4	14
10.5	336	291	1.98	4488	19.7	64.5	180	2659	766	39.5	34.5	70.3	318	18	131	92	2.58	42.	9	31	2.5	15
11.0	352	305	2.08	4594	20.1	63.0	188	2781	732	37.0	32.3	71.5	336	16	134	88	2.46	44.	9	32	2.6	16
11.5	368	319	2.17	4698	20.6	61.7	196	2892	700	34.8	30.4	72.6	353	15	136	84	2.36	45.	9	34	2.7	17
12.0	384	333	2.27	4800	21.0	60.4	204	2994	671	32.9	28.7	73.5	370	14	138	81	2.27	47.	10	35	2.7	18
13.0	416	361	2.46	4997	21.9	58.0	219	3174	619	29.7	25.8	75.2	403	13	142	75	2.12	51.	10	37	2.9	19
14.0	448	389	2.65	5187	22.7	55.9	233	3328	575	27.0	23.5	76.5	437	11	145	71	1.99	54.	11	39	3.1	21
15.0	480	416	2.83	5371	23.5	54.0	246	3462	536	24.8	21.6	77.6	470	10	148	67	1.89	58.	12	42	3.2	22
16.0	512	444	3.02	5548	24.3	52.3	258	3579	503	22.9	19.9	78.6	503	9	151	64	1.80	61.	12	44	3.3	24
17.0	544	472	3.21	5721	25.0	50.7	270	3682	473	21.3	18.5	79.4	535	9	154	61	1.72	65.	13	46	3.5	25
18.0	576	500	3.40	5888	25.8	49.3	281	3773	447	19.9	17.3	80.1	568	8	157	59	1.65	68.	14	48	3.6	27
19.0	608	527	3.59	6051	26.5	48.0	292	3855	423	18.7	16.2	80.7	601	7	159	56	1.59	71.	14	50	3.7	28
20.0	640	555	3.78	6210	27.1	46.8	303	3929	402	17.6	15.3	81.2	633	7	162	55	1.53	74.	15	52	3.9	30
25.0	800	694	4.72	6952	30.3	41.8	350	4208	322	13.6	11.8	83.2	795	5	173	47	1.32	90.	18	61	4.4	36
30.0	960	833	5.67	7626	33.2	38.2	392	4394	268	11.1	9.6	84.4	956	4	183	42	1.18	106.	21	70	4.9	41
35.0	1120	971	6.61	8248	35.9	35.3	430	4527	230	9.4	8.2	85.3	1117	3	193	38	1.08	120.	24	78	5.4	
40.0	1280	1110	7.56	8829	38.4	33.1	465	4626	201	8.1	7.1	85.9	1277	3	201	35	1.00	134.	28	87	5.8	
45.0	1440	1249	8.50	9377	40.7	31.2	497	4704	178	7.2	6.2	86.4	1437	3	210	33	0.93	147.	31	95	6.2	
50.0	1600	1388	9.45	9897	42.9	29.6	528	4765	161	6.4	5.6	86.8	1598	2	218	31	0.88	160.	34	102	6.5	

#176 32 S on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 16. ZT= 92. ZC=108.( )
NEUTRON NUMBERS: NP= 16. NT=146. NC=162.

AP**1/3= 3.175 AT**1/3= 6.197
REDUCED MASS NUMBER= 28.21 AP+AT=AC=270.

INTERACTION RADIUS RINT=13.29 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.27 CT= 7.16 CT+CP=10.44 C= 2.25

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.56 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.55 RCT= 6.98 RC=RCP+RCT=10.53

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 275.25 MeV K= .12586 n=2.710
VC(RINT)= 159.3 MeV

FISSION-TKE= 215. MeV
ASYMM. FISSION-TKE= 109. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 24.96 MeV
L-RLD= 44 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.05 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -25.6 TARGET: 47.2
COMPOUND NUCLEUS: 127.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.98 fm V(RB)= 165.7 MeV
Q-VALUE= -106.3 MeV
L-CRITICAL= 96.

32 S on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	32	28	0.18	1382	6.2	231.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	64	56	0.35	1954	8.7	163.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	96	85	0.53	2394	10.7	133.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	128	113	0.71	2765	12.3	115.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	144	127	0.80	2934	13.1	109.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	160	141	0.89	3093	13.8	103.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	176	155	0.97	3244	14.5	98.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	192	169	1.06	3389	15.1	94.6	48	331	94	126.1	119.4	26.9	128	64	80	391	10.24	22.	4	16	1.4	6
6.5	208	183	1.15	3528	15.7	90.9	75	739	434	100.7	93.0	39.6	156	52	93	251	6.54	24.	5	18	1.5	8
7.0	224	197	1.24	3661	16.3	87.6	95	1087	725	85.3	77.8	47.3	181	43	102	199	5.18	26.	5	20	1.6	9
7.5	240	212	1.33	3790	16.9	84.6	111	1388	978	74.5	67.4	52.8	203	37	109	170	4.42	27.	6	22	1.8	10
8.0	256	226	1.42	3915	17.5	81.9	125	1651	967	66.3	59.6	56.9	224	32	114	151	3.92	29.	6	23	1.9	11
8.5	272	240	1.50	4036	18.0	79.5	138	1882	910	59.8	53.6	60.1	244	28	119	137	3.56	31.	7	25	2.0	13
9.0	288	254	1.59	4154	18.5	77.3	150	2088	859	54.5	48.7	62.7	263	25	123	127	3.28	32.	7	26	2.1	14
9.5	304	268	1.68	4268	19.0	75.2	161	2272	814	50.2	44.7	64.9	281	23	126	118	3.06	34.	8	28	2.2	15
10.0	320	282	1.77	4379	19.5	73.3	171	2437	773	46.4	41.3	66.8	299	21	129	111	2.88	36.	8	29	2.3	16
10.5	336	296	1.86	4488	20.0	71.5	180	2586	737	43.3	38.5	68.4	317	19	132	105	2.73	37.	8	30	2.4	17
11.0	352	310	1.95	4594	20.5	69.9	189	2722	703	40.5	36.0	69.8	334	18	134	100	2.60	39.	9	31	2.5	18
11.5	368	324	2.04	4698	20.9	68.3	198	2846	673	38.1	33.8	71.0	352	16	136	96	2.48	41.	9	33	2.5	19
12.0	384	338	2.12	4800	21.4	66.9	206	2960	644	35.9	31.8	72.0	369	15	138	92	2.38	42.	10	34	2.6	20
13.0	416	367	2.30	4997	22.2	64.3	222	3161	595	32.3	28.6	73.9	403	13	142	85	2.22	45.	10	36	2.8	22
14.0	448	395	2.48	5187	23.1	61.9	237	3333	552	29.3	26.0	75.3	436	12	145	80	2.08	49.	11	38	2.9	23
15.0	480	423	2.66	5371	23.9	59.8	251	3482	515	26.9	23.8	76.6	469	11	148	76	1.97	52.	12	40	3.1	25
16.0	512	451	2.83	5548	24.7	57.9	264	3612	483	24.8	21.9	77.6	502	10	151	72	1.87	55.	12	42	3.2	26
17.0	544	480	3.01	5721	25.4	56.2	276	3727	455	23.0	20.3	78.5	535	9	153	69	1.78	58.	13	44	3.3	28
18.0	576	508	3.19	5888	26.2	54.6	288	3829	429	21.5	19.0	79.3	568	8	156	66	1.71	61.	14	46	3.4	30
19.0	608	536	3.36	6051	26.9	53.2	299	3920	407	20.1	17.8	79.9	600	8	158	63	1.64	64.	14	48	3.6	31
20.0	640	564	3.54	6210	27.6	51.8	310	4002	386	19.0	16.7	80.5	633	7	160	61	1.59	67.	15	50	3.7	33
25.0	800	705	4.43	6952	30.8	46.4	360	4314	309	14.7	12.9	82.7	795	5	171	53	1.37	81.	18	59	4.2	39
30.0	960	846	5.31	7626	33.8	42.3	404	4522	257	11.9	10.5	84.0	956	4	180	47	1.22	95.	21	68	4.7	45
35.0	1120	987	6.20	8248	36.5	39.2	444	4670	221	10.1	8.9	85.0	1116	4	188	43	1.11	108.	24	76	5.1	
40.0	1280	1128	7.08	8829	39.0	36.6	480	4781	193	8.7	7.7	85.6	1277	3	196	40	1.03	120.	27	84	5.5	
45.0	1440	1269	7.97	9377	41.4	34.6	514	4867	171	7.7	6.8	86.2	1437	3	203	37	0.96	133.	30	92	5.9	
50.0	1600	1410	8.85	9897	43.6	32.8	546	4936	154	6.9	6.1	86.6	1598	2	211	35	0.90	145.	33	99	6.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ms	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 32 S

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#177 35 Cl on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 6. ZC= 23.(V)
NEUTRON NUMBERS: NP= 18. NT= 6. NC= 24.

AP**1/3= 3.271 AT**1/3= 2.289 ELSCAT <20 deg
REDUCED MASS NUMBER= 8.94 AP+AT=AC= 47.

INTERACTION RADIUS RINT= 9.14 fm RO= 1.64 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 2.12 CT+CP= 5.52 C= 1.31

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.65 RCT= 2.51 RC=RCP+RCT= 6.16

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 33.15 MeV K= .09100 n=2.548
VC(RINT)= 16.0 MeV

FISSION-TKE= 38. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 15.62 MeV
L-RLD= 47 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 21.56 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: 0.0
COMPOUND NUCLEUS: -43.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.31 fm V(RB)= 16.3 MeV
Q-VALUE= 16.7 MeV
L-CRITICAL= 30.

35 Cl on 12 C — 35 Cl on 12 C

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	9	0.56	1511	2.0	16.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	70	18	1.11	2138	2.8	11.4	8	336	185	109.4	20.0	35.3	35	35	0	35	9.19	50.	0	0	2.4	2
3.0	105	27	1.67	2619	3.4	9.3	20	1163	846	50.7	12.3	64.7	90	15	0	15	3.77	75.	0	0	2.7	2
4.0	140	36	2.23	3025	3.9	8.0	27	1557	1177	33.7	8.4	73.2	131	9	125	11	2.79	100.	4	14	3.0	2
4.5	158	40	2.51	3209	4.1	7.6	29	1686	1287	28.9	7.3	75.5	150	7	140	10	2.51	110.	5	18	3.1	3
5.0	175	45	2.79	3383	4.4	7.2	32	1789	1376	25.3	6.4	77.3	169	6	153	9	2.31	122.	6	20	3.2	3
5.5	193	49	3.06	3548	4.6	6.8	34	1872	1408	22.5	5.7	78.7	187	6	166	8	2.15	134.	6	23	3.3	3
6.0	210	54	3.34	3706	4.8	6.6	37	1941	1291	20.3	5.1	79.9	205	5	179	8	2.02	146.	7	25	3.5	3
6.5	228	58	3.62	3858	5.0	6.3	39	1999	1192	18.5	4.7	80.8	223	4	192	7	1.91	159.	7	27	3.6	3
7.0	245	63	3.90	4004	5.2	6.1	41	2049	1106	16.9	4.3	81.5	241	4	204	7	1.81	167.	8	29	3.7	4
7.5	263	67	4.18	4146	5.4	5.9	43	2091	1033	15.7	4.0	82.2	259	4	217	7	1.73	179.	8	31	3.8	4
8.0	280	71	4.46	4282	5.5	5.7	45	2128	968	14.5	3.7	82.7	277	3	229	6	1.66	191.	9	33	3.9	4
8.5	298	76	4.73	4414	5.7	5.5	46	2161	911	13.6	3.5	83.2	294	3	241	6	1.60	203.	9	35	4.0	4
9.0	315	80	5.01	4543	5.9	5.4	48	2190	860	12.7	3.2	83.6	312	3	253	6	1.54	214.	10	36	4.1	4
9.5	333	85	5.29	4668	6.0	5.2	50	2216	815	12.0	3.1	84.0	330	3	264	6	1.49	226.	10	38	4.2	4
10.0	350	89	5.57	4790	6.2	5.1	51	2239	774	11.3	2.9	84.3	347	3	276	6	1.44	233.	11	40	4.2	5
10.5	368	94	5.85	4909	6.3	5.0	53	2260	737	10.7	2.7	84.6	365	2	288	5	1.40	244.	11	41	4.3	5
11.0	385	98	6.13	5025	6.5	4.8	54	2279	704	10.2	2.6	84.9	383	2	300	5	1.36	256.	12	43	4.4	5
11.5	403	103	6.41	5139	6.6	4.7	56	2296	673	9.7	2.5	85.1	400	2	311	5	1.33	268.	12	45	4.5	5
12.0	420	107	6.68	5250	6.8	4.6	57	2312	645	9.3	2.4	85.4	418	2	323	5	1.29	279.	13	46	4.6	5
13.0	455	116	7.24	5466	7.0	4.5	60	2339	596	8.5	2.2	85.7	453	2	346	5	1.24	295.	14	49	4.8	6
14.0	490	125	7.80	5674	7.3	4.3	62	2363	553	7.9	2.0	86.1	488	2	368	5	1.18	318.	15	52	4.9	6
15.0	525	134	8.36	5874	7.6	4.1	65	2383	516	7.3	1.9	86.3	523	2	391	4	1.14	341.	16	55	5.1	6
16.0	560	143	8.91	6069	7.8	4.0	67	2401	484	6.8	1.7	86.6	558	2	414	4	1.10	355.	17	58	5.2	7
17.0	595	152	9.47	6257	8.1	3.9	70	2416	455	6.4	1.6	86.8	594	1	436	4	1.06	377.	18	61	5.4	7
18.0	630	161	10.03	6440	8.3	3.8	72	2430	430	6.0	1.5	87.0	629	1	458	4	1.03	399.	19	64	5.5	7
19.0	665	170	10.58	6618	8.5	3.7	74	2442	407	5.7	1.5	87.2	664	1	481	4	1.00	421.	20	67	5.6	7
20.0	700	179	11.14	6792	8.7	3.6	76	2453	387	5.4	1.4	87.3	699	1	503	4	0.97	432.	21	69	5.8	8
25.0	875	223	13.93	7604	9.8	3.2	86	2494	309	4.3	1.1	87.9	874	1	613	3	0.86	526.	25	83	6.4	9
30.0	1050	268	16.71	8341	10.7	2.9	95	2521	258	3.5	0.9	88.2	1049	1	721	3	0.78	615.	30	95	7.0	10
35.0	1225	313	19.50	9021	11.6	2.7	103	2540	221	3.0	0.8	88.5	1224	1	829	3	0.72	698.	35	107	7.5	
40.0	1400	357	22.28	9656	12.4	2.5	110	2554	193	2.6	0.7	88.7	1399	1	936	3	0.67	776.	39	119	8.0	
45.0	1575	402	25.07	10256	13.1	2.4	117	2564	172	2.3	0.6	88.8	1575	0	1042	2	0.63	848.	44	130	8.4	
50.0	1750	447	27.85	10825	13.8	2.3	124	2573	154	2.1	0.5	89.0	1750	0	1148	2	0.60	914.	49	141	8.9	

#178 35 Cl on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 8. ZC= 25.(Mn)
NEUTRON NUMBERS: NP= 18. NT= 8. NC= 26.

AP**1/3= 3.271 AT**1/3= 2.520 ELSCAT <27 deg
REDUCED MASS NUMBER= 10.98 AP+AT=AC= 51.

INTERACTION RADIUS RINT= 9.40 fm RO= 1.62 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 2.42 CT+CP= 5.82 C= 1.41

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.65 RCT= 2.78 RC=RCP+RCT= 6.43

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 42.61 MeV K= .11733 n=2.495
VC(RINT)= 20.8 MeV

FISSION-TKE= 40. MeV
ASYMM. FISSION-TKE= 35. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 16.91 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -4.7
COMPOUND NUCLEUS: -50.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.51 fm V(RB)= 21.4 MeV
Q-VALUE= 18.9 MeV
L-CRITICAL= 36.

35 Cl on 16 O — 35 Cl on 16 O

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	11	0.53	1511	2.4	21.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	70	22	1.06	2138	3.4	15.1	7	183	61	129.1	26.5	25.4	21	49	0	66	13.30	46.	0	0	2.5	2
3.0	105	33	1.58	2619	4.2	12.4	24	1107	799	55.1	16.6	62.4	86	19	0	20	4.05	69.	0	0	2.9	2
4.0	140	44	2.11	3025	4.8	10.7	33	1548	1168	36.2	11.2	71.9	128	12	120	15	2.93	90.	4	15	3.1	3
4.5	158	49	2.37	3209	5.1	10.1	36	1693	1291	31.0	9.6	74.5	148	10	134	13	2.63	102.	5	18	3.3	3
5.0	175	55	2.64	3383	5.4	9.6	40	1808	1390	27.1	8.4	76.5	167	8	147	12	2.41	113.	6	21	3.4	3
5.5	193	60	2.90	3548	5.6	9.1	43	1902	1361	24.1	7.5	78.0	185	7	159	11	2.24	122.	6	23	3.5	4
6.0	210	66	3.17	3706	5.9	8.7	46	1980	1247	21.7	6.8	79.2	204	6	171	11	2.10	133.	7	26	3.6	4
6.5	228	71	3.43	3858	6.1	8.4	48	2046	1151	19.7	6.1	80.2	222	6	183	10	1.98	144.	7	28	3.8	4
7.0	245	77	3.69	4004	6.4	8.1	51	2101	1069	18.0	5.6	81.0	240	5	194	9	1.88	155.	8	30	3.9	4
7.5	263	82	3.96	4146	6.6	7.8	53	2150	998	16.7	5.2	81.7	258	5	205	9	1.80	166.	8	32	4.0	4
8.0	280	88	4.22	4282	6.8	7.6	56	2192	935	15.5	4.8	82.3	276	4	216	9	1.72	173.	9	34	4.1	5
8.5	298	93	4.48	4414	7.0	7.3	58	2229	880	14.4	4.5	82.8	293	4	227	8	1.65	184.	9	36	4.2	5
9.0	315	99	4.75	4543	7.2	7.1	60	2262	831	13.5	4.2	83.2	311	4	238	8	1.59	195.	10	37	4.3	5
9.5	333	104	5.01	4668	7.4	6.9	62	2291	788	12.7	4.0	83.6	329	4	249	8	1.54	206.	10	39	4.4	5
10.0	350	110	5.28	4790	7.6	6.8	64	2318	748	12.0	3.8	84.0	347	3	259	8	1.49	212.	11	41	4.5	6
10.5	368	115	5.54	4909	7.8	6.6	66	2341	713	11.4	3.6	84.3	364	3	270	7	1.45	222.	11	43	4.6	6
11.0	385	121	5.80	5025	8.0	6.5	68	2363	680	10.8	3.4	84.6	382	3	280	7	1.41	233.	12	44	4.7	6
11.5	403	126	6.07	5139	8.1	6.3	70	2382	651	10.3	3.2	84.8	400	3	290	7	1.37	244.	12	46	4.8	6
12.0	420	132	6.33	5250	8.3	6.2	72	2400	623	9.9	3.1	85.1	417	3	301	7	1.34	254.	13	47	4.9	6
13.0	455	143	6.86	5466	8.7	5.9	75	2432	575	9.0	2.8	85.5	453	2	321	6	1.28	269.	14	51	5.0	7
14.0	490	154	7.39	5674	9.0	5.7	78	2459	534	8.3	2.6	85.8	488	2	341	6	1.22	290.	15	54	5.2	7
15.0	525	165	7.91	5874	9.3	5.5	82	2482	499	7.7	2.4	86.1	523	2	362	6	1.17	311.	16	57	5.4	7
16.0	560	176	8.44	6069	9.6	5.4	85	2502	467	7.2	2.3	86.4	558	2	382	6	1.13	324.	17	60	5.5	8
17.0	595	187	8.97	6257	9.9	5.2	88	2520	440	6.8	2.1	86.6	593	2	401	6	1.09	344.	18	62	5.7	8
18.0	630	198	9.50	6440	10.2	5.0	91	2536	415	6.4	2.0	86.8	628	2	421	5	1.06	364.	19	65	5.8	8
19.0	665	209	10.02	6618	10.5	4.9	93	2550	394	6.0	1.9	87.0	663	2	441	5	1.03	376.	19	68	6.0	9
20.0	700	220	10.55	6792	10.7	4.8	96	2563	374	5.7	1.8	87.1	699	1	460	5	1.00	395.	20	71	6.1	9
25.0	875	275	13.19	7604	12.0	4.3	108	2610	299	4.5	1.4	87.7	874	1	557	4	0.88	471.	25	84	6.8	11
30.0	1050	329	15.83	8341	13.2	3.9	120	2642	249	3.7	1.2	88.1	1049	1	653	4	0.80	551.	30	97	7.4	12
35.0	1225	384	18.46	9021	14.2	3.6	130	2664	213	3.2	1.0	88.4	1224	1	747	4	0.74	626.	34	109	8.0	
40.0	1400	439	21.10	9656	15.2	3.4	139	2680	187	2.8	0.9	88.6	1399	1	840	3	0.69	697.	39	121	8.5	
45.0	1575	494	23.74	10256	16.1	3.2	148	2692	166	2.5	0.8	88.8	1574	1	933	3	0.65	763.	43	132	9.0	
50.0	1750	549	26.38	10825	17.0	3.0	157	2702	149	2.2	0.7	88.9	1749	1	1025	3	0.61	824.	47	143	9.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#179 35 Cl on 27 Al

35 Cl on 27 Al

35 Cl on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 13. ZC= 30.(Zn)
NEUTRON NUMBERS: NP= 18. NT= 14. NC= 32.

AP**1/3= 3.271 AT**1/3= 3.000 ELSCAT <50 des
REDUCED MASS NUMBER= 15.24 AP+AT=AC= 62.

INTERACTION RADIUS RINT= 9.92 fm R0= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 3.05 CT+CP= 6.45 C= 1.61

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.65 RCT= 3.32 RC=RCP+RCT= 6.97

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 64.23 MeV K= .16132 n=2.446
VC(RINT)= 32.0 MeV

FISSION-TKE= 47. MeV
ASYMM. FISSION-TKE= 46. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.950 MeV/fm**2 PROX-FACTOR= 19.18 MeV
L-RLD= 59 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.82 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -20.6
COMPOUND NUCLEUS: -61.6

FUSION RELATED PARAMETERS:
R-BARRIER= 8.94 fm V(RB)= 33.2 MeV
Q-VALUE= 14.3 MeV
L-CRITICAL= 50.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	15	0.48	1511	3.3	34.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	70	30	0.95	2138	4.7	24.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	105	46	1.43	2619	5.8	20.1	31	983	689	65.4	28.0	57.3	75	30	0	37	4.74	56.	0 0	2.8	3
4.0	140	61	1.90	3025	6.7	17.4	46	1531	1145	41.8	18.1	69.1	122	18	109	25	3.26	74.	4 16	3.1	4
4.5	158	69	2.14	3209	7.1	16.4	51	1711	1297	35.5	15.4	72.2	143	14	122	22	2.90	83.	5 19	3.3	4
5.0	175	76	2.38	3383	7.5	15.6	56	1855	1418	30.9	13.4	74.5	163	12	133	20	2.64	91.	5 22	3.4	5
5.5	193	84	2.62	3548	7.8	14.8	61	1973	1341	27.4	11.9	76.3	182	11	143	19	2.43	100.	6 24	3.6	5
6.0	210	91	2.86	3706	8.2	14.2	65	2070	1230	24.6	10.7	77.7	201	9	153	18	2.27	109.	7 27	3.7	5
6.5	228	99	3.09	3858	8.5	13.6	69	2152	1135	22.3	9.7	78.9	219	8	163	17	2.14	116.	7 29	3.8	6
7.0	245	107	3.33	4004	8.8	13.2	73	2223	1054	20.4	8.9	79.8	237	8	172	16	2.03	125.	8 31	4.0	6
7.5	263	114	3.57	4146	9.1	12.7	77	2283	984	18.8	8.2	80.6	256	7	181	15	1.93	134.	8 33	4.1	6
8.0	280	122	3.81	4282	9.4	12.3	80	2336	922	17.4	7.6	81.3	274	6	190	14	1.85	143.	9 35	4.2	6
8.5	298	130	4.04	4414	9.7	11.9	84	2383	868	16.2	7.1	81.9	292	6	198	14	1.77	149.	9 36	4.3	7
9.0	315	137	4.28	4543	10.0	11.6	87	2424	820	15.2	6.6	82.4	310	5	207	13	1.71	158.	10 38	4.4	7
9.5	333	145	4.52	4668	10.3	11.3	90	2461	776	14.3	6.2	82.8	327	5	215	13	1.65	166.	10 40	4.5	7
10.0	350	152	4.76	4790	10.5	11.0	93	2495	738	13.5	5.9	83.2	345	5	223	12	1.60	175.	11 42	4.6	7
10.5	368	160	5.00	4909	10.8	10.7	96	2525	702	12.8	5.6	83.6	363	4	231	12	1.55	181.	11 43	4.7	8
11.0	385	168	5.23	5025	11.1	10.5	99	2552	670	12.1	5.3	83.9	381	4	239	12	1.50	189.	11 45	4.8	8
11.5	403	175	5.47	5139	11.3	10.3	101	2577	641	11.6	5.0	84.2	398	4	247	11	1.46	198.	12 47	4.9	8
12.0	420	183	5.71	5250	11.5	10.0	104	2600	615	11.0	4.8	84.5	416	4	255	11	1.43	206.	12 48	5.0	8
13.0	455	198	6.19	5466	12.0	9.7	109	2640	567	10.1	4.4	84.9	452	3	271	11	1.36	219.	13 51	5.2	9
14.0	490	213	6.66	5674	12.5	9.3	114	2674	527	9.3	4.1	85.3	487	3	286	10	1.30	236.	14 54	5.4	9
15.0	525	229	7.14	5874	12.9	9.0	119	2704	492	8.7	3.8	85.7	522	3	301	10	1.25	248.	15 57	5.6	10
16.0	560	244	7.61	6069	13.3	8.7	123	2730	461	8.1	3.5	86.0	557	3	316	9	1.20	265.	16 60	5.8	10
17.0	595	259	8.09	6257	13.7	8.4	128	2752	434	7.6	3.3	86.2	592	3	331	9	1.16	276.	17 63	5.9	11
18.0	630	274	8.57	6440	14.1	8.2	132	2773	410	7.1	3.1	86.4	628	2	346	9	1.13	292.	18 66	6.1	11
19.0	665	290	9.04	6618	14.5	8.0	136	2791	388	6.7	2.9	86.6	663	2	361	8	1.09	303.	19 69	6.3	12
20.0	700	305	9.52	6792	14.9	7.8	140	2807	369	6.4	2.8	86.8	698	2	375	8	1.06	318.	20 71	6.4	12
25.0	875	381	11.90	7604	16.7	7.0	158	2868	295	5.0	2.2	87.5	873	2	447	7	0.94	382.	24 84	7.1	14
30.0	1050	457	14.28	8341	18.3	6.4	175	2909	246	4.2	1.8	87.9	1049	1	517	7	0.85	440.	28 97	7.8	16
35.0	1225	533	16.66	9021	19.7	5.9	190	2937	210	3.6	1.5	88.2	1224	1	586	6	0.78	490.	32 109	8.4	
40.0	1400	610	19.03	9656	21.1	5.5	204	2959	184	3.1	1.3	88.5	1399	1	654	6	0.73	548.	37 120	9.0	
45.0	1575	686	21.41	10256	22.4	5.2	217	2975	164	2.7	1.2	88.6	1574	1	722	5	0.68	602.	41 131	9.5	
50.0	1750	762	23.79	10825	23.6	4.9	229	2988	147	2.5	1.1	88.8	1749	1	788	5	0.65	637.	45 142	10.0	

#180 35 Cl on 40 Ca

35 Cl on 40 Ca

35 Cl on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 20. ZC= 37.(Rb)
NEUTRON NUMBERS: NP= 18. NT= 20. NC= 38.

AP**1/3= 3.271 AT**1/3= 3.420
REDUCED MASS NUMBER= 18.67 AP+AT=AC= 75.

INTERACTION RADIUS RINT=10.38 fm R0= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 3.59 CT+CP= 6.99 C= 1.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.65 RCT= 3.84 RC=RCP+RCT= 7.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 92.03 MeV K= .19580 n=2.442
VC(RINT)= 47.1 MeV

FISSION-TKE= 57. MeV
ASYMM. FISSION-TKE= 57. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 20.88 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -33.0
COMPOUND NUCLEUS: -59.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.31 fm V(RB)= 49.3 MeV
Q-VALUE= -0.3 MeV
L-CRITICAL= 61.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	19	0.40	1511	4.1	53.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	70	37	0.79	2138	5.8	37.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	105	56	1.19	2619	7.1	30.9	29	571	327	93.3	50.7	43.3	50	55	0	78	6.82	47.	0 0	2.4	3
4.0	140	75	1.59	3025	8.2	26.8	51	1296	925	55.0	29.5	62.5	110	30	95	44	3.87	62.	4 15	2.8	4
4.5	158	84	1.78	3209	8.7	25.2	60	1535	1125	45.9	24.6	67.0	134	24	109	38	3.34	70.	4 18	3.0	4
5.0	175	93	1.98	3383	9.1	23.9	67	1725	1284	39.5	21.1	70.2	155	20	121	34	2.98	77.	5 21	3.2	4
5.5	193	103	2.18	3548	9.6	22.8	73	1880	1302	34.7	18.5	72.7	175	17	131	31	2.72	84.	6 24	3.3	5
6.0	210	112	2.38	3706	10.0	21.9	79	2010	1194	30.9	16.5	74.5	195	15	140	29	2.52	91.	6 26	3.5	5
6.5	228	121	2.58	3858	10.4	21.0	84	2118	1102	27.9	14.9	76.0	214	13	148	27	2.35	98.	7 28	3.6	6
7.0	245	131	2.77	4004	10.8	20.2	90	2212	1023	25.4	13.6	77.3	233	12	156	25	2.22	105.	7 30	3.7	6
7.5	263	140	2.97	4146	11.2	19.5	95	2292	955	23.4	12.5	78.3	252	11	164	24	2.10	113.	8 32	3.9	6
8.0	280	149	3.17	4282	11.5	18.9	99	2363	895	21.6	11.5	79.2	270	10	171	23	2.01	118.	8 34	4.0	7
8.5	298	159	3.37	4414	11.9	18.4	104	2425	842	20.1	10.7	79.9	288	9	178	22	1.92	126.	9 36	4.1	7
9.0	315	168	3.57	4543	12.2	17.8	108	2480	796	18.8	10.0	80.6	307	8	185	21	1.84	131.	9 38	4.2	8
9.5	333	177	3.76	4668	12.6	17.4	112	2529	754	17.6	9.4	81.2	325	8	192	20	1.78	139.	10 39	4.3	8
10.0	350	187	3.96	4790	12.9	16.9	116	2574	716	16.6	8.9	81.7	343	7	198	20	1.72	146.	10 41	4.5	8
10.5	368	196	4.16	4909	13.2	16.5	120	2614	682	15.7	8.4	82.1	361	7	205	19	1.66	151.	11 43	4.6	9
11.0	385	205	4.36	5025	13.5	16.1	123	2650	651	14.9	8.0	82.5	379	6	211	18	1.61	158.	11 44	4.7	9
11.5	403	215	4.56	5139	13.8	15.8	127	2683	623	14.2	7.6	82.9	396	6	218	18	1.57	165.	11 46	4.8	9
12.0	420	224	4.76	5250	14.1	15.5	130	2713	597	13.5	7.2	83.2	414	6	224	17	1.52	170.	12 47	4.9	10
13.0	455	243	5.15	5466	14.7	14.8	137	2767	551	12.4	6.6	83.8	450	5	236	17	1.45	184.	13 50	5.1	10
14.0	490	261	5.55	5674	15.3	14.3	144	2813	511	11.4	6.1	84.3	485	5	248	16	1.39	195.	14 53	5.3	11
15.0	525	280	5.94	5874	15.8	13.8	150	2853	477	10.6	5.6	84.7	521	4	260	15	1.33	209.	14 56	5.5	11
16.0	560	299	6.34	6069	16.3	13.4	156	2887	447	9.8	5.2	85.1	556	4	272	15	1.28	219.	15 59	5.6	12
17.0	595	317	6.74	6257	16.8	13.0	161	2918	421	9.2	4.9	85.4	591	4	283	14	1.23	233.	16 62	5.8	12
18.0	630	336	7.13	6440	17.3	12.6	167	2945	398	8.7	4.6	85.7	626	4	295	14	1.19	243.	17 65	6.0	13
19.0	665	355	7.53	6618	17.8	12.3	172	2969	377	8.2	4.4	85.9	662	3	306	13	1.16	256.	18 67	6.1	13
20.0	700	373	7.93	6792	18.3	12.0	177	2991	358	7.7	4.1	86.1	697	3	317	13	1.12	266.	19 70	6.3	14
25.0	875	467	9.91	7604	20.4	10.7	201	3073	286	6.1	3.3	86.9	873	2	372	11	0.99	321.	23 83	7.1	16
30.0	1050	560	11.89	8341	22.4	9.8	222	3128	238	5.0	2.7	87.5	1048	2	424	10	0.90	372.	27 95	7.7	18
35.0	1225	653	13.87	9021	24.2	9.0	242	3167	204	4.3	2.3	87.9	1223	2	476	9	0.82	419.	31 106	8.3	
40.0	1400	747	15.85	9656	25.8	8.5	259	3196	179	3.7	2.0	88.1	1399	1	527	9	0.77	461.	35 117	8.9	
45.0	1575	840	17.83	10256	27.4	8.0	276	3218	159	3.3	1.8	88.3	1574	1	576	8	0.72	499.	39 128	9.5	
50.0	1750	933	19.82	10825	28.9	7.6	292	3236	143	3.0	1.6	88.5	1749	1	626	8	0.68	544.	43 138	10.0	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#181 35 Cl on 56 Fe

35 Cl on 56 Fe

35 Cl on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 26. ZC= 43.(Tc)
NEUTRON NUMBERS: NP= 18. NT= 30. NC= 48.

AP**1/3= 3.271 AT**1/3= 3.826
REDUCED MASS NUMBER= 21.54 AP+AT=AC= 91.

INTERACTION RADIUS RINT=10.82 fm R0= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 4.12 CT+CP= 7.52 C̄= 1.86

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.65 RCT= 4.27 RC=RCP+RCT= 7.92

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 112.96 MeV K= .20308 n=2.456
VC(RINT)= 58.7 MeV

FISSION-TKE= 66. MeV
ASYMM. FISSION-TKE= 63. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 22.15 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.17 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -61.4
COMPOUND NUCLEUS: -77.8

FUSION RELATED PARAMETERS:
R-BARRIER= 9.69 fm V(RB)= 61.4 MeV
Q-VALUE= -10.2 MeV
L-CRITICAL= 72.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	35	22	0.37	1511	4.7	69.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	70	43	0.73	2138	6.7	49.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	105	65	1.10	2619	8.2	40.2	26	356	146	113.2	75.9	33.4	36	69	35	133	9.42	39.	1	4	2.2	3
4.0	140	86	1.47	3025	9.4	34.8	57	1209	846	62.4	39.2	58.8	104	36	86	62	4.34	51.	4	15	2.6	4
4.5	158	97	1.65	3209	10.0	32.8	68	1490	1080	51.6	32.2	64.2	129	28	100	52	3.68	57.	4	18	2.8	5
5.0	175	108	1.83	3383	10.5	31.1	77	1714	1266	44.1	27.4	67.9	152	23	110	46	3.25	64.	5	21	2.9	5
5.5	193	118	2.02	3548	11.0	29.7	85	1897	1384	38.6	23.9	70.7	173	20	120	42	2.94	69.	5	23	3.1	6
6.0	210	129	2.20	3706	11.5	28.4	92	2049	1268	34.3	21.2	72.9	193	17	128	38	2.71	75.	6	25	3.2	6
6.5	228	140	2.38	3858	12.0	27.3	99	2177	1171	30.8	19.1	74.6	212	15	135	36	2.52	81.	7	27	3.4	7
7.0	245	151	2.57	4004	12.5	26.3	105	2287	1087	28.0	17.3	76.0	231	14	142	34	2.37	87.	7	29	3.5	7
7.5	263	162	2.75	4146	12.9	25.4	111	2382	1014	25.7	15.9	77.1	250	12	148	32	2.24	92.	7	31	3.6	8
8.0	280	172	2.93	4282	13.3	24.6	117	2465	951	23.7	14.7	78.1	269	11	154	30	2.13	98.	8	33	3.8	8
8.5	298	183	3.12	4414	13.7	23.9	122	2538	895	22.1	13.6	79.0	287	10	160	29	2.04	103.	8	35	3.9	9
9.0	315	194	3.30	4543	14.1	23.2	128	2603	845	20.6	12.7	79.7	305	10	165	28	1.95	109.	9	36	4.0	9
9.5	333	205	3.48	4668	14.5	22.6	133	2661	801	19.3	11.9	80.3	324	9	171	27	1.88	115.	9	38	4.1	9
10.0	350	215	3.67	4790	14.9	22.0	137	2714	761	18.2	11.2	80.9	342	8	176	26	1.81	120.	10	40	4.2	10
10.5	368	226	3.85	4909	15.3	21.5	142	2761	724	17.2	10.6	81.4	360	8	181	25	1.76	126.	10	41	4.4	10
11.0	385	237	4.03	5025	15.6	21.0	147	2804	692	16.3	10.0	81.9	378	7	186	24	1.70	130.	11	43	4.5	11
11.5	403	248	4.22	5139	16.0	20.5	151	2843	661	15.5	9.5	82.3	396	7	191	23	1.65	136.	11	44	4.6	11
12.0	420	258	4.40	5250	16.3	20.1	155	2879	634	14.8	9.1	82.6	413	7	196	23	1.61	142.	11	46	4.7	11
13.0	455	280	4.77	5466	17.0	19.3	163	2942	585	13.5	8.3	83.3	449	6	206	22	1.53	152.	12	49	4.9	12
14.0	490	302	5.13	5674	17.6	18.6	171	2996	543	12.4	7.6	83.8	485	5	215	21	1.46	161.	13	52	5.1	13
15.0	525	323	5.50	5874	18.2	18.0	179	3043	507	11.5	7.1	84.3	520	5	224	20	1.40	171.	14	54	5.2	14
16.0	560	345	5.87	6069	18.8	17.4	186	3084	475	10.7	6.6	84.6	555	5	233	19	1.34	182.	15	57	5.4	14
17.0	595	366	6.23	6257	19.4	16.9	193	3120	447	10.0	6.2	85.0	591	4	242	18	1.30	191.	15	60	5.6	15
18.0	630	388	6.60	6440	20.0	16.4	199	3152	422	9.4	5.8	85.3	626	4	251	18	1.25	200.	16	62	5.8	16
19.0	665	409	6.97	6618	20.5	16.0	206	3181	400	8.9	5.5	85.6	661	4	260	17	1.21	211.	17	65	5.9	16
20.0	700	431	7.33	6792	21.1	15.6	212	3207	380	8.4	5.2	85.8	696	4	268	17	1.18	219.	18	68	6.1	17
25.0	875	538	9.17	7604	23.6	13.9	241	3305	304	6.6	4.1	86.7	872	3	310	15	1.04	262.	22	80	6.8	20
30.0	1050	646	11.00	8341	25.8	12.7	266	3369	253	5.5	3.4	87.3	1048	2	349	13	0.94	306.	26	91	7.5	22
35.0	1225	754	12.84	9021	27.9	11.8	290	3416	217	4.7	2.9	87.7	1223	2	388	12	0.86	342.	29	102	8.1	
40.0	1400	862	14.67	9656	29.8	11.0	311	3450	190	4.0	2.5	88.0	1398	2	425	11	0.80	378.	33	113	8.7	
45.0	1575	969	16.50	10256	31.6	10.4	331	3477	169	3.6	2.2	88.2	1574	1	462	11	0.75	412.	37	123	9.2	
50.0	1750	1077	18.34	10825	33.3	9.8	351	3498	152	3.2	2.0	88.4	1749	1	498	10	0.71	444.	40	133	9.7	

#182 35 Cl on 63 Cu

35 Cl on 63 Cu

35 Cl on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 29. ZC= 46.(Pd)
NEUTRON NUMBERS: NP= 18. NT= 34. NC= 52.

AP**1/3= 3.271 AT**1/3= 3.979
REDUCED MASS NUMBER= 22.50 AP+AT=AC= 98.

INTERACTION RADIUS RINT=10.99 fm R0= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 4.31 CT+CP= 7.71 C̄= 1.90

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.65 RCT= 4.45 RC=RCP+RCT= 8.09

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 123.11 MeV K= .20484 n=2.466
VC(RINT)= 64.5 MeV

FISSION-TKE= 71. MeV
ASYMM. FISSION-TKE= 66. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 22.58 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.79 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -65.2
COMPOUND NUCLEUS: -82.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.83 fm V(RB)= 67.5 MeV
Q-VALUE= -9.8 MeV
L-CRITICAL= 76.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	35	23	0.35	1511	4.9	77.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	70	45	0.70	2138	7.0	54.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	105	68	1.05	2619	8.5	44.8	19	180	0	133.2	100.0	23.4	24	81	23	213	13.84	0.	1	3	2.2	3
4.0	140	90	1.39	3025	9.8	38.8	57	1108	758	68.1	45.0	56.0	100	40	81	73	4.68	47.	3	14	2.6	5
4.5	158	101	1.57	3209	10.4	36.6	69	1413	1010	55.9	36.5	62.1	126	32	96	61	3.89	53.	4	18	2.7	5
5.0	175	113	1.74	3383	11.0	34.7	79	1656	1213	47.5	30.9	66.3	149	26	107	53	3.41	59.	5	20	2.9	6
5.5	193	124	1.92	3548	11.5	33.1	88	1855	1378	41.4	26.8	69.3	170	22	116	48	3.06	65.	5	23	3.1	6
6.0	210	135	2.09	3706	12.1	31.7	96	2020	1281	36.7	23.7	71.7	191	19	124	44	2.81	70.	6	25	3.2	7
6.5	228	146	2.27	3858	12.5	30.4	103	2159	1182	32.9	21.3	73.5	211	17	131	41	2.61	75.	6	27	3.3	7
7.0	245	158	2.44	4004	13.0	29.3	110	2278	1098	29.9	19.3	75.0	230	15	137	38	2.45	80.	7	29	3.5	8
7.5	263	169	2.62	4146	13.5	28.3	116	2382	1025	27.4	17.7	76.3	249	14	143	36	2.31	86.	7	31	3.6	8
8.0	280	180	2.79	4282	13.9	27.4	122	2472	961	25.3	16.3	77.4	268	12	149	34	2.19	91.	8	33	3.7	9
8.5	298	191	2.96	4414	14.3	26.6	128	2551	904	23.4	15.1	78.3	286	11	155	33	2.09	96.	8	34	3.8	9
9.0	315	203	3.14	4543	14.8	25.9	134	2622	854	21.9	14.1	79.1	305	10	160	31	2.01	101.	9	36	4.0	10
9.5	333	214	3.31	4668	15.2	25.2	139	2685	809	20.5	13.2	79.7	323	10	165	30	1.93	107.	9	38	4.1	10
10.0	350	225	3.49	4790	15.6	24.5	144	2742	768	19.3	12.4	80.4	341	9	170	29	1.86	112.	10	39	4.2	10
10.5	368	236	3.66	4909	15.9	24.0	149	2793	732	18.2	11.7	80.9	359	8	175	28	1.80	116.	10	41	4.3	11
11.0	385	248	3.84	5025	16.3	23.4	154	2840	698	17.3	11.1	81.4	377	8	179	27	1.74	122.	10	42	4.4	11
11.5	403	259	4.01	5139	16.7	22.9	159	2882	668	16.4	10.6	81.8	395	8	184	26	1.69	126.	11	44	4.5	12
12.0	420	270	4.18	5250	17.0	22.4	163	2921	640	15.6	10.1	82.2	413	7	188	26	1.64	132.	11	45	4.6	12
13.0	455	293	4.53	5466	17.7	21.5	172	2990	591	14.3	9.2	82.9	449	6	197	24	1.56	141.	12	48	4.8	13
14.0	490	315	4.88	5674	18.4	20.7	180	3049	549	13.1	8.4	83.4	484	6	206	23	1.49	150.	13	51	5.0	14
15.0	525	338	5.23	5874	19.1	20.0	188	3100	512	12.2	7.8	83.9	520	5	214	22	1.43	159.	14	54	5.2	15
16.0	560	360	5.58	6069	19.7	19.4	196	3144	480	11.3	7.3	84.3	555	5	223	21	1.37	169.	14	56	5.3	15
17.0	595	383	5.93	6257	20.3	18.8	203	3184	452	10.6	6.8	84.7	590	5	231	21	1.32	178.	15	59	5.5	16
18.0	630	405	6.28	6440	20.9	18.3	210	3219	427	9.9	6.4	85.0	626	4	239	20	1.28	186.	16	61	5.7	17
19.0	665	428	6.63	6618	21.5	17.8	217	3250	404	9.4	6.0	85.3	661	4	246	19	1.24	196.	17	64	5.8	17
20.0	700	450	6.97	6792	22.0	17.4	224	3278	384	8.9	5.7	85.6	696	4	254	19	1.20	204.	18	66	6.0	18
25.0	875	563	8.72	7604	24.6	15.5	254	3384	307	7.0	4.5	86.5	872	3	291	17	1.06	245.	21	78	6.7	21
30.0	1050	675	10.46	8341	27.0	14.2	282	3455	256	5.8	3.7	87.1	1048	2	327	15	0.95	283.	25	90	7.4	24
35.0	1225	788	12.21	9021	29.1	13.1	307	3505	219	4.9	3.2	87.5	1223	2	362	14	0.88	321.	29	101	8.0	
40.0	1400	900	13.95	9656	31.1	12.3	329	3542	192	4.3	2.7	87.9	1398	2	396	13	0.82	352.	33	111	8.5	
45.0	1575	1013	15.69	10256	33.0	11.6	351	3571	170	3.8	2.4	88.1	1573	2	429	12	0.77	384.	36	121	9.0	
50.0	1750	1125	17.44	10825	34.8	11.0	371	3595	153	3.4	2.2	88.3	1749	1	461	11	0.72	414.	40	131	9.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#183 35 Cl on 92 Mo

35 Cl on 92 Mo

35 Cl on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 42. ZC= 59.(Pr)
NEUTRON NUMBERS: NP= 18. NT= 50. NC= 68.

AP**1/3= 3.271 AT**1/3= 4.514
REDUCED MASS NUMBER= 25.35 AP+AT=AC=127.

INTERACTION RADIUS RINT=11.57 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 5.00 CT+CP= 8.40 C= 2.02

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.65 RCT= 5.08 RC=RCP+RCT= 8.72

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 164.43 MeV K= .20026 n=2.517
VC(RINT)= 88.7 MeV

FISSION-TKE= 96. MeV
ASYMM. FISSION-TKE= 79. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.943 MeV/fm**2 PROX-FACTOR= 23.99 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.83 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -87.5
COMPOUND NUCLEUS: -66.0

FUSION RELATED PARAMETERS:
R-BARRIER=10.37 fm V(RB)= 93.0 MeV
Q-VALUE= -48.2 MeV
L-CRITICAL= 86.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	25	0.29	1511	5.5	112.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	70	51	0.57	2138	7.8	79.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	105	76	0.86	2619	9.6	64.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	140	101	1.14	3025	11.1	56.2	45	544	279	102.5	80.4	38.8	72	68	57	159	7.43	38.	3 11	1.8	3
4.5	158	114	1.29	3209	11.8	53.0	64	959	624	79.3	60.0	50.4	106	51	79	112	5.24	42.	3 15	2.0	4
5.0	175	127	1.43	3383	12.4	50.3	78	1290	900	65.3	48.7	57.3	134	41	94	92	4.28	46.	4 18	2.2	5
5.5	193	139	1.57	3548	13.0	47.9	91	1559	1125	55.8	41.2	62.1	159	34	104	80	3.70	51.	5 21	2.4	6
6.0	210	152	1.71	3706	13.6	45.9	101	1783	1292	48.7	35.9	65.6	181	29	113	71	3.31	55.	5 23	2.6	6
6.5	228	165	1.86	3858	14.1	44.1	111	1973	1193	43.3	31.8	68.3	203	25	120	65	3.02	59.	6 25	2.7	7
7.0	245	177	2.00	4004	14.7	42.5	120	2135	1108	39.0	28.5	70.5	223	22	127	60	2.80	63.	6 27	2.9	8
7.5	263	190	2.14	4146	15.2	41.1	128	2275	1034	35.5	25.9	72.2	243	19	132	56	2.62	68.	7 29	3.0	8
8.0	280	203	2.29	4282	15.7	39.7	136	2398	969	32.6	23.8	73.7	262	18	137	53	2.47	72.	7 30	3.1	9
8.5	298	216	2.43	4414	16.2	38.6	143	2506	912	30.1	21.9	74.9	281	16	142	50	2.34	76.	8 32	3.2	9
9.0	315	228	2.57	4543	16.6	37.5	150	2602	861	28.0	20.4	76.0	300	15	147	48	2.23	80.	8 34	3.4	10
9.5	333	241	2.71	4668	17.1	36.5	157	2687	816	26.1	19.0	76.9	319	14	151	46	2.14	84.	9 35	3.5	10
10.0	350	254	2.86	4790	17.5	35.6	164	2765	775	24.5	17.8	77.7	337	13	155	44	2.05	88.	9 37	3.6	11
10.5	368	266	3.00	4909	18.0	34.7	170	2834	738	23.1	16.8	78.4	356	12	159	42	1.98	92.	10 38	3.7	12
11.0	385	279	3.14	5025	18.4	33.9	176	2898	705	21.8	15.9	79.1	374	11	162	41	1.91	96.	10 40	3.8	12
11.5	403	292	3.29	5139	18.8	33.2	181	2956	674	20.7	15.0	79.6	392	10	166	40	1.85	100.	10 41	3.9	13
12.0	420	304	3.43	5250	19.2	32.5	187	3009	646	19.7	14.3	80.2	410	10	170	39	1.79	104.	11 42	4.0	13
13.0	455	330	3.71	5466	20.0	31.2	198	3102	596	17.9	13.0	81.0	446	9	176	36	1.70	112.	12 45	4.2	14
14.0	490	355	4.00	5674	20.7	30.0	208	3183	554	16.5	11.9	81.8	482	8	183	35	1.61	119.	12 48	4.4	15
15.0	525	380	4.29	5874	21.5	29.0	218	3252	517	15.2	11.0	82.4	518	7	189	33	1.54	126.	13 50	4.6	16
16.0	560	406	4.57	6069	22.2	28.1	227	3313	484	14.1	10.2	82.9	553	7	196	32	1.48	134.	14 53	4.7	17
17.0	595	431	4.86	6257	22.9	27.3	236	3366	456	13.2	9.6	83.4	589	6	202	31	1.42	141.	15 55	4.9	18
18.0	630	456	5.14	6440	23.5	26.5	244	3414	430	12.4	9.0	83.8	624	6	207	30	1.37	148.	15 58	5.1	19
19.0	665	482	5.43	6618	24.2	25.8	253	3456	408	11.7	8.5	84.2	660	5	213	29	1.33	154.	16 60	5.2	20
20.0	700	507	5.71	6792	24.8	25.1	261	3495	387	11.0	8.0	84.5	695	5	219	28	1.29	162.	17 62	5.4	20
25.0	875	634	7.14	7604	27.7	22.5	297	3640	310	8.6	6.3	85.7	871	4	246	24	1.13	195.	20 74	6.1	24
30.0	1050	761	8.57	8341	30.4	20.5	330	3736	258	7.1	5.2	86.4	1047	3	271	22	1.02	225.	24 84	6.7	28
35.0	1225	887	10.00	9021	32.8	19.0	360	3805	221	6.0	4.4	87.0	1222	3	296	20	0.93	255.	27 94	7.3	
40.0	1400	1014	11.43	9656	35.1	17.8	388	3856	193	5.3	3.8	87.4	1398	2	319	19	0.87	282.	31 104	7.8	
45.0	1575	1141	12.86	10256	37.2	16.8	413	3896	172	4.6	3.4	87.7	1573	2	342	17	0.81	311.	34 114	8.3	
50.0	1750	1268	14.28	10825	39.2	15.9	437	3928	155	4.2	3.0	87.9	1748	2	364	16	0.77	334.	38 123	8.8	

#184 35 Cl on 108 Ag

35 Cl on 108 Ag

35 Cl on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 47. ZC= 64.(Gd)
NEUTRON NUMBERS: NP= 18. NT= 61. NC= 79.

AP**1/3= 3.271 AT**1/3= 4.762
REDUCED MASS NUMBER= 26.43 AP+AT=AC=143.

INTERACTION RADIUS RINT=11.84 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 5.32 CT+CP= 8.72 C= 2.07

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.65 RCT= 5.34 RC=RCP+RCT= 8.98

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 178.33 MeV K= .19307 n=2.535
VC(RINT)= 97.1 MeV

FISSION-TKE= 106. MeV
ASYMM. FISSION-TKE= 83. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.933 MeV/fm**2 PROX-FACTOR= 24.32 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.52 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -87.6
COMPOUND NUCLEUS: -69.0

FUSION RELATED PARAMETERS:
R-BARRIER=10.63 fm V(RB)= 101.5 MeV
Q-VALUE= -45.2 MeV
L-CRITICAL= 92.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	26	0.27	1511	5.8	125.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	70	53	0.54	2138	8.2	89.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	105	79	0.82	2619	10.0	72.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	140	106	1.09	3025	11.6	62.9	39	375	141	116.5	97.8	31.7	65	75	50	220	9.41	33.	2 11	1.8	4
4.5	158	119	1.23	3209	12.3	59.3	62	832	520	87.4	69.7	46.3	102	56	74	138	5.90	37.	3 14	2.0	5
5.0	175	132	1.36	3383	12.9	56.3	79	1195	823	71.1	55.6	54.5	131	44	90	109	4.65	41.	4 17	2.2	6
5.5	193	145	1.50	3548	13.6	53.6	92	1491	1070	60.3	46.6	59.9	157	36	101	93	3.96	45.	5 20	2.4	7
6.0	210	159	1.63	3706	14.2	51.4	104	1738	1277	52.4	40.3	63.8	180	30	109	82	3.51	49.	5 22	2.5	7
6.5	228	172	1.77	3858	14.7	49.3	115	1946	1240	46.4	35.6	66.8	201	26	116	75	3.19	53.	6 24	2.7	8
7.0	245	185	1.91	4004	15.3	47.6	125	2124	1152	41.7	31.9	69.1	222	23	122	69	2.94	56.	6 26	2.8	9
7.5	263	198	2.04	4146	15.8	45.9	134	2278	1075	37.9	28.9	71.1	242	20	128	64	2.74	60.	7 28	2.9	10
8.0	280	211	2.18	4282	16.4	44.5	142	2413	1008	34.7	26.4	72.6	262	18	133	60	2.57	64.	7 29	3.1	10
8.5	298	225	2.31	4414	16.9	43.2	150	2532	948	32.0	24.4	74.0	281	17	137	57	2.44	67.	8 31	3.2	11
9.0	315	238	2.45	4543	17.3	41.9	158	2637	896	29.7	22.6	75.1	300	15	141	55	2.32	71.	8 33	3.3	12
9.5	333	251	2.59	4668	17.8	40.8	165	2731	848	27.8	21.1	76.1	318	14	145	52	2.22	75.	9 34	3.4	12
10.0	350	264	2.72	4790	18.3	39.8	172	2816	806	26.0	19.7	77.0	337	13	149	50	2.13	78.	9 36	3.5	13
10.5	368	278	2.86	4909	18.7	38.8	179	2893	768	24.5	18.6	77.7	355	12	152	48	2.05	81.	9 37	3.6	14
11.0	385	291	3.00	5025	19.2	37.9	185	2963	733	23.1	17.5	78.4	374	11	155	46	1.98	85.	10 38	3.7	14
11.5	403	304	3.13	5139	19.6	37.1	191	3026	701	21.9	16.6	79.0	392	11	159	45	1.91	88.	10 40	3.8	15
12.0	420	317	3.27	5250	20.0	36.3	197	3085	672	20.8	15.8	79.6	410	10	162	44	1.86	92.	11 41	3.9	15
13.0	455	344	3.54	5466	20.8	34.9	209	3188	620	19.0	14.4	80.5	446	9	168	41	1.75	99.	11 44	4.1	16
14.0	490	370	3.81	5674	21.6	33.6	220	3276	576	17.4	13.2	81.3	482	8	174	39	1.67	106.	12 46	4.3	17
15.0	525	397	4.09	5874	22.4	32.5	230	3352	537	16.1	12.1	82.0	517	8	179	37	1.59	111.	13 49	4.4	19
16.0	560	423	4.36	6069	23.1	31.5	240	3419	504	14.9	11.3	82.5	553	7	185	36	1.52	118.	13 51	4.6	20
17.0	595	449	4.63	6257	23.8	30.5	250	3478	474	13.9	10.5	83.0	589	6	190	34	1.47	124.	14 54	4.8	21
18.0	630	476	4.90	6440	24.5	29.7	259	3530	448	13.1	9.9	83.5	624	6	195	33	1.41	131.	15 56	4.9	21
19.0	665	502	5.17	6618	25.2	28.9	268	3577	424	12.3	9.3	83.9	659	6	200	32	1.37	138.	16 58	5.1	22
20.0	700	529	5.45	6792	25.9	28.1	277	3619	403	11.6	8.8	84.2	695	5	205	31	1.32	144.	16 61	5.2	23
25.0	875	661	6.81	7604	28.9	25.2	316	3779	322	9.1	6.9	85.4	871	4	228	27	1.16	174.	20 72	5.9	27
30.0	1050	793	8.17	8341	31.7	23.0	351	3885	268	7.5	5.7	86.3	1047	3	250	25	1.04	201.	23 82	6.5	31
35.0	1225	925	9.53	9021	34.2	21.3	383	3960	230	6.4	4.8	86.8	1222	3	271	22	0.96	226.	27 92	7.0	
40.0	1400	1057	10.89	9656	36.6	19.9	412	4017	201	5.5	4.2	87.2	1398	2	291	21	0.89	251.	30 101	7.5	
45.0	1575	1190	12.26	10256	38.8	18.8	440	4061	179	4.9	3.7	87.6	1573	2	310	20	0.83	275.	33 110	8.0	
50.0	1750	1322	13.62	10825	40.9	17.8	466	4096	161	4.4	3.3	87.8	1748	2	329	18	0.79	299.	37 119	8.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#185 35 Cl on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 58. ZC= 75.(Re)
NEUTRON NUMBERS: NP= 18. NT= 82. NC=100.

AP**1/3= 3.271 AT**1/3= 5.192
REDUCED MASS NUMBER= 28.00 AP+AT=AC=175.

INTERACTION RADIUS RINT=12.30 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 5.87 CT+CP= 9.27 C= 2.15

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.65 RCT= 5.82 RC=RCP+RCT= 9.46

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 208.00 MeV K= .17785 n=2.576
VC(RINT)= 115.2 MeV

FISSION-TKE= 130. MeV
ASYMM. FISSION-TKE= 91. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.917 MeV/fm**2 PROX-FACTOR= 24.82 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -88.2
COMPOUND NUCLEUS: -44.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.07 fm V(RB)= 120.3 MeV
Q-VALUE= -69.9 MeV
L-CRITICAL= 98.

35 Cl on 140 Ce — 35 Cl on 140 Ce

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	35	28	0.24	1511	6.1	155.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	70	56	0.49	2138	8.7	109.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	105	84	0.73	2619	10.6	89.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	140	112	0.97	3025	12.2	77.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	158	126	1.09	3209	13.0	73.2	46	418	174	115.3	101.1	32.4	86	72	61	250	9.04	31.	3	13	1.6	4
5.0	175	140	1.21	3383	13.7	69.4	71	860	541	89.0	75.0	45.5	120	55	81	165	5.93	34.	4	16	1.8	5
5.5	193	154	1.34	3548	14.4	66.2	88	1220	842	73.6	61.0	53.2	148	44	94	132	4.74	37.	4	18	2.0	6
6.0	210	168	1.46	3706	15.0	63.4	103	1518	1093	63.1	51.7	58.5	173	37	104	113	4.06	40.	5	21	2.1	7
6.5	228	182	1.58	3858	15.6	60.9	116	1771	1265	55.3	45.1	62.3	196	31	111	101	3.61	43.	6	23	2.3	8
7.0	245	196	1.70	4004	16.2	58.7	128	1987	1175	49.3	40.1	65.3	218	27	118	91	3.28	46.	6	24	2.4	9
7.5	263	210	1.82	4146	16.8	56.7	139	2174	1096	44.5	36.1	67.7	238	24	123	84	3.03	49.	7	26	2.5	10
8.0	280	224	1.94	4282	17.3	54.9	148	2337	1028	40.6	32.8	69.7	258	22	127	79	2.82	52.	7	28	2.7	11
8.5	298	238	2.07	4414	17.9	53.3	158	2481	967	37.3	30.1	71.3	278	19	132	74	2.66	55.	7	29	2.8	12
9.0	315	252	2.19	4543	18.4	51.8	166	2609	914	34.5	27.8	72.7	297	18	135	70	2.52	58.	8	31	2.9	13
9.5	333	266	2.31	4668	18.9	50.4	175	2724	866	32.2	25.9	73.9	316	16	139	67	2.40	61.	8	32	3.0	14
10.0	350	280	2.43	4790	19.4	49.1	183	2827	822	30.1	24.2	75.0	335	15	142	64	2.29	64.	9	34	3.1	14
10.5	368	294	2.55	4909	19.8	47.9	190	2920	783	28.3	22.7	75.9	353	14	145	61	2.20	67.	9	35	3.2	15
11.0	385	308	2.67	5025	20.3	46.8	198	3004	747	26.7	21.4	76.7	372	13	148	59	2.12	70.	9	36	3.3	16
11.5	403	322	2.79	5139	20.8	45.8	205	3081	715	25.2	20.3	77.4	390	12	151	57	2.05	73.	10	38	3.4	17
12.0	420	336	2.92	5250	21.2	44.8	212	3152	685	23.9	19.2	78.0	408	12	154	55	1.98	75.	10	39	3.5	18
13.0	455	364	3.16	5466	22.1	43.1	225	3277	632	21.7	17.4	79.1	445	10	159	52	1.87	81.	11	42	3.7	19
14.0	490	392	3.40	5674	22.9	41.5	237	3384	587	19.9	15.9	80.1	481	9	164	49	1.77	87.	12	44	3.8	20
15.0	525	420	3.64	5874	23.7	40.1	249	3477	548	18.3	14.7	80.8	516	9	168	47	1.69	92.	12	46	4.0	21
16.0	560	448	3.89	6069	24.5	38.8	260	3558	514	17.0	13.6	81.5	552	8	173	45	1.61	98.	13	49	4.2	22
17.0	595	476	4.13	6257	25.3	37.7	270	3630	483	15.9	12.7	82.1	588	7	177	43	1.55	103.	14	51	4.3	24
18.0	630	504	4.37	6440	26.0	36.6	281	3693	457	14.9	11.9	82.6	623	7	181	42	1.49	108.	14	53	4.5	25
19.0	665	532	4.62	6618	26.7	35.6	291	3750	433	14.0	11.2	83.0	659	6	185	40	1.44	113.	15	55	4.6	26
20.0	700	560	4.86	6792	27.4	34.7	300	3801	411	13.2	10.6	83.4	694	6	189	39	1.40	118.	16	58	4.7	27
25.0	875	700	6.07	7604	30.6	31.1	344	3995	329	10.3	8.3	84.8	870	5	207	34	1.22	143.	19	68	5.4	32
30.0	1050	840	7.29	8341	33.5	28.3	383	4124	274	8.5	6.8	85.8	1046	4	224	31	1.09	167.	23	78	5.9	36
35.0	1225	980	8.50	9021	36.2	26.2	419	4216	235	7.2	5.7	86.4	1222	3	240	28	1.00	189.	26	87	6.5	
40.0	1400	1120	9.72	9656	38.7	24.5	451	4285	205	6.2	5.0	86.9	1397	3	256	26	0.93	209.	29	96	6.9	
45.0	1575	1260	10.93	10256	41.1	23.1	482	4338	182	5.5	4.4	87.2	1573	2	271	24	0.87	228.	32	105	7.4	
50.0	1750	1400	12.15	10825	43.3	22.0	510	4381	164	4.9	3.9	87.5	1748	2	285	23	0.82	248.	36	113	7.8	

#186 35 Cl on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 62. ZC= 79.(Au)
NEUTRON NUMBERS: NP= 18. NT= 92. NC=110.

AP**1/3= 3.271 AT**1/3= 5.360
REDUCED MASS NUMBER= 28.52 AP+AT=AC=189.

INTERACTION RADIUS RINT=12.48 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 6.09 CT+CP= 9.49 C= 2.18

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.00 RC=RCP+RCT= 9.64

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 217.87 MeV K= .17124 n=2.590
VC(RINT)= 121.4 MeV

FISSION-TKE= 139. MeV
ASYMM. FISSION-TKE= 94. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 24.84 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.99 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -72.1
COMPOUND NUCLEUS: -32.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.24 fm V(RB)= 126.6 MeV
Q-VALUE= -66.6 MeV
L-CRITICAL= 100.

35 Cl on 154 Sm — 35 Cl on 154 Sm

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	35	29	0.23	1511	6.2	166.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	70	57	0.47	2138	8.8	117.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	105	86	0.70	2619	10.8	95.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	140	114	0.94	3025	12.5	83.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	158	128	1.06	3209	13.2	78.2	38	273	54	128.2	116.5	25.9	81	77	57	337	11.58	28.	3	12	1.6	5
5.0	175	143	1.17	3383	13.9	74.2	67	744	446	95.9	82.9	42.0	117	58	78	193	6.57	31.	4	15	1.8	6
5.5	193	157	1.29	3548	14.6	70.8	87	1128	766	78.5	66.5	50.8	146	46	92	149	5.07	34.	4	18	2.0	7
6.0	210	171	1.41	3706	15.3	67.8	103	1446	1033	66.8	56.0	56.6	172	38	102	126	4.28	37.	5	20	2.1	8
6.5	228	185	1.53	3858	15.9	65.1	116	1715	1259	58.4	48.6	60.8	195	33	110	111	3.77	40.	6	22	2.2	10
7.0	245	200	1.64	4004	16.5	62.7	129	1945	1185	51.9	43.0	64.0	217	28	116	100	3.41	43.	6	24	2.4	10
7.5	263	214	1.76	4146	17.1	60.6	140	2144	1106	46.8	38.6	66.6	238	25	121	92	3.14	46.	6	26	2.5	11
8.0	280	228	1.88	4282	17.6	58.7	151	2318	1036	42.6	35.1	68.7	258	22	126	86	2.92	49.	7	27	2.6	12
8.5	298	242	2.00	4414	18.2	56.9	160	2472	975	39.1	32.2	70.5	277	20	130	81	2.74	51.	7	29	2.7	13
9.0	315	257	2.11	4543	18.7	55.3	170	2608	921	36.1	29.7	71.9	297	18	134	76	2.59	54.	8	30	2.8	14
9.5	333	271	2.23	4668	19.2	53.8	178	2730	873	33.6	27.6	73.2	316	17	137	72	2.47	57.	8	32	2.9	15
10.0	350	285	2.35	4790	19.7	52.5	187	2840	829	31.4	25.8	74.3	335	15	140	69	2.36	59.	9	33	3.0	16
10.5	368	299	2.47	4909	20.2	51.2	194	2939	790	29.5	24.2	75.2	353	14	143	66	2.26	62.	9	34	3.1	17
11.0	385	314	2.58	5025	20.7	50.0	202	3029	754	27.8	22.8	76.1	372	13	146	64	2.17	64.	9	36	3.2	18
11.5	403	328	2.70	5139	21.2	48.9	210	3111	721	26.3	21.5	76.9	390	13	148	62	2.10	67.	10	37	3.3	18
12.0	420	342	2.82	5250	21.6	47.9	217	3187	691	24.9	20.4	77.5	408	12	151	60	2.03	70.	10	38	3.4	19
13.0	455	371	3.05	5466	22.5	46.0	230	3320	638	22.6	18.5	78.7	444	11	156	56	1.91	75.	11	41	3.6	21
14.0	490	399	3.29	5674	23.3	44.4	243	3434	592	20.7	16.9	79.7	480	10	160	53	1.81	80.	12	43	3.8	22
15.0	525	428	3.52	5874	24.2	42.9	255	3533	553	19.1	15.6	80.5	516	9	164	51	1.72	85.	12	45	3.9	23
16.0	560	456	3.76	6069	25.0	41.5	267	3619	518	17.7	14.4	81.2	552	8	168	48	1.65	90.	13	48	4.1	25
17.0	595	485	3.99	6257	25.7	40.3	278	3696	487	16.5	13.5	81.8	588	7	172	46	1.58	95.	14	50	4.2	26
18.0	630	513	4.23	6440	26.5	39.1	289	3763	460	15.4	12.6	82.3	623	7	176	45	1.52	100.	14	52	4.3	27
19.0	665	542	4.46	6618	27.2	38.1	299	3824	436	14.5	11.8	82.7	659	6	180	43	1.47	105.	15	54	4.5	28
20.0	700	570	4.70	6792	27.9	37.1	309	3878	414	13.7	11.2	83.2	694	6	184	42	1.42	109.	16	56	4.6	30
25.0	875	713	5.87	7604	31.2	33.2	355	4085	331	10.7	8.7	84.7	870	5	200	36	1.24	132.	19	67	5.2	35
30.0	1050	856	7.05	8341	34.2	30.3	395	4223	276	8.8	7.2	85.6	1046	4	216	33	1.11	154.	22	76	5.8	39
35.0	1225	998	8.22	9021	36.9	28.1	432	4321	237	7.4	6.1	86.3	1222	3	231	30	1.02	175.	25	85	6.3	
40.0	1400	1141	9.40	9656	39.4	26.2	466	4394	207	6.5	5.3	86.8	1397	3	245	28	0.94	195.	29	94	6.7	
45.0	1575	1283	10.57	10256	41.8	24.7	497	4451	184	5.7	4.6	87.2	1573	2	258	26	0.88	213.	32	103	7.2	
50.0	1750	1426	11.75	10825	44.1	23.5	527	4497	165	5.1	4.2	87.4	1748	2	271	25	0.83	230.	35	111	7.6	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#187 35 Cl on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 67. ZC= 84.(Po)
NEUTRON NUMBERS: NP= 18. NT= 98. NC=116.

AP**1/3= 3.271 AT**1/3= 5.485
REDUCED MASS NUMBER= 28.88 AP+AT=AC=200.

INTERACTION RADIUS RINT=12.62 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 6.25 CT+CP= 9.65 C̄= 2.20

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.15 RC=RCP+RCT= 9.80

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 231.21 MeV K= .16600 n=2.609
VC(RINT)= 129.8 MeV

FISSION-TKE= 151. MeV
ASYMM. FISSION-TKE= 98. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.908 MeV/fm**2 PROX-FACTOR= 25.13 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.90 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -63.7
COMPOUND NUCLEUS: -16.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.37 fm V(RB)= 135.3 MeV
Q-VALUE= -74.2 MeV
L-CRITICAL= 101.

35 Cl on 165 Ho — 35 Cl on 165 Ho

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	35	29	0.22	1511	6.3	179.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	70	58	0.44	2138	8.9	126.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	105	87	0.67	2619	10.9	103.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	140	116	0.89	3025	12.6	89.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	158	130	1.00	3209	13.4	84.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	175	144	1.11	3383	14.1	80.2	56	518	253	109.8	97.7	35.1	107	68	72	252	8.07	30.	3	1.7	6
5.5	193	159	1.22	3548	14.8	76.5	80	932	599	87.6	75.8	46.2	139	53	88	179	5.71	32.	4	1.8	7
6.0	210	173	1.33	3706	15.5	73.2	98	1276	887	73.8	62.9	53.1	166	44	100	146	4.66	35.	5	2.0	8
6.5	228	188	1.45	3858	16.1	70.3	113	1567	1131	63.9	54.1	58.0	191	37	108	127	4.04	38.	5	2.1	9
7.0	245	202	1.56	4004	16.7	67.8	126	1815	1159	56.6	47.6	61.7	213	32	115	113	3.61	41.	6	2.3	10
7.5	263	217	1.67	4146	17.3	65.5	138	2030	1082	50.8	42.5	64.6	235	28	121	103	3.29	43.	6	2.4	11
8.0	280	231	1.78	4282	17.9	63.4	149	2218	1014	46.1	38.5	67.0	255	25	126	96	3.05	46.	7	2.5	12
8.5	298	245	1.89	4414	18.4	61.5	159	2384	955	42.2	35.2	68.9	275	22	130	90	2.85	49.	7	2.6	13
9.0	315	260	2.00	4543	18.9	59.8	169	2531	902	38.9	32.4	70.5	295	20	134	84	2.69	51.	8	2.7	14
9.5	333	274	2.11	4668	19.5	58.2	178	2663	854	36.2	30.1	71.9	314	18	137	80	2.55	54.	8	2.8	14
10.0	350	289	2.22	4790	20.0	56.7	187	2781	811	33.8	28.0	73.1	333	17	140	76	2.43	57.	8	2.9	15
10.5	368	303	2.34	4909	20.5	55.3	195	2888	773	31.7	26.3	74.2	352	16	143	73	2.33	59.	9	3.0	16
11.0	385	318	2.45	5025	20.9	54.1	203	2985	738	29.8	24.7	75.1	370	15	146	70	2.24	62.	9	3.1	17
11.5	403	332	2.56	5139	21.4	52.9	211	3074	705	28.2	23.3	75.9	389	14	149	68	2.16	64.	10	3.2	18
12.0	420	347	2.67	5250	21.9	51.8	218	3156	676	26.7	22.1	76.7	407	13	151	65	2.08	66.	10	3.3	19
13.0	455	375	2.89	5466	22.8	49.7	232	3299	624	24.2	20.0	77.9	443	12	156	61	1.96	72.	11	3.5	20
14.0	490	404	3.11	5674	23.6	47.9	246	3423	579	22.1	18.3	79.0	480	10	160	58	1.85	76.	11	3.6	22
15.0	525	433	3.34	5874	24.5	46.3	258	3529	541	20.3	16.8	79.8	516	9	164	55	1.76	81.	12	3.8	23
16.0	560	462	3.56	6069	25.3	44.8	270	3623	507	18.8	15.6	80.6	551	9	168	53	1.68	86.	13	3.9	24
17.0	595	491	3.78	6257	26.0	43.5	282	3705	477	17.6	14.5	81.2	587	8	172	51	1.61	91.	14	4.1	26
18.0	630	520	4.00	6440	26.8	42.3	293	3778	451	16.4	13.6	81.8	623	7	176	49	1.55	95.	14	4.2	27
19.0	665	549	4.23	6618	27.5	41.1	303	3843	427	15.4	12.8	82.3	658	7	179	47	1.50	100.	15	4.4	28
20.0	700	578	4.45	6792	28.2	40.1	314	3902	405	14.6	12.0	82.7	694	6	183	46	1.45	104.	16	4.5	30
25.0	875	722	5.56	7604	31.6	35.9	361	4125	324	11.4	9.4	84.3	870	5	199	40	1.26	126.	19	5.4	35
30.0	1050	866	6.67	8341	34.6	32.7	402	4274	270	9.3	7.7	85.3	1046	4	213	36	1.13	147.	22	75	5.6	40
35.0	1225	1011	7.79	9021	37.4	30.3	440	4380	231	7.9	6.5	86.1	1222	3	227	32	1.03	167.	25	84	6.1	
40.0	1400	1155	8.90	9656	39.9	28.4	475	4459	202	6.8	5.6	86.6	1397	3	240	30	0.96	186.	28	93	6.6	
45.0	1575	1299	10.01	10256	42.4	26.7	507	4521	180	6.0	5.0	87.0	1572	3	253	28	0.90	204.	32	101	7.0	
50.0	1750	1444	11.12	10825	44.7	25.4	538	4570	162	5.4	4.5	87.3	1748	2	265	27	0.85	220.	35	110	7.4	

#188 35 Cl on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 73. ZC= 90.(Th)
NEUTRON NUMBERS: NP= 18. NT=108. NC=126.

AP**1/3= 3.271 AT**1/3= 5.657
REDUCED MASS NUMBER= 29.33 AP+AT=AC=216.

INTERACTION RADIUS RINT=12.81 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 6.47 CT+CP= 9.87 C̄= 2.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.35 RC=RCP+RCT=10.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 246.26 MeV K= .15859 n=2.631
VC(RINT)= 139.4 MeV

FISSION-TKE= 167. MeV
ASYMM. FISSION-TKE= 102. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.905 MeV/fm**2 PROX-FACTOR= 25.33 MeV
L-RLD= 71 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.80 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -46.0
COMPOUND NUCLEUS: 8.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.54 fm V(RB)= 145.2 MeV
Q-VALUE= -81.5 MeV
L-CRITICAL= 101.

35 Cl on 181 Ta — 35 Cl on 181 Ta

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	35	29	0.21	1511	6.4	195.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	70	59	0.42	2138	9.1	138.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	105	88	0.63	2619	11.1	112.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	140	117	0.84	3025	12.8	97.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	158	132	0.95	3209	13.6	92.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	175	147	1.05	3383	14.3	87.4	40	262	39	130.3	120.8	24.8	97	78	65	392	11.76	28.	3	1.6	5
5.5	193	161	1.16	3548	15.0	83.3	71	715	416	99.3	88.2	40.3	132	61	84	226	6.72	30.	4	1.7	6
6.0	210	176	1.26	3706	15.7	79.8	92	1090	730	82.1	71.6	48.9	161	49	97	175	5.19	33.	5	1.9	8
6.5	228	191	1.37	3858	16.4	76.6	108	1407	995	70.5	60.8	54.7	186	41	107	148	4.39	35.	5	2.1	9
7.0	245	205	1.47	4004	17.0	73.9	123	1677	1136	62.0	53.1	59.0	210	35	114	130	3.87	38.	6	2.2	10
7.5	263	220	1.58	4146	17.6	71.4	136	1912	1060	55.4	47.2	62.3	232	31	120	118	3.50	40.	6	2.4	11
8.0	280	235	1.68	4282	18.1	69.1	148	2116	994	50.1	42.6	65.0	253	27	125	108	3.22	43.	7	2.6	12
8.5	298	249	1.79	4414	18.7	67.0	159	2297	936	45.7	38.8	67.1	273	24	130	101	2.99	45.	7	2.7	13
9.0	315	264	1.89	4543	19.2	65.1	169	2457	884	42.1	35.6	68.9	293	22	133	95	2.81	48.	8	2.9	14
9.5	333	279	2.00	4668	19.8	63.4	179	2601	837	39.0	33.0	70.5	312	20	137	90	2.66	50.	8	3.0	15
10.0	350	293	2.10	4790	20.3	61.8	188	2730	795	36.4	30.7	71.8	331	19	140	85	2.53	52.	8	3.2	16
10.5	368	308	2.21	4909	20.8	60.3	197	2846	757	34.1	28.7	73.0	350	17	143	82	2.42	55.	9	3.3	16
11.0	385	323	2.32	5025	21.3	58.9	205	2952	723	32.0	27.0	74.0	369	16	146	78	2.32	57.	9	3.4	17
11.5	403	337	2.42	5139	21.8	57.6	213	3049	691	30.2	25.5	74.9	388	15	148	75	2.23	60.	10	3.6	18
12.0	420	352	2.53	5250	22.2	56.4	221	3137	663	28.6	24.1	75.7	406	14	151	73	2.15	62.	10	3.7	19
13.0	455	381	2.74	5466	23.1	54.2	236	3294	612	25.9	21.8	77.1	443	12	155	68	2.02	67.	11	3.9	20
14.0	490	411	2.95	5674	24.0	52.2	250	3428	568	23.6	19.9	78.2	479	11	159	64	1.90	71.	11	4.2	22
15.0	525	440	3.16	5874	24.8	50.5	263	3545	530	21.7	18.3	79.1	515	10	163	61	1.81	76.	12	4.4	24
16.0	560	469	3.37	6069	25.7	48.9	275	3646	497	20.1	16.9	79.9	551	9	167	58	1.73	80.	13	4.6	25
17.0	595	499	3.58	6257	26.4	47.4	287	3736	468	18.7	15.7	80.6	586	9	171	56	1.65	85.	13	4.8	26
18.0	630	528	3.79	6440	27.2	46.1	299	3816	442	17.5	14.7	81.2	622	8	174	54	1.59	89.	14	5.0	28
19.0	665	557	4.00	6618	28.0	44.8	310	3887	418	16.5	13.8	81.8	658	7	177	52	1.53	93.	15	5.2	29
20.0	700	587	4.21	6792	28.7	43.7	321	3951	397	15.5	13.0	82.2	693	7	180	50	1.48	98.	15	5.4	30
25.0	875	733	5.26	7604	32.1	39.1	370	4194	318	12.1	10.1	84.0	870	5	195	43	1.29	118.	19	6.4	36
30.0	1050	880	6.31	8341	35.1	35.7	413	4356	265	9.9	8.3	85.1	1046	4	209	39	1.15	138.	22	74	5.4	41
35.0	1225	1027	7.37	9021	38.0	33.0	452	4471	227	8.4	7.0	85.8	1221	4	222	36	1.05	156.	25	82	5.9	
40.0	1400	1173	8.42	9656	40.6	30.9	488	4558	198	7.3	6.1	86.4	1397	3	234	33	0.98	174.	28	91	6.4	
45.0	1575	1320	9.47	10256	43.0	29.1	521	4625	176	6.4	5.4	86.8	1572	3	245	31	0.91	191.	31	99	6.8	
50.0	1750	1466	10.52	10825	45.4	27.6	553	4678	159	5.7	4.8	87.1	1748	2	256	29	0.86	207.	34	108	7.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#189 35 Cl on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 79. ZC= 96.(Cm)
NEUTRON NUMBERS: NP= 18. NT=118. NC=136.

AP**1/3= 3.271 AT**1/3= 5.819
REDUCED MASS NUMBER= 29.72 AP+AT=AC=232.

INTERACTION RADIUS RINT=12.98 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 6.68 CT+CP=10.08 C= 2.25

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.55 RC=RCP+RCT=10.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 260.93 MeV K= .15141 n=2.652
VC(RINT)= 148.8 MeV

FISSION-TKE= 183. MeV
ASYMM. FISSION-TKE= 107. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 25.51 MeV
L-RLD= 65 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.71 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -28.6
COMPOUND NUCLEUS: 46.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.70 fm V(RB)= 155.0 MeV
Q-VALUE= -102.2 MeV
L-CRITICAL= 101.

35 Cl on 197 Au — 35 Cl on 197 Au

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	35	30	0.20	1511	6.5	211.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	70	59	0.40	2138	9.2	149.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	105	89	0.60	2619	11.3	122.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	140	119	0.80	3025	13.0	105.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	158	134	0.90	3209	13.8	99.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	175	149	1.00	3383	14.5	94.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	193	163	1.10	3548	15.2	90.2	59	485	223	113.7	103.7	33.2	123	69	79	301	8.40	28.	4	15	1.5	6
6.0	210	178	1.20	3706	15.9	86.3	84	892	562	91.7	81.5	44.2	155	55	94	212	5.91	31.	4	18	1.6	7
6.5	228	193	1.30	3858	16.6	82.9	103	1235	850	77.7	68.2	51.1	182	46	105	173	4.81	33.	5	20	1.8	8
7.0	245	208	1.40	4004	17.2	79.9	119	1529	1096	67.8	59.0	56.1	206	39	113	150	4.16	36.	6	22	1.9	9
7.5	263	223	1.50	4146	17.8	77.2	133	1782	1033	60.2	52.2	59.9	229	34	120	134	3.72	38.	6	24	2.0	10
8.0	280	238	1.60	4282	18.4	74.8	146	2004	968	54.3	46.8	62.9	250	30	125	122	3.40	40.	7	25	2.2	11
8.5	298	253	1.70	4414	19.0	72.5	158	2200	911	49.4	42.5	65.3	271	27	129	113	3.14	43.	7	27	2.3	12
9.0	315	267	1.80	4543	19.5	70.5	169	2373	860	45.4	39.0	67.3	291	24	133	106	2.94	45.	8	28	2.4	13
9.5	333	282	1.90	4668	20.0	68.6	179	2529	815	42.0	36.0	69.0	311	22	137	100	2.77	47.	8	30	2.5	14
10.0	350	297	2.00	4790	20.6	66.9	188	2668	774	39.1	33.5	70.5	330	20	140	95	2.63	49.	8	31	2.6	15
10.5	368	312	2.10	4909	21.1	65.3	198	2795	737	36.5	31.3	71.7	349	19	143	90	2.51	52.	9	32	2.7	16
11.0	385	327	2.20	5025	21.6	63.8	206	2910	704	34.3	29.3	72.8	368	17	146	86	2.40	54.	9	34	2.8	17
11.5	403	342	2.30	5139	22.0	62.4	215	3014	673	32.4	27.6	73.8	386	16	148	83	2.30	56.	9	35	2.9	18
12.0	420	357	2.40	5250	22.5	61.0	223	3110	645	30.6	26.1	74.7	405	15	151	80	2.22	58.	10	36	3.0	19
13.0	455	386	2.60	5466	23.4	58.7	238	3280	596	27.6	23.6	76.2	442	13	155	75	2.08	62.	11	38	3.1	21
14.0	490	416	2.80	5674	24.3	56.5	253	3425	553	25.2	21.5	77.4	478	12	159	71	1.96	67.	11	41	3.3	22
15.0	525	446	3.00	5874	25.2	54.6	267	3551	516	23.1	19.7	78.4	514	11	163	67	1.86	71.	12	43	3.4	24
16.0	560	476	3.20	6069	26.0	52.9	280	3661	484	21.4	18.2	79.3	550	10	166	64	1.77	75.	13	45	3.6	25
17.0	595	505	3.40	6257	26.8	51.3	292	3759	455	19.9	16.9	80.0	586	9	170	61	1.70	79.	13	47	3.7	27
18.0	630	535	3.60	6440	27.6	49.8	304	3845	430	18.6	15.8	80.7	622	8	173	59	1.63	84.	14	49	3.9	28
19.0	665	565	3.80	6618	28.3	48.5	316	3922	407	17.5	14.9	81.3	657	8	176	57	1.57	87.	15	51	4.0	30
20.0	700	594	4.00	6792	29.1	47.3	327	3991	387	16.5	14.0	81.8	693	7	179	55	1.52	91.	15	53	4.1	31
25.0	875	743	4.99	7604	32.5	42.3	377	4255	309	12.8	10.9	83.6	869	6	193	47	1.31	111.	18	63	4.7	37
30.0	1050	892	5.99	8341	35.6	38.6	422	4430	258	10.5	8.9	84.8	1046	4	206	42	1.17	129.	22	72	5.2	43
35.0	1225	1040	6.99	9021	38.5	35.7	462	4555	221	8.8	7.5	85.6	1221	4	218	39	1.07	146.	25	81	5.7	
40.0	1400	1189	7.99	9656	41.1	33.4	499	4649	193	7.7	6.5	86.2	1397	3	229	36	0.99	164.	28	89	6.1	
45.0	1575	1337	8.99	10256	43.6	31.5	534	4722	172	6.8	5.7	86.6	1572	3	239	33	0.93	180.	31	98	6.5	
50.0	1750	1486	9.99	10825	46.0	29.9	566	4780	154	6.0	5.1	87.0	1748	2	250	32	0.88	196.	34	106	6.9	

#190 35 Cl on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 82. ZC= 99.(Es)
NEUTRON NUMBERS: NP= 18. NT=126. NC=144.

AP**1/3= 3.271 AT**1/3= 5.925
REDUCED MASS NUMBER= 29.96 AP+AT=AC=243.

INTERACTION RADIUS RINT=13.10 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 6.82 CT+CP=10.21 C= 2.27

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.66 RC=RCP+RCT=10.31

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 267.55 MeV K= .14712 n=2.661
VC(RINT)= 153.1 MeV

FISSION-TKE= 190. MeV
ASYMM. FISSION-TKE= 108. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 25.47 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -19.5
COMPOUND NUCLEUS: 65.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.81 fm V(RB)= 159.3 MeV
Q-VALUE= -111.9 MeV
L-CRITICAL= 102.

35 Cl on 208 Pb — 35 Cl on 208 Pb

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	35	30	0.20	1511	6.6	219.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	70	60	0.39	2138	9.3	155.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	105	90	0.59	2619	11.3	126.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	140	120	0.78	3025	13.1	109.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	158	135	0.88	3209	13.9	103.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	175	150	0.98	3383	14.7	98.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	193	165	1.08	3548	15.4	93.6	53	391	145	120.8	111.8	29.6	121	72	77	351	9.55	27.	4	15	1.3	5
6.0	210	180	1.17	3706	16.1	89.6	81	814	498	96.0	86.3	42.0	153	57	93	233	6.30	29.	4	17	1.5	6
6.5	228	195	1.27	3858	16.7	86.1	101	1170	796	80.9	71.7	49.5	180	47	104	186	5.03	32.	5	20	1.7	8
7.0	245	210	1.37	4004	17.3	83.0	118	1475	1052	70.3	61.8	54.8	205	40	112	160	4.31	34.	6	21	1.8	9
7.5	263	225	1.47	4146	17.9	80.1	133	1739	1025	62.3	54.5	58.8	228	35	119	142	3.84	36.	6	23	1.9	10
8.0	280	240	1.57	4282	18.5	77.6	146	1969	961	56.1	48.8	62.0	249	31	124	129	3.49	38.	7	25	2.1	11
8.5	298	255	1.66	4414	19.1	75.3	158	2172	905	51.0	44.3	64.5	270	27	129	119	3.22	41.	7	26	2.2	12
9.0	315	270	1.76	4543	19.7	73.2	169	2353	854	46.8	40.5	66.6	291	24	133	111	3.00	43.	7	28	2.3	13
9.5	333	285	1.86	4668	20.2	71.2	180	2514	809	43.2	37.4	68.4	310	22	136	105	2.83	45.	8	29	2.4	14
10.0	350	300	1.96	4790	20.7	69.4	190	2659	769	40.2	34.7	69.9	330	20	140	99	2.68	47.	8	31	2.5	16
10.5	368	315	2.06	4909	21.2	67.7	199	2791	732	37.6	32.4	71.2	349	19	142	95	2.55	49.	9	32	2.6	17
11.0	385	330	2.15	5025	21.7	66.2	208	2910	699	35.3	30.4	72.4	368	17	145	90	2.44	51.	9	33	2.7	18
11.5	403	345	2.25	5139	22.2	64.7	217	3019	668	33.2	28.6	73.4	386	16	148	87	2.34	53.	9	34	2.8	19
12.0	420	360	2.35	5250	22.7	63.4	225	3118	641	31.4	27.0	74.3	405	15	150	84	2.26	56.	10	36	2.9	19
13.0	455	389	2.54	5466	23.6	60.9	241	3295	591	28.4	24.4	75.8	442	13	154	78	2.11	60.	10	38	3.0	21
14.0	490	419	2.74	5674	24.5	58.7	256	3446	549	25.8	22.2	77.1	478	12	158	74	1.99	64.	11	40	3.2	23
15.0	525	449	2.94	5874	25.4	56.7	270	3577	512	23.7	20.4	78.1	514	11	162	70	1.88	68.	12	42	3.3	24
16.0	560	479	3.13	6069	26.2	54.9	283	3691	480	21.9	18.8	79.0	550	10	165	67	1.79	72.	13	45	3.5	26
17.0	595	509	3.33	6257	27.0	53.2	296	3792	452	20.4	17.5	79.8	586	9	168	64	1.72	76.	13	47	3.6	28
18.0	630	539	3.52	6440	27.8	51.7	308	3882	427	19.1	16.4	80.5	621	9	172	61	1.65	80.	14	49	3.8	29
19.0	665	569	3.72	6618	28.6	50.4	320	3962	404	17.9	15.3	81.1	657	8	175	59	1.59	84.	15	51	3.9	31
20.0	700	599	3.91	6792	29.3	49.1	331	4034	384	16.9	14.5	81.6	693	7	177	57	1.53	87.	15	53	4.0	32
25.0	875	749	4.89	7604	32.8	43.9	383	4308	307	13.1	11.2	83.5	869	6	191	49	1.33	106.	18	62	4.6	39
30.0	1050	899	5.87	8341	35.9	40.1	428	4490	256	10.7	9.2	84.7	1046	4	203	44	1.19	124.	22	71	5.1	44
35.0	1225	1049	6.85	9021	38.8	37.1	469	4620	219	9.0	7.7	85.5	1221	4	214	40	1.08	140.	25	80	5.6	
40.0	1400	1198	7.83	9656	41.4	34.7	507	4717	192	7.8	6.7	86.1	1397	3	225	37	1.00	157.	28	88	6.0	
45.0	1575	1348	8.81	10256	44.0	32.7	542	4793	170	6.9	5.9	86.5	1572	3	235	35	0.94	172.	31	96	6.4	
50.0	1750	1498	9.79	10825	46.3	31.0	575	4853	153	6.2	5.3	86.9	1747	3	244	33	0.88	187.	34	104	6.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fs	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#191 35 Cl on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 83. ZC=100.(Fm)
NEUTRON NUMBERS: NP= 18. NT=126. NC=144.

AP**1/3= 3.271 AT**1/3= 5.934
REDUCED MASS NUMBER= 29.98 AP+AT=AC=244.

INTERACTION RADIUS RINT=13.11 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 6.83 CT+CP=10.23 C= 2.27

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.68 RC=RCP+RCT=10.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 270.25 MeV K= .14645 n=2.665
VC(RINT)= 154.8 MeV

FISSION-TKE= 194. MeV
ASYMM. FISSION-TKE= 109. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 25.57 MeV
L-RLD= 59 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.65 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: -16.5
COMPOUND NUCLEUS: 69.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.81 fm V(RB)= 161.2 MeV
Q-VALUE= -112.9 MeV
L-CRITICAL= 101.

35 Cl on 209 Bi

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	30	0.19	1511	6.6	222.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	70	60	0.39	2138	9.3	157.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	105	90	0.58	2619	11.4	128.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	140	120	0.77	3025	13.1	111.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	158	135	0.87	3209	13.9	104.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	175	150	0.97	3383	14.7	99.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	193	165	1.07	3548	15.4	94.7	49	336	99	125.0	116.4	27.5	118	74	75	383	10.33	27.	4 15	1.3	5
6.0	210	180	1.16	3706	16.1	90.7	78	765	456	98.4	88.8	40.8	151	59	92	243	6.51	29.	4 17	1.5	6
6.5	228	195	1.26	3858	16.7	87.1	99	1126	758	82.7	73.4	48.7	179	49	104	192	5.14	32.	5 19	1.6	7
7.0	245	210	1.36	4004	17.3	84.0	116	1435	1017	71.7	63.1	54.2	204	41	112	164	4.38	34.	6 21	1.8	9
7.5	263	225	1.45	4146	18.0	81.1	131	1702	1015	63.5	55.5	58.3	227	36	119	145	3.88	36.	6 23	1.9	10
8.0	280	240	1.55	4282	18.5	78.6	145	1935	951	57.0	49.7	61.5	249	31	125	132	3.52	38.	7 25	2.0	11
8.5	298	255	1.65	4414	19.1	76.2	157	2141	895	51.8	45.0	64.1	270	28	129	122	3.25	41.	7 26	2.2	12
9.0	315	270	1.74	4543	19.7	74.1	168	2323	846	47.5	41.2	66.2	290	25	133	113	3.03	43.	7 28	2.3	13
9.5	333	285	1.84	4668	20.2	72.1	179	2487	801	43.9	38.0	68.0	310	23	137	107	2.85	45.	8 29	2.4	14
10.0	350	300	1.94	4790	20.7	70.3	189	2634	761	40.8	35.3	69.6	329	21	140	101	2.70	47.	8 30	2.5	15
10.5	368	315	2.03	4909	21.2	68.6	198	2767	725	38.1	32.9	70.9	348	19	143	96	2.57	49.	9 32	2.6	16
11.0	385	330	2.13	5025	21.7	67.0	207	2887	692	35.8	30.9	72.1	367	18	146	92	2.45	51.	9 33	2.7	17
11.5	403	345	2.23	5139	22.2	65.5	216	2998	662	33.7	29.1	73.1	386	17	148	88	2.36	53.	9 34	2.8	18
12.0	420	360	2.32	5250	22.7	64.1	225	3099	634	31.9	27.4	74.1	404	16	151	85	2.27	56.	10 36	2.8	19
13.0	455	390	2.52	5466	23.6	61.6	240	3277	585	28.7	24.7	75.6	441	14	155	79	2.12	60.	10 38	3.0	21
14.0	490	420	2.71	5674	24.5	59.4	255	3430	543	26.2	22.5	76.9	478	12	159	75	1.99	64.	11 40	3.2	22
15.0	525	450	2.90	5874	25.4	57.4	269	3562	507	24.0	20.7	78.0	514	11	162	71	1.89	68.	12 42	3.3	24
16.0	560	480	3.10	6069	26.2	55.5	283	3678	475	22.2	19.1	78.9	550	10	166	67	1.80	72.	13 45	3.5	26
17.0	595	510	3.29	6257	27.0	53.9	296	3780	447	20.7	17.7	79.7	586	9	169	65	1.72	76.	13 47	3.6	27
18.0	630	540	3.49	6440	27.8	52.4	308	3871	423	19.3	16.6	80.3	621	9	172	62	1.65	80.	14 49	3.7	29
19.0	665	570	3.68	6618	28.6	51.0	320	3952	400	18.1	15.6	80.9	657	8	175	60	1.59	84.	15 51	3.9	30
20.0	700	600	3.87	6792	29.3	49.7	331	4025	380	17.1	14.6	81.5	692	8	178	58	1.54	87.	15 53	4.0	32
25.0	875	749	4.84	7604	32.8	44.4	383	4303	304	13.2	11.4	83.4	869	6	192	50	1.33	106.	18 62	4.6	38
30.0	1050	899	5.81	8341	35.9	40.6	428	4487	253	10.8	9.3	84.6	1045	5	204	45	1.19	123.	22 71	5.1	44
35.0	1225	1049	6.78	9021	38.8	37.6	469	4619	217	9.1	7.8	85.4	1221	4	215	41	1.09	140.	25 80	5.5	
40.0	1400	1199	7.75	9656	41.5	35.1	507	4717	190	7.9	6.8	86.0	1397	3	225	38	1.00	156.	28 88	6.0	
45.0	1575	1349	8.71	10256	44.0	33.1	542	4794	169	7.0	6.0	86.5	1572	3	235	35	0.94	172.	31 96	6.4	
50.0	1750	1499	9.68	10825	46.4	31.4	575	4855	152	6.3	5.4	86.9	1747	3	245	33	0.89	187.	34 104	6.7	

#192 35 Cl on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 17. ZT= 92. ZC=109.( )
NEUTRON NUMBERS: NP= 18. NT=146. NC=164.

AP**1/3= 3.271 AT**1/3= 6.197
REDUCED MASS NUMBER= 30.51 AP+AT=AC=273.

INTERACTION RADIUS RINT=13.39 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.40 CT= 7.16 CT+CP=10.56 C= 2.31

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.67 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.65 RCT= 6.98 RC=RCP+RCT=10.62

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 290.33 MeV K= .13549 n=2.693
VC(RINT)= 168.0 MeV

FISSION-TKE= 218. MeV
ASYMM. FISSION-TKE= 115. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.883 MeV/fm**2 PROX-FACTOR= 25.58 MeV
L-RLD= 41 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.54 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -26.6 TARGET: 47.2
COMPOUND NUCLEUS: 136.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.08 fm V(RB)= 174.5 MeV
Q-VALUE= -116.0 MeV
L-CRITICAL= 100.

35 Cl on 238 U

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	35	31	0.18	1511	6.7	246.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	70	61	0.36	2138	9.4	174.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	105	92	0.54	2619	11.6	142.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	140	122	0.73	3025	13.3	123.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	158	137	0.82	3209	14.2	116.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	175	153	0.91	3383	14.9	110.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	193	168	1.00	3548	15.7	105.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	210	183	1.09	3706	16.3	100.5	62	473	213	116.3	108.3	31.8	142	68	87	350	8.66	26.	4 16	1.4	7
6.5	228	198	1.18	3858	17.0	96.6	89	876	549	94.8	86.3	42.6	172	55	101	247	6.09	28.	5 18	1.6	8
7.0	245	214	1.27	4004	17.7	93.1	109	1220	837	81.0	72.9	49.5	199	46	111	201	4.96	30.	5 20	1.7	10
7.5	263	229	1.36	4146	18.3	89.9	126	1517	967	71.0	63.5	54.5	223	40	118	174	4.29	32.	6 22	1.8	11
8.0	280	244	1.45	4282	18.9	87.1	141	1777	906	63.4	56.4	58.3	245	35	124	156	3.84	34.	6 24	1.9	12
8.5	298	259	1.54	4414	19.5	84.5	154	2006	853	57.3	50.8	61.3	267	31	129	142	3.50	36.	7 25	2.0	14
9.0	315	275	1.63	4543	20.0	82.1	167	2209	805	52.4	46.3	63.8	288	27	133	132	3.24	38.	7 27	2.2	15
9.5	333	290	1.73	4668	20.6	79.9	178	2391	763	48.2	42.5	65.9	308	25	137	123	3.03	40.	8 29	2.3	16
10.0	350	305	1.82	4790	21.1	77.9	189	2555	725	44.7	39.4	67.6	327	23	140	116	2.86	42.	8 29	2.4	17
10.5	368	320	1.91	4909	21.6	76.0	200	2703	690	41.7	36.7	69.2	347	21	143	110	2.71	44.	9 31	2.4	18
11.0	385	336	2.00	5025	22.1	74.3	209	2837	659	39.1	34.3	70.5	366	19	146	105	2.58	46.	9 32	2.5	19
11.5	403	351	2.09	5139	22.6	72.6	219	2960	630	36.7	32.2	71.6	385	18	148	101	2.47	48.	9 33	2.6	20
12.0	420	366	2.18	5250	23.1	71.1	228	3072	604	34.7	30.4	72.7	403	17	150	97	2.38	50.	10 34	2.7	21
13.0	455	397	2.36	5466	24.1	68.3	245	3271	557	31.2	27.3	74.4	440	15	155	90	2.21	53.	10 37	2.9	23
14.0	490	427	2.54	5674	25.0	65.8	260	3441	518	28.4	24.8	75.8	477	13	158	84	2.08	57.	11 39	3.0	25
15.0	525	458	2.72	5874	25.8	63.6	275	3589	483	26.0	22.8	77.0	513	12	162	80	1.97	61.	12 41	3.2	27
16.0	560	488	2.91	6069	26.7	61.6	289	3718	453	24.0	21.0	78.0	549	11	165	76	1.87	64.	12 43	3.3	28
17.0	595	519	3.09	6257	27.5	59.7	303	3832	426	22.3	19.5	78.8	585	10	168	73	1.79	68.	13 45	3.4	30
18.0	630	549	3.27	6440	28.3	58.0	316	3933	402	20.8	18.2	79.6	621	9	171	70	1.71	72.	14 47	3.6	31
19.0	665	580	3.45	6618	29.1	56.5	328	4023	381	19.5	17.1	80.2	656	9	174	67	1.65	75.	14 49	3.7	33
20.0	700	610	3.63	6792	29.8	55.1	340	4104	362	18.4	16.1	80.8	692	8	176	65	1.59	78.	15 51	3.8	35
25.0	875	763	4.54	7604	33.4	49.3	394	4413	290	14.2	12.4	82.9	869	6	188	56	1.37	95.	18 60	4.4	42
30.0	1050	915	5.45	8341	36.6	45.0	442	4619	241	11.6	10.1	84.2	1045	5	199	50	1.22	111.	21 69	4.8	48
35.0	1225	1068	6.36	9021	39.5	41.6	485	4765	207	9.8	8.6	85.1	1221	4	209	45	1.11	126.	24 78	5.3	
40.0	1400	1221	7.27	9656	42.2	38.9	525	4875	181	8.5	7.4	85.8	1397	3	218	42	1.03	141.	27 86	5.7	
45.0	1575	1373	8.17	10256	44.8	36.7	562	4960	161	7.5	6.5	86.3	1572	3	227	39	0.96	154.	30 94	6.1	
50.0	1750	1526	9.08	10825	47.2	34.8	596	5029	145	6.7	5.8	86.7	1747	3	236	37	0.91	168.	33 101	6.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	ans	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 35 Cl

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#193 40 Ar on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 6. ZC= 24.(Cr)
NEUTRON NUMBERS: NP= 22. NT= 6. NC= 28.

AP**1/3= 3.420 AT**1/3= 2.289 ELSCAT <17 deg
REDUCED MASS NUMBER= 9.23 AP+AT=AC= 52.

INTERACTION RADIUS RINT= 9.30 fm R0= 1.63 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 2.12 CT+CP= 5.71 C= 1.33

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.77 RCT= 2.51 RC=RCP+RCT= 6.29

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 34.38 MeV K= .08861 n=2.553
VC(RINT)= 16.7 MeV

FISSION-TKE= 39. MeV
ASYMM. FISSION-TKE= 29. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 15.79 MeV
L-RLD= 52 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 20.89 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: 0.0
COMPOUND NUCLEUS: -57.8

FUSION RELATED PARAMETERS:
R-BARRIER= 8.46 fm V(RB)= 17.0 MeV
Q-VALUE= 23.2 MeV
L-CRITICAL= 32.

40 Ar on 12 C

40 Ar on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	9	0.55	1727	2.0	17.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	80	18	1.11	2443	2.9	12.0	8	325	182	111.6	17.4	34.2	41	39	0	39	9.66	59.	0	2.5	2
3.0	120	28	1.66	2993	3.5	9.8	20	1186	872	51.2	11.1	64.4	104	16	0	16	3.86	87.	0	2.8	3
4.0	160	37	2.21	3457	4.0	8.5	28	1598	1216	34.0	7.7	73.0	150	10	143	11	2.84	116.	4	3.0	3
4.5	180	42	2.49	3667	4.3	8.0	31	1733	1331	29.2	6.6	75.4	172	8	160	10	2.57	128.	5	3.2	4
5.0	200	46	2.77	3866	4.5	7.6	34	1840	1423	25.5	5.8	77.2	193	7	176	10	2.36	142.	6	3.3	4
5.5	220	51	3.04	4055	4.7	7.3	36	1927	1498	22.7	5.2	78.6	214	6	191	9	2.19	156.	6	3.4	4
6.0	240	55	3.32	4236	4.9	6.9	38	1999	1397	20.5	4.7	79.8	235	5	207	8	2.06	170.	7	3.5	4
6.5	260	60	3.59	4409	5.1	6.7	41	2060	1290	18.6	4.3	80.7	255	5	221	8	1.94	185.	7	3.6	4
7.0	280	65	3.87	4576	5.3	6.4	43	2112	1198	17.1	3.9	81.5	276	4	236	7	1.85	199.	8	3.7	4
7.5	300	69	4.15	4738	5.5	6.2	45	2157	1118	15.8	3.6	82.1	296	4	251	7	1.76	208.	8	3.8	5
8.0	320	74	4.42	4894	5.7	6.0	47	2195	1048	14.7	3.4	82.7	316	4	265	7	1.69	222.	9	3.9	5
8.5	340	78	4.70	5045	5.9	5.8	49	2230	986	13.7	3.1	83.2	337	3	279	7	1.63	236.	9	4.0	5
9.0	360	83	4.98	5192	6.1	5.7	50	2260	931	12.8	3.0	83.6	357	3	293	6	1.57	250.	10	4.0	5
9.5	380	88	5.25	5335	6.2	5.5	52	2287	882	12.1	2.8	84.0	377	3	307	6	1.52	258.	10	4.1	6
10.0	400	92	5.53	5474	6.4	5.4	54	2311	838	11.4	2.6	84.3	397	3	321	6	1.47	272.	11	4.2	6
10.5	420	97	5.81	5610	6.5	5.2	55	2333	798	10.8	2.5	84.6	417	3	335	6	1.43	286.	12	4.3	6
11.0	440	102	6.08	5743	6.7	5.1	57	2353	762	10.3	2.4	84.9	437	3	349	6	1.39	299.	12	4.4	6
11.5	460	106	6.36	5873	6.8	5.0	58	2371	729	9.8	2.3	85.1	458	2	363	5	1.35	313.	13	4.4	6
12.0	480	111	6.64	6000	7.0	4.9	60	2387	698	9.4	2.2	85.3	478	2	377	5	1.32	326.	13	4.5	6
13.0	520	120	7.19	6247	7.3	4.7	63	2416	645	8.6	2.0	85.7	518	2	404	5	1.26	346.	14	4.7	7
14.0	560	129	7.74	6484	7.6	4.5	66	2441	599	7.9	1.8	86.0	558	2	431	5	1.21	373.	15	4.8	7
15.0	600	138	8.30	6714	7.8	4.4	68	2462	559	7.4	1.7	86.3	598	2	458	5	1.16	399.	16	5.0	7
16.0	640	148	8.85	6936	8.1	4.3	71	2481	524	6.9	1.6	86.6	638	2	485	5	1.12	416.	17	5.1	8
17.0	680	157	9.40	7151	8.3	4.1	73	2497	493	6.4	1.5	86.8	678	2	512	4	1.08	442.	18	5.3	8
18.0	720	166	9.95	7360	8.6	4.0	76	2512	465	6.1	1.4	87.0	719	1	539	4	1.05	468.	19	5.4	8
19.0	760	175	10.51	7564	8.8	3.9	78	2524	441	5.7	1.3	87.1	759	1	566	4	1.01	483.	20	5.5	9
20.0	800	185	11.06	7762	9.0	3.8	80	2536	419	5.4	1.3	87.3	799	1	592	4	0.99	509.	21	5.7	9
25.0	1000	231	13.83	8690	10.1	3.4	90	2579	335	4.3	1.0	87.8	999	1	724	4	0.87	621.	26	6.3	10
30.0	1200	277	16.59	9532	11.1	3.1	100	2607	279	3.6	0.8	88.2	1199	1	854	3	0.79	710.	30	6.8	12
35.0	1400	323	19.36	10310	11.9	2.9	108	2627	239	3.0	0.7	88.5	1399	1	984	3	0.73	807.	35	7.3	
40.0	1600	369	22.12	11036	12.8	2.7	116	2642	209	2.7	0.6	88.7	1599	1	1113	3	0.68	899.	40	7.8	
45.0	1800	415	24.89	11721	13.5	2.5	123	2653	186	2.4	0.5	88.8	1799	1	1241	3	0.64	985.	44	8.2	
50.0	2000	462	27.65	12371	14.3	2.4	130	2662	167	2.1	0.5	88.9	2000	0	1368	2	0.61	1064.	49	8.6	

#194 40 Ar on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 8. ZC= 26.(Fe)
NEUTRON NUMBERS: NP= 22. NT= 8. NC= 30.

AP**1/3= 3.420 AT**1/3= 2.520 ELSCAT <23 deg
REDUCED MASS NUMBER= 11.43 AP+AT=AC= 56.

INTERACTION RADIUS RINT= 9.56 fm R0= 1.61 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 2.42 CT+CP= 6.02 C= 1.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.77 RCT= 2.78 RC=RCP+RCT= 6.56

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 44.22 MeV K= .11480 n=2.500
VC(RINT)= 21.7 MeV

FISSION-TKE= 41. MeV
ASYMM. FISSION-TKE= 35. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.943 MeV/fm**2 PROX-FACTOR= 17.15 MeV
L-RLD= 56 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -4.7
COMPOUND NUCLEUS: -61.4

FUSION RELATED PARAMETERS:
R-BARRIER= 8.66 fm V(RB)= 22.2 MeV
Q-VALUE= 22.1 MeV
L-CRITICAL= 39.

40 Ar on 16 O

40 Ar on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	11	0.53	1727	2.5	22.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	80	23	1.06	2443	3.5	16.0	8	187	70	129.1	22.5	25.4	27	53	0	70	13.54	54.	0	2.5	3
3.0	120	34	1.58	2993	4.3	13.1	25	1140	832	55.1	15.0	62.4	99	21	0	22	4.12	81.	0	2.8	3
4.0	160	46	2.11	3457	5.0	11.3	35	1596	1214	36.2	10.1	71.9	147	13	138	16	2.98	106.	4	15	3.1	4
4.5	180	51	2.37	3667	5.3	10.7	39	1747	1341	31.0	8.7	74.5	170	10	154	14	2.68	119.	5	18	3.2	4
5.0	200	57	2.64	3866	5.6	10.1	42	1866	1442	27.1	7.7	76.5	191	9	169	13	2.45	133.	6	21	3.4	4
5.5	220	63	2.90	4055	5.9	9.7	45	1963	1462	24.1	6.8	78.0	212	8	183	12	2.28	146.	6	23	3.5	4
6.0	240	69	3.17	4236	6.1	9.3	48	2044	1340	21.7	6.1	79.2	233	7	198	11	2.13	156.	7	26	3.6	5
6.5	260	74	3.43	4409	6.4	8.9	51	2112	1237	19.7	5.6	80.2	254	6	211	11	2.01	169.	7	28	3.7	5
7.0	280	80	3.69	4576	6.6	8.6	54	2170	1149	18.0	5.1	81.0	274	6	225	10	1.91	182.	8	30	3.8	5
7.5	300	86	3.96	4738	6.8	8.3	57	2220	1072	16.7	4.7	81.7	295	5	238	10	1.83	191.	8	32	3.9	6
8.0	320	91	4.22	4894	7.1	8.0	59	2264	1005	15.5	4.4	82.3	315	5	251	9	1.75	204.	9	34	4.0	6
8.5	340	97	4.48	5045	7.3	7.8	61	2302	946	14.4	4.1	82.8	336	4	264	9	1.68	217.	9	35	4.1	6
9.0	360	103	4.75	5192	7.5	7.6	64	2336	893	13.5	3.9	83.2	356	4	277	9	1.62	229.	10	37	4.2	6
9.5	380	109	5.01	5335	7.7	7.4	66	2367	846	12.7	3.6	83.6	376	4	290	8	1.57	242.	10	39	4.3	6
10.0	400	114	5.28	5474	7.9	7.2	68	2394	804	12.0	3.4	84.0	396	4	303	8	1.52	250.	11	41	4.4	7
10.5	420	120	5.54	5610	8.1	7.0	70	2419	766	11.4	3.3	84.3	417	3	315	8	1.47	262.	11	42	4.5	7
11.0	440	126	5.80	5743	8.3	6.8	72	2441	731	10.8	3.1	84.6	437	3	328	8	1.43	275.	12	44	4.6	7
11.5	460	131	6.07	5873	8.5	6.7	74	2462	699	10.3	2.9	84.8	457	3	340	7	1.39	287.	12	46	4.7	7
12.0	480	137	6.33	6000	8.7	6.5	76	2480	670	9.9	2.8	85.1	477	3	352	7	1.36	294.	13	47	4.8	8
13.0	520	149	6.86	6247	9.0	6.3	80	2513	618	9.0	2.6	85.5	517	3	377	7	1.30	318.	14	50	4.9	8
14.0	560	160	7.39	6484	9.4	6.1	83	2541	574	8.3	2.4	85.8	558	2	402	7	1.24	343.	15	53	5.1	8
15.0	600	171	7.91	6714	9.7	5.9	86	2565	536	7.7	2.2	86.1	598	2	426	6	1.19	359.	16	56	5.3	9
16.0	640	183	8.44	6936	10.0	5.7	90	2586	502	7.2	2.1	86.4	638	2	450	6	1.15	383.	17	59	5.4	9
17.0	680	194	8.97	7151	10.3	5.5	93	2605	473	6.8	1.9	86.6	678	2	474	6	1.11	407.	18	62	5.6	9
18.0	720	206	9.50	7360	10.6	5.3	96	2621	446	6.4	1.8	86.8	718	2	498	6	1.08	422.	19	65	5.7	10
19.0	760	217	10.02	7564	10.9	5.2	99	2636	423	6.0	1.7	87.0	758	2	522	5	1.05	446.	20	68	5.8	10
20.0	800	229	10.55	7762	11.2	5.1	102	2649	402	5.7	1.6	87.1	798	2	545	5	1.02	469.	21	70	6.0	10
25.0	1000	286	13.19	8690	12.5	4.5	115	2699	321	4.5	1.3	87.7	999	1	663	5	0.90	561.	25	84	6.6	12
30.0	1200	343	15.83	9532	13.7	4.1	127	2731	268	3.7	1.1	88.1	1199	1	779	4	0.82	642.	30	96	7.2	14
35.0	1400	400	18.46	10310	14.8	3.8	137	2754	229	3.2	0.9	88.4	1399	1	893	4	0.75	732.	34	108	7.8	
40.0	1600	457	21.10	11036	15.8	3.6	147	2771	201	2.8	0.8	88.6	1599	1	1007	4	0.70	816.	39	120	8.3	
45.0	1800	514	23.74	11721	16.8	3.4	157	2784	178	2.5	0.7	88.8	1799	1	1120	3	0.66	895.	44	131	8.8	
50.0	2000	571	26.38	12371	17.7	3.2	166	2795	160	2.2	0.6	88.9	1999	1	1232	3	0.62	969.	48	143	9.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ars	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#195 40 Ar on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 13. ZC= 31.(Ga)
NEUTRON NUMBERS: NP= 22. NT= 14. NC= 36.

AP**1/3= 3.420 AT**1/3= 3.000 ELSCAT <42 deg
REDUCED MASS NUMBER= 16.12 AP+AT=AC= 67.

INTERACTION RADIUS RINT=10.08 fm RO= 1.57 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 3.05 CT+CP= 6.64 C̄= 1.65

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.77 RCT= 3.32 RC=RCP+RCT= 7.10

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 66.78 MeV K= .15973 n=2.448
VC(RINT)= 33.4 MeV

FISSION-TKE= 48. MeV
ASYMM. FISSION-TKE= 46. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 19.52 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.14 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -20.6
COMPOUND NUCLEUS: -66.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.09 fm V(RB)= 34.5 MeV
Q-VALUE= 10.9 MeV
L-CRITICAL= 54.

40 Ar on 27 Al

40 Ar on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-GP	ET-QT	EPGMX	ETA'	TAU	E-ER	EM-EM	TEMP	MULT
1.0	40	16	0.48	1727	3.5	36.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	32	0.97	2443	5.0	26.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	48	1.45	2993	6.1	21.3	34	1046	746	63.7	25.0	58.1	88	32	86	38	4.74	67.	2 8	2.7	4
4.0	160	64	1.93	3457	7.1	18.4	49	1602	1209	40.9	16.3	69.5	141	19	125	27	3.28	90.	4 17	3.0	4
4.5	180	73	2.17	3667	7.5	17.4	55	1786	1363	34.8	13.9	72.6	164	16	140	24	2.93	99.	5 20	3.2	5
5.0	200	81	2.42	3866	7.9	16.5	61	1932	1486	30.3	12.1	74.8	187	13	153	22	2.67	110.	5 22	3.3	5
5.5	220	89	2.66	4055	8.3	15.7	66	2052	1414	26.9	10.8	76.6	209	11	165	20	2.46	120.	6 25	3.4	6
6.0	240	97	2.90	4236	8.6	15.0	70	2151	1296	24.1	9.7	77.9	230	10	177	19	2.30	130.	7 27	3.6	6
6.5	260	105	3.14	4409	9.0	14.5	75	2234	1197	21.9	8.8	79.1	251	9	189	18	2.17	141.	7 29	3.7	6
7.0	280	113	3.38	4576	9.3	13.9	79	2306	1111	20.0	8.0	80.0	272	8	200	17	2.05	150.	8 31	3.8	7
7.5	300	121	3.62	4738	9.7	13.5	83	2368	1037	18.5	7.4	80.8	293	7	210	16	1.96	160.	8 33	4.0	7
8.0	320	129	3.86	4894	10.0	13.0	87	2422	972	17.1	6.9	81.4	313	7	221	15	1.87	168.	9 35	4.1	8
8.5	340	137	4.11	5045	10.3	12.6	90	2470	915	16.0	6.4	82.0	334	6	231	15	1.80	179.	9 37	4.2	8
9.0	360	145	4.35	5192	10.6	12.3	94	2512	864	15.0	6.0	82.5	354	6	242	14	1.73	189.	10 38	4.3	8
9.5	380	153	4.59	5335	10.9	12.0	97	2549	819	14.1	5.7	83.0	375	5	252	14	1.67	200.	10 40	4.4	8
10.0	400	161	4.83	5474	11.1	11.7	100	2583	778	13.3	5.3	83.4	395	5	262	13	1.62	207.	11 42	4.5	9
10.5	420	169	5.07	5610	11.4	11.4	103	2614	741	12.6	5.1	83.7	415	5	272	13	1.57	217.	11 44	4.6	9
11.0	440	177	5.31	5743	11.7	11.1	106	2642	707	11.9	4.8	84.0	435	5	281	12	1.53	227.	12 45	4.7	9
11.5	460	185	5.56	5873	12.0	10.9	109	2667	676	11.4	4.6	84.3	456	4	291	12	1.49	233.	12 47	4.8	10
12.0	480	193	5.80	6000	12.2	10.6	112	2690	648	10.8	4.4	84.6	476	4	301	12	1.45	244.	12 48	4.9	10
13.0	520	210	6.28	6247	12.7	10.2	118	2731	598	9.9	4.0	85.0	516	4	320	11	1.38	264.	13 52	5.1	10
14.0	560	226	6.76	6484	13.2	9.8	123	2766	555	9.2	3.7	85.4	557	3	339	11	1.32	279.	14 55	5.3	11
15.0	600	242	7.25	6714	13.7	9.5	128	2796	518	8.5	3.4	85.7	597	3	357	10	1.27	299.	15 58	5.5	11
16.0	640	258	7.73	6936	14.1	9.2	133	2823	486	7.9	3.2	86.0	637	3	376	10	1.22	313.	16 60	5.7	12
17.0	680	274	8.21	7151	14.5	8.9	137	2846	457	7.4	3.0	86.3	677	3	394	10	1.18	333.	17 63	5.8	12
18.0	720	290	8.70	7360	15.0	8.7	142	2867	432	7.0	2.8	86.5	717	3	413	9	1.14	346.	18 66	6.0	13
19.0	760	306	9.18	7564	15.4	8.5	146	2885	409	6.6	2.7	86.7	758	2	431	9	1.11	365.	19 69	6.2	13
20.0	800	322	9.66	7762	15.8	8.2	151	2902	389	6.3	2.5	86.9	798	2	449	9	1.08	378.	20 72	6.3	14
25.0	1000	403	12.08	8690	17.6	7.4	170	2964	311	5.0	2.0	87.5	998	2	538	8	0.95	454.	24 85	7.0	16
30.0	1200	484	14.49	9532	19.3	6.7	188	3006	259	4.1	1.7	87.9	1199	1	625	7	0.86	524.	28 97	7.7	18
35.0	1400	564	16.91	10310	20.9	6.2	204	3035	222	3.5	1.4	88.3	1399	1	710	6	0.79	586.	33 109	8.3	
40.0	1600	645	19.32	11036	22.3	5.8	219	3057	194	3.0	1.2	88.5	1599	1	795	6	0.74	655.	37 121	8.8	
45.0	1800	725	21.74	11721	23.7	5.5	233	3074	172	2.7	1.1	88.6	1799	1	879	6	0.70	705.	41 132	9.4	
50.0	2000	806	24.15	12371	24.9	5.2	246	3087	155	2.4	1.0	88.8	1999	1	962	5	0.66	766.	46 143	9.9	

#196 40 Ar on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 20. ZC= 38.(Sr)
NEUTRON NUMBERS: NP= 22. NT= 20. NC= 42.

INTERACTION RADIUS RINT=10.54 fm RO= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 3.59 CT+CP= 7.18 C̄= 1.80

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.77 RCT= 3.84 RC=RCP+RCT= 7.62

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 95.79 MeV K= .19458 n=2.444
VC(RINT)= 49.1 MeV

FISSION-TKE= 58. MeV
ASYMM. FISSION-TKE= 58. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.947 MeV/fm**2 PROX-FACTOR= 21.38 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.85 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -33.0
COMPOUND NUCLEUS: -71.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.46 fm V(RB)= 51.2 MeV
Q-VALUE= 3.8 MeV
L-CRITICAL= 67.

40 Ar on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-GP	ET-QT	EPGMX	ETA'	TAU	E-ER	EM-EM	TEMP	MULT
1.0	40	20	0.41	1727	4.4	56.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	40	0.81	2443	6.2	40.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	60	1.22	2993	7.6	32.7	34	668	412	87.9	44.0	46.0	62	58	61	77	6.48	57.	2 6	2.5	4
4.0	160	80	1.63	3457	8.7	28.3	57	1393	1011	52.7	26.3	63.7	129	31	110	46	3.84	76.	4 16	2.9	4
4.5	180	90	1.83	3667	9.3	26.7	66	1633	1211	44.1	22.1	67.9	155	25	126	40	3.34	84.	5 19	3.1	5
5.0	200	100	2.04	3866	9.8	25.4	74	1823	1370	38.0	19.0	71.0	179	21	139	36	2.99	92.	5 22	3.2	6
5.5	220	110	2.24	4055	10.3	24.2	80	1979	1363	33.5	16.7	73.3	202	18	151	32	2.73	102.	6 24	3.4	6
6.0	240	120	2.44	4236	10.7	23.1	87	2109	1250	29.9	14.9	75.1	224	16	161	30	2.53	111.	6 26	3.5	6
6.5	260	130	2.65	4409	11.2	22.2	93	2218	1153	27.0	13.5	76.5	246	14	171	28	2.37	119.	7 29	3.7	7
7.0	280	140	2.85	4576	11.6	21.4	98	2312	1071	24.6	12.3	77.7	267	13	181	27	2.24	128.	7 31	3.8	7
7.5	300	150	3.05	4738	12.0	20.7	104	2393	1000	22.6	11.3	78.7	288	12	190	25	2.12	135.	8 33	3.9	8
8.0	320	160	3.26	4894	12.4	20.0	109	2463	937	20.9	10.5	79.5	309	11	199	24	2.03	144.	8 34	4.0	8
8.5	340	170	3.46	5045	12.8	19.4	113	2526	882	19.5	9.7	80.3	330	10	208	23	1.94	153.	9 36	4.2	8
9.0	360	180	3.67	5192	13.1	18.9	118	2581	833	18.2	9.1	80.9	351	9	216	22	1.86	160.	9 38	4.3	9
9.5	380	190	3.87	5335	13.5	18.4	122	2631	789	17.1	8.5	81.5	372	8	224	21	1.80	169.	10 40	4.4	9
10.0	400	200	4.07	5474	13.8	17.9	127	2675	750	16.1	8.1	81.9	392	8	232	21	1.74	175.	10 41	4.5	10
10.5	420	210	4.28	5610	14.2	17.5	131	2715	714	15.2	7.6	82.4	413	7	240	20	1.68	184.	11 43	4.6	10
11.0	440	220	4.48	5743	14.5	17.1	135	2752	681	14.5	7.2	82.8	433	7	248	19	1.63	192.	11 45	4.7	10
11.5	460	230	4.69	5873	14.8	16.7	139	2785	652	13.7	6.9	83.1	453	7	256	19	1.59	198.	12 46	4.8	11
12.0	480	240	4.89	6000	15.2	16.4	142	2815	625	13.1	6.6	83.4	474	6	264	18	1.54	207.	12 48	4.9	11
13.0	520	260	5.29	6247	15.8	15.7	150	2869	576	12.0	6.0	84.0	514	6	279	17	1.47	221.	13 51	5.1	12
14.0	560	280	5.70	6484	16.4	15.1	157	2915	535	11.0	5.5	84.5	555	5	294	17	1.40	238.	14 54	5.3	12
15.0	600	300	6.11	6714	16.9	14.6	163	2955	500	10.2	5.1	84.9	595	5	309	16	1.35	251.	15 57	5.5	13
16.0	640	320	6.52	6936	17.5	14.2	170	2990	468	9.5	4.8	85.2	636	4	323	15	1.30	264.	16 60	5.7	14
17.0	680	340	6.92	7151	18.0	13.7	176	3021	441	8.9	4.5	85.5	676	4	338	15	1.25	280.	16 62	5.9	14
18.0	720	360	7.33	7360	18.6	13.4	182	3048	416	8.4	4.2	85.8	716	4	352	14	1.21	292.	17 65	6.0	15
19.0	760	380	7.74	7564	19.1	13.0	188	3072	394	7.9	4.0	86.0	756	4	366	14	1.17	309.	18 68	6.2	15
20.0	800	400	8.15	7762	19.6	12.7	193	3094	375	7.5	3.8	86.2	797	3	380	14	1.14	320.	19 71	6.4	16
25.0	1000	500	10.18	8690	21.9	11.3	219	3177	300	5.9	3.0	87.0	997	3	448	12	1.00	387.	23 83	7.1	18
30.0	1200	600	12.22	9532	24.0	10.3	242	3232	250	4.9	2.4	87.6	1198	2	515	11	0.91	442.	27 96	7.8	21
35.0	1400	700	14.26	10310	25.9	9.6	263	3271	214	4.2	2.1	87.9	1398	2	580	10	0.84	498.	31 107	8.4	
40.0	1600	800	16.29	11036	27.7	9.0	283	3300	187	3.6	1.8	88.2	1598	2	644	9	0.78	550.	35 119	9.0	
45.0	1800	900	18.33	11721	29.3	8.5	301	3323	166	3.2	1.6	88.4	1799	1	707	9	0.73	596.	39 129	9.5	
50.0	2000	1000	20.36	12371	30.9	8.0	318	3341	150	2.9	1.4	88.6	1999	1	769	8	0.69	650.	43 140	10.0	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	K	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#197 40 Ar on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 26. ZC= 44.(Ru)
NEUTRON NUMBERS: NP= 22. NT= 30. NC= 52.

AP**1/3= 3.420 AT**1/3= 3.826
REDUCED MASS NUMBER= 23.33 AP+AT=AC= 96.

INTERACTION RADIUS RINT=10.98 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 4.12 CT+CP= 7.71 C̄= 1.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.77 RCT= 4.27 RC=RCP+RCT= 8.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 117.74 MeV K= .20430 n=2.454
VC(RINT)= 61.3 MeV

FISSION-TKE= 67. MeV
ASYMM. FISSION-TKE= 65. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.940 MeV/fm**2 PROX-FACTOR= 22.66 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -61.4
COMPOUND NUCLEUS: -86.3

FUSION RELATED PARAMETERS:
R-BARRIER= 9.83 fm V(RB)= 63.9 MeV
Q-VALUE= -9.7 MeV
L-CRITICAL= 80.

40 Ar on 56 Fe

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SQMAX	SQFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	23	0.38	1727	5.1	73.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	47	0.76	2443	7.2	52.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	70	1.14	2993	8.8	42.5	34	496	266	102.5	63.0	38.7	49	71	47	120	8.16	48.	2	7	2.2	4
4.0	160	93	1.52	3457	10.2	36.8	66	1339	959	58.6	34.7	60.7	123	37	100	63	4.24	63.	4	16	2.6	5
4.5	180	105	1.71	3667	10.8	34.7	77	1617	1190	48.7	28.7	65.6	150	30	115	54	3.63	70.	4	19	2.8	6
5.0	200	117	1.90	3866	11.4	33.0	86	1839	1375	41.8	24.5	69.1	175	25	127	48	3.23	78.	5	21	3.0	6
5.5	220	128	2.09	4055	12.0	31.4	95	2020	1421	36.6	21.5	71.7	199	21	137	43	2.93	85.	6	24	3.1	7
6.0	240	140	2.29	4236	12.5	30.1	103	2171	1303	32.6	19.1	73.7	222	18	147	40	2.71	93.	6	26	3.3	7
6.5	260	152	2.48	4409	13.0	28.9	110	2298	1202	29.4	17.2	75.3	244	16	155	37	2.52	99.	7	28	3.4	8
7.0	280	163	2.67	4576	13.5	27.9	117	2407	1116	26.7	15.6	76.6	265	15	164	35	2.38	107.	7	30	3.6	8
7.5	300	175	2.86	4738	14.0	26.9	124	2502	1042	24.5	14.3	77.7	287	13	171	33	2.25	113.	8	32	3.7	9
8.0	320	187	3.05	4894	14.4	26.1	130	2584	977	22.7	13.3	78.7	308	12	178	32	2.14	121.	8	34	3.8	9
8.5	340	198	3.24	5045	14.9	25.3	136	2657	919	21.1	12.3	79.5	329	11	186	30	2.05	127.	9	35	4.0	10
9.0	360	210	3.43	5192	15.3	24.6	141	2721	868	19.7	11.5	80.2	350	10	192	29	1.97	134.	9	37	4.1	10
9.5	380	222	3.62	5335	15.7	23.9	147	2779	823	18.5	10.8	80.8	370	10	199	28	1.89	140.	9	39	4.2	11
10.0	400	233	3.81	5474	16.1	23.3	152	2831	781	17.4	10.2	81.3	391	9	206	27	1.83	147.	10	40	4.3	11
10.5	420	245	4.00	5610	16.5	22.7	157	2878	744	16.5	9.6	81.8	412	8	212	26	1.77	153.	10	42	4.4	12
11.0	440	257	4.19	5743	16.9	22.2	162	2920	710	15.6	9.1	82.2	432	8	218	25	1.72	160.	11	44	4.5	12
11.5	460	268	4.38	5873	17.3	21.7	167	2959	679	14.8	8.7	82.6	453	7	225	25	1.67	166.	11	45	4.6	13
12.0	480	280	4.57	6000	17.7	21.3	172	2994	651	14.1	8.3	82.9	473	7	231	24	1.62	173.	12	47	4.7	13
13.0	520	303	4.95	6247	18.4	20.4	181	3057	601	12.9	7.5	83.5	514	6	243	23	1.54	185.	12	50	4.9	14
14.0	560	327	5.33	6484	19.1	19.7	189	3111	558	11.9	6.9	84.1	554	6	254	22	1.47	197.	13	53	5.1	15
15.0	600	350	5.71	6714	19.8	19.0	197	3158	521	11.0	6.4	84.5	595	5	266	21	1.41	208.	14	55	5.3	16
16.0	640	373	6.09	6936	20.4	18.4	205	3198	488	10.3	6.0	84.9	635	5	277	20	1.36	222.	15	58	5.5	16
17.0	680	397	6.47	7151	21.0	17.9	213	3234	459	9.6	5.6	85.2	675	5	288	19	1.31	233.	16	61	5.7	17
18.0	720	420	6.86	7360	21.7	17.4	220	3266	434	9.0	5.3	85.5	716	4	299	19	1.27	244.	17	63	5.8	18
19.0	760	443	7.24	7564	22.2	16.9	227	3295	411	8.5	5.0	85.7	756	4	310	18	1.23	257.	17	66	6.0	18
20.0	800	467	7.62	7762	22.8	16.5	234	3320	390	8.1	4.7	86.0	796	4	321	18	1.19	267.	18	69	6.2	19
25.0	1000	583	9.52	8690	25.5	14.7	265	3417	312	6.4	3.7	86.8	997	3	373	16	1.05	321.	22	81	6.9	22
30.0	1200	700	11.43	9532	28.0	13.5	293	3482	260	5.3	3.1	87.4	1198	2	424	14	0.95	370.	26	93	7.6	25
35.0	1400	817	13.33	10310	30.2	12.5	319	3528	223	4.5	2.6	87.8	1398	2	473	13	0.87	413.	30	104	8.2	
40.0	1600	933	15.23	11036	32.3	11.7	343	3562	195	3.9	2.3	88.1	1598	2	521	12	0.81	458.	34	115	8.8	
45.0	1800	1050	17.14	11721	34.2	11.0	365	3588	173	3.4	2.0	88.3	1798	2	568	11	0.76	500.	37	125	9.3	
50.0	2000	1167	19.04	12371	36.1	10.4	386	3610	156	3.1	1.8	88.5	1999	1	615	11	0.72	538.	41	136	9.8	

#198 40 Ar on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 29. ZC= 47.(Ag)
NEUTRON NUMBERS: NP= 22. NT= 34. NC= 56.

AP**1/3= 3.420 AT**1/3= 3.979
REDUCED MASS NUMBER= 24.47 AP+AT=AC=103.

INTERACTION RADIUS RINT=11.15 fm RO= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 4.31 CT+CP= 7.91 C̄= 1.96

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.77 RCT= 4.45 RC=RCP+RCT= 8.22

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 128.38 MeV K= .20664 n=2.463
VC(RINT)= 67.3 MeV

FISSION-TKE= 73. MeV
ASYMM. FISSION-TKE= 69. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.939 MeV/fm**2 PROX-FACTOR= 23.12 MeV
L-RLD= 83 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -65.2
COMPOUND NUCLEUS: -84.8

FUSION RELATED PARAMETERS:
R-BARRIER= 9.98 fm V(RB)= 70.2 MeV
Q-VALUE= -15.0 MeV
L-CRITICAL= 84.

40 Ar on 63 Cu

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SQMAX	SQFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	24	0.36	1727	5.4	82.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	49	0.73	2443	7.6	58.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	73	1.09	2993	9.3	47.5	30	341	135	116.2	77.8	31.9	38	82	36	165	10.19	45.	1	6	2.1	4
4.0	160	98	1.45	3457	10.7	41.1	67	1253	884	63.4	39.5	58.3	118	42	95	74	4.52	58.	4	15	2.5	6
4.5	180	110	1.64	3667	11.4	38.7	79	1553	1133	52.4	32.4	63.8	147	33	110	62	3.82	66.	4	18	2.7	6
5.0	200	122	1.82	3866	12.0	36.8	89	1793	1333	44.7	27.6	67.7	173	27	123	55	3.37	72.	5	21	2.9	7
5.5	220	135	2.00	4055	12.5	35.0	99	1989	1430	39.0	24.0	70.5	197	23	133	50	3.04	80.	5	23	3.0	7
6.0	240	147	2.18	4236	13.1	33.6	107	2152	1310	34.7	21.3	72.7	220	20	142	46	2.80	86.	6	26	3.2	8
6.5	260	159	2.36	4409	13.6	32.2	115	2290	1210	31.2	19.2	74.4	242	18	151	42	2.61	93.	7	28	3.3	8
7.0	280	171	2.54	4576	14.2	31.1	123	2407	1123	28.4	17.4	75.8	264	16	158	40	2.45	99.	7	30	3.5	9
7.5	300	183	2.73	4738	14.7	30.0	130	2509	1048	26.0	16.0	77.0	286	14	166	38	2.31	105.	7	31	3.6	10
8.0	320	196	2.91	4894	15.1	29.1	137	2599	983	24.0	14.7	78.0	307	13	173	36	2.20	112.	8	33	3.7	10
8.5	340	208	3.09	5045	15.6	28.2	143	2677	925	22.3	13.7	78.8	328	12	179	34	2.10	118.	8	35	3.9	11
9.0	360	220	3.27	5192	16.1	27.4	149	2747	873	20.8	12.8	79.6	349	11	186	33	2.02	125.	9	37	4.0	11
9.5	380	232	3.45	5335	16.5	26.7	155	2809	827	19.5	12.0	80.2	370	10	192	32	1.94	130.	9	38	4.1	12
10.0	400	245	3.63	5474	16.9	26.0	161	2865	786	18.4	11.3	80.8	390	10	198	31	1.87	137.	10	40	4.2	12
10.5	420	257	3.82	5610	17.3	25.4	166	2916	749	17.4	10.6	81.3	411	9	204	30	1.81	144.	10	42	4.3	12
11.0	440	269	4.00	5743	17.7	24.8	171	2962	715	16.5	10.1	81.8	431	9	210	29	1.76	149.	11	43	4.4	13
11.5	460	281	4.18	5873	18.1	24.2	176	3004	683	15.6	9.6	82.2	452	8	215	28	1.71	156.	11	45	4.5	13
12.0	480	294	4.36	6000	18.5	23.7	181	3043	655	14.9	9.1	82.5	472	8	221	27	1.66	161.	11	46	4.7	14
13.0	520	318	4.72	6247	19.3	22.8	191	3111	605	13.6	8.3	83.2	513	7	232	26	1.58	172.	12	49	4.9	15
14.0	560	343	5.09	6484	20.0	22.0	200	3169	561	12.5	7.7	83.7	554	6	243	25	1.50	184.	13	52	5.0	16
15.0	600	367	5.45	6714	20.7	21.2	209	3219	524	11.6	7.1	84.2	594	6	253	23	1.44	197.	14	55	5.2	16
16.0	640	391	5.82	6936	21.4	20.5	217	3263	491	10.8	6.6	84.6	635	5	264	23	1.39	207.	15	57	5.4	17
17.0	680	416	6.18	7151	22.1	19.9	225	3302	462	10.1	6.2	84.9	675	5	274	22	1.34	218.	15	60	5.6	18
18.0	720	440	6.54	7360	22.7	19.4	233	3337	436	9.5	5.8	85.2	715	5	284	21	1.29	228.	16	63	5.7	19
19.0	760	465	6.91	7564	23.3	18.9	240	3368	413	9.0	5.5	85.5	756	4	294	20	1.25	238.	17	65	5.9	20
20.0	800	489	7.27	7762	23.9	18.4	248	3395	393	8.5	5.2	85.8	796	4	304	20	1.21	250.	18	68	6.1	20
25.0	1000	612	9.09	8690	26.8	16.4	281	3500	314	6.7	4.1	86.7	997	3	351	17	1.07	298.	22	80	6.8	24
30.0	1200	734	10.90	9532	29.3	15.0	311	3570	262	5.5	3.4	87.2	1197	3	397	16	0.97	344.	26	91	7.5	27
35.0	1400	856	12.72	10310	31.7	13.9	339	3620	224	4.7	2.9	87.7	1398	2	441	14	0.89	390.	29	102	8.1	
40.0	1600	979	14.54	11036	33.8	13.0	364	3657	196	4.1	2.5	88.0	1598	2	484	13	0.83	428.	33	113	8.7	
45.0	1800	1101	16.35	11721	35.9	12.3	388	3686	174	3.6	2.2	88.2	1798	2	527	13	0.78	468.	37	123	9.2	
50.0	2000	1223	18.17	12371	37.8	11.6	410	3709	157	3.2	2.0	88.4	1998	2	568	12	0.73	505.	41	134	9.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#199 40 Ar on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 42. ZC= 60.(Nd)
NEUTRON NUMBERS: NP= 22. NT= 50. NC= 72.

AP**1/3= 3.420 AT**1/3= 4.514
REDUCED MASS NUMBER= 27.88 AP+AT=AC=132.

INTERACTION RADIUS RINT=11.73 fm R0= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 5.00 CT+CP= 8.59 C= 2.09

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.77 RCT= 5.08 RC=RCP+RCT= 8.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 171.68 MeV K= .20335 n=2.514
VC(RINT)= 92.7 MeV

FISSION-TKE= 98. MeV
ASYMM. FISSION-TKE= 82. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.938 MeV/fm**2 PROX-FACTOR= 24.64 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -87.5
COMPOUND NUCLEUS: -71.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.53 fm V(RB)= 96.8 MeV
Q-VALUE= -50.3 MeV
L-CRITICAL= 95.

40 Ar on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	28	0.30	1727	6.1	119.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	56	0.60	2443	8.6	84.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	84	0.90	2993	10.6	68.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	112	1.20	3457	12.2	59.5	59	751	458	90.9	67.2	44.6	91	69	71	145	6.47	47.	3	13	1.9	4
4.5	180	125	1.35	3667	12.9	56.1	77	1155	794	71.9	51.9	54.1	128	52	93	110	4.90	52.	4	16	2.1	5
5.0	200	139	1.50	3866	13.6	53.2	92	1477	1063	59.8	42.7	60.1	158	42	108	92	4.10	58.	4	19	2.3	6
5.5	220	153	1.65	4055	14.3	50.8	105	1740	1283	51.4	36.5	64.3	185	35	120	81	3.60	64.	5	21	2.5	6
6.0	240	167	1.81	4236	14.9	48.6	117	1958	1310	45.1	31.9	67.4	210	30	130	73	3.25	69.	6	24	2.7	7
6.5	260	181	1.96	4409	15.5	46.7	127	2143	1209	40.3	28.3	69.9	234	26	138	67	2.98	74.	6	26	2.8	8
7.0	280	195	2.11	4576	16.1	45.0	137	2301	1123	36.3	25.5	71.8	257	23	145	62	2.77	79.	7	28	3.0	9
7.5	300	209	2.26	4738	16.7	43.5	146	2438	1048	33.1	23.3	73.4	279	21	151	58	2.60	84.	7	29	3.1	10
8.0	320	223	2.41	4894	17.2	42.1	155	2558	983	30.5	21.3	74.8	301	19	157	55	2.45	90.	8	31	3.2	10
8.5	340	237	2.56	5045	17.8	40.8	163	2663	925	28.2	19.7	75.9	323	17	163	52	2.33	96.	8	33	3.4	11
9.0	360	251	2.71	5192	18.3	39.7	170	2757	873	26.2	18.4	76.9	344	16	168	50	2.23	99.	8	35	3.5	12
9.5	380	265	2.86	5335	18.8	38.6	178	2841	827	24.5	17.2	77.7	366	14	174	48	2.14	105.	9	36	3.6	12
10.0	400	279	3.01	5474	19.3	37.6	185	2916	786	23.0	16.1	78.5	387	13	179	46	2.05	109.	9	38	3.7	13
10.5	420	293	3.16	5610	19.8	36.7	192	2984	749	21.7	15.2	79.1	407	13	183	44	1.98	115.	10	39	3.8	13
11.0	440	307	3.31	5743	20.2	35.9	198	3046	714	20.5	14.3	79.7	428	12	188	43	1.92	119.	10	41	3.9	14
11.5	460	321	3.46	5873	20.7	35.1	204	3102	683	19.5	13.6	80.3	449	11	192	42	1.86	125.	10	42	4.0	14
12.0	480	335	3.61	6000	21.1	34.4	211	3154	655	18.5	12.9	80.7	469	11	197	40	1.80	129.	11	44	4.2	15
13.0	520	362	3.91	6247	22.0	33.0	222	3246	604	16.9	11.8	81.6	511	9	205	38	1.71	138.	12	46	4.3	16
14.0	560	390	4.21	6484	22.8	31.8	234	3324	561	15.5	10.8	82.2	551	9	213	36	1.62	148.	12	49	4.5	17
15.0	600	418	4.51	6714	23.6	30.7	244	3392	524	14.3	10.0	82.8	592	8	221	35	1.55	157.	13	52	4.7	18
16.0	640	446	4.81	6936	24.4	29.8	255	3451	491	13.3	9.3	83.3	633	7	229	33	1.49	166.	14	54	4.9	19
17.0	680	474	5.11	7151	25.1	28.9	264	3504	462	12.5	8.7	83.8	673	7	237	32	1.43	175.	15	57	5.1	20
18.0	720	502	5.42	7360	25.9	28.1	274	3550	436	11.7	8.2	84.2	714	6	244	31	1.38	183.	15	59	5.2	21
19.0	760	530	5.72	7564	26.6	27.3	283	3592	413	11.0	7.7	84.5	754	6	251	30	1.34	192.	16	62	5.4	22
20.0	800	558	6.02	7762	27.3	26.6	292	3629	393	10.4	7.3	84.8	794	6	258	29	1.30	200.	17	64	5.5	23
25.0	1000	697	7.52	8690	30.5	23.8	333	3771	314	8.2	5.7	85.9	996	4	293	26	1.14	241.	21	75	6.3	27
30.0	1200	836	9.03	9532	33.4	21.7	369	3865	262	6.7	4.7	86.6	1197	3	325	23	1.03	278.	24	86	6.9	31
35.0	1400	976	10.53	10310	36.1	20.1	403	3932	224	5.7	4.0	87.1	1397	3	357	21	0.94	315.	28	97	7.5	
40.0	1600	1115	12.03	11036	38.6	18.8	433	3982	196	5.0	3.5	87.5	1597	3	387	20	0.88	349.	31	107	8.0	
45.0	1800	1255	13.54	11721	40.9	17.7	462	4021	174	4.4	3.1	87.8	1798	2	417	18	0.82	380.	35	117	8.5	
50.0	2000	1394	15.04	12371	43.1	16.8	489	4052	157	3.9	2.8	88.0	1998	2	446	17	0.78	408.	38	126	9.0	

#200 40 Ar on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 47. ZC= 65.(Tb)
NEUTRON NUMBERS: NP= 22. NT= 61. NC= 83.

AP**1/3= 3.420 AT**1/3= 4.762
REDUCED MASS NUMBER= 29.19 AP+AT=AC=148.

INTERACTION RADIUS RINT=12.00 fm R0= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 5.32 CT+CP= 8.91 C= 2.14

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.77 RCT= 5.34 RC=RCP+RCT= 9.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 186.32 MeV K= .19754 n=2.529
VC(RINT)= 101.4 MeV

FISSION-TKE= 108. MeV
ASYMM. FISSION-TKE= 86. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.927 MeV/fm**2 PROX-FACTOR= 24.97 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.84 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -87.6
COMPOUND NUCLEUS: -71.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.79 fm V(RB)= 105.7 MeV
Q-VALUE= -50.9 MeV
L-CRITICAL= 102.

40 Ar on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SDMAX	SDFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	29	0.29	1727	6.4	133.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	58	0.58	2443	9.0	94.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	88	0.86	2993	11.1	76.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	117	1.15	3457	12.8	66.6	55	612	345	100.5	79.2	39.7	85	75	65	184	7.51	42.	3	12	1.9	5
4.5	180	131	1.30	3667	13.5	62.8	77	1055	713	78.1	59.5	51.0	124	56	88	131	5.37	47.	4	16	2.1	6
5.0	200	146	1.44	3866	14.3	59.6	95	1407	1007	64.4	48.4	57.8	155	45	104	108	4.40	51.	4	18	2.3	7
5.5	220	161	1.58	4055	15.0	56.8	109	1694	1248	55.1	41.0	62.5	183	37	115	94	3.82	57.	5	21	2.4	7
6.0	240	175	1.73	4236	15.6	54.4	122	1933	1351	48.2	35.7	65.9	208	32	125	84	3.42	61.	5	23	2.6	8
6.5	260	190	1.87	4409	16.3	52.2	133	2135	1247	42.8	31.6	68.6	233	27	133	77	3.12	66.	6	25	2.7	9
7.0	280	204	2.02	4576	16.9	50.3	144	2308	1158	38.6	28.4	70.7	256	24	140	71	2.89	71.	6	27	2.9	10
7.5	300	219	2.16	4738	17.5	48.6	154	2458	1081	35.1	25.8	72.4	278	22	146	66	2.71	75.	7	29	3.0	11
8.0	320	234	2.30	4894	18.1	47.1	163	2589	1013	32.2	23.7	73.9	301	19	151	63	2.55	79.	7	30	3.1	12
8.5	340	248	2.45	5045	18.6	45.7	172	2704	954	29.8	21.9	75.1	322	18	156	59	2.42	84.	8	32	3.3	12
9.0	360	263	2.59	5192	19.2	44.4	180	2807	901	27.7	20.3	76.1	344	16	161	57	2.31	89.	8	34	3.4	13
9.5	380	277	2.74	5335	19.7	43.2	188	2898	853	25.9	19.0	77.1	365	15	166	54	2.21	93.	9	35	3.5	14
10.0	400	292	2.88	5474	20.2	42.1	196	2981	811	24.3	17.8	77.8	386	14	170	52	2.12	97.	9	37	3.6	15
10.5	420	306	3.02	5610	20.7	41.1	203	3055	772	22.9	16.8	78.6	407	13	175	50	2.05	102.	9	38	3.7	15
11.0	440	321	3.17	5743	21.2	40.2	210	3123	737	21.6	15.8	79.2	428	12	179	49	1.98	106.	10	40	3.8	16
11.5	460	336	3.31	5873	21.7	39.3	217	3185	705	20.5	15.0	79.7	448	12	183	47	1.92	110.	10	41	3.9	17
12.0	480	350	3.46	6000	22.1	38.5	224	3242	675	19.5	14.3	80.2	469	11	187	46	1.86	115.	11	42	4.0	17
13.0	520	379	3.74	6247	23.0	36.9	236	3342	623	17.8	13.0	81.1	510	10	194	43	1.76	123.	11	45	4.2	18
14.0	560	409	4.03	6484	23.9	35.6	249	3428	579	16.3	11.9	81.8	551	9	201	41	1.67	131.	12	48	4.4	20
15.0	600	438	4.32	6714	24.7	34.4	260	3502	540	15.1	11.0	82.5	592	8	208	39	1.60	139.	13	50	4.6	21
16.0	640	467	4.61	6936	25.5	33.3	271	3567	506	14.0	10.2	83.0	632	8	215	38	1.53	147.	14	53	4.7	22
17.0	680	496	4.89	7151	26.3	32.3	282	3624	477	13.1	9.6	83.5	673	7	222	36	1.48	155.	14	55	4.9	23
18.0	720	525	5.18	7360	27.1	31.4	292	3675	450	12.3	9.0	83.9	714	6	228	35	1.42	163.	15	58	5.1	24
19.0	760	555	5.47	7564	27.8	30.6	302	3720	426	11.6	8.4	84.2	754	6	234	34	1.38	171.	16	60	5.2	25
20.0	800	584	5.76	7762	28.6	29.8	311	3761	405	10.9	8.0	84.5	794	6	241	33	1.33	178.	17	62	5.4	26
25.0	1000	730	7.20	8690	31.9	26.6	355	3917	324	8.6	6.3	85.7	996	4	270	29	1.17	215.	20	73	6.1	30
30.0	1200	876	8.64	9532	35.0	24.3	395	4020	270	7.1	5.1	86.5	1196	4	298	26	1.05	250.	24	84	6.7	34
35.0	1400	1022	10.08	10310	37.8	22.5	430	4093	231	6.0	4.4	87.0	1397	3	325	24	0.97	281.	27	94	7.2	
40.0	1600	1168	11.52	11036	40.4	21.1	463	4148	202	5.2	3.8	87.4	1597	3	351	22	0.90	310.	31	104	7.8	
45.0	1800	1314	12.96	11721	42.8	19.9	494	4191	180	4.6	3.4	87.7	1798	2	376	21	0.84	338.	34	113	8.3	
50.0	2000	1459	14.40	12371	45.1	18.8	523	4225	162	4.1	3.0	87.9	1998	2	400	20	0.80	365.	37	122	8.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#201 40 Ar on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 58. ZC= 76.(Os)
NEUTRON NUMBERS: NP= 22. NT= 82. NC=104.

AP**1/3= 3.420 AT**1/3= 5.192
REDUCED MASS NUMBER= 31.11 AP+AT=AC=180.

INTERACTION RADIUS RINT=12.47 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 5.87 CT+CP= 9.47 C̄= 2.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.77 RCT= 5.82 RC=RCP+RCT= 9.59

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 217.53 MeV K= .18365 n=2.568
VC(RINT)= 120.4 MeV

FISSION-TKE= 132. MeV
ASYMM. FISSION-TKE= 95. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.911 MeV/fm**2 PROX-FACTOR= 25.51 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.43 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -88.2
COMPOUND NUCLEUS: -42.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.22 fm V(RB)= 125.3 MeV
Q-VALUE= -79.8 MeV
L-CRITICAL= 109.

40 Ar on 140 Ce

40 Ar on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	31	0.26	1727	6.8	164.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	62	0.52	2443	9.6	116.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	93	0.77	2993	11.8	94.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	124	1.03	3457	13.6	82.2	30	162	0	140.0	126.8	20.0	62	98	45	458	16.00	0.	2	10	1.4	4
4.5	180	140	1.16	3667	14.4	77.5	67	697	414	98.3	81.9	40.9	109	71	76	207	7.14	39.	3	14	1.6	5
5.0	200	156	1.29	3866	15.2	73.5	90	1122	768	78.5	63.7	50.7	145	55	95	155	5.32	43.	4	17	1.8	6
5.5	220	171	1.42	4055	16.0	70.1	108	1468	1058	65.9	52.8	57.0	175	45	108	129	4.42	47.	5	19	2.0	7
6.0	240	187	1.55	4236	16.7	67.1	124	1756	1300	57.0	45.3	61.5	202	38	118	113	3.87	51.	5	22	2.2	8
6.5	260	202	1.68	4409	17.3	64.5	137	2000	1263	50.3	39.7	64.9	228	32	126	101	3.48	55.	6	24	2.3	10
7.0	280	218	1.81	4576	18.0	62.1	150	2208	1173	45.0	35.5	67.5	252	28	133	93	3.19	59.	6	25	2.5	10
7.5	300	233	1.94	4738	18.6	60.0	161	2388	1095	40.8	32.1	69.6	275	25	139	86	2.96	62.	7	27	2.6	12
8.0	320	249	2.07	4894	19.2	58.1	172	2546	1026	37.3	29.3	71.4	297	23	144	81	2.78	66.	7	29	2.7	12
8.5	340	264	2.20	5045	19.8	56.4	182	2685	966	34.4	26.9	72.8	319	21	149	76	2.62	70.	8	30	2.9	13
9.0	360	280	2.32	5192	20.4	54.8	192	2809	912	31.9	24.9	74.1	341	19	154	73	2.49	74.	8	32	3.0	14
9.5	380	296	2.45	5335	21.0	53.3	201	2919	864	29.7	23.2	75.2	363	17	158	69	2.38	77.	8	33	3.1	15
10.0	400	311	2.58	5474	21.5	52.0	210	3018	821	27.8	21.7	76.1	384	16	162	66	2.28	81.	9	35	3.2	16
10.5	420	327	2.71	5610	22.0	50.7	218	3108	782	26.2	20.4	76.9	405	15	165	64	2.19	84.	9	36	3.3	17
11.0	440	342	2.84	5743	22.6	49.6	226	3190	746	24.7	19.3	77.7	426	14	169	62	2.11	88.	10	38	3.4	18
11.5	460	358	2.97	5873	23.1	48.5	234	3264	714	23.4	18.3	78.3	447	13	172	60	2.04	91.	10	39	3.5	19
12.0	480	373	3.10	6000	23.6	47.5	242	3333	684	22.2	17.3	78.9	468	12	175	58	1.98	95.	10	40	3.6	20
13.0	520	404	3.36	6247	24.5	45.6	256	3453	631	20.2	15.7	79.9	509	11	182	54	1.87	102.	11	43	3.8	21
14.0	560	436	3.62	6484	25.5	43.9	270	3557	586	18.5	14.4	80.8	550	10	188	52	1.77	109.	12	45	4.0	22
15.0	600	467	3.87	6714	26.4	42.4	283	3646	547	17.1	13.3	81.5	591	9	193	49	1.69	115.	13	48	4.1	24
16.0	640	498	4.13	6936	27.2	41.1	295	3724	513	15.8	12.3	82.1	632	8	199	47	1.62	122.	13	50	4.3	25
17.0	680	529	4.39	7151	28.1	39.9	307	3793	483	14.8	11.5	82.6	672	8	204	45	1.56	129.	14	52	4.5	26
18.0	720	560	4.65	7360	28.9	38.7	319	3855	456	13.9	10.8	83.1	713	7	209	44	1.50	135.	15	55	4.6	28
19.0	760	591	4.91	7564	29.7	37.7	330	3910	432	13.0	10.2	83.5	753	7	214	42	1.45	142.	15	57	4.8	29
20.0	800	622	5.17	7762	30.4	36.8	341	3959	410	12.3	9.6	83.8	794	6	219	41	1.40	148.	16	59	4.9	30
25.0	1000	778	6.46	8690	34.0	32.9	390	4146	328	9.6	7.5	85.2	995	5	243	36	1.23	179.	19	70	5.6	35
30.0	1200	933	7.75	9532	37.3	30.0	434	4271	273	7.9	6.2	86.0	1196	4	265	32	1.10	207.	23	80	6.2	40
35.0	1400	1089	9.04	10310	40.3	27.8	473	4360	234	6.7	5.2	86.6	1397	3	285	29	1.01	235.	26	89	6.7	
40.0	1600	1244	10.33	11036	43.0	26.0	510	4426	205	5.8	4.5	87.1	1597	3	305	27	0.94	261.	30	99	7.2	
45.0	1800	1400	11.62	11721	45.6	24.5	544	4478	182	5.2	4.0	87.4	1797	3	325	26	0.88	284.	33	108	7.7	
50.0	2000	1556	12.92	12371	48.1	23.2	576	4519	164	4.6	3.6	87.7	1998	2	343	24	0.83	308.	36	117	8.1	

#202 40 Ar on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 62. ZC= 80.(Hg)
NEUTRON NUMBERS: NP= 22. NT= 92. NC=114.

AP**1/3= 3.420 AT**1/3= 5.360
REDUCED MASS NUMBER= 31.75 AP+AT=AC=194.

INTERACTION RADIUS RINT=12.65 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.09 CT+CP= 9.68 C̄= 2.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.00 RC=RCP+RCT= 9.77

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 227.94 MeV K= .17763 n=2.581
VC(RINT)= 126.9 MeV

FISSION-TKE= 141. MeV
ASYMM. FISSION-TKE= 98. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.900 MeV/fm**2 PROX-FACTOR= 25.54 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.31 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -72.1
COMPOUND NUCLEUS: -30.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.40 fm V(RB)= 131.9 MeV
Q-VALUE= -76.5 MeV
L-CRITICAL= 112.

40 Ar on 154 Sm

40 Ar on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	32	0.25	1727	6.9	175.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	64	0.50	2443	9.8	124.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	95	0.75	2993	12.0	101.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	127	1.00	3457	13.9	87.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	143	1.13	3667	14.7	82.8	62	575	313	106.3	91.3	36.8	104	76	72	248	8.10	36.	3	13	1.7	6
5.0	200	159	1.25	3866	15.5	78.6	88	1027	690	83.7	69.6	48.2	142	58	92	175	5.72	40.	4	16	1.8	7
5.5	220	175	1.38	4055	16.3	74.9	108	1395	998	69.7	57.1	55.1	173	47	106	143	4.67	43.	5	19	2.0	8
6.0	240	191	1.50	4236	17.0	71.7	124	1701	1255	60.0	48.8	60.0	201	39	116	124	4.05	47.	5	21	2.2	9
6.5	260	206	1.63	4409	17.7	68.9	139	1960	1270	52.8	42.7	63.6	226	34	124	111	3.62	51.	6	23	2.3	10
7.0	280	222	1.75	4576	18.4	66.4	152	2181	1179	47.2	38.0	66.4	251	29	131	101	3.30	54.	6	25	2.5	12
7.5	300	238	1.88	4738	19.0	64.2	164	2373	1101	42.7	34.3	68.7	274	26	137	94	3.06	58.	7	27	2.6	13
8.0	320	254	2.00	4894	19.6	62.1	176	2540	1032	39.0	31.2	70.5	297	23	142	88	2.86	61.	7	28	2.7	14
8.5	340	270	2.13	5045	20.2	60.3	186	2688	971	35.9	28.7	72.1	319	21	147	83	2.70	65.	7	30	2.8	15
9.0	360	286	2.25	5192	20.8	58.6	196	2820	917	33.2	26.6	73.4	341	19	151	79	2.56	68.	8	31	2.9	16
9.5	380	302	2.38	5335	21.4	57.0	206	2937	869	30.9	24.7	74.5	362	18	155	75	2.44	71.	8	33	3.0	17
10.0	400	318	2.50	5474	22.0	55.6	215	3043	825	29.0	23.1	75.5	384	16	159	72	2.33	75.	9	34	3.2	18
10.5	420	333	2.63	5610	22.5	54.2	224	3138	786	27.2	21.7	76.4	405	15	162	69	2.24	79.	9	35	3.3	18
11.0	440	349	2.75	5743	23.0	53.0	232	3225	750	25.7	20.5	77.2	426	14	165	66	2.16	82.	9	37	3.4	19
11.5	460	365	2.88	5873	23.6	51.8	241	3304	718	24.3	19.4	77.8	447	13	169	64	2.09	85.	10	38	3.5	20
12.0	480	381	3.00	6000	24.1	50.7	248	3377	688	23.1	18.4	78.5	467	13	172	62	2.02	88.	10	39	3.5	21
13.0	520	413	3.25	6247	25.0	48.7	263	3505	635	21.0	16.7	79.5	509	11	177	59	1.91	94.	11	42	3.7	23
14.0	560	445	3.50	6484	26.0	47.0	278	3615	589	19.2	15.3	80.4	550	10	183	56	1.81	101.	12	44	3.9	24
15.0	600	476	3.75	6714	26.9	45.4	291	3710	550	17.7	14.1	81.1	591	9	188	53	1.72	107.	12	47	4.1	26
16.0	640	508	4.00	6936	27.8	43.9	304	3793	516	16.4	13.1	81.8	631	9	193	51	1.65	114.	13	49	4.2	27
17.0	680	540	4.25	7151	28.6	42.6	317	3867	485	15.3	12.2	82.3	672	8	198	49	1.59	119.	14	51	4.4	29
18.0	720	572	4.50	7360	29.5	41.4	329	3932	458	14.4	11.4	82.8	713	7	203	47	1.53	125.	14	54	4.5	30
19.0	760	603	4.75	7564	30.3	40.3	340	3990	434	13.5	10.7	83.2	753	7	208	45	1.48	131.	15	56	4.7	32
20.0	800	635	5.00	7762	31.1	39.3	351	4043	412	12.8	10.1	83.6	794	6	212	44	1.43	137.	16	58	4.8	33
25.0	1000	794	6.26	8690	34.7	35.1	402	4242	330	10.0	7.9	85.0	995	5	234	38	1.25	166.	19	68	5.4	38
30.0	1200	953	7.51	9532	38.0	32.1	448	4374	275	8.2	6.5	85.9	1196	4	254	34	1.12	192.	23	78	6.0	43
35.0	1400	1111	8.76	10310	41.1	29.7	489	4469	235	7.0	5.5	86.5	1397	3	273	32	1.03	217.	26	88	6.5	
40.0	1600	1270	10.01	11036	43.9	27.8	527	4540	206	6.0	4.8	87.0	1597	3	291	29	0.95	241.	29	97	7.0	
45.0	1800	1429	11.26	11721	46.6	26.2	562	4595	183	5.3	4.2	87.3	1797	3	308	27	0.89	264.	32	106	7.5	
50.0	2000	1588	12.51	12371	49.1	24.9	596	4638	165	4.8	3.8	87.6	1998	2	325	26	0.84	285.	36	114	7.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#203 40 Ar on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 67. ZC= 85.(At)
NEUTRON NUMBERS: NP= 22. NT= 98. NC=120.

AP**1/3= 3.420 AT**1/3= 5.485
REDUCED MASS NUMBER= 32.20 AP+AT=AC=205.

INTERACTION RADIUS RINT=12.78 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.25 CT+CP= 9.84 C= 2.28

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.15 RC=RCP+RCT= 9.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 241.93 MeV K= .17217 n=2.600
VC(RINT)= 135.7 MeV

FISSION-TKE= 153. MeV
ASYMM. FISSION-TKE= 102. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 25.86 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -63.7
COMPOUND NUCLEUS: -11.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.52 fm V(RB)= 141.1 MeV
Q-VALUE= -86.5 MeV
L-CRITICAL= 112.

40 Ar on 165 Ho

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	32	0.24	1727	7.0	189.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	64	0.47	2443	10.0	134.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	97	0.71	2993	12.2	109.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	129	0.95	3457	14.1	94.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	145	1.07	3667	14.9	89.5	48	333	110	123.9	110.8	28.0	92	88	63	355	10.91	34.	3	12	1.5	5
5.0	200	161	1.19	3866	15.7	84.9	80	821	515	93.8	80.0	43.1	133	67	87	214	6.54	38.	4	16	1.7	6
5.5	220	177	1.31	4055	16.5	81.0	102	1219	847	77.0	64.3	51.5	166	54	103	167	5.11	41.	4	18	1.9	7
6.0	240	193	1.42	4236	17.2	77.5	120	1549	1124	65.7	54.3	57.2	196	44	114	142	4.33	45.	5	20	2.0	9
6.5	260	209	1.54	4409	18.0	74.5	136	1827	1244	57.4	47.2	61.3	222	38	123	126	3.83	48.	6	22	2.2	10
7.0	280	225	1.66	4576	18.6	71.8	150	2066	1155	51.1	41.8	64.4	247	33	130	114	3.47	52.	6	24	2.3	11
7.5	300	241	1.78	4738	19.3	69.3	163	2273	1078	46.1	37.6	67.0	271	29	136	105	3.19	55.	7	26	2.5	12
8.0	320	258	1.90	4894	19.9	67.1	175	2453	1011	42.0	34.2	69.0	294	26	142	98	2.97	58.	7	28	2.6	13
8.5	340	274	2.02	5045	20.5	65.1	186	2613	951	38.6	31.3	70.7	317	23	146	92	2.79	62.	7	29	2.7	14
9.0	360	290	2.14	5192	21.1	63.3	197	2754	899	35.7	28.9	72.2	339	21	151	87	2.64	65.	8	31	2.8	15
9.5	380	306	2.25	5335	21.7	61.6	207	2881	851	33.2	26.9	73.4	361	19	155	83	2.52	68.	8	32	2.9	16
10.0	400	322	2.37	5474	22.3	60.1	216	2995	809	31.0	25.1	74.5	382	18	158	79	2.40	72.	9	34	3.0	17
10.5	420	338	2.49	5610	22.8	58.6	226	3097	770	29.1	23.6	75.4	403	17	162	76	2.31	75.	9	35	3.1	18
11.0	440	354	2.61	5743	23.4	57.3	234	3191	735	27.5	22.2	76.3	424	16	165	73	2.22	78.	9	36	3.2	19
11.5	460	370	2.73	5873	23.9	56.0	243	3276	703	26.0	21.0	77.0	445	15	168	70	2.14	81.	10	38	3.3	20
12.0	480	386	2.85	6000	24.4	54.8	251	3355	674	24.6	19.9	77.7	466	14	171	68	2.07	84.	10	39	3.4	21
13.0	520	419	3.08	6247	25.4	52.7	267	3493	622	22.3	18.0	78.8	508	12	177	64	1.95	91.	11	41	3.6	22
14.0	560	451	3.32	6484	26.3	50.8	281	3611	577	20.4	16.5	79.8	549	11	182	61	1.85	96.	12	44	3.8	24
15.0	600	483	3.56	6714	27.3	49.0	296	3714	539	18.8	15.2	80.6	590	10	187	58	1.76	103.	12	46	3.9	25
16.0	640	515	3.80	6936	28.2	47.5	309	3804	505	17.5	14.1	81.3	631	9	192	55	1.68	108.	13	48	4.1	27
17.0	680	547	4.03	7151	29.0	46.1	322	3883	475	16.3	13.1	81.9	671	9	197	53	1.62	114.	14	51	4.2	28
18.0	720	580	4.27	7360	29.9	44.8	334	3953	449	15.3	12.3	82.4	712	8	202	51	1.56	120.	14	53	4.4	30
19.0	760	612	4.51	7564	30.7	43.6	346	4016	425	14.4	11.6	82.8	753	7	206	49	1.50	126.	15	55	4.5	31
20.0	800	644	4.75	7762	31.5	42.5	358	4073	404	13.5	10.9	83.2	793	7	210	48	1.45	131.	16	57	4.7	33
25.0	1000	805	5.93	8690	35.2	38.0	410	4287	323	10.6	8.5	84.7	995	5	231	42	1.27	158.	19	67	5.3	39
30.0	1200	966	7.12	9532	38.6	34.7	457	4430	269	8.7	7.0	85.7	1196	4	249	37	1.14	184.	22	77	5.9	44
35.0	1400	1127	8.31	10310	41.7	32.1	499	4532	231	7.4	5.9	86.3	1396	4	267	34	1.04	209.	26	87	6.4	
40.0	1600	1288	9.49	11036	44.5	30.0	538	4608	202	6.4	5.1	86.8	1597	3	284	32	0.97	231.	29	95	6.8	
45.0	1800	1449	10.68	11721	47.2	28.3	575	4668	179	5.6	4.5	87.2	1797	3	301	30	0.91	253.	32	104	7.3	
50.0	2000	1610	11.86	12371	49.8	26.9	609	4715	161	5.0	4.1	87.5	1998	2	316	28	0.85	274.	35	113	7.7	

#204 40 Ar on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 73. ZC= 91.(Pa)
NEUTRON NUMBERS: NP= 22. NT=108. NC=130.

AP**1/3= 3.420 AT**1/3= 5.657
REDUCED MASS NUMBER= 32.76 AP+AT=AC=221.

INTERACTION RADIUS RINT=12.97 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.47 CT+CP=10.06 C= 2.31

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.35 RC=RCP+RCT=10.13

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 257.76 MeV K= .16479 n=2.621
VC(RINT)= 145.7 MeV

FISSION-TKE= 169. MeV
ASYMM. FISSION-TKE= 107. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 26.09 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.12 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -46.0
COMPOUND NUCLEUS: 19.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.69 fm V(RB)= 151.4 MeV
Q-VALUE= -100.2 MeV
L-CRITICAL= 113.

40 Ar on 181 Ta

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	33	0.22	1727	7.2	206.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	66	0.45	2443	10.1	146.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	98	0.67	2993	12.4	119.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	131	0.90	3457	14.3	103.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	147	1.01	3667	15.2	97.5	20	60	0	156.7	150.5	11.6	78	102	52	904	27.15	0.	2	11	1.3	5
5.0	200	164	1.12	3866	16.0	92.5	69	595	325	106.8	94.1	36.6	124	76	80	278	7.93	35.	3	15	1.5	6
5.5	220	180	1.24	4055	16.8	88.2	95	1027	685	85.7	73.5	47.1	160	60	99	202	5.73	39.	4	17	1.7	7
6.0	240	197	1.35	4236	17.6	84.5	116	1386	986	72.3	61.2	53.8	190	50	112	166	4.72	42.	5	20	1.9	8
6.5	260	213	1.46	4409	18.3	81.2	133	1689	1220	62.8	52.7	58.6	218	42	121	144	4.10	45.	5	22	2.0	10
7.0	280	229	1.57	4576	19.0	78.2	148	1948	1132	55.6	46.4	62.2	244	36	129	130	3.67	48.	6	24	2.2	11
7.5	300	246	1.69	4738	19.6	75.6	162	2173	1057	50.0	41.5	65.0	268	32	135	118	3.36	51.	6	25	2.3	12
8.0	320	262	1.80	4894	20.3	73.2	175	2369	991	45.4	37.6	67.3	292	28	141	110	3.11	54.	7	27	2.4	13
8.5	340	278	1.91	5045	20.9	71.0	187	2542	933	41.6	34.4	69.2	315	25	146	103	2.91	58.	7	28	2.5	14
9.0	360	295	2.02	5192	21.5	69.0	198	2696	881	38.4	31.7	70.8	337	23	150	97	2.75	61.	8	30	2.7	15
9.5	380	311	2.14	5335	22.1	67.1	209	2834	834	35.7	29.4	72.2	359	21	154	92	2.61	64.	8	31	2.8	16
10.0	400	328	2.25	5474	22.7	65.4	219	2957	793	33.3	27.4	73.4	381	19	158	88	2.49	67.	8	33	2.9	17
10.5	420	344	2.36	5610	23.2	63.9	228	3069	755	31.2	25.7	74.4	402	18	161	84	2.38	70.	9	34	3.0	18
11.0	440	360	2.47	5743	23.8	62.4	238	3171	720	29.4	24.2	75.3	423	17	164	81	2.29	73.	9	35	3.1	19
11.5	460	377	2.59	5873	24.3	61.0	247	3264	689	27.8	22.9	76.1	444	16	167	78	2.21	76.	10	37	3.2	20
12.0	480	393	2.70	6000	24.8	59.7	255	3349	660	26.3	21.7	76.8	465	15	170	75	2.13	79.	10	38	3.3	21
13.0	520	426	2.92	6247	25.8	57.4	272	3499	610	23.9	19.6	78.1	507	13	176	71	2.01	84.	11	40	3.4	23
14.0	560	459	3.15	6484	26.8	55.3	287	3628	566	21.8	17.9	79.1	548	12	181	67	1.90	90.	11	43	3.6	24
15.0	600	491	3.37	6714	27.8	53.4	302	3739	528	20.1	16.5	80.0	589	11	185	64	1.81	96.	12	45	3.8	26
16.0	640	524	3.60	6936	28.7	51.7	316	3837	495	18.6	15.3	80.7	630	10	190	61	1.73	101.	13	47	3.9	28
17.0	680	557	3.82	7151	29.5	50.2	329	3923	466	17.3	14.2	81.3	671	9	195	58	1.66	107.	14	50	4.1	29
18.0	720	590	4.05	7360	30.4	48.8	342	3999	440	16.2	13.3	81.9	711	9	199	56	1.59	112.	14	52	4.2	31
19.0	760	622	4.27	7564	31.2	47.5	354	4068	417	15.3	12.5	82.4	752	8	203	54	1.54	118.	15	54	4.3	32
20.0	800	655	4.50	7762	32.0	46.3	366	4129	396	14.4	11.8	82.8	793	7	207	52	1.49	123.	16	56	4.5	33
25.0	1000	819	5.62	8690	35.8	41.4	421	4363	317	11.2	9.2	84.4	994	6	226	46	1.29	148.	19	66	5.1	40
30.0	1200	983	6.75	9532	39.2	37.8	470	4518	264	9.2	7.5	85.4	1195	5	243	41	1.16	173.	22	76	5.7	45
35.0	1400	1147	7.87	10310	42.4	35.0	514	4629	226	7.8	6.4	86.1	1396	4	259	37	1.06	196.	25	85	6.2	
40.0	1600	1310	8.99	11036	45.3	32.7	554	4712	198	6.8	5.5	86.6	1597	3	275	35	0.98	217.	29	94	6.6	
45.0	1800	1474	10.12	11721	48.1	30.8	592	4776	176	6.0	4.9	87.0	1797	3	290	32	0.92	239.	32	102	7.1	
50.0	2000	1638	11.24	12371	50.7	29.3	627	4828	158	5.3	4.4	87.3	1997	3	304	31	0.87	259.	35	111	7.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#205 40 Ar on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 79. ZC= 97.(Bk)
NEUTRON NUMBERS: NP= 22. NT=118. NC=140.

AP**1/3= 3.420 AT**1/3= 5.819
REDUCED MASS NUMBER= 33.25 AP+AT=AC=237.

INTERACTION RADIUS RINT=13.14 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.68 CT+CP=10.27 C= 2.34

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.55 RC=RCP+RCT=10.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 273.18 MeV K= .15759 n=2.642
VC(RINT)= 155.6 MeV

FISSION-TKE= 185. MeV
ASYMM. FISSION-TKE= 112. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 26.29 MeV
L-RLD= 65 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.03 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -28.6
COMPOUND NUCLEUS: 54.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.85 fm V(RB)= 161.6 MeV
Q-VALUE= -117.3 MeV
L-CRITICAL= 113.

40 Ar on 197 Au — 40 Ar on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	40	33	0.21	1727	7.3	223.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	66	0.43	2443	10.3	158.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	100	0.64	2993	12.6	129.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	160	133	0.85	3457	14.5	112.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	180	150	0.96	3667	15.4	105.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	200	166	1.07	3866	16.3	100.1	54	355	124	123.7	112.9	28.2	113	87	73	395	10.59	33.	3 14	1.3	4
5.5	220	183	1.18	4055	17.1	95.5	86	823	514	95.8	84.1	42.1	152	68	94	247	6.58	36.	4 17	1.5	6
6.0	240	199	1.28	4236	17.8	91.4	110	1211	838	79.7	68.8	50.2	185	55	109	195	5.18	39.	5 19	1.7	7
6.5	260	216	1.39	4409	18.5	87.8	129	1539	1113	68.6	58.6	55.7	214	46	120	166	4.41	42.	5 21	1.8	9
7.0	280	233	1.50	4576	19.2	84.6	145	1819	1104	60.4	51.3	59.8	240	40	128	147	3.91	45.	6 23	2.0	10
7.5	300	249	1.60	4738	19.9	81.8	160	2062	1030	54.0	45.7	63.0	265	35	135	133	3.54	48.	6 25	2.1	12
8.0	320	266	1.71	4894	20.6	79.2	174	2275	966	48.9	41.2	65.5	289	31	140	123	3.26	51.	7 26	2.2	13
8.5	340	283	1.82	5045	21.2	76.8	187	2462	909	44.7	37.6	67.6	312	28	145	115	3.04	54.	7 28	2.4	14
9.0	360	299	1.92	5192	21.8	74.6	199	2628	858	41.2	34.6	69.4	335	25	150	108	2.86	57.	8 29	2.5	15
9.5	380	316	2.03	5335	22.4	72.6	210	2777	813	38.2	32.0	70.9	357	23	154	102	2.71	60.	8 31	2.6	16
10.0	400	332	2.14	5474	23.0	70.8	220	2911	772	35.6	29.8	72.2	379	21	157	97	2.58	63.	8 32	2.7	17
10.5	420	349	2.24	5610	23.6	69.1	230	3032	736	33.4	27.9	73.3	401	19	161	93	2.46	65.	9 33	2.8	18
11.0	440	366	2.35	5743	24.1	67.5	240	3141	702	31.4	26.2	74.3	422	18	164	89	2.37	68.	9 35	2.9	19
11.5	460	382	2.46	5873	24.7	66.0	250	3242	672	29.6	24.8	75.2	443	17	167	86	2.28	71.	10 36	3.0	20
12.0	480	399	2.56	6000	25.2	64.6	259	3334	644	28.1	23.4	76.0	464	16	170	83	2.20	74.	10 37	3.1	21
13.0	520	432	2.78	6247	26.2	62.1	276	3496	594	25.4	21.2	77.3	506	14	175	78	2.06	79.	11 40	3.3	23
14.0	560	465	2.99	6484	27.2	59.8	292	3636	552	23.2	19.3	78.4	547	13	180	73	1.95	84.	11 42	3.4	25
15.0	600	499	3.21	6714	28.2	57.8	307	3756	515	21.3	17.8	79.3	588	12	184	70	1.85	90.	12 44	3.6	26
16.0	640	532	3.42	6936	29.1	56.0	322	3862	483	19.8	16.5	80.1	629	11	189	67	1.77	95.	13 47	3.7	28
17.0	680	565	3.63	7151	30.0	54.3	335	3955	454	18.4	15.3	80.8	670	10	193	64	1.69	100.	13 49	3.9	30
18.0	720	598	3.85	7360	30.9	52.8	349	4037	429	17.2	14.3	81.4	711	9	197	61	1.63	106.	14 51	4.0	31
19.0	760	632	4.06	7564	31.7	51.4	362	4111	406	16.2	13.5	81.9	752	8	201	59	1.57	110.	15 53	4.2	33
20.0	800	665	4.27	7762	32.5	50.1	374	4178	386	15.2	12.7	82.4	792	8	205	57	1.52	116.	15 55	4.3	34
25.0	1000	831	5.34	8690	36.4	44.8	431	4430	309	11.9	9.9	84.1	994	6	222	50	1.32	139.	19 65	4.9	41
30.0	1200	997	6.41	9532	39.8	40.9	481	4598	257	9.7	8.1	85.1	1195	5	238	44	1.18	162.	22 74	5.5	47
35.0	1400	1164	7.48	10310	43.0	37.8	526	4718	220	8.2	6.8	85.9	1396	4	253	41	1.08	184.	25 83	5.9	
40.0	1600	1330	8.55	11036	46.0	35.4	568	4808	193	7.1	5.9	86.4	1597	3	268	38	1.00	205.	28 92	6.4	
45.0	1800	1496	9.62	11721	48.8	33.4	607	4878	171	6.3	5.2	86.9	1797	3	282	35	0.94	224.	31 100	6.8	
50.0	2000	1662	10.69	12371	51.4	31.7	643	4934	154	5.6	4.7	87.2	1997	3	295	33	0.88	243.	35 109	7.2	

#206 40 Ar on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 82. ZC=100.(Fm)
NEUTRON NUMBERS: NP= 22. NT=126. NC=148.

AP**1/3= 3.420 AT**1/3= 5.925
REDUCED MASS NUMBER= 33.55 AP+AT=AC=248.

INTERACTION RADIUS RINT=13.26 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.82 CT+CP=10.41 C= 2.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.66 RC=RCP+RCT=10.43

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 280.17 MeV K= .15354 n=2.650
VC(RINT)= 160.1 MeV

FISSION-TKE= 193. MeV
ASYMM. FISSION-TKE= 114. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 26.25 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.98 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -19.5
COMPOUND NUCLEUS: 73.1

FUSION RELATED PARAMETERS:
R-BARRIER=11.96 fm V(RB)= 166.1 MeV
Q-VALUE= -127.2 MeV
L-CRITICAL= 114.

40 Ar on 208 Pb — 40 Ar on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	40	34	0.21	1727	7.3	232.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	67	0.42	2443	10.4	164.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	101	0.63	2993	12.7	134.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	160	134	0.84	3457	14.7	116.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	180	151	0.94	3667	15.6	109.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	200	168	1.05	3866	16.4	103.9	46	256	44	132.4	123.1	23.8	109	91	71	487	12.72	32.	3 13	1.1	4
5.5	220	185	1.15	4055	17.2	99.1	83	743	448	100.3	89.2	39.8	150	70	93	272	7.06	35.	4 16	1.4	6
6.0	240	201	1.26	4236	18.0	94.9	108	1146	785	82.8	72.3	48.6	183	57	108	210	5.42	38.	5 19	1.5	7
6.5	260	218	1.36	4409	18.7	91.2	128	1486	1070	71.1	61.3	54.5	212	48	119	177	4.57	40.	5 21	1.7	9
7.0	280	235	1.47	4576	19.4	87.8	145	1777	1095	62.4	53.5	58.8	239	41	127	156	4.02	43.	6 23	1.9	10
7.5	300	252	1.57	4738	20.1	84.9	161	2029	1022	55.7	47.6	62.1	265	35	134	141	3.63	46.	6 24	2.0	11
8.0	320	268	1.68	4894	20.8	82.2	175	2250	958	50.4	42.9	64.8	289	31	140	129	3.34	49.	7 26	2.1	12
8.5	340	285	1.78	5045	21.4	79.7	188	2444	902	46.0	39.1	67.0	312	28	145	120	3.11	52.	7 27	2.3	14
9.0	360	302	1.89	5192	22.0	77.5	200	2617	851	42.4	35.9	68.8	335	25	149	113	2.92	55.	8 29	2.4	15
9.5	380	319	1.99	5335	22.6	75.4	211	2771	807	39.3	33.2	70.4	357	23	153	107	2.76	57.	8 30	2.5	16
10.0	400	335	2.10	5474	23.2	73.5	222	2910	766	36.6	30.9	71.7	379	21	156	102	2.62	60.	8 32	2.6	17
10.5	420	352	2.20	5610	23.8	71.7	233	3035	730	34.3	28.9	72.9	400	20	160	97	2.51	63.	9 33	2.7	18
11.0	440	369	2.31	5743	24.3	70.1	243	3149	697	32.2	27.2	73.9	422	18	163	93	2.40	65.	9 34	2.8	20
11.5	460	386	2.41	5873	24.9	68.5	252	3254	666	30.4	25.6	74.8	443	17	166	90	2.31	68.	9 36	2.9	21
12.0	480	403	2.51	6000	25.4	67.1	261	3349	638	28.8	24.3	75.6	464	16	168	86	2.23	71.	10 37	3.0	22
13.0	520	436	2.72	6247	26.5	64.5	279	3518	589	26.0	21.9	77.0	506	14	173	81	2.09	76.	11 39	3.2	24
14.0	560	470	2.93	6484	27.5	62.1	295	3662	547	23.7	20.0	78.1	547	13	178	77	1.97	81.	11 42	3.3	25
15.0	600	503	3.14	6714	28.4	60.0	311	3788	511	21.8	18.4	79.1	588	12	183	73	1.88	86.	12 44	3.5	27
16.0	640	537	3.35	6936	29.4	58.1	326	3897	479	20.2	17.0	79.9	629	11	187	69	1.79	91.	13 46	3.6	29
17.0	680	570	3.56	7151	30.3	56.4	340	3994	451	18.8	15.8	80.6	670	10	191	66	1.71	96.	13 48	3.8	31
18.0	720	604	3.77	7360	31.1	54.8	354	4079	425	17.6	14.8	81.2	711	9	195	64	1.65	101.	14 50	3.9	32
19.0	760	637	3.98	7564	32.0	53.3	367	4156	403	16.5	13.9	81.7	751	9	198	62	1.59	106.	15 52	4.1	34
20.0	800	671	4.19	7762	32.8	52.0	380	4225	383	15.6	13.1	82.2	792	8	202	60	1.54	111.	15 54	4.2	35
25.0	1000	839	5.24	8690	36.7	46.5	437	4467	306	12.1	10.2	83.9	994	6	219	52	1.33	133.	19 64	4.8	43
30.0	1200	1006	6.29	9532	40.2	42.4	489	4642	255	9.9	8.3	85.0	1195	5	234	46	1.19	155.	22 73	5.3	49
35.0	1400	1174	7.33	10310	43.4	39.3	535	4786	219	8.4	7.0	85.8	1396	4	248	42	1.09	177.	25 82	5.8	
40.0	1600	1342	8.38	11036	46.4	36.7	577	4880	191	7.3	6.1	86.4	1597	3	262	39	1.01	197.	28 91	6.3	
45.0	1800	1510	9.43	11721	49.2	34.6	617	4952	170	6.4	5.4	86.8	1797	3	275	37	0.95	215.	31 99	6.7	
50.0	2000	1677	10.48	12371	51.9	32.9	654	5010	153	5.8	4.8	87.1	1997	3	288	35	0.89	234.	34 107	7.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#207 40 Ar on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 83. ZC=101.(Md)
NEUTRON NUMBERS: NP= 22. NT=126. NC=148.

AP**1/3= 3.420 AT**1/3= 5.934
REDUCED MASS NUMBER= 33.57 AP+AT=AC=249.

INTERACTION RADIUS RINT=13.27 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.83 CT+CP=10.42 C= 2.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.68 RC=RCP+RCT=10.45

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 282.99 MeV K= .15270 n=2.654
VC(RINT)= 161.9 MeV

FISSION-TKE= 196. MeV
ASYMM. FISSION-TKE= 115. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 26.36 MeV
L-RLD= 59 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.97 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: -16.5
COMPOUND NUCLEUS: 78.3

FUSION RELATED PARAMETERS:
R-BARRIER=11.96 fm V(RB)= 168.0 MeV
Q-VALUE= -129.4 MeV
L-CRITICAL= 113.

40 Ar on 209 Bi — 40 Ar on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	34	0.21	1727	7.3	235.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	67	0.41	2443	10.4	166.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	101	0.62	2993	12.7	135.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	160	134	0.83	3457	14.7	117.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	180	151	0.93	3667	15.6	110.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	200	168	1.04	3866	16.4	105.2	40	199	0	138.1	129.6	21.0	106	94	68	559	14.50	0.	3 13	1.1	4
5.5	220	185	1.14	4055	17.2	100.3	80	692	405	103.0	91.9	38.5	147	73	91	286	7.32	35.	4 16	1.3	5
6.0	240	201	1.24	4236	18.0	96.0	105	1100	746	84.7	74.0	47.7	181	59	107	217	5.54	37.	5 18	1.5	7
6.5	260	218	1.35	4409	18.7	92.3	126	1445	1034	72.4	62.7	53.8	211	49	118	182	4.64	40.	5 21	1.7	8
7.0	280	235	1.45	4576	19.4	88.9	144	1740	1065	63.5	54.6	58.2	238	42	127	159	4.07	43.	6 22	1.8	10
7.5	300	252	1.56	4738	20.1	85.9	159	1995	1012	56.7	48.5	61.7	264	36	134	144	3.67	46.	6 24	2.0	11
8.0	320	269	1.66	4894	20.8	83.2	174	2218	949	51.2	43.6	64.4	288	32	140	132	3.37	49.	7 26	2.1	12
8.5	340	285	1.76	5045	21.4	80.7	187	2414	893	46.7	39.7	66.6	311	29	145	123	3.13	52.	7 27	2.2	13
9.0	360	302	1.87	5192	22.0	78.4	199	2589	844	43.0	36.5	68.5	334	26	149	115	2.94	54.	8 29	2.4	15
9.5	380	319	1.97	5335	22.6	76.3	211	2745	799	39.8	33.7	70.1	356	24	153	109	2.78	57.	8 30	2.5	16
10.0	400	336	2.07	5474	23.2	74.4	222	2886	759	37.1	31.4	71.4	378	22	157	103	2.64	60.	8 32	2.6	17
10.5	420	353	2.18	5610	23.8	72.6	232	3013	723	34.7	29.4	72.6	400	20	160	99	2.52	63.	9 33	2.7	18
11.0	440	369	2.28	5743	24.4	70.9	242	3129	690	32.7	27.6	73.7	421	19	163	95	2.42	65.	9 34	2.8	19
11.5	460	386	2.38	5873	24.9	69.4	252	3234	660	30.8	26.0	74.6	442	18	166	91	2.32	68.	9 35	2.9	20
12.0	480	403	2.49	6000	25.4	67.9	261	3331	633	29.2	24.6	75.4	464	16	169	88	2.24	71.	10 37	3.0	21
13.0	520	436	2.70	6247	26.5	65.2	279	3501	584	26.4	22.2	76.8	505	15	174	82	2.10	76.	11 39	3.1	23
14.0	560	470	2.90	6484	27.5	62.9	295	3648	542	24.1	20.3	78.0	547	13	179	78	1.98	81.	11 41	3.3	25
15.0	600	504	3.11	6714	28.4	60.7	311	3775	506	22.1	18.6	78.9	588	12	183	74	1.88	86.	12 44	3.5	27
16.0	640	537	3.32	6936	29.4	58.8	326	3885	474	20.5	17.2	79.8	629	11	188	70	1.80	91.	13 46	3.6	28
17.0	680	571	3.53	7151	30.3	57.1	340	3983	446	19.1	16.0	80.5	670	10	192	67	1.72	96.	13 48	3.8	30
18.0	720	604	3.73	7360	31.2	55.4	354	4070	422	17.8	15.0	81.1	711	9	195	65	1.65	101.	14 50	3.9	32
19.0	760	638	3.94	7564	32.0	54.0	367	4148	399	16.7	14.1	81.6	751	9	199	62	1.59	106.	15 52	4.0	33
20.0	800	671	4.15	7762	32.8	52.6	380	4218	379	15.8	13.3	82.1	792	8	203	60	1.54	110.	15 54	4.2	35
25.0	1000	839	5.18	8690	36.7	47.0	438	4483	303	12.3	10.3	83.9	994	6	220	52	1.34	133.	19 64	4.8	42
30.0	1200	1007	6.22	9532	40.2	42.9	489	4660	253	10.0	8.4	85.0	1195	5	235	47	1.20	156.	22 73	5.3	48
35.0	1400	1175	7.26	10310	43.4	39.8	535	4786	217	8.5	7.1	85.8	1396	4	249	43	1.09	176.	25 82	5.8	
40.0	1600	1343	8.29	11036	46.4	37.2	578	4890	189	7.4	6.2	86.3	1596	4	263	40	1.01	196.	28 91	6.2	
45.0	1800	1511	9.33	11721	49.3	35.1	618	4953	168	6.5	5.5	86.7	1797	3	276	37	0.95	215.	31 99	6.7	
50.0	2000	1679	10.37	12371	51.9	33.3	655	5012	151	5.8	4.9	87.1	1997	3	288	35	0.89	233.	34 107	7.1	

#208 40 Ar on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 18. ZT= 92. ZC=110.( )
NEUTRON NUMBERS: NP= 22. NT=146. NC=168.

AP**1/3= 3.420 AT**1/3= 6.197
REDUCED MASS NUMBER= 34.24 AP+AT=AC=278.

INTERACTION RADIUS RINT=13.55 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 7.16 CT+CP=10.76 C= 2.39

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.77 RCT= 6.98 RC=RCP+RCT=10.75

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 304.15 MeV K= .14195 n=2.681
VC(RINT)= 175.7 MeV

FISSION-TKE= 221. MeV
ASYMM. FISSION-TKE= 121. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.878 MeV/fm**2 PROX-FACTOR= 26.39 MeV
L-RLD= 40 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -34.6 TARGET: 47.2
COMPOUND NUCLEUS: 147.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.23 fm V(RB)= 182.0 MeV
Q-VALUE= -134.7 MeV
L-CRITICAL= 113.

40 Ar on 238 U — 40 Ar on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	34	0.19	1727	7.5	260.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	68	0.39	2443	10.6	184.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	103	0.58	2993	13.0	150.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	160	137	0.78	3457	15.0	130.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	180	154	0.88	3667	15.9	122.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	200	171	0.97	3866	16.7	116.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	220	188	1.07	4055	17.6	111.2	61	393	158	122.4	113.6	28.8	137	83	85	429	10.18	31.	4 15	1.2	6
6.0	240	205	1.17	4236	18.3	106.5	94	847	536	97.0	87.3	41.5	174	66	103	280	6.60	34.	4 17	1.4	8
6.5	260	223	1.27	4409	19.1	102.3	118	1230	856	81.6	72.4	49.2	205	55	116	223	5.25	36.	5 20	1.6	9
7.0	280	240	1.36	4576	19.8	98.6	139	1557	1034	70.9	62.3	54.6	234	46	125	191	4.49	39.	6 21	1.7	11
7.5	300	257	1.46	4738	20.5	95.2	156	1841	965	62.8	54.9	58.6	260	40	133	169	3.99	41.	6 23	1.9	12
8.0	320	274	1.56	4894	21.2	92.2	172	2089	905	56.5	49.2	61.8	285	35	139	154	3.62	44.	7 25	2.0	14
8.5	340	291	1.66	5045	21.8	89.4	186	2307	852	51.3	44.6	64.3	309	31	144	142	3.34	46.	7 26	2.1	15
9.0	360	308	1.75	5192	22.5	86.9	199	2501	804	47.1	40.8	66.5	332	28	149	133	3.12	49.	7 28	2.2	16
9.5	380	325	1.85	5335	23.1	84.6	212	2675	762	43.5	37.6	68.2	354	26	153	125	2.93	51.	8 29	2.3	18
10.0	400	342	1.95	5474	23.7	82.5	224	2831	724	40.4	34.9	69.8	376	24	156	118	2.78	54.	8 31	2.4	19
10.5	420	360	2.05	5610	24.3	80.5	235	2972	689	37.8	32.6	71.1	398	22	160	113	2.65	56.	9 32	2.5	20
11.0	440	377	2.14	5743	24.8	78.6	246	3100	658	35.5	30.6	72.3	420	20	163	108	2.53	58.	9 33	2.6	21
11.5	460	394	2.24	5873	25.4	76.9	256	3217	629	33.4	28.8	73.3	441	19	165	103	2.43	61.	9 34	2.7	22
12.0	480	411	2.34	6000	25.9	75.3	266	3325	603	31.6	27.2	74.2	462	18	168	99	2.34	63.	10 36	2.8	23
13.0	520	445	2.53	6247	27.0	72.3	285	3514	557	28.5	24.5	75.7	504	16	173	93	2.19	68.	10 38	3.0	25
14.0	560	479	2.73	6484	28.0	69.7	302	3677	517	26.0	22.3	77.0	546	14	177	88	2.06	72.	11 40	3.1	28
15.0	600	514	2.92	6714	29.0	67.3	319	3818	482	23.9	20.5	78.1	587	13	181	83	1.95	77.	12 42	3.3	29
16.0	640	548	3.12	6936	30.0	65.2	335	3941	452	22.1	18.9	79.0	628	12	185	79	1.86	82.	12 45	3.4	31
17.0	680	582	3.31	7151	30.9	63.2	350	4049	426	20.5	17.6	79.7	669	11	189	76	1.78	86.	13 47	3.6	33
18.0	720	616	3.51	7360	31.8	61.5	364	4146	402	19.2	16.4	80.4	710	10	193	73	1.71	90.	14 49	3.7	35
19.0	760	651	3.70	7564	32.6	59.8	378	4232	381	18.0	15.4	81.0	751	9	196	70	1.65	95.	14 51	3.9	36
20.0	800	685	3.90	7762	33.5	58.3	391	4310	362	16.9	14.5	81.5	791	9	199	68	1.59	99.	15 53	4.0	38
25.0	1000	856	4.87	8690	37.4	52.2	452	4605	289	13.2	11.3	83.4	994	6	214	58	1.38	120.	18 62	4.6	46
30.0	1200	1027	5.85	9532	41.0	47.6	506	4801	241	10.7	9.2	84.6	1195	5	228	52	1.23	140.	22 71	5.1	53
35.0	1400	1199	6.82	10310	44.3	44.1	555	4941	206	9.1	7.8	85.5	1396	4	241	48	1.12	159.	25 80	5.5	
40.0	1600	1370	7.80	11036	47.4	41.2	599	5046	181	7.9	6.7	86.1	1596	4	253	44	1.04	177.	28 88	6.0	
45.0	1800	1541	8.77	11721	50.2	38.9	641	5127	160	6.9	5.9	86.5	1797	3	264	41	0.97	195.	31 96	6.4	
50.0	2000	1712	9.74	12371	53.0	36.9	680	5192	144	6.2	5.3	86.9	1997	3	275	39	0.91	211.	34 104	6.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 40 Ar

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#209 40 Ca on 12 C

40 Ca on 12 C

40 Ca on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 6. ZC= 26.(Fe)
NEUTRON NUMBERS: NP= 20. NT= 6. NC= 26.

AP**1/3= 3.420 AT**1/3= 2.289 ELSCAT <17 deg
REDUCED MASS NUMBER= 9.23 AP+AT=AC= 52.

INTERACTION RADIUS RINT= 9.30 fm RO= 1.63 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 2.12 CT+CP= 5.71 C̄= 1.33

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 2.52

COULOMB RADII [fm]:
RCP= 3.84 RCT= 2.51 RC=RCP+RCT= 6.36

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 37.64 MeV K= .08744 n=2.589
VC(RINT)= 18.5 MeV

FISSION-TKE= 42. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 15.96 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 20.89 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: 0.0
COMPOUND NUCLEUS: -51.2

FUSION RELATED PARAMETERS:
R-BARRIER= 8.44 fm V(RB)= 19.0 MeV
Q-VALUE= 18.2 MeV
L-CRITICAL= 32.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	9	0.50	1727	2.0	18.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	80	18	1.00	2443	2.9	13.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	120	28	1.49	2993	3.5	10.9	19	995	703	60.6	12.8	59.7	98	22	0	19	4.23	89.	0	2.7	2
4.0	160	37	1.99	3457	4.0	9.4	26	1456	1087	39.3	8.8	70.4	147	13	141	13	2.98	118.	4	2.9	2
4.5	180	42	2.24	3667	4.3	8.9	30	1607	1215	33.5	7.5	73.3	169	11	158	12	2.67	133.	5	3.0	2
5.0	200	46	2.49	3866	4.5	8.5	32	1727	1318	29.2	6.6	75.4	191	9	175	11	2.43	145.	6	3.1	3
5.5	220	51	2.74	4055	4.7	8.1	35	1825	1401	25.9	5.9	77.1	212	8	191	10	2.25	159.	6	3.3	3
6.0	240	55	2.99	4236	4.9	7.7	38	1906	1358	23.2	5.3	78.4	233	7	206	9	2.11	174.	7	3.4	3
6.5	260	60	3.24	4409	5.1	7.4	40	1974	1254	21.1	4.8	79.5	254	6	221	9	1.99	188.	7	3.5	3
7.0	280	65	3.48	4576	5.3	7.1	42	2032	1164	19.3	4.4	80.3	274	6	236	8	1.88	199.	8	3.6	4
7.5	300	69	3.73	4738	5.5	6.9	44	2082	1086	17.8	4.1	81.1	295	5	251	8	1.80	213.	8	3.7	4
8.0	320	74	3.98	4894	5.7	6.7	46	2126	1018	16.5	3.8	81.7	315	5	265	8	1.72	227.	9	3.8	4
8.5	340	78	4.23	5045	5.9	6.5	48	2164	958	15.4	3.5	82.3	336	4	279	7	1.65	241.	9	3.9	4
9.0	360	83	4.48	5192	6.1	6.3	50	2198	905	14.5	3.3	82.8	356	4	294	7	1.59	255.	10	3.9	4
9.5	380	88	4.73	5335	6.2	6.1	51	2229	858	13.6	3.1	83.2	376	4	308	7	1.54	270.	10	4.0	4
10.0	400	92	4.98	5474	6.4	6.0	53	2255	815	12.8	3.0	83.6	396	4	322	7	1.49	278.	11	4.1	5
10.5	420	97	5.23	5610	6.5	5.8	55	2280	776	12.2	2.8	83.9	417	3	336	6	1.44	292.	11	4.2	5
11.0	440	102	5.48	5743	6.7	5.7	56	2302	741	11.6	2.7	84.2	437	3	350	6	1.40	306.	12	4.3	5
11.5	460	106	5.72	5873	6.8	5.6	58	2322	708	11.0	2.5	84.5	457	3	364	6	1.37	320.	13	4.4	5
12.0	480	111	5.97	6000	7.0	5.5	59	2341	679	10.5	2.4	84.8	477	3	377	6	1.33	334.	13	4.6	5
13.0	520	120	6.47	6247	7.3	5.2	62	2374	627	9.6	2.2	85.2	517	3	405	6	1.27	354.	14	4.9	6
14.0	560	129	6.97	6484	7.6	5.0	65	2401	582	8.9	2.0	85.6	558	2	432	5	1.22	381.	15	5.2	6
15.0	600	138	7.47	6714	7.8	4.9	68	2425	543	8.2	1.9	85.9	598	2	459	5	1.17	408.	16	5.5	6
16.0	640	148	7.96	6936	8.1	4.7	70	2446	509	7.7	1.8	86.2	638	2	486	5	1.12	426.	17	5.8	7
17.0	680	157	8.46	7151	8.3	4.6	73	2465	479	7.2	1.7	86.4	678	2	513	5	1.09	452.	18	6.0	5.2	7
18.0	720	166	8.96	7360	8.6	4.5	75	2481	452	6.8	1.6	86.6	718	2	540	5	1.05	479.	19	6.3	5.3	7
19.0	760	175	9.46	7564	8.8	4.3	77	2495	429	6.4	1.5	86.8	758	2	567	5	1.02	494.	20	6.6	5.5	8
20.0	800	185	9.95	7762	9.0	4.2	80	2508	407	6.1	1.4	87.0	798	2	593	4	0.99	520.	21	6.9	5.6	8
25.0	1000	231	12.44	8690	10.1	3.8	90	2557	326	4.8	1.1	87.6	999	1	725	4	0.88	636.	26	8.2	6.2	9
30.0	1200	277	14.93	9532	11.1	3.4	99	2589	271	4.0	0.9	88.0	1199	1	856	4	0.80	745.	30	9.4	6.7	10
35.0	1400	323	17.42	10310	11.9	3.2	108	2611	232	3.4	0.8	88.3	1399	1	985	3	0.73	828.	35	106	7.2	
40.0	1600	369	19.91	11036	12.8	3.0	116	2628	203	3.0	0.7	88.5	1599	1	1114	3	0.68	923.	40	118	7.7	
45.0	1800	415	22.40	11721	13.5	2.8	123	2641	181	2.6	0.6	88.7	1799	1	1242	3	0.64	1011.	44	129	8.2	
50.0	2000	462	24.89	12371	14.3	2.7	130	2651	163	2.4	0.5	88.8	1999	1	1370	3	0.61	1124.	49	140	8.6	

#210 40 Ca on 16 O

40 Ca on 16 O

40 Ca on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 8. ZC= 28.(Ni)
NEUTRON NUMBERS: NP= 20. NT= 8. NC= 28.

AP**1/3= 3.420 AT**1/3= 2.520 ELSCAT <23 deg
REDUCED MASS NUMBER= 11.43 AP+AT=AC= 56.

INTERACTION RADIUS RINT= 9.56 fm RO= 1.61 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 2.42 CT+CP= 6.02 C̄= 1.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 2.78

COULOMB RADII [fm]:
RCP= 3.84 RCT= 2.78 RC=RCP+RCT= 6.62

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 48.49 MeV K= .11598 n=2.526
VC(RINT)= 24.1 MeV

FISSION-TKE= 44. MeV
ASYMM. FISSION-TKE= 36. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 17.31 MeV
L-RLD= 53 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -4.7
COMPOUND NUCLEUS: -58.3

FUSION RELATED PARAMETERS:
R-BARRIER= 8.64 fm V(RB)= 24.8 MeV
Q-VALUE= 20.5 MeV
L-CRITICAL= 38.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	11	0.47	1727	2.5	25.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	80	23	0.95	2443	3.5	17.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	120	34	1.42	2993	4.3	14.5	23	930	647	65.6	17.4	57.2	91	29	0	27	4.58	83.	0	2.8	2
4.0	160	46	1.90	3457	5.0	12.6	33	1441	1072	42.0	11.6	69.0	143	17	135	18	3.14	108.	4	3.1	3
4.5	180	51	2.14	3667	5.3	11.9	37	1609	1213	35.6	10.0	72.2	166	14	152	16	2.80	122.	5	3.2	3
5.0	200	57	2.37	3866	5.6	11.3	41	1742	1327	31.0	8.7	74.5	188	12	168	15	2.54	135.	5	3.3	3
5.5	220	63	2.61	4055	5.9	10.7	44	1851	1408	27.4	7.7	76.3	210	10	183	14	2.35	146.	6	3.5	4
6.0	240	69	2.85	4236	6.1	10.3	47	1941	1291	24.6	7.0	77.7	231	9	197	13	2.19	159.	7	3.6	4
6.5	260	74	3.09	4409	6.4	9.9	50	2017	1192	22.3	6.3	78.8	252	8	211	12	2.06	172.	7	3.7	4
7.0	280	80	3.32	4576	6.6	9.5	53	2082	1107	20.4	5.8	79.8	273	7	225	11	1.95	186.	8	3.8	4
7.5	300	86	3.56	4738	6.8	9.2	55	2138	1033	18.8	5.4	80.6	293	7	239	11	1.86	199.	8	3.9	4
8.0	320	91	3.80	4894	7.1	8.9	58	2187	968	17.5	5.0	81.3	314	6	252	10	1.78	208.	9	4.0	5
8.5	340	97	4.04	5045	7.3	8.6	60	2230	911	16.3	4.6	81.9	334	6	265	10	1.71	221.	9	4.1	5
9.0	360	103	4.27	5192	7.5	8.4	63	2268	861	15.3	4.3	82.4	355	5	278	10	1.65	234.	10	4.2	5
9.5	380	109	4.51	5335	7.7	8.2	65	2302	815	14.3	4.1	82.8	375	5	291	9	1.59	247.	10	4.3	5
10.0	400	114	4.75	5474	7.9	8.0	67	2333	774	13.5	3.9	83.2	395	5	304	9	1.54	255.	11	4.4	6
10.5	420	120	4.99	5610	8.1	7.8	69	2360	738	12.8	3.7	83.6	416	4	316	9	1.49	268.	11	4.2	4.5	6
11.0	440	126	5.22	5743	8.3	7.6	71	2385	704	12.2	3.5	83.9	436	4	329	8	1.45	280.	12	44	4.6	6
11.5	460	131	5.46	5873	8.5	7.4	73	2408	673	11.6	3.3	84.2	456	4	341	8	1.41	293.	12	45	4.7	6
12.0	480	137	5.70	6000	8.7	7.3	75	2429	645	11.1	3.2	84.5	476	4	354	8	1.37	306.	13	47	4.7	6
13.0	520	149	6.17	6247	9.0	7.0	79	2466	596	10.1	2.9	84.9	517	3	379	8	1.31	325.	14	50	4.9	7
14.0	560	160	6.65	6484	9.4	6.7	82	2497	553	9.3	2.7	85.3	557	3	403	7	1.25	350.	15	53	5.1	7
15.0	600	171	7.12	6714	9.7	6.5	86	2524	516	8.7	2.5	85.7	597	3	427	7	1.20	367.	16	56	5.2	8
16.0	640	183	7.60	6936	10.0	6.3	89	2548	484	8.1	2.3	86.0	637	3	452	7	1.16	392.	17	59	5.4	8
17.0	680	194	8.07	7151	10.3	6.1	92	2569	455	7.6	2.2	86.2	678	2	476	7	1.12	416.	18	62	5.5	8
18.0	720	206	8.55	7360	10.6	5.9	95	2587	430	7.1	2.0	86.4	718	2	500	6	1.08	441.	19	65	5.7	8
19.0	760	217	9.02	7564	10.9	5.8	98	2604	407	6.7	1.9	86.6	758	2	524	6	1.05	455.	20	68	5.8	9
20.0	800	229	9.50	7762	11.2	5.6	101	2618	387	6.4	1.8	86.8	798	2	547	6	1.02	479.	21	70	6.0	9
25.0	1000	286	11.87	8690	12.5	5.0	114	2674	309	5.0	1.4	87.5	998	2	665	5	0.90	574.	25	84	6.6	11
30.0	1200	343	14.24	9532	13.7	4.6	126	2711	258	4.2	1.2	87.9	1199	1	781	5	0.82	673.	30	96	7.2	12
35.0	1400	400	16.62	10310	14.8	4.3	137	2737	221	3.6	1.0	88.2	1399	1	896	4	0.75	750.	34	108	7.8	
40.0	1600	457	18.99	11036	15.8	4.0	147	2756	193	3.1	0.9	88.4	1599	1	1010	4	0.70	836.	39	120	8.3	
45.0	1800	514	21.36	11721	16.8	3.8	156	2771	172	2.7	0.8	88.6	1799	1	1123	4	0.66	918.	44	131	8.7	
50.0	2000	571	23.74	12371	17.7	3.6	165	2782	154	2.5	0.7	88.8	1999	1	1236	4	0.62	994.	48	143	9.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#211 40 Ca on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 13. ZC= 33.(As)
NEUTRON NUMBERS: NP= 20. NT= 14. NC= 34.

AP**1/3= 3.420 AT**1/3= 3.000 ELSCAT <42 deg
REDUCED MASS NUMBER= 16.12 AP+AT=AC= 67.

INTERACTION RADIUS RINT=10.08 fm RO= 1.57 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 3.05 CT+CP= 6.64 C= 1.65

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 3.35

COULOMB RADII [fm]:
RCP= 3.84 RCT= 3.32 RC=RCP+RCT= 7.16

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 73.40 MeV K= .16702 n=2.460
VC(RINT)= 37.1 MeV

FISSION-TKE= 51. MeV
ASYMM. FISSION-TKE= 49. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 19.71 MeV
L-RLD= 61 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.14 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -20.6
COMPOUND NUCLEUS: -57.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.07 fm V(RB)= 38.6 MeV
Q-VALUE= 3.4 MeV
L-CRITICAL= 53.

40 Ca on 27 Al — 40 Ca on 27 Al

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	16	0.43	1727	3.5	40.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	32	0.87	2443	5.0	28.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	48	1.30	2993	6.1	23.6	30	793	523	77.1	29.7	51.5	75	45	0	49	5.46	68.	0 0	2.5	3
4.0	160	64	1.74	3457	7.1	20.5	46	1414	1038	47.7	18.9	66.2	135	25	122	31	3.50	91.	4 16	2.8	3
4.5	180	73	1.96	3667	7.5	19.3	53	1619	1210	40.2	16.0	69.9	160	20	138	28	3.08	101.	5 19	3.0	4
5.0	200	81	2.17	3866	7.9	18.3	58	1783	1347	34.8	13.9	72.6	183	17	152	25	2.78	112.	5 22	3.2	4
5.5	220	89	2.39	4055	8.3	17.5	64	1916	1344	30.7	12.3	74.6	205	15	165	23	2.55	123.	6 24	3.3	4
6.0	240	97	2.61	4236	8.6	16.7	68	2026	1232	27.5	11.0	76.3	227	13	178	21	2.37	133.	6 26	3.5	5
6.5	260	105	2.83	4409	9.0	16.1	73	2120	1137	24.9	10.0	77.6	248	12	190	20	2.23	144.	7 28	3.6	5
7.0	280	113	3.04	4576	9.3	15.5	77	2200	1056	22.7	9.1	78.6	270	10	201	19	2.10	152.	8 31	3.7	6
7.5	300	121	3.26	4738	9.7	14.9	81	2269	985	20.9	8.4	79.5	291	9	212	18	2.00	163.	8 33	3.9	6
8.0	320	129	3.48	4894	10.0	14.5	85	2329	924	19.4	7.8	80.3	311	9	223	17	1.91	174.	9 34	4.0	6
8.5	340	137	3.70	5045	10.3	14.0	89	2382	869	18.0	7.3	81.0	332	8	233	16	1.83	185.	9 36	4.1	6
9.0	360	145	3.91	5192	10.6	13.6	92	2429	821	16.9	6.8	81.6	353	7	244	16	1.76	192.	10 38	4.2	7
9.5	380	153	4.13	5335	10.9	13.3	95	2471	778	15.9	6.4	82.1	373	7	254	15	1.70	203.	10 40	4.3	7
10.0	400	161	4.35	5474	11.1	12.9	99	2509	739	15.0	6.0	82.5	393	7	264	15	1.64	214.	11 42	4.4	7
10.5	420	169	4.57	5610	11.4	12.6	102	2543	704	14.2	5.7	82.9	414	6	274	14	1.59	221.	11 43	4.5	8
11.0	440	177	4.78	5743	11.7	12.3	105	2574	672	13.4	5.4	83.3	434	6	284	14	1.55	231.	12 45	4.6	8
11.5	460	185	5.00	5873	12.0	12.1	108	2602	642	12.8	5.1	83.6	455	5	294	13	1.50	242.	12 47	4.7	8
12.0	480	193	5.22	6000	12.2	11.8	111	2628	616	12.2	4.9	83.9	475	5	304	13	1.46	252.	12 48	4.8	8
13.0	520	210	5.65	6247	12.7	11.4	116	2674	568	11.2	4.5	84.4	515	5	323	13	1.39	269.	13 51	5.0	9
14.0	560	226	6.09	6484	13.2	10.9	122	2713	528	10.3	4.1	84.9	556	4	342	12	1.33	289.	14 54	5.2	9
15.0	600	242	6.52	6714	13.7	10.6	127	2747	492	9.5	3.8	85.2	596	4	361	11	1.28	305.	15 57	5.4	10
16.0	640	258	6.96	6936	14.1	10.2	132	2777	462	8.9	3.6	85.6	636	4	380	11	1.23	325.	16 60	5.6	10
17.0	680	274	7.39	7151	14.5	9.9	136	2803	434	8.3	3.4	85.8	677	3	398	11	1.19	339.	17 63	5.8	11
18.0	720	290	7.83	7360	15.0	9.6	141	2826	410	7.8	3.2	86.1	717	3	417	10	1.15	359.	18 66	5.9	11
19.0	760	306	8.26	7564	15.4	9.4	145	2846	389	7.4	3.0	86.3	757	3	435	10	1.12	372.	19 69	6.1	12
20.0	800	322	8.70	7762	15.8	9.2	150	2865	369	7.0	2.8	86.5	797	3	453	10	1.08	392.	20 71	6.2	12
25.0	1000	403	10.87	8690	17.6	8.2	169	2935	295	5.5	2.2	87.2	998	2	542	9	0.96	472.	24 85	7.0	14
30.0	1200	484	13.04	9532	19.3	7.5	187	2981	246	4.6	1.8	87.7	1198	2	630	8	0.87	545.	29 97	7.6	16
35.0	1400	564	15.22	10310	20.9	6.9	203	3014	211	3.9	1.6	88.1	1398	2	716	7	0.80	611.	33 109	8.2	
40.0	1600	645	17.39	11036	22.3	6.5	218	3038	184	3.4	1.4	88.3	1599	1	801	7	0.74	670.	37 121	8.8	
45.0	1800	725	19.56	11721	23.7	6.1	232	3057	164	3.0	1.2	88.5	1799	1	885	6	0.70	737.	41 132	9.3	
50.0	2000	806	21.74	12371	24.9	5.8	246	3072	147	2.7	1.1	88.6	1999	1	969	6	0.66	801.	46 143	9.8	

#212 40 Ca on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 20. ZC= 40.(Zr)
NEUTRON NUMBERS: NP= 20. NT= 20. NC= 40.

INTERACTION RADIUS RINT=10.54 fm RO= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 3.59 CT+CP= 7.18 C= 1.80

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 3.85

COULOMB RADII [fm]:
RCP= 3.84 RCT= 3.84 RC=RCP+RCT= 7.68

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 105.57 MeV K= .21272 n=2.438
VC(RINT)= 54.6 MeV

FISSION-TKE= 62. MeV
ASYMM. FISSION-TKE= 62. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.952 MeV/fm**2 PROX-FACTOR= 21.48 MeV
L-RLD= 67 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.85 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -33.0
COMPOUND NUCLEUS: -56.8

FUSION RELATED PARAMETERS:
R-BARRIER= 9.43 fm V(RB)= 57.3 MeV
Q-VALUE= -9.2 MeV
L-CRITICAL= 64.

40 Ca on 40 Ca — 40 Ca on 40 Ca

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	20	0.37	1727	4.4	63.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	40	0.73	2443	6.2	44.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	60	1.10	2993	7.6	36.4	24	339	125	113.4	56.7	33.3	36	84	0	121	9.20	58.	0 0	2.3	2
4.0	160	80	1.47	3457	8.7	31.5	52	1150	792	62.5	31.2	58.8	117	43	104	56	4.23	77.	4 14	2.7	3
4.5	180	90	1.65	3667	9.3	29.7	61	1417	1015	51.7	25.8	64.2	146	34	122	47	3.58	85.	4 18	2.8	4
5.0	200	100	1.83	3866	9.8	28.2	69	1630	1193	44.1	22.1	67.9	172	28	137	42	3.17	95.	5 21	3.0	4
5.5	220	110	2.02	4055	10.3	26.9	77	1804	1252	38.6	19.3	70.7	196	24	151	38	2.86	103.	6 23	3.2	5
6.0	240	120	2.20	4236	10.7	25.7	83	1948	1147	34.3	17.1	72.9	219	21	162	35	2.64	112.	6 26	3.3	5
6.5	260	130	2.38	4409	11.2	24.7	90	2070	1059	30.9	15.4	74.6	242	18	173	32	2.46	120.	7 28	3.5	6
7.0	280	140	2.57	4576	11.6	23.8	95	2174	983	28.1	14.0	76.0	264	16	183	30	2.31	129.	7 30	3.6	6
7.5	300	150	2.75	4738	12.0	23.0	101	2264	918	25.7	12.9	77.1	285	15	193	29	2.18	139.	8 32	3.8	6
8.0	320	160	2.93	4894	12.4	22.3	106	2343	860	23.8	11.9	78.1	306	14	202	27	2.08	146.	8 34	3.9	7
8.5	340	170	3.12	5045	12.8	21.6	111	2413	810	22.1	11.0	79.0	328	12	211	26	1.98	155.	9 36	4.0	7
9.0	360	180	3.30	5192	13.1	21.0	115	2474	765	20.6	10.3	79.7	348	12	220	25	1.90	162.	9 38	4.1	8
9.5	380	190	3.48	5335	13.5	20.4	120	2529	725	19.3	9.7	80.3	369	11	228	24	1.83	171.	10 39	4.3	8
10.0	400	200	3.67	5474	13.8	19.9	124	2579	688	18.2	9.1	80.9	390	10	237	23	1.77	180.	10 41	4.4	8
10.5	420	210	3.85	5610	14.2	19.4	129	2624	655	17.2	8.6	81.4	411	9	245	23	1.71	186.	11 43	4.5	9
11.0	440	220	4.03	5743	14.5	19.0	133	2664	626	16.3	8.1	81.9	431	9	253	22	1.66	195.	11 44	4.6	9
11.5	460	230	4.22	5873	14.8	18.6	137	2701	598	15.5	7.7	82.3	452	8	261	21	1.61	204.	12 46	4.7	9
12.0	480	240	4.40	6000	15.2	18.2	140	2735	573	14.8	7.4	82.6	472	8	269	21	1.57	210.	12 48	4.8	10
13.0	520	260	4.77	6247	15.8	17.5	148	2795	529	13.5	6.7	83.3	513	7	284	20	1.49	227.	13 51	5.0	10
14.0	560	280	5.13	6484	16.4	16.8	155	2847	491	12.4	6.2	83.8	553	7	300	19	1.42	241.	14 54	5.2	11
15.0	600	300	5.50	6714	16.9	16.3	162	2891	459	11.5	5.7	84.3	594	6	315	18	1.36	255.	15 57	5.4	12
16.0	640	320	5.87	6936	17.5	15.7	168	2930	430	10.7	5.4	84.6	634	6	329	17	1.31	272.	16 59	5.6	12
17.0	680	340	6.23	7151	18.0	15.3	174	2964	405	10.0	5.0	85.0	675	5	344	17	1.26	285.	16 62	5.8	13
18.0	720	360	6.60	7360	18.6	14.8	180	2995	382	9.4	4.7	85.3	715	5	358	16	1.22	301.	17 65	5.9	13
19.0	760	380	6.96	7564	19.1	14.4	186	3022	362	8.9	4.4	85.6	755	5	373	16	1.18	313.	18 68	6.1	14
20.0	800	400	7.33	7762	19.6	14.1	192	3046	344	8.4	4.2	85.8	796	4	387	15	1.15	330.	19 70	6.3	14
25.0	1000	500	9.16	8690	21.9	12.6	218	3139	275	6.6	3.3	86.7	997	3	456	13	1.01	394.	23 83	7.0	17
30.0	1200	600	11.00	9532	24.0	11.5	241	3200	229	5.5	2.7	87.3	1197	3	523	12	0.91	457.	27 95	7.7	19
35.0	1400	700	12.83	10310	25.9	10.6	262	3244	196	4.7	2.3	87.7	1398	2	589	11	0.84	516.	31 107	8.3	
40.0	1600	800	14.66	11036	27.7	10.0	282	3276	172	4.1	2.0	88.0	1598	2	653	10	0.78	570.	35 118	8.9	
45.0	1800	900	16.50	11721	29.3	9.4	300	3302	153	3.6	1.8	88.2	1798	2	717	10	0.73	618.	39 129	9.4	
50.0	2000	1000	18.33	12371	30.9	8.9	317	3322	137	3.2	1.6	88.4	1998	2	780	9	0.69	662.	43 140	10.0	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nms	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#213 40 Ca on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 26. ZC= 46.(Pd)
NEUTRON NUMBERS: NP= 20. NT= 30. NC= 50.

AP**1/3= 3.420 AT**1/3= 3.826
REDUCED MASS NUMBER= 23.33 AP+AT=AC= 96.

INTERACTION RADIUS RINT=10.98 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 4.12 CT+CP= 7.71 C̄= 1.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 4.35

COULOMB RADII [fm]:
RCP= 3.84 RCT= 4.27 RC=RCP+RCT= 8.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 129.86 MeV K= .22554 n=2.445
VC(RINT)= 68.1 MeV

FISSION-TKE= 72. MeV
ASYMM. FISSION-TKE= 70. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.949 MeV/fm**2 PROX-FACTOR= 22.87 MeV
L-RLD= 76 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -61.4
COMPOUND NUCLEUS: -78.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.82 fm V(RB)= 71.4 MeV
Q-VALUE= -16.4 MeV
L-CRITICAL= 76.

40 Ca on 56 Fe

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN—EN	TEMP	MULT
1.0	40	23	0.34	1727	5.1	81.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	80	47	0.69	2443	7.2	57.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	120	70	1.03	2993	8.8	47.3	16	112	0	143.2	98.2	18.4	15	105	0	285	17.70	0.	0	0	3
4.0	160	93	1.37	3457	10.2	40.9	58	1058	709	70.2	41.8	54.9	109	51	92	79	4.78	64.	3	14	4
4.5	180	105	1.54	3667	10.8	38.6	70	1368	967	57.4	33.9	61.3	140	40	111	65	3.95	71.	4	18	5
5.0	200	117	1.71	3866	11.4	36.6	81	1615	1173	48.7	28.7	65.6	167	33	126	57	3.44	79.	5	20	5
5.5	220	128	1.89	4055	12.0	34.9	90	1817	1301	42.4	24.9	68.8	192	28	138	51	3.09	86.	5	23	6
6.0	240	140	2.06	4236	12.5	33.4	98	1985	1193	37.5	22.0	71.2	216	24	148	47	2.83	94.	6	25	6
6.5	260	152	2.23	4409	13.0	32.1	106	2126	1101	33.7	19.7	73.2	239	21	158	43	2.63	100.	7	27	7
7.0	280	163	2.40	4576	13.5	30.9	113	2248	1022	30.6	17.9	74.7	261	19	167	41	2.46	108.	7	29	7
7.5	300	175	2.57	4738	14.0	29.9	120	2353	954	28.0	16.4	76.0	283	17	175	38	2.32	115.	8	31	8
8.0	320	187	2.74	4894	14.4	28.9	126	2445	894	25.8	15.1	77.1	304	16	183	36	2.20	122.	8	33	8
8.5	340	198	2.91	5045	14.9	28.1	132	2525	842	24.0	14.0	78.0	326	14	190	35	2.10	128.	8	35	9
9.0	360	210	3.08	5192	15.3	27.3	138	2597	795	22.3	13.1	78.8	347	13	197	33	2.01	136.	9	37	9
9.5	380	222	3.26	5335	15.7	26.6	144	2661	753	20.9	12.2	79.5	368	12	204	32	1.94	142.	9	38	10
10.0	400	233	3.43	5474	16.1	25.9	149	2719	715	19.7	11.5	80.2	389	11	211	31	1.87	149.	10	40	10
10.5	420	245	3.60	5610	16.5	25.3	154	2771	681	18.6	10.9	80.7	409	11	218	30	1.80	157.	10	42	10
11.0	440	257	3.77	5743	16.9	24.7	159	2819	650	17.6	10.3	81.2	430	10	224	29	1.75	162.	11	43	11
11.5	460	268	3.94	5873	17.3	24.1	164	2862	622	16.7	9.8	81.6	451	9	231	28	1.70	170.	11	45	11
12.0	480	280	4.11	6000	17.7	23.6	169	2902	596	15.9	9.3	82.0	471	9	237	27	1.65	175.	12	46	12
13.0	520	303	4.46	6247	18.4	22.7	178	2972	550	14.5	8.5	82.7	512	8	249	26	1.56	189.	12	49	12
14.0	560	327	4.80	6484	19.1	21.9	187	3032	511	13.4	7.8	83.3	553	7	261	25	1.49	202.	13	52	13
15.0	600	350	5.14	6714	19.8	21.1	195	3084	477	12.4	7.2	83.8	593	7	273	24	1.43	213.	14	55	13
16.0	640	373	5.48	6936	20.4	20.5	203	3129	447	11.5	6.7	84.2	634	6	285	23	1.37	225.	15	58	15
17.0	680	397	5.83	7151	21.0	19.9	210	3169	421	10.8	6.3	84.6	674	6	296	22	1.32	236.	16	61	16
18.0	720	420	6.17	7360	21.7	19.3	218	3204	397	10.1	5.9	84.9	715	5	307	21	1.28	250.	17	63	16
19.0	760	443	6.51	7564	22.2	18.8	225	3236	376	9.6	5.6	85.2	755	5	318	20	1.24	260.	17	66	17
20.0	800	467	6.86	7762	22.8	18.3	232	3265	357	9.0	5.3	85.5	795	5	329	20	1.20	271.	18	68	18
25.0	1000	583	8.57	8690	25.5	16.4	263	3373	286	7.1	4.2	86.4	996	4	382	17	1.06	325.	22	81	21
30.0	1200	700	10.28	9532	28.0	14.9	292	3445	238	5.9	3.4	87.1	1197	3	434	16	0.95	375.	26	93	24
35.0	1400	817	12.00	10310	30.2	13.8	317	3496	204	5.0	2.9	87.5	1397	3	483	14	0.88	425.	30	104	8.2
40.0	1600	933	13.71	11036	32.3	12.9	341	3534	178	4.3	2.5	87.8	1598	2	532	13	0.82	472.	34	115	8.7
45.0	1800	1050	15.42	11721	34.2	12.2	364	3564	159	3.8	2.2	88.1	1798	2	580	13	0.77	515.	38	125	9.3
50.0	2000	1167	17.14	12371	36.1	11.6	385	3587	143	3.4	2.0	88.3	1998	2	627	12	0.72	555.	41	135	9.8

#214 40 Ca on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 29. ZC= 49.(In)
NEUTRON NUMBERS: NP= 20. NT= 34. NC= 54.

AP**1/3= 3.420 AT**1/3= 3.979
REDUCED MASS NUMBER= 24.47 AP+AT=AC=103.

INTERACTION RADIUS RINT=11.15 fm RO= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 4.31 CT+CP= 7.91 C̄= 1.96

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 4.53

COULOMB RADII [fm]:
RCP= 3.84 RCT= 4.45 RC=RCP+RCT= 8.29

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 141.68 MeV K= .23002 n=2.451
VC(RINT)= 74.8 MeV

FISSION-TKE= 77. MeV
ASYMM. FISSION-TKE= 74. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.948 MeV/fm**2 PROX-FACTOR= 23.34 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -65.2
COMPOUND NUCLEUS: -75.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.97 fm V(RB)= 78.5 MeV
Q-VALUE= -22.3 MeV
L-CRITICAL= 80.

40 Ca on 63 Cu

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN—EN	TEMP	MULT
1.0	40	24	0.33	1727	5.4	91.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	80	49	0.65	2443	7.6	64.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	120	73	0.98	2993	9.3	52.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	160	98	1.31	3457	10.7	45.7	58	949	617	76.6	48.3	51.7	102	58	85	94	5.20	60.	3	14	4
4.5	180	110	1.47	3667	11.4	43.1	72	1284	895	62.1	38.7	59.0	135	45	106	76	4.20	66.	4	17	5
5.0	200	122	1.64	3866	12.0	40.8	83	1551	1118	52.4	32.4	63.8	163	37	121	66	3.62	73.	5	20	6
5.5	220	135	1.80	4055	12.5	38.9	93	1769	1298	45.4	28.0	67.3	189	31	133	58	3.23	80.	5	22	6
6.0	240	147	1.96	4236	13.1	37.3	102	1951	1190	40.1	24.7	70.0	213	27	144	53	2.94	87.	6	25	7
6.5	260	159	2.13	4409	13.6	35.8	111	2104	1098	35.9	22.1	72.1	237	23	153	49	2.72	94.	6	27	7
7.0	280	171	2.29	4576	14.2	34.5	118	2235	1020	32.5	20.0	73.7	259	21	162	46	2.54	100.	7	29	8
7.5	300	183	2.45	4738	14.7	33.3	126	2349	952	29.7	18.2	75.1	281	19	170	43	2.39	107.	7	31	8
8.0	320	196	2.62	4894	15.1	32.3	133	2448	892	27.4	16.8	76.3	303	17	177	41	2.27	113.	8	33	9
8.5	340	208	2.78	5045	15.6	31.3	139	2535	840	25.4	15.6	77.3	324	16	184	39	2.16	120.	8	35	9
9.0	360	220	2.94	5192	16.1	30.4	145	2613	793	23.6	14.5	78.2	346	14	191	37	2.07	126.	9	36	10
9.5	380	232	3.11	5335	16.5	29.6	151	2683	751	22.1	13.6	78.9	367	13	197	36	1.99	133.	9	38	10
10.0	400	245	3.27	5474	16.9	28.9	157	2745	714	20.8	12.8	79.6	388	12	204	35	1.91	139.	10	40	11
10.5	420	257	3.43	5610	17.3	28.2	163	2801	680	19.7	12.0	80.2	408	12	210	33	1.85	146.	10	41	11
11.0	440	269	3.60	5743	17.7	27.5	168	2853	649	18.6	11.4	80.7	429	11	216	32	1.79	151.	11	43	12
11.5	460	281	3.76	5873	18.1	26.9	173	2900	621	17.7	10.8	81.2	450	10	222	31	1.74	158.	11	44	12
12.0	480	294	3.93	6000	18.5	26.4	178	2942	595	16.8	10.3	81.6	470	10	228	31	1.69	165.	11	46	12
13.0	520	318	4.25	6247	19.3	25.3	188	3018	549	15.3	9.4	82.3	511	9	239	29	1.60	176.	12	49	13
14.0	560	343	4.58	6484	20.0	24.4	197	3083	510	14.1	8.6	82.9	552	8	250	28	1.52	188.	13	52	14
15.0	600	367	4.91	6714	20.7	23.6	206	3139	476	13.0	8.0	83.5	593	7	261	26	1.46	199.	14	54	15
16.0	640	391	5.23	6936	21.4	22.8	215	3188	446	12.1	7.4	83.9	633	7	272	25	1.40	210.	15	57	16
17.0	680	416	5.56	7151	22.1	22.2	223	3232	420	11.4	7.0	84.3	674	6	282	24	1.35	220.	16	60	17
18.0	720	440	5.89	7360	22.7	21.5	231	3270	396	10.7	6.5	84.7	714	6	292	24	1.30	233.	16	62	17
19.0	760	465	6.21	7564	23.3	21.0	238	3304	375	10.1	6.2	85.0	754	6	302	23	1.26	243.	17	65	18
20.0	800	489	6.54	7762	23.9	20.4	246	3335	357	9.5	5.8	85.2	795	5	312	22	1.23	253.	18	68	19
25.0	1000	612	8.18	8690	26.8	18.3	279	3452	285	7.5	4.6	86.3	996	4	361	19	1.08	305.	22	80	22
30.0	1200	734	9.81	9532	29.3	16.7	310	3530	238	6.2	3.8	86.9	1197	3	407	18	0.97	353.	26	91	25
35.0	1400	856	11.45	10310	31.7	15.4	337	3586	204	5.2	3.2	87.4	1397	3	452	16	0.89	396.	29	102	8.0
40.0	1600	979	13.08	11036	33.8	14.4	363	3627	178	4.6	2.8	87.7	1598	2	496	15	0.83	440.	33	113	8.6
45.0	1800	1101	14.72	11721	35.9	13.6	386	3659	158	4.0	2.5	88.0	1798	2	539	14	0.78	482.	37	123	9.2
50.0	2000	1223	16.35	12371	37.8	12.9	409	3685	142	3.6	2.2	88.2	1998	2	581	13	0.74	520.	41	133	9.7

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#215 40 Ca on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 42. ZC= 62.(Sm)
NEUTRON NUMBERS: NP= 20. NT= 50. NC= 70.

AP**1/3= 3.420 AT**1/3= 4.514
REDUCED MASS NUMBER= 27.88 AP+AT=AC=132.

INTERACTION RADIUS RINT=11.73 fm R0= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 5.00 CT+CP= 8.59 C̄= 2.09

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 5.20

COULOMB RADII [fm]:
RCP= 3.84 RCT= 5.08 RC=RCP+RCT= 8.92

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 189.82 MeV K= .23401 n=2.490
VC(RINT)= 103.0 MeV

FISSION-TKE= 103. MeV
ASYMM. FISSION-TKE= 90. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 24.84 MeV
L-RLD= 73 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -87.5
COMPOUND NUCLEUS: -56.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.52 fm V(RB)= 108.3 MeV
Q-VALUE= -63.6 MeV
L-CRITICAL= 89.

40 Ca on 92 Mo

40 Ca on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	28	0.27	1727	6.1	132.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	56	0.54	2443	8.6	93.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	84	0.81	2993	10.6	76.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	112	1.08	3457	12.2	66.1	39	343	101	118.5	92.8	30.7	60	100	48	239	9.65	47.	2	10	1.7	3
4.5	180	125	1.22	3667	12.9	62.4	64	795	476	88.4	65.2	45.8	106	74	81	147	5.92	53.	3	14	1.9	4
5.0	200	139	1.35	3866	13.6	59.2	82	1154	776	71.9	51.9	54.1	142	58	102	116	4.65	59.	4	18	2.1	4
5.5	220	153	1.49	4055	14.3	56.4	96	1446	1021	60.9	43.5	59.6	172	48	118	98	3.95	64.	5	20	2.3	5
6.0	240	167	1.62	4236	14.9	54.0	109	1690	1136	52.9	37.5	63.5	200	40	130	87	3.50	69.	5	23	2.5	6
6.5	260	181	1.76	4409	15.5	51.9	120	1895	1049	46.9	33.1	66.6	225	35	140	79	3.17	75.	6	25	2.7	7
7.0	280	195	1.90	4576	16.1	50.0	130	2071	974	42.1	29.7	69.0	250	30	148	73	2.92	80.	6	27	2.8	8
7.5	300	209	2.03	4738	16.7	48.3	139	2223	909	38.2	26.9	70.9	273	27	156	68	2.72	85.	7	29	3.0	8
8.0	320	223	2.17	4894	17.2	46.8	148	2356	852	35.0	24.6	72.5	296	24	163	64	2.56	90.	7	31	3.1	9
8.5	340	237	2.30	5045	17.8	45.4	157	2474	802	32.3	22.6	73.9	318	22	169	60	2.42	95.	8	32	3.2	10
9.0	360	251	2.44	5192	18.3	44.1	165	2578	757	30.0	21.0	75.0	340	20	175	57	2.30	101.	8	34	3.4	10
9.5	380	265	2.57	5335	18.8	42.9	172	2671	717	28.0	19.6	76.0	361	19	180	55	2.20	105.	9	36	3.5	11
10.0	400	279	2.71	5474	19.3	41.8	180	2755	681	26.2	18.4	76.9	383	17	186	53	2.11	111.	9	37	3.6	11
10.5	420	293	2.84	5610	19.8	40.8	187	2831	649	24.7	17.3	77.7	404	16	191	51	2.03	116.	10	39	3.7	12
11.0	440	307	2.98	5743	20.2	39.9	193	2900	619	23.3	16.3	78.3	425	15	196	49	1.96	121.	10	40	3.8	12
11.5	460	321	3.11	5873	20.7	39.0	200	2963	593	22.1	15.4	79.0	446	14	200	47	1.90	126.	10	42	3.9	13
12.0	480	335	3.25	6000	21.1	38.2	206	3020	568	21.0	14.7	79.5	467	13	205	46	1.84	130.	11	43	4.1	14
13.0	520	362	3.52	6247	22.0	36.7	218	3122	524	19.1	13.3	80.5	508	12	214	43	1.74	140.	12	46	4.3	15
14.0	560	390	3.79	6484	22.8	35.3	230	3209	487	17.5	12.2	81.2	549	11	223	41	1.65	149.	12	49	4.4	16
15.0	600	418	4.06	6714	23.6	34.2	240	3285	454	16.2	11.3	81.9	590	10	231	39	1.58	158.	13	51	4.6	17
16.0	640	446	4.33	6936	24.4	33.1	251	3351	426	15.0	10.5	82.5	631	9	239	38	1.51	167.	14	54	4.8	18
17.0	680	474	4.60	7151	25.1	32.1	261	3409	401	14.0	9.8	83.0	671	9	247	36	1.45	176.	15	57	5.0	19
18.0	720	502	4.87	7360	25.9	31.2	271	3461	378	13.1	9.2	83.4	712	8	254	35	1.40	185.	16	59	5.2	20
19.0	760	530	5.14	7564	26.6	30.3	280	3507	358	12.4	8.6	83.8	753	7	262	34	1.36	195.	16	61	5.3	20
20.0	800	558	5.42	7762	27.3	29.6	289	3549	340	11.7	8.2	84.2	793	7	269	33	1.31	204.	17	64	5.5	21
25.0	1000	697	6.77	8690	30.5	26.5	330	3706	272	9.2	6.4	85.4	995	5	305	29	1.15	245.	21	75	6.2	25
30.0	1200	836	8.12	9532	33.4	24.1	367	3811	227	7.5	5.3	86.2	1196	4	338	26	1.03	284.	24	86	6.8	29
35.0	1400	976	9.48	10310	36.1	22.4	400	3886	194	6.4	4.5	86.8	1396	4	370	24	0.95	321.	28	97	7.4	
40.0	1600	1115	10.83	11036	38.6	20.9	431	3942	170	5.6	3.9	87.2	1597	3	401	22	0.88	356.	31	107	8.0	
45.0	1800	1255	12.18	11721	40.9	19.7	460	3986	151	4.9	3.4	87.5	1797	3	431	21	0.83	388.	35	116	8.5	
50.0	2000	1394	13.54	12371	43.1	18.7	487	4020	136	4.4	3.1	87.8	1998	2	461	19	0.78	418.	38	126	9.0	

#216 40 Ca on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 47. ZC= 67.(Ho)
NEUTRON NUMBERS: NP= 20. NT= 61. NC= 81.

AP**1/3= 3.420 AT**1/3= 4.762
REDUCED MASS NUMBER= 29.19 AP+AT=AC=148.

INTERACTION RADIUS RINT=12.00 fm R0= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 5.32 CT+CP= 8.91 C̄= 2.14

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 5.50

COULOMB RADII [fm]:
RCP= 3.84 RCT= 5.34 RC=RCP+RCT= 9.18

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 206.03 MeV K= .22734 n=2.506
VC(RINT)= 112.6 MeV

FISSION-TKE= 113. MeV
ASYMM. FISSION-TKE= 95. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.937 MeV/fm**2 PROX-FACTOR= 25.24 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.84 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -87.6
COMPOUND NUCLEUS: -59.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.77 fm V(RB)= 118.2 MeV
Q-VALUE= -60.8 MeV
L-CRITICAL= 94.

40 Ca on 108 Ag

40 Ca on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	29	0.26	1727	6.4	148.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	58	0.52	2443	9.0	104.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	88	0.78	2993	11.1	85.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	117	1.04	3457	12.8	74.0	28	165	0	138.2	119.4	20.9	50	110	38	394	14.71	0.	2	9	1.7	3
4.5	180	131	1.17	3667	13.5	69.8	61	660	365	97.6	76.5	41.2	100	80	74	185	6.80	47.	3	14	2.0	4
5.0	200	146	1.30	3866	14.3	66.2	82	1053	693	78.1	59.5	51.0	137	63	97	139	5.09	52.	4	17	2.1	5
5.5	220	161	1.43	4055	15.0	63.1	98	1373	961	65.6	49.3	57.2	169	51	113	116	4.24	57.	5	20	2.3	6
6.0	240	175	1.55	4236	15.6	60.4	112	1639	1166	56.7	42.3	61.6	197	43	125	101	3.71	62.	5	22	2.5	7
6.5	260	190	1.68	4409	16.3	58.1	124	1864	1076	50.0	37.1	65.0	223	37	135	91	3.34	66.	6	24	2.6	8
7.0	280	204	1.81	4576	16.9	55.9	136	2057	999	44.8	33.1	67.6	248	32	143	84	3.06	71.	6	26	2.8	9
7.5	300	219	1.94	4738	17.5	54.0	146	2223	933	40.6	30.0	69.7	272	28	150	78	2.85	76.	7	28	2.9	10
8.0	320	234	2.07	4894	18.1	52.3	156	2369	874	37.1	27.3	71.4	294	26	157	73	2.67	81.	7	30	3.1	10
8.5	340	248	2.20	5045	18.6	50.8	165	2497	823	34.2	25.2	72.9	317	23	162	69	2.52	85.	8	31	3.2	11
9.0	360	263	2.33	5192	19.2	49.3	174	2611	777	31.7	23.3	74.1	339	21	168	65	2.39	89.	8	33	3.3	12
9.5	380	277	2.46	5335	19.7	48.0	182	2713	736	29.6	21.7	75.2	360	20	173	62	2.29	94.	9	35	3.4	13
10.0	400	292	2.59	5474	20.2	46.8	190	2805	699	27.7	20.3	76.1	382	18	178	60	2.19	99.	9	36	3.5	13
10.5	420	306	2.72	5610	20.7	45.7	197	2888	666	26.1	19.1	77.0	403	17	183	57	2.11	103.	9	38	3.6	14
11.0	440	321	2.85	5743	21.2	44.6	205	2964	636	24.6	18.0	77.7	424	16	187	55	2.03	107.	10	39	3.8	15
11.5	460	336	2.98	5873	21.7	43.6	212	3032	608	23.3	17.1	78.4	445	15	191	54	1.96	112.	10	41	3.9	15
12.0	480	350	3.11	6000	22.1	42.7	219	3095	583	22.1	16.2	78.9	466	14	195	52	1.90	116.	11	42	4.0	16
13.0	520	379	3.37	6247	23.0	41.1	232	3207	538	20.1	14.7	79.9	508	12	203	49	1.80	124.	11	45	4.2	17
14.0	560	409	3.63	6484	23.9	39.6	244	3302	499	18.4	13.5	80.8	549	11	211	46	1.70	133.	12	47	4.3	18
15.0	600	438	3.89	6714	24.7	38.2	256	3385	466	17.0	12.4	81.5	590	10	218	44	1.63	141.	13	50	4.5	19
16.0	640	467	4.15	6936	25.5	37.0	267	3457	437	15.8	11.5	82.1	630	10	225	42	1.56	150.	14	53	4.7	20
17.0	680	496	4.41	7151	26.3	35.9	278	3521	411	14.7	10.8	82.6	671	9	232	41	1.50	158.	14	55	4.9	21
18.0	720	525	4.66	7360	27.1	34.9	288	3577	388	13.8	10.1	83.1	712	8	239	39	1.44	166.	15	57	5.0	22
19.0	760	555	4.92	7564	27.8	34.0	298	3628	368	13.0	9.5	83.5	752	8	245	38	1.39	173.	16	60	5.2	23
20.0	800	584	5.18	7762	28.6	33.1	308	3674	349	12.3	9.0	83.9	793	7	252	37	1.35	181.	17	62	5.3	24
25.0	1000	730	6.48	8690	31.9	29.6	352	3846	279	9.6	7.0	85.2	994	6	282	32	1.18	217.	20	73	6.0	29
30.0	1200	876	7.77	9532	35.0	27.0	392	3961	233	7.9	5.8	86.1	1196	4	311	29	1.06	252.	24	84	6.6	33
35.0	1400	1022	9.07	10310	37.8	25.0	427	4043	199	6.7	4.9	86.7	1396	4	338	27	0.97	286.	27	94	7.2	
40.0	1600	1168	10.37	11036	40.4	23.4	461	4105	174	5.8	4.2	87.1	1597	3	365	25	0.90	315.	31	104	7.7	
45.0	1800	1314	11.66	11721	42.8	22.1	491	4152	155	5.1	3.8	87.4	1797	3	391	23	0.85	345.	34	113	8.2	
50.0	2000	1459	12.96	12371	45.1	20.9	520	4190	139	4.6	3.4	87.7	1997	3	416	22	0.80	372.	38	122	8.7	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fr	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#217 40 Ca on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 58. ZC= 78.(Pt)
NEUTRON NUMBERS: NP= 20. NT= 82. NC=102.

AP**1/3= 3.420 AT**1/3= 5.192
REDUCED MASS NUMBER= 31.11 AP+AT=AC=180.

INTERACTION RADIUS RINT=12.47 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 5.87 CT+CP= 9.47 C= 2.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.04

COULOMB RADII [fm]:
RCP= 3.84 RCT= 5.82 RC=RCP+RCT= 9.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 240.68 MeV K= .21318 n=2.542
VC(RINT)= 133.8 MeV

FISSION-TKE= 138. MeV
ASYMM. FISSION-TKE= 105. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.922 MeV/fm**2 PROX-FACTOR= 25.81 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.43 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -88.2
COMPOUND NUCLEUS: -34.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.21 fm V(RB)= 140.1 MeV
Q-VALUE= -87.2 MeV
L-CRITICAL= 100.

40 Ca on 140 Ce — 40 Ca on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	31	0.23	1727	6.8	182.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	62	0.46	2443	9.6	129.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	93	0.70	2993	11.8	105.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	124	0.93	3457	13.6	91.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	140	1.05	3667	14.4	86.1	37	221	0	133.1	118.6	23.4	75	105	54	410	12.82	0.	2	11	1.5	4
5.0	200	156	1.16	3866	15.2	81.7	71	696	391	98.3	81.9	40.9	121	79	83	218	6.77	43.	3	15	1.7	5
5.5	220	171	1.28	4055	16.0	77.9	93	1082	714	80.1	65.1	50.0	157	63	103	167	5.16	47.	4	18	1.9	6
6.0	240	187	1.39	4236	16.7	74.6	110	1403	984	68.1	54.6	56.0	188	52	117	140	4.33	51.	5	20	2.1	7
6.5	260	202	1.51	4409	17.3	71.6	126	1674	1055	59.4	47.3	60.3	216	44	127	123	3.81	55.	6	23	2.3	8
7.0	280	218	1.63	4576	18.0	69.0	139	1906	980	52.8	41.8	63.6	242	38	136	111	3.43	59.	6	25	2.4	10
7.5	300	233	1.74	4738	18.6	66.7	152	2106	914	47.5	37.5	66.3	266	34	143	102	3.15	63.	7	26	2.5	10
8.0	320	249	1.86	4894	19.2	64.6	163	2282	857	43.2	34.0	68.4	290	30	150	95	2.93	67.	7	28	2.7	11
8.5	340	264	1.98	5045	19.8	62.6	174	2436	807	39.7	31.2	70.2	313	27	155	89	2.75	70.	7	30	2.8	12
9.0	360	280	2.09	5192	20.4	60.9	184	2574	762	36.7	28.8	71.7	335	25	161	84	2.60	74.	8	31	2.9	13
9.5	380	296	2.21	5335	21.0	59.3	193	2697	722	34.1	26.7	73.0	357	23	165	80	2.47	78.	8	33	3.0	14
10.0	400	311	2.32	5474	21.5	57.8	202	2807	686	31.9	24.9	74.1	379	21	170	77	2.36	81.	9	34	3.2	15
10.5	420	327	2.44	5610	22.0	56.4	211	2907	653	29.9	23.4	75.0	401	19	174	73	2.26	85.	9	36	3.3	16
11.0	440	342	2.56	5743	22.6	55.1	219	2998	623	28.2	22.0	75.9	422	18	178	71	2.18	88.	10	37	3.4	17
11.5	460	358	2.67	5873	23.1	53.9	228	3081	596	26.6	20.8	76.7	443	17	181	68	2.10	92.	10	39	3.5	18
12.0	480	373	2.79	6000	23.6	52.7	235	3157	571	25.3	19.7	77.4	464	16	185	66	2.03	96.	10	40	3.6	18
13.0	520	404	3.02	6247	24.5	50.7	250	3291	527	22.9	17.9	78.5	506	14	192	62	1.91	103.	11	43	3.8	20
14.0	560	436	3.25	6484	25.5	48.8	264	3406	490	20.9	16.3	79.5	547	13	198	59	1.81	110.	12	45	3.9	21
15.0	600	467	3.49	6714	26.4	47.2	277	3505	457	19.3	15.0	80.4	588	12	204	56	1.72	117.	13	48	4.1	22
16.0	640	498	3.72	6936	27.2	45.7	290	3593	428	17.9	13.9	81.1	629	11	210	53	1.65	123.	13	50	4.3	24
17.0	680	529	3.95	7151	28.1	44.3	302	3669	403	16.7	13.0	81.7	670	10	216	51	1.58	130.	14	52	4.4	25
18.0	720	560	4.18	7360	28.9	43.1	314	3738	381	15.6	12.2	82.2	711	9	221	49	1.52	137.	15	55	4.6	26
19.0	760	591	4.42	7564	29.7	41.9	325	3799	361	14.7	11.4	82.7	751	9	226	48	1.47	143.	15	57	4.7	27
20.0	800	622	4.65	7762	30.4	40.8	336	3854	343	13.9	10.8	83.1	792	8	231	46	1.42	150.	16	59	4.9	28
25.0	1000	778	5.81	8690	34.0	36.5	386	4062	274	10.8	8.4	84.6	994	6	256	40	1.24	181.	20	70	5.5	33
30.0	1200	933	6.97	9532	37.3	33.3	430	4201	228	8.9	6.9	85.6	1195	5	278	36	1.11	210.	23	80	6.1	38
35.0	1400	1089	8.14	10310	40.3	30.9	470	4300	196	7.5	5.8	86.2	1396	4	300	33	1.02	237.	26	89	6.7	
40.0	1600	1244	9.30	11036	43.0	28.9	507	4374	171	6.5	5.1	86.7	1596	4	320	31	0.94	263.	30	99	7.2	
45.0	1800	1400	10.46	11721	45.6	27.2	541	4431	152	5.8	4.5	87.1	1797	3	340	29	0.88	289.	33	108	7.6	
50.0	2000	1556	11.62	12371	48.1	25.8	573	4477	137	5.2	4.0	87.4	1997	3	359	27	0.83	311.	36	117	8.1	

#218 40 Ca on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 62. ZC= 82.(Pb)
NEUTRON NUMBERS: NP= 20. NT= 92. NC=112.

AP**1/3= 3.420 AT**1/3= 5.360
REDUCED MASS NUMBER= 31.75 AP+AT=AC=194.

INTERACTION RADIUS RINT=12.65 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.09 CT+CP= 9.68 C= 2.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.25

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.00 RC=RCP+RCT= 9.84

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 252.21 MeV K= .20607 n=2.555
VC(RINT)= 141.0 MeV

FISSION-TKE= 147. MeV
ASYMM. FISSION-TKE= 108. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.911 MeV/fm**2 PROX-FACTOR= 25.87 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.31 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -72.1
COMPOUND NUCLEUS: -24.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.38 fm V(RB)= 147.4 MeV
Q-VALUE= -80.7 MeV
L-CRITICAL= 101.

40 Ca on 154 Sm — 40 Ca on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	32	0.23	1727	6.9	195.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	64	0.45	2443	9.8	138.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	95	0.68	2993	12.0	112.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	127	0.90	3457	13.9	97.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	143	1.01	3667	14.7	92.0	20	67	0	155.0	146.8	12.5	68	112	47	799	24.58	0.	2	11	1.6	5
5.0	200	159	1.13	3866	15.5	87.3	65	574	289	106.3	91.3	36.8	116	84	79	261	7.68	40.	3	14	1.8	6
5.5	220	175	1.24	4055	16.3	83.3	90	985	633	85.4	71.2	47.3	154	66	100	190	5.57	44.	4	17	2.0	7
6.0	240	191	1.35	4236	17.0	79.7	109	1325	919	72.1	59.2	53.9	186	54	114	156	4.59	47.	5	20	2.1	8
6.5	260	206	1.46	4409	17.7	76.6	126	1613	1049	62.6	51.0	58.7	214	46	125	136	3.99	51.	5	22	2.3	10
7.0	280	222	1.58	4576	18.4	73.8	140	1860	974	55.5	44.9	62.3	240	40	134	122	3.58	54.	6	24	2.4	11
7.5	300	238	1.69	4738	19.0	71.3	153	2073	909	49.8	40.2	65.1	265	35	141	112	3.27	58.	6	26	2.5	12
8.0	320	254	1.80	4894	19.6	69.0	166	2260	853	45.3	36.4	67.4	289	31	148	103	3.03	62.	7	28	2.7	13
8.5	340	270	1.91	5045	20.2	67.0	177	2424	802	41.5	33.3	69.3	312	28	153	97	2.84	65.	7	29	2.8	14
9.0	360	286	2.03	5192	20.8	65.1	187	2570	758	38.3	30.7	70.9	335	25	158	91	2.68	68.	8	31	2.9	15
9.5	380	302	2.14	5335	21.4	63.3	197	2701	718	35.6	28.5	72.2	357	23	163	87	2.54	72.	8	32	3.0	16
10.0	400	318	2.25	5474	22.0	61.7	207	2818	682	33.2	26.6	73.4	379	21	167	83	2.43	76.	9	34	3.1	16
10.5	420	333	2.36	5610	22.5	60.3	216	2924	649	31.2	24.9	74.4	400	20	171	79	2.32	79.	9	35	3.2	17
11.0	440	349	2.48	5743	23.0	58.9	225	3021	620	29.3	23.4	75.3	422	18	174	76	2.23	82.	9	36	3.3	18
11.5	460	365	2.59	5873	23.6	57.6	233	3109	593	27.7	22.1	76.1	443	17	178	73	2.15	86.	10	38	3.4	19
12.0	480	381	2.70	6000	24.1	56.4	241	3190	568	26.3	21.0	76.9	464	16	181	71	2.08	89.	10	39	3.5	20
13.0	520	413	2.93	6247	25.0	54.2	257	3332	524	23.8	19.0	78.1	506	14	188	67	1.96	95.	11	42	3.7	22
14.0	560	445	3.15	6484	26.0	52.2	271	3455	487	21.8	17.3	79.1	547	13	194	63	1.85	102.	12	44	3.9	23
15.0	600	476	3.38	6714	26.9	50.4	285	3561	454	20.0	15.9	80.0	588	12	199	60	1.76	108.	12	47	4.0	24
16.0	640	508	3.60	6936	27.8	48.8	299	3653	426	18.6	14.8	80.7	629	11	205	57	1.68	114.	13	49	4.2	26
17.0	680	540	3.83	7151	28.6	47.4	311	3735	401	17.3	13.8	81.3	670	10	210	55	1.61	121.	14	51	4.4	27
18.0	720	572	4.05	7360	29.5	46.0	323	3807	379	16.2	12.9	81.9	711	9	215	53	1.55	126.	15	54	4.5	29
19.0	760	603	4.28	7564	30.3	44.8	335	3872	359	15.2	12.1	82.4	751	9	220	51	1.50	132.	15	56	4.6	30
20.0	800	635	4.50	7762	31.1	43.7	346	3931	341	14.4	11.4	82.8	792	8	225	49	1.45	139.	16	58	4.8	31
25.0	1000	794	5.63	8690	34.7	39.1	398	4152	272	11.2	8.9	84.4	994	6	247	43	1.26	168.	19	68	5.4	36
30.0	1200	953	6.76	9532	38.0	35.6	444	4300	227	9.2	7.3	85.4	1195	5	268	39	1.13	195.	23	78	6.0	41
35.0	1400	1111	7.88	10310	41.1	33.0	486	4405	194	7.8	6.2	86.1	1396	4	287	35	1.03	220.	26	88	6.5	
40.0	1600	1270	9.01	11036	43.9	30.9	524	4484	170	6.7	5.4	86.6	1596	4	306	33	0.96	245.	29	97	7.0	
45.0	1800	1429	10.13	11721	46.6	29.1	559	4545	151	6.0	4.7	87.0	1797	3	324	31	0.90	268.	33	106	7.5	
50.0	2000	1588	11.26	12371	49.1	27.6	593	4594	136	5.3	4.2	87.3	1997	3	341	29	0.85	289.	36	114	7.9	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#219 40 Ca on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 67. ZC= 87.(Fr)
NEUTRON NUMBERS: NP= 20. NT= 98. NC=118.

AP**1/3= 3.420 AT**1/3= 5.485
REDUCED MASS NUMBER= 32.20 AP+AT=AC=205.

INTERACTION RADIUS RINT=12.78 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.25 CT+CP= 9.84 C= 2.28

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.41

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.15 RC=RCP+RCT= 9.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 267.81 MeV K= .20168 n=2.571
VC(RINT)= 150.8 MeV

FISSION-TKE= 160. MeV
ASYMM. FISSION-TKE= 113. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.913 MeV/fm**2 PROX-FACTOR= 26.17 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -63.7
COMPOUND NUCLEUS: -0.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.50 fm V(RB)= 157.7 MeV
Q-VALUE= -95.9 MeV
L-CRITICAL= 100.

40 Ca on 165 Ho

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	32	0.21	1727	7.0	211.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	80	64	0.43	2443	10.0	149.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	120	97	0.64	2993	12.2	121.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	160	129	0.85	3457	14.1	105.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	180	145	0.96	3667	14.9	99.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	200	161	1.07	3866	15.7	94.4	50	333	84	123.9	110.8	28.0	102	98	69	374	10.35	38.	3	13	1.6	5
5.5	220	177	1.17	4055	16.5	90.0	81	776	454	95.9	82.1	42.0	144	76	94	233	6.42	42.	4	16	1.8	6
6.0	240	193	1.28	4236	17.2	86.1	103	1144	762	79.8	66.9	50.1	178	62	110	184	5.05	45.	5	19	1.9	8
6.5	260	209	1.39	4409	18.0	82.8	121	1454	1000	68.7	57.0	55.7	208	52	123	157	4.29	48.	5	21	2.1	9
7.0	280	225	1.49	4576	18.6	79.7	137	1720	928	60.5	49.8	59.8	235	45	132	139	3.80	52.	6	23	2.2	10
7.5	300	241	1.60	4738	19.3	77.0	151	1950	866	54.1	44.3	63.0	261	39	140	126	3.45	55.	6	25	2.4	11
8.0	320	258	1.71	4894	19.9	74.6	164	2151	812	49.0	40.0	65.5	285	35	147	116	3.18	59.	7	27	2.5	12
8.5	340	274	1.82	5045	20.5	72.4	176	2328	764	44.8	36.5	67.6	309	31	153	108	2.96	62.	7	29	2.6	13
9.0	360	290	1.92	5192	21.1	70.3	187	2485	722	41.2	33.5	69.4	332	28	158	102	2.78	65.	8	30	2.8	14
9.5	380	306	2.03	5335	21.7	68.5	197	2626	684	38.2	31.1	70.9	354	26	162	96	2.63	69.	8	32	2.9	15
10.0	400	322	2.14	5474	22.3	66.7	207	2753	650	35.7	28.9	72.2	376	24	167	91	2.51	72.	9	33	3.0	16
10.5	420	338	2.24	5610	22.8	65.1	217	2867	619	33.4	27.1	73.3	398	22	171	87	2.40	75.	9	34	3.1	17
11.0	440	354	2.35	5743	23.4	63.6	226	2971	590	31.4	25.4	74.3	420	20	174	84	2.30	78.	9	36	3.2	18
11.5	460	370	2.46	5873	23.9	62.2	235	3066	565	29.7	24.0	75.2	441	19	178	81	2.21	82.	10	37	3.3	18
12.0	480	386	2.56	6000	24.4	60.9	243	3153	541	28.1	22.7	75.9	462	18	181	78	2.14	85.	10	38	3.4	19
13.0	520	419	2.78	6247	25.4	58.5	259	3307	500	25.4	20.5	77.3	504	16	187	73	2.00	91.	11	41	3.5	21
14.0	560	451	2.99	6484	26.3	56.4	275	3439	464	23.2	18.7	78.4	546	14	193	69	1.89	97.	12	43	3.7	22
15.0	600	483	3.20	6714	27.3	54.5	289	3553	433	21.3	17.2	79.3	587	13	199	66	1.80	103.	12	46	3.9	24
16.0	640	515	3.42	6936	28.2	52.7	303	3653	406	19.8	15.9	80.1	628	12	204	63	1.72	110.	13	48	4.0	25
17.0	680	547	3.63	7151	29.0	51.2	316	3741	382	18.4	14.8	80.8	669	11	209	60	1.65	115.	14	51	4.2	27
18.0	720	580	3.84	7360	29.9	49.7	328	3819	361	17.2	13.9	81.4	710	10	214	58	1.58	121.	14	53	4.3	28
19.0	760	612	4.06	7564	30.7	48.4	341	3889	342	16.2	13.0	81.9	751	9	219	56	1.53	127.	15	55	4.5	30
20.0	800	644	4.27	7762	31.5	47.2	352	3952	325	15.3	12.3	82.4	791	9	223	54	1.48	132.	16	57	4.6	31
25.0	1000	805	5.34	8690	35.2	42.2	406	4191	260	11.9	9.6	84.1	993	7	244	47	1.28	160.	19	67	5.3	37
30.0	1200	966	6.41	9532	38.6	38.5	453	4350	216	9.7	7.8	85.1	1195	5	264	42	1.15	186.	23	77	5.8	42
35.0	1400	1127	7.47	10310	41.7	35.7	496	4463	185	8.2	6.6	85.9	1395	5	282	38	1.05	212.	26	87	6.3	
40.0	1600	1288	8.54	11036	44.5	33.4	535	4548	162	7.1	5.7	86.4	1596	4	300	36	0.97	234.	29	96	6.8	
45.0	1800	1449	9.61	11721	47.2	31.5	571	4614	144	6.3	5.1	86.8	1797	3	317	33	0.91	257.	32	104	7.3	
50.0	2000	1610	10.68	12371	49.8	29.8	606	4667	130	5.6	4.5	87.2	1997	3	333	31	0.86	278.	35	113	7.7	

#220 40 Ca on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 73. ZC= 93.(Np)
NEUTRON NUMBERS: NP= 20. NT=108. NC=128.

AP**1/3= 3.420 AT**1/3= 5.657
REDUCED MASS NUMBER= 32.76 AP+AT=AC=221.

INTERACTION RADIUS RINT=12.97 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.47 CT+CP=10.06 C= 2.31

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.62

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.35 RC=RCP+RCT=10.20

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 285.43 MeV K= .19434 n=2.590
VC(RINT)= 161.9 MeV

FISSION-TKE= 175. MeV
ASYMM. FISSION-TKE= 118. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 26.39 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.12 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -46.0
COMPOUND NUCLEUS: 27.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.67 fm V(RB)= 169.3 MeV
Q-VALUE= -106.8 MeV
L-CRITICAL= 99.

40 Ca on 181 Ta

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	40	33	0.20	1727	7.2	229.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	80	66	0.40	2443	10.1	162.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	120	98	0.61	2993	12.4	132.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	160	131	0.81	3457	14.3	114.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	180	147	0.91	3667	15.2	108.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	200	164	1.01	3866	16.0	102.8	21	60	0	156.7	150.5	11.6	86	114	57	953	25.75	0.	3	12	1.4	5
5.5	220	180	1.11	4055	16.8	98.0	69	546	259	109.7	97.0	35.2	133	87	86	308	7.89	39.	4	15	1.6	6
6.0	240	197	1.21	4236	17.6	93.9	95	946	594	89.1	76.7	45.4	170	70	106	223	5.72	42.	4	18	1.8	7
6.5	260	213	1.32	4409	18.3	90.2	116	1283	877	75.8	64.3	52.1	202	58	120	184	4.71	45.	5	20	2.0	8
7.0	280	229	1.42	4576	19.0	86.9	133	1572	881	66.3	55.7	56.9	230	50	130	160	4.09	48.	6	23	2.1	10
7.5	300	246	1.52	4738	19.6	83.9	148	1822	822	59.0	49.3	60.5	257	43	139	144	3.67	52.	6	24	2.2	11
8.0	320	262	1.62	4894	20.3	81.3	162	2040	771	53.2	44.3	63.4	282	38	146	131	3.36	55.	7	26	2.4	12
8.5	340	278	1.72	5045	20.9	78.9	175	2233	725	48.5	40.3	65.8	306	34	152	122	3.11	58.	7	28	2.5	13
9.0	360	295	1.82	5192	21.5	76.6	187	2404	685	44.6	36.9	67.7	329	31	157	114	2.91	61.	8	29	2.6	14
9.5	380	311	1.92	5335	22.1	74.6	198	2557	649	41.2	34.1	69.4	352	28	162	108	2.75	64.	8	31	2.7	15
10.0	400	328	2.02	5474	22.7	72.7	209	2695	616	38.4	31.7	70.8	374	26	166	102	2.61	67.	8	32	2.8	16
10.5	420	344	2.12	5610	23.2	70.9	219	2819	587	35.9	29.6	72.0	396	24	170	98	2.49	70.	9	34	2.9	17
11.0	440	360	2.23	5743	23.8	69.3	229	2932	560	33.7	27.8	73.1	418	22	174	93	2.38	73.	9	35	3.0	18
11.5	460	377	2.33	5873	24.3	67.8	238	3035	536	31.8	26.2	74.1	440	20	177	90	2.29	76.	10	36	3.1	19
12.0	480	393	2.43	6000	24.8	66.4	247	3130	514	30.1	24.8	74.9	461	19	180	87	2.21	79.	10	38	3.2	20
13.0	520	426	2.63	6247	25.8	63.8	264	3297	474	27.2	22.4	76.4	503	17	186	81	2.07	85.	11	40	3.4	21
14.0	560	459	2.83	6484	26.8	61.4	280	3440	440	24.8	20.4	77.6	545	15	192	76	1.95	91.	11	43	3.6	23
15.0	600	491	3.04	6714	27.8	59.4	295	3564	411	22.8	18.7	78.6	586	14	197	72	1.85	96.	12	45	3.7	25
16.0	640	524	3.24	6936	28.7	57.5	309	3673	385	21.1	17.3	79.5	627	13	202	69	1.76	102.	13	47	3.9	26
17.0	680	557	3.44	7151	29.5	55.8	323	3769	362	19.6	16.1	80.2	668	12	207	66	1.69	107.	14	49	4.0	28
18.0	720	590	3.64	7360	30.4	54.2	336	3854	342	18.3	15.0	80.8	709	11	211	64	1.62	113.	14	52	4.2	29
19.0	760	622	3.84	7564	31.2	52.7	348	3930	324	17.2	14.1	81.4	750	10	216	61	1.56	119.	15	54	4.3	30
20.0	800	655	4.05	7762	32.0	51.4	360	3998	308	16.2	13.3	81.9	791	9	220	59	1.51	124.	16	56	4.5	32
25.0	1000	819	5.06	8690	35.8	46.0	416	4258	246	12.6	10.3	83.7	993	7	240	51	1.31	150.	19	66	5.1	38
30.0	1200	983	6.07	9532	39.2	42.0	465	4431	205	10.3	8.5	84.8	1194	6	258	46	1.17	174.	22	76	5.6	44
35.0	1400	1147	7.08	10310	42.4	38.9	509	4554	176	8.7	7.1	85.6	1395	5	275	42	1.07	197.	26	85	6.1	
40.0	1600	1310	8.09	11036	45.3	36.3	550	4647	154	7.6	6.2	86.2	1596	4	291	39	0.99	220.	29	94	6.6	
45.0	1800	1474	9.11	11721	48.1	34.3	588	4718	137	6.7	5.5	86.7	1796	4	306	36	0.93	242.	32	102	7.0	
50.0	2000	1638	10.12	12371	50.7	32.5	624	4776	123	6.0	4.9	87.0	1997	3	321	34	0.87	262.	35	111	7.4	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	--MeV--	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#221 40 Ca on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 79. ZC= 99.(Es)
NEUTRON NUMBERS: NP= 20. NT=118. NC=138.

AP**1/3= 3.420 AT**1/3= 5.819
REDUCED MASS NUMBER= 33.25 AP+AT=AC=237.

INTERACTION RADIUS RINT=13.14 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.68 CT+CP=10.27 C̄= 2.34

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.83

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.55 RC=RCP+RCT=10.39

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 302.59 MeV K= .18703 n=2.609
VC(RINT)= 172.9 MeV

FISSION-TKE= 192. MeV
ASYMM. FISSION-TKE= 124. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 26.59 MeV
L-RLD= 58 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.03 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -28.6
COMPOUND NUCLEUS: 63.7

FUSION RELATED PARAMETERS:
R-BARRIER=11.83 fm V(RB)= 180.6 MeV
Q-VALUE= -125.3 MeV
L-CRITICAL= 98.

40 Ca on 197 Au

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	33	0.19	1727	7.3	248.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	66	0.38	2443	10.3	175.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	100	0.58	2993	12.6	143.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	133	0.77	3457	14.5	124.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	150	0.87	3667	15.4	117.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	200	166	0.96	3866	16.3	111.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	220	183	1.06	4055	17.1	106.1	52	302	53	127.9	117.5	26.0	120	100	78	454	10.96	36.	3	14	1.4	5
6.0	240	199	1.15	4236	17.8	101.6	85	735	415	100.0	88.3	40.0	161	79	100	278	6.67	39.	4	17	1.6	6
6.5	260	216	1.25	4409	18.5	97.6	109	1100	721	83.8	72.6	48.1	195	65	116	218	5.22	42.	5	20	1.8	8
7.0	280	233	1.35	4576	19.2	94.0	128	1413	827	72.6	62.2	53.7	225	55	128	185	4.44	45.	6	22	1.9	9
7.5	300	249	1.44	4738	19.9	90.8	145	1683	772	64.2	54.7	57.9	252	48	137	164	3.92	48.	6	24	2.0	10
8.0	320	266	1.54	4894	20.6	88.0	160	1919	723	57.7	48.9	61.2	278	42	145	149	3.56	51.	7	25	2.2	12
8.5	340	283	1.63	5045	21.2	85.3	173	2128	681	52.4	44.2	63.8	303	37	151	137	3.27	54.	7	27	2.3	13
9.0	360	299	1.73	5192	21.8	82.9	186	2313	643	48.0	40.4	66.0	327	33	157	128	3.05	57.	8	29	2.4	14
9.5	380	316	1.83	5335	22.4	80.7	198	2478	609	44.3	37.3	67.8	350	30	161	120	2.87	60.	8	30	2.5	15
10.0	400	332	1.92	5474	23.0	78.7	209	2627	579	41.2	34.6	69.4	372	28	166	114	2.71	63.	8	32	2.6	16
10.5	420	349	2.02	5610	23.6	76.8	220	2761	551	38.5	32.3	70.8	394	26	170	108	2.58	66.	9	33	2.7	17
11.0	440	366	2.12	5743	24.1	75.0	230	2884	526	36.1	30.2	71.9	416	24	173	103	2.47	69.	9	34	2.8	18
11.5	460	382	2.21	5873	24.7	73.4	240	2995	503	34.0	28.5	73.0	438	22	177	99	2.37	71.	10	36	2.9	19
12.0	480	399	2.31	6000	25.2	71.8	249	3097	482	32.2	26.9	73.9	459	21	180	95	2.28	74.	10	37	3.0	20
13.0	520	432	2.50	6247	26.2	69.0	267	3278	445	29.0	24.2	75.5	502	18	186	89	2.13	80.	11	39	3.2	22
14.0	560	465	2.69	6484	27.2	66.5	283	3433	413	26.4	22.0	76.8	544	16	191	84	2.00	85.	11	42	3.4	23
15.0	600	499	2.89	6714	28.2	64.2	299	3567	386	24.2	20.2	77.9	585	15	196	79	1.90	91.	12	44	3.6	25
16.0	640	532	3.08	6936	29.1	62.2	314	3685	361	22.4	18.7	78.8	626	14	201	76	1.81	96.	13	46	3.7	27
17.0	680	565	3.27	7151	30.0	60.3	328	3798	340	20.8	17.4	79.6	668	12	206	72	1.73	101.	13	49	3.9	28
18.0	720	598	3.46	7360	30.9	58.6	342	3880	321	19.5	16.2	80.3	708	12	210	70	1.66	106.	14	51	4.0	30
19.0	760	632	3.65	7564	31.7	57.1	355	3962	304	18.3	15.2	80.9	749	11	214	67	1.60	111.	15	53	4.1	31
20.0	800	665	3.85	7762	32.5	55.6	368	4036	289	17.2	14.3	81.4	790	10	218	65	1.55	116.	16	55	4.3	33
25.0	1000	831	4.81	8690	36.4	49.8	425	4317	231	13.3	11.1	83.3	992	8	237	56	1.34	141.	19	65	4.9	39
30.0	1200	997	5.77	9532	39.8	45.4	476	4504	193	10.9	9.1	84.5	1194	6	253	50	1.19	164.	22	74	5.4	45
35.0	1400	1164	6.73	10310	43.0	42.1	522	4637	165	9.2	7.7	85.4	1395	5	269	46	1.09	186.	25	83	5.9	
40.0	1600	1330	7.69	11036	46.0	39.3	564	4737	144	8.0	6.6	86.0	1596	4	284	42	1.01	207.	28	92	6.4	
45.0	1800	1496	8.66	11721	48.8	37.1	603	4815	128	7.0	5.9	86.5	1796	4	298	39	0.94	227.	32	100	6.8	
50.0	2000	1662	9.62	12371	51.4	35.2	640	4877	115	6.3	5.2	86.9	1997	3	312	37	0.89	246.	35	109	7.2	

#222 40 Ca on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 82. ZC=102.(No)
NEUTRON NUMBERS: NP= 20. NT=126. NC=146.

AP**1/3= 3.420 AT**1/3= 5.925
REDUCED MASS NUMBER= 33.55 AP+AT=AC=248.

INTERACTION RADIUS RINT=13.26 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.82 CT+CP=10.41 C̄= 2.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.96

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.66 RC=RCP+RCT=10.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 310.34 MeV K= .18207 n=2.617
VC(RINT)= 177.9 MeV

FISSION-TKE= 200. MeV
ASYMM. FISSION-TKE= 126. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 26.55 MeV
L-RLD= 54 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.98 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -19.5
COMPOUND NUCLEUS: 81.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.93 fm V(RB)= 185.7 MeV
Q-VALUE= -133.7 MeV
L-CRITICAL= 97.

40 Ca on 208 Pb

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	40	34	0.19	1727	7.3	258.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	80	67	0.38	2443	10.4	182.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	120	101	0.57	2993	12.7	149.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	160	134	0.75	3457	14.7	129.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	180	151	0.85	3667	15.6	121.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	200	168	0.94	3866	16.4	115.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	220	185	1.04	4055	17.2	110.1	43	201	0	137.8	129.2	21.1	116	104	75	580	13.71	0.	3	14	1.3	5
6.0	240	201	1.13	4236	18.0	105.4	81	652	346	105.0	93.9	37.5	158	82	98	309	7.21	38.	4	17	1.5	6
6.5	260	218	1.23	4409	18.7	101.3	106	1031	664	87.3	76.5	46.4	193	67	115	236	5.49	41.	5	19	1.6	8
7.0	280	235	1.32	4576	19.4	97.6	127	1355	807	75.3	65.2	52.4	223	57	127	198	4.61	43.	5	21	1.8	9
7.5	300	252	1.41	4738	20.1	94.3	144	1636	754	66.4	57.1	56.8	251	49	136	174	4.05	46.	6	23	2.0	10
8.0	320	268	1.51	4894	20.8	91.3	160	1881	706	59.5	51.0	60.2	277	43	144	157	3.65	49.	7	25	2.1	11
8.5	340	285	1.60	5045	21.4	88.6	174	2097	665	54.0	46.1	63.0	302	38	150	144	3.36	52.	7	27	2.2	13
9.0	360	302	1.70	5192	22.0	86.1	187	2289	628	49.5	42.1	65.3	326	34	156	134	3.12	55.	7	28	2.3	14
9.5	380	319	1.79	5335	22.6	83.8	199	2461	595	45.6	38.7	67.2	349	31	161	126	2.93	58.	8	30	2.4	15
10.0	400	335	1.89	5474	23.2	81.7	211	2615	565	42.4	35.9	68.8	372	28	165	119	2.77	60.	8	31	2.6	16
10.5	420	352	1.98	5610	23.8	79.7	222	2755	538	39.6	33.5	70.2	394	26	169	113	2.63	63.	9	33	2.7	17
11.0	440	369	2.07	5743	24.3	77.9	232	2882	514	37.1	31.3	71.5	416	24	172	108	2.51	66.	9	34	2.8	18
11.5	460	386	2.17	5873	24.9	76.1	242	2998	491	34.9	29.5	72.5	438	22	176	104	2.41	68.	9	35	2.9	19
12.0	480	403	2.26	6000	25.4	74.5	252	3104	471	33.0	27.8	73.5	459	21	179	100	2.32	71.	10	36	2.9	20
13.0	520	436	2.45	6247	26.5	71.6	270	3291	435	29.7	25.1	75.1	501	19	185	93	2.16	76.	11	39	3.1	22
14.0	560	470	2.64	6484	27.5	69.0	287	3452	403	27.1	22.8	76.5	543	17	190	88	2.03	82.	11	41	3.3	24
15.0	600	503	2.83	6714	28.4	66.7	303	3591	377	24.8	20.9	77.6	585	15	195	83	1.93	87.	12	44	3.5	26
16.0	640	537	3.02	6936	29.4	64.6	318	3713	353	22.9	19.3	78.5	626	14	199	79	1.83	92.	13	46	3.6	27
17.0	680	570	3.21	7151	30.3	62.6	333	3821	332	21.3	17.9	79.3	667	13	204	76	1.75	97.	13	48	3.8	29
18.0	720	604	3.39	7360	31.1	60.9	347	3916	314	19.9	16.7	80.0	708	12	208	72	1.68	102.	14	50	3.9	31
19.0	760	637	3.58	7564	32.0	59.2	360	4001	297	18.7	15.7	80.7	749	11	212	70	1.62	107.	15	52	4.0	32
20.0	800	671	3.77	7762	32.8	57.7	373	4078	282	17.6	14.8	81.2	790	10	216	67	1.56	111.	15	54	4.2	34
25.0	1000	839	4.72	8690	36.7	51.6	432	4370	226	13.6	11.5	83.2	992	8	233	58	1.35	135.	19	64	4.8	41
30.0	1200	1006	5.66	9532	40.2	47.1	483	4564	186	11.1	9.4	84.4	1194	6	249	52	1.21	157.	22	73	5.3	47
35.0	1400	1174	6.60	10310	43.4	43.6	530	4702	161	9.4	7.9	85.3	1395	5	264	47	1.10	178.	25	82	5.8	
40.0	1600	1342	7.54	11036	46.4	40.8	573	4806	141	8.2	6.8	85.9	1596	4	278	44	1.02	199.	28	91	6.2	
45.0	1800	1510	8.49	11721	49.2	38.5	613	4887	125	7.2	6.0	86.4	1796	4	292	41	0.95	218.	31	99	6.7	
50.0	2000	1677	9.43	12371	51.9	36.5	650	4951	113	6.4	5.4	86.8	1997	3	305	39	0.90	237.	34	107	7.1	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ars	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#223 40 Ca on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 83. ZC=103.(Lw)
NEUTRON NUMBERS: NP= 20. NT=126. NC=146.

AP**1/3= 3.420 AT**1/3= 5.934
REDUCED MASS NUMBER= 33.57 AP+AT=AC=249.

INTERACTION RADIUS RINT=13.27 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 6.83 CT+CP=10.42 C= 2.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 6.97

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.68 RC=RCP+RCT=10.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 313.50 MeV K= .18166 n=2.621
VC(RINT)= 179.9 MeV

FISSION-TKE= 203. MeV
ASYMM. FISSION-TKE= 127. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 26.65 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.97 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: -16.5
COMPOUND NUCLEUS: 87.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.94 fm V(RB)= 187.9 MeV
Q-VALUE= -137.0 MeV
L-CRITICAL= 97.

40 Ca on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPOMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	40	34	0.19	1727	7.3	261.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	67	0.37	2443	10.4	184.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	101	0.56	2993	12.7	150.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	160	134	0.75	3457	14.7	130.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	180	151	0.84	3667	15.6	123.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	200	168	0.93	3866	16.4	116.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	220	185	1.03	4055	17.2	111.5	36	143	0	144.4	136.9	17.8	112	108	72	695	16.35	0.	3 14	1.2	4
6.0	240	201	1.12	4236	18.0	106.7	78	600	302	107.9	97.0	36.0	155	85	97	326	7.53	38.	4 17	1.4	6
6.5	260	218	1.21	4409	18.7	102.5	104	994	623	89.3	78.5	45.4	191	69	114	245	5.63	41.	5 19	1.6	7
7.0	280	235	1.31	4576	19.4	98.8	125	1312	792	76.8	66.7	51.6	222	58	126	204	4.69	44.	5 21	1.8	8
7.5	300	252	1.40	4738	20.1	95.4	142	1596	739	67.7	58.3	56.2	250	50	136	179	4.11	46.	6 23	1.9	10
8.0	320	269	1.49	4894	20.8	92.4	158	1845	693	60.6	51.9	59.7	276	44	144	161	3.70	49.	7 25	2.1	11
8.5	340	285	1.59	5045	21.4	89.7	173	2063	652	54.9	46.9	62.5	301	39	150	147	3.39	52.	7 27	2.2	12
9.0	360	302	1.68	5192	22.0	87.1	186	2258	616	50.3	42.8	64.9	325	35	156	137	3.15	55.	7 28	2.3	13
9.5	380	319	1.77	5335	22.6	84.8	198	2432	583	46.3	39.4	66.8	348	32	161	128	2.95	58.	8 30	2.4	14
10.0	400	336	1.87	5474	23.2	82.7	210	2588	554	43.0	36.5	68.5	371	29	165	121	2.79	60.	8 31	2.5	16
10.5	420	353	1.96	5610	23.8	80.7	221	2729	528	40.1	34.0	69.9	393	27	169	115	2.65	63.	9 32	2.6	17
11.0	440	369	2.05	5743	24.4	78.8	231	2858	504	37.6	31.8	71.2	415	25	173	110	2.53	66.	9 34	2.7	18
11.5	460	386	2.15	5873	24.9	77.1	241	2975	482	35.4	29.9	72.3	437	23	176	105	2.42	68.	9 35	2.8	19
12.0	480	403	2.24	6000	25.4	75.5	251	3082	462	33.5	28.3	73.3	459	21	180	101	2.33	71.	10 36	2.9	20
13.0	520	436	2.43	6247	26.5	72.5	269	3272	426	30.1	25.4	74.9	501	19	185	95	2.17	76.	11 39	3.1	22
14.0	560	470	2.61	6484	27.5	69.9	286	3435	396	27.4	23.1	76.3	543	17	191	89	2.04	82.	11 41	3.3	23
15.0	600	504	2.80	6714	28.4	67.5	302	3576	369	25.2	21.2	77.4	585	15	196	84	1.93	87.	12 43	3.4	25
16.0	640	537	2.99	6936	29.4	65.3	318	3699	346	23.2	19.6	78.4	626	14	200	80	1.84	92.	13 46	3.6	27
17.0	680	571	3.17	7151	30.3	63.4	332	3808	326	21.6	18.2	79.2	667	13	204	77	1.76	96.	13 48	3.7	29
18.0	720	604	3.36	7360	31.2	61.6	346	3905	308	20.2	17.0	79.9	708	12	209	74	1.69	102.	14 50	3.9	30
19.0	760	638	3.55	7564	32.0	60.0	360	3991	291	18.9	15.9	80.5	749	11	213	71	1.62	106.	15 52	4.0	32
20.0	800	671	3.73	7762	32.8	58.4	373	4069	277	17.8	15.0	81.1	790	10	216	68	1.57	111.	15 54	4.1	33
25.0	1000	839	4.67	8690	36.7	52.3	432	4364	221	13.8	11.6	83.1	992	8	234	59	1.35	135.	19 64	4.8	40
30.0	1200	1007	5.60	9532	40.2	47.7	484	4560	184	11.3	9.5	84.4	1194	6	250	53	1.21	157.	22 73	5.3	46
35.0	1400	1175	6.53	10310	43.4	44.2	530	4701	158	9.5	8.0	85.2	1395	5	265	48	1.10	178.	25 82	5.8	
40.0	1600	1343	7.46	11036	46.4	41.3	573	4806	138	8.2	6.9	85.9	1596	4	279	44	1.02	198.	28 91	6.2	
45.0	1800	1511	8.40	11721	49.3	39.0	613	4887	123	7.3	6.1	86.4	1796	4	293	42	0.95	217.	31 99	6.6	
50.0	2000	1679	9.33	12371	51.9	37.0	651	4953	110	6.5	5.5	86.7	1997	3	306	39	0.90	236.	34 107	7.0	

#224 40 Ca on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 20. ZT= 92. ZC=112.( )
NEUTRON NUMBERS: NP= 20. NT=146. NC=166.

AP**1/3= 3.420 AT**1/3= 6.197
REDUCED MASS NUMBER= 34.24 AP+AT=AC=278.

INTERACTION RADIUS RINT=13.55 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.59 CT= 7.16 CT+CP=10.76 C= 2.39

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 3.85 RT= 7.30

COULOMB RADII [fm]:
RCP= 3.84 RCT= 6.98 RC=RCP+RCT=10.82

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 337.01 MeV K= .16937 n=2.647
VC(RINT)= 195.2 MeV

FISSION-TKE= 228. MeV
ASYMM. FISSION-TKE= 134. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 26.69 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -33.0 TARGET: 47.2
COMPOUND NUCLEUS: 154.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.20 fm V(RB)= 203.5 MeV
Q-VALUE= -140.5 MeV
L-CRITICAL= 93.

40 Ca on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SOMAR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPOMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	40	34	0.18	1727	7.5	289.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	80	68	0.35	2443	10.6	204.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	120	103	0.53	2993	13.0	167.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	160	137	0.70	3457	15.0	144.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	180	154	0.79	3667	15.9	136.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	200	171	0.88	3866	16.7	129.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	220	188	0.96	4055	17.6	123.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	240	205	1.05	4236	18.3	118.3	55	291	44	130.3	122.1	24.9	143	97	89	530	11.35	34.	4 15	1.4	6
6.5	260	223	1.14	4409	19.1	113.6	90	718	401	103.1	93.4	38.5	181	79	109	324	6.89	36.	5 18	1.5	8
7.0	280	240	1.23	4576	19.8	109.5	115	1083	704	87.0	77.6	46.5	215	65	123	254	5.39	39.	5 20	1.7	10
7.5	300	257	1.32	4738	20.5	105.8	136	1399	657	75.8	66.9	52.1	244	56	134	216	4.58	41.	6 22	1.8	11
8.0	320	274	1.40	4894	21.2	102.4	154	1674	616	67.4	59.1	56.3	271	49	142	191	4.05	44.	6 24	2.0	12
8.5	340	291	1.49	5045	21.8	99.4	170	1917	580	60.7	53.0	59.6	297	43	149	173	3.67	46.	7 26	2.1	14
9.0	360	308	1.58	5192	22.5	96.6	184	2133	548	55.3	48.2	62.3	322	38	155	160	3.38	49.	7 27	2.2	15
9.5	380	325	1.67	5335	23.1	94.0	198	2326	519	50.9	44.1	64.6	345	35	160	149	3.15	51.	8 29	2.3	16
10.0	400	342	1.75	5474	23.7	91.6	210	2500	493	47.1	40.8	66.5	369	31	165	140	2.96	54.	8 30	2.4	17
10.5	420	360	1.84	5610	24.3	89.4	222	2657	469	43.8	37.9	68.1	391	29	169	132	2.80	56.	9 31	2.5	19
11.0	440	377	1.93	5743	24.8	87.4	233	2800	448	41.0	35.4	69.5	413	27	172	126	2.66	59.	9 33	2.6	20
11.5	460	394	2.02	5873	25.4	85.4	244	2930	429	38.6	33.3	70.7	435	25	176	120	2.55	61.	9 34	2.7	21
12.0	480	411	2.10	6000	25.9	83.6	255	3049	411	36.4	31.4	71.8	457	23	179	115	2.44	64.	10 35	2.8	22
13.0	520	445	2.28	6247	27.0	80.4	274	3260	379	32.7	28.1	73.7	500	20	184	107	2.27	68.	10 38	3.0	24
14.0	560	479	2.46	6484	28.0	77.4	292	3441	352	29.7	25.5	75.2	542	18	189	101	2.13	73.	11 40	3.1	26
15.0	600	514	2.63	6714	29.0	74.8	309	3597	328	27.2	23.4	76.4	584	16	194	95	2.01	78.	12 42	3.3	28
16.0	640	548	2.81	6936	30.0	72.4	326	3734	308	25.1	21.5	77.5	625	15	198	90	1.91	82.	13 44	3.4	30
17.0	680	582	2.98	7151	30.9	70.3	341	3855	290	23.3	20.0	78.4	666	14	202	86	1.82	87.	13 47	3.6	31
18.0	720	616	3.16	7360	31.8	68.3	356	3962	274	21.7	18.6	79.1	707	13	206	83	1.75	91.	14 49	3.7	33
19.0	760	651	3.33	7564	32.6	66.5	370	4058	259	20.4	17.5	79.8	748	12	210	79	1.68	96.	15 51	3.8	35
20.0	800	685	3.51	7762	33.5	64.8	384	4145	246	19.2	16.4	80.4	789	11	213	77	1.62	100.	15 53	4.0	37
25.0	1000	856	4.39	8690	37.4	57.9	446	4473	197	14.8	12.7	82.6	992	8	229	66	1.40	121.	18 62	4.5	44
30.0	1200	1027	5.26	9532	41.0	52.9	500	4691	164	12.1	10.3	84.0	1193	7	244	59	1.24	141.	22 71	5.1	51
35.0	1400	1199	6.14	10310	44.3	49.0	549	4847	140	10.2	8.7	84.9	1395	5	257	54	1.13	160.	25 80	5.5	
40.0	1600	1370	7.02	11036	47.4	45.8	594	4963	123	8.8	7.5	85.6	1595	5	269	49	1.05	179.	28 88	5.9	
45.0	1800	1541	7.89	11721	50.2	43.2	636	5054	109	7.8	6.7	86.1	1796	4	281	46	0.98	196.	31 96	6.3	
50.0	2000	1712	8.77	12371	53.0	41.0	676	5126	98	6.9	5.9	86.5	1996	4	293	44	0.92	213.	34 104	6.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 40 Ca

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#225 46 Ti on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 6. ZC= 28.(Ni)
NEUTRON NUMBERS: NP= 24. NT= 6. NC= 30.

AP**1/3= 3.583 AT**1/3= 2.289 ELSCAT <15 deg
REDUCED MASS NUMBER= 9.52 AP+AT=AC= 58.

INTERACTION RADIUS RINT= 9.48 fm R0= 1.61 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 2.12 CT+CP= 5.93 C= 1.36

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 2.52

COULOMB RADII [fm]:
RCP= 4.00 RCT= 2.51 RC=RCP+RCT= 6.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 40.29 MeV K= .08433 n=2.607
VC(RINT)= 20.0 MeV

FISSION-TKE= 44. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.950 MeV/fm**2 PROX-FACTOR= 16.26 MeV
L-RLD= 56 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 20.27 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: 0.0
COMPOUND NUCLEUS: -62.6

FUSION RELATED PARAMETERS:
R-BARRIER= 8.60 fm V(RB)= 20.5 MeV
Q-VALUE= 17.8 MeV
L-CRITICAL= 34.

46 Ti on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	10	0.48	1986	2.1	20.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	92	19	0.95	2809	2.9	14.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	138	29	1.43	3442	3.6	12.0	19	934	656	65.5	12.1	57.3	112	26	0	22	4.53	106.	0	2.5	2
4.0	184	38	1.90	3975	4.2	10.4	27	1438	1073	41.9	8.3	69.1	169	15	161	15	3.12	138.	4	2.8	3
4.5	207	43	2.14	4217	4.4	9.8	31	1603	1213	35.6	7.1	72.2	194	13	182	13	2.77	156.	5	2.9	3
5.0	230	48	2.38	4446	4.7	9.3	34	1734	1324	30.9	6.3	74.5	219	11	202	12	2.52	173.	6	3.0	3
5.5	253	52	2.61	4663	4.9	8.9	36	1840	1415	27.4	5.6	76.3	244	9	221	11	2.33	187.	6	3.1	4
6.0	276	57	2.85	4871	5.1	8.5	39	1929	1476	24.6	5.0	77.7	268	8	239	11	2.17	204.	7	3.2	4
6.5	299	62	3.09	5071	5.3	8.2	41	2003	1363	22.3	4.6	78.9	292	7	257	10	2.05	221.	7	3.3	4
7.0	322	67	3.33	5263	5.5	7.9	44	2066	1265	20.4	4.2	79.8	315	7	275	9	1.94	238.	8	3.4	4
7.5	345	71	3.57	5448	5.7	7.6	46	2121	1181	18.8	3.9	80.6	339	6	292	9	1.85	255.	8	3.5	4
8.0	368	76	3.80	5628	5.9	7.3	48	2169	1107	17.4	3.6	81.3	362	6	309	9	1.77	272.	9	3.6	4
8.5	391	81	4.04	5802	6.1	7.1	50	2211	1042	16.3	3.3	81.9	386	5	327	8	1.70	288.	9	3.7	5
9.0	414	86	4.28	5971	6.2	6.9	52	2248	984	15.2	3.1	82.4	409	5	344	8	1.63	300.	10	3.8	5
9.5	437	90	4.52	6135	6.4	6.7	54	2281	932	14.3	2.9	82.8	433	4	360	8	1.58	317.	10	3.9	5
10.0	460	95	4.75	6295	6.6	6.6	55	2311	886	13.5	2.8	83.2	456	4	377	7	1.53	333.	11	3.9	5
10.5	483	100	4.99	6452	6.7	6.4	57	2338	843	12.8	2.6	83.6	479	4	394	7	1.48	348.	12	4.0	6
11.0	506	105	5.23	6604	6.9	6.3	59	2362	805	12.2	2.5	83.9	502	4	411	7	1.44	360.	12	4.1	6
11.5	529	109	5.47	6754	7.1	6.1	60	2384	770	11.6	2.4	84.2	525	4	427	7	1.40	376.	13	4.2	6
12.0	552	114	5.71	6900	7.2	6.0	62	2405	738	11.0	2.3	84.5	549	3	444	7	1.36	392.	13	4.3	6
13.0	598	124	6.18	7184	7.5	5.8	65	2440	681	10.1	2.1	84.9	595	3	477	6	1.30	425.	14	4.4	6
14.0	644	133	6.66	7457	7.8	5.6	68	2471	632	9.3	1.9	85.3	641	3	509	6	1.24	449.	15	4.6	7
15.0	690	143	7.13	7721	8.1	5.4	71	2497	590	8.7	1.8	85.7	687	3	542	6	1.19	481.	16	4.7	7
16.0	736	152	7.61	7976	8.3	5.2	74	2520	553	8.1	1.7	86.0	734	2	574	6	1.15	513.	17	4.8	7
17.0	782	162	8.08	8224	8.6	5.0	76	2540	521	7.6	1.6	86.2	780	2	607	5	1.11	534.	18	5.0	8
18.0	828	171	8.56	8464	8.8	4.9	79	2558	492	7.1	1.5	86.4	826	2	639	5	1.08	566.	19	5.1	8
19.0	874	181	9.03	8699	9.1	4.8	81	2574	466	6.7	1.4	86.6	872	2	671	5	1.04	597.	20	5.2	8
20.0	920	190	9.51	8927	9.3	4.6	83	2588	443	6.4	1.3	86.8	918	2	703	5	1.01	616.	21	5.4	9
25.0	1150	238	11.89	9994	10.4	4.2	94	2642	354	5.0	1.0	87.5	1149	1	862	4	0.90	754.	26	5.9	10
30.0	1380	286	14.26	10962	11.4	3.8	104	2677	295	4.2	0.9	87.9	1379	1	1019	4	0.81	886.	31	6.5	11
35.0	1610	333	16.64	11856	12.3	3.5	113	2702	253	3.6	0.7	88.2	1609	1	1176	4	0.75	990.	35	7.0	
40.0	1840	381	19.02	12691	13.2	3.3	122	2720	221	3.1	0.6	88.5	1839	1	1332	3	0.70	1106.	40	7.4	
45.0	2070	428	21.40	13479	14.0	3.1	129	2734	196	2.7	0.6	88.6	2069	1	1486	3	0.65	1216.	45	7.8	
50.0	2300	476	23.77	14227	14.7	2.9	137	2746	177	2.5	0.5	88.8	2299	1	1641	3	0.62	1320.	49	8.3	

#226 46 Ti on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 8. ZC= 30.(Zn)
NEUTRON NUMBERS: NP= 24. NT= 8. NC= 32.

AP**1/3= 3.583 AT**1/3= 2.520 ELSCAT <20 deg
REDUCED MASS NUMBER= 11.87 AP+AT=AC= 62.

INTERACTION RADIUS RINT= 9.74 fm R0= 1.60 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 2.42 CT+CP= 6.23 C= 1.48

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 2.78

COULOMB RADII [fm]:
RCP= 4.00 RCT= 2.78 RC=RCP+RCT= 6.79

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 51.97 MeV K= .11332 n=2.540
VC(RINT)= 26.0 MeV

FISSION-TKE= 47. MeV
ASYMM. FISSION-TKE= 36. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.950 MeV/fm**2 PROX-FACTOR= 17.67 MeV
L-RLD= 59 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.34 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -4.7
COMPOUND NUCLEUS: -61.6

FUSION RELATED PARAMETERS:
R-BARRIER= 8.80 fm V(RB)= 26.8 MeV
Q-VALUE= 12.0 MeV
L-CRITICAL= 41.

46 Ti on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	12	0.46	1986	2.6	27.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	92	24	0.91	2809	3.7	19.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	138	36	1.37	3442	4.5	16.0	23	873	602	70.3	16.3	54.8	103	35	0	31	4.90	97.	0	2.5	3
4.0	184	47	1.83	3975	5.2	13.9	34	1426	1060	44.4	11.0	67.8	164	20	155	21	3.27	130.	4	15	2.8	3
4.5	207	53	2.05	4217	5.5	13.1	38	1607	1213	37.6	9.4	71.2	191	16	175	18	2.90	144.	5	18	2.9	4
5.0	230	59	2.28	4446	5.8	12.4	42	1752	1335	32.6	8.3	73.7	216	14	194	17	2.63	160.	5	21	3.0	4
5.5	253	65	2.51	4663	6.1	11.8	46	1869	1435	28.8	7.3	75.6	241	12	212	15	2.42	175.	6	23	3.2	4
6.0	276	71	2.74	4871	6.4	11.3	49	1967	1388	25.8	6.6	77.1	265	11	229	14	2.26	191.	7	25	3.3	4
6.5	299	77	2.97	5071	6.6	10.9	52	2049	1282	23.4	6.0	78.3	290	9	246	13	2.12	207.	7	27	3.4	4
7.0	322	83	3.20	5263	6.9	10.5	55	2119	1190	21.4	5.5	79.3	313	9	263	13	2.01	220.	8	29	3.5	5
7.5	345	89	3.42	5448	7.1	10.1	58	2180	1111	19.7	5.1	80.1	337	8	279	12	1.91	235.	8	31	3.6	5
8.0	368	95	3.65	5628	7.3	9.8	61	2233	1041	18.3	4.7	80.9	361	7	295	11	1.83	251.	9	33	3.7	5
8.5	391	101	3.88	5802	7.6	9.5	63	2280	980	17.0	4.4	81.5	384	7	311	11	1.75	262.	9	35	3.8	6
9.0	414	107	4.11	5971	7.8	9.2	66	2321	925	15.9	4.1	82.0	408	6	326	11	1.69	277.	10	37	3.9	6
9.5	437	113	4.34	6135	8.0	9.0	68	2358	877	15.0	3.9	82.5	431	6	342	10	1.63	293.	10	38	4.0	6
10.0	460	119	4.57	6295	8.2	8.8	71	2391	833	14.1	3.6	82.9	455	5	357	10	1.58	308.	11	40	4.1	6
10.5	483	125	4.79	6452	8.4	8.6	73	2421	793	13.4	3.4	83.3	478	5	373	10	1.53	323.	11	42	4.2	6
11.0	506	131	5.02	6604	8.6	8.4	75	2448	757	12.7	3.3	83.6	501	5	388	9	1.48	338.	12	43	4.3	7
11.5	529	137	5.25	6754	8.8	8.2	77	2473	724	12.1	3.1	84.0	525	4	403	9	1.44	348.	12	45	4.4	7
12.0	552	142	5.48	6900	9.0	8.0	79	2495	694	11.5	3.0	84.2	548	4	418	9	1.41	363.	13	47	4.5	7
13.0	598	154	5.94	7184	9.4	7.7	83	2535	641	10.6	2.7	84.7	594	4	448	8	1.34	393.	14	50	4.6	7
14.0	644	166	6.39	7457	9.7	7.4	87	2569	595	9.7	2.5	85.1	640	4	478	8	1.28	416.	15	53	4.8	8
15.0	690	178	6.85	7721	10.1	7.2	90	2599	555	9.0	2.3	85.5	687	3	507	8	1.23	446.	16	56	5.0	8
16.0	736	190	7.31	7976	10.4	6.9	94	2625	520	8.4	2.2	85.8	733	3	537	7	1.18	467.	17	59	5.1	9
17.0	782	202	7.76	8224	10.7	6.7	97	2647	490	7.9	2.0	86.0	779	3	566	7	1.14	496.	18	61	5.3	9
18.0	828	214	8.22	8464	11.0	6.5	101	2667	462	7.4	1.9	86.3	825	3	595	7	1.11	525.	19	64	5.4	9
19.0	874	226	8.68	8699	11.3	6.4	104	2685	438	7.0	1.8	86.5	871	3	624	7	1.07	544.	20	67	5.5	10
20.0	920	237	9.13	8927	11.6	6.2	107	2701	416	6.6	1.7	86.7	918	2	653	7	1.04	572.	21	70	5.7	10
25.0	1150	297	11.42	9994	13.0	5.5	121	2762	333	5.3	1.4	87.4	1148	2	796	6	0.92	688.	25	83	6.3	12
30.0	1380	356	13.70	10962	14.2	5.1	133	2802	277	4.3	1.1	87.8	1378	2	938	5	0.83	809.	30	95	6.9	13
35.0	1610	415	15.98	11856	15.4	4.7	145	2830	238	3.7	1.0	88.1	1609	1	1078	5	0.77	905.	35	107	7.4	
40.0	1840	475	18.27	12691	16.4	4.4	155	2851	208	3.2	0.8	88.4	1839	1	1217	5	0.72	1012.	39	119	7.9	
45.0	2070	534	20.55	13479	17.4	4.1	165	2867	185	2.9	0.7	88.6	2069	1	1356	4	0.67	1114.	44	131	8.4	
50.0	2300	594	22.83	14227	18.4	3.9	175	2880	166	2.6	0.7	88.7	2299	1	1493	4	0.64	1183.	49	142	8.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#227 46 Ti on 27 Al

46 Ti on 27 Al

46 Ti on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 13. ZC= 35.(Br)
NEUTRON NUMBERS: NP= 24. NT= 14. NC= 38.

AP**1/3= 3.583 AT**1/3= 3.000 ELSCAT <36 deg
REDUCED MASS NUMBER= 17.01 AP+AT=AC= 73.

INTERACTION RADIUS RINT=10.26 fm R0= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 3.05 CT+CP= 6.85 C= 1.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 3.35

COULOMB RADII [fm]:
RCP= 4.00 RCT= 3.32 RC=RCP+RCT= 7.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 78.88 MeV K= .16721 n=2.467
VC(RINT)= 40.1 MeV

FISSION-TKE= 54. MeV
ASYMM. FISSION-TKE= 50. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.949 MeV/fm**2 PROX-FACTOR= 20.17 MeV
L-RLD= 67 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 11.52 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -20.6
COMPOUND NUCLEUS: -65.2

FUSION RELATED PARAMETERS:
R-BARRIER= 9.23 fm V(RB)= 41.7 MeV
Q-VALUE= -0.2 MeV
L-CRITICAL= 57.

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-GP	ET-GT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	17	0.42	1986	3.7	45.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	92	34	0.85	2809	5.3	31.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	138	51	1.27	3442	6.4	26.0	31	754	491	80.7	27.9	49.6	84	54	84	56	5.79	83.	2 6	2.4	3
4.0	184	68	1.70	3975	7.4	22.5	49	1414	1037	49.4	17.9	65.3	154	30	139	35	3.62	110.	4 16	2.7	4
4.5	207	77	1.91	4217	7.9	21.2	56	1631	1219	41.6	15.2	69.2	183	24	159	31	3.17	123.	5 19	2.9	4
5.0	230	85	2.12	4446	8.3	20.1	62	1804	1364	36.0	13.2	72.0	210	20	176	28	2.86	137.	5 22	3.0	4
5.5	253	94	2.33	4663	8.7	19.2	68	1946	1409	31.7	11.6	74.2	235	18	192	25	2.62	148.	6 24	3.2	5
6.0	276	102	2.55	4871	9.1	18.4	73	2063	1292	28.3	10.4	75.8	261	15	207	24	2.43	162.	7 26	3.3	5
6.5	299	111	2.76	5071	9.5	17.7	78	2162	1192	25.6	9.4	77.2	285	14	222	22	2.28	173.	7 28	3.5	6
7.0	322	119	2.97	5263	9.8	17.0	82	2247	1107	23.4	8.6	78.3	310	12	236	21	2.15	186.	8 31	3.6	6
7.5	345	128	3.18	5448	10.2	16.4	87	2320	1033	21.5	7.9	79.2	334	11	249	20	2.05	199.	8 32	3.7	6
8.0	368	136	3.40	5628	10.5	15.9	91	2385	969	19.9	7.3	80.0	358	10	262	19	1.95	210.	9 34	3.9	7
8.5	391	145	3.61	5802	10.8	15.4	95	2441	912	18.5	6.8	80.7	382	9	275	18	1.87	223.	9 36	4.0	7
9.0	414	153	3.82	5971	11.2	15.0	98	2491	861	17.3	6.4	81.3	405	9	288	17	1.80	236.	10 38	4.1	7
9.5	437	162	4.03	6135	11.5	14.6	102	2536	816	16.3	6.0	81.9	429	8	301	17	1.74	245.	10 40	4.2	8
10.0	460	170	4.25	6295	11.8	14.2	106	2576	775	15.4	5.7	82.3	452	8	313	16	1.68	258.	11 42	4.3	8
10.5	483	179	4.46	6452	12.1	13.9	109	2612	738	14.5	5.4	82.7	476	7	326	16	1.63	271.	11 43	4.4	8
11.0	506	187	4.67	6604	12.3	13.6	112	2645	704	13.8	5.1	83.1	499	7	338	15	1.58	279.	12 45	4.5	9
11.5	529	196	4.88	6754	12.6	13.3	115	2675	674	13.1	4.8	83.4	523	6	350	15	1.53	292.	12 47	4.6	9
12.0	552	204	5.09	6900	12.9	13.0	119	2703	646	12.5	4.6	83.7	546	6	362	15	1.49	305.	13 48	4.7	9
13.0	598	221	5.52	7184	13.4	12.5	125	2752	596	11.5	4.2	84.3	592	6	386	14	1.42	325.	14 51	4.9	10
14.0	644	238	5.94	7457	13.9	12.0	130	2793	553	10.6	3.9	84.7	639	5	409	13	1.36	350.	14 54	5.1	10
15.0	690	255	6.37	7721	14.4	11.6	136	2829	516	9.8	3.6	85.1	685	5	433	13	1.31	369.	15 57	5.3	11
16.0	736	272	6.79	7976	14.9	11.3	141	2861	484	9.1	3.4	85.4	732	4	456	12	1.26	387.	16 60	5.5	12
17.0	782	289	7.22	8224	15.3	10.9	146	2888	456	8.5	3.2	85.7	778	4	479	12	1.21	412.	17 63	5.6	12
18.0	828	306	7.64	8464	15.8	10.6	151	2913	430	8.0	3.0	86.0	824	4	502	11	1.17	436.	18 66	5.8	12
19.0	874	323	8.07	8699	16.2	10.3	156	2935	406	7.6	2.8	86.2	870	4	524	11	1.14	452.	19 69	5.9	13
20.0	920	340	8.49	8927	16.6	10.1	160	2955	387	7.2	2.7	86.4	917	3	547	11	1.10	468.	20 71	6.1	14
25.0	1150	425	10.61	9994	18.6	9.0	182	3029	310	5.7	2.1	87.2	1147	3	658	9	0.98	565.	24 85	6.8	16
30.0	1380	510	12.74	10962	20.4	8.2	201	3079	258	4.7	1.7	87.7	1378	2	767	9	0.88	655.	29 97	7.5	18
35.0	1610	595	14.86	11856	22.0	7.6	218	3114	221	4.0	1.5	88.0	1608	2	875	8	0.81	736.	33 109	8.1	
40.0	1840	681	16.98	12691	23.5	7.1	234	3140	193	3.5	1.3	88.3	1838	2	981	7	0.76	825.	38 121	8.6	
45.0	2070	766	19.10	13479	25.0	6.7	249	3160	172	3.1	1.1	88.5	2069	1	1087	7	0.71	893.	42 132	9.2	
50.0	2300	851	21.23	14227	26.3	6.4	264	3176	155	2.8	1.0	88.6	2299	1	1192	7	0.67	972.	46 143	9.7	

#228 46 Ti on 40 Ca

46 Ti on 40 Ca

46 Ti on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 20. ZC= 42.(Mo)
NEUTRON NUMBERS: NP= 24. NT= 20. NC= 44.

AP**1/3= 3.583 AT**1/3= 3.420 ELSCAT <60 deg
REDUCED MASS NUMBER= 21.40 AP+AT=AC= 86.

INTERACTION RADIUS RINT=10.72 fm R0= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 3.59 CT+CP= 7.39 C= 1.85

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 3.85

COULOMB RADII [fm]:
RCP= 4.00 RCT= 3.84 RC=RCP+RCT= 7.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 113.70 MeV K= .21711 n=2.440
VC(RINT)= 59.0 MeV

FISSION-TKE= 65. MeV
ASYMM. FISSION-TKE= 65. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.951 MeV/fm**2 PROX-FACTOR= 22.07 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -33.0
COMPOUND NUCLEUS: -65.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.59 fm V(RB)= 61.9 MeV
Q-VALUE= -12.0 MeV
L-CRITICAL= 69.

EL/u	ELAB	ECN	ECN/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-GP	ET-GT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	21	0.36	1986	4.7	69.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	92	43	0.72	2809	6.6	49.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	138	64	1.09	3442	8.1	40.0	24	310	101	117.1	52.0	31.4	38	100	0	141	9.94	71.	0 0	2.2	3
4.0	184	86	1.45	3975	9.4	34.6	56	1158	798	63.7	29.3	58.2	133	51	118	62	4.36	94.	3 15	2.6	4
4.5	207	96	1.63	4217	9.9	32.7	66	1437	1030	52.6	24.3	63.7	167	40	141	53	3.68	106.	4 18	2.8	4
5.0	230	107	1.81	4446	10.5	31.0	75	1659	1215	44.9	20.8	67.6	197	33	159	46	3.24	116.	5 21	3.0	5
5.5	253	118	1.99	4663	11.0	29.5	83	1841	1287	39.2	18.2	70.4	225	28	175	42	2.93	127.	6 23	3.1	5
6.0	276	128	2.17	4871	11.5	28.3	90	1992	1180	34.8	16.1	72.6	251	25	189	38	2.69	137.	6 26	3.3	6
6.5	299	139	2.36	5071	11.9	27.2	97	2119	1089	31.3	14.5	74.3	277	22	203	36	2.51	149.	7 28	3.4	6
7.0	322	150	2.54	5263	12.4	26.2	103	2228	1011	28.5	13.2	75.8	303	19	215	34	2.35	158.	7 30	3.6	7
7.5	345	160	2.72	5448	12.8	25.3	109	2323	944	26.1	12.1	77.0	328	17	227	32	2.23	169.	8 32	3.7	7
8.0	368	171	2.90	5628	13.2	24.5	115	2405	885	24.1	11.2	78.0	352	16	238	30	2.12	181.	8 34	3.8	7
8.5	391	182	3.08	5802	13.6	23.8	120	2478	833	22.4	10.4	78.8	376	15	249	29	2.02	190.	9 36	4.0	8
9.0	414	193	3.26	5971	14.0	23.1	125	2542	786	20.9	9.7	79.6	400	14	260	28	1.94	201.	9 38	4.1	8
9.5	437	203	3.44	6135	14.4	22.5	130	2600	745	19.6	9.1	80.2	424	13	271	27	1.87	209.	10 40	4.2	9
10.0	460	214	3.62	6295	14.8	21.9	135	2652	708	18.4	8.6	80.8	448	12	281	26	1.80	220.	10 41	4.3	9
10.5	483	225	3.81	6452	15.2	21.4	140	2699	674	17.4	8.1	81.3	472	11	292	25	1.74	228.	11 43	4.4	10
11.0	506	235	3.99	6604	15.5	20.9	144	2741	643	16.5	7.7	81.7	496	10	302	24	1.69	239.	11 45	4.6	10
11.5	529	246	4.17	6754	15.9	20.4	148	2780	615	15.7	7.3	82.2	519	10	312	23	1.64	250.	12 46	4.7	10
12.0	552	257	4.35	6900	16.2	20.0	152	2816	590	14.9	6.9	82.5	543	9	321	23	1.59	257.	12 48	4.8	11
13.0	598	278	4.71	7184	16.9	19.2	161	2879	544	13.7	6.3	83.2	590	8	341	22	1.51	279.	13 51	5.0	11
14.0	644	300	5.07	7457	17.5	18.5	168	2933	505	12.6	5.8	83.7	636	8	360	21	1.45	296.	14 54	5.2	12
15.0	690	321	5.44	7721	18.1	17.9	175	2979	472	11.6	5.4	84.2	683	7	379	20	1.39	313.	15 57	5.4	13
16.0	736	342	5.80	7976	18.7	17.3	183	3020	442	10.8	5.0	84.6	729	7	397	19	1.33	334.	16 60	5.5	13
17.0	782	364	6.16	8224	19.3	16.8	189	3056	416	10.1	4.7	84.9	776	6	416	18	1.28	350.	17 63	5.7	14
18.0	828	385	6.52	8464	19.9	16.3	196	3088	393	9.5	4.4	85.2	822	6	434	18	1.24	365.	18 66	5.9	15
19.0	874	407	6.89	8699	20.4	15.9	202	3116	372	9.0	4.2	85.5	869	5	452	17	1.20	386.	18 68	6.1	15
20.0	920	428	7.25	8927	20.9	15.5	208	3142	354	8.5	4.0	85.7	915	5	470	17	1.17	400.	19 71	6.2	16
25.0	1150	535	9.06	9994	23.4	13.9	237	3239	283	6.7	3.1	86.6	1146	4	557	15	1.03	479.	24 84	7.0	19
30.0	1380	642	10.87	10962	25.6	12.6	262	3303	236	5.5	2.6	87.2	1377	3	642	13	0.93	558.	28 96	7.7	21
35.0	1610	749	12.69	11856	27.7	11.7	285	3349	202	4.7	2.2	87.6	1607	3	726	12	0.85	630.	32 108	8.3	
40.0	1840	856	14.50	12691	29.6	11.0	306	3383	177	4.1	1.9	88.0	1838	2	808	11	0.79	698.	36 120	8.9	
45.0	2070	963	16.31	13479	31.4	10.3	326	3409	157	3.6	1.7	88.2	2068	2	889	11	0.75	759.	40 131	9.4	
50.0	2300	1070	18.12	14227	33.1	9.8	345	3431	141	3.3	1.5	88.4	2298	2	970	10	0.71	815.	44 141	9.9	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM GP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#229 46 Ti on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 26. ZC= 48.(Cd)
NEUTRON NUMBERS: NP= 24. NT= 30. NC= 54.

AP**1/3= 3.583 AT**1/3= 3.826
REDUCED MASS NUMBER= 25.25 AP+AT=AC=102.

INTERACTION RADIUS RINT=11.16 fm RO= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 4.12 CT+CP= 7.92 C= 1.98

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 4.35

COULOMB RADII [fm]:
RCP= 4.00 RCT= 4.27 RC=RCP+RCT= 8.28

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 140.10 MeV K= .23400 n=2.441
VC(RINT)= 73.7 MeV

FISSION-TKE= 75. MeV
ASYMM. FISSION-TKE= 74. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 23.49 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.87 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -61.4
COMPOUND NUCLEUS: -80.3

FUSION RELATED PARAMETERS:
R-BARRIER= 9.99 fm V(RB)= 77.2 MeV
Q-VALUE= -25.9 MeV
L-CRITICAL= 83.

46 Ti on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	25	0.34	1986	5.5	90.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	92	51	0.69	2809	7.8	63.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	138	76	1.03	3442	9.6	52.0	17	114	0	143.3	88.1	18.4	15	123	15	314	18.03	0.	0	3	2.0	3
4.0	184	101	1.37	3975	11.0	45.0	64	1068	737	76.2	39.1	54.9	124	60	105	87	4.86	80.	3	14	2.4	4
4.5	207	114	1.54	4217	11.7	42.5	77	1408	1003	57.5	31.8	61.3	160	47	128	72	4.02	89.	4	18	2.6	5
5.0	230	126	1.71	4446	12.4	40.3	89	1664	1216	48.8	26.9	65.6	191	39	145	62	3.50	98.	5	21	2.8	6
5.5	253	139	1.88	4663	13.0	38.4	99	1872	1307	42.4	23.4	68.8	220	33	160	56	3.14	107.	5	23	3.0	6
6.0	276	152	2.06	4871	13.5	36.8	108	2045	1198	37.5	20.7	71.2	248	28	173	51	2.88	116.	6	26	3.1	7
6.5	299	164	2.23	5071	14.1	35.3	117	2192	1106	33.7	18.6	73.1	274	25	185	48	2.67	124.	7	28	3.3	8
7.0	322	177	2.40	5263	14.6	34.0	125	2317	1027	30.6	16.8	74.7	300	22	195	45	2.50	134.	7	30	3.4	8
7.5	345	189	2.57	5448	15.1	32.9	132	2426	959	28.0	15.4	76.0	325	20	206	42	2.36	142.	8	32	3.6	9
8.0	368	202	2.74	5628	15.6	31.8	139	2520	899	25.8	14.2	77.1	350	18	215	40	2.24	151.	8	34	3.7	9
8.5	391	215	2.91	5802	16.1	30.9	146	2604	846	24.0	13.2	78.0	374	17	225	38	2.14	159.	9	35	3.8	10
9.0	414	227	3.08	5971	16.6	30.0	152	2678	799	22.3	12.3	78.8	399	15	234	37	2.05	168.	9	37	4.0	10
9.5	437	240	3.26	6135	17.0	29.2	158	2745	757	20.9	11.5	79.5	423	14	242	35	1.97	176.	10	39	4.1	11
10.0	460	253	3.43	6295	17.5	28.5	164	2804	719	19.7	10.8	80.1	447	13	251	34	1.90	185.	10	41	4.2	11
10.5	483	265	3.60	6452	17.9	27.8	170	2858	685	18.6	10.2	80.7	471	12	259	33	1.83	192.	10	42	4.3	12
11.0	506	278	3.77	6604	18.3	27.2	175	2907	653	17.6	9.7	81.2	494	12	267	32	1.78	201.	11	44	4.4	12
11.5	529	290	3.94	6754	18.7	26.6	181	2952	625	16.7	9.2	81.6	518	11	276	31	1.72	210.	11	45	4.6	12
12.0	552	303	4.11	6900	19.1	26.0	186	2993	599	15.9	8.8	82.0	541	11	283	30	1.68	217.	12	47	4.7	13
13.0	598	328	4.46	7184	19.9	25.0	196	3065	553	14.5	8.0	82.7	589	9	299	28	1.59	233.	13	50	4.9	14
14.0	644	354	4.80	7457	20.7	24.1	205	3127	513	13.4	7.3	83.3	635	9	314	27	1.52	248.	13	53	5.1	15
15.0	690	379	5.14	7721	21.4	23.3	214	3181	479	12.4	6.8	83.8	682	8	329	26	1.45	262.	14	56	5.3	16
16.0	736	404	5.48	7976	22.1	22.5	223	3228	449	11.5	6.3	84.2	729	7	344	25	1.40	280.	15	59	5.4	16
17.0	782	429	5.83	8224	22.8	21.8	231	3269	423	10.8	5.9	84.6	775	7	358	24	1.35	294.	16	61	5.6	17
18.0	828	455	6.17	8464	23.4	21.2	239	3306	399	10.1	5.6	84.9	822	6	373	23	1.30	307.	17	64	5.8	18
19.0	874	480	6.51	8699	24.1	20.7	247	3339	378	9.6	5.2	85.2	868	6	387	22	1.26	321.	18	67	6.0	19
20.0	920	505	6.85	8927	24.7	20.1	255	3368	359	9.0	5.0	85.5	914	6	401	22	1.22	337.	18	69	6.1	19
25.0	1150	631	8.57	9994	27.6	18.0	290	3480	287	7.1	3.9	86.4	1146	4	469	19	1.07	401.	23	82	6.9	23
30.0	1380	758	10.28	10962	30.3	16.4	321	3555	239	5.9	3.2	87.1	1376	4	535	17	0.97	463.	27	94	7.6	26
35.0	1610	884	11.99	11856	32.7	15.2	349	3608	205	5.0	2.7	87.5	1607	3	599	16	0.89	526.	30	105	8.2	
40.0	1840	1010	13.71	12691	34.9	14.2	375	3647	179	4.3	2.4	87.8	1837	3	662	15	0.83	577.	34	116	8.8	
45.0	2070	1136	15.42	13479	37.1	13.4	400	3678	159	3.8	2.1	88.1	2068	2	724	14	0.78	631.	38	127	9.3	
50.0	2300	1263	17.14	14227	39.1	12.7	423	3703	143	3.4	1.9	88.3	2298	2	785	13	0.74	681.	42	138	9.8	

#230 46 Ti on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 29. ZC= 51.(Sb)
NEUTRON NUMBERS: NP= 24. NT= 34. NC= 58.

AP**1/3= 3.583 AT**1/3= 3.979
REDUCED MASS NUMBER= 26.59 AP+AT=AC=109.

INTERACTION RADIUS RINT=11.33 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 4.31 CT+CP= 8.12 C= 2.02

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 4.53

COULOMB RADII [fm]:
RCP= 4.00 RCT= 4.45 RC=RCP+RCT= 8.45

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 152.94 MeV K= .24004 n=2.446
VC(RINT)= 81.0 MeV

FISSION-TKE= 81. MeV
ASYMM. FISSION-TKE= 79. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 23.99 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -65.2
COMPOUND NUCLEUS: -77.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.14 fm V(RB)= 84.9 MeV
Q-VALUE= -32.9 MeV
L-CRITICAL= 87.

46 Ti on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	27	0.33	1986	5.8	100.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	92	53	0.66	2809	8.2	71.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	138	80	0.98	3442	10.1	58.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	184	106	1.31	3975	11.6	50.2	64	988	651	76.1	45.0	52.0	116	68	97	103	5.26	74.	3	14	2.3	5
4.5	207	120	1.48	4217	12.3	47.4	79	1332	938	61.7	36.2	59.2	154	53	121	83	4.25	83.	4	17	2.5	5
5.0	230	133	1.64	4446	13.0	44.9	92	1607	1167	52.1	30.4	64.0	187	43	140	72	3.67	92.	5	20	2.7	6
5.5	253	146	1.81	4663	13.6	42.8	103	1831	1294	45.1	26.3	67.4	217	36	155	64	3.27	100.	5	23	2.9	7
6.0	276	160	1.97	4871	14.2	41.0	113	2017	1186	39.8	23.2	70.1	245	31	168	58	2.98	108.	6	25	3.0	8
6.5	299	173	2.13	5071	14.8	39.4	122	2175	1095	35.7	20.7	72.1	272	27	179	54	2.76	117.	6	27	3.2	8
7.0	322	186	2.30	5263	15.4	38.0	131	2310	1017	32.3	18.8	73.8	298	24	189	51	2.58	125.	7	29	3.4	9
7.5	345	199	2.46	5448	15.9	36.7	139	2427	949	29.6	17.1	75.2	323	22	199	48	2.43	133.	7	31	3.5	9
8.0	368	213	2.63	5628	16.4	35.5	147	2529	890	27.2	15.8	76.4	348	20	208	45	2.30	141.	8	33	3.6	10
8.5	391	226	2.79	5802	17.0	34.5	154	2619	837	25.3	14.6	77.4	373	18	217	43	2.19	150.	8	35	3.8	10
9.0	414	239	2.95	5971	17.4	33.5	161	2699	791	23.5	13.6	78.2	397	17	226	41	2.10	157.	9	37	3.9	11
9.5	437	253	3.12	6135	17.9	32.6	167	2770	749	22.0	12.8	79.0	421	16	234	40	2.02	166.	9	39	4.0	11
10.0	460	266	3.28	6295	18.4	31.8	174	2834	712	20.7	12.0	79.6	445	15	242	38	1.94	173.	10	40	4.1	12
10.5	483	279	3.45	6452	18.8	31.0	180	2892	678	19.6	11.3	80.2	469	14	250	37	1.88	181.	10	42	4.3	12
11.0	506	292	3.61	6604	19.3	30.3	186	2945	647	18.5	10.7	80.7	493	13	257	36	1.82	188.	11	43	4.4	13
11.5	529	306	3.78	6754	19.7	29.6	191	2993	619	17.6	10.2	81.2	517	12	265	35	1.76	197.	11	45	4.5	13
12.0	552	319	3.94	6900	20.1	29.0	197	3037	593	16.7	9.7	81.6	541	11	272	34	1.71	203.	12	46	4.6	14
13.0	598	346	4.27	7184	21.0	27.9	208	3115	547	15.3	8.8	82.4	588	10	287	32	1.62	218.	12	49	4.8	15
14.0	644	372	4.60	7457	21.8	26.8	218	3182	508	14.0	8.1	83.0	635	9	301	30	1.55	232.	13	52	5.0	16
15.0	690	399	4.92	7721	22.5	25.9	228	3240	474	13.0	7.5	83.5	681	9	315	29	1.48	248.	14	55	5.2	16
16.0	736	425	5.25	7976	23.3	25.1	237	3291	445	12.1	7.0	84.0	728	8	328	28	1.42	262.	15	58	5.4	17
17.0	782	452	5.58	8224	24.0	24.4	246	3335	418	11.3	6.5	84.3	775	7	341	27	1.37	275.	16	61	5.5	18
18.0	828	479	5.91	8464	24.7	23.7	255	3375	395	10.6	6.1	84.7	821	7	354	26	1.32	288.	17	63	5.7	19
19.0	874	505	6.24	8699	25.3	23.0	263	3410	374	10.0	5.8	85.0	868	6	367	25	1.28	301.	17	66	5.9	20
20.0	920	532	6.57	8927	26.0	22.5	271	3442	356	9.5	5.5	85.3	914	6	380	24	1.24	317.	18	69	6.1	20
25.0	1150	665	8.21	9994	29.1	20.1	309	3563	284	7.4	4.3	86.3	1145	5	442	21	1.09	378.	22	81	6.8	24
30.0	1380	798	9.85	10962	31.9	18.3	342	3643	237	6.1	3.5	86.9	1376	4	502	19	0.99	438.	26	93	7.5	27
35.0	1610	931	11.49	11856	34.4	17.0	372	3700	203	5.2	3.0	87.4	1607	3	560	18	0.91	492.	30	104	8.1	
40.0	1840	1063	13.13	12691	36.8	15.9	400	3743	178	4.5	2.6	87.7	1837	3	617	17	0.84	541.	34	115	8.7	
45.0	2070	1196	14.77	13479	39.0	15.0	427	3776	158	4.0	2.3	88.0	2068	2	673	16	0.79	593.	38	126	9.2	
50.0	2300	1329	16.41	14227	41.1	14.2	451	3802	142	3.6	2.1	88.2	2298	2	728	15	0.75	632.	41	136	9.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#231 46 Ti on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 42. ZC= 64.(Gd)
NEUTRON NUMBERS: NP= 24. NT= 50. NC= 74.

AP**1/3= 3.583 AT**1/3= 4.514
REDUCED MASS NUMBER= 30.67 AP+AT=AC=138.

INTERACTION RADIUS RINT=11.91 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 5.00 CT+CP= 8.81 C̄= 2.16

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 5.20

COULOMB RADII [fm]:
RCP= 4.00 RCT= 5.08 RC=RCP+RCT= 9.08

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 205.32 MeV K= .24881 n=2.479
VC(RINT)= 111.6 MeV

FISSION-TKE= 107. MeV
ASYMM. FISSION-TKE= 97. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.943 MeV/fm**2 PROX-FACTOR= 25.60 MeV
L-RLD= 73 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -87.5
COMPOUND NUCLEUS: -57.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.68 fm V(RB)= 117.2 MeV
Q-VALUE= -75.3 MeV
L-CRITICAL= 96.

46 Ti on 92 Mo — 46 Ti on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	31	0.27	1986	6.7	145.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	92	61	0.55	2809	9.5	102.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	138	92	0.82	3442	11.6	84.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	184	123	1.10	3975	13.4	72.7	48	415	160	113.5	83.7	33.3	70	114	56	242	9.01	60.	2	1.7	3
4.5	207	138	1.24	4217	14.2	68.6	74	872	541	85.7	60.0	47.2	122	85	93	157	5.82	67.	3	1.9	4
5.0	230	153	1.37	4446	15.0	65.1	93	1236	845	69.9	48.1	55.0	163	67	118	125	4.62	74.	4	2.1	5
5.5	253	169	1.51	4663	15.7	62.0	109	1532	1094	59.4	40.4	60.3	198	55	136	107	3.95	81.	5	2.3	6
6.0	276	184	1.65	4871	16.4	59.4	123	1779	1102	51.7	35.0	64.2	229	47	150	95	3.51	87.	5	2.5	7
6.5	299	199	1.79	5071	17.1	57.1	135	1988	1017	45.8	30.9	67.1	259	40	162	86	3.19	95.	6	2.7	7
7.0	322	215	1.92	5263	17.7	55.0	146	2166	944	41.2	27.7	69.4	287	35	172	79	2.94	101.	7	2.8	8
7.5	345	230	2.06	5448	18.4	53.1	157	2321	881	37.4	25.1	71.3	313	32	182	74	2.74	107.	7	2.9	9
8.0	368	245	2.20	5628	19.0	51.4	167	2456	826	34.3	23.0	72.9	340	28	190	70	2.58	114.	8	3.1	10
8.5	391	261	2.34	5802	19.6	49.9	176	2575	778	31.7	21.2	74.2	365	26	198	66	2.44	121.	8	3.3	10
9.0	414	276	2.47	5971	20.1	48.5	185	2681	734	29.4	19.7	75.3	390	24	205	63	2.33	127.	8	3.5	11
9.5	437	291	2.61	6135	20.7	47.2	193	2776	696	27.4	18.4	76.3	415	22	212	60	2.23	133.	9	3.6	12
10.0	460	307	2.75	6295	21.2	46.0	201	2861	661	25.7	17.2	77.1	440	20	219	58	2.14	140.	9	3.8	12
10.5	483	322	2.89	6452	21.7	44.9	209	2938	629	24.2	16.2	77.9	464	19	225	56	2.06	146.	10	4.0	13
11.0	506	337	3.02	6604	22.2	43.9	217	3008	601	22.9	15.3	78.6	488	18	232	54	1.99	151.	10	4.1	14
11.5	529	353	3.16	6754	22.7	42.9	224	3071	575	21.7	14.5	79.2	512	17	238	52	1.92	158.	11	4.3	14
12.0	552	368	3.30	6900	23.2	42.0	231	3130	551	20.6	13.8	79.7	536	16	243	50	1.86	164.	11	4.4	15
13.0	598	399	3.57	7184	24.2	40.4	244	3233	508	18.8	12.5	80.6	584	14	255	48	1.76	176.	12	4.7	16
14.0	644	429	3.85	7457	25.1	38.9	257	3322	472	17.2	11.5	81.4	631	13	266	45	1.67	188.	13	5.0	17
15.0	690	460	4.12	7721	26.0	37.6	269	3399	440	15.9	10.6	82.1	678	12	276	43	1.60	200.	13	5.3	18
16.0	736	491	4.40	7976	26.8	36.4	281	3466	413	14.8	9.9	82.6	725	11	287	41	1.53	211.	14	5.5	19
17.0	782	521	4.67	8224	27.7	35.3	292	3525	389	13.8	9.2	83.1	772	10	297	40	1.47	223.	15	5.8	20
18.0	828	552	4.95	8464	28.5	34.3	303	3577	367	12.9	8.6	83.5	819	9	306	38	1.42	232.	16	6.0	22
19.0	874	583	5.22	8699	29.2	33.4	313	3624	348	12.2	8.1	83.9	865	9	316	37	1.37	243.	17	6.3	23
20.0	920	613	5.50	8927	30.0	32.5	323	3667	330	11.5	7.7	84.2	912	8	326	36	1.33	253.	17	6.5	24
25.0	1150	767	6.87	9994	33.5	29.1	369	3827	264	9.0	6.0	85.5	1144	6	371	31	1.17	305.	21	7.7	6.3	28
30.0	1380	920	8.25	10962	36.7	26.6	410	3934	220	7.4	4.9	86.3	1375	5	415	28	1.05	353.	25	88	7.0	32
35.0	1610	1073	9.62	11856	39.7	24.6	447	4010	188	6.3	4.2	86.9	1606	4	457	26	0.96	400.	28	99	7.6	
40.0	1840	1227	10.99	12691	42.4	23.0	482	4067	165	5.5	3.6	87.3	1836	4	497	24	0.89	440.	32	109	8.2	
45.0	2070	1380	12.37	13479	45.0	21.7	514	4111	146	4.8	3.2	87.6	2067	3	537	23	0.84	480.	36	119	8.7	
50.0	2300	1533	13.74	14227	47.4	20.6	544	4146	132	4.3	2.9	87.8	2297	3	576	21	0.79	522.	39	129	9.2	

#232 46 Ti on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 47. ZC= 69.(Tm)
NEUTRON NUMBERS: NP= 24. NT= 61. NC= 85.

AP**1/3= 3.583 AT**1/3= 4.762
REDUCED MASS NUMBER= 32.26 AP+AT=AC=154.

INTERACTION RADIUS RINT=12.18 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 5.32 CT+CP= 9.12 C̄= 2.22

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 5.50

COULOMB RADII [fm]:
RCP= 4.00 RCT= 5.34 RC=RCP+RCT= 9.34

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 223.02 MeV K= .24366 n=2.492
VC(RINT)= 122.1 MeV

FISSION-TKE= 117. MeV
ASYMM. FISSION-TKE= 102. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.933 MeV/fm**2 PROX-FACTOR= 26.01 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -87.6
COMPOUND NUCLEUS: -55.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.94 fm V(RB)= 128.0 MeV
Q-VALUE= -76.5 MeV
L-CRITICAL= 102.

46 Ti on 108 Ag — 46 Ti on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	32	0.26	1986	7.1	162.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	92	65	0.53	2809	10.0	115.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	138	97	0.79	3442	12.2	94.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	184	129	1.06	3975	14.1	81.4	39	257	31	128.3	103.9	25.8	59	125	45	351	12.01	54.	2	10	1.7	4
4.5	207	145	1.19	4217	15.0	76.8	72	756	445	93.3	69.8	43.3	115	92	86	193	6.53	60.	3	14	1.9	5
5.0	230	161	1.32	4446	15.8	72.8	95	1152	776	75.2	54.8	52.4	158	72	112	148	5.01	66.	4	17	2.1	6
5.5	253	177	1.45	4663	16.5	69.4	112	1475	1047	63.4	45.7	58.3	194	59	130	124	4.21	72.	5	20	2.3	7
6.0	276	194	1.59	4871	17.3	66.5	128	1743	1117	55.0	39.3	62.5	227	49	144	109	3.70	78.	5	23	2.5	8
6.5	299	210	1.72	5071	18.0	63.9	141	1970	1031	48.6	34.6	65.7	257	42	156	99	3.34	84.	6	25	2.6	9
7.0	322	226	1.85	5263	18.7	61.5	154	2164	958	43.6	30.9	68.2	285	37	166	91	3.07	91.	6	27	2.8	9
7.5	345	242	1.98	5448	19.3	59.5	166	2333	894	39.5	28.0	70.2	312	33	175	84	2.86	96.	7	29	2.9	10
8.0	368	258	2.11	5628	20.0	57.6	176	2480	838	36.2	25.6	71.9	338	30	183	79	2.68	102.	7	31	3.1	11
8.5	391	274	2.25	5802	20.6	55.8	186	2609	789	33.3	23.5	73.3	364	27	190	75	2.54	108.	8	32	3.2	12
9.0	414	290	2.38	5971	21.2	54.3	196	2725	745	30.9	21.8	74.5	389	25	197	71	2.41	113.	8	34	3.3	13
9.5	437	306	2.51	6135	21.7	52.8	205	2828	706	28.9	20.3	75.6	414	23	203	68	2.30	119.	9	36	3.5	14
10.0	460	323	2.64	6295	22.3	51.5	214	2920	670	27.0	19.0	76.5	439	21	209	65	2.21	125.	9	37	3.6	14
10.5	483	339	2.77	6452	22.9	50.2	223	3004	638	25.4	17.9	77.3	463	20	215	63	2.13	130.	10	39	3.7	15
11.0	506	355	2.91	6604	23.4	49.1	231	3080	609	24.0	16.9	78.0	488	18	220	61	2.05	135.	10	40	3.8	16
11.5	529	371	3.04	6754	23.9	48.0	239	3150	583	22.8	16.0	78.6	512	17	226	59	1.98	140.	10	42	3.9	17
12.0	552	387	3.17	6900	24.4	47.0	246	3213	558	21.6	15.2	79.2	536	16	231	57	1.92	147.	11	43	4.0	17
13.0	598	419	3.43	7184	25.4	45.2	261	3326	515	19.6	13.8	80.2	583	15	241	54	1.81	156.	12	46	4.2	19
14.0	644	452	3.70	7457	26.4	43.5	275	3422	479	18.0	12.7	81.0	631	13	251	51	1.72	167.	12	49	4.4	20
15.0	690	484	3.96	7721	27.3	42.0	288	3506	447	16.6	11.7	81.7	678	12	260	49	1.64	178.	13	51	4.6	21
16.0	736	516	4.23	7976	28.2	40.7	300	3579	419	15.4	10.8	82.3	725	11	269	47	1.58	188.	14	54	4.8	22
17.0	782	548	4.49	8224	29.1	39.5	312	3643	394	14.4	10.1	82.8	772	10	278	45	1.52	199.	15	56	5.0	23
18.0	828	581	4.76	8464	29.9	38.4	324	3701	372	13.5	9.5	83.2	818	10	287	43	1.46	209.	15	59	5.1	24
19.0	874	613	5.02	8699	30.8	37.4	335	3752	353	12.7	8.9	83.6	865	9	295	42	1.41	219.	16	61	5.3	25
20.0	920	645	5.28	8927	31.6	36.4	346	3798	335	12.0	8.4	84.0	912	8	303	40	1.37	226.	17	64	5.4	27
25.0	1150	806	6.61	9994	35.3	32.6	396	3973	268	9.4	6.6	85.3	1144	6	343	35	1.20	274.	21	75	6.2	31
30.0	1380	968	7.93	10962	38.6	29.7	440	4089	223	7.7	5.4	86.1	1375	5	381	32	1.08	316.	24	86	6.8	36
35.0	1610	1129	9.25	11856	41.7	27.5	480	4172	191	6.6	4.6	86.7	1606	4	416	29	0.99	356.	28	96	7.4	
40.0	1840	1290	10.57	12691	44.6	25.7	517	4234	167	5.7	4.0	87.1	1836	4	451	27	0.92	396.	31	106	7.9	
45.0	2070	1452	11.89	13479	47.3	24.3	552	4282	149	5.0	3.5	87.5	2067	3	485	25	0.86	429.	35	116	8.5	
50.0	2300	1613	13.21	14227	49.9	23.0	584	4320	134	4.5	3.2	87.7	2297	3	518	24	0.81	464.	38	126	8.9	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#233 46 Ti on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 58. ZC= 80.(Hg)
NEUTRON NUMBERS: NP= 24. NT= 82. NC=106.

AP**1/3= 3.583 AT**1/3= 5.192
REDUCED MASS NUMBER= 34.62 AP+AT=AC=186.

INTERACTION RADIUS RINT=12.64 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 5.87 CT+CP= 9.68 C= 2.31

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.04

COULOMB RADII [fm]:
RCP= 4.00 RCT= 5.82 RC=RCP+RCT= 9.82

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 260.85 MeV K= .23144 n=2.525
VC(RINT)= 145.1 MeV

FISSION-TKE= 142. MeV
ASYMM. FISSION-TKE= 113. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.919 MeV/fm**2 PROX-FACTOR= 26.65 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.81 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -88.2
COMPOUND NUCLEUS: -28.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.37 fm V(RB)= 151.8 MeV
Q-VALUE= -104.8 MeV
L-CRITICAL= 107.

46 Ti on 140 Ce

46 Ti on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	35	0.24	1986	7.6	200.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	92	69	0.48	2809	10.7	142.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	138	104	0.72	3442	13.1	116.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	184	138	0.95	3975	15.1	100.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	207	156	1.07	4217	16.1	94.7	53	351	104	121.8	103.1	29.1	89	118	63	362	10.38	50.	2	12	1.5	4
5.0	230	173	1.19	4446	16.9	89.9	86	826	500	92.6	74.2	43.7	140	90	96	223	6.38	55.	3	16	1.7	5
5.5	253	190	1.31	4663	17.8	85.7	109	1212	824	76.2	59.7	51.9	181	72	118	176	5.01	60.	4	19	1.9	7
6.0	276	208	1.43	4871	18.5	82.0	129	1533	1072	65.1	50.4	57.5	217	59	134	149	4.26	65.	5	21	2.1	8
6.5	299	225	1.55	5071	19.3	78.8	145	1804	989	56.9	43.8	61.5	248	51	147	132	3.77	70.	6	23	2.3	9
7.0	322	242	1.67	5263	20.0	75.9	160	2036	918	50.7	38.8	64.7	278	44	157	120	3.41	75.	6	25	2.4	10
7.5	345	260	1.79	5448	20.7	73.4	174	2237	857	45.7	34.9	67.1	306	39	166	110	3.15	80.	7	27	2.6	11
8.0	368	277	1.91	5628	21.4	71.0	187	2413	804	41.7	31.7	69.2	333	35	173	103	2.93	85.	7	29	2.7	12
8.5	391	294	2.03	5802	22.1	68.9	199	2568	756	38.3	29.1	70.9	360	31	180	97	2.76	90.	8	31	2.9	13
9.0	414	312	2.15	5971	22.7	67.0	210	2706	714	35.4	26.9	72.3	386	28	187	92	2.61	95.	8	32	3.0	14
9.5	437	329	2.27	6135	23.3	65.2	220	2829	677	32.9	25.0	73.5	411	26	192	87	2.48	99.	8	34	3.1	15
10.0	460	346	2.39	6295	23.9	63.5	231	2940	643	30.8	23.3	74.6	436	24	198	83	2.37	104.	9	35	3.2	16
10.5	483	364	2.51	6452	24.5	62.0	240	3040	612	28.9	21.9	75.5	461	22	203	80	2.28	108.	9	37	3.3	17
11.0	506	381	2.62	6604	25.1	60.6	250	3131	584	27.3	20.6	76.4	485	21	208	77	2.19	113.	10	38	3.4	18
11.5	529	398	2.74	6754	25.7	59.2	259	3214	559	25.8	19.5	77.1	509	20	212	74	2.12	117.	10	40	3.6	19
12.0	552	415	2.86	6900	26.2	58.0	267	3290	536	24.5	18.5	77.8	534	18	217	72	2.05	122.	10	41	3.7	20
13.0	598	450	3.10	7184	27.3	55.7	284	3425	494	22.2	16.8	78.9	582	16	225	68	1.93	130.	11	44	3.9	22
14.0	644	485	3.34	7457	28.3	53.7	300	3540	459	20.3	15.3	79.8	629	15	234	64	1.83	139.	12	46	4.0	23
15.0	690	519	3.58	7721	29.3	51.9	315	3640	428	18.7	14.1	80.6	676	14	241	61	1.74	149.	13	49	4.2	24
16.0	736	554	3.82	7976	30.3	50.2	329	3727	402	17.4	13.1	81.3	724	12	249	58	1.66	156.	13	51	4.4	26
17.0	782	589	4.06	8224	31.2	48.7	343	3804	378	16.2	12.2	81.9	770	12	256	56	1.60	165.	14	54	4.6	27
18.0	828	623	4.29	8464	32.1	47.4	356	3873	357	15.2	11.4	82.4	817	11	263	54	1.54	174.	15	56	4.7	28
19.0	874	658	4.53	8699	33.0	46.1	368	3934	338	14.3	10.8	82.9	864	10	270	52	1.49	181.	16	58	4.9	30
20.0	920	692	4.77	8927	33.9	44.9	381	3989	321	13.5	10.1	83.3	911	9	277	51	1.44	189.	16	61	5.0	31
25.0	1150	866	5.96	9994	37.9	40.2	437	4198	257	10.5	7.9	84.7	1143	7	308	44	1.25	229.	20	72	5.7	36
30.0	1380	1039	7.16	10962	41.5	36.7	486	4337	214	8.6	6.5	85.7	1374	6	338	40	1.13	264.	23	82	6.3	42
35.0	1610	1212	8.35	11856	44.8	34.0	531	4437	183	7.3	5.5	86.3	1605	5	366	36	1.03	300.	27	92	6.9	
40.0	1840	1385	9.54	12691	47.9	31.8	573	4511	160	6.3	4.8	86.8	1836	4	393	34	0.96	330.	30	101	7.4	
45.0	2070	1558	10.74	13479	50.8	30.0	612	4569	142	5.6	4.2	87.2	2066	4	419	31	0.90	360.	34	111	7.9	
50.0	2300	1731	11.93	14227	53.5	28.4	648	4615	128	5.0	3.8	87.5	2297	3	444	30	0.84	391.	37	120	8.4	

#234 46 Ti on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 62. ZC= 84.(Po)
NEUTRON NUMBERS: NP= 24. NT= 92. NC=116.

AP**1/3= 3.583 AT**1/3= 5.360
REDUCED MASS NUMBER= 35.42 AP+AT=AC=200.

INTERACTION RADIUS RINT=12.82 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 6.09 CT+CP= 9.89 C= 2.34

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.25

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.00 RC=RCP+RCT=10.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 273.47 MeV K= .22477 n=2.537
VC(RINT)= 152.9 MeV

FISSION-TKE= 151. MeV
ASYMM. FISSION-TKE= 117. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.908 MeV/fm**2 PROX-FACTOR= 26.72 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.68 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -72.1
COMPOUND NUCLEUS: -16.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.54 fm V(RB)= 159.8 MeV
Q-VALUE= -100.8 MeV
L-CRITICAL= 109.

46 Ti on 154 Sm

46 Ti on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	35	0.23	1986	7.7	214.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	92	71	0.46	2809	11.0	151.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	138	106	0.69	3442	13.4	124.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	184	142	0.93	3975	15.5	107.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	207	159	1.04	4217	16.4	101.2	42	213	0	135.2	120.2	22.4	82	125	57	503	13.80	0.	2	11	1.5	5
5.0	230	177	1.16	4446	17.3	96.1	82	716	409	99.2	82.0	40.4	135	95	92	260	7.05	51.	3	15	1.7	6
5.5	253	195	1.27	4663	18.2	91.6	108	1126	752	80.7	65.0	49.6	178	75	115	198	5.35	56.	4	18	1.9	8
6.0	276	213	1.39	4871	19.0	87.7	129	1466	1038	68.6	54.5	55.7	214	62	131	166	4.48	61.	5	21	2.1	9
6.5	299	230	1.51	5071	19.8	84.2	147	1754	976	59.8	47.1	60.1	246	53	144	145	3.93	65.	5	23	2.3	10
7.0	322	248	1.62	5263	20.5	81.2	163	2000	906	53.1	41.6	63.5	276	46	154	131	3.54	70.	6	25	2.4	11
7.5	345	266	1.74	5448	21.2	78.4	177	2213	846	47.8	37.3	66.1	305	40	163	120	3.25	75.	7	27	2.6	12
8.0	368	283	1.85	5628	21.9	75.9	191	2400	793	43.5	33.9	68.3	332	36	170	112	3.02	79.	7	28	2.7	13
8.5	391	301	1.97	5802	22.6	73.7	203	2564	746	39.9	31.0	70.1	359	32	177	105	2.84	84.	7	30	2.8	14
9.0	414	319	2.08	5971	23.2	71.6	215	2710	705	36.9	28.6	71.6	385	29	183	99	2.68	88.	8	32	3.0	16
9.5	437	336	2.20	6135	23.9	69.7	226	2841	668	34.3	26.6	72.9	410	27	189	94	2.55	92.	8	33	3.1	17
10.0	460	354	2.32	6295	24.5	67.9	237	2958	634	32.0	24.8	74.0	435	25	194	90	2.43	96.	9	35	3.2	18
10.5	483	372	2.43	6452	25.1	66.3	247	3064	604	30.1	23.3	75.0	460	23	199	86	2.33	101.	9	36	3.3	18
11.0	506	390	2.55	6604	25.7	64.8	257	3161	577	28.3	21.9	75.8	485	21	203	83	2.24	105.	10	38	3.4	20
11.5	529	407	2.66	6754	26.3	63.3	266	3249	551	26.8	20.7	76.6	509	20	208	80	2.16	109.	10	39	3.5	20
12.0	552	425	2.78	6900	26.8	62.0	275	3330	528	25.4	19.6	77.3	533	19	212	77	2.09	114.	10	40	3.6	21
13.0	598	460	3.01	7184	27.9	59.6	293	3472	488	23.0	17.8	78.5	581	17	220	73	1.97	122.	11	43	3.8	23
14.0	644	496	3.24	7457	29.0	57.4	309	3595	453	21.0	16.2	79.5	629	15	228	69	1.86	130.	12	45	4.0	25
15.0	690	531	3.47	7721	30.0	55.5	325	3701	423	19.4	15.0	80.3	676	14	235	66	1.77	138.	13	48	4.1	26
16.0	736	567	3.71	7976	31.0	53.7	340	3793	396	18.0	13.9	81.0	723	13	242	63	1.70	145.	13	50	4.3	28
17.0	782	602	3.94	8224	31.9	52.1	354	3875	373	16.8	12.9	81.6	770	12	248	60	1.63	153.	14	53	4.5	30
18.0	828	636	4.17	8464	32.9	50.6	367	3948	352	15.7	12.1	82.2	817	11	255	58	1.57	161.	15	55	4.6	31
19.0	874	673	4.40	8699	33.8	49.3	381	4012	334	14.8	11.4	82.6	864	10	261	56	1.51	169.	15	57	4.8	32
20.0	920	708	4.63	8927	34.6	48.0	393	4071	317	13.9	10.7	83.0	910	10	267	54	1.46	176.	16	60	4.9	34
25.0	1150	886	5.79	9994	38.7	43.0	452	4293	253	10.9	8.4	84.6	1143	7	296	47	1.28	211.	20	70	5.6	40
30.0	1380	1063	6.95	10962	42.4	39.2	503	4440	211	8.9	6.9	85.5	1374	6	323	42	1.14	246.	23	80	6.2	45
35.0	1610	1240	8.11	11856	45.8	36.3	550	4545	181	7.5	5.8	86.2	1605	5	349	39	1.05	278.	26	90	6.7	
40.0	1840	1417	9.26	12691	49.0	34.0	593	4624	158	6.6	5.0	86.7	1836	4	374	36	0.97	309.	30	100	7.3	
45.0	2070	1594	10.42	13479	52.0	32.0	634	4686	141	5.8	4.5	87.1	2066	4	397	34	0.91	338.	33	109	7.7	
50.0	2300	1771	11.58	14227	54.8	30.4	671	4735	126	5.2	4.0	87.4	2297	3	420	32	0.86	365.	36	118	8.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#235 46 Ti on 165 Ho

46 Ti on 165 Ho

46 Ti on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 67. ZC= 89.(Ac)
NEUTRON NUMBERS: NP= 24. NT= 98. NC=122.

AP**1/3= 3.583 AT**1/3= 5.485
REDUCED MASS NUMBER= 35.97 AP+AT=AC=211.

INTERACTION RADIUS RINT=12.96 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 6.25 CT+CP=10.05 $\bar{C}$= 2.36

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.41

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.15 RC=RCP+RCT=10.16

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 290.48 MeV K= .22070 n=2.552
VC(RINT)= 163.6 MeV

FISSION-TKE= 165. MeV
ASYMM. FISSION-TKE= 123. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.910 MeV/fm**2 PROX-FACTOR= 27.04 MeV
L-RLD= 71 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.60 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -63.7
COMPOUND NUCLEUS: 7.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.66 fm V(RB)= 170.9 MeV
Q-VALUE= -115.6 MeV
L-CRITICAL= 108.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	36	0.22	1986	7.9	232.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	92	72	0.44	2809	11.1	164.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	138	108	0.66	3442	13.6	134.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	184	144	0.88	3975	15.7	116.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	207	162	0.99	4217	16.7	109.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	230	180	1.10	4446	17.6	103.8	68	486	213	113.4	97.3	33.3	120	110	81	345	8.76	49.	3 14	1.6	5
5.5	253	198	1.21	4663	18.5	99.0	99	927	581	89.8	74.3	45.1	167	86	108	238	6.02	54.	4 17	1.8	6
6.0	276	216	1.32	4871	19.3	94.8	123	1294	889	75.4	61.2	52.3	206	70	127	193	4.87	58.	5 20	1.9	8
6.5	299	234	1.43	5071	20.1	91.0	142	1603	920	65.2	52.5	57.4	240	59	141	166	4.20	62.	5 22	2.1	9
7.0	322	252	1.54	5263	20.8	87.7	160	1868	854	57.6	46.0	61.2	271	51	152	148	3.75	67.	6 24	2.3	10
7.5	345	270	1.65	5448	21.5	84.7	175	2097	797	51.7	41.1	64.2	300	45	161	135	3.41	71.	6 26	2.4	12
8.0	368	288	1.76	5628	22.3	82.1	189	2298	748	46.9	37.2	66.6	328	40	169	125	3.16	75.	7 28	2.6	13
8.5	391	306	1.87	5802	22.9	79.6	203	2475	704	42.9	33.9	68.5	355	36	176	117	2.95	80.	7 29	2.7	14
9.0	414	324	1.98	5971	23.6	77.4	215	2632	664	39.6	31.3	70.2	382	32	182	110	2.78	84.	8 31	2.8	15
9.5	437	342	2.09	6135	24.2	75.3	227	2772	629	36.7	29.0	71.6	407	30	188	104	2.63	88.	8 33	2.9	16
10.0	460	360	2.20	6295	24.9	73.4	238	2899	598	34.3	27.0	72.9	433	27	193	99	2.51	92.	9 34	3.0	17
10.5	483	378	2.31	6452	25.5	71.6	249	3013	569	32.1	25.3	73.9	458	25	198	95	2.40	96.	9 35	3.2	18
11.0	506	396	2.42	6604	26.1	70.0	259	3117	544	30.3	23.8	74.9	483	23	203	91	2.31	100.	9 37	3.3	19
11.5	529	414	2.53	6754	26.7	68.4	269	3211	520	28.6	22.5	75.7	507	22	207	88	2.22	104.	10 38	3.4	20
12.0	552	432	2.64	6900	27.3	67.0	278	3298	498	27.1	21.3	76.5	531	21	211	85	2.15	108.	10 40	3.5	21
13.0	598	468	2.86	7184	28.4	64.4	296	3452	460	24.5	19.2	77.7	580	18	219	80	2.02	116.	11 42	3.7	23
14.0	644	504	3.08	7457	29.4	62.0	313	3583	427	22.4	17.6	78.8	627	17	227	75	1.91	124.	12 45	3.8	24
15.0	690	540	3.30	7721	30.5	59.9	330	3697	398	20.6	16.2	79.7	675	15	234	72	1.81	132.	13 47	4.0	26
16.0	736	576	3.52	7976	31.5	58.0	345	3797	374	19.1	15.0	80.5	722	14	240	69	1.73	139.	13 50	4.2	28
17.0	782	612	3.74	8224	32.4	56.3	360	3885	352	17.8	13.9	81.1	769	13	247	66	1.66	147.	14 52	4.3	29
18.0	828	647	3.96	8464	33.4	54.7	374	3963	332	16.6	13.0	81.7	816	12	253	63	1.60	154.	15 54	4.5	31
19.0	874	683	4.18	8699	34.3	53.2	388	4033	314	15.6	12.3	82.2	863	11	259	61	1.54	162.	15 57	4.6	32
20.0	920	719	4.40	8927	35.2	51.9	401	4096	299	14.8	11.6	82.6	910	10	265	59	1.49	169.	16 59	4.8	33
25.0	1150	899	5.50	9994	39.3	46.4	461	4334	239	11.5	9.0	84.3	1142	8	292	51	1.30	203.	20 69	5.5	40
30.0	1380	1079	6.60	10962	43.1	42.4	514	4493	199	9.4	7.4	85.3	1374	6	318	46	1.16	237.	23 79	6.0	45
35.0	1610	1259	7.70	11856	46.5	39.2	563	4607	170	8.0	6.2	86.0	1605	5	342	42	1.06	268.	26 89	6.6	
40.0	1840	1439	8.80	12691	49.8	36.7	607	4691	149	6.9	5.4	86.5	1835	5	365	39	0.98	296.	30 98	7.1	
45.0	2070	1619	9.90	13479	52.8	34.6	648	4757	132	6.1	4.8	86.9	2066	4	387	36	0.92	323.	33 107	7.5	
50.0	2300	1799	11.00	14227	55.6	32.8	687	4810	119	5.5	4.3	87.3	2296	4	409	34	0.87	349.	36 116	8.0	

#236 46 Ti on 181 Ta

46 Ti on 181 Ta

46 Ti on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 73. ZC= 95.(Am)
NEUTRON NUMBERS: NP= 24. NT=108. NC=132.

AP**1/3= 3.583 AT**1/3= 5.657
REDUCED MASS NUMBER= 36.68 AP+AT=AC=227.

INTERACTION RADIUS RINT=13.15 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 6.47 CT+CP=10.27 $\bar{C}$= 2.40

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.62

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.35 RC=RCP+RCT=10.36

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 309.72 MeV K= .21360 n=2.569
VC(RINT)= 175.7 MeV

FISSION-TKE= 181. MeV
ASYMM. FISSION-TKE= 129. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.907 MeV/fm**2 PROX-FACTOR= 27.29 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -46.0
COMPOUND NUCLEUS: 42.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.83 fm V(RB)= 183.4 MeV
Q-VALUE= -133.0 MeV
L-CRITICAL= 106.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	37	0.21	1986	8.0	252.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	92	73	0.42	2809	11.3	178.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	138	110	0.63	3442	13.9	146.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	184	147	0.84	3975	16.0	126.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	207	165	0.94	4217	17.0	119.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	230	183	1.04	4446	17.9	113.1	48	231	0	134.3	121.8	22.8	104	126	69	551	13.16	0.	3 13	1.3	5
5.5	253	202	1.15	4663	18.8	107.8	88	711	398	101.2	86.6	39.4	155	98	100	300	7.08	50.	4 16	1.6	6
6.0	276	220	1.25	4871	19.7	103.2	116	1108	731	83.5	69.7	48.3	197	79	122	230	5.42	54.	5 19	1.8	8
6.5	299	238	1.36	5071	20.5	99.2	138	1444	861	71.5	59.0	54.2	233	66	137	193	4.55	58.	5 21	1.9	9
7.0	322	257	1.46	5263	21.2	95.6	157	1731	800	62.8	51.4	58.6	265	57	149	170	4.00	62.	6 23	2.1	10
7.5	345	275	1.57	5448	22.0	92.3	173	1980	746	56.1	45.6	62.0	296	49	159	154	3.61	66.	6 25	2.2	11
8.0	368	293	1.67	5628	22.7	89.4	189	2198	700	50.7	41.1	64.7	324	44	168	141	3.32	70.	7 27	2.4	13
8.5	391	312	1.77	5802	23.4	86.7	203	2389	658	46.3	37.4	66.9	352	39	175	131	3.09	74.	7 29	2.5	14
9.0	414	330	1.88	5971	24.1	84.3	216	2560	622	42.6	34.3	68.7	379	35	181	123	2.90	78.	8 30	2.6	15
9.5	437	348	1.98	6135	24.7	82.0	229	2712	589	39.5	31.8	70.3	405	32	187	117	2.74	82.	8 32	2.8	16
10.0	460	367	2.09	6295	25.4	80.0	241	2849	560	36.8	29.6	71.6	430	30	192	111	2.61	86.	9 33	2.9	17
10.5	483	385	2.19	6452	26.0	78.0	252	2973	533	34.4	27.7	72.8	456	27	197	106	2.49	90.	9 35	3.0	18
11.0	506	403	2.30	6604	26.6	76.2	263	3085	509	32.4	26.0	73.8	481	25	201	101	2.39	94.	9 36	3.1	19
11.5	529	422	2.40	6754	27.2	74.6	273	3188	487	30.5	24.5	74.7	505	24	206	98	2.30	98.	10 37	3.2	20
12.0	552	440	2.51	6900	27.8	73.0	283	3282	466	28.9	23.2	75.5	530	22	210	94	2.21	101.	10 39	3.3	21
13.0	598	477	2.71	7184	28.9	70.1	302	3449	430	26.1	20.9	76.9	578	20	217	88	2.08	109.	11 41	3.5	23
14.0	644	513	2.92	7457	30.0	67.6	320	3592	400	23.9	19.1	78.1	626	18	224	83	1.96	116.	12 44	3.7	25
15.0	690	550	3.13	7721	31.1	65.3	337	3715	373	21.9	17.5	79.0	674	16	231	79	1.86	123.	12 46	3.8	27
16.0	736	587	3.34	7976	32.1	63.2	353	3823	350	20.3	16.2	79.8	721	15	237	76	1.78	131.	13 49	4.0	28
17.0	782	624	3.55	8224	33.1	61.3	368	3919	329	18.9	15.1	80.5	768	14	243	72	1.70	137.	14 51	4.2	30
18.0	828	660	3.76	8464	34.0	59.6	383	4003	311	17.7	14.1	81.2	815	13	249	70	1.64	144.	15 53	4.3	32
19.0	874	697	3.97	8699	35.0	58.0	397	4079	294	16.6	13.3	81.7	862	12	255	67	1.58	151.	15 55	4.5	33
20.0	920	734	4.18	8927	35.9	56.5	411	4147	280	15.7	12.5	82.2	909	11	260	65	1.52	158.	16 58	4.6	35
25.0	1150	917	5.22	9994	40.1	50.6	474	4406	224	12.2	9.7	83.9	1142	8	286	56	1.32	191.	19 68	5.3	41
30.0	1380	1100	6.26	10962	43.9	46.2	529	4578	186	10.0	8.0	85.0	1373	7	309	50	1.18	222.	23 78	5.8	47
35.0	1610	1284	7.31	11856	47.5	42.7	580	4701	160	8.4	6.7	85.8	1604	6	332	46	1.08	250.	26 87	6.4	
40.0	1840	1467	8.35	12691	50.7	40.0	626	4793	140	7.3	5.8	86.3	1835	5	353	43	1.00	277.	29 96	6.9	
45.0	2070	1651	9.40	13479	53.8	37.7	669	4865	124	6.5	5.1	86.8	2066	4	373	40	0.94	305.	32 105	7.3	
50.0	2300	1834	10.44	14227	56.7	35.8	709	4922	112	5.8	4.6	87.1	2296	4	393	38	0.88	330.	36 114	7.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#237 46 Ti on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 79. ZC=101.(Md)
NEUTRON NUMBERS: NP= 24. NT=118. NC=142.

AP**1/3= 3.583 AT**1/3= 5.819
REDUCED MASS NUMBER= 37.29 AP+AT=AC=243.

INTERACTION RADIUS RINT=13.32 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 6.68 CT+CP=10.48 C= 2.42

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.83

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.55 RC=RCP+RCT=10.55

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 328.46 MeV K= .20640 n=2.587
VC(RINT)= 187.6 MeV

FISSION-TKE= 197. MeV
ASYMM. FISSION-TKE= 134. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.903 MeV/fm**2 PROX-FACTOR= 27.51 MeV
L-RLD= 54 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.41 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -28.6
COMPOUND NUCLEUS: 75.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.98 fm V(RB)= 195.8 MeV
Q-VALUE= -148.7 MeV
L-CRITICAL= 104.

46 Ti on 197 Au

46 Ti on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	37	0.20	1986	8.2	273.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	92	75	0.40	2809	11.5	193.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	138	112	0.60	3442	14.1	158.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	184	149	0.80	3975	16.3	136.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	207	168	0.89	4217	17.3	129.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	230	186	0.99	4446	18.2	122.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	253	205	1.09	4663	19.1	116.7	74	482	204	115.3	102.1	32.3	142	111	91	400	8.86	47.	3	15	1.4	5
6.0	276	224	1.19	4871	20.0	111.7	107	911	563	92.7	79.4	43.7	187	89	116	278	6.14	51.	4	18	1.6	6
6.5	299	242	1.29	5071	20.8	107.3	131	1273	796	78.5	66.2	50.8	226	73	133	226	4.98	55.	5	20	1.8	8
7.0	322	261	1.39	5263	21.6	103.4	152	1584	739	68.4	57.1	55.8	260	62	147	195	4.30	59.	6	23	1.9	9
7.5	345	280	1.49	5448	22.3	99.9	171	1852	690	60.7	50.4	59.6	291	54	157	174	3.84	62.	6	24	2.1	11
8.0	368	298	1.59	5628	23.1	96.8	187	2087	646	54.7	45.2	62.6	320	48	166	159	3.50	66.	7	26	2.2	12
8.5	391	317	1.69	5802	23.8	93.9	202	2293	608	49.8	41.0	65.1	348	43	173	147	3.24	70.	7	28	2.4	14
9.0	414	336	1.79	5971	24.5	91.2	216	2477	575	45.7	37.6	67.1	376	38	180	137	3.03	73.	8	30	2.5	15
9.5	437	354	1.89	6135	25.1	88.8	230	2641	544	42.3	34.7	68.9	402	35	186	129	2.85	77.	8	31	2.6	16
10.0	460	373	1.99	6295	25.8	86.5	242	2789	517	39.3	32.2	70.3	428	32	191	123	2.70	81.	8	33	2.7	17
10.5	483	392	2.09	6452	26.4	84.5	254	2923	492	36.8	30.1	71.6	453	30	196	117	2.58	85.	9	34	2.8	18
11.0	506	410	2.19	6604	27.1	82.5	265	3045	470	34.6	28.2	72.7	479	27	200	112	2.47	88.	9	35	2.9	19
11.5	529	429	2.29	6754	27.7	80.7	276	3155	450	32.6	26.6	73.7	503	26	205	108	2.37	92.	10	37	3.0	20
12.0	552	448	2.39	6900	28.3	79.0	287	3257	431	30.8	25.1	74.6	528	24	209	104	2.28	95.	10	38	3.1	21
13.0	598	485	2.58	7184	29.4	75.9	307	3437	398	27.8	22.7	76.1	577	21	216	97	2.13	102.	11	41	3.3	23
14.0	644	522	2.78	7457	30.5	73.1	325	3591	369	25.3	20.6	77.3	625	19	223	91	2.01	109.	12	43	3.5	25
15.0	690	559	2.98	7721	31.6	70.7	343	3724	345	23.3	18.9	78.4	673	17	229	87	1.91	116.	12	45	3.7	27
16.0	736	597	3.19	7976	32.6	68.4	360	3841	323	21.5	17.5	79.2	720	16	235	83	1.82	123.	13	48	3.8	29
17.0	782	634	3.38	8224	33.6	66.4	376	3944	304	20.0	16.3	80.0	767	15	241	79	1.74	129.	14	50	4.0	31
18.0	828	671	3.58	8464	34.6	64.5	391	4035	287	18.7	15.2	80.6	815	13	246	76	1.67	136.	14	52	4.1	32
19.0	874	709	3.78	8699	35.6	62.8	406	4117	272	17.6	14.3	81.2	861	13	252	73	1.61	142.	15	54	4.3	34
20.0	920	746	3.98	8927	36.5	61.2	420	4190	258	16.6	13.5	81.7	908	12	257	71	1.56	148.	16	57	4.4	36
25.0	1150	932	4.97	9994	40.8	54.7	485	4470	207	12.9	10.4	83.6	1141	9	281	61	1.35	179.	19	67	5.1	43
30.0	1380	1119	5.96	10962	44.7	50.0	543	4656	172	10.5	8.5	84.7	1373	7	303	55	1.21	208.	22	77	5.7	49
35.0	1610	1305	6.96	11856	48.3	46.3	595	4788	147	8.9	7.2	85.6	1604	6	323	50	1.10	236.	26	86	6.2	
40.0	1840	1492	7.95	12691	51.6	43.3	642	4888	129	7.7	6.2	86.1	1835	5	343	46	1.02	262.	29	95	6.6	
45.0	2070	1678	8.94	13479	54.7	40.8	687	4965	115	6.8	5.5	86.6	2066	4	362	43	0.95	287.	32	103	7.1	
50.0	2300	1865	9.94	14227	57.7	38.7	729	5027	103	6.1	4.9	87.0	2296	4	380	41	0.90	312.	35	112	7.5	

#238 46 Ti on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 82. ZC=104.( )
NEUTRON NUMBERS: NP= 24. NT=126. NC=150.

AP**1/3= 3.583 AT**1/3= 5.925
REDUCED MASS NUMBER= 37.67 AP+AT=AC=254.

INTERACTION RADIUS RINT=13.44 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 6.82 CT+CP=10.62 C= 2.44

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.96

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.66 RC=RCP+RCT=10.67

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 336.95 MeV K= .20145 n=2.595
VC(RINT)= 193.1 MeV

FISSION-TKE= 205. MeV
ASYMM. FISSION-TKE= 137. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 27.48 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -19.5
COMPOUND NUCLEUS: 94.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.09 fm V(RB)= 201.3 MeV
Q-VALUE= -158.6 MeV
L-CRITICAL= 103.

46 Ti on 208 Pb

46 Ti on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	46	38	0.20	1986	8.2	284.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	92	75	0.39	2809	11.7	200.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	138	113	0.59	3442	14.3	164.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	184	151	0.78	3975	16.5	142.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	207	170	0.88	4217	17.5	133.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	230	188	0.98	4446	18.4	127.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	253	207	1.07	4663	19.3	121.1	67	391	130	122.0	110.0	29.0	138	115	88	464	10.02	45.	3	15	1.2	4
6.0	276	226	1.17	4871	20.2	116.0	103	836	502	96.7	84.0	41.6	185	91	114	304	6.52	49.	4	18	1.5	6
6.5	299	245	1.27	5071	21.0	111.4	129	1212	771	81.4	69.5	49.3	224	75	132	242	5.19	52.	5	20	1.6	8
7.0	322	264	1.37	5263	21.8	107.4	151	1533	715	70.7	59.7	54.6	258	64	145	207	4.45	56.	6	22	1.8	9
7.5	345	283	1.46	5448	22.6	103.7	170	1812	668	62.7	52.6	58.7	290	55	156	184	3.95	60.	6	24	2.0	11
8.0	368	301	1.56	5628	23.3	100.4	187	2055	626	56.4	47.0	61.8	319	49	165	168	3.59	63.	7	26	2.1	12
8.5	391	320	1.66	5802	24.0	97.4	203	2269	589	51.2	42.6	64.4	348	43	172	155	3.31	67.	7	28	2.3	14
9.0	414	339	1.76	5971	24.7	94.7	218	2460	556	47.0	39.0	66.5	375	39	179	144	3.09	71.	8	29	2.4	15
9.5	437	358	1.85	6135	25.4	92.2	231	2630	527	43.4	36.0	68.3	401	36	185	136	2.91	74.	8	31	2.5	16
10.0	460	377	1.95	6295	26.1	89.8	244	2783	501	40.4	33.4	69.8	427	33	190	129	2.75	78.	8	32	2.6	17
10.5	483	396	2.05	6452	26.7	87.7	256	2922	477	37.7	31.2	71.1	453	30	195	123	2.62	81.	9	34	2.7	18
11.0	506	414	2.15	6604	27.3	85.6	268	3048	455	35.4	29.2	72.3	478	28	199	117	2.51	84.	9	35	2.8	20
11.5	529	433	2.24	6754	27.9	83.8	279	3163	435	33.4	27.5	73.3	503	26	203	113	2.41	88.	10	36	2.9	21
12.0	552	452	2.34	6900	28.5	82.0	290	3268	417	31.6	26.0	74.2	528	24	207	108	2.32	91.	10	38	3.0	22
13.0	598	490	2.54	7184	29.7	78.8	311	3455	385	28.5	23.4	75.8	577	21	214	101	2.17	98.	11	40	3.2	24
14.0	644	527	2.73	7457	30.8	75.9	330	3614	357	25.9	21.3	77.0	625	19	221	95	2.04	105.	11	43	3.4	26
15.0	690	565	2.93	7721	31.9	73.3	348	3752	334	23.8	19.6	78.1	673	17	227	90	1.93	111.	12	45	3.6	28
16.0	736	603	3.12	7976	33.0	71.0	365	3873	313	22.0	18.1	79.0	720	16	233	86	1.84	117.	13	47	3.7	30
17.0	782	640	3.32	8224	34.0	68.9	381	3980	294	20.5	16.8	79.8	767	15	238	82	1.76	124.	14	49	3.9	32
18.0	828	678	3.51	8464	35.0	67.0	397	4075	278	19.1	15.7	80.4	814	14	243	79	1.69	130.	14	52	4.0	34
19.0	874	716	3.71	8699	35.9	65.2	412	4159	263	18.0	14.7	81.0	861	13	249	76	1.63	136.	15	54	4.2	35
20.0	920	753	3.90	8927	36.8	63.5	427	4236	250	16.9	13.9	81.5	908	12	253	74	1.58	142.	16	56	4.3	37
25.0	1150	942	4.88	9994	41.2	56.8	493	4525	200	13.1	10.8	83.4	1141	9	276	64	1.36	172.	19	66	5.0	44
30.0	1380	1130	5.85	10962	45.1	51.9	552	4718	167	10.7	8.8	84.6	1373	7	297	57	1.22	200.	22	76	5.5	51
35.0	1610	1318	6.83	11856	48.7	48.0	605	4856	143	9.1	7.4	85.5	1604	6	317	52	1.11	226.	26	85	6.0	
40.0	1840	1507	7.80	12691	52.1	44.9	654	4959	125	7.9	6.4	86.1	1835	5	335	48	1.03	252.	29	94	6.5	
45.0	2070	1695	8.78	13479	55.3	42.3	699	5039	111	6.9	5.7	86.5	2066	4	353	45	0.96	276.	32	102	7.0	
50.0	2300	1883	9.75	14227	58.3	40.2	741	5103	100	6.2	5.1	86.9	2296	4	370	42	0.91	298.	35	111	7.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#239 46 Ti on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 83. ZC=105.( )
NEUTRON NUMBERS: NP= 24. NT=126. NC=150.

AP**1/3= 3.583 AT**1/3= 5.934
REDUCED MASS NUMBER= 37.70 AP+AT=AC=255.

INTERACTION RADIUS RINT=13.45 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 6.83 CT+CP=10.63 C̄= 2.44

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 6.97

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.68 RC=RCP+RCT=10.68

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 340.40 MeV K= .20102 n=2.598
VC(RINT)= 195.3 MeV

FISSION-TKE= 208. MeV
ASYMM. FISSION-TKE= 138. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 27.59 MeV
L-RLD= 46 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: -16.5
COMPOUND NUCLEUS: 100.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.10 fm V(RB)= 203.6 MeV
Q-VALUE= -162.0 MeV
L-CRITICAL= 102.

46 Ti on 209 Bi

46 Ti on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	38	0.19	1986	8.2	287.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	92	75	0.39	2809	11.7	203.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	138	113	0.58	3442	14.3	166.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	184	151	0.77	3975	16.5	143.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	207	170	0.87	4217	17.5	135.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	230	189	0.97	4446	18.4	128.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	253	207	1.06	4663	19.3	122.6	62	335	82	126.3	114.7	26.9	134	119	85	508	10.85	45.	3 15	1.2	4
6.0	276	226	1.16	4871	20.2	117.4	100	786	458	99.1	86.4	40.4	181	95	112	317	6.74	49.	4 17	1.4	6
6.5	299	245	1.25	5071	21.0	112.8	127	1166	753	83.2	71.1	48.4	221	78	131	250	5.30	52.	5 20	1.6	7
7.0	322	264	1.35	5263	21.8	108.7	149	1491	699	72.1	61.0	54.0	256	66	145	213	4.51	56.	6 22	1.8	9
7.5	345	283	1.45	5448	22.6	105.0	169	1773	653	63.8	53.6	58.1	288	57	156	189	4.00	60.	6 24	1.9	10
8.0	368	302	1.54	5628	23.3	101.7	186	2019	612	57.3	47.9	61.3	318	50	165	171	3.62	63.	7 26	2.1	12
8.5	391	320	1.64	5802	24.0	98.6	202	2236	576	52.1	43.4	64.0	346	45	173	158	3.34	67.	7 28	2.2	13
9.0	414	339	1.74	5971	24.7	95.8	217	2429	544	47.7	39.7	66.1	374	40	179	147	3.11	71.	8 29	2.4	14
9.5	437	358	1.83	6135	25.4	93.3	230	2602	515	44.1	36.6	67.9	401	36	185	138	2.93	74.	8 31	2.5	16
10.0	460	377	1.93	6295	26.1	90.9	243	2757	489	41.0	33.9	69.5	427	33	190	131	2.77	77.	8 32	2.6	17
10.5	483	396	2.03	6452	26.7	88.7	256	2897	466	38.3	31.7	70.9	452	31	195	125	2.64	81.	9 33	2.7	18
11.0	506	415	2.12	6604	27.3	86.7	267	3024	445	35.9	29.7	72.0	478	28	200	119	2.52	84.	9 35	2.8	19
11.5	529	434	2.22	6754	28.0	84.8	279	3141	425	33.9	27.9	73.1	502	27	204	114	2.42	88.	10 36	2.9	20
12.0	552	452	2.32	6900	28.6	83.0	289	3247	408	32.0	26.4	74.0	527	25	208	110	2.33	91.	10 38	3.0	22
13.0	598	490	2.51	7184	29.7	79.7	310	3436	376	28.9	23.8	75.6	576	22	215	103	2.18	98.	11 40	3.2	24
14.0	644	528	2.70	7457	30.9	76.8	329	3598	349	26.3	21.6	76.9	624	20	221	97	2.05	104.	11 42	3.4	26
15.0	690	566	2.90	7721	31.9	74.2	347	3738	326	24.1	19.8	77.9	672	18	228	92	1.94	111.	12 45	3.6	28
16.0	736	603	3.09	7976	33.0	71.9	365	3860	306	22.3	18.3	78.8	720	16	233	87	1.85	118.	13 47	3.7	29
17.0	782	641	3.28	8224	34.0	69.7	381	3968	288	20.7	17.0	79.6	767	15	239	84	1.77	124.	14 49	3.9	31
18.0	828	679	3.48	8464	35.0	67.8	397	4064	272	19.4	15.9	80.3	814	14	244	80	1.70	130.	14 52	4.0	33
19.0	874	716	3.67	8699	35.9	66.0	412	4150	257	18.2	14.9	80.9	861	13	249	77	1.64	136.	15 54	4.2	35
20.0	920	754	3.86	8927	36.9	64.3	427	4227	244	17.1	14.1	81.4	908	12	254	75	1.58	142.	16 56	4.3	36
25.0	1150	943	4.83	9994	41.2	57.5	494	4520	195	13.3	10.9	83.4	1141	9	277	65	1.37	172.	19 66	4.9	44
30.0	1380	1131	5.79	10962	45.2	52.5	552	4715	163	10.9	8.9	84.6	1373	7	298	58	1.22	199.	22 76	5.5	51
35.0	1610	1320	6.76	11856	48.8	48.6	605	4854	139	9.2	7.5	85.4	1604	6	318	53	1.11	227.	25 85	6.0	
40.0	1840	1508	7.72	12691	52.2	45.5	654	4959	122	8.0	6.5	86.0	1835	5	336	49	1.03	251.	29 94	6.5	
45.0	2070	1697	8.69	13479	55.3	42.9	700	5040	108	7.0	5.7	86.5	2065	5	354	46	0.96	275.	32 102	6.9	
50.0	2300	1885	9.65	14227	58.3	40.7	742	5104	97	6.3	5.1	86.9	2296	4	371	43	0.91	299.	35 111	7.4	

#240 46 Ti on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 22. ZT= 92. ZC=114.( )
NEUTRON NUMBERS: NP= 24. NT=146. NC=170.

AP**1/3= 3.583 AT**1/3= 6.197
REDUCED MASS NUMBER= 38.55 AP+AT=AC=284.

INTERACTION RADIUS RINT=13.73 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 3.80 CT= 7.16 CT+CP=10.97 C̄= 2.48

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.05 RT= 7.30

COULOMB RADII [fm]:
RCP= 4.00 RCT= 6.98 RC=RCP+RCT=10.98

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 366.11 MeV K= .18858 n=2.623
VC(RINT)= 212.0 MeV

FISSION-TKE= 234. MeV
ASYMM. FISSION-TKE= 146. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 27.65 MeV
L-RLD= 26 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.24 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -44.8 TARGET: 47.2
COMPOUND NUCLEUS: 172.8

FUSION RELATED PARAMETERS:
R-BARRIER=12.35 fm V(RB)= 220.6 MeV
Q-VALUE= -170.4 MeV
L-CRITICAL= 97.

46 Ti on 238 U

46 Ti on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	46	39	0.18	1986	8.4	318.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	92	77	0.36	2809	11.9	225.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	138	116	0.55	3442	14.6	184.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	184	154	0.73	3975	16.9	159.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	207	173	0.82	4217	17.9	150.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	230	193	0.91	4446	18.9	142.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	253	212	1.00	4663	19.8	135.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	276	231	1.09	4871	20.7	130.1	81	500	220	116.0	105.2	32.0	168	108	103	450	8.83	44.	4 16	1.3	6
6.5	299	251	1.18	5071	21.5	125.0	115	921	572	94.6	83.5	42.7	211	88	125	319	6.23	47.	5 19	1.5	8
7.0	322	270	1.27	5263	22.3	120.5	141	1282	602	80.8	70.3	49.6	249	73	141	260	5.08	50.	5 21	1.7	10
7.5	345	289	1.36	5448	23.1	116.4	163	1594	562	70.9	61.1	54.6	282	63	153	225	4.40	53.	6 23	1.8	12
8.0	368	308	1.45	5628	23.8	112.7	183	1867	527	63.3	54.3	58.4	313	55	163	202	3.93	57.	6 25	2.0	13
8.5	391	328	1.55	5802	24.6	109.3	200	2107	496	57.2	48.9	61.4	342	49	171	184	3.59	60.	7 27	2.1	15
9.0	414	347	1.64	5971	25.3	106.2	216	2320	468	52.3	44.5	63.9	370	44	178	170	3.32	63.	7 28	2.2	16
9.5	437	366	1.73	6135	26.0	103.4	231	2511	443	48.2	40.9	65.9	397	40	184	159	3.11	67.	8 30	2.3	17
10.0	460	385	1.82	6295	26.7	100.8	245	2683	421	44.7	37.8	67.7	424	36	189	150	2.93	69.	8 31	2.5	19
10.5	483	405	1.91	6452	27.3	98.4	259	2839	401	41.6	35.2	69.2	450	33	194	143	2.78	73.	9 32	2.6	20
11.0	506	424	2.00	6604	28.0	96.1	271	2980	383	39.0	33.0	70.5	475	31	198	136	2.65	76.	9 34	2.7	21
11.5	529	443	2.09	6754	28.6	94.0	283	3109	366	36.7	31.0	71.7	501	28	202	130	2.54	79.	9 35	2.8	22
12.0	552	463	2.18	6900	29.2	92.0	295	3227	351	34.6	29.2	72.7	525	27	206	125	2.44	82.	10 36	2.9	24
13.0	598	501	2.36	7184	30.4	88.4	317	3436	324	31.2	26.3	74.4	575	23	213	116	2.27	88.	11 39	3.1	26
14.0	644	540	2.55	7457	31.5	85.2	337	3614	301	28.3	23.9	75.8	623	21	219	109	2.13	94.	11 41	3.2	28
15.0	690	578	2.73	7721	32.7	82.3	357	3769	281	26.0	21.9	77.0	671	19	225	103	2.01	100.	12 44	3.4	30
16.0	736	617	2.91	7976	33.7	79.7	375	3905	263	24.0	20.2	78.0	719	17	230	98	1.92	106.	13 46	3.5	32
17.0	782	655	3.09	8224	34.8	77.3	392	4025	248	22.3	18.7	78.9	766	16	235	94	1.83	111.	13 48	3.7	34
18.0	828	694	3.27	8464	35.8	75.1	409	4131	234	20.8	17.5	79.6	813	15	240	90	1.76	117.	14 50	3.8	36
19.0	874	732	3.46	8699	36.8	73.1	425	4226	221	19.5	16.4	80.2	860	14	245	87	1.69	123.	15 52	4.0	38
20.0	920	771	3.64	8927	37.7	71.3	441	4311	210	18.4	15.4	80.8	907	13	249	84	1.63	128.	15 54	4.1	40
25.0	1150	964	4.55	9994	42.2	63.7	511	4636	168	14.2	11.9	82.9	1140	10	270	72	1.41	155.	19 64	4.7	48
30.0	1380	1156	5.46	10962	46.2	58.2	573	4852	140	11.6	9.7	84.2	1372	8	289	64	1.25	180.	22 74	5.3	55
35.0	1610	1349	6.36	11856	49.9	53.9	629	5007	120	9.8	8.2	85.1	1604	6	306	59	1.14	204.	25 82	5.8	
40.0	1840	1542	7.27	12691	53.3	50.4	680	5122	105	8.5	7.1	85.8	1835	5	322	54	1.06	227.	28 91	6.2	
45.0	2070	1735	8.18	13479	56.6	47.5	728	5212	93	7.5	6.3	86.3	2065	5	338	51	0.99	249.	31 99	6.6	
50.0	2300	1927	9.09	14227	59.6	45.1	772	5284	84	6.7	5.6	86.7	2296	4	353	48	0.93	270.	35 108	7.0	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	ℏ	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 46 Ti

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#241 56 Fe on 12 C

56 Fe on 12 C

56 Fe on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 6. ZC= 32.(Ge)
NEUTRON NUMBERS: NP= 30. NT= 6. NC= 36.

AP**1/3= 3.826 AT**1/3= 2.289 ELSCAT <12 deg
REDUCED MASS NUMBER= 9.88 AP+AT=AC= 68.

INTERACTION RADIUS RINT= 9.75 fm RO= 1.59 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 2.12 CT+CP= 6.24 C= 1.40

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 2.52

COULOMB RADII [fm]:
RCP= 4.27 RCT= 2.51 RC=RCP+RCT= 6.79

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 45.54 MeV K= .07837 n=2.648
VC(RINT)= 23.0 MeV

FISSION-TKE= 49. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 16.65 MeV
L-RLD= 64 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 19.53 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: 0.0
COMPOUND NUCLEUS: -66.5

FUSION RELATED PARAMETERS:
R-BARRIER= 8.84 fm V(RB)= 23.6 MeV
Q-VALUE= 5.1 MeV
L-CRITICAL= 37.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	10	0.43	2418	2.2	24.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	112	20	0.86	3420	3.1	17.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	168	30	1.29	4190	3.7	14.2	17	744	500	79.0	11.4	50.5	129	39	0	30	5.39	134.	0	2.0	2
4.0	224	40	1.72	4839	4.3	12.3	27	1338	988	48.6	8.0	65.7	202	22	195	19	3.41	179.	4	2.3	2
4.5	252	44	1.93	5134	4.6	11.6	31	1532	1151	40.9	6.9	69.5	234	18	222	17	2.99	198.	5	2.4	3
5.0	280	49	2.15	5412	4.8	11.0	34	1686	1281	35.4	6.0	72.3	265	15	247	15	2.70	220.	5	2.5	3
5.5	308	54	2.36	5677	5.1	10.5	37	1812	1388	31.2	5.4	74.4	295	13	271	14	2.48	242.	6	2.6	3
6.0	336	59	2.58	5930	5.3	10.0	40	1916	1476	27.9	4.8	76.0	325	11	294	13	2.30	260.	7	2.8	4
6.5	364	64	2.79	6173	5.5	9.6	43	2004	1517	25.3	4.4	77.4	354	10	317	12	2.16	282.	7	2.9	4
7.0	392	69	3.01	6407	5.7	9.3	46	2079	1408	23.1	4.0	78.5	383	9	340	11	2.04	304.	8	3.0	4
7.5	420	74	3.22	6633	5.9	9.0	48	2143	1314	21.2	3.7	79.4	412	8	362	11	1.94	325.	8	3.1	4
8.0	448	79	3.43	6851	6.1	8.7	50	2200	1232	19.6	3.4	80.2	440	8	385	10	1.85	342.	9	3.1	5
8.5	476	84	3.65	7063	6.3	8.4	52	2249	1160	18.3	3.2	80.9	469	7	406	10	1.77	363.	9	3.2	5
9.0	504	89	3.86	7269	6.5	8.2	54	2293	1095	17.1	3.0	81.4	498	6	428	10	1.71	384.	10	3.3	5
9.5	532	94	4.08	7469	6.7	8.0	56	2332	1037	16.1	2.8	82.0	526	6	450	9	1.65	406.	10	3.4	5
10.0	560	99	4.29	7664	6.8	7.8	58	2368	986	15.2	2.7	82.4	554	6	471	9	1.59	420.	11	3.5	6
10.5	588	104	4.51	7854	7.0	7.6	60	2399	939	14.4	2.5	82.8	583	5	493	9	1.54	441.	12	3.6	6
11.0	616	109	4.72	8040	7.2	7.4	62	2428	896	13.6	2.4	83.2	611	5	514	8	1.50	462.	12	3.7	6
11.5	644	114	4.94	8222	7.3	7.2	64	2454	857	13.0	2.3	83.5	639	5	536	8	1.46	483.	13	3.7	6
12.0	672	119	5.15	8400	7.5	7.1	66	2478	821	12.4	2.2	83.8	667	5	557	8	1.42	504.	13	3.8	6
13.0	728	128	5.58	8745	7.8	6.8	69	2521	758	11.3	2.0	84.3	724	4	599	8	1.35	537.	14	4.0	7
14.0	784	138	6.01	9078	8.1	6.6	72	2557	704	10.4	1.8	84.8	780	4	641	7	1.29	579.	15	4.1	7
15.0	840	148	6.44	9399	8.4	6.3	75	2588	657	9.7	1.7	85.2	837	3	683	7	1.24	610.	16	4.2	8
16.0	896	158	6.87	9710	8.6	6.1	78	2615	616	9.0	1.6	85.5	893	3	725	7	1.19	651.	17	4.4	8
17.0	952	168	7.30	10011	8.9	6.0	81	2639	580	8.4	1.5	85.8	949	3	766	6	1.15	691.	18	4.5	8
18.0	1008	178	7.73	10304	9.2	5.8	83	2660	547	7.9	1.4	86.0	1005	3	808	6	1.11	720.	19	4.6	9
19.0	1064	188	8.16	10589	9.4	5.6	86	2679	518	7.5	1.3	86.3	1061	3	849	6	1.08	760.	20	4.8	9
20.0	1120	198	8.59	10867	9.7	5.5	89	2696	493	7.1	1.3	86.5	1118	2	891	6	1.05	800.	21	4.9	9
25.0	1400	247	10.73	12166	10.8	4.9	100	2760	394	5.6	1.0	87.2	1398	2	1096	5	0.93	986.	26	5.4	11
30.0	1680	296	12.88	13345	11.8	4.5	111	2802	328	4.6	0.8	87.7	1678	2	1299	5	0.84	1139.	31	5.9	12
35.0	1960	346	15.03	14433	12.8	4.2	120	2832	281	3.9	0.7	88.0	1959	1	1502	4	0.77	1281.	36	6.4	
40.0	2240	395	17.17	15450	13.7	3.9	129	2854	246	3.4	0.6	88.3	2239	1	1703	4	0.72	1437.	40	6.9	
45.0	2520	445	19.32	16409	14.5	3.7	138	2871	219	3.0	0.5	88.5	2519	1	1904	4	0.67	1586.	45	7.3	
50.0	2800	494	21.47	17319	15.3	3.5	145	2884	197	2.7	0.5	88.6	2799	1	2104	4	0.64	1694.	50	7.7	

#242 56 Fe on 16 O

56 Fe on 16 O

56 Fe on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 8. ZC= 34.(Se)
NEUTRON NUMBERS: NP= 30. NT= 8. NC= 38.

AP**1/3= 3.826 AT**1/3= 2.520 ELSCAT <16 deg
REDUCED MASS NUMBER= 12.44 AP+AT=AC= 72.

INTERACTION RADIUS RINT=10.00 fm RO= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 2.42 CT+CP= 6.54 C= 1.53

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 2.78

COULOMB RADII [fm]:
RCP= 4.27 RCT= 2.78 RC=RCP+RCT= 7.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 58.88 MeV K= .10805 n=2.573
VC(RINT)= 29.9 MeV

FISSION-TKE= 52. MeV
ASYMM. FISSION-TKE= 37. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 18.14 MeV
L-RLD= 67 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.60 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -4.7
COMPOUND NUCLEUS: -68.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.03 fm V(RB)= 30.9 MeV
Q-VALUE= 2.4 MeV
L-CRITICAL= 45.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	12	0.42	2418	2.7	32.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	112	25	0.83	3420	3.8	23.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	168	37	1.25	4190	4.7	18.9	21	682	443	84.1	15.4	48.0	116	52	0	42	5.87	127.	0	2.1	2
4.0	224	50	1.66	4839	5.4	16.4	34	1325	973	51.0	10.7	64.5	195	29	186	26	3.58	167.	4	2.4	3
4.5	252	56	1.87	5134	5.8	15.4	39	1537	1150	42.8	9.1	68.6	229	23	213	23	3.13	188.	5	2.5	3
5.0	280	62	2.08	5412	6.1	14.6	44	1705	1291	37.0	8.0	71.5	261	19	238	20	2.81	206.	5	2.7	4
5.5	308	68	2.29	5677	6.4	14.0	48	1841	1407	32.5	7.1	73.7	291	17	261	19	2.57	226.	6	2.8	4
6.0	336	75	2.50	5930	6.7	13.4	52	1955	1503	29.1	6.3	75.5	321	15	283	17	2.39	247.	7	2.9	4
6.5	364	81	2.70	6173	6.9	12.8	55	2051	1402	26.3	5.7	76.9	351	13	305	16	2.23	267.	7	3.0	4
7.0	392	87	2.91	6407	7.2	12.4	58	2133	1302	24.0	5.3	78.0	380	12	327	15	2.11	284.	8	3.2	5
7.5	420	93	3.12	6633	7.5	12.0	61	2203	1215	22.0	4.8	79.0	409	11	348	15	2.00	304.	8	3.3	5
8.0	448	100	3.33	6851	7.7	11.6	64	2265	1139	20.4	4.5	79.8	438	10	368	14	1.91	324.	9	3.4	5
8.5	476	106	3.54	7063	7.9	11.2	67	2320	1072	19.0	4.2	80.5	467	9	389	13	1.83	339.	9	3.4	5
9.0	504	112	3.74	7269	8.2	10.9	70	2368	1012	17.8	3.9	81.1	496	8	409	13	1.76	359.	10	3.6	6
9.5	532	118	3.95	7469	8.4	10.6	72	2411	959	16.7	3.7	81.7	524	8	429	12	1.70	379.	10	3.8	6
10.0	560	124	4.16	7664	8.6	10.4	75	2449	911	15.7	3.5	82.1	553	7	449	12	1.64	399.	11	3.9	6
10.5	588	131	4.37	7854	8.8	10.1	77	2484	868	14.9	3.3	82.6	581	7	469	12	1.59	413.	11	4.1	7
11.0	616	137	4.58	8040	9.0	9.9	80	2516	828	14.1	3.1	82.9	610	6	489	11	1.54	432.	12	4.2	7
11.5	644	143	4.78	8222	9.2	9.7	82	2545	792	13.4	3.0	83.3	638	6	509	11	1.50	452.	12	4.4	7
12.0	672	149	4.99	8400	9.4	9.5	84	2571	759	12.8	2.8	83.6	666	6	528	11	1.46	464.	13	4.6	8
13.0	728	162	5.41	8745	9.8	9.1	89	2618	701	11.7	2.6	84.1	723	5	567	10	1.39	503.	14	4.9	8
14.0	784	174	5.82	9078	10.2	8.8	93	2658	651	10.8	2.4	84.6	779	5	606	10	1.33	533.	15	5.2	9
15.0	840	187	6.24	9399	10.5	8.5	97	2692	607	10.0	2.2	85.0	836	4	644	9	1.27	571.	16	5.5	9
16.0	896	199	6.66	9710	10.9	8.2	100	2722	569	9.3	2.1	85.3	892	4	683	9	1.23	600.	17	5.7	10
17.0	952	212	7.07	10011	11.2	7.9	104	2749	536	8.7	1.9	85.6	948	4	721	9	1.18	637.	18	6.0	10
18.0	1008	224	7.49	10304	11.5	7.7	107	2772	506	8.2	1.8	85.9	1004	4	759	8	1.15	675.	19	6.3	10
19.0	1064	236	7.90	10589	11.9	7.5	111	2793	479	7.8	1.7	86.1	1061	3	797	8	1.11	701.	20	6.6	11
20.0	1120	249	8.32	10867	12.2	7.3	114	2812	455	7.3	1.6	86.3	1117	3	835	8	1.08	738.	21	6.9	11
25.0	1400	311	10.40	12166	13.6	6.6	129	2883	364	5.8	1.3	87.1	1398	2	1022	7	0.95	892.	26	8.2	13
30.0	1680	373	12.48	13345	14.9	6.0	143	2930	303	4.8	1.1	87.6	1678	2	1208	6	0.86	1034.	30	9.4	15
35.0	1960	436	14.56	14433	16.1	5.5	155	2963	260	4.1	0.9	88.0	1958	2	1392	6	0.79	1185.	35	10.6	7.0
40.0	2240	498	16.64	15450	17.2	5.2	167	2988	227	3.6	0.8	88.2	2239	1	1575	5	0.74	1306.	40	11.8	7.5
45.0	2520	560	18.72	16409	18.3	4.9	178	3007	202	3.1	0.7	88.4	2519	1	1758	5	0.69	1442.	45	12.9	7.9
50.0	2800	622	20.80	17319	19.2	4.6	188	3022	182	2.8	0.6	88.6	2799	1	1939	5	0.66	1542.	49	14.0	8.3
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#243 56 Fe on 27 Al

56 Fe on 27 Al

56 Fe on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 13. ZC= 39.(Y)
NEUTRON NUMBERS: NP= 30. NT= 14. NC= 44.

AP**1/3= 3.826 AT**1/3= 3.000 ELSCAT <28 deg
REDUCED MASS NUMBER= 18.22 AP+AT=AC= 83.

INTERACTION RADIUS RINT=10.53 fm RO= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 3.05 CT+CP= 7.16 C̄= 1.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 3.35

COULOMB RADII [fm]:
RCP= 4.27 RCT= 3.32 RC=RCP+RCT= 7.59

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 89.74 MeV K= .16674 n=2.486
VC(RINT)= 46.2 MeV

FISSION-TKE= 60. MeV
ASYMM. FISSION-TKE= 53. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.946 MeV/fm**2 PROX-FACTOR= 20.81 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.78 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -20.6
COMPOUND NUCLEUS: -73.5

FUSION RELATED PARAMETERS:
R-BARRIER= 9.45 fm V(RB)= 48.0 MeV
Q-VALUE= -8.5 MeV
L-CRITICAL= 63.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	18	0.39	2418	4.0	53.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	112	36	0.79	3420	5.6	37.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	168	55	1.18	4190	6.9	30.7	29	574	339	94.3	26.5	42.9	89	79	88	78	7.00	109.	2	6	2.1	3
4.0	224	73	1.58	4839	8.0	26.6	51	1323	956	55.4	17.3	62.3	182	42	167	44	3.94	144.	4	15	2.5	4
4.5	252	82	1.78	5134	8.5	25.1	59	1570	1162	46.3	14.6	66.9	218	34	193	38	3.40	162.	5	19	2.7	4
5.0	280	91	1.97	5412	8.9	23.8	66	1766	1326	39.8	12.7	70.1	252	28	217	34	3.03	177.	5	21	2.8	5
5.5	308	100	2.17	5677	9.3	22.7	72	1927	1461	34.9	11.2	72.5	284	24	238	31	2.77	195.	6	24	3.0	5
6.0	336	109	2.37	5930	9.8	21.7	78	2060	1359	31.1	10.0	74.4	315	21	258	29	2.56	210.	6	26	3.1	6
6.5	364	118	2.56	6173	10.2	20.9	83	2173	1255	28.1	9.0	76.0	345	19	277	27	2.39	228.	7	28	3.3	6
7.0	392	128	2.76	6407	10.5	20.1	89	2269	1165	25.6	8.3	77.2	375	17	296	25	2.25	245.	8	30	3.4	6
7.5	420	137	2.96	6633	10.9	19.4	93	2352	1087	23.5	7.6	78.2	405	15	314	24	2.14	259.	8	32	3.5	7
8.0	448	146	3.16	6851	11.3	18.8	98	2425	1019	21.7	7.0	79.1	434	14	331	23	2.04	277.	9	34	3.6	7
8.5	476	155	3.35	7063	11.6	18.3	102	2489	959	20.2	6.5	79.9	463	13	349	22	1.95	290.	9	36	3.8	8
9.0	504	164	3.55	7269	12.0	17.7	107	2546	906	18.9	6.1	80.6	492	12	366	21	1.87	307.	10	38	3.9	8
9.5	532	173	3.75	7469	12.3	17.3	111	2597	858	17.7	5.7	81.1	521	11	382	20	1.80	324.	10	39	4.0	8
10.0	560	182	3.95	7664	12.6	16.8	115	2643	815	16.7	5.4	81.6	550	10	399	19	1.74	337.	11	41	4.1	9
10.5	588	191	4.14	7854	12.9	16.4	118	2684	777	15.8	5.1	82.1	578	10	416	19	1.69	353.	11	43	4.2	9
11.0	616	200	4.34	8040	13.2	16.0	122	2722	741	15.0	4.9	82.5	607	9	432	18	1.64	370.	12	44	4.3	9
11.5	644	209	4.54	8222	13.5	15.7	126	2756	709	14.3	4.6	82.9	635	9	448	18	1.59	382.	12	46	4.4	10
12.0	672	219	4.73	8400	13.8	15.4	129	2787	679	13.6	4.4	83.2	664	8	464	17	1.55	399.	13	48	4.5	10
13.0	728	237	5.13	8745	14.4	14.8	136	2843	627	12.4	4.0	83.8	721	7	496	16	1.47	426.	14	51	4.7	11
14.0	784	255	5.52	9078	14.9	14.2	142	2890	582	11.4	3.7	84.3	777	7	528	16	1.41	459.	15	54	4.9	11
15.0	840	273	5.92	9399	15.4	13.7	148	2931	543	10.6	3.4	84.7	834	6	559	15	1.35	485.	16	57	5.1	12
16.0	896	291	6.31	9710	15.9	13.3	154	2967	509	9.9	3.2	85.1	890	6	590	15	1.30	510.	17	60	5.2	13
17.0	952	310	6.71	10011	16.4	12.9	159	2998	479	9.3	3.0	85.4	947	5	621	14	1.25	541.	17	63	5.4	13
18.0	1008	328	7.10	10304	16.9	12.5	165	3026	453	8.7	2.8	85.7	1003	5	652	14	1.21	565.	18	66	5.5	14
19.0	1064	346	7.50	10589	17.4	12.2	170	3051	429	8.2	2.7	85.9	1059	5	682	13	1.17	596.	19	68	5.7	14
20.0	1120	364	7.89	10867	17.8	11.9	175	3074	407	7.8	2.5	86.1	1115	5	713	13	1.14	619.	20	71	5.9	15
25.0	1400	455	9.86	12166	19.9	10.6	199	3159	326	6.1	2.0	86.9	1396	4	863	11	1.00	751.	25	84	6.6	17
30.0	1680	547	11.84	13345	21.8	9.7	220	3215	271	5.1	1.6	87.5	1677	3	1011	10	0.91	860.	29	97	7.2	20
35.0	1960	638	13.81	14433	23.6	9.0	239	3255	233	4.3	1.4	87.8	1958	2	1157	9	0.84	971.	34	109	7.8	
40.0	2240	729	15.78	15450	25.2	8.4	257	3285	203	3.8	1.2	88.1	2238	2	1301	9	0.78	1074.	38	121	8.3	
45.0	2520	820	17.75	16409	26.7	7.9	273	3308	181	3.3	1.1	88.3	2518	2	1445	8	0.73	1167.	43	132	8.8	
50.0	2800	911	19.73	17319	28.2	7.5	289	3327	163	3.0	1.0	88.5	2798	2	1588	8	0.69	1274.	47	143	9.3	

#244 56 Fe on 40 Ca

56 Fe on 40 Ca

56 Fe on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 20. ZC= 46.(Pd)
NEUTRON NUMBERS: NP= 30. NT= 20. NC= 50.

AP**1/3= 3.826 AT**1/3= 3.420 ELSCAT <45 deg
REDUCED MASS NUMBER= 23.33 AP+AT=AC= 96.

INTERACTION RADIUS RINT=10.98 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 3.59 CT+CP= 7.71 C̄= 1.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 3.85

COULOMB RADII [fm]:
RCP= 4.27 RCT= 3.84 RC=RCP+RCT= 8.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 129.86 MeV K= .22554 n=2.445
VC(RINT)= 68.1 MeV

FISSION-TKE= 72. MeV
ASYMM. FISSION-TKE= 70. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.949 MeV/fm**2 PROX-FACTOR= 22.87 MeV
L-RLD= 76 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -33.0
COMPOUND NUCLEUS: -78.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.82 fm V(RB)= 71.4 MeV
Q-VALUE= -16.4 MeV
L-CRITICAL= 76.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	23	0.34	2418	5.1	81.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	112	47	0.69	3420	7.2	57.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	168	70	1.03	4190	8.8	47.3	16	112	0	143.2	45.0	18.4	21	147	0	285	17.70	0.	0	2.1	3
4.0	224	93	1.37	4839	10.2	40.9	58	1058	709	70.2	28.4	54.9	152	72	138	79	4.78	125.	3	14	2.5	4
4.5	252	105	1.54	5134	10.8	38.6	70	1368	967	57.4	23.5	61.3	195	57	169	65	3.95	139.	4	18	2.7	5
5.0	280	117	1.71	5412	11.4	36.6	81	1615	1173	48.7	20.1	65.6	234	46	194	57	3.44	155.	5	21	2.9	5
5.5	308	128	1.89	5677	12.0	34.9	90	1817	1301	42.4	17.5	68.8	269	39	216	51	3.09	168.	6	23	3.1	6
6.0	336	140	2.06	5930	12.5	33.4	98	1985	1193	37.5	15.5	71.2	302	34	236	47	2.83	184.	6	26	3.2	6
6.5	364	152	2.23	6173	13.0	32.1	106	2126	1101	33.7	14.0	73.2	334	30	254	43	2.63	197.	7	28	3.4	7
7.0	392	163	2.40	6407	13.5	30.9	113	2248	1022	30.6	12.7	74.7	366	26	271	41	2.46	212.	7	30	3.5	7
7.5	420	175	2.57	6633	14.0	29.9	120	2353	954	28.0	11.6	76.0	396	24	287	38	2.32	224.	8	32	3.6	8
8.0	448	187	2.74	6851	14.4	28.9	126	2445	894	25.8	10.7	77.1	426	22	302	36	2.20	239.	8	34	3.8	8
8.5	476	198	2.91	7063	14.9	28.1	132	2525	842	24.0	10.0	78.0	456	20	317	35	2.10	251.	9	36	3.9	9
9.0	504	210	3.08	7269	15.3	27.3	138	2597	795	22.3	9.3	78.8	486	18	332	33	2.01	266.	9	38	4.0	9
9.5	532	222	3.26	7469	15.7	26.6	144	2661	753	20.9	8.7	79.5	515	17	347	32	1.94	278.	10	40	4.1	10
10.0	560	233	3.43	7664	16.1	25.9	149	2719	715	19.7	8.2	80.2	544	16	361	31	1.87	292.	10	41	4.3	10
10.5	588	245	3.60	7854	16.5	25.3	154	2771	681	18.6	7.7	80.7	573	15	375	30	1.80	307.	11	43	4.4	10
11.0	616	257	3.77	8040	16.9	24.7	159	2819	650	17.6	7.3	81.2	602	14	389	29	1.75	318.	11	45	4.5	11
11.5	644	268	3.94	8222	17.3	24.1	164	2862	622	16.7	7.0	81.6	631	13	402	28	1.70	332.	12	46	4.6	11
12.0	672	280	4.11	8400	17.7	23.6	169	2902	596	15.9	6.6	82.0	659	13	416	27	1.65	343.	12	48	4.7	12
13.0	728	303	4.46	8745	18.4	22.7	178	2972	550	14.5	6.1	82.7	717	11	442	26	1.56	371.	13	51	4.9	12
14.0	784	327	4.80	9078	19.1	21.9	187	3032	511	13.4	5.6	83.3	774	10	468	25	1.49	395.	14	54	5.1	13
15.0	840	350	5.14	9399	19.8	21.1	195	3084	477	12.4	5.2	83.8	830	10	494	24	1.43	418.	15	57	5.3	14
16.0	896	373	5.48	9710	20.4	20.5	203	3129	447	11.5	4.8	84.2	887	9	520	23	1.37	441.	16	60	5.5	15
17.0	952	397	5.83	10011	21.0	19.9	210	3169	421	10.8	4.5	84.6	944	8	545	22	1.32	462.	17	63	5.6	16
18.0	1008	420	6.17	10304	21.7	19.3	218	3204	397	10.1	4.2	84.9	1000	8	570	21	1.28	490.	18	66	5.8	16
19.0	1064	443	6.51	10589	22.2	18.8	225	3236	376	9.6	4.0	85.2	1057	7	595	20	1.24	510.	19	69	6.0	17
20.0	1120	467	6.86	10867	22.8	18.3	232	3265	357	9.0	3.8	85.5	1113	7	619	20	1.20	531.	20	71	6.1	18
25.0	1400	583	8.57	12166	25.5	16.4	263	3373	286	7.1	3.0	86.4	1395	5	740	17	1.06	638.	24	84	6.9	21
30.0	1680	700	10.28	13345	28.0	14.9	292	3445	238	5.9	2.4	87.1	1676	4	859	16	0.95	735.	28	97	7.5	24
35.0	1960	817	12.00	14433	30.2	13.8	317	3496	204	5.0	2.1	87.5	1956	4	975	14	0.88	833.	33	109	8.2	
40.0	2240	933	13.71	15450	32.3	12.9	341	3534	178	4.3	1.8	87.8	2237	3	1090	13	0.82	925.	37	121	8.7	
45.0	2520	1050	15.42	16409	34.2	12.2	364	3564	159	3.8	1.6	88.1	2517	3	1204	13	0.77	1010.	41	132	9.3	
50.0	2800	1167	17.14	17319	36.1	11.6	385	3587	143	3.4	1.4	88.3	2798	2	1316	12	0.72	1088.	45	143	9.8	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#245 56 Fe on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 26. ZC= 52.(Te)
NEUTRON NUMBERS: NP= 30. NT= 30. NC= 60.

INTERACTION RADIUS RINT=11.43 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 4.12 CT+CP= 8.23 C= 2.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 4.35

COULOMB RADII [fm]:
RCP= 4.27 RCT= 4.27 RC=RCP+RCT= 8.54

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 160.45 MeV K= .24959 n=2.438
VC(RINT)= 85.1 MeV

FISSION-TKE= 82. MeV
ASYMM. FISSION-TKE= 82. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.943 MeV/fm**2 PROX-FACTOR= 24.39 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.13 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -61.4
COMPOUND NUCLEUS: -78.0

FUSION RELATED PARAMETERS:
R-BARRIER=10.24 fm V(RB)= 89.2 MeV
Q-VALUE= -44.8 MeV
L-CRITICAL= 91.

56 Fe on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	28	0.33	2418	6.1	106.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	112	56	0.66	3420	8.7	75.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	168	84	0.99	4190	10.6	61.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	224	112	1.32	4839	12.2	53.2	68	1011	670	75.7	37.9	52.1	140	84	121	109	5.28	108.	3 14	2.2	4
4.5	252	126	1.48	5134	13.0	50.2	84	1360	962	61.4	30.7	59.3	186	66	153	88	4.28	120.	4 18	2.4	5
5.0	280	140	1.65	5412	13.7	47.6	98	1639	1194	51.9	25.9	64.1	226	54	177	76	3.69	132.	5 21	2.6	6
5.5	308	154	1.81	5677	14.4	45.4	110	1866	1277	45.0	22.5	67.5	263	45	198	68	3.30	144.	5 23	2.8	7
6.0	336	168	1.97	5930	15.0	43.5	120	2055	1170	39.7	19.9	70.1	297	39	216	62	3.00	157.	6 26	3.0	7
6.5	364	182	2.14	6173	15.6	41.8	130	2215	1080	35.6	17.8	72.2	330	34	232	57	2.78	169.	7 28	3.1	8
7.0	392	196	2.30	6407	16.2	40.2	139	2352	1003	32.2	16.1	73.9	362	30	247	53	2.60	180.	7 30	3.3	9
7.5	420	210	2.47	6633	16.8	38.9	148	2471	936	29.5	14.7	75.3	393	27	261	50	2.45	191.	8 32	3.4	10
8.0	448	224	2.63	6851	17.3	37.6	156	2574	878	27.2	13.6	76.4	423	25	274	48	2.32	204.	8 34	3.6	10
8.5	476	238	2.80	7063	17.9	36.5	163	2666	826	25.2	12.6	77.4	453	23	287	46	2.21	214.	9 36	3.7	11
9.0	504	252	2.96	7269	18.4	35.5	171	2747	780	23.5	11.7	78.3	483	21	299	44	2.12	227.	9 38	3.8	11
9.5	532	266	3.13	7469	18.9	34.5	178	2819	739	22.0	11.0	79.0	513	19	311	42	2.03	237.	10 39	4.0	12
10.0	560	280	3.29	7664	19.4	33.7	185	2885	702	20.7	10.3	79.7	542	18	323	40	1.96	250.	10 41	4.1	12
10.5	588	294	3.46	7854	19.8	32.8	191	2944	668	19.5	9.8	80.2	571	17	335	39	1.89	260.	11 43	4.2	13
11.0	616	308	3.62	8040	20.3	32.1	197	2997	638	18.5	9.2	80.8	600	16	346	38	1.83	272.	11 44	4.3	13
11.5	644	322	3.78	8222	20.8	31.4	203	3046	610	17.5	8.8	81.2	629	15	357	37	1.78	282.	11 46	4.4	14
12.0	672	336	3.95	8400	21.2	30.7	209	3091	585	16.7	8.3	81.7	658	14	368	36	1.73	294.	12 48	4.6	14
13.0	728	364	4.28	8745	22.1	29.5	221	3170	540	15.2	7.6	82.4	715	13	390	34	1.64	315.	13 51	4.8	15
14.0	784	392	4.61	9078	22.9	28.4	232	3238	501	14.0	7.0	83.0	772	12	411	32	1.56	336.	14 54	5.0	16
15.0	840	420	4.94	9399	23.7	27.5	242	3297	468	13.0	6.5	83.5	829	11	432	31	1.49	356.	15 57	5.2	17
16.0	896	448	5.27	9710	24.5	26.6	252	3348	439	12.1	6.0	84.0	886	10	453	30	1.44	376.	15 60	5.4	18
17.0	952	476	5.59	10011	25.3	25.8	261	3393	413	11.3	5.6	84.4	943	9	473	28	1.38	395.	16 62	5.5	19
18.0	1008	504	5.92	10304	26.0	25.1	271	3433	390	10.6	5.3	84.7	999	9	493	28	1.34	414.	17 65	5.7	20
19.0	1064	532	6.25	10589	26.7	24.4	280	3469	369	10.0	5.0	85.0	1056	8	513	27	1.29	432.	18 68	5.9	21
20.0	1120	560	6.58	10867	27.4	23.8	288	3502	351	9.4	4.7	85.3	1112	8	533	26	1.25	455.	19 70	6.1	21
25.0	1400	700	8.23	12166	30.6	21.3	328	3624	280	7.4	3.7	86.3	1394	6	629	23	1.10	543.	23 83	6.8	25
30.0	1680	840	9.87	13345	33.5	19.4	363	3706	234	6.1	3.1	86.9	1675	5	723	20	1.00	622.	27 96	7.5	29
35.0	1960	980	11.52	14433	36.2	18.0	396	3764	200	5.2	2.6	87.4	1956	4	814	19	0.91	700.	31 107	8.2	
40.0	2240	1120	13.16	15450	38.7	16.8	425	3807	175	4.5	2.3	87.7	2236	4	904	18	0.85	780.	35 118	8.8	
45.0	2520	1260	14.81	16409	41.1	15.9	453	3841	156	4.0	2.0	88.0	2517	3	992	16	0.80	843.	39 129	9.3	
50.0	2800	1400	16.46	17319	43.3	15.1	479	3868	140	3.6	1.8	88.2	2797	3	1080	16	0.75	912.	43 140	9.8	

#246 56 Fe on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 29. ZC= 55.(Cs)
NEUTRON NUMBERS: NP= 30. NT= 34. NC= 64.

AP**1/3= 3.826 AT**1/3= 3.979
REDUCED MASS NUMBER= 29.65 AP+AT=AC=119.

INTERACTION RADIUS RINT=11.59 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 4.31 CT+CP= 8.43 C= 2.11

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 4.53

COULOMB RADII [fm]:
RCP= 4.27 RCT= 4.45 RC=RCP+RCT= 8.72

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 175.34 MeV K= .25883 n=2.440
VC(RINT)= 93.5 MeV

FISSION-TKE= 88. MeV
ASYMM. FISSION-TKE= 88. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 24.93 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.75 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -65.2
COMPOUND NUCLEUS: -73.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.39 fm V(RB)= 98.1 MeV
Q-VALUE= -53.2 MeV
L-CRITICAL= 95.

56 Fe on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	30	0.32	2418	6.5	118.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	112	59	0.63	3420	9.2	84.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	168	89	0.95	4190	11.2	68.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	224	119	1.27	4839	13.0	59.4	69	914	586	81.5	43.6	49.3	129	95	110	129	5.72	102.	3 14	2.1	4
4.5	252	133	1.43	5134	13.8	56.0	87	1287	898	65.5	34.9	57.3	179	73	145	102	4.53	114.	4 17	2.3	5
5.0	280	148	1.58	5412	14.5	53.1	102	1565	1147	55.0	29.3	62.5	221	59	170	87	3.86	125.	5 20	2.5	6
5.5	308	163	1.74	5677	15.2	50.6	115	1828	1245	47.5	25.2	66.2	258	50	191	78	3.43	136.	5 23	2.7	7
6.0	336	178	1.90	5930	15.9	48.5	127	2031	1141	41.9	22.2	69.1	293	43	208	70	3.11	149.	6 25	2.9	7
6.5	364	193	2.06	6173	16.5	46.6	137	2202	1053	37.4	19.9	71.3	327	37	224	65	2.87	160.	6 28	3.1	8
7.0	392	208	2.22	6407	17.2	44.9	147	2348	978	33.9	18.0	73.1	359	33	239	61	2.67	170.	7 30	3.2	9
7.5	420	222	2.38	6633	17.8	43.4	157	2475	913	30.9	16.4	74.5	390	30	252	57	2.52	181.	8 32	3.4	10
8.0	448	237	2.54	6851	18.3	42.0	165	2586	856	28.5	15.1	75.8	421	27	265	54	2.38	193.	8 34	3.5	10
8.5	476	252	2.69	7063	18.9	40.7	174	2683	805	26.4	14.0	76.8	451	25	277	51	2.27	203.	9 35	3.7	11
9.0	504	267	2.85	7269	19.5	39.6	182	2770	761	24.6	13.0	77.7	481	23	289	49	2.17	213.	9 37	3.8	12
9.5	532	282	3.01	7469	20.0	38.5	189	2848	721	23.0	12.2	78.5	511	21	301	47	2.08	225.	10 39	3.9	12
10.0	560	296	3.17	7664	20.5	37.5	197	2918	685	21.6	11.5	79.2	540	20	312	45	2.00	235.	10 41	4.0	13
10.5	588	311	3.33	7854	21.0	36.6	204	2981	652	20.4	10.8	79.8	570	18	323	44	1.93	244.	10 42	4.2	14
11.0	616	326	3.49	8040	21.5	35.8	210	3038	622	19.3	10.2	80.3	599	17	333	42	1.87	256.	11 44	4.3	14
11.5	644	341	3.65	8222	22.0	35.0	217	3090	595	18.3	9.7	80.8	628	16	344	41	1.81	265.	11 46	4.4	15
12.0	672	356	3.80	8400	22.5	34.3	224	3138	570	17.4	9.2	81.3	657	15	354	40	1.76	276.	12 47	4.5	15
13.0	728	385	4.12	8745	23.4	32.9	236	3223	526	15.9	8.4	82.1	714	14	374	38	1.67	296.	13 50	4.7	16
14.0	784	415	4.44	9078	24.3	31.7	248	3296	489	14.6	7.7	82.7	771	13	394	36	1.59	316.	14 53	4.9	17
15.0	840	445	4.75	9399	25.1	30.7	259	3358	456	13.5	7.2	83.2	828	12	413	34	1.52	335.	14 56	5.1	18
16.0	896	474	5.07	9710	25.9	29.7	269	3413	428	12.6	6.7	83.7	885	11	432	33	1.46	354.	15 59	5.3	19
17.0	952	504	5.39	10011	26.7	28.8	280	3462	402	11.8	6.2	84.1	942	10	451	32	1.41	372.	16 62	5.5	20
18.0	1008	534	5.71	10304	27.5	28.0	290	3505	380	11.0	5.8	84.5	999	9	470	31	1.36	390.	17 65	5.7	21
19.0	1064	563	6.02	10589	28.3	27.2	299	3543	360	10.4	5.5	84.8	1055	9	488	30	1.32	408.	18 67	5.9	22
20.0	1120	593	6.34	10867	29.0	26.5	308	3578	342	9.8	5.2	85.1	1112	8	506	29	1.28	425.	19 70	6.0	23
25.0	1400	741	7.92	12166	32.4	23.7	351	3709	274	7.7	4.1	86.1	1394	6	594	25	1.12	509.	23 83	6.8	27
30.0	1680	889	9.51	13345	35.5	21.7	389	3797	228	6.4	3.4	86.8	1675	5	680	23	1.01	591.	27 95	7.5	30
35.0	1960	1038	11.09	14433	38.4	20.1	424	3859	195	5.4	2.9	87.3	1956	4	763	21	0.93	658.	31 106	8.1	
40.0	2240	1186	12.68	15450	41.0	18.8	456	3905	171	4.7	2.5	87.6	2236	4	845	20	0.86	735.	35 117	8.7	
45.0	2520	1334	14.26	16409	43.5	17.7	486	3942	152	4.2	2.2	87.9	2517	3	926	18	0.81	797.	39 128	9.3	
50.0	2800	1482	15.85	17319	45.9	16.8	514	3970	137	3.7	2.0	88.1	2797	3	1005	17	0.77	852.	43 139	9.8	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	mrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#247 56 Fe on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 42. ZC= 68.(Er)
NEUTRON NUMBERS: NP= 30. NT= 50. NC= 80.

AP**1/3= 3.826 AT**1/3= 4.514
REDUCED MASS NUMBER= 34.81 AP+AT=AC=148.

INTERACTION RADIUS RINT=12.17 fm R0= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 5.00 CT+CP= 9.12 $\bar{C}$= 2.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 5.20

COULOMB RADII [fm]:
RCP= 4.27 RCT= 5.08 RC=RCP+RCT= 9.35

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 236.20 MeV K= .27838 n=2.461
VC(RINT)= 129.0 MeV

FISSION-TKE= 116. MeV
ASYMM. FISSION-TKE= 109. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.941 MeV/fm**2 PROX-FACTOR= 26.69 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.79 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -87.5
COMPOUND NUCLEUS: -53.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.93 fm V(RB)= 135.5 MeV
Q-VALUE= -95.7 MeV
L-CRITICAL= 104.

56 Fe on 92 Mo

56 Fe on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	35	0.27	2418	7.6	171.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	112	70	0.54	3420	10.8	121.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	168	104	0.81	4190	13.2	99.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	224	139	1.08	4839	15.2	86.0	50	351	101	119.8	82.6	30.1	66	158	54	317	10.23	83.	2 10	1.5	3
4.5	252	157	1.21	5134	16.2	81.1	82	837	506	89.1	58.0	45.5	135	117	106	193	6.19	93.	3 15	1.8	4
5.0	280	174	1.35	5412	17.0	76.9	105	1224	831	72.3	46.2	53.8	188	92	140	151	4.85	102.	4 18	2.1	5
5.5	308	191	1.48	5677	17.9	73.3	124	1539	1085	61.2	38.8	59.4	233	75	165	128	4.11	112.	5 21	2.3	6
6.0	336	209	1.62	5930	18.6	70.2	140	1802	995	53.2	33.5	63.4	273	63	185	114	3.64	121.	5 23	2.5	7
6.5	364	226	1.75	6173	19.4	67.4	155	2024	918	47.1	29.6	66.5	309	55	201	103	3.30	130.	6 26	2.7	8
7.0	392	244	1.89	6407	20.1	65.0	168	2214	852	42.3	26.5	68.9	344	48	216	95	3.03	139.	7 28	2.8	9
7.5	420	261	2.02	6633	20.9	62.8	180	2378	796	38.4	24.0	70.8	377	43	228	88	2.83	148.	7 30	3.0	10
8.0	448	278	2.16	6851	21.5	60.8	192	2522	746	35.1	22.0	72.4	410	38	240	83	2.66	158.	8 32	3.1	10
8.5	476	296	2.29	7063	22.2	59.0	203	2649	702	32.4	20.3	73.8	441	35	251	79	2.52	167.	8 34	3.3	11
9.0	504	313	2.43	7269	22.8	57.3	213	2762	663	30.1	18.8	75.0	472	32	261	75	2.39	175.	9 36	3.4	12
9.5	532	331	2.56	7469	23.5	55.8	223	2863	628	28.1	17.5	76.0	503	29	271	71	2.29	184.	9 37	3.6	13
10.0	560	348	2.70	7664	24.1	54.4	232	2953	597	26.3	16.4	76.8	533	27	281	69	2.19	192.	10 39	3.7	14
10.5	588	366	2.83	7854	24.7	53.1	242	3035	568	24.8	15.5	77.6	563	25	290	66	2.11	201.	10 41	3.8	14
11.0	616	383	2.97	8040	25.3	51.8	250	3110	542	23.4	14.6	78.3	592	24	298	64	2.04	209.	10 42	3.9	15
11.5	644	400	3.10	8222	25.8	50.7	259	3178	519	22.2	13.8	76.9	622	22	307	62	1.97	217.	11 44	4.1	16
12.0	672	418	3.24	8400	26.4	49.6	267	3240	497	21.1	13.1	79.5	651	21	315	60	1.91	225.	11 45	4.2	17
13.0	728	453	3.51	8745	27.5	47.7	282	3350	459	19.2	11.9	80.4	709	19	331	56	1.81	242.	12 48	4.4	18
14.0	784	487	3.78	9078	28.5	46.0	297	3445	426	17.6	10.9	81.2	767	17	347	54	1.72	258.	13 51	4.6	19
15.0	840	522	4.05	9399	29.5	44.4	311	3526	398	16.2	10.1	81.9	824	16	362	51	1.64	275.	14 54	4.8	20
16.0	896	557	4.32	9710	30.5	43.0	325	3598	373	15.1	9.4	82.5	881	15	377	49	1.57	288.	15 57	5.0	22
17.0	952	592	4.59	10011	31.4	41.7	338	3661	351	14.1	8.8	83.0	939	13	391	47	1.51	304.	15 59	5.2	23
18.0	1008	627	4.86	10304	32.3	40.5	350	3717	331	13.2	8.2	83.4	995	13	405	45	1.46	319.	16 62	5.4	24
19.0	1064	661	5.13	10589	33.2	39.4	362	3767	314	12.4	7.7	83.8	1052	12	419	44	1.41	334.	17 64	5.5	25
20.0	1120	696	5.40	10867	34.1	38.4	374	3812	298	11.7	7.3	84.1	1109	11	433	43	1.36	349.	18 67	5.7	26
25.0	1400	870	6.75	12166	38.1	34.4	428	3983	238	9.2	5.7	85.4	1392	8	499	37	1.19	419.	22 79	6.5	31
30.0	1680	1044	8.10	13345	41.7	31.4	475	4097	199	7.6	4.7	86.2	1673	7	562	34	1.07	485.	25 91	7.2	35
35.0	1960	1218	9.45	14433	45.0	29.1	518	4178	170	6.4	4.0	86.8	1954	6	623	31	0.98	546.	29 102	7.8	
40.0	2240	1392	10.79	15450	48.2	27.2	558	4239	149	5.6	3.5	87.2	2235	5	683	29	0.91	601.	33 112	8.4	
45.0	2520	1566	12.14	16409	51.1	25.6	596	4286	132	4.9	3.1	87.5	2516	4	741	27	0.86	657.	37 123	8.9	
50.0	2800	1741	13.49	17319	53.8	24.3	631	4324	119	4.4	2.7	87.8	2796	4	798	25	0.81	708.	40 133	9.4	

#248 56 Fe on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 47. ZC= 73.(Ta)
NEUTRON NUMBERS: NP= 30. NT= 61. NC= 91.

AP**1/3= 3.826 AT**1/3= 4.762
REDUCED MASS NUMBER= 36.88 AP+AT=AC=164.

INTERACTION RADIUS RINT=12.44 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 5.32 CT+CP= 9.44 $\bar{C}$= 2.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 5.50

COULOMB RADII [fm]:
RCP= 4.27 RCT= 5.34 RC=RCP+RCT= 9.61

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 256.86 MeV K= .27584 n=2.471
VC(RINT)= 141.2 MeV

FISSION-TKE= 126. MeV
ASYMM. FISSION-TKE= 116. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.931 MeV/fm**2 PROX-FACTOR= 27.16 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.48 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -87.6
COMPOUND NUCLEUS: -43.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.18 fm V(RB)= 148.0 MeV
Q-VALUE= -105.2 MeV
L-CRITICAL= 110.

56 Fe on 108 Ag

56 Fe on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	37	0.26	2418	8.1	192.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	112	74	0.52	3420	11.4	136.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	168	111	0.78	4190	14.0	111.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	224	148	1.04	4839	16.1	96.2	41	211	0	134.0	103.8	23.0	53	171	40	466	13.84	0.	1 9	1.4	3
4.5	252	166	1.17	5134	17.1	90.7	82	737	423	95.9	67.3	42.1	127	125	96	235	6.90	83.	3 14	1.7	5
5.0	280	184	1.31	5412	18.0	86.1	108	1154	773	76.9	52.6	51.5	183	97	132	178	5.21	92.	4 17	2.0	6
5.5	308	203	1.44	5677	18.9	82.0	130	1495	1060	64.7	43.7	57.6	229	79	157	149	4.36	101.	5 20	2.2	7
6.0	336	221	1.57	5930	19.8	78.6	148	1779	987	56.0	37.6	62.0	269	67	177	131	3.82	109.	5 23	2.4	8
6.5	364	240	1.70	6173	20.6	75.5	164	2018	911	49.5	33.0	65.3	307	57	193	118	3.45	117.	6 25	2.6	9
7.0	392	258	1.83	6407	21.3	72.7	179	2224	846	44.3	29.5	67.8	342	50	207	108	3.16	126.	6 27	2.7	10
7.5	420	277	1.96	6633	22.1	70.3	192	2401	789	40.2	26.7	69.9	375	45	219	100	2.94	134.	7 29	2.9	11
8.0	448	295	2.09	6851	22.8	68.0	205	2557	740	36.7	24.4	71.6	408	40	230	94	2.76	142.	7 31	3.0	12
8.5	476	313	2.22	7063	23.5	66.0	217	2694	696	33.9	22.4	73.1	440	36	240	89	2.60	150.	8 33	3.2	13
9.0	504	332	2.35	7269	24.2	64.1	228	2816	658	31.4	20.8	74.3	471	33	250	85	2.48	157.	8 35	3.3	14
9.5	532	350	2.48	7469	24.9	62.4	239	2924	623	29.3	19.4	75.4	501	31	258	81	2.36	165.	9 36	3.5	15
10.0	560	369	2.61	7664	25.5	60.8	249	3022	592	27.4	18.1	76.3	532	28	267	77	2.27	172.	9 38	3.6	16
10.5	588	387	2.74	7854	26.1	59.4	259	3111	564	25.8	17.1	77.1	562	26	275	75	2.18	181.	10 40	3.7	16
11.0	616	406	2.87	8040	26.8	58.0	269	3191	538	24.4	16.1	77.8	591	25	283	72	2.10	188.	10 41	3.8	17
11.5	644	424	3.00	8222	27.4	56.7	278	3265	515	23.1	15.2	78.5	621	23	291	69	2.03	196.	11 43	3.9	18
12.0	672	443	3.13	8400	27.9	55.5	287	3332	493	21.9	14.5	79.0	650	22	298	67	1.97	203.	11 44	4.1	19
13.0	728	479	3.39	8745	29.1	53.4	304	3451	455	19.9	13.2	80.0	708	20	313	64	1.86	218.	12 47	4.3	20
14.0	784	516	3.66	9078	30.2	51.4	320	3553	423	18.3	12.0	80.9	766	18	327	60	1.76	232.	13 50	4.5	22
15.0	840	553	3.92	9399	31.2	49.7	335	3641	394	16.9	11.1	81.6	824	16	340	58	1.68	246.	13 53	4.7	23
16.0	896	590	4.18	9710	32.3	48.1	350	3719	370	15.7	10.3	82.2	881	15	353	55	1.61	261.	14 55	4.9	24
17.0	952	627	4.44	10011	33.3	46.7	364	3787	348	14.6	9.6	82.7	938	14	366	53	1.55	273.	15 58	5.0	26
18.0	1008	664	4.70	10304	34.2	45.4	378	3847	329	13.7	9.0	83.2	995	13	378	51	1.49	287.	16 61	5.2	27
19.0	1064	701	4.96	10589	35.2	44.1	391	3901	311	12.9	8.5	83.6	1052	12	390	49	1.44	301.	17 63	5.4	28
20.0	1120	738	5.22	10867	36.1	43.0	403	3950	296	12.2	8.0	83.9	1109	11	402	48	1.40	315.	17 66	5.6	29
25.0	1400	922	6.53	12166	40.3	38.5	462	4135	236	9.5	6.3	85.2	1391	9	460	42	1.22	376.	21 77	6.3	35
30.0	1680	1106	7.83	13345	44.2	35.1	513	4258	197	7.8	5.2	86.1	1673	7	515	38	1.10	433.	25 89	7.0	40
35.0	1960	1291	9.14	14433	47.7	32.5	560	4346	169	6.6	4.4	86.7	1954	6	567	34	1.01	489.	29 99	7.6	
40.0	2240	1475	10.44	15450	51.0	30.4	604	4411	148	5.8	3.8	87.1	2235	5	619	32	0.94	541.	32 110	8.2	
45.0	2520	1660	11.75	16409	54.1	28.7	644	4462	131	5.1	3.4	87.4	2516	4	669	30	0.88	587.	36 120	8.7	
50.0	2800	1844	13.06	17319	57.0	27.2	682	4503	118	4.6	3.0	87.7	2796	4	718	28	0.83	635.	39 130	9.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	aps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#249 56 Fe on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 58. ZC= 84.(Po)
NEUTRON NUMBERS: NP= 30. NT= 82. NC=112.

AP**1/3= 3.826 AT**1/3= 5.192
REDUCED MASS NUMBER= 40.00 AP+AT=AC=196.

INTERACTION RADIUS RINT=12.91 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 5.87 CT+CP= 9.99 C= 2.42

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.04

COULOMB RADII [fm]:
RCP= 4.27 RCT= 5.82 RC=RCP+RCT=10.09

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 301.04 MeV K= .26763 n=2.498
VC(RINT)= 168.0 MeV

FISSION-TKE= 152. MeV
ASYMM. FISSION-TKE= 130. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.917 MeV/fm**2 PROX-FACTOR= 27.89 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.07 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -88.2
COMPOUND NUCLEUS: -13.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.60 fm V(RB)= 175.7 MeV
Q-VALUE= -136.0 MeV
L-CRITICAL= 113.

56 Fe on 140 Ce

56 Fe on 140 Ce

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMMR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	40	0.24	2418	8.7	237.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	80	0.48	3420	12.4	167.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	120	0.71	4190	15.2	137.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	160	0.95	4839	17.5	118.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	180	1.07	5134	18.6	111.9	61	354	100	122.6	99.3	28.7	94	158	66	434	10.75	71.	2	12	1.3	3
5.0	280	200	1.19	5412	19.6	106.2	101	848	513	93.1	70.9	43.5	160	120	111	265	6.55	78.	3	16	1.6	5
5.5	308	220	1.31	5677	20.5	101.2	128	1251	851	76.5	56.9	51.8	212	96	141	208	5.13	85.	4	19	1.9	6
6.0	336	240	1.43	5930	21.4	96.9	151	1586	896	65.3	48.0	57.3	256	80	163	177	4.36	92.	5	21	2.1	8
6.5	364	260	1.55	6173	22.3	93.1	171	1869	827	57.1	41.7	61.4	296	68	180	157	3.85	99.	6	24	2.2	9
7.0	392	280	1.67	6407	23.1	89.7	189	2112	768	50.9	36.9	64.6	333	59	194	142	3.49	106.	6	26	2.4	10
7.5	420	300	1.79	6633	24.0	86.7	205	2322	717	45.9	33.2	67.1	368	52	206	131	3.22	113.	7	28	2.6	12
8.0	448	320	1.90	6851	24.7	84.0	220	2505	672	41.8	30.2	69.1	402	46	217	122	3.00	119.	7	30	2.7	13
8.5	476	340	2.02	7063	25.5	81.4	234	2667	632	38.4	27.7	70.8	434	42	226	115	2.82	126.	8	32	2.9	14
9.0	504	360	2.14	7269	26.2	79.1	247	2811	597	35.5	25.6	72.3	466	38	235	108	2.67	133.	8	33	3.0	15
9.5	532	380	2.26	7469	27.0	77.0	260	2940	566	33.0	23.8	73.5	497	35	243	103	2.54	140.	9	35	3.2	16
10.0	560	400	2.38	7664	27.7	75.1	272	3055	537	30.9	22.2	74.6	528	32	251	99	2.42	146.	9	36	3.3	17
10.5	588	420	2.50	7854	28.3	73.3	283	3160	512	29.0	20.8	75.5	558	30	258	95	2.33	152.	9	38	3.4	18
11.0	616	440	2.62	8040	29.0	71.6	294	3255	489	27.3	19.6	76.3	588	28	265	91	2.24	158.	10	39	3.5	20
11.5	644	460	2.74	8222	29.7	70.0	305	3342	467	25.9	18.5	77.1	618	26	271	88	2.16	165.	10	41	3.6	20
12.0	672	480	2.86	8400	30.3	68.5	315	3421	448	24.5	17.6	77.7	647	25	278	85	2.09	170.	11	42	3.7	22
13.0	728	520	3.10	8745	31.5	65.9	335	3562	413	22.3	15.9	78.9	706	22	290	80	1.97	183.	11	45	4.0	23
14.0	784	560	3.33	9078	32.7	63.5	353	3683	384	20.4	14.6	79.8	764	20	302	76	1.86	195.	12	48	4.2	25
15.0	840	600	3.57	9399	33.9	61.3	371	3787	358	18.8	13.4	80.6	822	18	313	72	1.78	207.	13	51	4.4	27
16.0	896	640	3.81	9710	35.0	59.4	388	3878	336	17.4	12.5	81.3	879	17	324	69	1.70	218.	14	53	4.5	29
17.0	952	680	4.05	10011	36.1	57.6	404	3959	316	16.2	11.6	81.9	937	15	334	66	1.63	230.	15	56	4.7	30
18.0	1008	720	4.29	10304	37.1	56.0	419	4030	298	15.2	10.9	82.4	994	14	344	64	1.57	241.	15	58	4.9	32
19.0	1064	760	4.52	10589	38.1	54.5	434	4094	283	14.3	10.2	82.9	1051	13	354	62	1.52	253.	16	60	5.0	33
20.0	1120	800	4.76	10867	39.1	53.1	449	4152	268	13.5	9.6	83.3	1107	13	364	60	1.47	264.	17	63	5.2	34
25.0	1400	1000	5.95	12166	43.7	47.5	515	4371	215	10.5	7.5	84.7	1390	10	410	52	1.28	318.	20	74	5.9	40
30.0	1680	1200	7.14	13345	47.9	43.4	574	4516	179	8.6	6.2	85.7	1672	8	453	47	1.15	367.	24	85	6.6	46
35.0	1960	1400	8.33	14433	51.8	40.1	627	4620	153	7.3	5.2	86.3	1953	7	495	43	1.05	414.	28	95	7.2	
40.0	2240	1600	9.52	15450	55.3	37.5	676	4698	134	6.4	4.5	86.8	2234	6	535	40	0.98	457.	31	105	7.7	
45.0	2520	1800	10.71	16409	58.7	35.4	721	4758	119	5.6	4.0	87.2	2515	5	574	37	0.91	499.	34	115	8.2	
50.0	2800	2000	11.90	17319	61.9	33.6	764	4806	107	5.0	3.6	87.5	2796	4	612	35	0.86	538.	38	124	8.7	

#250 56 Fe on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 62. ZC= 88.(Ra)
NEUTRON NUMBERS: NP= 30. NT= 92. NC=122.

AP**1/3= 3.826 AT**1/3= 5.360
REDUCED MASS NUMBER= 41.07 AP+AT=AC=210.

INTERACTION RADIUS RINT=13.09 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 6.09 CT+CP=10.21 C= 2.46

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.25

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.00 RC=RCP+RCT=10.27

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 315.81 MeV K= .26168 n=2.508
VC(RINT)= 177.1 MeV

FISSION-TKE= 162. MeV
ASYMM. FISSION-TKE= 135. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.907 MeV/fm**2 PROX-FACTOR= 28.00 MeV
L-RLD= 73 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.94 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -72.1
COMPOUND NUCLEUS: 0.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.77 fm V(RB)= 185.0 MeV
Q-VALUE= -134.4 MeV
L-CRITICAL= 115.

56 Fe on 154 Sm

56 Fe on 154 Sm

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SOMMR	SOFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	41	0.23	2418	9.0	253.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	82	0.46	3420	12.7	179.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	123	0.70	4190	15.6	146.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	164	0.93	4839	18.0	126.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	185	1.04	5134	19.1	119.7	50	226	0	134.5	115.3	22.7	84	168	58	586	13.87	0.	2	11	1.4	4
5.0	280	205	1.16	5412	20.1	113.5	97	749	431	98.9	78.1	40.5	154	126	105	306	7.17	72.	3	15	1.6	6
5.5	308	226	1.28	5677	21.1	108.2	128	1175	787	80.5	61.8	49.7	207	101	136	233	5.44	79.	4	18	1.9	7
6.0	336	246	1.39	5930	22.0	103.6	152	1529	867	68.4	51.8	55.8	253	83	158	195	4.56	86.	5	21	2.1	9
6.5	364	267	1.51	6173	22.9	99.6	174	1828	900	59.6	44.8	60.2	294	70	176	172	4.01	92.	5	23	2.2	10
7.0	392	287	1.62	6407	23.8	95.9	193	2084	743	53.0	39.6	63.5	331	61	190	155	3.61	98.	6	25	2.4	12
7.5	420	308	1.74	6633	24.6	92.7	210	2305	693	47.7	35.5	66.2	366	54	202	142	3.32	105.	7	27	2.6	13
8.0	448	329	1.86	6851	25.4	89.7	226	2499	650	43.4	32.2	68.3	400	48	212	132	3.08	111.	7	29	2.7	14
8.5	476	349	1.97	7063	26.2	87.1	240	2670	612	39.8	29.5	70.1	433	43	221	124	2.89	117.	8	31	2.9	16
9.0	504	370	2.09	7269	26.9	84.6	254	2822	578	36.8	27.2	71.6	465	39	230	117	2.74	123.	8	33	3.0	17
9.5	532	390	2.20	7469	27.7	82.4	268	2958	547	34.2	25.3	72.9	496	36	238	111	2.60	130.	8	34	3.1	18
10.0	560	411	2.32	7664	28.4	80.3	280	3080	520	32.0	23.6	74.0	527	33	245	106	2.48	136.	9	36	3.2	19
10.5	588	431	2.43	7854	29.1	78.3	292	3191	495	30.0	22.1	75.0	557	31	252	102	2.38	142.	9	37	3.4	20
11.0	616	452	2.55	8040	29.8	76.5	304	3291	472	28.3	20.8	75.9	587	29	258	98	2.29	148.	10	39	3.5	21
11.5	644	472	2.67	8222	30.5	74.8	315	3383	452	26.7	19.7	76.6	617	27	265	95	2.21	154.	10	40	3.6	22
12.0	672	493	2.78	8400	31.1	73.3	326	3467	433	25.3	18.7	77.3	647	25	271	92	2.14	159.	11	42	3.7	23
13.0	728	534	3.01	8745	32.4	70.4	346	3615	400	23.0	16.9	78.5	705	23	282	86	2.01	171.	11	44	3.9	25
14.0	784	575	3.25	9078	33.6	67.8	366	3743	371	21.0	15.5	79.5	764	20	293	82	1.90	182.	12	47	4.1	27
15.0	840	616	3.48	9399	34.8	65.5	384	3853	346	19.4	14.2	80.3	821	19	303	78	1.81	193.	13	50	4.3	29
16.0	896	657	3.71	9710	35.9	63.5	402	3949	325	17.9	13.2	81.0	879	17	313	74	1.73	205.	14	52	4.5	30
17.0	952	698	3.94	10011	37.0	61.6	419	4034	306	16.7	12.3	81.6	936	16	323	71	1.66	215.	14	55	4.6	32
18.0	1008	739	4.17	10304	38.1	59.8	435	4110	289	15.7	11.5	82.2	993	15	332	69	1.60	225.	15	57	4.8	34
19.0	1064	780	4.41	10589	39.2	58.2	450	4178	273	14.7	10.8	82.6	1050	14	342	66	1.54	235.	16	59	5.0	36
20.0	1120	821	4.64	10867	40.2	56.8	466	4238	260	13.9	10.2	83.0	1107	13	351	64	1.49	246.	17	62	5.1	37
25.0	1400	1027	5.80	12166	44.9	50.8	535	4469	208	10.8	8.0	84.6	1390	10	393	56	1.30	295.	20	73	5.8	44
30.0	1680	1232	6.96	13345	49.2	46.3	596	4623	173	8.9	6.5	85.6	1672	8	433	50	1.17	341.	24	84	6.5	50
35.0	1960	1437	8.12	14433	53.1	42.9	651	4733	148	7.5	5.5	86.2	1953	7	471	46	1.07	386.	27	94	7.0	
40.0	2240	1643	9.28	15450	56.8	40.1	702	4815	130	6.5	4.8	86.7	2234	6	507	42	0.99	426.	31	103	7.6	
45.0	2520	1848	10.43	16409	60.3	37.8	750	4879	115	5.8	4.2	87.1	2515	5	543	40	0.93	467.	34	113	8.1	
50.0	2800	2053	11.59	17319	63.5	35.9	795	4930	104	5.2	3.8	87.4	2796	4	577	38	0.88	501.	37	122	8.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	ff	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ars	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#251 56 Fe on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 67. ZC= 93.(Np)
NEUTRON NUMBERS: NP= 30. NT= 98. NC=128.

AP**1/3= 3.826 AT**1/3= 5.485
REDUCED MASS NUMBER= 41.81 AP+AT=AC=221.

INTERACTION RADIUS RINT=13.22 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 6.25 CT+CP=10.37 C= 2.48

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.41

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.15 RC=RCP+RCT=10.42

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 335.66 MeV K= .25891 n=2.521
VC(RINT)= 189.4 MeV

FISSION-TKE= 175. MeV
ASYMM. FISSION-TKE= 141. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 28.35 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -63.7
COMPOUND NUCLEUS: 27.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.89 fm V(RB)= 197.9 MeV
Q-VALUE= -152.9 MeV
L-CRITICAL= 111.

56 Fe on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	42	0.22	2418	9.1	274.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	84	0.44	3420	12.9	194.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	125	0.66	4190	15.8	158.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	167	0.88	4839	18.3	137.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	188	0.99	5134	19.4	129.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	280	209	1.10	5412	20.4	122.7	82	522	236	112.3	92.4	33.9	134	146	90	400	8.78	69.	3	14	1.4	5
5.5	308	230	1.21	5677	21.4	117.0	119	979	618	89.2	70.5	45.4	193	115	127	279	6.09	76.	4	17	1.7	6
6.0	336	251	1.32	5930	22.4	112.0	146	1358	788	74.9	58.1	52.6	242	94	152	226	4.94	82.	5	20	1.9	8
6.5	364	272	1.43	6173	23.3	107.6	169	1679	728	64.8	49.8	57.6	285	79	171	195	4.27	88.	5	23	2.1	9
7.0	392	293	1.55	6407	24.2	103.7	190	1954	676	57.3	43.7	61.4	324	68	186	175	3.81	94.	6	25	2.2	11
7.5	420	314	1.66	6633	25.0	100.2	208	2192	631	51.4	39.0	64.3	360	60	199	159	3.47	101.	6	27	2.4	12
8.0	448	334	1.77	6851	25.9	97.0	225	2400	591	46.6	35.3	66.7	395	53	210	147	3.21	106.	7	29	2.6	14
8.5	476	355	1.88	7063	26.7	94.1	241	2583	556	42.7	32.3	68.7	428	48	220	138	3.00	112.	7	30	2.7	15
9.0	504	376	1.99	7269	27.4	91.4	255	2746	525	39.4	29.7	70.3	461	43	228	130	2.83	118.	8	32	2.8	16
9.5	532	397	2.10	7469	28.2	89.0	269	2892	498	36.6	27.5	71.7	492	40	236	123	2.68	124.	8	34	3.0	17
10.0	560	418	2.21	7664	28.9	86.7	283	3023	473	34.1	25.7	72.9	524	36	243	117	2.56	130.	9	35	3.1	18
10.5	588	439	2.32	7854	29.6	84.6	295	3141	450	32.0	24.0	74.0	554	34	250	112	2.45	135.	9	37	3.2	20
11.0	616	460	2.43	8040	30.3	82.7	307	3249	430	30.1	22.6	74.9	585	31	257	108	2.35	141.	10	38	3.3	21
11.5	644	481	2.54	8222	31.0	80.9	319	3347	411	28.4	21.3	75.8	615	29	263	104	2.27	147.	10	40	3.4	22
12.0	672	502	2.65	8400	31.7	79.2	330	3438	394	27.0	20.2	76.5	644	28	269	100	2.19	152.	10	41	3.6	23
13.0	728	544	2.87	8745	33.0	76.1	352	3597	364	24.4	18.3	77.8	703	25	280	94	2.06	164.	11	44	3.8	25
14.0	784	585	3.09	9078	34.2	73.3	372	3734	338	22.3	16.7	78.9	762	22	291	89	1.94	174.	12	46	4.0	27
15.0	840	627	3.31	9399	35.4	70.8	391	3852	315	20.5	15.4	79.7	820	20	301	85	1.85	185.	13	49	4.1	29
16.0	896	669	3.53	9710	36.6	68.6	409	3955	295	19.0	14.2	80.5	877	19	310	81	1.77	195.	14	51	4.3	31
17.0	952	711	3.75	10011	37.7	66.5	427	4047	278	17.7	13.3	81.1	935	17	320	78	1.69	206.	14	54	4.5	32
18.0	1008	753	3.97	10304	38.8	64.7	444	4128	262	16.6	12.4	81.7	992	16	329	75	1.63	216.	15	56	4.7	34
19.0	1064	794	4.19	10589	39.9	62.9	460	4200	249	15.6	11.7	82.2	1049	15	337	72	1.57	226.	16	59	4.8	36
20.0	1120	836	4.41	10867	40.9	61.3	476	4266	236	14.7	11.0	82.7	1106	14	346	70	1.52	236.	16	61	5.0	37
25.0	1400	1045	5.52	12166	45.7	54.9	547	4513	189	11.5	8.6	84.3	1389	11	386	61	1.32	284.	20	72	5.7	44
30.0	1680	1254	6.62	13345	50.1	50.1	610	4678	157	9.4	7.0	85.3	1671	9	424	54	1.18	329.	23	82	6.3	50
35.0	1960	1463	7.73	14433	54.1	46.4	667	4796	135	7.9	5.9	86.0	1953	7	460	50	1.08	371.	27	92	6.9	
40.0	2240	1672	8.83	15450	57.8	43.4	720	4884	118	6.9	5.1	86.6	2234	6	494	46	1.00	411.	30	102	7.4	
45.0	2520	1881	9.93	16409	61.3	40.9	769	4953	105	6.1	4.5	87.0	2515	5	527	43	0.94	448.	34	111	7.9	
50.0	2800	2090	11.04	17319	64.7	38.8	815	5008	94	5.4	4.1	87.3	2795	5	560	41	0.89	484.	37	120	8.4	

#252 56 Fe on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 73. ZC= 99.(Es)
NEUTRON NUMBERS: NP= 30. NT=108. NC=138.

AP**1/3= 3.826 AT**1/3= 5.657
REDUCED MASS NUMBER= 42.77 AP+AT=AC=237.

INTERACTION RADIUS RINT=13.41 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 6.47 CT+CP=10.59 C= 2.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.62

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.35 RC=RCP+RCT=10.63

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 358.15 MeV K= .25271 n=2.536
VC(RINT)= 203.5 MeV

FISSION-TKE= 192. MeV
ASYMM. FISSION-TKE= 149. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 28.64 MeV
L-RLD= 58 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.75 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -46.0
COMPOUND NUCLEUS: 63.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.05 fm V(RB)= 212.5 MeV
Q-VALUE= -171.1 MeV
L-CRITICAL= 107.

56 Fe on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	43	0.21	2418	9.4	298.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	86	0.42	3420	13.2	211.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	128	0.63	4190	16.2	172.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	171	0.84	4839	18.7	149.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	192	0.95	5134	19.8	140.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	280	214	1.05	5412	20.9	133.7	61	274	28	131.1	114.8	24.5	113	167	74	609	12.51	65.	2	13	1.2	4
5.5	308	235	1.16	5677	21.9	127.4	108	769	440	99.7	81.8	40.2	178	130	116	347	7.07	71.	4	16	1.5	5
6.0	336	257	1.26	5930	22.9	122.0	139	1180	703	82.4	66.0	48.8	231	105	144	268	5.46	77.	4	19	1.7	7
6.5	364	278	1.37	6173	23.8	117.2	165	1526	649	70.7	55.9	54.6	276	88	166	226	4.60	83.	5	22	1.9	9
7.0	392	299	1.47	6407	24.7	113.0	188	1823	603	62.1	48.7	58.9	317	75	182	200	4.06	88.	6	24	2.1	11
7.5	420	321	1.58	6633	25.6	109.1	207	2080	563	55.5	43.3	62.3	354	66	195	181	3.67	94.	6	26	2.2	12
8.0	448	342	1.68	6851	26.5	105.7	226	2305	527	50.2	39.0	64.9	390	58	207	166	3.37	100.	7	28	2.4	14
8.5	476	364	1.79	7063	27.3	102.5	242	2503	496	45.8	35.5	67.1	424	52	217	155	3.14	105.	7	30	2.5	15
9.0	504	385	1.89	7269	28.1	99.6	258	2679	469	42.2	32.6	68.9	457	47	225	145	2.95	111.	8	31	2.7	16
9.5	532	406	2.00	7469	28.8	97.0	273	2836	444	39.1	30.2	70.4	489	43	233	137	2.79	117.	8	33	2.8	17
10.0	560	428	2.10	7664	29.6	94.5	287	2978	422	36.5	28.1	71.8	520	40	241	131	2.65	122.	9	34	2.9	19
10.5	588	449	2.21	7854	30.3	92.2	300	3106	402	34.1	26.3	72.9	551	37	247	125	2.53	127.	9	36	3.1	20
11.0	616	470	2.31	8040	31.0	90.1	313	3223	383	32.1	24.7	74.0	582	34	254	120	2.43	133.	10	37	3.2	21
11.5	644	492	2.42	8222	31.7	88.1	326	3329	367	30.3	23.3	74.9	612	32	260	115	2.34	138.	10	39	3.3	22
12.0	672	513	2.52	8400	32.4	86.3	337	3426	351	28.7	22.0	75.7	642	30	265	111	2.25	143.	10	40	3.4	23
13.0	728	556	2.73	8745	33.7	82.9	360	3599	324	25.9	19.9	77.0	702	26	276	104	2.11	153.	11	43	3.6	26
14.0	784	599	2.94	9078	35.0	79.9	381	3746	301	23.7	18.1	78.2	760	24	286	98	2.00	163.	12	46	3.8	28
15.0	840	642	3.15	9399	36.2	77.2	401	3874	281	21.8	16.7	79.1	818	22	296	93	1.90	173.	13	48	4.0	30
16.0	896	684	3.36	9710	37.4	74.7	420	3986	263	20.2	15.4	79.9	876	20	305	89	1.81	183.	13	51	4.2	32
17.0	952	727	3.57	10011	38.6	72.5	439	4084	248	18.8	14.4	80.6	934	18	314	85	1.73	194.	14	53	4.3	33
18.0	1008	770	3.78	10304	39.7	70.4	456	4172	234	17.6	13.4	81.2	991	17	322	82	1.67	203.	15	55	4.5	35
19.0	1064	813	3.99	10589	40.8	68.6	473	4250	222	16.5	12.6	81.8	1048	16	330	79	1.61	212.	16	58	4.7	37
20.0	1120	855	4.20	10867	41.8	66.8	490	4321	211	15.5	11.9	82.2	1105	15	338	77	1.55	222.	16	60	4.8	38
25.0	1400	1069	5.25	12166	46.8	59.8	564	4589	168	12.1	9.2	84.0	1389	11	376	66	1.35	266.	20	71	5.5	46
30.0	1680	1283	6.30	13345	51.2	54.6	630	4767	140	9.9	7.6	85.1	1671	9	411	59	1.21	310.	23	81	6.1	52
35.0	1960	1497	7.35	14433	55.3	50.5	690	4894	120	8.4	6.4	85.8	1952	8	443	54	1.10	350.	27	91	6.7	
40.0	2240	1711	8.41	15450	59.2	47.3	745	4990	105	7.3	5.5	86.4	2234	6	475	50	1.02	386.	30	100	7.2	
45.0	2520	1925	9.46	16409	62.7	44.6	796	5064	93	6.4	4.9	86.8	2514	6	505	47	0.96	422.	33	109	7.7	
50.0	2800	2138	10.51	17319	66.1	42.3	844	5123	84	5.7	4.4	87.1	2795	5	535	44	0.90	455.	37	118	8.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fK	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ars	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#253 56 Fe on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 79. ZC=105.( )
NEUTRON NUMBERS: NP= 30. NT=118. NC=148.

AP**1/3= 3.826 AT**1/3= 5.819
REDUCED MASS NUMBER= 43.60 AP+AT=AC=253.

INTERACTION RADIUS RINT=13.58 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 6.68 CT+CP=10.79 C= 2.55

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.83

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.55 RC=RCP+RCT=10.82

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 380.08 MeV K= .24609 n=2.551
VC(RINT)= 217.4 MeV

FISSION-TKE= 209. MeV
ASYMM. FISSION-TKE= 156. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.903 MeV/fm**2 PROX-FACTOR= 28.89 MeV
L-RLD= 45 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -28.6
COMPOUND NUCLEUS: 100.0

FUSION RELATED PARAMETERS:
R-BARRIER=12.20 fm V(RB)= 226.9 MeV
Q-VALUE= -190.1 MeV
L-CRITICAL= 102.

56 Fe on 197 Au — 56 Fe on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	44	0.20	2418	9.5	323.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	87	0.40	3420	13.5	228.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	131	0.60	4190	16.5	186.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	174	0.80	4839	19.1	161.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	196	0.90	5134	20.2	152.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	280	218	1.00	5412	21.3	144.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	308	240	1.10	5677	22.4	137.9	92	547	253	112.4	96.0	33.8	161	147	104	451	8.62	67.	3	15	1.3	4
6.0	336	262	1.20	5930	23.4	132.0	130	989	612	90.9	74.9	44.6	218	118	136	321	6.12	73.	4	18	1.5	6
6.5	364	283	1.30	6173	24.3	126.9	159	1362	565	77.1	62.5	51.4	266	98	160	263	5.00	78.	5	21	1.7	8
7.0	392	305	1.40	6407	25.2	122.2	184	1681	525	67.3	54.0	56.3	309	83	178	228	4.34	83.	6	23	1.9	10
7.5	420	327	1.50	6633	26.1	118.1	205	1957	490	59.9	47.7	60.1	348	72	192	204	3.88	89.	6	25	2.1	11
8.0	448	349	1.60	6851	27.0	114.3	225	2199	459	53.9	42.8	63.0	384	64	204	186	3.54	94.	7	27	2.2	13
8.5	476	371	1.70	7063	27.8	110.9	243	2412	432	49.1	38.9	65.4	419	57	214	173	3.28	99.	7	29	2.4	14
9.0	504	392	1.80	7269	28.6	107.8	259	2602	408	45.1	35.6	67.4	453	51	223	161	3.07	104.	8	31	2.5	16
9.5	532	414	1.91	7469	29.4	104.9	275	2771	386	41.8	32.9	69.1	485	47	231	152	2.89	110.	8	32	2.7	17
10.0	560	436	2.01	7664	30.2	102.3	290	2923	367	38.9	30.6	70.6	517	43	238	144	2.75	115.	9	34	2.8	18
10.5	588	458	2.11	7854	30.9	99.8	304	3061	350	36.3	28.5	71.8	549	39	245	138	2.62	120.	9	35	2.9	20
11.0	616	480	2.21	8040	31.6	97.5	318	3186	334	34.1	26.8	72.9	579	37	252	132	2.51	125.	9	37	3.0	21
11.5	644	501	2.31	8222	32.3	95.4	331	3301	319	32.2	25.2	73.9	610	34	257	127	2.41	130.	10	38	3.1	22
12.0	672	523	2.41	8400	33.0	93.4	343	3405	306	30.5	23.9	74.8	640	32	263	122	2.32	135.	10	39	3.2	24
13.0	728	567	2.61	8745	34.4	89.7	367	3591	282	27.5	21.5	76.3	700	28	274	114	2.17	144.	11	42	3.5	26
14.0	784	610	2.81	9078	35.7	86.4	389	3750	262	25.1	19.6	77.5	759	25	283	108	2.05	154.	12	45	3.6	28
15.0	840	654	3.01	9399	36.9	83.5	410	3887	245	23.0	18.0	78.5	817	23	292	102	1.94	164.	13	47	3.8	30
16.0	896	698	3.21	9710	38.1	80.9	430	4007	229	21.3	16.6	79.3	875	21	301	97	1.85	173.	13	50	4.0	32
17.0	952	741	3.41	10011	39.3	78.4	449	4113	216	19.8	15.5	80.1	933	19	309	93	1.77	182.	14	52	4.2	34
18.0	1008	785	3.61	10304	40.5	76.2	467	4208	204	18.5	14.5	80.7	990	18	317	90	1.70	191.	15	54	4.3	36
19.0	1064	828	3.81	10589	41.6	74.2	485	4292	193	17.4	13.6	81.3	1047	17	325	86	1.64	200.	15	57	4.5	38
20.0	1120	872	4.01	10867	42.7	72.3	502	4368	183	16.4	12.8	81.8	1104	16	333	83	1.59	209.	16	59	4.6	40
25.0	1400	1090	5.01	12166	47.7	64.7	580	4656	147	12.7	9.9	83.6	1388	12	368	72	1.37	251.	20	70	5.3	48
30.0	1680	1308	6.02	13345	52.2	59.0	648	4848	122	10.4	8.1	84.8	1670	10	400	65	1.23	292.	23	80	5.9	54
35.0	1960	1526	7.02	14433	56.4	54.7	710	4985	105	8.8	6.9	85.6	1952	8	430	59	1.12	329.	26	89	6.5	
40.0	2240	1744	8.02	15450	60.3	51.1	767	5087	91	7.6	5.9	86.2	2233	7	460	55	1.04	366.	30	99	7.0	
45.0	2520	1962	9.02	16409	64.0	48.2	820	5167	81	6.7	5.2	86.6	2514	6	488	51	0.97	399.	33	108	7.5	
50.0	2800	2180	10.03	17319	67.4	45.7	869	5231	73	6.0	4.7	87.0	2795	5	515	48	0.92	431.	36	116	7.9	

#254 56 Fe on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 82. ZC=108.( )
NEUTRON NUMBERS: NP= 30. NT=126. NC=156.

AP**1/3= 3.826 AT**1/3= 5.925
REDUCED MASS NUMBER= 44.12 AP+AT=AC=264.

INTERACTION RADIUS RINT=13.70 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 6.82 CT+CP=10.93 C= 2.57

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.96

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.66 RC=RCP+RCT=10.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 390.03 MeV K= .24106 n=2.559
VC(RINT)= 223.8 MeV

FISSION-TKE= 217. MeV
ASYMM. FISSION-TKE= 159. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 28.88 MeV
L-RLD= 40 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -19.5
COMPOUND NUCLEUS: 121.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.31 fm V(RB)= 233.3 MeV
Q-VALUE= -202.2 MeV
L-CRITICAL= 100.

56 Fe on 208 Pb — 56 Fe on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	56	44	0.20	2418	9.7	335.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	88	0.39	3420	13.6	237.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	132	0.59	4190	16.7	193.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	176	0.79	4839	19.3	167.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	199	0.89	5134	20.5	158.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	280	221	0.99	5412	21.6	150.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	308	243	1.08	5677	22.6	143.1	86	463	184	118.1	102.9	30.9	157	151	100	513	9.54	64.	3	15	1.1	4
6.0	336	265	1.18	5930	23.6	137.1	127	920	565	94.4	79.1	42.8	215	121	133	348	6.45	70.	4	18	1.4	6
6.5	364	287	1.28	6173	24.6	131.7	158	1306	531	79.7	65.6	50.1	264	100	157	281	5.20	75.	5	21	1.6	8
7.0	392	309	1.38	6407	25.5	126.9	183	1636	493	69.4	56.4	55.3	307	85	176	242	4.47	80.	6	23	1.8	10
7.5	420	331	1.48	6633	26.4	122.6	206	1922	460	61.6	49.7	59.2	346	74	190	215	3.98	85.	6	25	2.0	11
8.0	448	353	1.58	6851	27.3	118.7	226	2172	431	55.4	44.5	62.3	383	65	202	196	3.62	90.	7	27	2.1	13
8.5	476	375	1.68	7063	28.1	115.1	245	2393	406	50.4	40.4	64.8	418	58	212	181	3.35	96.	7	29	2.3	14
9.0	504	397	1.77	7269	29.0	111.9	262	2589	383	46.3	37.0	66.9	452	52	221	169	3.13	100.	8	30	2.4	16
9.5	532	419	1.87	7469	29.7	108.9	278	2764	363	42.8	34.1	68.6	485	47	229	160	2.95	106.	8	32	2.6	17
10.0	560	441	1.97	7664	30.5	106.2	293	2922	345	39.8	31.7	70.1	517	43	236	151	2.79	110.	9	33	2.7	19
10.5	588	463	2.07	7854	31.3	103.6	308	3064	328	37.2	29.6	71.4	548	40	243	144	2.66	115.	9	35	2.8	20
11.0	616	485	2.17	8040	32.0	101.2	322	3194	313	34.9	27.7	72.5	579	37	249	138	2.55	120.	9	36	2.9	22
11.5	644	507	2.27	8222	32.7	99.0	335	3312	300	32.9	26.1	73.5	609	35	255	132	2.44	125.	10	38	3.0	23
12.0	672	529	2.37	8400	33.4	96.9	348	3421	287	31.1	24.7	74.4	640	32	260	128	2.35	130.	10	39	3.1	24
13.0	728	574	2.56	8745	34.8	93.1	372	3612	265	28.1	22.2	76.0	699	29	271	119	2.20	139.	11	42	3.4	26
14.0	784	618	2.76	9078	36.1	89.7	395	3777	246	25.6	20.3	77.2	758	26	280	112	2.07	148.	12	44	3.5	29
15.0	840	662	2.96	9399	37.4	86.7	416	3919	230	23.5	18.6	78.2	817	23	289	107	1.97	157.	12	47	3.7	31
16.0	896	706	3.15	9710	38.6	83.9	437	4043	215	21.7	17.2	79.1	875	21	297	102	1.87	166.	13	49	3.9	33
17.0	952	750	3.35	10011	39.8	81.4	456	4153	203	20.2	16.0	79.9	932	20	305	97	1.79	175.	14	51	4.1	35
18.0	1008	794	3.55	10304	40.9	79.1	475	4251	191	18.9	14.9	80.5	990	18	313	93	1.72	184.	15	54	4.2	37
19.0	1064	838	3.75	10589	42.1	77.0	493	4338	181	17.7	14.0	81.1	1047	17	320	90	1.66	192.	15	56	4.4	39
20.0	1120	882	3.94	10867	43.2	75.1	511	4416	172	16.7	13.2	81.6	1104	16	327	87	1.60	201.	16	58	4.5	41
25.0	1400	1103	4.93	12166	48.3	67.1	590	4715	138	13.0	10.2	83.5	1388	12	361	75	1.39	242.	19	69	5.2	49
30.0	1680	1324	5.91	13345	52.9	61.3	660	4913	115	10.6	8.4	84.7	1670	10	392	67	1.24	281.	23	79	5.8	56
35.0	1960	1544	6.90	14433	57.1	56.7	723	5055	98	9.0	7.1	85.5	1952	8	421	61	1.13	316.	26	88	6.4	
40.0	2240	1765	7.89	15450	61.0	53.1	781	5161	86	7.8	6.1	86.1	2233	7	448	57	1.05	351.	29	98	6.9	
45.0	2520	1985	8.87	16409	64.7	50.0	835	5244	76	6.9	5.4	86.6	2514	6	475	53	0.98	384.	33	106	7.4	
50.0	2800	2206	9.86	17319	68.2	47.5	886	5309	69	6.1	4.8	86.9	2795	5	500	50	0.92	414.	36	115	7.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ars	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#255 56 Fe on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 83. ZC=109.( )
NEUTRON NUMBERS: NP= 30. NT=126. NC=156.

AP**1/3= 3.826 AT**1/3= 5.934
REDUCED MASS NUMBER= 44.17 AP+AT=AC=265.

INTERACTION RADIUS RINT=13.71 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 6.83 CT+CP=10.94 C̄= 2.57

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 6.97

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.68 RC=RCP+RCT=10.95

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.439*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 394.05 MeV K= .24084 n=2.561
VC(RINT)= 226.3 MeV

FISSION-TKE= 220. MeV
ASYMM. FISSION-TKE= 160. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 28.99 MeV
L-RLD= 36 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: -16.5
COMPOUND NUCLEUS: 128.2

FUSION RELATED PARAMETERS:
R-BARRIER=12.31 fm V(RB)= 236.0 MeV
Q-VALUE= -206.0 MeV
L-CRITICAL= 98.

56 Fe on 209 Bi

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCWAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	44	0.20	2418	9.7	339.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	88	0.39	3420	13.7	240.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	132	0.59	4190	16.7	196.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	177	0.78	4839	19.3	169.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	199	0.88	5134	20.5	160.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	280	221	0.98	5412	21.6	152.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	308	243	1.07	5677	22.7	144.9	80	406	135	121.9	107.1	29.0	151	157	96	555	10.21	64.	3	15	1.1	3
6.0	336	265	1.17	5930	23.7	138.7	123	869	521	96.7	81.3	41.7	211	125	131	363	6.65	70.	4	18	1.3	5
6.5	364	287	1.27	6173	24.6	133.3	155	1260	510	81.4	67.1	49.3	261	103	156	290	5.30	75.	5	20	1.6	7
7.0	392	309	1.37	6407	25.6	128.4	181	1594	474	70.7	57.6	54.6	305	87	175	248	4.54	80.	6	23	1.8	9
7.5	420	331	1.46	6633	26.5	124.1	204	1883	442	62.7	50.7	58.7	344	76	190	220	4.03	85.	6	25	1.9	11
8.0	448	353	1.56	6851	27.3	120.1	224	2136	414	56.3	45.4	61.8	381	67	202	200	3.66	90.	7	27	2.1	12
8.5	476	375	1.66	7063	28.2	116.5	243	2360	390	51.2	41.1	64.4	417	59	212	185	3.38	95.	7	28	2.3	14
9.0	504	397	1.76	7269	29.0	113.3	260	2558	368	47.0	37.6	66.5	451	53	221	173	3.15	100.	8	30	2.4	16
9.5	532	420	1.85	7469	29.8	110.2	277	2735	349	43.4	34.7	68.3	483	49	230	162	2.97	105.	8	32	2.5	17
10.0	560	442	1.95	7664	30.5	107.5	292	2895	331	40.4	32.2	69.8	516	44	237	154	2.81	110.	9	33	2.7	18
10.5	588	464	2.05	7854	31.3	104.9	307	3039	316	37.7	30.0	71.1	547	41	244	147	2.68	115.	9	35	2.8	20
11.0	616	486	2.15	8040	32.0	102.5	321	3170	301	35.4	28.2	72.3	578	38	250	140	2.56	120.	9	36	2.9	21
11.5	644	508	2.24	8222	32.8	100.2	334	3290	288	33.4	26.5	73.3	609	35	256	135	2.46	125.	10	39	3.0	22
12.0	672	530	2.34	8400	33.5	98.1	347	3400	276	31.6	25.0	74.2	639	33	261	130	2.37	129.	10	39	3.1	24
13.0	728	574	2.54	8745	34.8	94.2	372	3594	255	28.5	22.6	75.8	699	29	271	121	2.21	139.	11	42	3.3	26
14.0	784	618	2.73	9078	36.1	90.8	394	3760	237	25.9	20.5	77.0	758	26	281	114	2.08	148.	12	44	3.5	28
15.0	840	662	2.93	9399	37.4	87.7	416	3904	221	23.8	18.8	78.1	816	24	290	108	1.97	157.	12	47	3.7	31
16.0	896	707	3.12	9710	38.6	84.9	437	4030	207	22.0	17.4	79.0	874	22	298	103	1.88	166.	13	49	3.9	33
17.0	952	751	3.32	10011	39.8	82.4	456	4141	195	20.5	16.2	79.8	932	20	306	99	1.80	174.	14	51	4.1	35
18.0	1008	795	3.51	10304	41.0	80.1	475	4240	184	19.1	15.1	80.4	989	19	314	95	1.73	183.	15	54	4.2	37
19.0	1064	839	3.71	10589	42.1	78.0	493	4328	174	18.0	14.2	81.0	1047	17	321	91	1.66	192.	15	56	4.4	38
20.0	1120	883	3.90	10867	43.2	76.0	511	4407	165	16.9	13.4	81.5	1104	16	328	88	1.61	201.	16	58	4.5	40
25.0	1400	1104	4.88	12166	48.3	68.0	590	4709	132	13.1	10.4	83.4	1388	12	362	76	1.39	241.	19	69	5.2	49
30.0	1680	1325	5.85	13345	52.9	62.0	660	4910	110	10.7	8.5	84.6	1670	10	392	68	1.24	280.	23	79	5.8	56
35.0	1960	1546	6.83	14433	57.1	57.4	724	5053	94	9.1	7.2	85.5	1952	8	421	62	1.13	316.	26	88	6.4	
40.0	2240	1767	7.81	15450	61.1	53.7	782	5161	82	7.9	6.2	86.1	2233	7	449	58	1.05	350.	29	97	6.9	
45.0	2520	1987	8.78	16409	64.8	50.7	836	5244	73	6.9	5.5	86.5	2514	6	475	54	0.98	384.	33	106	7.3	
50.0	2800	2208	9.76	17319	68.3	48.1	887	5311	66	6.2	4.9	86.9	2795	5	501	51	0.93	415.	36	115	7.8	

#256 56 Fe on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 26. ZT= 92. ZC=118.( )
NEUTRON NUMBERS: NP= 30. NT=146. NC=176.

AP**1/3= 3.826 AT**1/3= 6.197
REDUCED MASS NUMBER= 45.33 AP+AT=AC=294.

INTERACTION RADIUS RINT=13.99 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.12 CT= 7.16 CT+CP=11.28 C̄= 2.61

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.35 RT= 7.30

COULOMB RADII [fm]:
RCP= 4.27 RCT= 6.98 RC=RCP+RCT=11.25

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 424.19 MeV K= .22818 n=2.583
VC(RINT)= 245.8 MeV

FISSION-TKE= 246. MeV
ASYMM. FISSION-TKE= 169. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 29.10 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -61.4 TARGET: 47.2
COMPOUND NUCLEUS: 200.8

FUSION RELATED PARAMETERS:
R-BARRIER=12.57 fm V(RB)= 255.7 MeV
Q-VALUE= -214.9 MeV
L-CRITICAL= 87.

56 Fe on 238 U

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SCWAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	56	45	0.18	2418	9.9	376.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	112	91	0.37	3420	14.0	266.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	168	136	0.55	4190	17.2	217.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	224	181	0.74	4839	19.8	188.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	252	204	0.83	5134	21.0	177.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	280	227	0.92	5412	22.2	168.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	308	249	1.01	5677	23.3	160.6	37	84	0	154.0	146.6	13.0	128	180	78	1348	23.73	0.	3	13	1.0	3
6.0	336	272	1.11	5930	24.3	153.8	105	597	297	111.4	97.9	34.3	195	141	119	495	8.37	63.	4	17	1.2	6
6.5	364	295	1.20	6173	25.3	147.7	144	1028	379	91.6	78.3	44.2	249	115	148	363	6.11	67.	5	19	1.5	8
7.0	392	317	1.29	6407	26.2	142.4	174	1397	352	78.6	66.2	50.7	295	97	169	300	5.05	72.	5	22	1.7	10
7.5	420	340	1.38	6633	27.2	137.5	200	1716	328	69.1	57.6	55.4	337	83	185	261	4.40	77.	6	24	1.8	12
8.0	448	363	1.48	6851	28.0	133.2	222	1995	308	61.8	51.2	59.1	375	73	198	235	3.95	82.	6	26	2.0	13
8.5	476	385	1.57	7063	28.9	129.2	243	2241	289	56.0	46.2	62.0	411	65	209	215	3.61	86.	7	27	2.2	15
9.0	504	408	1.66	7269	29.7	125.5	262	2460	273	51.2	42.1	64.4	446	58	218	199	3.35	90.	7	29	2.3	17
9.5	532	431	1.75	7469	30.6	122.2	280	2655	259	47.2	38.7	66.4	479	53	226	187	3.14	95.	8	31	2.4	18
10.0	560	453	1.84	7664	31.4	119.1	297	2831	246	43.7	35.8	68.1	512	48	234	176	2.96	99.	8	32	2.5	20
10.5	588	476	1.94	7854	32.1	116.2	312	2990	234	40.8	33.4	69.6	544	44	240	167	2.81	104.	9	34	2.7	22
11.0	616	499	2.03	8040	32.9	113.6	328	3135	224	38.2	31.2	70.9	575	41	246	159	2.68	108.	9	35	2.8	23
11.5	644	521	2.12	8222	33.6	111.1	342	3267	214	36.0	29.4	72.0	606	38	252	153	2.57	113.	10	36	2.9	24
12.0	672	544	2.21	8400	34.3	108.7	356	3388	205	34.0	27.7	73.0	637	35	257	147	2.47	117.	10	38	3.0	26
13.0	728	589	2.40	8745	35.8	104.5	382	3602	189	30.6	24.9	74.7	697	31	267	137	2.30	125.	11	40	3.2	28
14.0	784	635	2.58	9078	37.1	100.7	406	3785	176	27.8	22.6	76.1	756	28	276	129	2.16	134.	12	43	3.4	31
15.0	840	680	2.77	9399	38.4	97.2	429	3944	164	25.5	20.7	77.2	815	25	284	122	2.05	142.	12	45	3.6	33
16.0	896	725	2.95	9710	39.7	94.2	451	4083	154	23.6	19.2	78.2	873	23	292	116	1.95	150.	13	48	3.7	36
17.0	952	771	3.14	10011	40.9	91.3	472	4205	144	21.9	17.8	79.0	931	21	299	111	1.86	158.	14	50	3.9	38
18.0	1008	816	3.32	10304	42.1	88.8	492	4314	136	20.5	16.6	79.8	988	20	306	106	1.78	166.	14	52	4.0	40
19.0	1064	861	3.50	10589	43.2	86.4	511	4412	129	19.2	15.6	80.4	1046	18	313	102	1.72	174.	15	54	4.2	42
20.0	1120	907	3.69	10867	44.3	84.2	530	4499	123	18.1	14.7	81.0	1103	17	320	99	1.66	181.	16	57	4.3	44
25.0	1400	1133	4.61	12166	49.6	75.3	614	4832	98	14.0	11.3	83.0	1387	13	350	85	1.43	218.	19	67	5.0	53
30.0	1680	1360	5.53	13345	54.3	68.8	688	5054	82	11.4	9.3	84.3	1670	10	377	76	1.28	253.	22	77	5.6	61
35.0	1960	1587	6.46	14433	58.7	63.7	755	5212	70	9.6	7.8	85.2	1951	9	403	69	1.16	287.	26	86	6.1	
40.0	2240	1813	7.38	15450	62.7	59.6	816	5330	61	8.3	6.8	85.8	2233	7	427	64	1.08	318.	29	95	6.6	
45.0	2520	2040	8.30	16409	66.5	56.1	873	5423	54	7.4	6.0	86.3	2514	6	451	60	1.01	348.	32	104	7.0	
50.0	2800	2267	9.22	17319	70.1	53.3	926	5496	49	6.6	5.3	86.7	2794	6	473	56	0.95	377.	35	112	7.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 56 Fe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#257 63 Cu on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 6. ZC= 35.(Br)
NEUTRON NUMBERS: NP= 34. NT= 6. NC= 40.

AP**1/3= 3.979 AT**1/3= 2.289 ELSCAT <11 deg
REDUCED MASS NUMBER= 10.08 AP+AT=AC= 75.

INTERACTION RADIUS RINT= 9.91 fm RO= 1.58 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 2.12 CT+CP= 6.44 $\bar{C}$= 1.42

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 2.52

COULOMB RADII [fm]:
RCP= 4.45 RCT= 2.51 RC=RCP+RCT= 6.96

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 49.36 MeV K= .07408 n=2.680
VC(RINT)= 25.2 MeV

FISSION-TKE= 53. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 16.88 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 19.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: 0.0
COMPOUND NUCLEUS: -70.4

FUSION RELATED PARAMETERS:
R-BARRIER= 8.98 fm V(RB)= 25.9 MeV
Q-VALUE= 5.2 MeV
L-CRITICAL= 39.

63 Cu on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	63	10	0.40	2720	2.2	27.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	126	20	0.80	3848	3.1	19.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	189	30	1.20	4714	3.8	15.8	15	575	362	91.8	10.8	44.1	137	52	0	39	6.39	154. 0	0	1.9	2
4.0	252	40	1.60	5444	4.4	13.7	27	1240	905	54.3	7.9	62.8	224	28	217	22	3.67	203. 4	14	2.2	3
4.5	284	45	1.80	5775	4.7	12.9	31	1457	1086	45.4	6.8	67.3	261	23	249	19	3.18	228. 5	17	2.3	3
5.0	315	50	2.00	6089	4.9	12.3	35	1630	1231	39.1	6.0	70.5	296	19	278	17	2.84	254. 5	19	2.4	3
5.5	347	55	2.20	6387	5.2	11.7	38	1770	1349	34.3	5.3	72.8	330	16	306	16	2.59	275. 6	21	2.5	4
6.0	378	60	2.40	6671	5.4	11.2	41	1886	1448	30.6	4.8	74.7	364	14	333	15	2.40	300. 7	23	2.6	4
6.5	410	66	2.60	6945	5.6	10.7	44	1984	1532	27.6	4.3	76.2	397	13	360	14	2.24	325. 7	25	2.7	4
7.0	441	71	2.80	7208	5.8	10.4	46	2068	1499	25.2	4.0	77.4	430	11	386	13	2.11	350. 8	27	2.8	4
7.5	473	76	3.00	7462	6.0	10.0	49	2140	1399	23.2	3.6	78.4	462	10	412	12	2.01	370. 8	29	2.9	5
8.0	504	81	3.19	7708	6.2	9.7	51	2203	1312	21.4	3.4	79.3	495	9	438	12	1.91	395. 9	31	3.0	5
8.5	536	86	3.39	7946	6.4	9.4	54	2259	1235	19.9	3.2	80.0	527	9	463	11	1.83	420. 9	32	3.1	5
9.0	567	91	3.59	8177	6.6	9.1	56	2308	1166	18.6	3.0	80.7	559	8	488	11	1.76	444. 10	34	3.2	5
9.5	599	96	3.79	8403	6.8	8.9	58	2352	1105	17.5	2.8	81.3	591	7	513	10	1.70	462. 10	36	3.3	6
10.0	630	101	3.99	8622	7.0	8.7	60	2391	1049	16.5	2.6	81.8	623	7	538	10	1.64	487. 11	37	3.4	6
10.5	662	106	4.19	8836	7.1	8.5	62	2427	999	15.6	2.5	82.2	655	7	563	10	1.59	511. 11	39	3.4	6
11.0	693	111	4.39	9045	7.3	8.3	64	2459	954	14.8	2.3	82.6	687	6	588	9	1.54	535. 12	40	3.5	6
11.5	725	116	4.59	9250	7.5	8.1	66	2488	913	14.1	2.2	83.0	719	6	613	9	1.49	560. 13	42	3.6	6
12.0	756	121	4.79	9450	7.6	7.9	67	2515	874	13.4	2.1	83.3	750	6	637	9	1.45	575. 13	43	3.7	7
13.0	819	131	5.19	9838	7.9	7.6	71	2563	807	12.3	2.0	83.9	814	5	686	8	1.38	623. 14	46	3.8	7
14.0	882	141	5.59	10213	8.2	7.3	74	2603	749	11.3	1.8	84.4	877	5	735	8	1.32	661. 15	49	4.0	8
15.0	945	151	5.99	10574	8.5	7.1	77	2638	699	10.5	1.7	84.8	941	4	783	8	1.27	709. 16	52	4.1	8
16.0	1008	161	6.39	10924	8.8	6.8	80	2669	656	9.8	1.6	85.1	1004	4	832	7	1.22	756. 17	55	4.2	8
17.0	1071	171	6.79	11263	9.1	6.6	83	2696	617	9.1	1.5	85.4	1067	4	880	7	1.18	791. 18	57	4.3	9
18.0	1134	181	7.19	11592	9.4	6.5	86	2719	583	8.6	1.4	85.7	1131	3	928	7	1.14	838. 19	60	4.5	9
19.0	1197	192	7.59	11913	9.6	6.3	89	2741	552	8.1	1.3	85.9	1194	3	976	7	1.10	871. 20	63	4.6	10
20.0	1260	202	7.99	12226	9.9	6.1	91	2760	524	7.7	1.2	86.2	1257	3	1024	7	1.07	917. 21	65	4.7	10
25.0	1575	252	9.98	13687	11.0	5.5	104	2831	419	6.1	1.0	87.0	1573	2	1262	6	0.95	1111. 26	78	5.2	12
30.0	1890	302	11.98	15013	12.1	5.0	115	2879	349	5.0	0.8	87.5	1888	2	1499	5	0.85	1312. 31	90	5.7	13
35.0	2205	353	13.98	16238	13.0	4.6	125	2912	299	4.3	0.7	87.9	2203	2	1734	5	0.79	1481. 36	102	6.2	
40.0	2520	403	15.97	17382	13.9	4.3	134	2937	262	3.7	0.6	88.1	2519	1	1968	4	0.73	1664. 41	113	6.6	
45.0	2835	454	17.97	18460	14.8	4.1	142	2956	233	3.3	0.5	88.4	2834	1	2202	4	0.69	1840. 45	124	7.0	
50.0	3150	504	19.97	19484	15.6	3.9	151	2971	209	2.9	0.5	88.5	3149	1	2435	4	0.65	1974. 50	135	7.4	

#258 63 Cu on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 8. ZC= 37.(Rb)
NEUTRON NUMBERS: NP= 34. NT= 8. NC= 42.

AP**1/3= 3.979 AT**1/3= 2.520 ELSCAT <14 deg
REDUCED MASS NUMBER= 12.76 AP+AT=AC= 79.

INTERACTION RADIUS RINT=10.17 fm RO= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 2.42 CT+CP= 6.74 $\bar{C}$= 1.55

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 2.78

COULOMB RADII [fm]:
RCP= 4.45 RCT= 2.78 RC=RCP+RCT= 7.23

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 63.90 MeV K= .10393 n=2.599
VC(RINT)= 32.8 MeV

FISSION-TKE= 56. MeV
ASYMM. FISSION-TKE= 38. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.945 MeV/fm**2 PROX-FACTOR= 18.43 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 15.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -4.7
COMPOUND NUCLEUS: -72.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.18 fm V(RB)= 33.9 MeV
Q-VALUE= 2.2 MeV
L-CRITICAL= 48.

63 Cu on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	63	13	0.39	2720	2.8	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	126	26	0.78	3848	3.9	25.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	189	38	1.17	4714	4.8	21.1	18	511	302	97.5	14.6	41.2	120	69	120	56	7.05	147. 2	4	2.0	2
4.0	252	51	1.56	5444	5.6	18.3	34	1226	887	56.7	10.5	61.7	215	37	207	31	3.85	193. 4	14	2.3	3
4.5	284	57	1.75	5775	5.9	17.2	39	1460	1083	47.3	9.0	66.4	254	29	239	26	3.31	217. 5	17	2.5	3
5.0	315	64	1.94	6089	6.2	16.3	44	1647	1239	40.6	7.9	69.7	291	24	268	23	2.95	238. 5	20	2.6	4
5.5	347	70	2.14	6387	6.5	15.6	49	1799	1367	35.6	7.0	72.2	326	21	295	21	2.69	262. 6	22	2.7	4
6.0	378	77	2.33	6671	6.8	14.9	53	1925	1473	31.7	6.3	74.1	360	18	322	20	2.48	286. 7	24	2.8	4
6.5	410	83	2.53	6945	7.1	14.3	56	2031	1476	28.6	5.7	75.7	393	16	347	18	2.32	306. 7	26	2.9	5
7.0	441	89	2.72	7208	7.4	13.8	60	2122	1371	26.1	5.2	77.0	427	14	372	17	2.19	329. 8	28	3.0	5
7.5	473	96	2.92	7462	7.6	13.3	63	2200	1279	23.9	4.8	78.0	459	13	396	16	2.07	353. 8	30	3.1	5
8.0	504	102	3.11	7708	7.9	12.9	66	2269	1199	22.1	4.4	78.9	492	12	421	16	1.97	371. 9	32	3.2	6
8.5	536	108	3.30	7946	8.1	12.5	69	2329	1129	20.6	4.1	79.7	524	11	444	15	1.89	394. 9	34	3.3	6
9.0	567	115	3.50	8177	8.4	12.2	72	2383	1066	19.2	3.9	80.4	557	10	468	14	1.81	418. 10	35	3.4	6
9.5	599	121	3.69	8403	8.6	11.9	75	2431	1010	18.0	3.6	81.0	589	10	492	14	1.75	435. 10	37	3.5	7
10.0	630	128	3.89	8622	8.8	11.6	77	2474	959	17.0	3.4	81.5	621	9	515	13	1.69	458. 11	39	3.6	7
10.5	662	134	4.08	8836	9.0	11.3	80	2512	914	16.1	3.2	82.0	653	8	538	13	1.63	480. 11	40	3.7	7
11.0	693	140	4.28	9045	9.3	11.0	82	2548	872	15.2	3.1	82.4	685	8	561	13	1.58	503. 12	42	3.8	7
11.5	725	147	4.47	9250	9.5	10.8	85	2580	834	14.5	2.9	82.8	717	7	584	12	1.54	519. 12	43	3.9	8
12.0	756	153	4.67	9450	9.7	10.5	87	2609	799	13.8	2.8	83.1	749	7	607	12	1.50	542. 13	45	4.0	8
13.0	819	166	5.05	9838	10.1	10.1	92	2661	738	12.6	2.5	83.7	813	6	652	11	1.42	587. 14	48	4.1	8
14.0	882	179	5.44	10213	10.4	9.8	96	2705	685	11.6	2.3	84.2	876	6	698	11	1.36	623. 15	51	4.3	9
15.0	945	191	5.83	10574	10.8	9.4	100	2744	639	10.8	2.2	84.6	940	5	743	10	1.30	667. 16	54	4.4	9
16.0	1008	204	6.22	10924	11.2	9.1	104	2777	599	10.0	2.0	85.0	1003	5	787	10	1.25	702. 17	57	4.6	10
17.0	1071	217	6.61	11263	11.5	8.9	108	2806	564	9.4	1.9	85.3	1066	5	832	10	1.21	746. 18	60	4.7	10
18.0	1134	230	7.00	11592	11.8	8.6	111	2833	533	8.8	1.8	85.6	1130	4	877	9	1.17	778. 19	62	4.8	11
19.0	1197	242	7.39	11913	12.2	8.4	115	2856	505	8.3	1.7	85.8	1193	4	921	9	1.13	821. 20	65	5.0	11
20.0	1260	255	7.78	12226	12.5	8.2	118	2877	479	7.9	1.6	86.1	1256	4	965	9	1.10	852. 21	68	5.1	12
25.0	1575	319	9.72	13687	14.0	7.3	134	2956	383	6.2	1.3	86.9	1572	3	1184	8	0.97	1033. 26	81	5.7	14
30.0	1890	383	11.66	15013	15.3	6.7	149	3008	319	5.1	1.0	87.4	1888	2	1402	7	0.88	1201. 31	93	6.2	16
35.0	2205	447	13.61	16238	16.5	6.2	162	3045	274	4.4	0.9	87.8	2203	2	1618	6	0.81	1379. 35	105	6.7	
40.0	2520	510	15.55	17382	17.7	5.8	174	3073	239	3.8	0.8	88.1	2518	2	1833	6	0.75	1525. 40	116	7.2	
45.0	2835	574	17.50	18460	18.7	5.4	185	3094	213	3.4	0.7	88.3	2833	2	2047	6	0.71	1687. 45	128	7.6	
50.0	3150	638	19.44	19484	19.7	5.2	195	3111	191	3.0	0.6	88.5	3149	1	2260	5	0.67	1811. 50	139	8.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#259 63 Cu on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 13. ZC= 42.(Mo)
NEUTRON NUMBERS: NP= 34. NT= 14. NC= 48.

AP**1/3= 3.979 AT**1/3= 3.000 ELSCAT <25 des
REDUCED MASS NUMBER= 18.90 AP+AT=AC= 90.

INTERACTION RADIUS RINT=10.69 fm R0= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 3.05 CT+CP= 7.36 C= 1.79

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 3.35

COULOMB RADII [fm]:
RCP= 4.45 RCT= 3.32 RC=RCP+RCT= 7.77

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 97.66 MeV K= .16526 n=2.501
VC(RINT)= 50.7 MeV

FISSION-TKE= 64. MeV
ASYMM. FISSION-TKE= 55. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.944 MeV/fm**2 PROX-FACTOR= 21.19 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 10.40 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -20.6
COMPOUND NUCLEUS: -81.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.59 fm V(RB)= 52.8 MeV
Q-VALUE= -4.4 MeV
L-CRITICAL= 67.

63 Cu on 27 Al

63 Cu on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	19	0.37	2720	4.1	59.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	38	0.75	3848	5.8	42.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	57	1.12	4714	7.2	34.3	25	407	199	108.3	25.2	35.8	85	104	85	105	8.63	128.	0	2.2	3
4.0	252	76	1.49	5444	8.3	29.7	51	1227	872	60.7	17.2	59.6	198	54	184	52	4.22	168.	4	2.5	4
4.5	284	85	1.68	5775	8.8	28.0	60	1497	1096	50.4	14.5	64.8	240	43	217	44	3.59	190.	5	2.7	4
5.0	315	95	1.86	6089	9.2	26.5	67	1712	1276	43.1	12.6	68.5	279	36	245	39	3.18	208.	5	2.8	5
5.5	347	104	2.05	6387	9.7	25.3	74	1887	1423	37.7	11.1	71.2	316	30	270	35	2.88	226.	6	3.0	6
6.0	378	113	2.24	6671	10.1	24.2	80	2033	1397	33.5	9.9	73.2	352	26	294	33	2.66	247.	6	3.1	6
6.5	410	123	2.42	6945	10.5	23.3	86	2157	1289	30.2	8.9	74.9	386	23	317	30	2.48	267.	7	3.2	6
7.0	441	132	2.61	7208	10.9	22.4	92	2262	1197	27.5	8.2	76.3	420	21	339	29	2.33	285.	8	3.4	7
7.5	473	142	2.80	7462	11.3	21.7	97	2353	1117	25.2	7.5	77.4	454	19	360	27	2.20	305.	8	3.5	7
8.0	504	151	2.98	7708	11.7	21.0	102	2433	1047	23.3	6.9	78.4	487	17	381	26	2.10	321.	9	3.6	8
8.5	536	161	3.17	7946	12.1	20.4	107	2503	986	21.6	6.4	79.2	520	16	401	25	2.01	341.	9	3.6	8
9.0	567	170	3.35	8177	12.4	19.8	111	2565	931	20.2	6.0	79.9	552	15	421	24	1.92	361.	10	3.7	8
9.5	599	180	3.54	8403	12.7	19.3	115	2621	882	19.0	5.7	80.5	585	14	441	23	1.85	377.	10	3.9	9
10.0	630	189	3.73	8622	13.1	18.8	120	2671	838	17.8	5.3	81.1	617	13	461	22	1.79	397.	11	4.1	9
10.5	662	198	3.91	8836	13.4	18.3	124	2716	798	16.9	5.0	81.6	650	12	481	21	1.73	411.	11	4.2	10
11.0	693	208	4.10	9045	13.7	17.9	127	2757	762	16.0	4.8	82.0	682	11	500	21	1.68	431.	12	4.4	10
11.5	725	217	4.29	9250	14.0	17.5	131	2795	729	15.2	4.5	82.4	714	11	519	20	1.63	451.	12	4.6	10
12.0	756	227	4.47	9450	14.3	17.1	135	2829	698	14.5	4.3	82.8	746	10	538	19	1.58	464.	13	4.7	11
13.0	819	246	4.85	9838	14.9	16.5	142	2890	644	13.2	4.0	83.4	810	9	576	18	1.51	503.	14	5.1	11
14.0	882	265	5.22	10213	15.5	15.9	149	2942	598	12.2	3.6	83.9	874	8	614	18	1.44	535.	15	5.4	12
15.0	945	284	5.59	10574	16.0	15.3	155	2987	558	11.3	3.4	84.4	937	8	651	17	1.38	566.	16	5.7	13
16.0	1008	302	5.96	10924	16.5	14.8	161	3026	523	10.5	3.1	84.7	1001	7	688	16	1.33	603.	17	5.9	13
17.0	1071	321	6.34	11263	17.0	14.4	167	3060	493	9.8	2.9	85.1	1064	7	725	16	1.28	633.	18	6.2	14
18.0	1134	340	6.71	11592	17.5	14.0	173	3091	465	9.2	2.8	85.4	1128	6	761	15	1.24	661.	19	6.5	15
19.0	1197	359	7.08	11913	18.0	13.6	179	3118	441	8.7	2.6	85.6	1191	6	798	15	1.20	698.	19	6.8	15
20.0	1260	378	7.46	12226	18.5	13.3	184	3143	419	8.3	2.5	85.9	1255	5	834	14	1.16	725.	20	7.1	16
25.0	1575	473	9.32	13687	20.7	11.9	209	3236	335	6.5	2.0	86.7	1571	4	1013	13	1.02	869.	25	8.4	19
30.0	1890	567	11.18	15013	22.6	10.8	231	3298	279	5.4	1.6	87.3	1887	3	1189	11	0.93	1014.	30	9.7	21
35.0	2205	662	13.05	16238	24.5	10.0	251	3342	239	4.6	1.4	87.7	2202	3	1363	10	0.85	1148.	34	109	7.6
40.0	2520	756	14.91	17382	26.1	9.4	270	3375	209	4.0	1.2	88.0	2517	3	1536	10	0.79	1273.	39	120	8.2
45.0	2835	851	16.77	18460	27.7	8.8	288	3401	186	3.5	1.1	88.2	2833	2	1708	9	0.74	1388.	43	132	8.7
50.0	3150	945	18.64	19484	29.2	8.4	304	3421	167	3.2	0.9	88.4	3148	2	1879	9	0.70	1494.	48	143	9.1

#260 63 Cu on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 20. ZC= 49.(In)
NEUTRON NUMBERS: NP= 34. NT= 20. NC= 54.

AP**1/3= 3.979 AT**1/3= 3.420 ELSCAT <39 des
REDUCED MASS NUMBER= 24.47 AP+AT=AC=103.

INTERACTION RADIUS RINT=11.15 fm R0= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 3.59 CT+CP= 7.91 C= 1.96

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 3.85

COULOMB RADII [fm]:
RCP= 4.45 RCT= 3.84 RC=RCP+RCT= 8.29

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 141.68 MeV K= .23002 n=2.451
VC(RINT)= 74.8 MeV

FISSION-TKE= 77. MeV
ASYMM. FISSION-TKE= 74. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.948 MeV/fm**2 PROX-FACTOR= 23.34 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -33.0
COMPOUND NUCLEUS: -75.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.97 fm V(RB)= 78.5 MeV
Q-VALUE= -22.3 MeV
L-CRITICAL= 80.

63 Cu on 40 Ca

63 Cu on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	24	0.33	2720	5.4	91.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	49	0.65	3848	7.6	64.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	73	0.98	4714	9.3	52.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	98	1.31	5444	10.7	45.7	58	949	617	76.6	28.3	51.7	160	92	147	94	5.20	148.	3	14	2.4	4
4.5	284	110	1.47	5775	11.4	43.1	72	1284	895	62.1	23.4	59.0	212	72	187	76	4.20	165.	4	17	2.6	5
5.0	315	122	1.64	6089	12.0	40.8	83	1551	1118	52.4	19.9	63.8	257	58	218	66	3.62	181.	5	20	2.8	6
5.5	347	135	1.80	6387	12.5	38.9	93	1769	1298	45.4	17.3	67.3	298	49	245	58	3.23	199.	6	23	3.0	6
6.0	378	147	1.96	6671	13.1	37.3	102	1951	1190	40.1	15.4	70.0	336	42	268	53	2.94	215.	6	25	3.1	7
6.5	410	159	2.13	6945	13.6	35.8	111	2104	1098	35.9	13.8	72.1	373	37	290	49	2.72	233.	7	28	3.3	7
7.0	441	171	2.29	7208	14.2	34.5	118	2235	1020	32.5	12.5	73.7	408	33	310	46	2.54	249.	7	30	3.4	8
7.5	473	183	2.45	7462	14.7	33.3	126	2349	952	29.7	11.5	75.1	443	30	330	43	2.39	266.	8	32	3.5	8
8.0	504	196	2.62	7708	15.1	32.3	133	2448	892	27.4	10.6	76.3	477	27	349	41	2.27	281.	8	34	3.7	9
8.5	536	208	2.78	7946	15.6	31.3	139	2535	840	25.4	9.8	77.3	511	25	367	39	2.16	299.	9	36	3.8	9
9.0	567	220	2.94	8177	16.1	30.4	145	2613	793	23.6	9.1	78.2	544	23	385	37	2.07	313.	9	38	3.9	10
9.5	599	232	3.11	8403	16.5	29.6	151	2683	751	22.1	8.6	78.9	578	21	402	36	1.99	330.	10	39	4.0	10
10.0	630	245	3.27	8622	16.9	28.9	157	2745	714	20.8	8.1	79.6	610	20	419	35	1.91	344.	10	41	4.2	11
10.5	662	257	3.43	8836	17.3	28.2	163	2801	680	19.7	7.6	80.2	643	18	436	33	1.85	361.	11	43	4.3	11
11.0	693	269	3.60	9045	17.7	27.5	168	2853	649	18.6	7.2	80.7	676	17	452	32	1.79	374.	11	45	4.4	12
11.5	725	281	3.76	9250	18.1	26.9	173	2900	621	17.7	6.8	81.2	708	16	469	31	1.74	391.	12	46	4.5	12
12.0	756	294	3.93	9450	18.5	26.4	178	2942	595	16.8	6.5	81.6	741	15	485	31	1.69	408.	12	48	4.6	12
13.0	819	318	4.25	9838	19.3	25.3	188	3018	549	15.3	5.9	82.3	805	14	517	29	1.60	437.	13	51	4.8	13
14.0	882	343	4.58	10213	20.0	24.4	197	3083	510	14.1	5.5	82.9	869	13	548	28	1.52	466.	14	54	5.0	14
15.0	945	367	4.91	10574	20.7	23.6	206	3139	476	13.0	5.1	83.5	933	12	579	26	1.46	494.	15	57	5.2	15
16.0	1008	391	5.23	10924	21.4	22.8	215	3188	446	12.1	4.7	83.9	997	11	610	25	1.40	520.	16	60	5.4	16
17.0	1071	416	5.56	11263	22.1	22.2	223	3232	420	11.4	4.4	84.3	1061	10	641	24	1.35	547.	17	63	5.5	17
18.0	1134	440	5.89	11592	22.7	21.5	231	3270	396	10.7	4.1	84.7	1125	9	671	24	1.30	579.	18	66	5.7	17
19.0	1197	465	6.21	11913	23.3	21.0	238	3304	375	10.1	3.9	85.0	1188	9	701	23	1.26	604.	19	69	5.9	18
20.0	1260	489	6.54	12226	23.9	20.4	246	3335	357	9.5	3.7	85.2	1252	8	731	22	1.23	628.	20	71	6.0	19
25.0	1575	612	8.18	13687	26.8	18.3	279	3452	285	7.5	2.9	86.3	1569	6	877	19	1.08	757.	24	85	6.8	22
30.0	1890	734	9.81	15013	29.3	16.7	310	3530	238	6.2	2.4	86.9	1885	5	1020	18	0.97	875.	29	97	7.4	25
35.0	2205	856	11.45	16238	31.7	15.4	337	3586	204	5.2	2.0	87.4	2201	4	1161	16	0.89	981.	33	109	8.0	
40.0	2520	979	13.08	17382	33.8	14.4	363	3627	178	4.6	1.8	87.7	2516	4	1301	15	0.83	1092.	37	121	8.6	
45.0	2835	1101	14.72	18460	35.9	13.6	386	3659	158	4.0	1.6	88.0	2832	3	1439	14	0.78	1195.	42	132	9.2	
50.0	3150	1223	16.35	19484	37.8	12.9	409	3685	142	3.6	1.4	88.2	3147	3	1576	13	0.74	1290.	46	143	9.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#261 63 Cu on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 26. ZC= 55.(Cs)
NEUTRON NUMBERS: NP= 34. NT= 30. NC= 64.

AP**1/3= 3.979 AT**1/3= 3.826 ELSCAT <62 deg
REDUCED MASS NUMBER= 29.65 AP+AT=AC=119.

INTERACTION RADIUS RINT=11.59 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 4.12 CT+CP= 8.43 C= 2.11

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 4.35

COULOMB RADII [fm]:
RCP= 4.45 RCT= 4.27 RC=RCP+RCT= 8.72

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 175.34 MeV K= .25883 n=2.440
VC(RINT)= 93.5 MeV

FISSION-TKE= 88. MeV
ASYMM. FISSION-TKE= 88. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.942 MeV/fm**2 PROX-FACTOR= 24.93 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.75 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -61.4
COMPOUND NUCLEUS: -73.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.39 fm V(RB)= 98.1 MeV
Q-VALUE= -53.2 MeV
L-CRITICAL= 95.

63 Cu on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	63	30	0.32	2720	6.5	118.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	126	59	0.63	3848	9.2	84.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	189	89	0.95	4714	11.2	68.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	252	119	1.27	5444	13.0	59.4	69	914	586	81.5	37.8	49.3	145	107	128	129	5.72	129.	3	14	2.1	4
4.5	284	133	1.43	5775	13.8	56.0	87	1287	898	65.5	30.6	57.3	201	83	168	102	4.53	144.	4	17	2.3	5
5.0	315	148	1.58	6089	14.5	53.1	102	1585	1147	55.0	25.7	62.5	248	67	199	87	3.86	158.	5	20	2.5	6
5.5	347	163	1.74	6387	15.2	50.6	115	1828	1245	47.5	22.3	66.2	290	56	224	78	3.43	173.	5	23	2.7	7
6.0	378	178	1.90	6671	15.9	48.5	127	2031	1141	41.9	19.6	69.1	330	48	246	70	3.11	188.	6	25	2.9	7
6.5	410	193	2.06	6945	16.5	46.6	137	2202	1053	37.4	17.6	71.3	367	42	265	65	2.87	202.	7	28	3.1	8
7.0	441	208	2.22	7208	17.2	44.9	147	2348	978	33.9	15.9	73.1	404	37	284	61	2.67	216.	7	30	3.2	9
7.5	473	222	2.38	7462	17.8	43.4	157	2475	913	30.9	14.5	74.5	439	34	301	57	2.52	229.	8	32	3.4	10
8.0	504	237	2.54	7708	18.3	42.0	165	2586	856	28.5	13.4	75.8	474	30	317	54	2.38	244.	8	34	3.5	10
8.5	536	252	2.69	7946	18.9	40.7	174	2683	805	26.4	12.4	76.8	508	28	333	51	2.27	257.	9	36	3.7	11
9.0	567	267	2.85	8177	19.5	39.6	182	2770	761	24.6	11.6	77.7	541	26	348	49	2.17	270.	9	38	3.8	12
9.5	599	282	3.01	8403	20.0	38.5	189	2848	721	23.0	10.8	78.5	575	24	362	47	2.08	285.	10	39	3.9	12
10.0	630	296	3.17	8622	20.5	37.5	197	2918	685	21.6	10.2	79.2	608	22	377	45	2.00	297.	10	41	4.0	13
10.5	662	311	3.33	8836	21.0	36.6	204	2981	652	20.4	9.6	79.8	641	21	391	44	1.93	309.	11	43	4.2	14
11.0	693	326	3.49	9045	21.5	35.8	210	3038	622	19.3	9.1	80.3	674	19	405	42	1.87	324.	11	45	4.3	14
11.5	725	341	3.65	9250	22.0	35.0	217	3090	595	18.3	8.6	80.8	706	18	418	41	1.81	335.	12	46	4.4	15
12.0	756	356	3.80	9450	22.5	34.3	224	3138	570	17.4	8.2	81.3	739	17	432	40	1.76	350.	12	48	4.5	15
13.0	819	385	4.12	9838	23.4	32.9	236	3223	526	15.9	7.5	82.1	803	16	458	38	1.67	375.	13	51	4.7	16
14.0	882	415	4.44	10213	24.3	31.7	248	3296	489	14.6	6.9	82.7	868	14	484	36	1.59	400.	14	54	4.9	17
15.0	945	445	4.75	10574	25.1	30.7	259	3358	456	13.5	6.4	83.2	932	13	510	34	1.52	424.	15	57	5.1	18
16.0	1008	474	5.07	10924	25.9	29.7	269	3413	428	12.6	5.9	83.7	996	12	535	33	1.46	448.	16	60	5.3	19
17.0	1071	504	5.39	11263	26.7	28.8	280	3462	402	11.8	5.5	84.1	1060	11	560	32	1.41	471.	17	63	5.5	20
18.0	1134	534	5.71	11592	27.5	28.0	290	3505	380	11.0	5.2	84.5	1124	10	584	31	1.36	494.	17	65	5.7	21
19.0	1197	563	6.02	11913	28.3	27.2	299	3543	360	10.4	4.9	84.8	1187	10	608	30	1.32	516.	18	68	5.9	22
20.0	1260	593	6.34	12226	29.0	26.5	308	3578	342	9.8	4.6	85.1	1251	9	633	29	1.28	538.	19	71	6.0	23
25.0	1575	741	7.92	13687	32.4	23.7	351	3709	274	7.7	3.6	86.1	1568	7	750	25	1.12	644.	23	84	6.8	27
30.0	1890	889	9.51	15013	35.5	21.7	389	3797	228	6.4	3.0	86.8	1884	6	865	23	1.01	748.	28	96	7.5	30
35.0	2205	1038	11.09	16238	38.4	20.1	424	3859	195	5.4	2.5	87.3	2200	5	978	21	0.93	833.	32	108	8.1	
40.0	2520	1186	12.68	17382	41.0	18.8	456	3905	171	4.7	2.2	87.6	2516	4	1088	20	0.86	930.	36	119	8.7	
45.0	2835	1334	14.26	18460	43.5	17.7	486	3942	152	4.2	2.0	87.9	2831	4	1197	18	0.81	1008.	40	130	9.3	
50.0	3150	1482	15.85	19484	45.9	16.8	514	3970	137	3.7	1.8	88.1	3147	3	1305	17	0.77	1078.	44	141	9.8	

#262 63 Cu on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 29. ZC= 58.(Ce)
NEUTRON NUMBERS: NP= 34. NT= 34. NC= 68.

INTERACTION RADIUS RINT=11.76 fm R0= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 4.31 CT+CP= 8.63 C= 2.16

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 4.53

COULOMB RADII [fm]:
RCP= 4.45 RCT= 4.45 RC=RCP+RCT= 8.89

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 191.74 MeV K= .27039 n=2.438
VC(RINT)= 102.8 MeV

FISSION-TKE= 94. MeV
ASYMM. FISSION-TKE= 94. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.941 MeV/fm**2 PROX-FACTOR= 25.51 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.37 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -65.2
COMPOUND NUCLEUS: -71.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.55 fm V(RB)= 107.9 MeV
Q-VALUE= -58.8 MeV
L-CRITICAL= 99.

63 Cu on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	63	32	0.31	2720	6.9	132.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	126	63	0.61	3848	9.7	93.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	189	95	0.92	4714	11.9	76.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	252	126	1.23	5444	13.8	66.2	69	817	502	87.4	43.7	46.3	132	120	115	154	6.22	122.	3	13	2.1	4
4.5	284	142	1.38	5775	14.6	62.4	90	1215	834	69.6	34.8	55.2	191	92	158	119	4.79	136.	4	17	2.3	5
5.0	315	158	1.53	6089	15.4	59.2	107	1532	1100	58.1	29.1	60.9	241	74	190	101	4.04	150.	5	20	2.5	6
5.5	347	173	1.68	6387	16.2	56.5	121	1791	1201	50.0	25.0	65.0	285	62	216	89	3.56	164.	5	23	2.7	7
6.0	378	189	1.84	6671	16.9	54.1	134	2007	1101	44.0	22.0	68.0	325	53	237	80	3.22	177.	6	25	2.9	8
6.5	410	205	1.99	6945	17.6	51.9	146	2189	1016	39.3	19.6	70.4	363	46	257	74	2.96	190.	6	28	3.0	9
7.0	441	221	2.14	7208	18.2	50.1	156	2345	943	35.5	17.7	72.3	400	41	275	69	2.75	205.	7	30	3.2	9
7.5	473	236	2.30	7462	18.9	48.4	167	2480	880	32.4	16.2	73.8	436	37	291	64	2.58	217.	8	32	3.4	10
8.0	504	252	2.45	7708	19.5	46.8	176	2598	825	29.8	14.9	75.1	471	33	307	61	2.44	230.	8	34	3.5	11
8.5	536	268	2.60	7946	20.1	45.4	185	2702	777	27.5	13.8	76.2	505	30	322	58	2.32	244.	9	36	3.6	11
9.0	567	284	2.76	8177	20.7	44.1	194	2795	734	25.6	12.8	77.2	539	28	336	55	2.22	256.	9	37	3.8	12
9.5	599	299	2.91	8403	21.2	43.0	202	2877	695	24.0	12.0	78.0	573	26	350	53	2.13	268.	10	39	3.9	13
10.0	630	315	3.06	8622	21.8	41.9	210	2952	660	22.5	11.3	78.7	606	24	364	51	2.05	280.	10	41	4.0	14
10.5	662	331	3.22	8836	22.3	40.9	218	3019	629	21.2	10.6	79.4	639	22	377	49	1.98	294.	11	43	4.2	14
11.0	693	347	3.37	9045	22.9	39.9	225	3080	600	20.1	10.1	79.9	672	21	390	48	1.91	305.	11	44	4.3	15
11.5	725	362	3.52	9250	23.4	39.0	232	3136	574	19.1	9.5	80.5	705	20	403	46	1.85	319.	11	46	4.4	15
12.0	756	378	3.68	9450	23.9	38.2	239	3187	550	18.1	9.1	80.9	737	19	415	45	1.80	330.	12	47	4.5	16
13.0	819	410	3.98	9838	24.8	36.7	253	3277	508	16.5	8.3	81.7	802	17	440	42	1.70	354.	13	51	4.7	17
14.0	882	441	4.29	10213	25.8	35.4	265	3355	471	15.2	7.6	82.4	867	15	464	40	1.62	378.	14	54	4.9	18
15.0	945	473	4.59	10574	26.7	34.2	277	3422	440	14.0	7.0	83.0	931	14	488	39	1.55	401.	15	57	5.1	19
16.0	1008	504	4.90	10924	27.6	33.1	289	3480	412	13.1	6.5	83.5	995	13	511	37	1.49	424.	15	59	5.3	20
17.0	1071	536	5.21	11263	28.4	32.1	300	3532	388	12.2	6.1	83.9	1059	12	534	36	1.43	446.	16	62	5.5	21
18.0	1134	567	5.51	11592	29.2	31.2	311	3578	367	11.5	5.7	84.3	1123	11	557	34	1.39	468.	17	65	5.7	22
19.0	1197	599	5.82	11913	30.0	30.4	321	3619	347	10.8	5.4	84.6	1186	11	579	33	1.34	489.	18	68	5.9	23
20.0	1260	630	6.13	12226	30.8	29.6	331	3656	330	10.2	5.1	84.9	1250	10	602	32	1.30	510.	19	70	6.0	24
25.0	1575	788	7.66	13687	34.4	26.5	378	3796	264	8.0	4.0	86.0	1567	8	710	28	1.14	612.	23	83	6.8	28
30.0	1890	945	9.19	15013	37.7	24.2	419	3889	220	6.6	3.3	86.7	1884	6	816	26	1.03	705.	27	95	7.5	32
35.0	2205	1103	10.72	16238	40.8	22.4	456	3955	188	5.6	2.8	87.2	2200	5	919	24	0.94	787.	31	107	8.1	
40.0	2520	1260	12.25	17382	43.6	20.9	491	4005	165	4.9	2.4	87.6	2515	5	1020	22	0.88	869.	35	118	8.7	
45.0	2835	1418	13.78	18460	46.2	19.7	523	4044	146	4.3	2.2	87.8	2831	4	1120	20	0.82	944.	39	129	9.3	
50.0	3150	1575	15.31	19484	48.7	18.7	554	4074	132	3.9	1.9	88.1	3146	4	1219	19	0.78	1024.	43	140	9.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	ab	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#263 63 Cu on 92 Mo

63 Cu on 92 Mo

63 Cu on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 42. ZC= 71.(Lu)
NEUTRON NUMBERS: NP= 34. NT= 50. NC= 84.

AP**1/3= 3.979 AT**1/3= 4.514
REDUCED MASS NUMBER= 37.39 AP+AT=AC=155.

INTERACTION RADIUS RINT=12.34 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 5.00 CT+CP= 9.32 C= 2.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 5.20

COULOMB RADII [fm]:
RCP= 4.45 RCT= 5.08 RC=RCP+RCT= 9.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 258.88 MeV K= .29825 n=2.452
VC(RINT)= 141.9 MeV

FISSION-TKE= 123. MeV
ASYMM. FISSION-TKE= 119. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.940 MeV/fm**2 PROX-FACTOR= 27.36 MeV
L-RLD= 71 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.41 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -87.5
COMPOUND NUCLEUS: -45.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.07 fm V(RB)= 149.1 MeV
Q-VALUE= -107.7 MeV
L-CRITICAL= 107.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	37	0.26	2720	8.2	191.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	75	0.53	3848	11.6	135.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	112	0.79	4714	14.2	110.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	150	1.05	5444	16.4	95.9	45	249	11	129.7	86.5	25.2	53	199	43	424	12.50	100.	1	1.5	3
4.5	284	168	1.19	5775	17.3	90.4	84	761	438	93.9	58.3	43.0	137	146	109	229	6.67	112.	3	1.8	4
5.0	315	187	1.32	6089	18.3	85.8	111	1168	779	75.6	46.1	52.2	201	114	152	175	5.09	124.	4	2.0	5
5.5	347	206	1.45	6387	19.2	81.8	132	1501	993	63.7	38.5	58.1	253	93	184	147	4.28	135.	5	2.2	6
6.0	378	224	1.58	6671	20.0	78.3	150	1777	910	55.2	33.2	62.4	300	78	208	129	3.76	147.	5	2.3	7
6.5	410	243	1.71	6945	20.9	75.2	166	2011	840	48.8	29.3	65.6	342	67	229	117	3.40	158.	6	2.6	8
7.0	441	262	1.84	7208	21.6	72.5	181	2211	780	43.8	26.2	68.1	382	59	247	107	3.12	169.	7	2.8	9
7.5	473	280	1.98	7462	22.4	70.0	194	2384	728	39.7	23.7	70.2	420	53	263	100	2.90	180.	7	3.0	10
8.0	504	299	2.11	7708	23.1	67.8	207	2535	682	36.3	21.7	71.8	457	47	277	94	2.72	190.	8	3.2	11
8.5	536	318	2.24	7946	23.8	65.8	219	2669	642	33.5	20.0	73.3	493	43	291	88	2.57	201.	8	3.4	12
9.0	567	337	2.37	8177	24.5	63.9	230	2788	607	31.1	18.5	74.5	528	39	303	84	2.45	211.	9	3.6	13
9.5	599	355	2.50	8403	25.2	62.2	241	2894	575	29.0	17.2	75.5	562	36	315	80	2.34	221.	9	3.8	14
10.0	630	374	2.63	8622	25.9	60.6	251	2989	546	27.1	16.2	76.4	597	33	327	77	2.24	233.	10	3.9	14
10.5	662	393	2.77	8836	26.5	59.2	261	3075	520	25.5	15.2	77.2	630	31	338	74	2.16	243.	10	4.1	15
11.0	693	411	2.90	9045	27.1	57.8	271	3154	496	24.1	14.3	77.9	664	29	349	71	2.08	252.	10	4.3	16
11.5	725	430	3.03	9250	27.7	56.6	280	3226	475	22.8	13.6	78.6	697	27	359	69	2.01	262.	11	4.4	17
12.0	756	449	3.16	9450	28.3	55.4	289	3291	455	21.7	12.9	79.2	730	26	370	67	1.95	271.	11	4.6	18
13.0	819	486	3.42	9838	29.5	53.2	306	3407	420	19.7	11.7	80.1	796	23	389	63	1.84	292.	12	4.9	19
14.0	882	524	3.69	10213	30.6	51.3	322	3507	390	18.1	10.7	81.0	861	21	409	60	1.75	312.	13	5.2	20
15.0	945	561	3.95	10574	31.7	49.5	338	3593	364	16.7	9.9	81.7	926	19	427	57	1.67	329.	14	5.5	22
16.0	1008	598	4.22	10924	32.7	47.9	352	3668	341	15.5	9.2	82.3	990	18	446	55	1.60	349.	15	5.7	23
17.0	1071	636	4.48	11263	33.7	46.5	367	3734	321	14.5	8.6	82.8	1055	16	463	53	1.54	368.	16	6.0	24
18.0	1134	673	4.74	11592	34.7	45.2	380	3793	303	13.6	8.1	83.2	1119	15	481	51	1.48	386.	16	6.3	25
19.0	1197	710	5.01	11913	35.7	44.0	393	3846	287	12.8	7.6	83.6	1183	14	498	49	1.43	402.	17	6.5	26
20.0	1260	748	5.27	12226	36.6	42.9	406	3894	273	12.1	7.2	84.0	1247	13	515	48	1.39	419.	18	6.8	27
25.0	1575	935	6.59	13687	40.9	38.4	465	4074	218	9.4	5.6	85.3	1565	10	598	42	1.21	504.	22	8.0	33
30.0	1890	1122	7.90	15013	44.8	35.0	517	4194	182	7.8	4.6	86.1	1882	8	676	37	1.09	580.	26	9.2	38
35.0	2205	1309	9.22	16238	48.4	32.4	564	4279	156	6.6	3.9	86.7	2198	7	753	34	1.00	653.	30	10.3	7.9
40.0	2520	1496	10.54	17382	51.7	30.3	607	4343	136	5.7	3.4	87.1	2514	6	827	32	0.93	720.	34	11.4	8.5
45.0	2835	1683	11.86	18460	54.9	28.6	648	4393	121	5.1	3.0	87.5	2830	5	900	30	0.87	788.	37	12.5	9.0
50.0	3150	1870	13.17	19484	57.8	27.1	686	4433	109	4.5	2.7	87.7	3145	5	972	28	0.82	842.	41	13.5	9.5

#264 63 Cu on 108 Ag

63 Cu on 108 Ag

63 Cu on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 47. ZC= 76.(Os)
NEUTRON NUMBERS: NP= 34. NT= 61. NC= 95.

AP**1/3= 3.979 AT**1/3= 4.762
REDUCED MASS NUMBER= 39.79 AP+AT=AC=171.

INTERACTION RADIUS RINT=12.61 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 5.32 CT+CP= 9.64 C= 2.38

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 5.50

COULOMB RADII [fm]:
RCP= 4.45 RCT= 5.34 RC=RCP+RCT= 9.78

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 281.73 MeV K= .29764 n=2.460
VC(RINT)= 155.5 MeV

FISSION-TKE= 134. MeV
ASYMM. FISSION-TKE= 126. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.931 MeV/fm**2 PROX-FACTOR= 27.87 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.10 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -87.6
COMPOUND NUCLEUS: -34.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.32 fm V(RB)= 163.0 MeV
Q-VALUE= -117.8 MeV
L-CRITICAL= 112.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	40	0.26	2720	8.7	214.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	80	0.51	3848	12.3	151.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	119	0.77	4714	15.1	123.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	159	1.02	5444	17.4	107.3	33	117	0	146.2	114.0	16.9	37	215	27	703	19.21	0.	1	1.4	3
4.5	284	179	1.15	5775	18.5	101.2	84	668	361	100.5	67.8	39.8	128	156	98	279	7.43	101.	3	1.7	5
5.0	315	199	1.28	6089	19.5	96.0	114	1106	727	80.0	52.4	50.0	194	121	143	205	5.47	112.	4	1.9	6
5.5	347	219	1.41	6387	20.4	91.5	138	1463	968	67.0	43.4	56.5	248	98	175	170	4.52	122.	4	2.0	7
6.0	378	239	1.54	6671	21.3	87.6	159	1760	888	57.8	37.2	61.1	296	82	199	148	3.95	132.	5	2.3	9
6.5	410	259	1.66	6945	22.2	84.2	177	2011	819	51.0	32.6	64.5	339	71	219	133	3.54	142.	6	2.5	10
7.0	441	279	1.79	7208	23.0	81.1	193	2226	761	45.6	29.1	67.2	379	62	236	122	3.24	152.	6	2.8	11
7.5	473	298	1.92	7462	23.8	78.4	208	2412	710	41.3	26.3	69.3	418	55	251	113	3.01	162.	7	2.9	12
8.0	504	318	2.05	7708	24.6	75.9	222	2575	666	37.8	24.0	71.1	455	49	265	106	2.82	171.	7	3.2	13
8.5	536	338	2.18	7946	25.4	73.6	235	2719	626	34.8	22.1	72.6	491	45	277	100	2.66	181.	8	3.3	14
9.0	567	358	2.30	8177	26.1	71.5	248	2846	592	32.2	20.5	73.9	526	41	289	95	2.53	190.	8	3.5	15
9.5	599	378	2.43	8403	26.8	69.6	259	2960	560	30.1	19.1	75.0	561	37	300	91	2.41	200.	9	3.7	16
10.0	630	398	2.56	8622	27.5	67.9	271	3063	532	28.1	17.8	75.9	595	35	311	87	2.31	209.	9	3.9	17
10.5	662	418	2.69	8836	28.2	66.2	282	3156	507	26.5	16.8	76.8	629	32	321	84	2.22	218.	10	4.0	18
11.0	693	438	2.82	9045	28.9	64.7	292	3240	484	25.0	15.8	77.5	663	30	331	81	2.14	228.	10	4.2	19
11.5	725	458	2.94	9250	29.5	63.3	302	3317	463	23.7	15.0	78.2	696	28	340	78	2.07	237.	11	4.3	19
12.0	756	477	3.07	9450	30.1	62.0	312	3388	444	22.5	14.2	78.8	729	27	349	75	2.00	246.	11	4.5	20
13.0	819	517	3.33	9838	31.4	59.5	331	3512	409	20.4	12.9	79.8	795	24	367	71	1.89	263.	12	4.8	22
14.0	882	557	3.58	10213	32.6	57.4	349	3619	380	18.7	11.8	80.7	860	22	384	68	1.79	281.	13	5.1	23
15.0	945	597	3.84	10574	33.7	55.4	365	3712	355	17.2	10.9	81.4	925	20	401	64	1.71	297.	14	5.4	25
16.0	1008	637	4.10	10924	34.8	53.7	381	3793	333	16.0	10.1	82.0	990	18	417	62	1.64	315.	14	5.6	26
17.0	1071	676	4.35	11263	35.9	52.1	397	3864	313	14.9	9.4	82.5	1054	17	433	59	1.58	332.	15	5.9	27
18.0	1134	716	4.61	11592	36.9	50.6	412	3928	296	14.0	8.9	83.0	1118	16	449	57	1.52	347.	16	6.2	29
19.0	1197	756	4.86	11913	37.9	49.2	426	3984	280	13.2	8.3	83.4	1182	15	464	55	1.47	363.	17	6.4	5.5	30
20.0	1260	796	5.12	12226	38.9	48.0	440	4036	266	12.4	7.9	83.8	1246	14	479	53	1.42	380.	18	6.7	5.6	31
25.0	1575	995	6.40	13687	43.5	42.9	504	4229	213	9.7	6.2	85.1	1564	11	551	47	1.24	454.	22	7.9	6.4	37
30.0	1890	1194	7.68	15013	47.7	39.2	560	4358	177	8.0	5.1	86.0	1881	9	619	42	1.12	525.	25	9.0	7.1	42
35.0	2205	1393	8.96	16238	51.5	36.3	612	4450	152	6.8	4.3	86.6	2198	7	686	38	1.02	589.	29	10.1	7.7
40.0	2520	1592	10.24	17382	55.0	33.9	659	4519	133	5.9	3.7	87.1	2514	6	750	36	0.95	651.	33	11.2	8.3
45.0	2835	1791	11.52	18460	58.4	32.0	703	4573	118	5.2	3.3	87.4	2830	5	813	33	0.89	708.	36	12.2	8.8
50.0	3150	1989	12.80	19484	61.5	30.4	745	4616	106	4.7	2.9	87.7	3145	5	875	32	0.84	760.	40	13.2	9.4

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#265 63 Cu on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 58. ZC= 87.(Fr)
NEUTRON NUMBERS: NP= 34. NT= 82. NC=116.

AP**1/3= 3.979 AT**1/3= 5.192
REDUCED MASS NUMBER= 43.45 AP+AT=AC=203.

INTERACTION RADIUS RINT=13.07 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 5.87 CT+CP=10.19 C̄= 2.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.04

COULOMB RADII [fm]:
RCP= 4.45 RCT= 5.82 RC=RCP+RCT=10.26

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 330.60 MeV K= .29279 n=2.483
VC(RINT)= 185.0 MeV

FISSION-TKE= 160. MeV
ASYMM. FISSION-TKE= 142. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.917 MeV/fm**2 PROX-FACTOR= 28.67 MeV
L-RLD= 70 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.69 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -88.2
COMPOUND NUCLEUS: 1.1

FUSION RELATED PARAMETERS:
R-BARRIER=11.74 fm V(RB)= 193.6 MeV
Q-VALUE= -154.4 MeV
L-CRITICAL= 114.

63 Cu on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	43	0.23	2720	9.5	264.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	126	87	0.47	3848	13.4	187.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	189	130	0.70	4714	16.5	152.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	252	174	0.94	5444	19.0	132.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	284	196	1.06	5775	20.2	124.9	60	292	43	128.3	102.3	25.8	87	197	61	538	12.15	87.	2	11	1.3	3
5.0	315	217	1.17	6089	21.2	118.4	107	806	472	96.0	70.8	42.0	166	149	117	307	6.89	95.	3	16	1.6	5
5.5	347	239	1.29	6387	22.3	112.9	138	1225	823	78.5	56.5	50.7	228	119	154	238	5.32	104.	4	19	1.8	6
6.0	378	261	1.41	6671	23.3	108.1	164	1573	767	66.9	47.5	56.6	280	98	182	201	4.49	113.	5	22	2.0	8
6.5	410	282	1.53	6945	24.2	103.9	186	1868	708	58.4	41.2	60.8	326	83	203	177	3.95	121.	6	24	2.2	10
7.0	441	304	1.64	7208	25.1	100.1	206	2120	657	51.9	36.4	64.0	369	72	220	160	3.57	129.	6	26	2.4	11
7.5	473	326	1.76	7462	26.0	96.7	224	2338	613	46.8	32.7	66.6	409	64	235	147	3.29	138.	7	28	2.6	12
8.0	504	348	1.88	7708	26.9	93.6	240	2529	575	42.6	29.7	68.7	447	57	248	137	3.06	146.	7	30	2.8	14
8.5	536	369	2.00	7946	27.7	90.8	256	2698	541	39.1	27.2	70.4	484	51	260	129	2.87	154.	8	32	2.9	15
9.0	567	391	2.11	8177	28.5	88.3	270	2847	511	36.2	25.1	71.9	520	47	271	122	2.72	162.	8	34	3.1	16
9.5	599	413	2.23	8403	29.3	85.9	284	2981	484	33.6	23.4	73.2	556	43	281	116	2.58	170.	9	35	3.2	17
10.0	630	434	2.35	8622	30.1	83.8	298	3101	460	31.4	21.8	74.3	590	40	291	111	2.47	178.	9	37	3.3	18
10.5	662	456	2.47	8836	30.8	81.7	310	3210	438	29.5	20.5	75.2	625	37	300	106	2.37	186.	10	39	3.4	19
11.0	693	478	2.58	9045	31.5	79.9	322	3309	418	27.8	19.3	76.1	659	34	308	102	2.28	194.	10	40	3.6	20
11.5	725	500	2.70	9250	32.2	78.1	334	3399	400	26.3	18.2	76.8	692	32	316	98	2.20	200.	10	42	3.7	22
12.0	756	521	2.82	9450	32.9	76.5	346	3482	383	24.9	17.3	77.5	726	30	324	95	2.13	209.	11	43	3.8	22
13.0	819	565	3.05	9838	34.3	73.5	367	3629	354	22.6	15.6	78.7	792	27	339	90	2.00	224.	12	46	4.0	24
14.0	882	608	3.29	10213	35.6	70.8	388	3754	328	20.7	14.3	79.7	858	24	354	85	1.89	239.	12	49	4.2	26
15.0	945	652	3.52	10574	36.8	68.4	407	3863	306	19.1	13.2	80.5	923	22	368	81	1.80	253.	13	51	4.4	28
16.0	1008	695	3.76	10924	38.0	66.2	426	3958	287	17.7	12.2	81.2	988	20	381	77	1.73	266.	14	54	4.6	30
17.0	1071	739	3.99	11263	39.2	64.2	443	4041	270	16.5	11.4	81.8	1052	19	394	74	1.66	280.	15	57	4.8	32
18.0	1134	782	4.23	11592	40.3	62.4	460	4116	255	15.4	10.7	82.3	1116	18	407	71	1.60	295.	16	59	5.0	33
19.0	1197	826	4.46	11913	41.4	60.8	477	4183	242	14.5	10.0	82.7	1181	16	419	69	1.54	307.	16	62	5.1	35
20.0	1260	869	4.70	12226	42.5	59.2	493	4242	230	13.7	9.5	83.1	1245	15	432	67	1.49	321.	17	64	5.3	36
25.0	1575	1086	5.87	13687	47.5	53.0	566	4470	184	10.7	7.4	84.7	1563	12	490	58	1.30	385.	21	76	6.1	43
30.0	1890	1303	7.05	15013	52.1	48.4	630	4621	153	9.0	6.1	85.6	1881	9	544	52	1.17	445.	24	87	6.7	49
35.0	2205	1521	8.22	16238	56.2	44.8	689	4730	131	7.4	5.1	86.3	2197	8	597	48	1.07	502.	28	97	7.3	
40.0	2520	1738	9.39	17382	60.1	41.9	743	4811	115	6.5	4.5	86.8	2513	7	648	44	0.99	554.	32	107	7.9	
45.0	2835	1955	10.57	18460	63.7	39.5	793	4874	102	5.7	3.9	87.1	2829	6	697	41	0.93	602.	35	117	8.4	
50.0	3150	2172	11.74	19484	67.2	37.5	840	4924	92	5.1	3.5	87.4	3145	5	745	39	0.87	650.	39	127	8.9	

#266 63 Cu on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 62. ZC= 91.(Pa)
NEUTRON NUMBERS: NP= 34. NT= 92. NC=126.

AP**1/3= 3.979 AT**1/3= 5.360
REDUCED MASS NUMBER= 44.71 AP+AT=AC=217.

INTERACTION RADIUS RINT=13.26 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 6.09 CT+CP=10.40 C̄= 2.53

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.25

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.00 RC=RCP+RCT=10.44

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 346.97 MeV K= .28744 n=2.492
VC(RINT)= 195.1 MeV

FISSION-TKE= 170. MeV
ASYMM. FISSION-TKE= 147. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.908 MeV/fm**2 PROX-FACTOR= 28.80 MeV
L-RLD= 69 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.56 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -72.1
COMPOUND NUCLEUS: 14.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.91 fm V(RB)= 203.8 MeV
Q-VALUE= -152.2 MeV
L-CRITICAL= 114.

63 Cu on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	45	0.23	2720	9.8	283.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	126	89	0.46	3848	13.8	200.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	189	134	0.69	4714	16.9	163.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	252	179	0.92	5444	19.6	141.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	284	201	1.03	5775	20.7	133.5	47	169	0	141.2	120.5	19.4	76	208	51	764	16.51	0.	2	11	1.3	4
5.0	315	224	1.15	6089	21.9	126.6	103	711	393	101.7	78.1	39.1	159	156	110	355	7.54	89.	3	15	1.6	6
5.5	347	246	1.26	6387	22.9	120.7	138	1152	762	82.4	61.4	48.8	223	124	148	265	5.63	97.	4	18	1.9	7
6.0	378	268	1.38	6671	24.0	115.6	166	1519	727	69.8	51.2	55.1	276	102	176	221	4.69	105.	5	21	2.1	9
6.5	410	291	1.49	6945	24.9	111.0	189	1830	671	60.8	44.2	59.6	323	86	198	194	4.11	113.	5	23	2.3	10
7.0	441	313	1.60	7208	25.9	107.0	210	2095	623	53.9	39.0	63.0	366	75	215	174	3.69	121.	6	26	2.4	12
7.5	473	335	1.72	7462	26.8	103.4	229	2325	582	48.5	35.0	65.7	407	66	230	160	3.39	128.	7	28	2.6	14
8.0	504	358	1.83	7708	27.7	100.1	247	2526	545	44.1	31.7	67.9	445	59	243	148	3.15	136.	7	30	2.8	15
8.5	536	380	1.95	7946	28.5	97.1	263	2704	513	40.5	29.0	69.8	483	53	254	139	2.95	144.	8	31	2.9	16
9.0	567	402	2.06	8177	29.3	94.4	279	2861	485	37.4	26.8	71.3	519	48	265	131	2.79	151.	8	33	3.0	18
9.5	599	425	2.18	8403	30.1	91.9	294	3002	459	34.7	24.8	72.6	555	44	275	125	2.65	158.	9	35	3.2	19
10.0	630	447	2.29	8622	30.9	89.5	308	3129	436	32.5	23.2	73.8	589	41	284	119	2.53	166.	9	36	3.3	20
10.5	662	469	2.41	8836	31.7	87.4	321	3244	415	30.5	21.7	74.8	624	38	292	114	2.42	173.	9	38	3.4	21
11.0	693	492	2.52	9045	32.4	85.4	334	3348	396	28.7	20.5	75.7	658	35	300	110	2.33	181.	10	40	3.5	22
11.5	725	514	2.64	9250	33.2	83.5	346	3443	379	27.1	19.3	76.4	692	33	308	106	2.24	187.	10	41	3.7	24
12.0	756	537	2.75	9450	33.9	81.7	358	3530	363	25.7	18.3	77.1	725	31	316	102	2.17	194.	11	42	3.8	25
13.0	819	581	2.98	9838	35.3	78.5	381	3684	335	23.3	16.6	78.3	791	28	330	96	2.04	208.	11	45	4.0	27
14.0	882	626	3.21	10213	36.6	75.7	402	3817	311	21.3	15.2	79.3	857	25	343	91	1.93	222.	12	48	4.2	29
15.0	945	671	3.44	10574	37.9	73.1	423	3931	291	19.6	14.0	80.2	922	23	356	87	1.84	235.	13	51	4.4	31
16.0	1008	715	3.67	10924	39.1	70.8	442	4031	272	18.2	12.9	80.9	987	21	369	83	1.76	249.	14	53	4.6	32
17.0	1071	760	3.90	11263	40.3	68.7	461	4119	256	17.0	12.1	81.5	1052	19	381	80	1.69	262.	15	56	4.7	34
18.0	1134	805	4.13	11592	41.5	66.7	479	4198	242	15.9	11.3	82.1	1116	18	393	77	1.62	274.	15	58	4.9	36
19.0	1197	849	4.36	11913	42.6	65.0	496	4268	229	14.9	10.6	82.5	1180	17	404	74	1.57	288.	16	61	5.1	37
20.0	1260	894	4.58	12226	43.7	63.3	512	4331	218	14.1	10.0	83.0	1244	16	415	72	1.52	300.	17	63	5.2	39
25.0	1575	1118	5.73	13687	48.9	56.6	589	4571	174	11.0	7.8	84.5	1563	12	469	62	1.32	360.	21	74	6.0	46
30.0	1890	1341	6.88	15013	53.6	51.7	656	4731	145	9.0	6.4	85.5	1880	10	519	56	1.18	414.	24	85	6.6	53
35.0	2205	1565	8.02	16238	57.9	47.9	717	4845	124	7.6	5.4	86.2	2197	8	567	51	1.08	469.	28	96	7.2	
40.0	2520	1788	9.17	17382	61.8	44.8	774	4930	109	6.6	4.7	86.7	2513	7	613	47	1.00	516.	31	106	7.8	
45.0	2835	2012	10.31	18460	65.6	42.2	826	4996	97	5.8	4.2	87.1	2829	6	658	44	0.94	565.	35	115	8.3	
50.0	3150	2235	11.46	19484	69.1	40.0	876	5049	87	5.2	3.7	87.4	3145	5	702	42	0.89	606.	38	125	8.8	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	aes	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#267 63 Cu on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 67. ZC= 96.(Cm)
NEUTRON NUMBERS: NP= 34. NT= 98. NC=132.

AP**1/3= 3.979 AT**1/3= 5.485
REDUCED MASS NUMBER= 45.59 AP+AT=AC=228.

INTERACTION RADIUS RINT=13.39 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 6.25 CT+CP=10.56 C= 2.55

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.41

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.15 RC=RCP+RCT=10.60

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 368.94 MeV K= .28595 n=2.503
VC(RINT)= 208.7 MeV

FISSION-TKE= 184. MeV
ASYMM. FISSION-TKE= 155. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 29.17 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -63.7
COMPOUND NUCLEUS: 47.0

FUSION RELATED PARAMETERS:
R-BARRIER=12.02 fm V(RB)= 218.1 MeV
Q-VALUE= -175.9 MeV
L-CRITICAL= 109.

63 Cu on 165 Ho — 63 Cu on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	46	0.22	2720	10.0	305.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	91	0.44	3848	14.1	216.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	137	0.66	4714	17.3	176.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	182	0.87	5444	19.9	153.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	284	205	0.98	5775	21.2	144.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	315	228	1.09	6089	22.3	136.8	86	481	197	115.5	93.1	32.2	135	180	91	470	9.37	85.	3 14	1.4	5
5.5	347	251	1.20	6387	23.4	130.5	128	954	592	91.1	70.1	44.4	205	141	136	318	6.32	93.	4 17	1.6	7
6.0	378	274	1.31	6671	24.4	124.9	159	1348	636	76.3	57.5	51.8	263	115	168	256	5.09	101.	5 20	1.9	8
6.5	410	296	1.42	6945	25.4	120.0	185	1680	587	66.0	49.2	57.0	312	97	192	221	4.37	108.	5 23	2.1	10
7.0	441	319	1.53	7208	26.4	115.6	208	1964	545	58.2	43.1	60.9	357	84	211	197	3.89	116.	6 25	2.2	11
7.5	473	342	1.64	7462	27.3	111.7	228	2210	508	52.2	38.5	63.9	399	73	226	179	3.54	123.	6 27	2.4	13
8.0	504	365	1.75	7708	28.2	108.2	247	2426	477	47.3	34.8	66.3	439	65	240	165	3.28	131.	7 29	2.6	14
8.5	536	388	1.86	7946	29.1	104.9	264	2616	448	43.3	31.7	68.3	477	58	252	154	3.06	137.	7 31	2.7	16
9.0	567	410	1.97	8177	29.9	102.0	281	2785	424	39.9	29.2	70.0	514	53	262	145	2.88	145.	8 33	2.9	17
9.5	599	433	2.08	8403	30.7	99.3	296	2936	401	37.1	27.1	71.5	550	48	272	138	2.73	152.	8 34	3.0	18
10.0	630	456	2.18	8622	31.5	96.7	311	3071	381	34.6	25.2	72.7	585	45	281	131	2.60	159.	9 36	3.1	20
10.5	662	479	2.29	8836	32.3	94.4	325	3194	363	32.4	23.6	73.8	620	41	290	126	2.49	166.	9 37	3.3	21
11.0	693	502	2.40	9045	33.1	92.2	338	3306	346	30.5	22.2	74.7	655	38	298	121	2.39	173.	10 39	3.4	22
11.5	725	524	2.51	9250	33.8	90.2	351	3408	331	28.8	21.0	75.6	689	36	305	116	2.30	180.	10 40	3.5	23
12.0	756	547	2.62	9450	34.5	88.3	364	3501	318	27.3	19.9	76.3	722	34	313	112	2.22	187.	11 42	3.6	24
13.0	819	593	2.84	9838	36.0	84.9	387	3666	293	24.7	18.0	77.6	789	30	327	105	2.09	200.	11 45	3.8	26
14.0	882	638	3.06	10213	37.3	81.8	410	3808	272	22.6	16.4	78.7	855	27	340	100	1.97	213.	12 47	4.0	29
15.0	945	684	3.28	10574	38.6	79.0	431	3930	254	20.8	15.1	79.6	920	25	353	95	1.88	225.	13 50	4.2	31
16.0	1008	729	3.50	10924	39.9	76.5	451	4037	238	19.2	14.0	80.4	985	23	365	91	1.79	239.	14 53	4.4	32
17.0	1071	775	3.71	11263	41.1	74.2	471	4132	224	17.9	13.0	81.0	1050	21	376	87	1.72	252.	14 55	4.6	34
18.0	1134	821	3.93	11592	42.3	72.1	489	4216	212	16.8	12.2	81.6	1115	19	387	84	1.65	264.	15 57	4.8	36
19.0	1197	866	4.15	11913	43.5	70.2	507	4291	200	15.8	11.4	82.1	1179	18	398	81	1.59	275.	16 60	4.9	38
20.0	1260	912	4.37	12226	44.6	68.4	524	4359	190	14.9	10.8	82.6	1243	17	409	78	1.54	286.	17 62	5.1	39
25.0	1575	1140	5.46	13687	49.9	61.2	603	4616	152	11.6	8.4	84.2	1562	13	460	68	1.34	345.	20 74	5.8	47
30.0	1890	1368	6.55	15013	54.6	55.9	673	4787	127	9.5	6.9	85.3	1880	10	507	61	1.20	398.	24 84	6.5	54
35.0	2205	1596	7.65	16238	59.0	51.7	736	4909	109	8.0	5.8	86.0	2196	9	553	55	1.10	451.	27 94	7.1	
40.0	2520	1824	8.74	17382	63.1	48.4	795	5000	95	7.0	5.0	86.5	2513	7	596	51	1.02	498.	31 104	7.6	
45.0	2835	2052	9.83	18460	66.9	45.6	849	5071	84	6.2	4.5	86.9	2828	7	638	48	0.95	543.	34 114	8.1	
50.0	3150	2280	10.92	19484	70.5	43.3	900	5128	76	5.5	4.0	87.2	3144	6	680	45	0.90	588.	38 123	8.6	

#268 63 Cu on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 73. ZC=102.(No)
NEUTRON NUMBERS: NP= 34. NT=108. NC=142.

AP**1/3= 3.979 AT**1/3= 5.657
REDUCED MASS NUMBER= 46.73 AP+AT=AC=244.

INTERACTION RADIUS RINT=13.58 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 6.47 CT+CP=10.78 C= 2.59

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.62

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.35 RC=RCP+RCT=10.80

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 393.84 MeV K= .28072 n=2.517
VC(RINT)= 224.2 MeV

FISSION-TKE= 201. MeV
ASYMM. FISSION-TKE= 163. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 29.47 MeV
L-RLD= 51 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.37 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -46.0
COMPOUND NUCLEUS: 80.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.19 fm V(RB)= 234.2 MeV
Q-VALUE= -191.5 MeV
L-CRITICAL= 102.

63 Cu on 181 Ta — 63 Cu on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	47	0.21	2720	10.2	333.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	93	0.42	3848	14.5	235.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	140	0.63	4714	17.7	192.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	187	0.83	5444	20.4	166.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	284	210	0.94	5775	21.7	157.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	315	234	1.04	6089	22.9	149.1	61	234	0	135.2	117.2	22.4	109	206	70	742	13.87	0.	2 12	1.2	4
5.5	347	257	1.15	6387	24.0	142.1	116	745	414	101.7	81.5	39.2	187	160	123	398	7.36	87.	3 16	1.5	6
6.0	378	280	1.25	6671	25.0	136.1	152	1169	536	83.8	65.3	48.1	249	129	158	304	5.61	95.	4 19	1.7	7
6.5	410	304	1.35	6945	26.1	130.7	181	1527	494	71.8	55.2	54.1	302	108	184	256	4.71	102.	5 22	1.9	9
7.0	441	327	1.46	7208	27.0	126.0	206	1834	459	63.0	48.0	58.5	349	92	205	225	4.14	109.	6 24	2.1	11
7.5	473	351	1.56	7462	28.0	121.7	228	2100	428	56.2	42.6	61.9	392	80	221	203	3.74	115.	6 26	2.3	13
8.0	504	374	1.67	7708	28.9	117.9	248	2332	402	50.8	38.4	64.6	433	71	235	186	3.43	123.	7 28	2.4	14
8.5	536	397	1.77	7946	29.8	114.3	267	2537	378	46.4	34.9	66.8	472	64	247	173	3.19	129.	7 30	2.6	16
9.0	567	421	1.88	8177	30.7	111.1	284	2719	357	42.7	32.1	68.6	509	58	258	163	3.00	136.	8 32	2.7	17
9.5	599	444	1.98	8403	31.5	108.2	301	2881	338	39.6	29.6	70.2	546	53	268	154	2.83	143.	8 33	2.9	18
10.0	630	467	2.08	8622	32.3	105.4	316	3028	321	36.9	27.6	71.6	582	48	277	146	2.69	149.	9 35	3.0	20
10.5	662	491	2.19	8836	33.1	102.9	331	3160	306	34.5	25.8	72.7	617	45	286	140	2.57	156.	9 37	3.1	21
11.0	693	514	2.29	9045	33.9	100.5	345	3280	292	32.4	24.2	73.8	652	41	293	134	2.47	163.	10 38	3.3	22
11.5	725	537	2.40	9250	34.7	98.3	359	3390	279	30.6	22.9	74.7	686	39	301	129	2.37	169.	10 40	3.4	24
12.0	756	561	2.50	9450	35.4	96.2	372	3491	268	29.0	21.6	75.5	720	36	308	124	2.29	175.	10 41	3.5	25
13.0	819	608	2.71	9838	36.9	92.5	397	3669	247	26.2	19.5	76.9	787	32	322	116	2.14	188.	11 44	3.7	27
14.0	882	654	2.92	10213	38.2	89.1	421	3821	229	23.9	17.8	78.0	853	29	334	110	2.02	201.	12 46	3.9	29
15.0	945	701	3.13	10574	39.6	86.1	443	3954	214	22.0	16.4	79.0	919	26	346	104	1.92	212.	13 49	4.1	32
16.0	1008	748	3.33	10924	40.9	83.3	464	4069	201	20.3	15.1	79.8	984	24	357	100	1.83	224.	14 52	4.3	34
17.0	1071	794	3.54	11263	42.1	80.8	485	4171	189	18.9	14.1	80.5	1049	22	368	95	1.76	236.	14 54	4.4	36
18.0	1134	841	3.75	11592	43.4	78.6	504	4262	178	17.7	13.2	81.1	1113	21	379	92	1.69	248.	15 56	4.6	37
19.0	1197	888	3.96	11913	44.6	76.5	523	4343	169	16.6	12.4	81.7	1178	19	389	88	1.63	260.	16 59	4.8	39
20.0	1260	935	4.17	12226	45.7	74.5	541	4416	160	15.7	11.7	82.2	1242	18	399	85	1.57	270.	17 61	4.9	41
25.0	1575	1168	5.21	13687	51.1	66.7	624	4693	128	12.2	9.1	83.9	1561	14	446	74	1.37	325.	20 72	5.7	49
30.0	1890	1402	6.25	15013	56.0	60.9	697	4877	107	10.0	7.4	85.0	1879	11	490	66	1.22	376.	24 83	6.3	56
35.0	2205	1636	7.29	16238	60.5	56.3	763	5009	91	8.5	6.3	85.8	2196	9	532	61	1.12	424.	27 93	6.9	
40.0	2520	1869	8.34	17382	64.6	52.7	823	5107	80	7.3	5.4	86.3	2512	8	572	56	1.03	469.	30 103	7.4	
45.0	2835	2103	9.38	18460	68.6	49.7	880	5184	71	6.5	4.8	86.8	2828	7	611	53	0.97	513.	34 112	7.9	
50.0	3150	2337	10.42	19484	72.3	47.1	933	5245	64	5.8	4.3	87.1	3144	6	648	50	0.91	553.	37 121	8.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#269 63 Cu on 197 Au

63 Cu on 197 Au

63 Cu on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 79. ZC=108.( )
NEUTRON NUMBERS: NP= 34. NT=118. NC=152.

AP**1/3= 3.979 AT**1/3= 5.819
REDUCED MASS NUMBER= 47.73 AP+AT=AC=260.

INTERACTION RADIUS RINT=13.75 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 6.68 CT+CP=10.99 C= 2.62

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.83

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.55 RC=RCP+RCT=10.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 418.14 MeV K= .27481 n=2.530
VC(RINT)= 239.6 MeV

FISSION-TKE= 218. MeV
ASYMM. FISSION-TKE= 171. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.903 MeV/fm**2 PROX-FACTOR= 29.74 MeV
L-RLD= 37 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.28 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -28.6
COMPOUND NUCLEUS: 119.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.34 fm V(RB)= 250.0 MeV
Q-VALUE= -213.2 MeV
L-CRITICAL= 94.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SCNAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	63	48	0.20	2720	10.4	360.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	95	0.40	3848	14.8	255.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	143	0.60	4714	18.1	208.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	191	0.80	5444	20.9	180.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	284	215	0.90	5775	22.1	170.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	315	239	1.00	6089	23.3	161.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	347	263	1.10	6387	24.5	153.8	99	523	228	114.5	96.0	32.7	166	180	107	520	9.02	83.	3 15	1.2	4
6.0	378	286	1.20	6671	25.6	147.3	142	979	430	92.2	74.3	43.9	234	144	148	364	6.30	89.	4 18	1.5	6
6.5	410	310	1.30	6945	26.6	141.5	174	1363	397	78.1	61.8	50.9	290	119	177	296	5.12	96.	5 21	1.7	8
7.0	441	334	1.39	7208	27.6	136.3	202	1693	368	68.1	53.3	55.9	339	102	199	256	4.42	103.	6 23	1.9	10
7.5	473	358	1.49	7462	28.6	131.7	226	1978	344	60.5	47.0	59.7	384	88	217	229	3.95	109.	6 26	2.1	12
8.0	504	382	1.59	7708	29.5	127.5	248	2227	322	54.5	42.1	62.7	426	78	231	209	3.61	115.	7 28	2.3	14
8.5	536	406	1.69	7946	30.4	123.7	268	2447	303	49.6	38.2	65.2	466	69	244	193	3.34	122.	7 29	2.4	15
9.0	567	430	1.79	8177	31.3	120.2	286	2642	286	45.6	35.0	67.2	505	62	255	181	3.12	128.	8 31	2.6	17
9.5	599	453	1.89	8403	32.2	117.0	304	2817	271	42.2	32.3	68.9	542	57	265	170	2.94	135.	8 33	2.7	18
10.0	630	477	1.99	8622	33.0	114.1	320	2974	258	39.2	30.0	70.4	578	52	274	162	2.79	141.	9 34	2.9	20
10.5	662	501	2.09	8836	33.8	111.3	336	3116	245	36.7	28.0	71.7	613	48	282	154	2.66	147.	9 36	3.0	21
11.0	693	525	2.19	9045	34.6	108.8	351	3245	234	34.4	26.3	72.8	648	45	290	148	2.54	154.	10 37	3.1	22
11.5	725	549	2.29	9250	35.4	106.4	365	3363	224	32.5	24.8	73.8	683	42	298	142	2.44	159.	10 39	3.2	24
12.0	756	573	2.39	9450	36.2	104.1	379	3471	215	30.7	23.4	74.6	717	39	305	137	2.35	165.	10 40	3.3	25
13.0	819	621	2.59	9838	37.6	100.1	405	3662	198	27.7	21.1	76.1	784	35	318	128	2.20	178.	11 43	3.5	27
14.0	882	668	2.79	10213	39.1	96.4	430	3826	184	25.3	19.2	77.4	851	31	330	120	2.08	189.	12 46	3.7	30
15.0	945	716	2.99	10574	40.4	93.1	453	3968	172	23.2	17.7	78.4	917	28	341	114	1.97	201.	13 48	3.9	32
16.0	1008	764	3.19	10924	41.8	90.2	476	4092	161	21.5	16.3	79.3	982	26	352	109	1.88	212.	13 51	4.1	34
17.0	1071	811	3.39	11263	43.0	87.5	497	4202	151	20.0	15.2	80.0	1047	24	362	104	1.80	223.	14 53	4.3	36
18.0	1134	859	3.59	11592	44.3	85.0	517	4299	143	18.7	14.2	80.7	1112	22	372	100	1.73	234.	15 56	4.5	38
19.0	1197	907	3.79	11913	45.5	82.8	537	4386	135	17.5	13.3	81.2	1177	20	382	96	1.66	245.	16 58	4.6	40
20.0	1260	955	3.98	12226	46.7	80.7	556	4464	129	16.5	12.5	81.7	1241	19	392	93	1.61	256.	16 60	4.8	42
25.0	1575	1193	4.98	13687	52.2	72.1	642	4761	103	12.8	9.7	83.6	1561	14	436	81	1.39	307.	20 71	5.5	51
30.0	1890	1432	5.98	15013	57.2	65.9	717	4959	86	10.5	8.0	84.8	1878	12	477	72	1.24	356.	23 81	6.1	58
35.0	2205	1671	6.97	16238	61.8	61.0	786	5101	73	8.9	6.7	85.6	2195	10	515	66	1.14	403.	27 91	6.7	
40.0	2520	1909	7.97	17382	66.0	57.0	849	5207	64	7.7	5.8	86.2	2512	8	552	61	1.05	444.	30 101	7.2	
45.0	2835	2148	8.97	18460	70.0	53.8	908	5289	57	6.8	5.1	86.6	2828	7	588	57	0.98	486.	33 110	7.7	
50.0	3150	2387	9.96	19484	73.8	51.0	963	5355	51	6.1	4.6	87.0	3144	6	623	54	0.93	525.	37 119	8.2	

#270 63 Cu on 208 Pb

63 Cu on 208 Pb

63 Cu on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 82. ZC=111.( )
NEUTRON NUMBERS: NP= 34. NT=126. NC=160.

AP**1/3= 3.979 AT**1/3= 5.925
REDUCED MASS NUMBER= 48.35 AP+AT=AC=271.

INTERACTION RADIUS RINT=13.87 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 6.82 CT+CP=11.13 C= 2.64

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.96

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.66 RC=RCP+RCT=11.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 429.18 MeV K= .26978 n=2.537
VC(RINT)= 246.6 MeV

FISSION-TKE= 226. MeV
ASYMM. FISSION-TKE= 175. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 29.75 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -19.5
COMPOUND NUCLEUS: 143.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.44 fm V(RB)= 257.1 MeV
Q-VALUE= -228.1 MeV
L-CRITICAL= 90.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SCNAR	SCFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	63	48	0.20	2720	10.6	374.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	126	97	0.39	3848	15.0	264.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	189	145	0.59	4714	18.3	216.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	252	193	0.78	5444	21.2	187.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	284	218	0.88	5775	22.4	176.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	315	242	0.98	6089	23.6	167.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	347	266	1.08	6387	24.8	159.7	92	442	162	120.1	102.9	29.9	161	186	102	592	10.00	79.	3 15	1.1	4
6.0	378	290	1.18	6671	25.9	152.9	139	913	385	95.6	78.3	42.2	230	148	144	395	6.63	86.	4 18	1.4	6
6.5	410	314	1.27	6945	27.0	146.9	173	1310	356	80.6	64.7	49.7	287	122	174	316	5.31	92.	5 21	1.6	8
7.0	441	338	1.37	7208	28.0	141.5	202	1650	330	70.1	55.6	55.0	337	104	196	272	4.56	99.	5 23	1.8	10
7.5	473	363	1.47	7462	29.0	136.7	227	1945	308	62.1	48.9	58.9	383	90	214	242	4.05	105.	6 25	2.0	12
8.0	504	387	1.57	7708	29.9	132.4	249	2202	289	55.9	43.8	62.0	425	79	229	220	3.69	111.	7 27	2.2	14
8.5	536	411	1.67	7946	30.8	128.4	270	2429	272	50.9	39.7	64.6	465	70	242	203	3.40	118.	7 29	2.3	15
9.0	567	435	1.76	8177	31.7	124.8	289	2631	257	46.7	36.3	66.7	504	63	253	190	3.18	123.	8 31	2.5	17
9.5	599	459	1.86	8403	32.6	121.5	307	2812	243	43.1	33.5	68.4	541	58	262	179	2.99	130.	8 32	2.6	18
10.0	630	484	1.96	8622	33.4	118.4	324	2974	231	40.1	31.1	69.9	577	53	271	169	2.83	136.	9 34	2.7	20
10.5	662	508	2.06	8836	34.3	115.6	341	3121	220	37.5	29.0	71.3	613	49	280	161	2.70	142.	9 36	2.9	21
11.0	693	532	2.16	9045	35.1	112.9	356	3255	210	35.2	27.2	72.4	648	45	287	154	2.58	147.	9 37	3.0	23
11.5	725	556	2.25	9250	35.9	110.4	371	3376	201	33.2	25.6	73.4	682	42	294	148	2.48	153.	10 38	3.1	24
12.0	756	580	2.35	9450	36.6	108.1	385	3488	192	31.4	24.2	74.3	717	39	301	143	2.39	159.	10 40	3.2	25
13.0	819	629	2.55	9838	38.1	103.9	412	3686	178	28.3	21.8	75.9	784	35	314	133	2.23	171.	11 43	3.4	28
14.0	882	677	2.75	10213	39.6	100.1	437	3855	165	25.8	19.9	77.1	851	31	326	126	2.10	181.	12 45	3.6	31
15.0	945	725	2.94	10574	41.0	96.7	461	4001	154	23.7	18.2	78.2	917	28	337	119	1.99	193.	13 48	3.8	33
16.0	1008	774	3.14	10924	42.3	93.6	484	4130	144	21.9	16.9	79.1	982	26	347	113	1.90	204.	13 50	4.0	35
17.0	1071	822	3.33	11263	43.6	90.8	506	4243	136	20.4	15.7	79.8	1047	24	357	109	1.82	215.	14 53	4.2	37
18.0	1134	870	3.53	11592	44.9	88.3	527	4343	128	19.0	14.6	80.5	1112	22	367	104	1.75	226.	15 55	4.4	39
19.0	1197	919	3.73	11913	46.1	85.9	547	4433	121	17.9	13.7	81.1	1176	21	376	100	1.68	236.	16 57	4.5	41
20.0	1260	967	3.92	12226	47.3	83.7	566	4514	115	16.8	12.9	81.6	1241	19	385	97	1.62	246.	16 60	4.7	43
25.0	1575	1209	4.90	13687	52.9	74.9	654	4821	92	13.1	10.0	83.5	1560	15	427	84	1.41	296.	20 70	5.4	52
30.0	1890	1451	5.88	15013	57.9	68.4	732	5026	77	10.7	8.2	84.7	1878	12	466	75	1.26	342.	23 81	6.0	60
35.0	2205	1692	6.86	16238	62.6	63.3	802	5172	66	9.0	6.9	85.5	2195	10	503	68	1.15	386.	27 90	6.6	
40.0	2520	1934	7.84	17382	66.9	59.2	866	5282	57	7.8	6.0	86.1	2512	8	538	63	1.06	428.	30 100	7.1	
45.0	2835	2176	8.82	18460	70.9	55.8	926	5367	51	6.9	5.3	86.6	2828	7	572	59	0.99	467.	33 109	7.6	
50.0	3150	2418	9.80	19484	74.8	53.0	983	5435	46	6.2	4.7	86.9	3143	7	605	56	0.94	505.	37 118	8.0	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS LAB

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#271 63 Cu on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 83. ZC=112.( )
NEUTRON NUMBERS: NP= 34. NT=126. NC=160.

AP**1/3= 3.979 AT**1/3= 5.934
REDUCED MASS NUMBER= 48.41 AP+AT=AC=272.

INTERACTION RADIUS RINT=13.88 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 6.83 CT+CP=11.14 C= 2.64

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 6.97

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.68 RC=RCP+RCT=11.13

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 433.63 MeV K= .26980 n=2.540
VC(RINT)= 249.4 MeV

FISSION-TKE= 230. MeV
ASYMM. FISSION-TKE= 176. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 29.86 MeV
L-RLD= 28 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: -16.5
COMPOUND NUCLEUS: 149.2

FUSION RELATED PARAMETERS:
R-BARRIER=12.45 fm V(RB)= 260.1 MeV
Q-VALUE= -230.9 MeV
L-CRITICAL= 87.

63 Cu on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	48	0.19	2720	10.6	379.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	126	97	0.39	3848	15.0	268.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	189	145	0.58	4714	18.3	218.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	252	194	0.78	5444	21.2	189.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	284	218	0.87	5775	22.5	178.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	315	242	0.97	6089	23.7	169.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	347	266	1.07	6387	24.8	161.6	86	384	112	124.1	107.4	28.0	154	192	98	643	10.75	79.	3	14	1.0	3
6.0	378	290	1.16	6671	25.9	154.7	135	860	361	97.9	80.6	41.0	225	153	141	812	6.84	86.	4	18	1.3	6
6.5	410	315	1.26	6945	27.0	148.7	170	1263	333	82.3	66.3	48.9	283	126	172	327	5.42	92.	5	21	1.6	8
7.0	441	339	1.36	7208	28.0	143.3	199	1607	309	71.4	56.8	54.3	334	107	195	279	4.62	98.	5	23	1.8	10
7.5	473	363	1.46	7462	29.0	138.4	225	1905	288	63.2	49.9	58.4	380	92	213	247	4.10	105.	6	25	2.0	11
8.0	504	387	1.55	7708	29.9	134.0	248	2166	270	56.8	44.6	61.6	423	81	229	225	3.72	111.	7	27	2.1	13
8.5	536	411	1.65	7946	30.9	130.0	269	2395	254	51.7	40.4	64.2	463	72	241	207	3.43	117.	7	29	2.3	15
9.0	567	436	1.75	8177	31.8	126.3	288	2600	240	47.4	36.9	66.3	502	65	253	193	3.20	124.	8	31	2.5	16
9.5	599	460	1.84	8403	32.6	123.0	306	2782	228	43.8	34.1	68.1	539	59	263	182	3.01	129.	8	32	2.6	18
10.0	630	484	1.94	8622	33.5	119.9	323	2947	216	40.7	31.6	69.7	576	54	272	172	2.85	135.	9	34	2.7	20
10.5	662	508	2.04	8836	34.3	117.0	340	3095	206	38.0	29.5	71.0	612	50	280	164	2.72	141.	9	35	2.9	21
11.0	693	532	2.13	9045	35.1	114.3	355	3230	196	35.7	27.6	72.2	647	46	288	157	2.60	147.	9	37	3.0	22
11.5	725	557	2.23	9250	35.9	111.8	370	3354	188	33.6	26.0	73.2	681	43	295	150	2.49	153.	10	38	3.1	24
12.0	756	581	2.33	9450	36.7	109.4	384	3467	180	31.8	24.6	74.1	716	40	302	145	2.40	159.	10	40	3.2	25
13.0	819	629	2.52	9838	38.2	105.1	411	3666	166	28.7	22.1	75.7	783	36	315	135	2.24	170.	11	42	3.4	28
14.0	882	678	2.72	10213	39.6	101.3	437	3838	154	26.1	20.1	76.9	850	32	326	127	2.11	182.	12	45	3.6	30
15.0	945	726	2.91	10574	41.0	97.9	461	3986	144	24.0	18.5	78.0	916	29	337	121	2.00	192.	13	48	3.8	33
16.0	1008	775	3.11	10924	42.4	94.8	484	4116	135	22.2	17.1	78.9	981	27	348	115	1.91	203.	13	50	4.0	35
17.0	1071	823	3.30	11263	43.7	91.9	506	4230	127	20.6	15.9	79.7	1047	24	358	110	1.82	214.	14	53	4.2	37
18.0	1134	871	3.49	11592	44.9	89.3	526	4332	120	19.3	14.8	80.4	1111	23	368	106	1.75	225.	15	55	4.3	39
19.0	1197	920	3.69	11913	46.2	86.9	547	4423	114	18.1	13.9	81.0	1176	21	377	102	1.69	235.	16	57	4.5	41
20.0	1260	968	3.88	12226	47.4	84.7	566	4505	108	17.0	13.1	81.5	1240	20	386	98	1.63	246.	16	59	4.7	43
25.0	1575	1210	4.85	13687	52.9	75.8	654	4816	86	13.2	10.2	83.4	1560	15	428	85	1.41	295.	20	70	5.4	52
30.0	1890	1452	5.82	15013	58.0	69.2	732	5023	72	10.8	8.3	84.6	1878	12	467	76	1.26	341.	23	81	6.0	60
35.0	2205	1694	6.79	16238	62.6	64.1	803	5171	61	9.1	7.0	85.4	2195	10	504	69	1.15	387.	27	90	6.6	
40.0	2520	1936	7.76	17382	67.0	59.9	867	5281	54	7.9	6.1	86.0	2511	9	539	64	1.06	427.	30	100	7.1	
45.0	2835	2178	8.73	18460	71.0	56.5	927	5367	48	7.0	5.4	86.5	2828	7	572	60	0.99	466.	33	109	7.6	
50.0	3150	2420	9.70	19484	74.9	53.6	984	5436	43	6.2	4.8	86.9	3143	7	605	57	0.94	504.	37	118	8.0	

#272 63 Cu on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 29. ZT= 92. ZC=121.( )
NEUTRON NUMBERS: NP= 34. NT=146. NC=180.

AP**1/3= 3.979 AT**1/3= 6.197
REDUCED MASS NUMBER= 49.81 AP+AT=AC=301.

INTERACTION RADIUS RINT=14.16 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.31 CT= 7.16 CT+CP=11.48 C= 2.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.53 RT= 7.30

COULOMB RADII [fm]:
RCP= 4.45 RCT= 6.98 RC=RCP+RCT=11.42

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 467.07 MeV K= .25724 n=2.560
VC(RINT)= 270.9 MeV

FISSION-TKE= 256. MeV
ASYMM. FISSION-TKE= 187. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 30.00 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -65.2 TARGET: 47.2
COMPOUND NUCLEUS: 221.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.69 fm V(RB)= 281.9 MeV
Q-VALUE= -239.5 MeV
L-CRITICAL= 66.

63 Cu on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	63	50	0.18	2720	10.9	420.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	126	100	0.37	3848	15.4	297.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	189	149	0.55	4714	18.9	242.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	252	199	0.74	5444	21.8	210.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	284	224	0.83	5775	23.1	198.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	315	249	0.92	6089	24.4	187.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	347	274	1.01	6387	25.6	179.1	36	66	0	157.3	149.6	11.3	126	221	75	1700	27.51	0.	2	13	1.0	3
6.0	378	299	1.10	6671	26.7	171.5	115	592	197	112.4	97.2	33.8	205	173	127	561	8.60	77.	4	17	1.3	6
6.5	410	324	1.20	6945	27.8	164.8	158	1035	182	92.3	77.3	43.9	269	141	162	408	6.24	83.	5	19	1.5	8
7.0	441	349	1.29	7208	28.8	158.8	192	1413	169	79.1	65.2	50.5	323	118	187	336	5.14	89.	5	22	1.7	10
7.5	473	374	1.38	7462	29.8	153.4	221	1741	158	69.5	56.7	55.3	371	102	207	293	4.47	95.	6	24	1.9	12
8.0	504	399	1.47	7708	30.8	148.5	247	2028	148	62.1	50.4	58.9	415	89	223	263	4.01	101.	6	26	2.1	14
8.5	536	423	1.56	7946	31.8	144.1	270	2280	139	56.2	45.4	61.9	457	79	237	240	3.66	106.	7	28	2.2	16
9.0	567	448	1.65	8177	32.7	140.0	291	2505	131	51.4	41.3	64.3	496	71	248	223	3.40	112.	7	30	2.4	18
9.5	599	473	1.75	8403	33.6	136.3	311	2706	124	47.4	38.0	66.3	535	64	258	208	3.18	117.	8	31	2.5	19
10.0	630	498	1.84	8622	34.5	132.8	329	2886	118	43.9	35.2	68.0	572	58	267	197	3.00	123.	8	33	2.6	21
10.5	662	523	1.93	8836	35.3	129.6	347	3050	112	41.0	32.8	69.5	608	54	275	187	2.85	128.	9	34	2.7	23
11.0	693	548	2.02	9045	36.1	126.7	364	3198	107	38.4	30.7	70.8	643	50	283	178	2.72	133.	9	36	2.9	24
11.5	725	573	2.11	9250	36.9	123.9	380	3334	103	36.1	28.8	71.9	678	46	290	171	2.60	138.	10	37	3.0	26
12.0	756	598	2.21	9450	37.7	121.3	395	3458	98	34.1	27.2	72.9	713	43	297	164	2.50	144.	10	39	3.1	27
13.0	819	648	2.39	9838	39.3	116.5	424	3678	91	30.7	24.4	74.6	781	38	309	153	2.33	154.	11	41	3.3	30
14.0	882	697	2.57	10213	40.8	112.3	451	3866	84	27.9	22.2	76.0	848	34	320	144	2.19	164.	12	44	3.5	33
15.0	945	747	2.76	10574	42.2	108.5	477	4029	79	25.6	20.3	77.2	914	31	330	136	2.07	175.	12	46	3.7	35
16.0	1008	797	2.94	10924	43.6	105.0	501	4172	74	23.7	18.8	78.2	980	28	340	129	1.97	184.	13	49	3.8	38
17.0	1071	847	3.13	11263	44.9	101.9	524	4298	69	22.0	17.4	79.0	1045	26	349	124	1.88	194.	14	51	4.0	40
18.0	1134	897	3.31	11592	46.2	99.0	547	4410	65	20.5	16.3	79.7	1110	24	358	119	1.81	203.	15	53	4.2	43
19.0	1197	946	3.49	11913	47.5	96.4	568	4510	62	19.3	15.3	80.4	1175	22	366	114	1.74	213.	15	56	4.3	45
20.0	1260	996	3.68	12226	48.7	93.9	589	4600	59	18.1	14.4	80.9	1239	21	374	110	1.68	222.	16	58	4.5	47
25.0	1575	1245	4.60	13687	54.5	84.0	682	4942	47	14.0	11.1	83.0	1559	16	412	95	1.45	267.	19	68	5.2	57
30.0	1890	1494	5.52	15013	59.7	76.7	765	5170	39	11.5	9.1	84.3	1878	12	447	85	1.29	310.	23	78	5.8	65
35.0	2205	1743	6.44	16238	64.5	71.0	839	5332	33	9.7	7.7	85.2	2195	10	480	77	1.18	351.	26	88	6.3	
40.0	2520	1993	7.35	17382	68.9	66.4	907	5454	29	8.4	6.6	85.8	2511	9	511	71	1.09	389.	29	97	6.8	
45.0	2835	2242	8.27	18460	73.1	62.6	970	5549	26	7.4	5.8	86.3	2827	8	540	67	1.02	424.	33	106	7.3	
50.0	3150	2491	9.19	19484	77.0	59.4	1030	5624	23	6.6	5.2	86.7	3143	7	569	63	0.96	458.	36	115	7.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 63 Cu

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#273 74 Ge on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 6. ZC= 38.(Sr)
NEUTRON NUMBERS: NP= 42. NT= 6. NC= 48.

AP**1/3= 4.198 AT**1/3= 2.289 ELSCAT < 9 deg
REDUCED MASS NUMBER= 10.33 AP+AT=AC= 86.

INTERACTION RADIUS RINT=10.15 fm RO= 1.56 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 2.12 CT+CP= 6.72 C̄= 1.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 2.52

COULOMB RADII [fm]:
RCP= 4.66 RCT= 2.51 RC=RCP+RCT= 7.18

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 52.72 MeV K= .06953 n=2.701
VC(RINT)= 27.2 MeV

FISSION-TKE= 57. MeV
ASYMM. FISSION-TKE= 30. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 16.95 MeV
L-RLD= 79 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 18.70 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: 0.0
COMPOUND NUCLEUS: -85.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.20 fm V(RB)= 27.9 MeV
Q-VALUE= 11.5 MeV
L-CRITICAL= 42.

74 Ge on 12 C

74 Ge on 12 C

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	10	0.38	3195	2.3	30.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	21	0.76	4519	3.2	21.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	31	1.14	5537	3.9	17.5	14	450	266	103.3	9.3	38.3	156	66	156	50	7.62	-184.	0	0	2.0	3
4.0	296	41	1.52	6395	4.5	15.1	27	1187	864	58.9	7.3	60.5	262	34	255	26	3.93	246.	4	14	2.2	3
4.5	333	46	1.71	6784	4.8	14.3	31	1427	1063	49.0	6.3	65.5	306	27	293	22	3.36	273.	5	16	2.3	4
5.0	370	52	1.90	7152	5.0	13.5	35	1618	1223	42.0	5.5	69.0	347	23	329	20	2.99	303.	5	19	2.4	4
5.5	407	57	2.09	7502	5.3	12.9	39	1773	1353	36.8	4.9	71.6	388	19	363	18	2.71	334.	6	21	2.5	4
6.0	444	62	2.28	7836	5.5	12.3	42	1902	1462	32.7	4.4	73.6	427	17	396	16	2.50	360.	7	23	2.6	5
6.5	481	67	2.47	8157	5.8	11.9	45	2010	1554	29.5	4.0	75.3	466	15	428	15	2.34	390.	7	25	2.7	5
7.0	518	72	2.66	8466	6.0	11.4	48	2103	1633	26.8	3.7	76.6	505	13	460	14	2.20	420.	8	26	2.8	5
7.5	555	77	2.85	8765	6.2	11.0	51	2183	1537	24.6	3.4	77.7	543	12	491	14	2.08	444.	8	28	2.9	6
8.0	592	83	3.04	9053	6.4	10.7	53	2253	1441	22.8	3.1	78.6	581	11	522	13	1.98	474.	9	30	3.0	6
8.5	629	88	3.23	9333	6.6	10.4	56	2314	1356	21.2	2.9	79.4	619	10	553	12	1.90	503.	9	32	3.0	6
9.0	666	93	3.42	9605	6.8	10.1	58	2368	1280	19.8	2.7	80.1	657	9	583	12	1.82	533.	10	33	3.1	6
9.5	703	98	3.61	9870	7.0	9.8	60	2417	1213	18.6	2.6	80.7	694	9	614	12	1.75	555.	10	35	3.2	7
10.0	740	103	3.80	10127	7.1	9.6	62	2461	1152	17.5	2.4	81.3	732	8	644	11	1.69	565.	11	36	3.3	7
10.5	777	108	3.99	10379	7.3	9.3	64	2500	1097	16.5	2.3	81.7	769	8	674	11	1.64	614.	11	38	3.3	7
11.0	814	114	4.18	10625	7.5	9.1	66	2536	1048	15.7	2.2	82.2	807	7	704	10	1.59	635.	12	39	3.4	8
11.5	851	119	4.37	10865	7.7	8.9	68	2568	1002	14.9	2.1	82.6	844	7	734	10	1.54	664.	13	41	3.5	8
12.0	888	124	4.56	11100	7.8	8.7	70	2598	960	14.2	2.0	82.9	881	7	764	10	1.50	693.	13	42	3.5	8
13.0	962	134	4.94	11556	8.1	8.4	74	2651	886	13.0	1.8	83.5	956	6	824	9	1.43	741.	14	45	3.7	9
14.0	1036	145	5.31	11996	8.5	8.1	77	2696	823	11.9	1.7	84.0	1031	5	883	9	1.36	798.	15	48	3.8	9
15.0	1110	155	5.69	12420	8.7	7.8	81	2735	768	11.1	1.5	84.5	1105	5	942	9	1.31	844.	16	51	3.9	10
16.0	1184	165	6.07	12831	9.0	7.6	84	2769	720	10.3	1.4	84.8	1179	5	1001	8	1.26	900.	17	54	4.1	10
17.0	1258	176	6.45	13229	9.3	7.3	87	2798	678	9.6	1.3	85.2	1254	4	1060	8	1.21	956.	18	56	4.2	10
18.0	1332	186	6.83	13616	9.6	7.1	90	2825	640	9.1	1.3	85.5	1328	4	1118	8	1.17	999.	19	59	4.3	11
19.0	1406	196	7.21	13993	9.8	6.9	93	2848	606	8.6	1.2	85.7	1402	4	1177	7	1.13	1054.	20	61	4.4	11
20.0	1480	207	7.59	14361	10.1	6.8	96	2870	576	8.1	1.1	86.0	1476	4	1235	7	1.10	1095.	21	64	4.5	12
25.0	1850	258	9.49	16077	11.3	6.0	108	2949	461	6.4	0.9	86.8	1847	3	1526	6	0.97	1332.	26	76	5.0	14
30.0	2220	310	11.39	17635	12.4	5.5	120	3002	384	5.3	0.7	87.4	2218	2	1814	6	0.88	1576.	31	88	5.5	15
35.0	2590	361	13.29	19073	13.4	5.1	130	3039	329	4.5	0.6	87.8	2588	2	2102	5	0.81	1787.	36	100	5.9	
40.0	2960	413	15.19	20416	14.3	4.8	140	3067	288	3.9	0.5	88.0	2958	2	2388	5	0.75	1983.	41	111	6.3	
45.0	3330	465	17.08	21683	15.1	4.5	149	3089	256	3.5	0.5	88.3	3329	1	2674	5	0.71	2198.	46	122	6.7	
50.0	3700	516	18.98	22886	16.0	4.3	158	3106	230	3.1	0.4	88.4	3699	1	2959	4	0.67	2405.	51	133	7.0	

#274 74 Ge on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 8. ZC= 40.(Zr)
NEUTRON NUMBERS: NP= 42. NT= 8. NC= 50.

AP**1/3= 4.198 AT**1/3= 2.520 ELSCAT <12 deg
REDUCED MASS NUMBER= 13.16 AP+AT=AC= 90.

INTERACTION RADIUS RINT=10.40 fm RO= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 2.42 CT+CP= 7.02 C̄= 1.59

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 2.78

COULOMB RADII [fm]:
RCP= 4.66 RCT= 2.78 RC=RCP+RCT= 7.45

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 68.33 MeV K= .09866 n=2.617
VC(RINT)= 35.4 MeV

FISSION-TKE= 60. MeV
ASYMM. FISSION-TKE= 39. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.931 MeV/fm**2 PROX-FACTOR= 18.56 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -4.7
COMPOUND NUCLEUS: -88.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.39 fm V(RB)= 36.5 MeV
Q-VALUE= 10.5 MeV
L-CRITICAL= 51.

74 Ge on 16 O

74 Ge on 16 O

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	13	0.37	3195	2.9	40.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	26	0.74	4519	4.1	28.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	39	1.12	5537	5.0	23.3	17	391	208	109.0	12.4	35.5	136	86	136	72	8.49	176.	2	5	2.1	3
4.0	296	53	1.49	6395	5.8	20.2	34	1177	849	61.0	9.7	59.5	251	45	243	35	4.12	232.	4	14	2.4	4
4.5	333	59	1.67	6784	6.1	19.0	40	1434	1063	50.6	8.4	64.7	298	35	282	30	3.50	261.	5	17	2.5	4
5.0	370	66	1.86	7152	6.4	18.0	45	1639	1233	43.3	7.3	68.4	341	29	317	27	3.10	287.	5	19	2.6	5
5.5	407	72	2.04	7502	6.7	17.2	50	1806	1373	37.8	6.5	71.1	382	25	351	24	2.81	316.	6	22	2.7	5
6.0	444	79	2.23	7836	7.0	16.5	54	1944	1490	33.6	5.8	73.2	422	22	383	22	2.59	345.	7	24	2.8	5
6.5	481	86	2.42	8157	7.3	15.8	58	2061	1588	30.3	5.3	74.9	462	19	414	21	2.41	369.	7	26	2.9	6
7.0	518	92	2.60	8466	7.6	15.2	62	2160	1491	27.6	4.8	76.2	501	17	444	19	2.27	397.	8	28	3.0	6
7.5	555	99	2.79	8765	7.9	14.7	66	2247	1392	25.3	4.4	77.4	539	16	474	18	2.15	426.	8	29	3.1	6
8.0	592	105	2.97	9053	8.1	14.3	69	2322	1305	23.4	4.1	78.3	578	14	503	17	2.04	449.	9	31	3.2	7
8.5	629	112	3.16	9333	8.4	13.8	72	2388	1228	21.7	3.8	79.2	616	13	533	17	1.95	477.	9	33	3.3	7
9.0	666	118	3.35	9605	8.6	13.4	75	2447	1160	20.3	3.6	79.9	654	12	562	16	1.87	499.	10	35	3.4	8
9.5	703	125	3.53	9870	8.9	13.1	78	2500	1099	19.0	3.3	80.5	692	11	590	15	1.80	526.	10	36	3.5	8
10.0	740	132	3.72	10127	9.1	12.7	81	2547	1044	17.9	3.2	81.0	730	10	619	15	1.74	554.	11	38	3.6	8
10.5	777	138	3.90	10379	9.3	12.4	84	2589	994	16.9	3.0	81.5	767	10	647	14	1.68	575.	11	39	3.6	9
11.0	814	145	4.09	10625	9.5	12.2	86	2628	949	16.0	2.8	82.0	805	9	675	14	1.63	602.	12	41	3.7	9
11.5	851	151	4.28	10865	9.8	11.9	89	2663	908	15.2	2.7	82.4	842	9	704	14	1.59	629.	12	43	3.8	9
12.0	888	158	4.46	11100	10.0	11.6	91	2696	870	14.5	2.6	82.7	880	8	732	13	1.54	649.	13	44	3.9	10
13.0	962	171	4.83	11556	10.4	11.2	96	2753	803	13.3	2.3	83.4	954	8	787	13	1.47	703.	14	47	4.0	10
14.0	1036	184	5.21	11996	10.8	10.8	101	2801	745	12.2	2.2	83.9	1029	7	843	12	1.40	747.	15	50	4.2	11
15.0	1110	197	5.58	12420	11.1	10.4	105	2844	696	11.3	2.0	84.3	1104	6	898	11	1.34	801.	16	53	4.3	11
16.0	1184	210	5.95	12831	11.5	10.1	109	2880	652	10.5	1.9	84.7	1178	6	953	11	1.29	843.	17	56	4.4	12
17.0	1258	224	6.32	13229	11.9	9.8	113	2913	614	9.9	1.7	85.1	1253	5	1008	11	1.24	896.	18	58	4.6	12
18.0	1332	237	6.69	13616	12.2	9.5	117	2942	580	9.3	1.6	85.4	1327	5	1063	10	1.20	936.	19	61	4.7	13
19.0	1406	250	7.06	13993	12.5	9.2	121	2967	549	8.7	1.6	85.6	1401	5	1117	10	1.17	988.	20	64	4.8	13
20.0	1480	263	7.44	14361	12.9	9.0	125	2990	522	8.3	1.5	85.9	1475	5	1172	10	1.13	1027.	21	66	4.9	14
25.0	1850	329	9.30	16077	14.4	8.1	141	3078	417	6.5	1.2	86.7	1846	4	1442	9	1.00	1250.	26	79	5.5	16
30.0	2220	395	11.15	17635	15.8	7.4	156	3135	348	5.4	1.0	87.3	2217	3	1710	8	0.90	1459.	31	91	6.0	18
35.0	2590	460	13.01	19073	17.0	6.8	170	3176	298	4.6	0.8	87.7	2588	2	1977	7	0.83	1655.	36	103	6.5	
40.0	2960	526	14.87	20416	18.2	6.4	183	3207	261	4.0	0.7	88.0	2958	2	2242	7	0.77	1838.	40	115	6.9	
45.0	3330	592	16.73	21683	19.3	6.0	195	3230	232	3.5	0.6	88.2	3328	2	2506	6	0.72	2037.	45	126	7.3	
50.0	3700	658	18.59	22886	20.3	5.7	206	3249	208	3.2	0.6	88.4	3698	2	2770	6	0.68	2196.	50	137	7.7	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#275 74 Ge on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 13. ZC= 45.(Rh)
NEUTRON NUMBERS: NP= 42. NT= 14. NC= 56.

AP**1/3= 4.198 AT**1/3= 3.000 ELSCAT <21 deg
REDUCED MASS NUMBER= 19.78 AP+AT=AC=101.

INTERACTION RADIUS RINT=10.93 fm R0= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 3.05 CT+CP= 7.64 C= 1.83

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 3.35

COULOMB RADII [fm]:
RCP= 4.66 RCT= 3.32 RC=RCP+RCT= 7.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 104.70 MeV K= .16053 n=2.514
VC(RINT)= 54.7 MeV

FISSION-TKE= 69. MeV
ASYMM. FISSION-TKE= 57. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.932 MeV/fm**2 PROX-FACTOR= 21.45 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -20.6
COMPOUND NUCLEUS: -87.0

FUSION RELATED PARAMETERS:
R-BARRIER= 9.81 fm V(RB)= 56.9 MeV
Q-VALUE= -7.3 MeV
L-CRITICAL= 72.

74 Ge on 27 Al

74 Ge on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	20	0.36	3195	4.3	65.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	148	40	0.72	4519	6.1	46.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	222	59	1.08	5537	7.5	37.8	23	314	126	118.1	21.2	30.9	94	128	94	136	10.31	156.	0 0	2.0	4
4.0	296	79	1.45	6395	8.7	32.8	52	1198	850	64.0	15.8	58.0	231	65	217	59	4.46	206.	4 15	2.4	5
4.5	333	89	1.63	6784	9.2	30.9	62	1490	1091	52.8	13.4	63.6	281	52	257	50	3.76	229.	5 18	2.5	6
5.0	370	99	1.81	7152	9.7	29.3	71	1722	1284	45.1	11.6	67.5	327	43	291	44	3.31	255.	5 21	2.7	6
5.5	407	109	1.99	7502	10.1	27.9	78	1911	1442	39.3	10.2	70.3	371	36	322	40	2.99	277.	6 23	2.8	7
6.0	444	119	2.17	7836	10.6	26.7	85	2068	1486	34.9	9.1	72.5	413	31	352	36	2.75	303.	6 25	3.0	7
6.5	481	129	2.35	8157	11.0	25.7	91	2201	1371	31.4	8.3	74.3	453	28	380	34	2.56	324.	7 27	3.1	8
7.0	518	138	2.53	8466	11.4	24.8	97	2315	1273	28.6	7.5	75.7	493	25	407	32	2.40	349.	8 29	3.2	8
7.5	555	148	2.71	8765	11.8	23.9	103	2413	1188	26.2	6.9	76.9	533	22	433	30	2.27	370.	8 31	3.3	9
8.0	592	158	2.89	9053	12.2	23.2	108	2499	1114	24.2	6.4	77.9	572	20	459	29	2.16	395.	9 33	3.5	9
8.5	629	168	3.07	9333	12.6	22.5	113	2575	1049	22.5	5.9	78.8	610	19	485	27	2.06	415.	9 35	3.6	10
9.0	666	178	3.25	9605	13.0	21.8	118	2642	990	21.0	5.6	79.5	649	17	510	26	1.98	439.	10 37	3.7	10
9.5	703	188	3.43	9870	13.3	21.3	123	2702	938	19.7	5.2	80.2	687	16	535	25	1.91	464.	10 39	3.8	10
10.0	740	198	3.61	10127	13.7	20.7	127	2756	891	18.5	4.9	80.7	725	15	559	24	1.84	483.	11 40	3.9	11
10.5	777	208	3.80	10379	14.0	20.2	131	2805	849	17.5	4.6	81.3	763	14	584	24	1.78	507.	11 42	4.0	11
11.0	814	218	3.98	10625	14.4	19.8	136	2850	810	16.6	4.4	81.7	801	13	608	23	1.72	525.	12 44	4.1	12
11.5	851	227	4.16	10865	14.7	19.3	140	2890	775	15.7	4.2	82.1	838	13	632	22	1.67	549.	12 45	4.2	12
12.0	888	237	4.34	11100	15.0	18.9	144	2927	743	15.0	4.0	82.5	876	12	656	22	1.63	567.	13 47	4.3	13
13.0	962	257	4.70	11556	15.6	18.2	151	2993	685	13.7	3.6	83.2	951	11	703	20	1.55	614.	14 50	4.4	13
14.0	1036	277	5.06	11996	16.2	17.5	158	3049	636	12.6	3.4	83.7	1026	10	750	20	1.47	653.	15 53	4.6	14
15.0	1110	297	5.42	12420	16.8	16.9	165	3097	594	11.7	3.1	84.2	1101	9	797	19	1.41	692.	16 56	4.8	15
16.0	1184	317	5.78	12831	17.3	16.4	172	3140	557	10.9	2.9	84.6	1176	8	843	18	1.36	730.	17 59	4.9	16
17.0	1258	336	6.14	13229	17.8	15.9	178	3177	524	10.2	2.7	84.9	1250	8	889	17	1.31	775.	18 62	5.1	16
18.0	1332	356	6.51	13616	18.4	15.4	185	3210	495	9.6	2.6	85.2	1325	7	935	17	1.27	811.	19 65	5.3	17
19.0	1406	376	6.87	13993	18.9	15.0	191	3240	469	9.0	2.4	85.5	1399	7	981	16	1.23	846.	20 67	5.4	18
20.0	1480	396	7.23	14361	19.3	14.6	196	3267	445	8.5	2.3	85.7	1474	6	1026	16	1.19	891.	21 70	5.5	18
25.0	1850	495	9.04	16077	21.6	13.1	223	3367	356	6.7	1.8	86.6	1845	5	1251	14	1.05	1073.	25 83	6.2	21
30.0	2220	593	10.84	17635	23.7	12.0	247	3434	297	5.5	1.5	87.2	2216	4	1474	13	0.95	1239.	30 96	6.8	24
35.0	2590	692	12.65	19073	25.6	11.1	268	3482	254	4.7	1.3	87.6	2587	3	1694	12	0.87	1408.	35 108	7.4	
40.0	2960	791	14.46	20416	27.4	10.4	289	3518	222	4.1	1.1	87.9	2957	3	1913	11	0.81	1545.	39 120	7.9	
45.0	3330	890	16.27	21683	29.0	9.8	307	3545	198	3.6	1.0	88.2	3327	3	2131	10	0.76	1690.	44 131	8.4	
50.0	3700	989	18.07	22886	30.6	9.3	325	3567	178	3.3	0.9	88.4	3698	2	2347	10	0.72	1824.	48 142	8.8	

#276 74 Ge on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 20. ZC= 52.(Te)
NEUTRON NUMBERS: NP= 42. NT= 20. NC= 62.

AP**1/3= 4.198 AT**1/3= 3.420 ELSCAT <32 deg
REDUCED MASS NUMBER= 25.96 AP+AT=AC=114.

INTERACTION RADIUS RINT=11.39 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 3.59 CT+CP= 8.19 C= 2.02

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 3.85

COULOMB RADII [fm]:
RCP= 4.66 RCT= 3.84 RC=RCP+RCT= 8.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 152.20 MeV K= .22705 n=2.460
VC(RINT)= 80.8 MeV

FISSION-TKE= 82. MeV
ASYMM. FISSION-TKE= 78. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.939 MeV/fm**2 PROX-FACTOR= 23.78 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -33.0
COMPOUND NUCLEUS: -82.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.20 fm V(RB)= 84.6 MeV
Q-VALUE= -24.5 MeV
L-CRITICAL= 87.

74 Ge on 40 Ca

74 Ge on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	26	0.32	3195	5.7	100.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	148	52	0.64	4519	8.0	71.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	222	78	0.96	5537	9.8	58.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	296	104	1.29	6395	11.4	50.4	61	930	605	79.3	25.8	50.4	186	110	174	107	5.48	184.	3 14	2.4	5
4.5	333	117	1.45	6784	12.0	47.5	76	1286	901	64.0	21.4	58.0	248	85	222	86	4.38	205.	4 17	2.5	6
5.0	370	130	1.61	7152	12.7	45.1	89	1570	1138	53.8	18.3	63.1	301	69	260	73	3.75	225.	5 20	2.7	7
5.5	407	143	1.77	7502	13.3	43.0	100	1802	1332	46.6	16.0	66.7	349	58	293	65	3.34	248.	6 23	2.9	7
6.0	444	156	1.93	7836	13.9	41.1	110	1994	1243	41.1	14.2	69.5	394	50	322	59	3.03	268.	6 25	3.0	8
6.5	481	169	2.09	8157	14.5	39.5	119	2157	1148	36.8	12.7	71.6	437	44	349	55	2.80	287.	7 28	3.2	9
7.0	518	182	2.25	8466	15.0	38.1	127	2296	1066	33.3	11.5	73.4	479	39	374	51	2.61	307.	7 30	3.3	10
7.5	555	195	2.41	8765	15.6	36.8	135	2417	995	30.4	10.6	74.8	520	35	399	48	2.46	328.	8 32	3.5	10
8.0	592	208	2.57	9053	16.1	35.6	143	2522	932	28.0	9.7	76.0	560	32	422	46	2.33	347.	8 34	3.6	11
8.5	629	221	2.73	9333	16.6	34.6	150	2615	877	25.9	9.0	77.0	600	29	445	43	2.22	369.	9 36	3.7	11
9.0	666	234	2.89	9605	17.0	33.6	157	2698	829	24.2	8.4	77.9	639	27	467	42	2.12	387.	10 37	3.8	12
9.5	703	247	3.05	9870	17.5	32.7	163	2772	785	22.6	7.9	78.7	678	25	489	40	2.04	408.	10 39	3.9	12
10.0	740	260	3.21	10127	18.0	31.9	170	2838	746	21.3	7.4	79.4	717	23	511	38	1.96	425.	11 41	4.1	13
10.5	777	273	3.37	10379	18.4	31.1	176	2898	710	20.1	7.0	80.0	756	21	532	37	1.90	447.	11 43	4.2	13
11.0	814	286	3.53	10625	18.8	30.4	182	2953	678	19.0	6.6	80.5	794	20	553	36	1.83	463.	12 44	4.3	14
11.5	851	299	3.70	10865	19.3	29.7	187	3002	648	18.0	6.3	81.0	832	19	574	35	1.78	484.	12 46	4.4	14
12.0	888	312	3.86	11100	19.7	29.1	193	3048	621	17.2	6.0	81.4	870	18	594	34	1.73	500.	13 48	4.5	15
13.0	962	338	4.18	11556	20.5	27.9	203	3128	574	15.7	5.5	82.2	946	16	635	32	1.64	536.	13 51	4.7	16
14.0	1036	364	4.50	11996	21.2	26.9	213	3197	533	14.4	5.0	82.8	1021	15	675	31	1.56	572.	14 54	4.9	17
15.0	1110	389	4.82	12420	22.0	26.0	223	3257	497	13.3	4.7	83.3	1096	14	715	29	1.49	613.	15 57	5.1	17
16.0	1184	415	5.14	12831	22.7	25.2	232	3309	466	12.4	4.3	83.8	1171	13	754	28	1.43	647.	16 60	5.2	18
17.0	1258	441	5.46	13229	23.4	24.4	241	3355	438	11.6	4.1	84.2	1246	12	793	27	1.38	680.	17 63	5.4	19
18.0	1332	467	5.78	13616	24.1	23.8	250	3396	414	10.9	3.8	84.6	1321	11	831	26	1.33	713.	18 66	5.6	20
19.0	1406	493	6.10	13993	24.8	23.1	258	3433	392	10.3	3.6	84.9	1396	10	870	25	1.29	744.	19 68	5.7	21
20.0	1480	519	6.43	14361	25.4	22.5	266	3466	373	9.7	3.4	85.2	1470	10	908	25	1.25	775.	20 71	5.9	22
25.0	1850	649	8.03	16077	28.4	20.2	303	3590	298	7.6	2.7	86.2	1843	7	1095	22	1.10	937.	25 84	6.6	25
30.0	2220	779	9.64	17635	31.1	18.4	335	3673	248	6.3	2.2	86.9	2214	6	1280	19	0.99	1086.	29 97	7.3	28
35.0	2590	909	11.25	19073	33.6	17.0	365	3732	213	5.3	1.9	87.3	2585	5	1462	18	0.91	1223.	34 109	7.9	
40.0	2960	1039	12.85	20416	35.9	15.9	393	3776	186	4.6	1.6	87.7	2956	4	1642	17	0.85	1348.	38 121	8.4	
45.0	3330	1168	14.46	21683	38.1	15.0	419	3811	165	4.1	1.4	87.9	3326	4	1820	16	0.80	1459.	42 132	9.0	
50.0	3700	1298	16.07	22886	40.2	14.3	443	3838	149	3.7	1.3	88.2	3697	3	1997	15	0.75	1579.	47 143	9.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#277 74 Ge on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 26. ZC= 58.(Ce)
NEUTRON NUMBERS: NP= 42. NT= 30. NC= 72.

AP**1/3= 4.198 AT**1/3= 3.826 ELSCAT <49 deg
REDUCED MASS NUMBER= 31.88 AP+AT=AC=130.

INTERACTION RADIUS RINT=11.83 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 4.12 CT+CP= 8.71 C= 2.17

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 4.35

COULOMB RADII [fm]:
RCP= 4.66 RCT= 4.27 RC=RCP+RCT= 8.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 188.72 MeV K= .26026 n=2.443
VC(RINT)= 101.1 MeV

FISSION-TKE= 93. MeV
ASYMM. FISSION-TKE= 92. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.932 MeV/fm**2 PROX-FACTOR= 25.43 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.30 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -61.4
COMPOUND NUCLEUS: -79.1

FUSION RELATED PARAMETERS:
R-BARRIER=10.62 fm V(RB)= 105.8 MeV
Q-VALUE= -55.9 MeV
L-CRITICAL= 103.

74 Ge on 56 Fe — 74 Ge on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	32	0.32	3195	7.0	131.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	64	0.63	4519	9.9	92.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	96	0.95	5537	12.1	75.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	296	128	1.26	6395	13.9	65.5	75	929	603	82.4	34.3	48.8	170	126	152	144	5.90	162.	3	14	2.1	5
4.5	333	143	1.42	6784	14.8	61.8	95	1320	929	66.1	27.9	56.9	236	97	201	114	4.65	181.	4	17	2.3	6
5.0	370	159	1.58	7152	15.6	58.6	111	1632	1191	55.5	23.6	62.3	291	79	238	97	3.96	199.	5	20	2.5	7
5.5	407	175	1.73	7502	16.4	55.9	126	1887	1269	47.9	20.4	66.0	341	66	269	86	3.51	217.	5	23	2.7	8
6.0	444	191	1.89	7836	17.1	53.5	139	2099	1163	42.2	18.0	68.9	388	56	296	78	3.18	235.	6	26	2.9	9
6.5	481	207	2.05	8157	17.8	51.4	150	2278	1074	37.7	16.2	71.1	432	49	320	72	2.93	253.	7	28	3.1	10
7.0	518	223	2.21	8466	18.4	49.5	161	2431	997	34.1	14.6	72.9	474	44	343	67	2.74	272.	7	30	3.2	10
7.5	555	239	2.36	8765	19.1	47.8	172	2564	930	31.2	13.4	74.4	516	39	364	63	2.57	289.	8	32	3.4	11
8.0	592	255	2.52	9053	19.7	46.3	181	2680	872	28.7	12.3	75.7	556	36	385	60	2.44	306.	8	34	3.5	12
8.5	629	271	2.68	9333	20.3	44.9	190	2783	821	26.6	11.4	76.7	596	33	405	57	2.32	322.	9	36	3.6	13
9.0	666	287	2.84	9605	20.9	43.7	199	2874	775	24.7	10.6	77.6	636	30	424	54	2.22	341.	9	38	3.8	13
9.5	703	303	2.99	9870	21.5	42.5	207	2955	734	23.2	10.0	78.4	675	28	443	52	2.13	357.	10	40	3.9	14
10.0	740	319	3.15	10127	22.0	41.4	215	3028	698	21.8	9.4	79.1	714	26	461	50	2.05	372.	10	41	4.0	15
10.5	777	335	3.31	10379	22.6	40.4	223	3094	664	20.5	8.8	79.7	753	24	479	48	1.98	391.	11	43	4.1	15
11.0	814	351	3.47	10625	23.1	39.5	231	3154	634	19.4	8.4	80.3	791	23	497	47	1.91	406.	11	45	4.3	16
11.5	851	367	3.62	10865	23.6	38.6	238	3209	607	18.4	7.9	80.8	830	21	514	45	1.85	421.	12	46	4.4	17
12.0	888	383	3.78	11100	24.2	37.8	245	3259	581	17.5	7.6	81.2	868	20	531	44	1.80	439.	12	48	4.5	17
13.0	962	414	4.10	11556	25.1	36.3	259	3348	537	16.0	6.9	82.0	944	18	566	42	1.71	467.	13	51	4.7	19
14.0	1036	446	4.41	11996	26.1	35.0	271	3424	498	14.7	6.3	82.6	1019	17	599	40	1.63	499.	14	54	4.9	20
15.0	1110	478	4.73	12420	27.0	33.8	284	3490	465	13.6	5.9	83.2	1095	15	632	38	1.56	529.	15	57	5.1	21
16.0	1184	510	5.04	12831	27.9	32.8	295	3548	436	12.7	5.4	83.7	1170	14	664	37	1.49	560.	16	60	5.3	22
17.0	1258	542	5.36	13229	28.7	31.8	307	3599	410	11.8	5.1	84.1	1245	13	697	35	1.44	589.	17	63	5.5	23
18.0	1332	574	5.67	13616	29.6	30.9	318	3644	387	11.1	4.8	84.4	1320	12	728	34	1.39	618.	18	66	5.6	24
19.0	1406	606	5.99	13993	30.4	30.1	328	3684	367	10.5	4.5	84.8	1395	11	760	33	1.34	646.	19	69	5.8	25
20.0	1480	638	6.30	14361	31.2	29.3	338	3720	349	9.9	4.3	85.1	1469	11	791	32	1.30	674.	19	71	6.0	26
25.0	1850	797	7.88	16077	34.9	26.2	385	3858	279	7.8	3.4	86.1	1842	8	945	28	1.15	810.	24	84	6.8	30
30.0	2220	956	9.46	17635	38.2	23.9	427	3950	232	6.4	2.8	86.8	2213	7	1095	25	1.03	933.	28	97	7.4	34
35.0	2590	1116	11.03	19073	41.2	22.1	465	4015	199	5.4	2.3	87.3	2584	6	1243	23	0.95	1043.	32	109	8.1	
40.0	2960	1275	12.61	20416	44.1	20.7	501	4064	174	4.7	2.0	87.6	2955	5	1388	22	0.88	1153.	37	120	8.7	
45.0	3330	1434	14.18	21683	46.8	19.5	533	4102	155	4.2	1.8	87.9	3326	4	1532	20	0.83	1253.	41	132	9.2	
50.0	3700	1594	15.76	22886	49.3	18.5	564	4132	139	3.8	1.6	88.1	3696	4	1674	19	0.78	1344.	45	142	9.7	

#278 74 Ge on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 29. ZC= 61.(Pm)
NEUTRON NUMBERS: NP= 42. NT= 34. NC= 76.

AP**1/3= 4.198 AT**1/3= 3.979 ELSCAT <58 deg
REDUCED MASS NUMBER= 34.03 AP+AT=AC=137.

INTERACTION RADIUS RINT=12.00 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 4.31 CT+CP= 8.91 C= 2.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 4.53

COULOMB RADII [fm]:
RCP= 4.66 RCT= 4.45 RC=RCP+RCT= 9.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 206.51 MeV K= .27350 n=2.440
VC(RINT)= 111.2 MeV

FISSION-TKE= 100. MeV
ASYMM. FISSION-TKE= 99. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.931 MeV/fm**2 PROX-FACTOR= 26.04 MeV
L-RLD= 83 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.92 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -65.2
COMPOUND NUCLEUS: -74.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.77 fm V(RB)= 116.4 MeV
Q-VALUE= -64.6 MeV
L-CRITICAL= 107.

74 Ge on 63 Cu — 74 Ge on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	34	0.31	3195	7.4	146.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	68	0.61	4519	10.5	103.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	102	0.92	5537	12.9	84.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	296	136	1.22	6395	14.9	73.1	76	844	527	87.6	39.4	46.2	155	141	137	171	6.36	154.	3	13	2.0	5
4.5	333	153	1.38	6784	15.8	68.9	99	1258	874	69.7	31.7	55.1	225	108	189	132	4.90	172.	4	17	2.3	6
5.0	370	170	1.53	7152	16.6	65.3	117	1588	1151	58.2	26.6	60.9	283	87	228	111	4.13	190.	5	20	2.5	7
5.5	407	187	1.68	7502	17.5	62.3	133	1858	1213	50.1	22.9	64.9	334	73	259	98	3.64	207.	5	23	2.7	8
6.0	444	204	1.84	7836	18.2	59.7	147	2083	1112	44.1	20.2	68.0	382	62	286	88	3.28	224.	6	25	2.9	9
6.5	481	221	1.99	8157	19.0	57.3	160	2273	1026	39.3	18.0	70.3	427	54	310	81	3.02	241.	7	28	3.0	10
7.0	518	238	2.14	8466	19.7	55.2	172	2435	953	35.5	16.3	72.2	470	48	332	76	2.81	257.	7	30	3.2	11
7.5	555	255	2.29	8765	20.4	53.4	184	2576	889	32.4	14.9	73.8	512	43	353	71	2.64	273.	8	32	3.3	12
8.0	592	272	2.45	9053	21.1	51.7	194	2699	834	29.8	13.7	75.1	553	39	372	67	2.50	292.	8	34	3.5	12
8.5	629	289	2.60	9333	21.7	50.1	204	2808	785	27.6	12.7	76.2	593	36	391	64	2.37	307.	9	36	3.6	13
9.0	666	306	2.75	9605	22.3	48.7	214	2904	741	25.7	11.8	77.2	633	33	410	61	2.27	323.	9	38	3.8	14
9.5	703	323	2.91	9870	22.9	47.4	223	2990	702	24.0	11.0	78.0	673	30	428	59	2.17	338.	10	39	3.9	15
10.0	740	340	3.06	10127	23.5	46.2	232	3068	667	22.6	10.4	78.7	712	28	445	56	2.09	353.	10	41	4.0	16
10.5	777	357	3.21	10379	24.1	45.1	240	3138	635	21.3	9.8	79.4	751	26	462	54	2.02	370.	11	43	4.1	16
11.0	814	374	3.37	10625	24.7	44.1	248	3202	606	20.1	9.2	79.9	789	25	479	53	1.95	385.	11	45	4.3	17
11.5	851	391	3.52	10865	25.2	43.1	256	3260	580	19.1	8.8	80.4	828	23	495	51	1.89	399.	12	46	4.4	18
12.0	888	408	3.67	11100	25.8	42.2	264	3313	556	18.2	8.3	80.9	866	22	511	49	1.84	416.	12	48	4.5	18
13.0	962	442	3.98	11556	26.8	40.5	278	3407	513	16.6	7.6	81.7	942	20	543	47	1.74	443.	13	51	4.7	20
14.0	1036	476	4.28	11996	27.8	39.1	292	3488	476	15.2	7.0	82.4	1018	18	575	45	1.66	474.	14	54	4.9	21
15.0	1110	510	4.59	12420	28.8	37.7	306	3558	444	14.1	6.5	83.0	1093	17	605	43	1.58	503.	15	57	5.1	22
16.0	1184	544	4.89	12831	29.8	36.5	319	3619	417	13.1	6.0	83.5	1169	15	636	41	1.52	532.	16	60	5.3	23
17.0	1258	578	5.20	13229	30.7	35.4	331	3673	392	12.2	5.6	83.9	1244	14	666	39	1.46	560.	17	63	5.5	24
18.0	1332	613	5.51	13616	31.6	34.4	343	3721	370	11.5	5.3	84.3	1319	13	695	38	1.41	588.	17	66	5.7	25
19.0	1406	647	5.81	13993	32.4	33.5	354	3764	351	10.8	5.0	84.6	1394	12	725	37	1.37	615.	18	68	5.8	26
20.0	1480	681	6.12	14361	33.3	32.7	365	3802	333	10.2	4.7	84.9	1468	12	754	36	1.33	641.	19	71	6.0	27
25.0	1850	851	7.65	16077	37.2	29.2	416	3948	266	8.0	3.7	86.0	1841	9	896	31	1.16	765.	23	84	6.8	32
30.0	2220	1021	9.18	17635	40.8	26.7	462	4046	222	6.6	3.0	86.7	2213	7	1035	28	1.05	883.	28	96	7.5	36
35.0	2590	1191	10.71	19073	44.0	24.7	503	4115	190	5.6	2.6	87.2	2584	6	1171	26	0.96	990.	32	108	8.1	
40.0	2960	1361	12.24	20416	47.1	23.1	541	4167	166	4.9	2.2	87.6	2955	5	1305	24	0.90	1096.	36	120	8.7	
45.0	3330	1531	13.77	21683	49.9	21.8	577	4207	148	4.3	2.0	87.8	3325	5	1437	23	0.84	1181.	40	131	9.3	
50.0	3700	1701	15.30	22886	52.6	20.7	610	4239	133	3.9	1.8	88.1	3696	4	1568	21	0.79	1283.	44	142	9.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#279 74 Ge on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 42. ZC= 74.(W)
NEUTRON NUMBERS: NP= 42. NT= 50. NC= 92.

AP**1/3= 4.198 AT**1/3= 4.514
REDUCED MASS NUMBER= 41.01 AP+AT=AC=166.

INTERACTION RADIUS RINT=12.58 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 5.00 CT+CP= 9.60 C= 2.40

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 5.20

COULOMB RADII [fm]:
RCP= 4.66 RCT= 5.08 RC=RCP+RCT= 9.74

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 279.43 MeV K= .30724 n=2.449
VC(RINT)= 153.7 MeV

FISSION-TKE= 129. MeV
ASYMM. FISSION-TKE= 127. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.932 MeV/fm**2 PROX-FACTOR= 28.05 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -87.5
COMPOUND NUCLEUS: -41.9

FUSION RELATED PARAMETERS:
R-BARRIER=11.29 fm V(RB)= 161.1 MeV
Q-VALUE= -119.2 MeV
L-CRITICAL= 116.

74 Ge on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGWAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	41	0.27	3195	9.0	211.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	148	82	0.53	4519	12.7	149.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	222	123	0.80	5537	15.5	122.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	296	164	1.07	6395	17.9	105.8	56	320	73	124.0	73.5	28.0	68	228	57	420	11.41	129.	1	9	1.5	3
4.5	333	185	1.20	6784	19.0	99.8	98	844	510	91.2	51.9	44.4	165	168	133	244	6.57	144.	3	14	1.8	5
5.0	370	205	1.33	7152	20.1	94.6	126	1261	860	73.8	41.6	53.1	236	132	184	189	5.09	159.	4	18	2.0	6
5.5	407	226	1.47	7502	21.0	90.2	149	1601	970	62.3	34.9	58.8	299	108	221	160	4.30	173.	5	21	2.3	8
6.0	444	246	1.60	7836	22.0	86.4	169	1885	889	54.1	30.2	62.9	353	91	251	141	3.79	187.	5	24	2.5	9
6.5	481	267	1.73	8157	22.9	83.0	187	2124	821	47.9	26.7	66.1	403	78	276	128	3.43	201.	6	26	2.7	10
7.0	518	287	1.87	8466	23.7	80.0	203	2329	762	42.9	23.9	68.5	449	69	297	117	3.16	215.	7	29	2.8	11
7.5	555	308	2.00	8765	24.6	77.3	218	2507	711	39.0	21.7	70.5	494	61	317	109	2.94	229.	7	31	3.0	12
8.0	592	328	2.14	9053	25.4	74.8	233	2662	667	35.7	19.8	72.2	537	55	335	103	2.76	243.	8	33	3.2	13
8.5	629	349	2.27	9333	26.2	72.6	246	2799	628	32.9	18.3	73.6	579	50	352	97	2.61	257.	8	35	3.3	14
9.0	666	369	2.40	9605	26.9	70.5	258	2921	593	30.5	17.0	74.7	620	46	368	92	2.48	270.	9	36	3.5	15
9.5	703	390	2.54	9870	27.6	68.7	271	3030	561	28.5	15.8	75.8	661	42	384	88	2.37	283.	9	38	3.6	16
10.0	740	410	2.67	10127	28.4	66.9	282	3128	533	26.7	14.8	76.7	701	39	399	85	2.28	296.	10	40	3.7	17
10.5	777	431	2.80	10379	29.1	65.3	293	3216	508	25.1	13.9	77.4	741	36	413	81	2.19	309.	10	42	3.9	18
11.0	814	451	2.94	10625	29.8	63.8	304	3297	485	23.7	13.2	78.1	780	34	427	79	2.11	323.	11	43	4.0	18
11.5	851	472	3.07	10865	30.4	62.4	314	3370	464	22.5	12.5	78.8	819	32	441	76	2.04	336.	11	45	4.1	19
12.0	888	492	3.20	11100	31.1	61.1	324	3437	444	21.4	11.8	79.3	858	30	454	74	1.98	348.	12	46	4.2	20
13.0	962	533	3.47	11556	32.3	58.7	343	3556	410	19.4	10.8	80.3	935	27	480	70	1.87	372.	12	50	4.5	22
14.0	1036	574	3.74	11996	33.6	56.6	361	3658	381	17.8	9.9	81.1	1011	25	505	66	1.78	398.	13	53	4.7	23
15.0	1110	615	4.00	12420	34.7	54.6	378	3747	355	16.4	9.1	81.8	1088	22	529	63	1.70	420.	14	55	4.9	25
16.0	1184	656	4.27	12831	35.9	52.9	395	3824	333	15.3	8.5	82.4	1163	21	553	60	1.63	445.	15	58	5.1	26
17.0	1258	697	4.54	13229	37.0	51.3	411	3892	314	14.2	7.9	82.9	1239	19	577	58	1.56	466.	16	61	5.3	28
18.0	1332	738	4.80	13616	38.1	49.9	426	3953	296	13.4	7.4	83.3	1314	18	600	56	1.51	490.	17	64	5.5	29
19.0	1406	779	5.07	13993	39.1	48.6	441	4007	280	12.6	7.0	83.7	1389	17	623	54	1.46	513.	18	66	5.6	30
20.0	1480	820	5.34	14361	40.1	47.3	455	4055	266	11.9	6.6	84.1	1464	16	645	52	1.41	532.	18	69	5.8	32
25.0	1850	1025	6.67	16077	44.9	42.3	520	4240	213	9.3	5.2	85.3	1838	12	755	46	1.23	640.	22	82	6.6	37
30.0	2220	1230	8.01	17635	49.1	38.6	578	4364	177	7.6	4.2	86.2	2210	10	860	41	1.11	733.	26	94	7.3	43
35.0	2590	1435	9.34	19073	53.1	35.8	631	4451	152	6.5	3.6	86.8	2582	8	962	38	1.02	827.	30	105	8.0	
40.0	2960	1640	10.68	20416	56.7	33.5	679	4517	133	5.6	3.1	87.2	2953	7	1063	35	0.94	914.	34	116	8.6	
45.0	3330	1846	12.01	21683	60.2	31.5	725	4568	118	5.0	2.8	87.5	3324	6	1161	33	0.89	992.	38	127	9.1	
50.0	3700	2051	13.35	22886	63.4	29.9	767	4609	106	4.5	2.5	87.8	3694	6	1258	31	0.84	1063.	42	137	9.6	

#280 74 Ge on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 47. ZC= 79.(Au)
NEUTRON NUMBERS: NP= 42. NT= 61. NC=103.

AP**1/3= 4.198 AT**1/3= 4.762
REDUCED MASS NUMBER= 43.91 AP+AT=AC=182.

INTERACTION RADIUS RINT=12.85 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 5.32 CT+CP= 9.92 C= 2.47

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 5.50

COULOMB RADII [fm]:
RCP= 4.66 RCT= 5.34 RC=RCP+RCT=10.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 304.39 MeV K= .30984 n=2.454
VC(RINT)= 168.4 MeV

FISSION-TKE= 140. MeV
ASYMM. FISSION-TKE= 135. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.922 MeV/fm**2 PROX-FACTOR= 28.58 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -87.6
COMPOUND NUCLEUS: -28.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.54 fm V(RB)= 176.1 MeV
Q-VALUE= -132.8 MeV
L-CRITICAL= 122.

74 Ge on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGWAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	44	0.26	3195	9.6	236.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	148	88	0.52	4519	13.6	167.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	222	132	0.78	5537	16.6	136.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	296	176	1.04	6395	19.2	118.4	50	217	0	134.6	91.4	22.7	53	243	41	581	14.47	0.	1	9	1.4	3
4.5	333	198	1.17	6784	20.4	111.6	100	777	455	96.1	59.8	41.9	155	178	121	290	7.14	132.	3	14	1.7	5
5.0	370	220	1.30	7152	21.5	105.9	133	1222	828	77.1	47.0	51.5	231	139	173	219	5.39	145.	4	18	2.0	7
5.5	407	242	1.43	7502	22.5	101.0	159	1586	929	64.8	39.2	57.6	294	113	210	183	4.51	158.	5	21	2.2	8
6.0	444	263	1.56	7836	23.5	96.7	181	1888	852	56.1	33.7	61.9	349	95	239	161	3.95	171.	5	24	2.4	9
6.5	481	285	1.70	8157	24.5	92.9	201	2144	786	49.5	29.7	65.2	399	82	263	145	3.56	184.	6	26	2.6	11
7.0	518	307	1.83	8466	25.4	89.5	219	2363	730	44.4	26.6	67.8	447	71	284	133	3.27	197.	7	28	2.8	12
7.5	555	329	1.96	8765	26.3	86.5	236	2552	681	40.2	24.0	69.9	492	63	303	124	3.04	209.	7	30	2.9	13
8.0	592	351	2.09	9053	27.2	83.7	252	2718	639	36.8	22.0	71.6	535	57	320	116	2.85	221.	8	32	3.1	15
8.5	629	373	2.22	9333	28.0	81.2	266	2864	601	33.9	20.2	73.0	577	52	336	110	2.69	233.	8	34	3.3	16
9.0	666	395	2.35	9605	28.8	78.9	280	2994	568	31.5	18.7	74.3	619	47	351	104	2.56	245.	9	36	3.4	17
9.5	703	417	2.48	9870	29.6	76.8	294	3111	538	29.3	17.5	75.3	660	43	365	99	2.44	257.	9	38	3.5	18
10.0	740	439	2.61	10127	30.4	74.9	306	3215	511	27.5	16.4	76.3	700	40	378	95	2.34	269.	10	39	3.7	19
10.5	777	461	2.74	10379	31.1	73.1	318	3310	486	25.9	15.4	77.1	739	38	391	92	2.25	281.	10	41	3.8	20
11.0	814	483	2.87	10625	31.9	71.4	330	3396	464	24.4	14.5	77.8	779	35	404	88	2.17	293.	10	43	3.9	21
11.5	851	505	3.00	10865	32.6	69.8	342	3474	444	23.1	13.7	78.4	818	33	416	86	2.10	304.	11	44	4.0	22
12.0	888	527	3.13	11100	33.3	68.4	352	3546	426	22.0	13.1	79.0	857	31	428	83	2.03	315.	11	46	4.2	23
13.0	962	571	3.39	11556	34.6	65.7	373	3673	393	20.0	11.9	80.0	934	28	451	78	1.92	337.	12	49	4.4	25
14.0	1036	615	3.65	11996	35.9	63.3	393	3782	365	18.3	10.9	80.9	1011	25	474	74	1.82	361.	13	52	4.6	26
15.0	1110	659	3.91	12420	37.2	61.1	412	3876	340	16.9	10.0	81.6	1087	23	496	71	1.74	382.	14	55	4.8	28
16.0	1184	703	4.17	12831	38.4	59.2	430	3959	319	15.7	9.3	82.2	1163	21	517	68	1.67	402.	15	57	5.0	30
17.0	1258	747	4.43	13229	39.6	57.4	448	4032	300	14.6	8.7	82.7	1238	20	538	65	1.60	424.	16	60	5.2	31
18.0	1332	790	4.69	13616	40.7	55.8	464	4096	284	13.7	8.1	83.1	1314	18	559	63	1.54	446.	16	63	5.4	32
19.0	1406	834	4.96	13993	41.9	54.3	480	4154	269	12.9	7.7	83.5	1389	17	579	61	1.49	465.	17	65	5.6	34
20.0	1480	878	5.22	14361	43.0	53.0	496	4206	255	12.2	7.2	83.9	1464	16	599	59	1.44	486.	18	68	5.7	35
25.0	1850	1098	6.52	16077	48.0	47.4	568	4404	204	9.5	5.7	85.2	1838	12	695	51	1.26	578.	22	80	6.5	42
30.0	2220	1317	7.82	17635	52.6	43.2	631	4535	170	7.8	4.7	86.1	2210	10	787	46	1.14	669.	26	92	7.2	47
35.0	2590	1537	9.13	19073	56.8	40.0	689	4629	146	6.7	3.9	86.7	2582	8	876	42	1.04	752.	30	103	7.9	
40.0	2960	1756	10.43	20416	60.7	37.4	742	4700	127	5.8	3.4	87.1	2953	7	964	39	0.97	826.	34	114	8.4	
45.0	3330	1976	11.74	21683	64.4	35.3	792	4754	113	5.1	3.0	87.4	3324	6	1049	37	0.91	900.	37	125	9.0	
50.0	3700	2196	13.04	22886	67.9	33.5	838	4798	102	4.6	2.7	87.7	3694	6	1133	35	0.85	967.	41	135	9.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	--	-N	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#281 74 Ge on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 58. ZC= 90.(Th)
NEUTRON NUMBERS: NP= 42. NT= 82. NC=124.

AP**1/3= 4.198 AT**1/3= 5.192
REDUCED MASS NUMBER= 48.41 AP+AT=AC=214.

INTERACTION RADIUS RINT=13.31 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 5.87 CT+CP=10.47 C= 2.58

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.04

COULOMB RADII [fm]:
RCP= 4.66 RCT= 5.82 RC=RCP+RCT=10.48

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 357.73 MeV K= .30954 n=2.472
VC(RINT)= 200.5 MeV

FISSION-TKE= 167. MeV
ASYMM. FISSION-TKE= 153. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 29.45 MeV
L-RLD= 70 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -88.2
COMPOUND NUCLEUS: 10.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.96 fm V(RB)= 209.2 MeV
Q-VALUE= -171.9 MeV
L-CRITICAL= 122.

74 Ge on 140 Ce

74 Ge on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	48	0.24	3195	10.6	292.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	97	0.48	4519	15.0	206.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	145	0.72	5537	18.3	168.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	296	194	0.97	6395	21.2	146.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	333	218	1.09	6784	22.5	137.8	84	448	177	117.4	85.6	31.3	113	220	82	488	10.13	113.	2	12	1.3	4
5.0	370	242	1.21	7152	23.7	130.7	130	965	608	90.2	62.3	44.9	202	168	144	315	6.52	124.	3	16	1.6	6
5.5	407	266	1.33	7502	24.8	124.6	164	1387	774	74.5	50.4	52.8	272	135	186	251	5.17	136.	4	20	1.9	7
6.0	444	290	1.45	7836	25.9	119.3	192	1738	709	63.7	42.7	58.1	332	112	218	214	4.42	147.	5	22	2.1	9
6.5	481	315	1.57	8157	27.0	114.6	216	2034	654	55.9	37.2	62.1	386	95	243	190	3.92	158.	6	25	2.3	11
7.0	518	339	1.69	8466	28.0	110.5	238	2288	608	49.8	33.0	65.1	435	83	264	173	3.56	169.	6	27	2.5	12
7.5	555	363	1.81	8765	29.0	106.7	258	2509	567	44.9	29.7	67.5	482	73	282	159	3.29	179.	7	29	2.7	14
8.0	592	387	1.93	9053	29.9	103.3	277	2701	532	41.0	27.0	69.5	526	66	298	149	3.07	190.	7	31	2.8	15
8.5	629	411	2.05	9333	30.9	100.2	294	2871	500	37.6	24.8	71.2	570	59	313	140	2.88	200.	8	33	3.0	17
9.0	666	436	2.17	9605	31.8	97.4	311	3022	473	34.8	22.9	72.6	612	54	327	133	2.73	211.	8	35	3.1	18
9.5	703	460	2.29	9870	32.6	94.8	326	3157	448	32.4	21.3	73.8	653	50	339	126	2.60	220.	9	36	3.3	20
10.0	740	484	2.41	10127	33.5	92.4	341	3278	425	30.3	19.9	74.8	694	46	351	121	2.49	231.	9	38	3.4	21
10.5	777	508	2.54	10379	34.3	90.2	355	3388	405	28.5	18.7	75.8	734	43	363	116	2.39	241.	10	40	3.5	22
11.0	814	533	2.66	10625	35.1	88.1	369	3487	387	26.9	17.6	76.6	774	40	374	112	2.30	251.	10	41	3.7	23
11.5	851	557	2.78	10865	35.9	86.2	382	3579	370	25.4	16.7	77.3	814	37	385	108	2.22	261.	11	43	3.8	24
12.0	888	581	2.90	11100	36.7	84.4	395	3662	354	24.1	15.8	77.9	853	35	395	104	2.15	270.	11	44	3.9	26
13.0	962	629	3.14	11556	38.2	81.1	419	3810	327	21.9	14.3	79.1	931	31	415	98	2.02	289.	12	47	4.1	28
14.0	1036	678	3.38	11996	39.6	78.1	442	3936	304	20.0	13.1	80.0	1008	28	434	93	1.92	308.	13	50	4.3	30
15.0	1110	726	3.62	12420	41.0	75.5	464	4046	283	18.5	12.1	80.8	1084	26	452	89	1.83	326.	13	53	4.6	32
16.0	1184	775	3.86	12831	42.4	73.1	485	4142	266	17.1	11.2	81.4	1160	24	470	85	1.75	344.	14	55	4.7	34
17.0	1258	823	4.10	13229	43.7	70.9	505	4226	250	16.0	10.5	82.0	1236	22	487	81	1.68	362.	15	58	4.9	36
18.0	1332	871	4.35	13616	44.9	68.9	525	4301	236	15.0	9.8	82.5	1312	20	504	79	1.62	381.	16	61	5.1	37
19.0	1406	920	4.59	13993	46.2	67.0	543	4368	224	14.1	9.2	83.0	1387	19	520	76	1.56	397.	17	63	5.3	39
20.0	1480	968	4.83	14361	47.4	65.3	561	4429	212	13.3	8.7	83.4	1462	18	537	73	1.51	413.	17	66	5.5	41
25.0	1850	1210	6.04	16077	52.9	58.4	644	4658	170	10.4	6.8	84.8	1836	14	614	64	1.32	496.	21	78	6.2	48
30.0	2220	1452	7.24	17635	58.0	53.4	717	4811	141	8.5	5.6	85.7	2209	11	688	57	1.18	570.	25	89	6.9	55
35.0	2590	1694	8.45	19073	62.6	49.4	783	4920	121	7.2	4.7	86.4	2581	9	760	53	1.08	644.	29	100	7.5	
40.0	2960	1936	9.66	20416	67.0	46.2	844	5002	106	6.3	4.1	86.9	2952	8	829	49	1.01	707.	32	110	8.1	
45.0	3330	2179	10.87	21683	71.0	43.6	901	5066	94	5.5	3.6	87.2	3323	7	896	46	0.94	769.	36	120	8.7	
50.0	3700	2421	12.07	22886	74.9	41.3	954	5116	85	5.0	3.2	87.5	3694	6	962	43	0.89	831.	40	130	9.2	

#282 74 Ge on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 62. ZC= 94.(Pu)
NEUTRON NUMBERS: NP= 42. NT= 92. NC=134.

AP**1/3= 4.198 AT**1/3= 5.360
REDUCED MASS NUMBER= 49.98 AP+AT=AC=228.

INTERACTION RADIUS RINT=13.49 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 6.09 CT+CP=10.69 C= 2.62

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.25

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.00 RC=RCP+RCT=10.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 375.65 MeV K= .30585 n=2.479
VC(RINT)= 211.4 MeV

FISSION-TKE= 177. MeV
ASYMM. FISSION-TKE= 159. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 29.61 MeV
L-RLD= 68 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.10 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -72.1
COMPOUND NUCLEUS: 37.0

FUSION RELATED PARAMETERS:
R-BARRIER=12.12 fm V(RB)= 220.3 MeV
Q-VALUE= -182.7 MeV
L-CRITICAL= 122.

74 Ge on 154 Sm

74 Ge on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	50	0.24	3195	10.9	312.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	100	0.47	4519	15.5	220.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	150	0.71	5537	18.9	180.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	296	200	0.95	6395	21.9	156.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	333	225	1.06	6784	23.2	147.3	76	345	93	125.5	97.0	27.3	102	231	71	601	11.86	106.	2	12	1.2	4
5.0	370	250	1.18	7152	24.4	139.7	129	888	546	94.6	68.1	42.7	195	175	136	356	6.98	117.	3	16	1.5	6
5.5	407	275	1.30	7502	25.6	133.2	166	1331	722	77.5	54.5	51.2	267	140	180	277	5.43	127.	4	19	1.8	8
6.0	444	300	1.42	7836	26.8	127.5	196	1699	662	66.1	45.9	56.9	328	116	212	235	4.59	138.	5	22	2.0	10
6.5	481	325	1.54	8157	27.9	122.5	222	2011	611	57.8	39.9	61.1	382	99	237	207	4.05	148.	6	24	2.2	12
7.0	518	350	1.65	8466	28.9	118.1	245	2277	567	51.4	35.3	64.3	433	85	258	188	3.67	158.	6	27	2.4	14
7.5	555	375	1.77	8765	29.9	114.1	267	2508	529	46.3	31.7	66.8	480	75	275	173	3.38	168.	7	29	2.6	15
8.0	592	400	1.89	9053	30.9	110.5	286	2710	496	42.2	28.8	68.9	525	67	291	161	3.14	178.	7	31	2.8	17
8.5	629	425	2.01	9333	31.9	107.2	305	2889	467	38.8	26.4	70.6	568	61	305	151	2.95	188.	8	32	2.9	18
9.0	666	450	2.13	9605	32.8	104.1	322	3047	441	35.8	24.4	72.1	611	55	318	143	2.80	197.	8	34	3.1	20
9.5	703	475	2.25	9870	33.7	101.4	338	3189	418	33.3	22.7	73.3	652	51	331	136	2.66	207.	9	36	3.2	21
10.0	740	500	2.36	10127	34.6	98.8	354	3316	397	31.2	21.2	74.4	693	47	342	130	2.54	216.	9	37	3.3	23
10.5	777	525	2.48	10379	35.4	96.4	369	3431	378	29.3	19.9	75.4	734	43	353	125	2.44	226.	10	39	3.5	24
11.0	814	550	2.60	10625	36.3	94.2	384	3536	361	27.6	18.7	76.2	773	41	363	120	2.35	235.	10	41	3.6	25
11.5	851	575	2.72	10865	37.1	92.1	398	3632	345	26.1	17.7	77.0	813	38	373	116	2.26	245.	10	42	3.7	26
12.0	888	600	2.84	11100	37.9	90.2	411	3719	331	24.7	16.8	77.6	852	36	383	112	2.19	253.	11	44	3.8	28
13.0	962	650	3.07	11556	39.4	86.6	437	3874	305	22.4	15.2	78.8	930	32	402	105	2.06	271.	12	46	4.0	30
14.0	1036	700	3.31	11996	40.9	83.5	461	4007	283	20.5	13.9	79.7	1007	29	419	100	1.95	289.	13	49	4.3	32
15.0	1110	750	3.55	12420	42.3	80.7	484	4122	264	18.9	12.8	80.5	1084	26	436	95	1.86	306.	13	52	4.5	34
16.0	1184	800	3.78	12831	43.7	78.1	506	4223	248	17.5	11.9	81.2	1160	24	453	91	1.78	323.	14	55	4.7	36
17.0	1258	850	4.02	13229	45.1	75.8	527	4311	233	16.4	11.1	81.8	1236	22	469	87	1.71	340.	15	57	4.8	38
18.0	1332	900	4.26	13616	46.4	73.6	547	4390	220	15.3	10.4	82.3	1311	21	485	84	1.64	356.	16	60	5.0	40
19.0	1406	950	4.49	13993	47.7	71.7	567	4461	209	14.4	9.7	82.8	1387	19	500	81	1.59	372.	16	62	5.2	42
20.0	1480	1000	4.73	14361	48.9	69.9	586	4524	198	13.6	9.2	83.2	1462	18	515	79	1.54	387.	17	65	5.4	44
25.0	1850	1250	5.91	16077	54.7	62.5	672	4765	158	10.6	7.2	84.7	1836	14	587	69	1.34	463.	21	76	6.1	52
30.0	2220	1499	7.09	17635	59.9	57.0	749	4926	132	8.7	5.9	85.6	2209	11	655	62	1.20	537.	25	88	6.8	58
35.0	2590	1749	8.27	19073	64.7	52.8	818	5040	113	7.4	5.0	86.3	2581	9	720	56	1.10	601.	28	98	7.4	
40.0	2960	1999	9.46	20416	69.1	49.4	882	5126	99	6.4	4.3	86.8	2952	8	783	52	1.02	665.	32	108	8.0	
45.0	3330	2249	10.64	21683	73.3	46.6	942	5193	88	5.7	3.8	87.2	3323	7	845	49	0.96	720.	35	118	8.5	
50.0	3700	2499	11.82	22886	77.3	44.2	998	5246	79	5.1	3.4	87.5	3694	6	905	46	0.90	779.	39	128	9.0	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#283 74 Ge on 165 Ho

74 Ge on 165 Ho

74 Ge on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 67. ZC= 99.(Es)
NEUTRON NUMBERS: NP= 42. NT= 98. NC=140.

AP**1/3= 4.198 AT**1/3= 5.485
REDUCED MASS NUMBER= 51.09 AP+AT=AC=239.

INTERACTION RADIUS RINT=13.63 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 6.25 CT+CP=10.85 C= 2.65

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.41

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.15 RC=RCP+RCT=10.81

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 399.58 MeV K= .30509 n=2.490
VC(RINT)= 226.2 MeV

FISSION-TKE= 191. MeV
ASYMM. FISSION-TKE= 167. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 30.01 MeV
L-RLD= 60 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -63.7
COMPOUND NUCLEUS: 63.8

FUSION RELATED PARAMETERS:
R-BARRIER=12.23 fm V(RB)= 235.8 MeV
Q-VALUE= -201.2 MeV
L-CRITICAL= 115.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	51	0.23	3195	11.2	337.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	102	0.45	4519	15.8	238.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	153	0.68	5537	19.4	194.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	296	204	0.90	6395	22.3	168.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	333	230	1.02	6784	23.7	159.1	39	90	0	152.3	133.3	13.8	65	268	40	1259	23.94	0.	1	10 1.0	2
5.0	370	255	1.13	7152	25.0	151.0	115	672	361	105.6	79.4	37.2	169	201	117	446	8.19	112.	3	15 1.3	5
5.5	407	281	1.24	7502	26.2	144.0	157	1146	617	84.9	61.7	47.5	248	159	166	326	5.97	122.	4	18 1.6	7
6.0	444	307	1.35	7836	27.4	137.8	191	1539	566	71.7	51.3	54.1	314	130	202	269	4.92	132.	5	21 1.9	9
6.5	481	332	1.47	8157	28.5	132.4	219	1872	522	62.3	44.1	58.8	371	110	229	235	4.29	142.	5	24 2.1	11
7.0	518	358	1.58	8466	29.6	127.6	244	2157	485	55.2	38.9	62.4	423	95	252	211	3.85	152.	6	26 2.3	13
7.5	555	383	1.69	8765	30.6	123.3	267	2403	452	49.6	34.8	65.2	471	84	270	193	3.52	161.	7	28 2.5	15
8.0	592	409	1.81	9053	31.6	119.4	288	2619	424	45.1	31.5	67.5	518	74	287	179	3.26	171.	7	30 2.6	16
8.5	629	434	1.92	9333	32.6	115.8	307	2810	399	41.3	28.8	69.3	562	67	301	167	3.06	180.	8	32 2.8	18
9.0	666	460	2.03	9605	33.5	112.5	325	2979	377	38.2	26.6	70.9	605	61	315	156	2.88	190.	8	34 2.9	19
9.5	703	485	2.15	9870	34.4	109.5	343	3130	357	35.4	24.7	72.3	647	56	327	150	2.74	198.	9	35 3.1	21
10.0	740	511	2.26	10127	35.3	106.8	359	3266	339	33.1	23.0	73.5	689	51	338	143	2.61	208.	9	37 3.2	22
10.5	777	536	2.37	10379	36.2	104.2	375	3389	323	31.0	21.6	74.5	729	48	349	137	2.50	217.	9	38 3.3	23
11.0	814	562	2.48	10625	37.1	101.8	390	3501	308	29.2	20.3	75.4	770	44	359	132	2.40	226.	10	40 3.5	25
11.5	851	588	2.60	10865	37.9	99.6	405	3603	295	27.6	19.2	76.2	810	41	369	127	2.32	235.	10	42 3.6	26
12.0	888	613	2.71	11100	38.7	97.5	419	3697	283	26.2	18.2	76.9	849	39	379	123	2.24	244.	11	43 3.7	27
13.0	962	664	2.94	11556	40.3	93.6	446	3862	261	23.7	16.4	78.1	927	35	397	115	2.11	260.	12	46 3.9	30
14.0	1036	715	3.16	11996	41.8	90.2	471	4004	242	21.7	15.0	79.2	1005	31	414	109	1.99	278.	12	49 4.1	32
15.0	1110	766	3.39	12420	43.3	87.2	495	4127	226	20.0	13.8	80.0	1081	29	430	104	1.90	295.	13	51 4.3	34
16.0	1184	817	3.61	12831	44.7	84.4	518	4234	212	18.5	12.8	80.7	1158	26	446	99	1.81	311.	14	54 4.5	36
17.0	1258	868	3.84	13229	46.1	81.9	540	4329	199	17.2	11.9	81.4	1234	24	462	95	1.74	327.	15	57 4.7	38
18.0	1332	920	4.06	13616	47.4	79.6	561	4413	188	16.1	11.2	81.9	1310	22	477	92	1.67	343.	16	59 4.9	40
19.0	1406	971	4.29	13993	48.7	77.4	581	4489	178	15.2	10.5	82.4	1385	21	491	88	1.61	359.	16	62 5.1	42
20.0	1480	1022	4.52	14361	50.0	75.5	601	4557	169	14.3	9.9	82.8	1460	20	506	86	1.56	374.	17	64 5.2	44
25.0	1850	1277	5.65	16077	55.9	67.5	691	4814	135	11.2	7.7	84.4	1835	15	574	74	1.36	448.	21	76 6.0	52
30.0	2220	1533	6.77	17635	61.2	61.6	770	4986	113	9.2	6.3	85.4	2208	12	638	67	1.22	517.	24	87 6.7	59
35.0	2590	1788	7.90	19073	66.1	57.1	842	5108	97	7.8	5.4	86.1	2580	10	700	61	1.11	580.	28	97 7.3	
40.0	2960	2044	9.03	20416	70.7	53.4	908	5200	84	6.7	4.6	86.6	2951	9	759	57	1.03	640.	32	107 7.9	
45.0	3330	2299	10.16	21683	75.0	50.3	970	5271	75	5.9	4.1	87.0	3322	8	817	53	0.97	698.	35	117 8.4	
50.0	3700	2554	11.29	22886	79.0	47.7	1028	5328	67	5.3	3.7	87.3	3693	7	874	50	0.91	752.	39	127 8.9	

#284 74 Ge on 181 Ta

74 Ge on 181 Ta

74 Ge on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 73. ZC=105.( )
NEUTRON NUMBERS: NP= 42. NT=108. NC=150.

AP**1/3= 4.198 AT**1/3= 5.657
REDUCED MASS NUMBER= 52.53 AP+AT=AC=255.

INTERACTION RADIUS RINT=13.81 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 6.47 CT+CP=11.07 C= 2.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.62

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.35 RC=RCP+RCT=11.02

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 426.77 MeV K= .30094 n=2.502
VC(RINT)= 243.2 MeV

FISSION-TKE= 208. MeV
ASYMM. FISSION-TKE= 177. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 30.36 MeV
L-RLD= 46 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.92 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -46.0
COMPOUND NUCLEUS: 100.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.39 fm V(RB)= 253.2 MeV
Q-VALUE= -220.3 MeV
L-CRITICAL= 107.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	53	0.22	3195	11.5	367.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	148	105	0.43	4519	16.2	260.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	222	158	0.65	5537	19.9	212.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	296	210	0.86	6395	23.0	183.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	333	236	0.97	6784	24.4	173.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	370	263	1.08	7152	25.7	164.5	96	446	172	119.6	95.5	30.2	142	228	95	604	10.34	106.	2	13 1.2	4
5.5	407	289	1.19	7502	26.9	156.8	148	955	501	93.5	70.8	43.3	229	178	152	394	6.72	115.	4	17 1.5	6
6.0	444	315	1.30	7836	28.1	150.2	185	1378	459	78.0	57.8	51.0	299	145	191	314	5.35	125.	4	20 1.7	8
6.5	481	341	1.40	8157	29.3	144.3	217	1736	424	67.3	49.3	56.3	359	122	221	269	4.57	134.	5	23 1.9	10
7.0	518	368	1.51	8466	30.4	139.0	244	2042	394	59.3	43.1	60.3	413	105	244	239	4.06	143.	6	25 2.2	12
7.5	555	394	1.62	8765	31.5	134.3	269	2307	367	53.1	38.4	63.4	464	91	264	217	3.69	152.	6	27 2.3	14
8.0	592	420	1.73	9053	32.5	130.0	291	2539	344	48.1	34.7	65.9	511	81	281	200	3.41	161.	7	29 2.5	16
8.5	629	446	1.84	9333	33.5	126.2	312	2743	324	44.0	31.6	68.0	556	73	296	187	3.18	170.	7	31 2.7	18
9.0	666	473	1.94	9605	34.5	122.6	332	2925	306	40.6	29.1	69.7	600	66	309	176	2.99	179.	8	33 2.8	19
9.5	703	499	2.05	9870	35.4	119.3	350	3088	290	37.7	27.0	71.2	643	60	321	167	2.83	187.	8	35 3.0	21
10.0	740	525	2.16	10127	36.3	116.3	368	3234	275	35.1	25.1	72.4	685	55	332	159	2.70	196.	9	36 3.1	22
10.5	777	552	2.27	10379	37.2	113.5	384	3366	262	32.9	23.5	73.5	726	51	343	152	2.58	204.	9	38 3.2	24
11.0	814	578	2.38	10625	38.1	110.9	400	3486	250	31.0	22.1	74.5	766	48	353	146	2.48	213.	10	39 3.3	25
11.5	851	604	2.48	10865	39.0	108.5	416	3596	239	29.2	20.9	75.4	806	45	362	140	2.38	221.	10	41 3.5	27
12.0	888	630	2.59	11100	39.8	106.2	431	3697	229	27.7	19.8	76.2	846	42	372	135	2.30	229.	11	42 3.6	28
13.0	962	683	2.81	11556	41.4	102.0	459	3874	212	25.1	17.9	77.5	925	37	389	127	2.16	246.	11	45 3.8	30
14.0	1036	735	3.02	11996	43.0	98.3	486	4027	197	22.9	16.3	78.6	1002	34	405	120	2.04	262.	12	48 4.0	33
15.0	1110	788	3.24	12420	44.5	95.0	511	4159	183	21.1	15.0	79.5	1079	31	421	114	1.94	278.	13	50 4.2	35
16.0	1184	840	3.46	12831	46.0	92.0	535	4274	172	19.5	13.9	80.2	1156	28	436	109	1.85	292.	14	53 4.4	38
17.0	1258	893	3.67	13229	47.4	89.2	558	4376	162	18.2	12.9	80.9	1232	26	450	105	1.78	308.	15	56 4.6	40
18.0	1332	945	3.89	13616	48.7	86.7	580	4467	153	17.0	12.1	81.5	1308	24	464	101	1.71	323.	15	58 4.8	42
19.0	1406	998	4.10	13993	50.1	84.4	602	4548	145	16.0	11.4	82.0	1384	22	478	97	1.65	337.	16	61 4.9	44
20.0	1480	1051	4.32	14361	51.4	82.2	622	4621	137	15.1	10.7	82.5	1459	21	491	94	1.59	352.	17	63 5.1	46
25.0	1850	1313	5.40	16077	57.4	73.6	716	4897	110	11.7	8.3	84.1	1834	16	555	81	1.38	423.	21	74 5.9	54
30.0	2220	1576	6.48	17635	62.9	67.2	799	5082	91	9.6	6.8	85.2	2207	13	614	73	1.24	487.	24	85 6.5	62
35.0	2590	1838	7.56	19073	68.0	62.2	875	5213	78	8.1	5.8	85.9	2579	11	671	67	1.13	548.	28	96 7.1	
40.0	2960	2101	8.64	20416	72.7	58.2	944	5312	68	7.1	5.0	86.5	2951	9	726	62	1.05	606.	31	106 7.7	
45.0	3330	2364	9.72	21683	77.1	54.8	1008	5388	61	6.2	4.4	86.9	3322	8	779	58	0.98	659.	35	115 8.2	
50.0	3700	2626	10.80	22886	81.2	52.0	1069	5450	55	5.6	4.0	87.2	3693	7	830	55	0.93	711.	38	125 8.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nes	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#285 74 Ge on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 79. ZC=111.( )
NEUTRON NUMBERS: NP= 42. NT=118. NC=160.

AP**1/3= 4.198 AT**1/3= 5.819
REDUCED MASS NUMBER= 53.79 AP+AT=AC=271.

INTERACTION RADIUS RINT=13.99 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 6.68 CT+CP=11.28 C= 2.72

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.83

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.55 RC=RCP+RCT=11.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 453.30 MeV K= .29589 n=2.515
VC(RINT)= 259.9 MeV

FISSION-TKE= 226. MeV
ASYMM. FISSION-TKE= 186. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 30.66 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.83 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -28.6
COMPOUND NUCLEUS: 143.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.54 fm V(RB)= 270.4 MeV
Q-VALUE= -245.6 MeV
L-CRITICAL= 95.

74 Ge on 197 Au

74 Ge on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	54	0.21	3195	11.8	398.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	148	108	0.41	4519	16.6	281.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	222	161	0.62	5537	20.4	229.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	296	215	0.83	6395	23.5	199.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	333	242	0.93	6784	25.0	187.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	370	269	1.04	7152	26.3	178.0	66	207	0	139.0	120.1	20.5	112	258	70	967	15.66	0.	2 12	0.8	2
5.5	407	296	1.14	7502	27.6	169.7	134	752	379	103.4	81.6	38.3	208	199	136	487	7.77	109.	3 16	1.2	5
6.0	444	323	1.24	7836	28.8	162.5	178	1205	348	84.9	65.0	47.5	283	161	180	368	5.87	118.	4 19	1.5	7
6.5	481	350	1.35	8157	30.0	156.1	212	1588	321	72.7	54.8	53.7	347	134	212	308	4.90	127.	5 22	1.8	9
7.0	518	377	1.45	8466	31.1	150.5	242	1916	298	63.7	47.6	58.1	403	115	237	270	4.30	135.	6 24	2.0	12
7.5	555	403	1.55	8765	32.2	145.4	269	2200	278	56.8	42.2	61.6	455	100	258	244	3.88	144.	6 27	2.2	14
8.0	592	430	1.66	9053	33.3	140.7	293	2448	261	51.4	38.0	64.3	504	88	275	224	3.56	153.	7 29	2.3	15
8.5	629	457	1.76	9333	34.3	136.5	315	2667	245	46.9	34.6	66.6	550	79	291	208	3.31	161.	7 30	2.5	17
9.0	666	484	1.86	9605	35.3	132.7	336	2861	232	43.1	31.7	68.4	595	71	304	195	3.10	169.	8 32	2.7	19
9.5	703	511	1.97	9870	36.3	129.1	355	3035	219	39.9	29.3	70.0	638	65	316	184	2.93	177.	8 34	2.8	21
10.0	740	538	2.07	10127	37.2	125.9	374	3191	208	37.2	27.3	71.4	680	60	328	175	2.78	186.	9 35	2.9	22
10.5	777	565	2.17	10379	38.1	122.8	392	3333	198	34.8	25.5	72.6	722	55	338	167	2.66	193.	9 37	3.1	24
11.0	814	592	2.28	10625	39.0	120.0	409	3462	189	32.7	24.0	73.6	763	51	348	160	2.55	202.	10 39	3.2	25
11.5	851	619	2.38	10865	39.9	117.4	425	3579	181	30.9	22.6	74.6	803	48	357	154	2.45	209.	10 40	3.3	27
12.0	888	646	2.48	11100	40.8	114.9	441	3687	174	29.2	21.4	75.4	843	45	366	149	2.36	217.	10 42	3.4	28
13.0	962	699	2.69	11556	42.4	110.4	470	3877	160	26.4	19.3	76.8	922	40	383	139	2.21	232.	11 44	3.7	31
14.0	1036	753	2.90	11996	44.0	106.4	498	4040	149	24.1	17.6	77.9	1000	36	399	131	2.09	247.	12 47	3.9	34
15.0	1110	807	3.11	12420	45.6	102.8	525	4182	139	22.2	16.2	78.9	1077	33	413	125	1.98	263.	13 50	4.1	36
16.0	1184	861	3.31	12831	47.1	99.5	550	4305	130	20.5	15.0	79.7	1154	30	428	119	1.89	278.	14 52	4.3	38
17.0	1258	914	3.52	13229	48.5	96.5	574	4414	122	19.1	13.9	80.5	1231	27	441	114	1.81	293.	14 55	4.4	40
18.0	1332	968	3.73	13616	49.9	93.8	597	4511	116	17.9	13.0	81.1	1307	25	455	110	1.74	306.	15 57	4.6	43
19.0	1406	1022	3.93	13993	51.3	91.3	619	4598	109	16.8	12.2	81.6	1382	24	467	106	1.68	320.	16 60	4.8	45
20.0	1480	1076	4.14	14361	52.6	89.0	641	4676	104	15.8	11.5	82.1	1458	22	480	102	1.62	334.	17 62	5.0	47
25.0	1850	1345	5.18	16077	58.8	79.6	739	4972	83	12.3	8.9	83.9	1833	17	539	89	1.41	401.	20 73	5.7	56
30.0	2220	1614	6.21	17635	64.4	72.7	826	5170	69	10.1	7.3	85.0	2206	14	595	79	1.26	463.	24 84	6.4	64
35.0	2590	1883	7.25	19073	69.6	67.3	904	5310	59	8.5	6.2	85.7	2579	11	647	72	1.15	519.	27 94	7.0	
40.0	2960	2152	8.28	20416	74.4	62.9	976	5416	52	7.4	5.4	86.3	2950	10	698	67	1.07	575.	31 104	7.5	
45.0	3330	2421	9.32	21683	78.9	59.3	1043	5498	46	6.5	4.7	86.7	3321	9	747	63	1.00	627.	34 113	8.0	
50.0	3700	2690	10.35	22886	83.2	56.3	1106	5564	41	5.8	4.2	87.1	3692	8	795	59	0.94	674.	38 123	8.5	

#286 74 Ge on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 82. ZC=114.( )
NEUTRON NUMBERS: NP= 42. NT=126. NC=168.

AP**1/3= 4.198 AT**1/3= 5.925
REDUCED MASS NUMBER= 54.58 AP+AT=AC=282.

INTERACTION RADIUS RINT=14.10 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 6.82 CT+CP=11.41 C= 2.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.96

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.66 RC=RCP+RCT=11.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 465.42 MeV K= .29155 n=2.520
VC(RINT)= 267.5 MeV

FISSION-TKE= 234. MeV
ASYMM. FISSION-TKE= 189. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 30.68 MeV
L-RLD= 25 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.78 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -19.5
COMPOUND NUCLEUS: 170.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.64 fm V(RB)= 278.0 MeV
Q-VALUE= -263.6 MeV
L-CRITICAL= 89.

74 Ge on 208 Pb

74 Ge on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	55	0.20	3195	11.9	413.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	148	109	0.41	4519	16.9	292.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	222	164	0.61	5537	20.7	238.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	296	218	0.82	6395	23.9	206.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	333	246	0.92	6784	25.3	194.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	370	273	1.02	7152	26.7	184.8	51	120	0	149.0	134.3	15.5	104	266	63	1316	20.99	0.	2 12	0.5	1
5.5	407	300	1.12	7502	28.0	176.2	130	684	327	107.3	86.5	36.3	203	204	130	534	8.29	105.	3 16	1.0	4
6.0	444	327	1.22	7836	29.2	168.7	176	1151	300	87.6	68.3	46.2	279	165	176	394	6.10	114.	4 19	1.3	6
6.5	481	355	1.33	8157	30.4	162.1	212	1546	277	74.7	57.3	52.7	344	137	209	327	5.05	122.	5 22	1.6	9
7.0	518	382	1.43	8466	31.6	156.2	244	1883	257	65.3	49.6	57.3	401	117	234	285	4.41	131.	6 24	1.8	11
7.5	555	409	1.53	8765	32.7	150.9	271	2176	240	58.2	43.9	60.9	453	102	255	256	3.96	139.	6 26	2.0	13
8.0	592	437	1.63	9053	33.8	146.1	296	2432	225	52.5	39.5	63.7	502	90	272	235	3.63	147.	7 28	2.2	15
8.5	629	464	1.73	9333	34.8	141.7	319	2658	212	47.9	35.9	66.1	549	80	287	218	3.36	155.	7 30	2.4	17
9.0	666	491	1.84	9605	35.8	137.7	341	2859	200	44.0	32.9	68.0	594	72	301	204	3.15	163.	8 32	2.5	19
9.5	703	519	1.94	9870	36.8	134.1	361	3038	189	40.8	30.4	69.6	637	66	313	193	2.98	171.	8 34	2.7	21
10.0	740	546	2.04	10127	37.8	130.7	380	3199	180	38.0	28.3	71.0	679	61	324	183	2.83	178.	9 35	2.8	23
10.5	777	573	2.14	10379	38.7	127.5	398	3345	171	35.5	26.4	72.2	721	56	334	175	2.70	186.	9 37	3.0	24
11.0	814	600	2.24	10625	39.6	124.6	416	3478	163	33.4	24.8	73.3	762	52	343	167	2.58	194.	10 38	3.1	26
11.5	851	628	2.35	10865	40.5	121.8	432	3599	156	31.5	23.4	74.3	803	48	353	161	2.48	202.	10 40	3.2	27
12.0	888	655	2.45	11100	41.4	119.3	448	3710	150	29.8	22.1	75.1	843	45	361	155	2.39	209.	10 41	3.3	29
13.0	962	710	2.65	11556	43.0	114.6	479	3907	138	26.9	19.9	76.5	922	40	377	145	2.24	224.	11 44	3.6	32
14.0	1036	764	2.86	11996	44.7	110.4	508	4075	128	24.5	18.2	77.7	1000	36	393	137	2.12	239.	12 47	3.8	34
15.0	1110	819	3.06	12420	46.2	106.7	535	4221	120	22.6	16.7	78.7	1077	33	407	130	2.01	253.	13 49	4.0	37
16.0	1184	873	3.26	12831	47.8	103.3	561	4348	112	20.9	15.4	79.6	1154	30	421	124	1.91	266.	14 52	4.2	40
17.0	1258	928	3.47	13229	49.2	100.2	586	4461	106	19.4	14.4	80.3	1230	28	434	119	1.83	281.	14 54	4.3	42
18.0	1332	982	3.67	13616	50.6	97.4	609	4561	100	18.2	13.4	80.9	1306	26	446	114	1.76	295.	15 57	4.5	44
19.0	1406	1037	3.88	13993	52.0	94.8	632	4650	94	17.1	12.6	81.5	1382	24	459	110	1.70	307.	16 59	4.7	47
20.0	1480	1092	4.08	14361	53.4	92.4	654	4731	90	16.1	11.9	82.0	1458	22	471	106	1.64	321.	17 61	4.8	49
25.0	1850	1365	5.10	16077	59.7	82.6	755	5036	72	12.5	9.2	83.8	1833	17	528	92	1.42	385.	20 73	5.6	58
30.0	2220	1637	6.12	17635	65.4	75.4	843	5240	60	10.2	7.5	84.9	2206	14	580	82	1.27	444.	24 83	6.2	67
35.0	2590	1910	7.14	19073	70.6	69.8	924	5385	51	8.6	6.4	85.7	2579	11	630	75	1.16	501.	27 93	6.8	
40.0	2960	2183	8.16	20416	75.5	65.3	997	5494	45	7.5	5.5	86.3	2950	10	678	70	1.08	553.	31 103	7.4	
45.0	3330	2456	9.18	21683	80.1	61.6	1066	5579	40	6.6	4.9	86.7	3321	9	724	65	1.01	604.	34 112	7.9	
50.0	3700	2729	10.20	22886	84.4	58.4	1131	5646	36	5.9	4.4	87.0	3692	8	770	62	0.95	650.	37 122	8.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#287 74 Ge on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 83. ZC=115.( )
NEUTRON NUMBERS: NP= 42. NT=126. NC=168.

AP**1/3= 4.198 AT**1/3= 5.934
REDUCED MASS NUMBER= 54.65 AP+AT=AC=283.

INTERACTION RADIUS RINT=14.11 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 6.83 CT+CP=11.42 C= 2.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 6.97

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.68 RC=RCP+RCT=11.34

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 470.25 MeV K= .29148 n=2.523
VC(RINT)= 270.6 MeV

FISSION-TKE= 238. MeV
ASYMM. FISSION-TKE= 191. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 30.80 MeV
L-RLD= 20 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: -16.5
COMPOUND NUCLEUS: 177.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.65 fm V(RB)= 281.3 MeV
Q-VALUE= -267.6 MeV
L-CRITICAL= 86.

74 Ge on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	55	0.20	3195	12.0	418.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	148	109	0.40	4519	16.9	295.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	222	164	0.61	5537	20.7	241.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	296	219	0.81	6395	23.9	209.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	333	246	0.91	6784	25.4	197.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	370	273	1.01	7152	26.7	187.0	35	56	0	159.0	148.2	10.5	94	276	55	1896	31.01	0.	2	11	0.4	0
5.5	407	301	1.11	7502	28.0	178.3	124	627	300	110.3	89.5	34.9	195	212	126	565	8.67	105.	3	16	1.0	3
6.0	444	328	1.21	7836	29.3	170.7	172	1100	275	89.5	70.1	45.3	274	170	173	408	6.25	114.	4	19	1.3	6
6.5	481	355	1.31	8157	30.5	164.0	210	1499	254	76.1	58.5	51.9	340	141	207	336	5.14	122.	5	22	1.6	9
7.0	518	383	1.41	8466	31.6	158.1	241	1841	236	66.5	50.6	56.8	398	120	233	292	4.47	130.	6	24	1.8	11
7.5	555	410	1.51	8765	32.7	152.7	269	2137	220	59.2	44.7	60.4	451	104	254	262	4.00	138.	6	26	2.0	13
8.0	592	437	1.62	9053	33.8	147.9	294	2396	206	53.4	40.2	63.3	500	92	272	240	3.66	147.	7	28	2.2	15
8.5	629	465	1.72	9333	34.8	143.4	318	2625	194	48.6	36.5	65.7	547	82	287	222	3.39	154.	7	30	2.4	17
9.0	666	492	1.82	9605	35.9	139.4	339	2828	183	44.7	33.4	67.7	592	74	301	208	3.17	162.	8	32	2.5	19
9.5	703	519	1.92	9870	36.8	135.7	360	3009	173	41.3	30.9	69.3	635	68	313	196	2.99	171.	8	33	2.7	20
10.0	740	547	2.02	10127	37.8	132.3	379	3173	165	38.5	28.7	70.8	678	62	324	186	2.84	178.	9	35	2.8	22
10.5	777	574	2.12	10379	38.7	129.1	397	3320	157	36.0	26.8	72.0	720	57	334	178	2.71	186.	9	37	2.9	24
11.0	814	601	2.22	10625	39.6	126.1	415	3455	150	33.8	25.2	73.1	761	53	344	170	2.60	194.	10	38	3.1	25
11.5	851	628	2.32	10865	40.5	123.3	432	3577	143	31.9	23.7	74.1	801	50	353	163	2.50	201.	10	40	3.2	27
12.0	888	656	2.42	11100	41.4	120.7	448	3690	137	30.2	22.4	74.9	842	46	362	158	2.41	209.	10	41	3.3	28
13.0	962	710	2.63	11556	43.1	116.0	478	3888	127	27.3	20.2	76.4	921	41	378	147	2.25	224.	11	44	3.5	31
14.0	1036	765	2.83	11996	44.7	111.8	507	4058	118	24.8	18.4	77.6	999	37	393	139	2.12	238.	12	47	3.8	34
15.0	1110	820	3.03	12420	46.3	108.0	535	4206	110	22.8	16.9	78.6	1076	34	408	132	2.01	252.	13	49	4.0	37
16.0	1184	874	3.23	12831	47.8	104.6	561	4335	103	21.1	15.6	79.4	1153	31	422	126	1.92	267.	14	52	4.1	39
17.0	1258	929	3.43	13229	49.3	101.4	585	4449	97	19.7	14.6	80.2	1230	28	435	120	1.84	280.	14	54	4.3	42
18.0	1332	984	3.64	13616	50.7	98.6	609	4550	91	18.4	13.6	80.8	1306	26	447	116	1.77	294.	15	57	4.5	44
19.0	1406	1038	3.84	13993	52.1	95.9	632	4640	86	17.3	12.8	81.4	1382	24	460	112	1.70	308.	16	59	4.7	46
20.0	1480	1093	4.04	14361	53.5	93.5	654	4722	82	16.3	12.0	81.9	1457	23	472	108	1.65	321.	17	61	4.8	48
25.0	1850	1366	5.05	16077	59.8	83.6	755	5031	66	12.6	9.3	83.7	1833	17	528	93	1.43	384.	20	72	5.6	58
30.0	2220	1640	6.06	17635	65.5	76.4	844	5237	55	10.3	7.6	84.8	2206	14	581	84	1.28	445.	24	83	6.2	66
35.0	2590	1913	7.07	19073	70.7	70.7	925	5384	47	8.7	6.5	85.6	2578	12	631	76	1.16	500.	27	93	6.8	
40.0	2960	2186	8.08	20416	75.6	66.1	999	5494	41	7.6	5.6	86.2	2950	10	679	71	1.08	552.	31	103	7.4	
45.0	3330	2459	9.09	21683	80.2	62.3	1068	5580	36	6.7	4.9	86.7	3321	9	725	66	1.01	603.	34	112	7.9	
50.0	3700	2733	10.10	22886	84.5	59.1	1132	5648	33	6.0	4.4	87.0	3692	8	770	62	0.95	649.	37	121	8.3	

#288 74 Ge on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 32. ZT= 92. ZC=124.( )
NEUTRON NUMBERS: NP= 42. NT=146. NC=188.

AP**1/3= 4.198 AT**1/3= 6.197
REDUCED MASS NUMBER= 56.45 AP+AT=AC=312.

INTERACTION RADIUS RINT=14.40 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.60 CT= 7.16 CT+CP=11.76 C= 2.80

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 4.80 RT= 7.30

COULOMB RADII [fm]:
RCP= 4.66 RCT= 6.98 RC=RCP+RCT=11.64

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 506.87 MeV K= .28011 n=2.541
VC(RINT)= 294.0 MeV

FISSION-TKE= 265. MeV
ASYMM. FISSION-TKE= 203. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.880 MeV/fm**2 PROX-FACTOR= 30.97 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -73.6 TARGET: 47.2
COMPOUND NUCLEUS: 249.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.89 fm V(RB)= 305.0 MeV
Q-VALUE= -275.8 MeV
L-CRITICAL= 54.

74 Ge on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	74	56	0.19	3195	12.3	463.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	148	113	0.38	4519	17.5	327.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	222	169	0.58	5537	21.4	267.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	296	226	0.77	6395	24.7	231.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	333	254	0.86	6784	26.2	218.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	370	282	0.96	7152	27.6	207.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	407	310	1.06	7502	29.0	197.7	95	344	91	128.7	112.0	25.6	168	239	103	859	12.20	95.	3	14	0.9	4
6.0	444	339	1.15	7836	30.2	189.2	157	863	104	100.5	82.5	39.8	254	190	157	521	7.35	103.	4	18	1.3	7
6.5	481	367	1.25	8157	31.5	181.8	202	1300	96	84.1	67.4	47.9	325	156	195	408	5.74	111.	5	21	1.5	9
7.0	518	395	1.34	8466	32.7	175.2	237	1675	89	72.8	57.6	53.6	386	132	224	346	4.87	118.	5	23	1.7	12
7.5	555	423	1.44	8765	33.8	169.3	269	1999	83	64.4	50.5	57.8	441	114	246	306	4.31	126.	6	25	1.9	14
8.0	592	452	1.54	9053	34.9	163.9	297	2283	78	57.8	45.1	61.1	492	100	265	277	3.90	133.	7	27	2.1	16
8.5	629	480	1.63	9333	36.0	159.0	322	2533	73	52.5	40.8	63.7	540	89	280	256	3.59	140.	7	29	2.3	18
9.0	666	508	1.73	9605	37.0	154.5	346	2755	69	48.1	37.3	65.9	586	80	294	238	3.35	148.	8	31	2.4	20
9.5	703	536	1.82	9870	38.1	150.4	368	2954	66	44.5	34.4	67.8	630	73	306	224	3.15	155.	8	32	2.6	22
10.0	740	564	1.92	10127	39.0	146.6	389	3132	62	41.3	31.9	69.3	673	67	317	212	2.98	162.	9	34	2.7	24
10.5	777	593	2.02	10379	40.0	143.1	409	3294	59	38.6	29.7	70.7	716	61	327	202	2.83	169.	9	36	2.9	26
11.0	814	621	2.11	10625	40.9	139.8	428	3441	57	36.2	27.9	71.9	757	57	336	193	2.71	176.	9	37	3.0	27
11.5	851	649	2.21	10865	41.9	136.7	446	3575	54	34.1	26.2	72.9	798	53	345	185	2.60	183.	10	39	3.1	29
12.0	888	677	2.30	11100	42.8	133.8	463	3698	52	32.2	24.8	73.9	838	50	354	178	2.50	190.	10	40	3.2	31
13.0	962	734	2.50	11556	44.5	128.6	496	3916	48	29.1	22.3	75.5	918	44	369	166	2.33	203.	11	43	3.4	34
14.0	1036	790	2.69	11996	46.2	123.9	527	4102	44	26.5	20.3	76.8	997	39	383	156	2.20	216.	12	45	3.6	37
15.0	1110	847	2.88	12420	47.8	119.7	556	4264	41	24.3	18.6	77.9	1074	36	396	148	2.08	229.	13	48	3.8	40
16.0	1184	903	3.07	12831	49.4	115.9	584	4405	39	22.5	17.2	78.8	1152	32	409	141	1.98	243.	13	50	4.0	42
17.0	1258	960	3.26	13229	50.9	112.4	610	4530	36	20.9	16.0	79.6	1228	30	421	135	1.90	255.	14	53	4.2	45
18.0	1332	1016	3.46	13616	52.4	109.3	636	4641	34	19.5	14.9	80.2	1304	28	433	130	1.82	267.	15	55	4.4	48
19.0	1406	1073	3.65	13993	53.8	106.3	660	4740	33	18.3	14.0	80.8	1380	26	444	125	1.75	280.	16	58	4.5	50
20.0	1480	1129	3.84	14361	55.2	103.7	684	4829	31	17.2	13.2	81.4	1456	24	455	121	1.69	291.	16	60	4.7	53
25.0	1850	1411	4.80	16077	61.7	92.7	791	5168	25	13.4	10.2	83.3	1832	18	506	104	1.46	350.	20	71	5.4	63
30.0	2220	1693	5.76	17635	67.6	84.6	885	5393	20	10.9	8.3	84.5	2205	15	553	93	1.31	405.	23	81	6.0	72
35.0	2590	1976	6.72	19073	73.0	78.4	970	5554	17	9.2	7.0	85.4	2578	12	597	85	1.19	457.	27	91	6.6	
40.0	2960	2258	7.68	20416	78.1	73.3	1048	5675	15	8.0	6.1	86.0	2950	10	639	79	1.10	504.	30	100	7.1	
45.0	3330	2540	8.64	21683	82.8	69.1	1121	5769	13	7.1	5.4	86.5	3321	9	680	73	1.03	552.	33	110	7.6	
50.0	3700	2822	9.60	22886	87.3	65.6	1190	5844	12	6.3	4.8	86.8	3692	8	720	69	0.97	593.	37	118	8.1	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 74 Ge

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#289 84 Kr on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 6. ZC= 42.(Mo)
NEUTRON NUMBERS: NP= 48. NT= 6. NC= 54.

AP**1/3= 4.380 AT**1/3= 2.289 ELSCAT < 8 deg
REDUCED MASS NUMBER= 10.50 AP+AT=AC= 96.

INTERACTION RADIUS RINT=10.35 fm R0= 1.55 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 2.12 CT+CP= 6.95 C= 1.47

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 2.52

COULOMB RADII [fm]:
RCP= 4.87 RCT= 2.51 RC=RCP+RCT= 7.38

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 57.42 MeV K= .06447 n=2.738
VC(RINT)= 30.0 MeV

FISSION-TKE= 63. MeV
ASYMM. FISSION-TKE= 31. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.925 MeV/fm**2 PROX-FACTOR= 17.15 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 18.39 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: 0.0
COMPOUND NUCLEUS: -88.1

FUSION RELATED PARAMETERS:
R-BARRIER= 9.37 fm V(RB)= 30.8 MeV
Q-VALUE= 5.0 MeV
L-CRITICAL= 45.

84 Kr on 12 C

84 Kr on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	11	0.35	3627	2.3	34.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	21	0.70	5130	3.2	24.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	32	1.05	6285	4.0	19.6	9	191	61	131.6	6.7	24.2	160	92	160	90	12.61	213.	3 6	1.7	3
4.0	336	42	1.40	7259	4.6	17.0	25	1034	735	67.7	7.1	56.1	290	46	285	32	4.39	282.	4 13	2.0	4
4.5	378	47	1.57	7700	4.9	16.0	30	1306	960	55.6	6.2	62.2	342	36	331	27	3.66	317.	5 16	2.1	4
5.0	420	53	1.75	8118	5.1	15.2	35	1522	1140	47.3	5.5	66.4	390	30	373	23	3.20	352.	5 18	2.2	4
5.5	462	58	1.92	8515	5.4	14.5	39	1698	1287	41.2	4.9	69.4	437	25	413	21	2.88	383.	6 20	2.3	5
6.0	504	63	2.10	8895	5.6	13.9	42	1844	1410	36.5	4.4	71.7	482	22	452	19	2.64	418.	7 22	2.4	5
6.5	546	68	2.27	9260	5.9	13.3	45	1967	1514	32.8	4.0	73.6	527	19	490	18	2.45	453.	7 24	2.5	5
7.0	588	74	2.45	9611	6.1	12.9	48	2071	1603	29.8	3.6	75.1	571	17	527	17	2.30	482.	8 26	2.6	6
7.5	630	79	2.62	9949	6.3	12.4	51	2162	1645	27.3	3.3	76.4	615	15	563	16	2.17	516.	9 27	2.6	6
8.0	672	84	2.80	10277	6.5	12.0	54	2241	1542	25.2	3.1	77.4	658	14	599	15	2.06	551.	9 29	2.7	6
8.5	714	89	2.97	10595	6.7	11.7	56	2311	1452	23.4	2.9	78.3	701	13	635	14	1.97	585.	9 31	2.8	6
9.0	756	95	3.15	10903	6.9	11.3	59	2373	1371	21.8	2.7	79.1	744	12	671	14	1.89	613.	10 32	2.9	7
9.5	798	100	3.32	11203	7.1	11.0	61	2428	1299	20.4	2.5	79.8	787	11	706	13	1.82	647.	10 34	3.0	7
10.0	840	105	3.50	11496	7.3	10.8	63	2477	1234	19.2	2.4	80.4	830	10	741	13	1.75	681.	11 36	3.0	7
10.5	882	110	3.67	11782	7.4	10.5	66	2522	1175	18.2	2.2	80.9	872	10	777	12	1.69	707.	11 37	3.1	8
11.0	924	116	3.85	12060	7.6	10.3	68	2562	1122	17.2	2.1	81.4	915	9	811	12	1.64	741.	12 39	3.2	8
11.5	966	121	4.02	12333	7.8	10.0	70	2599	1073	16.3	2.0	81.8	957	9	846	12	1.59	774.	12 40	3.2	8
12.0	1008	126	4.20	12600	8.0	9.8	72	2633	1028	15.6	1.9	82.2	1000	8	881	11	1.55	808.	13 41	3.3	8
13.0	1092	137	4.55	13118	8.3	9.4	76	2693	949	14.2	1.8	82.9	1085	7	950	11	1.47	865.	14 44	3.4	9
14.0	1176	147	4.90	13617	8.6	9.1	79	2744	881	13.1	1.6	83.5	1169	7	1019	10	1.40	932.	15 47	3.6	9
15.0	1260	158	5.25	14098	8.9	8.8	83	2788	822	12.1	1.5	83.9	1254	6	1088	10	1.34	987.	16 50	3.7	10
16.0	1344	168	5.60	14565	9.2	8.5	86	2827	771	11.3	1.4	84.4	1338	6	1157	9	1.29	1053.	17 52	3.8	10
17.0	1428	179	5.95	15017	9.5	8.2	89	2860	726	10.5	1.3	84.7	1423	5	1225	9	1.24	1106.	18 55	3.9	11
18.0	1512	189	6.30	15456	9.7	8.0	92	2890	685	9.9	1.2	85.0	1507	5	1294	9	1.20	1171.	19 58	4.0	11
19.0	1596	200	6.65	15884	10.0	7.8	95	2917	649	9.3	1.2	85.3	1591	5	1362	8	1.16	1221.	20 60	4.1	12
20.0	1680	210	7.00	16301	10.3	7.6	98	2941	617	8.8	1.1	85.6	1676	4	1430	8	1.13	1285.	21 63	4.2	12
25.0	2100	263	8.75	18249	11.5	6.8	112	3032	493	7.0	0.9	86.5	2097	3	1769	7	0.99	1569.	26 75	4.7	14
30.0	2520	315	10.49	20018	12.6	6.2	124	3092	411	5.7	0.7	87.1	2517	3	2106	7	0.90	1836.	31 87	5.2	16
35.0	2940	368	12.24	21650	13.6	5.7	135	3135	352	4.9	0.6	87.6	2938	2	2441	6	0.83	2089.	36 98	5.6	
40.0	3360	420	13.99	23175	14.5	5.4	145	3166	308	4.3	0.5	87.9	3358	2	2776	6	0.77	2326.	41 109	6.0	
45.0	3780	473	15.74	24614	15.4	5.1	154	3191	274	3.8	0.5	88.1	3778	2	3110	5	0.72	2582.	46 120	6.3	
50.0	4200	525	17.49	25979	16.2	4.8	163	3210	246	3.4	0.4	88.3	4198	2	3443	5	0.68	2793.	51 131	6.6	

#290 84 Kr on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 8. ZC= 44.(Ru)
NEUTRON NUMBERS: NP= 48. NT= 8. NC= 56.

AP**1/3= 4.380 AT**1/3= 2.520 ELSCAT <11 deg
REDUCED MASS NUMBER= 13.44 AP+AT=AC=100.

INTERACTION RADIUS RINT=10.60 fm R0= 1.54 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 2.42 CT+CP= 7.25 C= 1.61

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 2.78

COULOMB RADII [fm]:
RCP= 4.87 RCT= 2.78 RC=RCP+RCT= 7.65

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 74.54 MeV K= .09320 n=2.648
VC(RINT)= 39.1 MeV

FISSION-TKE= 67. MeV
ASYMM. FISSION-TKE= 40. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.927 MeV/fm**2 PROX-FACTOR= 18.80 MeV
L-RLD= 87 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 14.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -4.7
COMPOUND NUCLEUS: -88.4

FUSION RELATED PARAMETERS:
R-BARRIER= 9.56 fm V(RB)= 40.3 MeV
Q-VALUE= 0.5 MeV
L-CRITICAL= 54.

84 Kr on 16 O

84 Kr on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	13	0.34	3627	2.9	45.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	27	0.69	5130	4.2	32.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	40	1.03	6285	5.1	26.2	9	129	0	140.8	8.0	19.6	132	120	132	149	16.02	0.	3 6	1.8	3
4.0	336	54	1.38	7259	5.9	22.7	33	1022	717	69.8	9.5	55.1	277	59	270	43	4.59	271.	4 13	2.1	4
4.5	378	60	1.55	7700	6.2	21.4	39	1311	957	57.1	8.2	61.4	332	46	318	36	3.80	305.	5 16	2.2	4
5.0	420	67	1.72	8118	6.6	20.3	45	1542	1148	48.5	7.2	65.8	382	38	360	31	3.32	335.	5 19	2.3	5
5.5	462	74	1.89	8515	6.9	19.3	50	1729	1305	42.2	6.4	68.9	430	32	400	28	2.98	365.	6 21	2.4	6
6.0	504	81	2.06	8895	7.2	18.5	55	1885	1436	37.3	5.7	71.3	476	28	438	26	2.73	398.	6 23	2.5	6
6.5	546	87	2.24	9260	7.5	17.8	59	2016	1546	33.5	5.2	73.2	522	24	474	24	2.53	431.	7 25	2.7	6
7.0	588	94	2.41	9611	7.8	17.1	63	2129	1578	30.4	4.7	74.8	566	22	510	22	2.37	459.	8 27	2.8	7
7.5	630	101	2.58	9949	8.1	16.6	67	2226	1473	27.9	4.4	76.1	610	20	545	21	2.24	492.	8 29	2.8	7
8.0	672	108	2.75	10277	8.3	16.0	70	2310	1381	25.7	4.0	77.2	654	18	580	20	2.12	525.	9 30	2.9	7
8.5	714	114	2.92	10595	8.6	15.6	74	2385	1300	23.8	3.8	78.1	698	16	614	19	2.03	551.	9 32	3.0	8
9.0	756	121	3.10	10903	8.8	15.1	77	2451	1227	22.2	3.5	78.9	741	15	648	18	1.94	584.	10 34	3.1	8
9.5	798	128	3.27	11203	9.1	14.7	80	2510	1163	20.8	3.3	79.6	784	14	681	18	1.87	616.	10 36	3.2	8
10.0	840	134	3.44	11496	9.3	14.3	83	2564	1105	19.6	3.1	80.2	827	13	715	17	1.80	642.	11 37	3.3	9
10.5	882	141	3.61	11782	9.5	14.0	86	2612	1052	18.5	2.9	80.7	870	12	748	16	1.74	674.	11 39	3.4	9
11.0	924	148	3.78	12060	9.7	13.7	89	2655	1004	17.5	2.8	81.2	912	12	781	16	1.69	706.	12 40	3.4	9
11.5	966	155	3.96	12333	10.0	13.4	91	2695	960	16.7	2.6	81.7	955	11	814	15	1.64	730.	12 42	3.5	10
12.0	1008	161	4.13	12600	10.2	13.1	94	2731	920	15.9	2.5	82.1	998	10	847	15	1.59	762.	13 43	3.6	10
13.0	1092	175	4.47	13118	10.6	12.6	99	2796	850	14.5	2.3	82.8	1083	9	913	14	1.51	825.	14 46	3.7	10
14.0	1176	188	4.82	13617	11.0	12.1	104	2851	789	13.3	2.1	83.3	1167	9	978	14	1.44	879.	15 49	3.9	11
15.0	1260	202	5.16	14098	11.4	11.7	108	2898	736	12.3	2.0	83.8	1252	8	1042	13	1.38	931.	16 52	4.0	12
16.0	1344	215	5.50	14565	11.8	11.3	113	2940	690	11.5	1.8	84.3	1337	7	1107	13	1.32	993.	17 55	4.2	12
17.0	1428	228	5.85	15017	12.1	11.0	117	2976	650	10.7	1.7	84.6	1421	7	1171	12	1.28	1043.	18 57	4.3	13
18.0	1512	242	6.19	15456	12.5	10.7	121	3009	613	10.1	1.6	85.0	1506	6	1236	12	1.23	1104.	19 60	4.4	13
19.0	1596	255	6.54	15884	12.8	10.4	125	3038	581	9.5	1.5	85.2	1590	6	1300	11	1.20	1152.	20 63	4.5	14
20.0	1680	269	6.88	16301	13.1	10.1	129	3064	552	9.0	1.4	85.5	1674	6	1363	11	1.16	1213.	21 65	4.6	14
25.0	2100	336	8.60	18249	14.7	9.1	146	3162	442	7.1	1.1	86.5	2096	4	1681	10	1.02	1463.	26 78	5.2	17
30.0	2520	403	10.32	20018	16.1	8.3	162	3227	368	5.8	0.9	87.1	2516	4	1996	9	0.92	1714.	31 90	5.7	19
35.0	2940	470	12.04	21650	17.4	7.7	177	3274	315	5.0	0.8	87.5	2937	3	2310	8	0.85	1950.	36 102	6.1	
40.0	3360	538	13.76	23175	18.6	7.2	190	3308	276	4.3	0.7	87.8	3357	3	2622	7	0.79	2172.	41 113	6.6	
45.0	3780	605	15.48	24614	19.7	6.8	202	3335	245	3.8	0.6	88.1	3778	2	2934	7	0.74	2380.	45 124	7.0	
50.0	4200	672	17.20	25979	20.8	6.4	214	3356	221	3.4	0.5	88.3	4198	2	3244	7	0.70	2609.	50 135	7.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	Å	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#291 84 Kr on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 13. ZC= 49.(In)
NEUTRON NUMBERS: NP= 48. NT= 14. NC= 62.

AP**1/3= 4.380 AT**1/3= 3.000 ELSCAT <18 deg
REDUCED MASS NUMBER= 20.43 AP+AT=AC=111.

INTERACTION RADIUS RINT=11.13 fm R0= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 3.05 CT+CP= 7.88 C= 1.87

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 3.35

COULOMB RADII [fm]:
RCP= 4.87 RCT= 3.32 RC=RCP+RCT= 8.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 114.53 MeV K= .15656 n=2.535
VC(RINT)= 60.5 MeV

FISSION-TKE= 76. MeV
ASYMM. FISSION-TKE= 59. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.928 MeV/fm**2 PROX-FACTOR= 21.80 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -20.6
COMPOUND NUCLEUS: -88.7

FUSION RELATED PARAMETERS:
R-BARRIER= 9.98 fm V(RB)= 62.9 MeV
Q-VALUE= -15.1 MeV
L-CRITICAL= 75.

84 Kr on 27 Al

84 Kr on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-GP	ET-GT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	84	20	0.34	3627	4.5	73.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	41	0.68	5130	6.3	52.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	61	1.01	6285	7.7	42.5	9	57	0	155.0	10.9	12.5	75	177	76	369	26.48	0.	3 8	1.8	3
4.0	336	82	1.35	7259	8.9	36.8	51	1048	720	72.1	15.6	53.9	250	86	239	72	4.94	243.	4 14	2.2	5
4.5	378	92	1.52	7700	9.5	34.7	62	1371	988	58.8	13.3	60.6	311	67	289	59	4.06	273.	4 17	2.4	5
5.0	420	102	1.69	8118	10.0	33.0	71	1629	1202	49.8	11.5	65.1	365	55	331	52	3.53	300.	5 20	2.5	6
5.5	462	112	1.86	8515	10.5	31.4	79	1839	1377	43.3	10.1	68.4	416	46	369	46	3.16	327.	6 22	2.6	7
6.0	504	123	2.03	8895	10.9	30.1	87	2014	1523	38.3	9.0	70.9	464	40	404	42	2.89	357.	6 25	2.8	7
6.5	546	133	2.20	9260	11.4	28.9	94	2161	1414	34.4	8.2	72.8	511	35	436	39	2.68	383.	7 27	2.9	8
7.0	588	143	2.36	9611	11.8	27.9	100	2288	1313	31.2	7.4	74.4	557	31	470	37	2.50	413.	8 29	3.0	8
7.5	630	153	2.53	9949	12.2	26.9	106	2397	1225	28.5	6.8	75.7	602	28	502	35	2.36	438.	8 31	3.2	9
8.0	672	163	2.70	10277	12.6	26.1	112	2493	1148	26.3	6.3	76.9	646	26	532	33	2.24	462.	9 33	3.3	10
8.5	714	174	2.87	10595	13.0	25.3	117	2577	1081	24.4	5.9	77.8	691	23	563	31	2.14	491.	9 35	3.4	10
9.0	756	184	3.04	10903	13.4	24.6	122	2652	1021	22.7	5.5	78.6	734	22	593	30	2.05	515.	10 36	3.5	11
9.5	798	194	3.21	11203	13.8	23.9	127	2718	967	21.3	5.1	79.3	778	20	622	29	1.97	544.	10 38	3.6	11
10.0	840	204	3.38	11496	14.1	23.3	132	2778	919	20.0	4.8	80.0	821	19	652	28	1.90	567.	11 40	3.7	12
10.5	882	215	3.55	11782	14.5	22.7	137	2833	875	18.9	4.6	80.5	864	18	681	27	1.83	595.	11 41	3.8	12
11.0	924	225	3.72	12060	14.8	22.2	141	2882	835	17.9	4.3	81.0	908	16	709	26	1.77	617.	12 43	3.9	13
11.5	966	235	3.88	12333	15.2	21.7	145	2927	799	17.0	4.1	81.5	950	16	738	25	1.72	645.	12 45	4.0	13
12.0	1008	245	4.05	12600	15.5	21.3	149	2968	765	16.2	3.9	81.9	993	15	766	25	1.67	673.	13 46	4.1	13
13.0	1092	266	4.39	13118	16.1	20.4	158	3041	707	14.8	3.6	82.6	1079	13	823	23	1.59	722.	14 49	4.2	14
14.0	1176	286	4.73	13617	16.7	19.7	165	3103	656	13.6	3.3	83.2	1164	12	879	22	1.51	769.	15 52	4.4	15
15.0	1260	306	5.07	14098	17.3	19.0	173	3157	612	12.6	3.1	83.7	1249	11	935	21	1.45	816.	16 55	4.6	16
16.0	1344	327	5.41	14565	17.9	18.4	180	3204	574	11.7	2.8	84.1	1334	10	990	20	1.39	870.	17 58	4.7	16
17.0	1428	347	5.74	15017	18.4	17.9	186	3246	540	11.0	2.7	84.5	1418	10	1045	20	1.34	915.	18 61	4.9	17
18.0	1512	368	6.08	15456	19.0	17.4	193	3283	510	10.3	2.5	84.9	1503	9	1100	19	1.30	958.	19 64	5.0	18
19.0	1596	388	6.42	15884	19.5	16.9	199	3316	483	9.7	2.4	85.1	1588	8	1154	18	1.26	1000.	20 67	5.2	19
20.0	1680	409	6.76	16301	20.0	16.5	205	3345	459	9.2	2.2	85.4	1672	8	1209	18	1.22	1053.	21 69	5.3	19
25.0	2100	511	8.45	18249	22.3	14.7	233	3458	367	7.2	1.8	86.4	2094	6	1478	16	1.07	1273.	25 82	6.0	22
30.0	2520	613	10.13	20018	24.5	13.5	259	3532	306	6.0	1.4	87.0	2515	5	1744	14	0.97	1477.	30 95	6.6	25
35.0	2940	715	11.82	21650	26.4	12.5	281	3586	262	5.1	1.2	87.5	2936	4	2008	13	0.89	1663.	35 107	7.1	
40.0	3360	817	13.51	23175	28.3	11.7	303	3625	229	4.4	1.1	87.8	3356	4	2270	12	0.83	1831.	40 119	7.6	
45.0	3780	919	15.20	24614	30.0	11.0	322	3656	204	3.9	0.9	88.0	3777	3	2531	11	0.78	2009.	44 130	8.1	
50.0	4200	1022	16.89	25979	31.6	10.4	341	3680	183	3.5	0.9	88.2	4197	3	2791	11	0.73	2175.	49 141	8.5	

#292 84 Kr on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 20. ZC= 56.(Ba)
NEUTRON NUMBERS: NP= 48. NT= 20. NC= 68.

AP**1/3= 4.380 AT**1/3= 3.420 ELSCAT <28 deg
REDUCED MASS NUMBER= 27.10 AP+AT=AC=124.

INTERACTION RADIUS RINT=11.59 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 3.59 CT+CP= 8.42 C= 2.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 3.85

COULOMB RADII [fm]:
RCP= 4.87 RCT= 3.84 RC=RCP+RCT= 8.71

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 166.92 MeV K= .22834 n=2.471
VC(RINT)= 89.4 MeV

FISSION-TKE= 90. MeV
ASYMM. FISSION-TKE= 82. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.936 MeV/fm**2 PROX-FACTOR= 24.22 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 7.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -33.0
COMPOUND NUCLEUS: -79.2

FUSION RELATED PARAMETERS:
R-BARRIER= 10.39 fm V(RB)= 93.6 MeV
Q-VALUE= -36.9 MeV
L-CRITICAL= 90.

84 Kr on 40 Ca

84 Kr on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-GP	ET-GT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	84	27	0.30	3627	5.9	113.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	54	0.61	5130	8.4	80.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	81	0.91	6285	10.3	65.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	108	1.21	7259	11.9	56.7	57	761	462	89.3	25.3	45.3	191	145	182	135	6.27	218.	3 13	2.1	5
4.5	378	122	1.36	7700	12.6	53.4	75	1152	787	70.8	21.3	54.6	267	111	245	103	4.79	244.	4 16	2.3	6
5.0	420	135	1.52	8118	13.3	50.7	89	1464	1047	59.1	18.2	60.5	331	89	293	87	4.02	271.	5 20	2.5	6
5.5	462	149	1.67	8515	13.9	48.3	102	1718	1260	50.8	15.8	64.6	388	74	333	76	3.53	295.	5 22	2.7	7
6.0	504	163	1.82	8895	14.5	46.3	113	1930	1238	44.6	14.0	67.7	440	64	369	69	3.19	319.	6 25	2.8	8
6.5	546	176	1.97	9260	15.1	44.5	123	2108	1143	39.8	12.6	70.1	491	55	402	63	2.93	346.	7 27	3.0	8
7.0	588	190	2.12	9611	15.7	42.9	132	2261	1061	36.0	11.4	72.0	539	49	433	59	2.72	369.	7 29	3.1	9
7.5	630	203	2.27	9949	16.2	41.4	141	2394	990	32.8	10.4	73.6	586	44	463	55	2.56	392.	8 31	3.3	10
8.0	672	217	2.43	10277	16.8	40.1	149	2509	928	30.1	9.6	74.9	632	40	491	52	2.42	415.	8 33	3.4	11
8.5	714	230	2.58	10595	17.3	38.9	157	2611	874	27.9	8.9	76.0	678	36	519	50	2.30	441.	9 35	3.5	11
9.0	756	244	2.73	10903	17.8	37.8	164	2702	825	26.0	8.3	77.0	723	33	546	47	2.19	462.	10 37	3.7	12
9.5	798	257	2.88	11203	18.3	36.8	171	2783	782	24.3	7.8	77.9	767	31	572	46	2.10	488.	10 39	3.8	12
10.0	840	271	3.03	11496	18.7	35.9	178	2856	743	22.8	7.3	78.6	811	29	598	44	2.02	509.	11 41	3.9	13
10.5	882	285	3.18	11782	19.2	35.0	184	2922	707	21.5	6.9	79.2	855	27	624	42	1.95	530.	11 42	4.0	14
11.0	924	298	3.34	12060	19.7	34.2	190	2982	675	20.3	6.5	79.8	899	25	649	41	1.89	555.	12 44	4.1	14
11.5	966	312	3.49	12333	20.1	33.4	197	3036	646	19.3	6.2	80.3	942	24	675	40	1.83	575.	12 46	4.2	15
12.0	1008	325	3.64	12600	20.5	32.7	202	3086	619	18.4	5.9	80.8	986	22	699	38	1.78	600.	13 47	4.3	15
13.0	1092	352	3.94	13118	21.4	31.4	214	3175	571	16.7	5.4	81.6	1072	20	748	36	1.68	644.	14 50	4.5	16
14.0	1176	379	4.24	13617	22.2	30.3	225	3251	530	15.4	4.9	82.3	1158	18	797	35	1.60	681.	15 54	4.7	18
15.0	1260	406	4.55	14098	23.0	29.3	235	3316	495	14.2	4.6	82.9	1243	17	845	33	1.53	729.	16 57	4.9	18
16.0	1344	434	4.85	14565	23.7	28.3	245	3374	464	13.2	4.3	83.4	1328	16	892	32	1.47	770.	16 60	5.1	19
17.0	1428	461	5.15	15017	24.4	27.5	254	3424	437	12.4	4.0	83.8	1414	14	939	31	1.42	811.	17 62	5.2	20
18.0	1512	488	5.46	15456	25.1	26.7	263	3469	412	11.6	3.7	84.2	1499	13	986	30	1.37	850.	18 65	5.4	21
19.0	1596	515	5.76	15884	25.8	26.0	272	3509	391	10.9	3.5	84.5	1583	13	1033	29	1.32	889.	19 68	5.6	22
20.0	1680	542	6.06	16301	26.5	25.4	281	3545	371	10.3	3.3	84.8	1668	12	1079	28	1.28	926.	20 71	5.7	23
25.0	2100	677	7.58	18249	29.6	22.7	320	3682	297	8.1	2.6	85.9	2091	9	1307	24	1.12	1112.	25 84	6.4	27
30.0	2520	813	9.10	20018	32.5	20.7	355	3774	247	6.7	2.2	86.7	2513	7	1531	22	1.01	1293.	29 97	7.1	30
35.0	2940	948	10.61	21650	35.1	19.2	387	3838	212	5.7	1.8	87.2	2934	6	1752	20	0.93	1461.	34 109	7.7	
40.0	3360	1084	12.13	23175	37.5	17.9	416	3887	185	4.9	1.6	87.5	3355	5	1971	19	0.86	1614.	38 121	8.2	
45.0	3780	1219	13.64	24614	39.8	16.9	443	3925	165	4.4	1.4	87.8	3775	5	2189	18	0.81	1754.	43 132	8.7	
50.0	4200	1355	15.16	25979	41.9	16.0	469	3955	148	3.9	1.3	88.0	4196	4	2405	17	0.77	1903.	47 143	9.2	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	ons	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#293 84 Kr on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 26. ZC= 62.(Sm)
NEUTRON NUMBERS: NP= 48. NT= 30. NC= 78.

AP**1/3= 4.380 AT**1/3= 3.826 ELSCAT <41 deg
REDUCED MASS NUMBER= 33.60 AP+AT=AC=140.

INTERACTION RADIUS RINT=12.03 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 4.12 CT+CP= 8.95 C= 2.22

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 4.35

COULOMB RADII [fm]:
RCP= 4.87 RCT= 4.27 RC=RCP+RCT= 9.14

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 207.34 MeV K= .26652 n=2.449
VC(RINT)= 111.9 MeV

FISSION-TKE= 101. MeV
ASYMM. FISSION-TKE= 99. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.930 MeV/fm**2 PROX-FACTOR= 25.96 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.99 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -61.4
COMPOUND NUCLEUS: -75.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.80 fm V(RB)= 117.1 MeV
Q-VALUE= -69.0 MeV
L-CRITICAL= 107.

84 Kr on 56 Fe — 84 Kr on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	34	0.30	3627	7.3	147.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	67	0.60	5130	10.4	104.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	101	0.90	6285	12.7	85.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	134	1.20	7259	14.7	73.7	72	777	471	91.3	34.1	44.4	171	165	157	180	6.67	196.	3 13	1.9	4
4.5	378	151	1.35	7700	15.6	69.5	95	1201	826	72.1	27.8	53.9	252	126	221	136	5.04	217.	4 17	2.2	6
5.0	420	168	1.50	8118	16.4	65.9	114	1540	1110	60.0	23.4	60.0	319	101	268	114	4.21	239.	5 20	2.4	7
5.5	462	185	1.65	8515	17.2	62.8	130	1816	1230	51.6	20.3	64.2	378	84	307	100	3.70	261.	5 23	2.6	8
6.0	504	202	1.80	8895	18.0	60.2	144	2046	1128	45.3	17.9	67.4	432	72	340	90	3.33	283.	6 25	2.8	9
6.5	546	218	1.95	9260	18.7	57.8	157	2241	1041	40.4	16.0	69.8	484	62	370	83	3.06	304.	7 28	2.9	10
7.0	588	235	2.10	9611	19.4	55.7	169	2407	966	36.4	14.5	71.8	533	55	398	77	2.84	327.	7 30	3.1	10
7.5	630	252	2.25	9949	20.1	53.8	180	2552	902	33.2	13.2	73.4	581	49	425	72	2.66	348.	8 32	3.2	11
8.0	672	269	2.40	10277	20.8	52.1	191	2678	846	30.5	12.1	74.7	627	45	450	68	2.52	368.	8 34	3.4	12
8.5	714	286	2.55	10595	21.4	50.6	201	2789	796	28.3	11.2	75.9	673	41	474	65	2.39	388.	9 36	3.5	13
9.0	756	302	2.70	10903	22.0	49.1	210	2888	752	26.3	10.5	76.9	718	38	498	62	2.28	408.	9 38	3.7	14
9.5	798	319	2.85	11203	22.7	47.8	219	2976	712	24.6	9.8	77.7	763	35	521	59	2.19	427.	10 39	3.8	15
10.0	840	336	3.00	11496	23.2	46.6	228	3055	676	23.1	9.2	78.5	808	32	543	57	2.11	450.	10 41	3.9	15
10.5	882	353	3.15	11782	23.8	45.5	237	3127	644	21.8	8.7	79.1	852	30	565	55	2.03	468.	11 43	4.0	16
11.0	924	370	3.30	12060	24.4	44.4	245	3192	615	20.6	8.2	79.7	896	28	587	53	1.96	487.	11 45	4.1	17
11.5	966	386	3.45	12333	24.9	43.5	253	3252	588	19.5	7.8	80.2	939	27	608	52	1.90	509.	12 46	4.3	17
12.0	1008	403	3.60	12600	25.5	42.5	260	3307	564	18.6	7.4	80.7	983	25	630	50	1.85	527.	12 48	4.4	18
13.0	1092	437	3.90	13118	26.5	40.9	275	3403	520	16.9	6.8	81.5	1069	23	671	47	1.75	566.	13 51	4.6	19
14.0	1176	470	4.20	13617	27.5	39.4	289	3486	483	15.5	6.2	82.2	1155	21	712	45	1.67	599.	14 54	4.8	21
15.0	1260	504	4.50	14098	28.5	38.1	302	3557	451	14.4	5.7	82.8	1241	19	753	43	1.59	637.	15 57	5.0	22
16.0	1344	538	4.80	14565	29.4	36.8	315	3620	423	13.4	5.3	83.3	1327	17	793	41	1.53	674.	16 60	5.2	23
17.0	1428	571	5.10	15017	30.3	35.7	327	3675	398	12.5	5.0	83.8	1412	16	832	40	1.47	709.	17 63	5.4	24
18.0	1512	605	5.40	15456	31.2	34.7	338	3724	376	11.7	4.7	84.1	1497	15	871	38	1.42	745.	18 66	5.5	25
19.0	1596	638	5.70	15884	32.0	33.8	350	3768	356	11.0	4.4	84.5	1582	14	910	37	1.37	779.	19 69	5.7	26
20.0	1680	672	6.00	16301	32.9	33.0	361	3807	338	10.4	4.2	84.8	1667	13	948	36	1.33	813.	20 71	5.9	27
25.0	2100	840	7.51	18249	36.7	29.5	411	3957	270	8.2	3.3	85.9	2090	10	1138	32	1.17	971.	24 85	6.6	32
30.0	2520	1008	9.01	20018	40.3	26.9	456	4057	225	6.7	2.7	86.6	2512	8	1323	29	1.05	1123.	28 97	7.3	36
35.0	2940	1176	10.51	21650	43.5	24.9	497	4128	193	5.7	2.3	87.1	2933	7	1505	26	0.97	1259.	33 109	8.0	
40.0	3360	1344	12.01	23175	46.5	23.3	535	4181	169	5.0	2.0	87.5	3354	6	1685	24	0.90	1382.	37 121	8.5	
45.0	3780	1512	13.51	24614	49.3	22.0	571	4222	150	4.4	1.8	87.8	3775	5	1863	23	0.84	1506.	41 132	9.1	
50.0	4200	1680	15.01	25979	52.0	20.8	604	4255	135	4.0	1.6	88.0	4195	5	2039	22	0.80	1619.	46 143	9.6	

#294 84 Kr on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 29. ZC= 65.(Tb)
NEUTRON NUMBERS: NP= 48. NT= 34. NC= 82.

AP**1/3= 4.380 AT**1/3= 3.979 ELSCAT <48 deg
REDUCED MASS NUMBER= 36.00 AP+AT=AC=147.

INTERACTION RADIUS RINT=12.19 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 4.31 CT+CP= 9.14 C= 2.28

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 4.53

COULOMB RADII [fm]:
RCP= 4.87 RCT= 4.45 RC=RCP+RCT= 9.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 227.05 MeV K= .28231 n=2.443
VC(RINT)= 123.1 MeV

FISSION-TKE= 108. MeV
ASYMM. FISSION-TKE= 107. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 26.60 MeV
L-RLD= 81 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -65.2
COMPOUND NUCLEUS: -71.9

FUSION RELATED PARAMETERS:
R-BARRIER=10.95 fm V(RB)= 128.9 MeV
Q-VALUE= -76.4 MeV
L-CRITICAL= 111.

84 Kr on 63 Cu — 84 Kr on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	36	0.29	3627	7.9	164.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	72	0.58	5130	11.1	116.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	108	0.88	6285	13.6	94.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	144	1.17	7259	15.7	82.2	73	691	395	96.9	39.3	41.5	152	184	138	216	7.27	187.	2 12	1.9	4
4.5	378	162	1.32	7700	16.7	77.5	100	1139	770	75.8	31.5	52.1	238	140	206	158	5.32	207.	3 16	2.2	6
5.0	420	180	1.46	8118	17.6	73.5	121	1496	1070	62.8	26.4	58.6	308	112	255	131	4.39	228.	4 20	2.4	7
5.5	462	198	1.61	8515	18.5	70.1	138	1788	1160	53.7	22.7	63.1	370	92	295	114	3.83	249.	5 22	2.6	8
6.0	504	216	1.75	8895	19.3	67.1	154	2031	1063	47.1	20.0	66.5	425	79	328	102	3.44	270.	6 25	2.8	9
6.5	546	234	1.90	9260	20.1	64.5	168	2236	981	41.9	17.8	69.0	478	68	358	94	3.14	291.	6 27	2.9	10
7.0	588	252	2.05	9611	20.8	62.1	182	2412	911	37.8	16.1	71.1	528	60	386	87	2.92	311.	7 30	3.1	11
7.5	630	270	2.19	9949	21.6	60.0	194	2564	850	34.4	14.7	72.8	576	54	411	81	2.73	330.	8 32	3.2	12
8.0	672	288	2.34	10277	22.3	58.1	205	2698	797	31.6	13.5	74.2	623	49	436	77	2.58	350.	8 34	3.4	13
8.5	714	306	2.49	10595	23.0	56.4	216	2815	750	29.2	12.5	75.4	669	45	459	73	2.45	369.	9 36	3.5	14
9.0	756	324	2.63	10903	23.6	54.8	227	2919	708	27.2	11.6	76.4	715	41	482	70	2.34	391.	9 38	3.7	14
9.5	798	342	2.78	11203	24.3	53.3	237	3013	671	25.4	10.9	77.3	760	38	503	67	2.24	409.	10 39	3.8	15
10.0	840	360	2.92	11496	24.9	52.0	246	3096	638	23.8	10.2	78.1	805	35	525	64	2.15	427.	10 41	3.9	16
10.5	882	378	3.07	11782	25.5	50.7	255	3172	607	22.5	9.6	78.8	849	33	546	62	2.07	445.	11 43	4.1	17
11.0	924	396	3.22	12060	26.1	49.6	264	3241	580	21.2	9.1	79.4	893	31	566	60	2.00	463.	11 45	4.2	18
11.5	966	414	3.36	12333	26.7	48.5	273	3304	554	20.1	8.6	79.9	937	29	587	58	1.94	484.	12 46	4.3	18
12.0	1008	432	3.51	12600	27.3	47.5	281	3362	531	19.2	8.2	80.4	981	27	607	56	1.88	501.	12 48	4.4	19
13.0	1092	468	3.80	13118	28.4	45.6	297	3464	490	17.4	7.5	81.3	1067	25	646	53	1.78	539.	13 51	4.6	20
14.0	1176	504	4.09	13617	29.5	43.9	312	3551	455	16.0	6.9	82.0	1154	22	684	51	1.70	571.	14 54	4.8	22
15.0	1260	540	4.39	14098	30.5	42.4	327	3627	425	14.8	6.3	82.6	1240	20	722	48	1.62	607.	15 57	5.0	23
16.0	1344	576	4.68	14565	31.5	41.1	340	3693	398	13.8	5.9	83.1	1325	19	760	46	1.55	642.	16 60	5.2	24
17.0	1428	612	4.97	15017	32.5	39.9	354	3751	375	12.9	5.5	83.6	1410	18	797	45	1.50	671.	17 63	5.4	26
18.0	1512	648	5.26	15456	33.4	38.7	367	3803	354	12.1	5.2	84.0	1496	16	833	43	1.44	705.	18 66	5.6	27
19.0	1596	684	5.56	15884	34.3	37.7	379	3849	335	11.4	4.9	84.3	1581	15	870	42	1.40	738.	19 68	5.8	28
20.0	1680	720	5.85	16301	35.2	36.8	391	3891	319	10.7	4.6	84.6	1666	14	905	40	1.35	770.	19 71	5.9	29
25.0	2100	900	7.31	18249	39.4	32.9	446	4049	255	8.4	3.6	85.8	2089	11	1082	35	1.19	922.	24 84	6.7	34
30.0	2520	1080	8.77	20018	43.1	30.0	495	4154	212	6.9	3.0	86.5	2511	9	1254	32	1.07	1067.	28 97	7.4	38
35.0	2940	1260	10.23	21650	46.6	27.8	540	4230	182	5.9	2.5	87.1	2932	8	1423	29	0.98	1188.	32 109	8.0	
40.0	3360	1440	11.70	23175	49.8	26.0	581	4286	159	5.1	2.2	87.4	3353	7	1589	27	0.91	1318.	37 120	8.6	
45.0	3780	1620	13.16	24614	52.8	24.5	619	4329	141	4.5	1.9	87.7	3774	6	1754	25	0.86	1424.	41 132	9.2	
50.0	4200	1800	14.62	25979	55.7	23.2	655	4364	127	4.1	1.7	88.0	4195	5	1917	24	0.81	1534.	45 142	9.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#295 84 Kr on 92 Mo

84 Kr on 92 Mo

84 Kr on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 42. ZC= 78.(Pt)
NEUTRON NUMBERS: NP= 48. NT= 50. NC= 98.

AP**1/3= 4.380 AT**1/3= 4.514
REDUCED MASS NUMBER= 43.91 AP+AT=AC=176.

INTERACTION RADIUS RINT=12.77 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 5.00 CT+CP= 9.83 C= 2.46

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 5.20

COULOMB RADII [fm]:
RCP= 4.87 RCT= 5.08 RC=RCP+RCT= 9.95

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 307.98 MeV K= .32599 n=2.444
VC(RINT)= 170.2 MeV

FISSION-TKE= 138. MeV
ASYMM. FISSION-TKE= 138. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.930 MeV/fm**2 PROX-FACTOR= 28.71 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -87.5
COMPOUND NUCLEUS: -29.3

FUSION RELATED PARAMETERS:
R-BARRIER=11.47 fm V(RB)= 178.4 MeV
Q-VALUE= -141.4 MeV
L-CRITICAL= 117.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	44	0.26	3627	9.6	238.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	168	88	0.52	5130	13.6	168.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	252	132	0.77	6285	16.6	137.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	336	176	1.03	7259	19.2	119.0	42	159	0	140.9	77.7	19.6	38	298	33	677	16.76	0.	1	8	1.2	2
4.5	378	198	1.16	7700	20.4	112.2	97	720	400	98.6	52.3	40.7	161	217	134	301	7.34	176.	3	14	1.6	4
5.0	420	220	1.29	8118	21.5	106.5	130	1165	773	78.7	41.5	50.6	251	169	200	225	5.46	194.	4	18	1.9	6
5.5	462	242	1.42	8515	22.5	101.5	156	1528	861	66.1	34.7	57.0	325	137	248	187	4.54	212.	5	21	2.1	7
6.0	504	263	1.55	8895	23.5	97.2	179	1831	789	57.1	30.0	61.4	389	115	285	163	3.97	229.	5	24	2.4	8
6.5	546	285	1.68	9260	24.5	93.4	199	2086	729	50.4	26.4	64.8	447	99	317	147	3.57	246.	6	26	2.6	10
7.0	588	307	1.81	9611	25.4	90.0	217	2305	677	45.1	23.6	67.4	502	86	344	135	3.27	263.	7	28	2.7	11
7.5	630	329	1.93	9949	26.3	86.9	233	2495	631	40.9	21.4	69.6	553	77	369	125	3.04	280.	7	31	2.9	12
8.0	672	351	2.06	10277	27.2	84.2	249	2661	592	37.4	19.6	71.3	603	69	392	117	2.85	295.	8	33	3.1	14
8.5	714	373	2.19	10595	28.0	81.7	264	2807	557	34.4	18.0	72.8	652	62	413	111	2.69	312.	8	35	3.2	15
9.0	756	395	2.32	10903	28.8	79.4	278	2937	526	31.9	16.7	74.0	699	57	433	105	2.55	328.	9	37	3.4	16
9.5	798	417	2.45	11203	29.6	77.2	291	3053	498	29.8	15.6	75.1	746	52	452	100	2.44	344.	9	38	3.5	17
10.0	840	439	2.58	11496	30.4	75.3	303	3157	473	27.9	14.6	76.1	791	49	471	96	2.34	360.	10	40	3.7	18
10.5	882	461	2.71	11782	31.1	73.5	316	3252	451	26.2	13.7	76.9	837	45	489	93	2.25	375.	10	42	3.8	19
11.0	924	483	2.84	12060	31.9	71.8	327	3338	430	24.7	12.9	77.6	882	42	506	89	2.16	391.	11	43	3.9	20
11.5	966	505	2.97	12333	32.6	70.2	339	3416	412	23.4	12.3	78.3	926	40	523	86	2.09	406.	11	45	4.1	21
12.0	1008	527	3.10	12600	33.3	68.7	350	3488	394	22.2	11.6	78.9	971	37	540	84	2.03	423.	12	47	4.2	21
13.0	1092	571	3.35	13118	34.6	66.0	370	3615	364	20.2	10.6	79.9	1058	34	572	79	1.91	453.	13	50	4.4	23
14.0	1176	615	3.61	13617	35.9	63.6	390	3724	338	18.5	9.7	80.7	1146	30	603	75	1.82	481.	13	53	4.6	25
15.0	1260	659	3.87	14098	37.2	61.5	409	3819	315	17.1	8.9	81.5	1232	28	634	71	1.73	512.	14	56	4.8	26
16.0	1344	703	4.13	14565	38.4	59.5	427	3901	296	15.9	8.3	82.1	1318	26	664	68	1.66	539.	15	59	5.1	28
17.0	1428	746	4.39	15017	39.6	57.7	444	3974	278	14.8	7.7	82.6	1404	24	693	66	1.59	569.	16	62	5.2	29
18.0	1512	790	4.64	15456	40.7	56.1	461	4039	263	13.9	7.3	83.1	1490	22	722	63	1.54	594.	17	64	5.4	31
19.0	1596	834	4.90	15884	41.9	54.6	477	4096	249	13.1	6.8	83.5	1575	21	751	61	1.49	623.	18	67	5.6	32
20.0	1680	878	5.16	16301	42.9	53.2	493	4148	236	12.3	6.5	83.8	1661	19	779	59	1.44	651.	19	70	5.8	33
25.0	2100	1098	6.45	18249	48.0	47.6	564	4346	189	9.7	5.0	85.2	2085	15	916	52	1.26	774.	23	83	6.6	40
30.0	2520	1317	7.74	20018	52.6	43.5	627	4477	157	7.9	4.1	86.0	2508	12	1049	47	1.13	895.	27	95	7.3	45
35.0	2940	1537	9.03	21650	56.8	40.2	684	4571	135	6.7	3.5	86.6	2930	10	1178	43	1.04	1004.	31	106	8.0	
40.0	3360	1756	10.32	23175	60.7	37.6	737	4642	118	5.8	3.1	87.1	3351	9	1304	40	0.96	1102.	35	117	8.6	
45.0	3780	1976	11.61	24614	64.4	35.5	787	4696	105	5.2	2.7	87.4	3772	8	1429	37	0.90	1199.	39	128	9.1	
50.0	4200	2195	12.90	25979	67.9	33.7	833	4740	94	4.6	2.4	87.7	4193	7	1552	35	0.85	1286.	43	139	9.7	

#296 84 Kr on 108 Ag

84 Kr on 108 Ag

84 Kr on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 47. ZC= 83.(Bi)
NEUTRON NUMBERS: NP= 48. NT= 61. NC=109.

AP**1/3= 4.380 AT**1/3= 4.762
REDUCED MASS NUMBER= 47.25 AP+AT=AC=192.

INTERACTION RADIUS RINT=13.04 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 5.32 CT+CP=10.15 C= 2.53

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 5.50

COULOMB RADII [fm]:
RCP= 4.87 RCT= 5.34 RC=RCP+RCT=10.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 335.76 MeV K= .33140 n=2.446
VC(RINT)= 186.5 MeV

FISSION-TKE= 150. MeV
ASYMM. FISSION-TKE= 147. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.921 MeV/fm**2 PROX-FACTOR= 29.29 MeV
L-RLD= 74 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.33 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -87.6
COMPOUND NUCLEUS: -15.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.71 fm V(RB)= 195.2 MeV
Q-VALUE= -155.8 MeV
L-CRITICAL= 122.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	47	0.25	3627	10.3	266.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	168	95	0.51	5130	14.6	186.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	252	142	0.76	6285	17.9	153.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	336	189	1.01	7259	20.7	133.2	29	67	0	155.3	107.3	12.4	20	316	15	1169	27.23	0.	1	7	1.2	3
4.5	378	213	1.14	7700	21.9	125.6	100	663	353	103.1	60.5	38.4	150	228	120	359	7.97	162.	2	13	1.5	4
5.0	420	236	1.27	8118	23.1	119.1	138	1135	749	81.6	47.0	49.2	243	177	187	260	5.76	178.	4	17	1.8	6
5.5	462	260	1.39	8515	24.2	113.6	168	1521	803	68.2	39.0	55.9	319	143	235	214	4.74	194.	4	21	2.1	8
6.0	504	284	1.52	8895	25.3	108.8	193	1842	736	58.8	33.5	60.6	384	120	272	186	4.12	210.	5	23	2.3	9
6.5	546	307	1.65	9260	26.3	104.5	215	2114	679	51.8	29.4	64.1	443	103	303	167	3.70	225.	6	26	2.5	11
7.0	588	331	1.77	9611	27.3	100.7	235	2346	631	46.3	26.2	66.8	498	90	329	153	3.38	241.	6	28	2.7	12
7.5	630	354	1.90	9949	28.3	97.3	254	2547	589	41.9	23.7	69.0	551	79	352	141	3.13	255.	7	30	2.9	14
8.0	672	378	2.03	10277	29.2	94.2	271	2723	552	38.3	21.6	70.8	601	71	374	132	2.93	271.	8	32	3.0	15
8.5	714	402	2.15	10595	30.1	91.4	287	2879	519	35.3	19.9	72.4	649	65	393	125	2.77	286.	8	34	3.2	16
9.0	756	425	2.28	10903	31.0	88.8	303	3017	491	32.7	18.4	73.7	697	59	412	119	2.63	301.	9	36	3.4	17
9.5	798	449	2.41	11203	31.9	86.4	317	3140	465	30.5	17.2	74.8	744	54	430	113	2.50	314.	9	38	3.5	19
10.0	840	473	2.53	11496	32.7	84.3	331	3251	441	28.5	16.1	75.7	790	50	447	108	2.40	329.	10	40	3.6	20
10.5	882	496	2.66	11782	33.5	82.2	345	3352	420	26.8	15.1	76.6	835	47	463	104	2.30	343.	10	41	3.8	21
11.0	924	520	2.79	12060	34.3	80.3	358	3443	401	25.3	14.3	77.3	880	44	479	100	2.22	358.	11	43	3.9	22
11.5	966	543	2.91	12333	35.0	78.6	370	3526	384	24.0	13.5	78.0	925	41	494	97	2.15	372.	11	45	4.0	23
12.0	1008	567	3.04	12600	35.8	76.9	382	3603	368	22.7	12.8	78.6	969	39	509	94	2.08	386.	11	46	4.1	24
13.0	1092	614	3.29	13118	37.3	73.9	405	3738	339	20.7	11.6	79.7	1057	35	538	89	1.96	413.	12	49	4.4	26
14.0	1176	662	3.55	13617	38.7	71.2	427	3853	315	18.9	10.7	80.5	1145	31	567	84	1.86	439.	13	52	4.6	28
15.0	1260	709	3.80	14098	40.0	68.8	448	3953	294	17.5	9.8	81.3	1231	29	594	80	1.77	465.	14	55	4.8	30
16.0	1344	756	4.05	14565	41.3	66.6	468	4041	276	16.2	9.1	81.9	1318	26	621	77	1.70	493.	15	58	5.0	31
17.0	1428	803	4.31	15017	42.6	64.6	487	4118	259	15.1	8.5	82.4	1404	24	647	74	1.63	517.	16	61	5.2	33
18.0	1512	851	4.56	15456	43.8	62.8	505	4187	245	14.2	8.0	82.9	1489	23	673	71	1.57	541.	17	64	5.4	35
19.0	1596	898	4.81	15884	45.0	61.1	523	4249	232	13.3	7.5	83.3	1575	21	698	69	1.52	567.	17	66	5.6	36
20.0	1680	945	5.07	16301	46.2	59.6	540	4304	220	12.6	7.1	83.7	1660	20	723	66	1.47	593.	18	69	5.7	37
25.0	2100	1181	6.33	18249	51.7	53.3	618	4514	176	9.8	5.5	85.1	2085	15	845	58	1.29	708.	22	81	6.5	44
30.0	2520	1418	7.60	20018	56.6	48.6	688	4654	147	8.1	4.6	86.0	2508	12	961	52	1.16	815.	26	93	7.3	50
35.0	2940	1654	8.87	21650	61.1	45.0	751	4753	126	6.9	3.9	86.6	2930	10	1075	48	1.06	911.	30	105	7.9	
40.0	3360	1890	10.13	23175	65.4	42.1	809	4828	110	6.0	3.4	87.0	3351	9	1185	44	0.98	1002.	34	116	8.5	
45.0	3780	2126	11.40	24614	69.3	39.7	864	4886	98	5.3	3.0	87.4	3772	8	1294	42	0.92	1093.	38	126	9.1	
50.0	4200	2363	12.66	25979	73.1	37.7	915	4933	88	4.7	2.7	87.6	4193	7	1402	39	0.87	1176.	42	137	9.6	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-fr	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#297 84 Kr on 140 Ce

84 Kr on 140 Ce

84 Kr on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 58. ZC= 94.(Pu)
NEUTRON NUMBERS: NP= 48. NT= 82. NC=130.

AP**1/3= 4.380 AT**1/3= 5.192
REDUCED MASS NUMBER= 52.50 AP+AT=AC=224.

INTERACTION RADIUS RINT=13.51 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 5.87 CT+CP=10.70 C= 2.65

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.04

COULOMB RADII [fm]:
RCP= 4.87 RCT= 5.82 RC=RCP+RCT=10.69

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 395.16 MeV K= .33621 n=2.460
VC(RINT)= 222.3 MeV

FISSION-TKE= 178. MeV
ASYMM. FISSION-TKE= 168. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.908 MeV/fm**2 PROX-FACTOR= 30.24 MeV
L-RLD= 65 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.92 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -88.2
COMPOUND NUCLEUS: 34.2

FUSION RELATED PARAMETERS:
R-BARRIER=12.12 fm V(RB)= 232.0 MeV
Q-VALUE= -205.6 MeV
L-CRITICAL= 118.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	53	0.24	3627	11.5	328.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	105	0.47	5130	16.2	232.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	158	0.71	6285	19.9	189.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	210	0.94	7259	23.0	164.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	378	236	1.06	7700	24.4	155.0	79	341	83	125.8	89.0	27.1	97	281	71	637	11.96	140.	2 11	1.0	3
5.0	420	263	1.18	8118	25.7	147.0	135	885	536	94.8	62.6	42.6	207	213	151	376	7.00	154.	3 16	1.4	5
5.5	462	289	1.30	8515	26.9	140.2	174	1330	612	77.7	50.2	51.2	292	170	205	292	5.44	168.	4 19	1.7	7
6.0	504	315	1.42	8895	28.1	134.2	206	1699	561	66.2	42.4	56.9	363	141	246	247	4.60	181.	5 22	2.0	9
6.5	546	341	1.54	9260	29.3	129.0	233	2011	518	57.9	36.8	61.1	426	120	278	218	4.06	195.	6 25	2.2	11
7.0	588	368	1.65	9611	30.4	124.3	258	2279	481	51.5	32.6	64.3	484	104	304	198	3.68	209.	6 27	2.4	12
7.5	630	394	1.77	9949	31.4	120.1	280	2510	448	46.4	29.3	66.8	538	92	327	182	3.38	221.	7 29	2.6	14
8.0	672	420	1.89	10277	32.5	116.2	301	2713	420	42.3	26.6	68.9	590	82	347	169	3.15	234.	7 31	2.8	16
8.5	714	446	2.01	10595	33.5	112.8	320	2892	396	38.8	24.4	70.6	640	74	366	159	2.96	247.	8 33	2.9	17
9.0	756	473	2.13	10903	34.4	109.6	338	3051	374	35.9	22.6	72.1	689	67	383	151	2.80	259.	8 35	3.1	19
9.5	798	499	2.24	11203	35.4	106.7	356	3193	354	33.4	21.0	73.3	736	62	399	143	2.66	272.	9 37	3.2	20
10.0	840	525	2.36	11496	36.3	104.0	372	3321	336	31.2	19.6	74.4	783	57	414	137	2.54	284.	9 38	3.4	22
10.5	882	551	2.48	11782	37.2	101.5	388	3436	320	29.3	18.4	75.4	829	53	428	131	2.44	297.	10 40	3.5	23
11.0	924	578	2.60	12060	38.1	99.1	403	3541	306	27.6	17.3	76.2	875	49	442	126	2.35	309.	10 42	3.6	24
11.5	966	604	2.72	12333	38.9	97.0	418	3637	292	26.1	16.4	76.9	920	46	456	122	2.27	320.	11 43	3.8	26
12.0	1008	630	2.83	12600	39.8	94.9	432	3725	280	24.8	15.5	77.6	965	43	469	118	2.19	332.	11 45	3.9	27
13.0	1092	683	3.07	13118	41.4	91.2	459	3880	259	22.5	14.1	78.8	1053	39	494	111	2.06	356.	12 48	4.1	29
14.0	1176	735	3.31	13617	43.0	87.9	485	4014	240	20.6	12.9	79.7	1141	35	518	105	1.96	380.	13 51	4.3	31
15.0	1260	788	3.54	14098	44.5	84.9	509	4129	224	18.9	11.9	80.5	1228	32	541	100	1.86	401.	14 54	4.6	34
16.0	1344	840	3.78	14565	45.9	82.2	532	4230	210	17.6	11.0	81.2	1315	29	563	96	1.78	423.	14 56	4.8	36
17.0	1428	893	4.02	15017	47.3	79.7	554	4319	198	16.4	10.2	81.8	1401	27	585	92	1.71	444.	15 59	5.0	38
18.0	1512	945	4.25	15456	48.7	77.5	575	4398	187	15.3	9.6	82.3	1487	25	606	89	1.65	468.	16 62	5.1	39
19.0	1596	998	4.49	15884	50.1	75.4	596	4469	177	14.4	9.0	82.8	1572	24	627	86	1.59	489.	17 64	5.3	41
20.0	1680	1050	4.72	16301	51.4	73.5	616	4533	168	13.6	8.5	83.2	1658	22	648	83	1.54	509.	18 67	5.5	43
25.0	2100	1313	5.91	18249	57.4	65.8	707	4774	134	10.6	6.6	84.7	2083	17	747	72	1.34	608.	22 79	6.3	51
30.0	2520	1575	7.09	20018	62.9	60.0	787	4935	112	8.7	5.5	85.6	2506	14	841	65	1.20	700.	25 90	7.0	58
35.0	2940	1838	8.27	21650	67.9	55.6	860	5050	96	7.4	4.6	86.3	2929	11	932	59	1.10	787.	29 101	7.6	
40.0	3360	2100	9.45	23175	72.6	52.0	928	5136	84	6.4	4.0	86.8	3350	10	1021	55	1.02	866.	33 112	8.2	
45.0	3780	2363	10.63	24614	77.0	49.0	990	5203	74	5.7	3.5	87.2	3771	9	1107	51	0.96	942.	37 122	8.8	
50.0	4200	2625	11.81	25979	81.2	46.5	1049	5257	67	5.1	3.2	87.5	4192	8	1192	49	0.90	1012.	40 132	9.3	

#298 84 Kr on 154 Sm

84 Kr on 154 Sm

84 Kr on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 62. ZC= 98.(Cf)
NEUTRON NUMBERS: NP= 48. NT= 92. NC=140.

AP**1/3= 4.380 AT**1/3= 5.360
REDUCED MASS NUMBER= 54.35 AP+AT=AC=238.

INTERACTION RADIUS RINT=13.69 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 6.09 CT+CP=10.92 C= 2.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.25

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.00 RC=RCP+RCT=10.87

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 415.15 MeV K= .33376 n=2.466
VC(RINT)= 234.4 MeV

FISSION-TKE= 188. MeV
ASYMM. FISSION-TKE= 175. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 30.43 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.79 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -72.1
COMPOUND NUCLEUS: 57.9

FUSION RELATED PARAMETERS:
R-BARRIER=12.28 fm V(RB)= 244.3 MeV
Q-VALUE= -213.2 MeV
L-CRITICAL= 116.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	54	0.23	3627	11.9	351.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	109	0.46	5130	16.8	248.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	163	0.70	6285	20.6	202.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	217	0.93	7259	23.8	175.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	378	245	1.04	7700	25.2	165.7	69	244	5	134.6	102.4	22.7	84	294	58	814	14.55	132.	2 11	1.0	3
5.0	420	272	1.16	8118	26.6	157.2	134	814	478	99.0	68.5	40.5	198	222	142	424	7.50	145.	3 15	1.4	5
5.5	462	299	1.28	8515	27.9	149.9	177	1279	549	80.5	54.3	49.7	286	176	197	323	5.70	157.	4 19	1.7	8
6.0	504	326	1.39	8895	29.1	143.5	211	1665	503	68.4	45.5	55.8	358	146	238	271	4.77	170.	5 22	1.9	10
6.5	546	353	1.51	9260	30.3	137.9	240	1992	464	59.7	39.4	60.2	423	123	270	238	4.19	183.	5 24	2.2	12
7.0	588	380	1.62	9611	31.5	132.8	266	2272	431	53.0	34.8	63.5	481	107	296	214	3.78	195.	6 27	2.4	14
7.5	630	408	1.74	9949	32.6	128.3	290	2515	402	47.7	31.3	66.1	536	94	319	197	3.47	207.	7 29	2.6	16
8.0	672	435	1.85	10277	33.6	124.3	312	2727	377	43.4	28.4	68.3	588	84	339	183	3.23	220.	7 31	2.7	17
8.5	714	462	1.97	10595	34.7	120.5	333	2914	355	39.8	26.0	70.1	638	76	356	172	3.03	232.	8 33	2.9	19
9.0	756	489	2.09	10903	35.7	117.2	352	3080	335	36.8	24.0	71.6	687	69	373	162	2.86	244.	8 34	3.0	20
9.5	798	516	2.20	11203	36.6	114.0	370	3229	317	34.2	22.3	72.9	735	63	388	154	2.72	255.	9 36	3.2	22
10.0	840	544	2.32	11496	37.6	111.1	388	3362	302	32.0	20.8	74.0	782	58	402	147	2.60	268.	9 38	3.3	23
10.5	882	571	2.43	11782	38.5	108.5	405	3483	287	30.0	19.5	75.0	828	54	416	141	2.49	278.	10 40	3.5	25
11.0	924	598	2.55	12060	39.4	106.0	421	3593	274	28.3	18.4	75.9	874	50	429	136	2.39	290.	10 41	3.6	26
11.5	966	625	2.67	12333	40.3	103.6	436	3694	262	26.7	17.4	76.6	919	47	442	131	2.31	301.	11 43	3.7	28
12.0	1008	652	2.78	12600	41.2	101.5	451	3786	251	25.4	16.5	77.3	964	44	454	127	2.23	312.	11 44	3.8	29
13.0	1092	707	3.01	13118	42.9	97.5	480	3948	232	23.0	14.9	78.5	1052	40	478	119	2.10	333.	12 47	4.1	32
14.0	1176	761	3.25	13617	44.5	93.9	506	4088	215	21.0	13.6	79.5	1140	36	500	113	1.99	356.	13 50	4.3	34
15.0	1260	815	3.48	14098	46.0	90.7	532	4208	201	19.4	12.6	80.3	1227	33	522	108	1.89	377.	13 53	4.5	36
16.0	1344	870	3.71	14565	47.6	87.9	556	4314	188	18.0	11.6	81.0	1314	30	543	103	1.81	398.	14 56	4.7	38
17.0	1428	924	3.94	15017	49.0	85.2	580	4407	177	16.7	10.8	81.6	1400	28	563	99	1.74	417.	15 58	4.9	41
18.0	1512	978	4.17	15456	50.4	82.8	602	4490	167	15.7	10.2	82.2	1486	26	583	95	1.67	437.	16 61	5.1	43
19.0	1596	1033	4.40	15884	51.8	80.6	624	4564	158	14.7	9.5	82.6	1572	24	602	92	1.62	459.	17 63	5.2	44
20.0	1680	1087	4.64	16301	53.2	78.6	644	4631	151	13.9	9.0	83.0	1658	22	621	89	1.56	478.	17 66	5.4	46
25.0	2100	1359	5.80	18249	59.4	70.3	740	4884	120	10.9	7.0	84.6	2083	17	713	77	1.36	570.	21 78	6.2	55
30.0	2520	1631	6.96	20018	65.1	64.2	825	5053	100	8.9	5.8	85.6	2506	14	800	69	1.22	657.	25 89	6.9	62
35.0	2940	1902	8.11	21650	70.3	59.4	901	5173	86	7.5	4.9	86.2	2928	12	883	63	1.12	736.	29 100	7.5	
40.0	3360	2174	9.27	23175	75.2	55.6	972	5263	75	6.5	4.2	86.7	3350	10	964	59	1.04	812.	32 111	8.1	
45.0	3780	2446	10.43	24614	79.7	52.4	1038	5333	67	5.8	3.7	87.1	3771	9	1043	55	0.97	885.	36 121	8.7	
50.0	4200	2718	11.59	25979	84.1	49.7	1100	5389	60	5.2	3.3	87.4	4192	8	1121	52	0.92	952.	40 131	9.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#299 84 Kr on 165 Ho

84 Kr on 165 Ho

84 Kr on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 67. ZC=103.(Lw)
NEUTRON NUMBERS: NP= 48. NT= 98. NC=146.

AP**1/3= 4.380 AT**1/3= 5.485
REDUCED MASS NUMBER= 55.66 AP+AT=AC=249.

INTERACTION RADIUS RINT=13.83 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 6.25 CT+CP=11.08 C= 2.72

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.41

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.15 RC=RCP+RCT=11.02

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 441.81 MeV K= .33494 n=2.475
VC(RINT)= 250.9 MeV

FISSION-TKE= 203. MeV
ASYMM. FISSION-TKE= 184. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 30.85 MeV
L-RLD= 50 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.71 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -63.7
COMPOUND NUCLEUS: 87.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.39 fm V(RB)= 261.5 MeV
Q-VALUE= -234.4 MeV
L-CRITICAL= 104.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	56	0.22	3627	12.2	379.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	111	0.44	5130	17.2	268.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	167	0.67	6285	21.1	219.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	223	0.89	7259	24.3	189.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	378	250	1.00	7700	25.8	179.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	420	278	1.11	8118	27.2	169.8	117	595	292	110.7	80.5	34.7	166	254	116	541	8.96	139.	3 14	1.2	4
5.5	462	306	1.22	8515	28.6	161.9	167	1091	428	88.2	61.6	45.9	262	200	180	381	6.29	152.	4 18	1.5	6
6.0	504	334	1.33	8895	29.8	155.1	205	1503	392	74.1	50.9	52.9	340	164	225	311	5.13	164.	5 21	1.8	9
6.5	546	362	1.44	9260	31.0	149.0	237	1851	362	64.2	43.7	57.9	408	138	260	269	4.43	176.	5 24	2.0	11
7.0	588	390	1.55	9611	32.2	143.5	265	2150	336	56.8	38.4	61.6	469	119	288	241	3.96	188.	6 26	2.2	13
7.5	630	417	1.66	9949	33.3	138.7	291	2408	313	51.0	34.3	64.5	526	104	312	220	3.62	200.	7 28	2.4	14
8.0	672	445	1.77	10277	34.4	134.3	314	2634	294	46.3	31.0	66.9	579	93	332	203	3.35	212.	7 30	2.6	16
8.5	714	473	1.89	10595	35.5	130.3	336	2833	276	42.4	28.4	68.8	631	83	351	190	3.13	223.	8 32	2.8	18
9.0	756	501	2.00	10903	36.5	126.6	357	3010	261	39.1	26.1	70.5	680	76	367	179	2.95	234.	8 34	2.9	20
9.5	798	529	2.11	11203	37.5	123.2	376	3169	247	36.3	24.2	71.8	729	69	383	170	2.80	246.	9 36	3.1	21
10.0	840	557	2.22	11496	38.5	120.1	394	3311	235	33.9	22.6	73.1	776	64	397	162	2.67	257.	9 37	3.2	23
10.5	882	584	2.33	11782	39.5	117.2	412	3440	224	31.8	21.2	74.1	823	59	411	155	2.55	269.	10 39	3.4	24
11.0	924	612	2.44	12060	40.4	114.5	429	3558	214	29.9	19.9	75.0	869	55	424	149	2.45	279.	10 41	3.5	26
11.5	966	640	2.55	12333	41.3	112.0	445	3665	204	28.3	18.8	75.9	915	51	436	144	2.36	290.	10 42	3.6	27
12.0	1008	668	2.66	12600	42.2	109.6	461	3763	196	26.8	17.8	76.6	960	48	448	139	2.28	300.	11 44	3.7	29
13.0	1092	724	2.88	13118	43.9	105.3	490	3936	181	24.2	16.1	77.9	1049	43	471	130	2.15	322.	12 47	4.0	31
14.0	1176	779	3.11	13617	45.6	101.5	518	4085	168	22.2	14.7	78.9	1137	39	493	123	2.03	342.	13 49	4.2	34
15.0	1260	835	3.33	14098	47.2	98.1	545	4213	156	20.4	13.5	79.8	1225	35	514	117	1.93	363.	13 52	4.4	36
16.0	1344	891	3.55	14565	48.7	94.9	570	4326	147	18.9	12.5	80.6	1312	32	534	112	1.84	382.	14 55	4.6	39
17.0	1428	946	3.77	15017	50.2	92.1	595	4425	138	17.6	11.7	81.2	1398	30	553	107	1.77	402.	15 58	4.8	41
18.0	1512	1002	3.99	15456	51.7	89.5	618	4514	130	16.5	10.9	81.8	1484	28	572	103	1.70	422.	16 60	5.0	43
19.0	1596	1058	4.22	15884	53.1	87.1	641	4593	123	15.5	10.3	82.3	1570	26	591	100	1.64	441.	17 63	5.1	45
20.0	1680	1113	4.44	16301	54.4	84.9	662	4664	117	14.6	9.7	82.7	1656	24	609	96	1.59	459.	17 65	5.3	47
25.0	2100	1392	5.55	18249	60.9	76.0	762	4934	94	11.4	7.6	84.3	2082	18	696	84	1.38	552.	21 77	6.1	55
30.0	2520	1670	6.66	20018	66.7	69.3	850	5113	78	9.3	6.2	85.3	2505	15	778	75	1.24	635.	25 88	6.8	63
35.0	2940	1948	7.77	21650	72.0	64.2	929	5242	67	7.9	5.2	86.0	2928	12	857	69	1.13	713.	29 99	7.4	
40.0	3360	2227	8.87	23175	77.0	60.1	1003	5338	58	6.9	4.5	86.6	3349	11	934	64	1.05	787.	32 109	8.0	
45.0	3780	2505	9.98	24614	81.7	56.6	1071	5412	52	6.1	4.0	87.0	3771	9	1008	60	0.98	855.	36 119	8.5	
50.0	4200	2783	11.09	25979	86.1	53.7	1135	5472	47	5.4	3.6	87.3	4192	8	1081	56	0.93	921.	39 129	9.0	

#300 84 Kr on 181 Ta

84 Kr on 181 Ta

84 Kr on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 73. ZC=109.( )
NEUTRON NUMBERS: NP= 48. NT=108. NC=156.

AP**1/3= 4.380 AT**1/3= 5.657
REDUCED MASS NUMBER= 57.37 AP+AT=AC=265.

INTERACTION RADIUS RINT=14.01 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 6.47 CT+CP=11.30 C= 2.77

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.62

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.35 RC=RCP+RCT=11.23

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 472.12 MeV K= .33251 n=2.485
VC(RINT)= 269.7 MeV

FISSION-TKE= 220. MeV
ASYMM. FISSION-TKE= 195. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 31.22 MeV
L-RLD= 36 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -46.0
COMPOUND NUCLEUS: 128.2

FUSION RELATED PARAMETERS:
R-BARRIER=12.55 fm V(RB)= 280.8 MeV
Q-VALUE= -257.3 MeV
L-CRITICAL= 89.

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	57	0.21	3627	12.5	413.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	115	0.43	5130	17.7	292.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	172	0.64	6285	21.7	238.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	229	0.85	7259	25.1	206.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	378	258	0.96	7700	26.6	195.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	420	287	1.06	8118	28.1	185.1	95	369	103	125.6	98.2	27.2	132	288	88	757	11.71	132.	2 13	0.9	3
5.5	462	316	1.17	8515	29.4	176.4	157	900	294	96.8	70.8	41.6	238	224	161	463	7.12	144.	3 17	1.3	5
6.0	504	344	1.28	8895	30.7	168.9	200	1342	269	80.4	57.4	49.8	322	182	211	363	5.57	155.	4 20	1.6	8
6.5	546	373	1.38	9260	32.0	162.3	235	1716	248	69.2	48.7	55.4	394	152	249	309	4.73	166.	5 23	1.9	10
7.0	588	402	1.49	9611	33.2	156.4	266	2035	231	60.9	42.6	59.6	457	131	279	273	4.18	178.	6 25	2.1	12
7.5	630	430	1.60	9949	34.4	151.1	294	2312	215	54.4	37.9	62.8	516	114	303	247	3.79	189.	6 27	2.3	14
8.0	672	459	1.70	10277	35.5	146.3	319	2554	202	49.3	34.2	65.4	571	101	324	228	3.49	200.	7 30	2.5	16
8.5	714	488	1.81	10595	36.6	141.9	342	2768	190	45.0	31.1	67.5	623	91	343	212	3.25	211.	8 31	2.6	18
9.0	756	516	1.91	10903	37.6	137.9	364	2958	179	41.5	28.6	69.3	674	82	360	200	3.06	221.	8 33	2.8	20
9.5	798	545	2.02	11203	38.7	134.3	385	3128	170	38.5	26.5	70.8	723	75	375	189	2.89	233.	8 35	2.9	21
10.0	840	574	2.13	11496	39.7	130.9	404	3280	161	35.9	24.7	72.1	771	69	389	180	2.75	243.	9 37	3.1	23
10.5	882	602	2.23	11782	40.7	127.7	423	3418	154	33.6	23.1	73.2	818	64	403	172	2.63	253.	9 38	3.2	25
11.0	924	631	2.34	12060	41.6	124.8	441	3544	147	31.6	21.7	74.2	865	59	415	165	2.53	264.	10 40	3.4	26
11.5	966	660	2.45	12333	42.6	122.0	458	3659	140	29.8	20.5	75.1	911	55	427	159	2.43	274.	10 41	3.5	28
12.0	1008	688	2.55	12600	43.5	119.5	475	3764	134	28.2	19.4	75.9	956	52	439	153	2.35	283.	11 43	3.6	30
13.0	1092	746	2.77	13118	45.2	114.8	506	3950	124	25.5	17.5	77.2	1046	46	461	144	2.20	304.	12 46	3.8	32
14.0	1176	803	2.98	13617	47.0	110.6	536	4109	115	23.3	16.0	78.3	1134	42	482	136	2.08	323.	12 49	4.1	35
15.0	1260	861	3.19	14098	48.6	106.8	564	4247	107	21.5	14.7	79.3	1222	38	501	129	1.97	343.	13 51	4.3	37
16.0	1344	918	3.40	14565	50.2	103.5	591	4368	101	19.9	13.6	80.1	1309	35	520	123	1.89	361.	14 54	4.5	40
17.0	1428	975	3.62	15017	51.7	100.4	616	4474	95	18.5	12.7	80.8	1396	32	539	118	1.81	381.	15 57	4.7	42
18.0	1512	1033	3.83	15456	53.2	97.5	641	4569	89	17.3	11.8	81.3	1482	30	557	113	1.74	399.	16 59	4.8	44
19.0	1596	1090	4.04	15884	54.7	94.9	665	4653	85	16.3	11.1	81.9	1568	28	574	109	1.68	416.	16 62	5.0	47
20.0	1680	1147	4.25	16301	56.1	92.5	688	4729	80	15.3	10.5	82.3	1654	26	591	106	1.62	434.	17 64	5.2	49
25.0	2100	1434	5.32	18249	62.7	82.8	792	5019	64	11.9	8.2	84.0	2080	20	672	92	1.41	520.	21 76	6.0	58
30.0	2520	1721	6.38	20018	68.7	75.6	884	5211	53	9.8	6.7	85.1	2504	16	748	82	1.26	599.	25 87	6.6	66
35.0	2940	2008	7.44	21650	74.2	69.9	968	5349	46	8.3	5.6	85.9	2927	13	821	75	1.15	675.	28 98	7.3	
40.0	3360	2295	8.51	23175	79.4	65.4	1045	5452	40	7.2	4.9	86.4	3349	11	891	70	1.07	743.	32 108	7.8	
45.0	3780	2582	9.57	24614	84.2	61.7	1116	5532	35	6.3	4.3	86.8	3770	10	960	65	1.00	809.	35 118	8.4	
50.0	4200	2869	10.64	25979	88.7	58.5	1183	5596	32	5.7	3.9	87.2	4191	9	1027	61	0.94	869.	39 127	8.9	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#301 84 Kr on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 79. ZC=115.( )
NEUTRON NUMBERS: NP= 48. NT=118. NC=166.

AP**1/3= 4.380 AT**1/3= 5.819
REDUCED MASS NUMBER= 58.89 AP+AT=AC=281.

INTERACTION RADIUS RINT=14.19 fm R0= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 6.68 CT+CP=11.51 C= 2.80

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.83

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.55 RC=RCP+RCT=11.42

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 501.72 MeV K= .32886 n=2.496
VC(RINT)= 288.3 MeV

FISSION-TKE= 238. MeV
ASYMM. FISSION-TKE= 205. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 31.55 MeV
L-RLD= 18 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.52 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -28.6
COMPOUND NUCLEUS: 176.1

FUSION RELATED PARAMETERS:
R-BARRIER=12.69 fm V(RB)= 299.9 MeV
Q-VALUE= -287.9 MeV
L-CRITICAL= 66.

84 Kr on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	59	0.20	3627	12.9	447.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	118	0.41	5130	18.2	316.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	177	0.61	6285	22.3	258.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	236	0.82	7259	25.8	223.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	378	265	0.92	7700	27.3	211.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	420	294	1.02	8118	28.8	200.3	57	129	0	148.1	128.6	16.0	95	325	57	1385	20.45	0.	2 11	0.4	0
5.5	462	324	1.12	8515	30.2	190.9	141	698	154	107.0	82.0	36.5	212	250	140	576	8.29	137.	3 16	1.0	3
6.0	504	353	1.23	8895	31.6	182.8	191	1169	141	87.3	64.7	46.3	303	201	196	426	6.12	147.	4 19	1.4	6
6.5	546	383	1.33	9260	32.8	175.6	231	1568	131	74.5	54.2	52.8	378	168	237	354	5.07	156.	5 22	1.6	9
7.0	588	412	1.43	9611	34.1	169.3	265	1910	121	65.2	47.0	57.4	445	143	269	309	4.43	169.	6 25	1.9	11
7.5	630	442	1.53	9949	35.3	163.5	295	2205	113	58.1	41.6	61.0	506	124	295	277	3.98	179.	6 27	2.1	14
8.0	672	471	1.63	10277	36.4	158.3	322	2464	106	52.4	37.4	63.8	562	110	317	254	3.64	189.	7 29	2.3	16
8.5	714	501	1.74	10595	37.6	153.6	347	2692	100	47.8	34.0	66.1	616	98	336	236	3.38	200.	7 31	2.5	18
9.0	756	530	1.84	10903	38.6	149.3	370	2895	94	44.0	31.2	68.0	667	89	353	221	3.17	210.	8 33	2.6	20
9.5	798	559	1.94	11203	39.7	145.3	392	3076	89	40.7	28.8	69.7	717	81	369	209	2.99	221.	8 34	2.8	21
10.0	840	589	2.04	11496	40.7	141.6	413	3239	85	37.9	26.8	71.1	766	74	383	198	2.84	230.	9 36	2.9	23
10.5	882	618	2.14	11782	41.7	138.2	432	3387	81	35.5	25.1	72.3	813	69	396	189	2.71	240.	9 38	3.1	25
11.0	924	648	2.25	12060	42.7	135.0	451	3521	77	33.3	23.5	73.3	860	64	408	181	2.60	251.	10 39	3.2	26
11.5	966	677	2.35	12333	43.7	132.1	469	3643	74	31.4	22.2	74.3	907	59	420	174	2.50	260.	10 41	3.3	28
12.0	1008	707	2.45	12600	44.6	129.3	487	3755	70	29.7	21.0	75.1	952	56	432	168	2.41	270.	11 42	3.5	29
13.0	1092	766	2.66	13118	46.4	124.2	520	3954	65	26.9	18.9	76.6	1043	49	453	157	2.25	289.	11 45	3.7	32
14.0	1176	824	2.86	13617	48.2	119.7	551	4124	60	24.5	17.2	77.7	1132	44	473	148	2.13	308.	12 48	3.9	35
15.0	1260	883	3.06	14098	49.9	115.6	581	4271	56	22.5	15.8	78.7	1220	40	491	141	2.02	326.	13 51	4.1	38
16.0	1344	942	3.27	14565	51.5	112.0	609	4400	53	20.8	14.7	79.6	1307	37	510	134	1.93	343.	14 53	4.3	41
17.0	1428	1001	3.47	15017	53.1	108.6	636	4514	50	19.4	13.6	80.3	1394	34	527	129	1.84	361.	15 56	4.5	43
18.0	1512	1060	3.68	15456	54.6	105.6	661	4615	47	18.1	12.7	80.9	1481	31	544	124	1.77	379.	15 58	4.7	45
19.0	1596	1119	3.88	15884	56.1	102.7	686	4705	44	17.0	12.0	81.5	1567	29	560	119	1.71	395.	16 61	4.9	48
20.0	1680	1178	4.09	16301	57.6	100.1	710	4786	42	16.1	11.3	82.0	1653	27	576	115	1.65	413.	17 63	5.0	50
25.0	2100	1472	5.11	18249	64.4	89.6	819	5095	34	12.5	8.8	83.8	2079	21	652	100	1.43	493.	21 75	5.8	60
30.0	2520	1767	6.13	20018	70.5	81.8	915	5301	28	10.2	7.2	84.9	2503	17	723	89	1.28	571.	24 86	6.5	68
35.0	2940	2061	7.15	21650	76.2	75.7	1002	5448	24	8.6	6.1	85.7	2926	14	791	82	1.17	641.	28 96	7.1	
40.0	3360	2356	8.17	23175	81.5	70.8	1083	5558	21	7.5	5.2	86.3	3348	12	856	76	1.08	707.	31 106	7.7	
45.0	3780	2650	9.19	24614	86.4	66.8	1157	5643	18	6.6	4.6	86.7	3769	11	919	71	1.01	772.	35 116	8.2	
50.0	4200	2944	10.21	25979	91.1	63.3	1227	5712	17	5.9	4.1	87.0	4191	9	981	67	0.96	831.	38 125	8.7	

#302 84 Kr on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 82. ZC=118.( )
NEUTRON NUMBERS: NP= 48. NT=126. NC=174.

AP**1/3= 4.380 AT**1/3= 5.925
REDUCED MASS NUMBER= 59.84 AP+AT=AC=292.

INTERACTION RADIUS RINT=14.30 fm R0= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 6.82 CT+CP=11.64 C= 2.83

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.96

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.66 RC=RCP+RCT=11.53

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 515.26 MeV K= .32485 n=2.501
VC(RINT)= 296.8 MeV

FISSION-TKE= 247. MeV
ASYMM. FISSION-TKE= 209. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 31.59 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -19.5
COMPOUND NUCLEUS: 199.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.79 fm V(RB)= 308.5 MeV
Q-VALUE= -302.3 MeV
L-CRITICAL= 52.

84 Kr on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	60	0.20	3627	13.1	464.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	168	120	0.40	5130	18.5	328.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	252	180	0.60	6285	22.7	268.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	336	239	0.81	7259	26.2	232.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	378	269	0.91	7700	27.8	219.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	420	299	1.01	8118	29.3	207.9	34	45	0	161.4	149.7	9.3	85	335	47	2346	35.64	0.	2 11	0.0	0
5.5	462	329	1.11	8515	30.7	198.2	137	632	94	110.8	87.1	34.6	205	257	134	633	8.86	132.	3 15	0.9	2
6.0	504	359	1.21	8895	32.1	189.8	190	1118	86	89.9	67.9	45.1	298	206	191	456	6.36	142.	4 19	1.2	5
6.5	546	389	1.31	9260	33.4	182.3	232	1528	80	76.4	56.7	51.8	375	171	233	375	5.22	153.	5 22	1.5	8
7.0	588	419	1.41	9611	34.6	175.7	267	1880	74	66.7	49.0	56.6	442	146	265	326	4.54	163.	6 24	1.8	11
7.5	630	449	1.51	9949	35.8	169.7	298	2185	69	59.3	43.3	60.3	503	127	291	292	4.06	173.	6 26	2.0	13
8.0	672	479	1.61	10277	37.0	164.3	326	2451	65	53.5	38.8	63.2	560	112	313	267	3.71	183.	7 29	2.2	15
8.5	714	509	1.71	10595	38.2	159.4	352	2686	61	48.8	35.3	65.6	614	100	332	247	3.44	193.	7 30	2.4	18
9.0	756	539	1.81	10903	39.3	154.9	376	2894	57	44.8	32.3	67.6	666	90	349	231	3.22	202.	8 32	2.5	20
9.5	798	568	1.92	11203	40.3	150.8	398	3081	54	41.5	29.9	69.3	716	82	364	218	3.04	212.	8 34	2.7	22
10.0	840	598	2.02	11496	41.4	147.0	420	3249	52	38.6	27.7	70.7	765	75	378	207	2.88	222.	9 36	2.8	23
10.5	882	628	2.12	11782	42.4	143.4	440	3401	49	36.1	25.9	72.0	813	69	391	197	2.75	232.	9 37	3.0	25
11.0	924	658	2.22	12060	43.4	140.1	460	3539	47	33.9	24.3	73.0	860	64	403	189	2.63	241.	10 39	3.1	27
11.5	966	688	2.32	12333	44.4	137.1	478	3665	45	32.0	22.9	74.0	906	60	414	182	2.53	250.	10 40	3.3	29
12.0	1008	718	2.42	12600	45.3	134.2	496	3781	43	30.3	21.7	74.9	952	56	425	175	2.44	260.	11 42	3.4	30
13.0	1092	778	2.62	13118	47.2	128.9	530	3985	40	27.3	19.6	76.3	1042	50	446	164	2.28	278.	11 45	3.6	33
14.0	1176	838	2.82	13617	49.0	124.2	563	4160	37	24.9	17.8	77.5	1131	45	465	155	2.15	296.	12 48	3.8	36
15.0	1260	898	3.02	14098	50.7	120.0	593	4312	34	22.9	16.4	78.6	1219	41	483	147	2.04	314.	13 50	4.0	39
16.0	1344	957	3.23	14565	52.3	116.2	622	4445	32	21.2	15.1	79.4	1307	37	501	140	1.95	331.	14 53	4.2	42
17.0	1428	1017	3.43	15017	54.0	112.7	649	4562	30	19.7	14.1	80.1	1394	34	517	134	1.86	347.	15 55	4.4	45
18.0	1512	1077	3.63	15456	55.5	109.6	676	4666	28	18.4	13.1	80.8	1480	32	534	129	1.79	365.	15 58	4.6	47
19.0	1596	1137	3.83	15884	57.0	106.6	701	4759	27	17.3	12.3	81.4	1566	30	549	124	1.73	380.	16 60	4.8	50
20.0	1680	1197	4.03	16301	58.5	103.9	726	4843	26	16.3	11.6	81.8	1652	28	565	120	1.67	397.	17 63	5.0	52
25.0	2100	1496	5.04	18249	65.4	93.0	838	5161	20	12.7	9.0	83.7	2079	21	637	104	1.44	476.	20 74	5.7	62
30.0	2520	1795	6.05	20018	71.7	84.9	936	5373	17	10.4	7.4	84.8	2503	17	705	93	1.29	548.	24 85	6.4	71
35.0	2940	2094	7.06	21650	77.4	78.6	1026	5524	14	8.8	6.2	85.6	2926	14	769	85	1.18	617.	28 95	7.0	
40.0	3360	2393	8.06	23175	82.8	73.5	1108	5637	13	7.6	5.4	86.2	3348	12	831	79	1.09	681.	31 105	7.6	
45.0	3780	2693	9.07	24614	87.8	69.3	1184	5726	11	6.7	4.8	86.7	3769	11	891	73	1.02	741.	35 115	8.1	
50.0	4200	2992	10.08	25979	92.5	65.7	1256	5796	10	6.0	4.3	87.0	4191	9	950	69	0.96	798.	38 124	8.6	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#303 84 Kr on 209 Bi

84 Kr on 209 Bi

84 Kr on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 83. ZC=119.( )
NEUTRON NUMBERS: NP= 48. NT=126. NC=174.

AP**1/3= 4.380 AT**1/3= 5.934
REDUCED MASS NUMBER= 59.92 AP+AT=AC=293.

INTERACTION RADIUS RINT=14.31 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 6.83 CT+CP=11.66 C= 2.83

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 6.97

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.68 RC=RCP+RCT=11.55

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 520.64 MeV K= .32512 n=2.503
VC(RINT)= 300.2 MeV

FISSION-TKE= 251. MeV
ASYMM. FISSION-TKE= 211. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 31.70 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: -16.5
COMPOUND NUCLEUS: 206.6

FUSION RELATED PARAMETERS:
R-BARRIER=12.80 fm V(RB)= 312.1 MeV
Q-VALUE= -306.2 MeV
L-CRITICAL= 43.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	60	0.20	3627	13.1	470.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	168	120	0.40	5130	18.5	332.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	252	180	0.60	6285	22.7	271.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	336	240	0.80	7259	26.2	235.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	378	270	0.90	7700	27.8	221.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	420	300	1.00	8118	29.3	210.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	462	330	1.10	8515	30.7	200.6	130	574	64	114.0	90.3	33.0	196	266	127	673	9.31	131.	3	15	0.8	2
6.0	504	360	1.20	8895	32.1	192.1	186	1065	58	91.9	69.7	44.1	291	213	187	473	6.53	142.	4	19	1.2	5
6.5	546	389	1.30	9260	33.4	184.5	228	1481	54	77.9	58.0	51.1	370	176	230	386	5.31	152.	5	22	1.5	8
7.0	588	419	1.40	9611	34.7	177.8	264	1836	50	67.9	50.0	56.0	438	150	263	334	4.60	163.	6	24	1.8	10
7.5	630	449	1.50	9949	35.9	171.8	296	2145	46	60.3	44.1	59.8	500	130	290	298	4.11	172.	6	26	2.0	13
8.0	672	479	1.60	10277	37.1	166.3	324	2414	44	54.4	39.5	62.8	557	115	312	272	3.75	183.	7	28	2.2	15
8.5	714	509	1.70	10595	38.2	161.4	350	2652	41	49.5	35.9	65.2	612	102	332	252	3.47	193.	7	30	2.4	17
9.0	756	539	1.80	10903	39.3	156.8	374	2863	39	45.5	32.9	67.3	664	92	349	236	3.24	203.	8	32	2.5	19
9.5	798	569	1.90	11203	40.4	152.6	397	3052	37	42.1	30.3	69.0	714	84	364	222	3.06	212.	8	34	2.7	21
10.0	840	599	2.00	11496	41.4	148.8	419	3222	35	39.1	28.2	70.4	763	77	378	211	2.90	222.	9	36	2.8	23
10.5	882	629	2.10	11782	42.5	145.2	439	3375	33	36.6	26.3	71.7	811	71	391	201	2.76	231.	9	37	3.0	25
11.0	924	659	2.20	12060	43.5	141.9	459	3515	32	34.4	24.7	72.8	858	66	403	192	2.65	241.	10	39	3.1	26
11.5	966	689	2.30	12333	44.4	138.7	478	3642	30	32.4	23.3	73.8	904	62	415	185	2.54	250.	10	40	3.2	28
12.0	1008	719	2.39	12600	45.4	135.8	496	3759	29	30.7	22.0	74.7	950	58	426	178	2.45	259.	11	42	3.4	30
13.0	1092	779	2.59	13118	47.3	130.5	530	3966	27	27.7	19.8	76.2	1041	51	447	166	2.29	278.	11	45	3.6	33
14.0	1176	839	2.79	13617	49.0	125.7	562	4143	25	25.2	18.1	77.4	1130	46	466	157	2.16	296.	12	47	3.8	36
15.0	1260	899	2.99	14098	50.8	121.5	593	4297	23	23.2	16.6	78.4	1218	42	484	149	2.05	313.	13	50	4.0	39
16.0	1344	959	3.19	14565	52.4	117.6	622	4431	22	21.4	15.3	79.3	1306	38	502	142	1.95	330.	14	53	4.2	42
17.0	1428	1019	3.39	15017	54.0	114.1	649	4549	20	19.9	14.3	80.0	1393	35	518	136	1.87	348.	15	55	4.4	44
18.0	1512	1079	3.59	15456	55.6	110.9	676	4655	19	18.6	13.3	80.7	1480	32	535	131	1.80	364.	15	58	4.6	47
19.0	1596	1138	3.79	15884	57.1	107.9	701	4749	18	17.5	12.5	81.3	1566	30	550	126	1.73	381.	16	60	4.8	49
20.0	1680	1198	3.99	16301	58.6	105.2	726	4834	17	16.5	11.8	81.8	1652	28	566	122	1.67	398.	17	63	4.9	51
25.0	2100	1498	4.99	18249	65.5	94.1	838	5155	14	12.8	9.1	83.6	2079	21	638	105	1.45	476.	20	74	5.7	61
30.0	2520	1798	5.99	20018	71.8	85.9	937	5370	11	10.5	7.5	84.8	2503	17	706	94	1.29	550.	24	85	6.4	70
35.0	2940	2097	6.98	21650	77.5	79.5	1027	5523	10	8.9	6.3	85.6	2926	14	770	86	1.18	618.	28	95	7.0	
40.0	3360	2397	7.98	23175	82.9	74.4	1109	5637	8	7.7	5.5	86.2	3348	12	832	80	1.09	680.	31	105	7.6	
45.0	3780	2696	8.98	24614	87.9	70.1	1186	5727	7	6.8	4.8	86.6	3769	11	891	74	1.02	739.	35	115	8.1	
50.0	4200	2996	9.98	25979	92.7	66.5	1258	5798	7	6.1	4.3	87.0	4190	10	950	70	0.96	797.	38	124	8.6	

#304 84 Kr on 238 U

84 Kr on 238 U

84 Kr on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 36. ZT= 92. ZC=128.( )
NEUTRON NUMBERS: NP= 48. NT=146. NC=194.

AP**1/3= 4.380 AT**1/3= 6.197
REDUCED MASS NUMBER= 62.09 AP+AT=AC=322.

INTERACTION RADIUS RINT=14.60 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 4.83 CT= 7.16 CT+CP=11.99 C= 2.88

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.03 RT= 7.30

COULOMB RADII [fm]:
RCP= 4.87 RCT= 6.98 RC=RCP+RCT=11.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 561.55 MeV K= .31471 n=2.519
VC(RINT)= 326.3 MeV

FISSION-TKE= 278. MeV
ASYMM. FISSION-TKE= 225. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.880 MeV/fm**2 PROX-FACTOR= 31.92 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.35 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -83.2 TARGET: 47.2
COMPOUND NUCLEUS: 288.7

FUSION RELATED PARAMETERS:
R-BARRIER=13.04 fm V(RB)= 338.7 MeV
Q-VALUE= -324.6 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	84	62	0.19	3627	13.6	521.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	168	124	0.38	5130	19.2	368.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	252	186	0.57	6285	23.5	301.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	336	248	0.76	7259	27.2	260.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	378	279	0.86	7700	28.8	245.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	420	310	0.95	8118	30.4	233.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	462	341	1.05	8515	31.8	222.4	97	295	0	133.0	114.3	23.5	162	300	99	1055	13.54	0.	2	14	0.6	2
6.0	504	373	1.14	8895	33.3	212.9	170	832	0	102.7	82.2	38.6	267	237	167	605	7.68	0.	4	18	1.1	6
6.5	546	404	1.24	9260	34.6	204.6	220	1286	0	85.7	66.8	47.1	351	195	215	468	5.93	0.	5	21	1.4	9
7.0	588	435	1.33	9611	35.9	197.1	261	1674	0	74.1	56.9	53.0	423	165	251	395	5.01	0.	5	23	1.7	12
7.5	630	466	1.43	9949	37.2	190.4	296	2010	0	65.4	49.8	57.3	488	142	279	348	4.41	0.	6	25	1.9	14
8.0	672	497	1.52	10277	38.4	184.4	328	2304	0	58.7	44.4	60.7	548	124	303	315	3.99	0.	7	27	2.1	16
8.5	714	528	1.62	10595	39.6	178.9	357	2563	0	53.3	40.1	63.4	603	111	322	290	3.67	0.	7	29	2.2	19
9.0	756	559	1.71	10903	40.7	173.8	383	2794	0	48.8	36.6	65.6	656	100	340	270	3.41	0.	8	31	2.4	21
9.5	798	590	1.81	11203	41.9	169.2	408	3000	0	45.0	33.7	67.5	708	90	355	253	3.21	0.	8	33	2.6	23
10.0	840	621	1.90	11496	42.9	164.9	431	3185	0	41.8	31.3	69.1	757	83	369	239	3.03	0.	9	35	2.7	25
10.5	882	652	2.00	11782	44.0	160.9	454	3353	0	39.1	29.2	70.5	806	76	381	228	2.88	0.	9	36	2.9	27
11.0	924	683	2.09	12060	45.0	157.2	475	3505	0	36.7	27.3	71.7	854	70	393	218	2.76	0.	9	38	3.0	29
11.5	966	714	2.19	12333	46.1	153.8	495	3645	0	34.5	25.7	72.7	900	66	404	209	2.64	0.	10	39	3.1	30
12.0	1008	745	2.28	12600	47.0	150.5	514	3772	0	32.6	24.3	73.7	947	61	415	201	2.54	0.	10	41	3.2	32
13.0	1092	807	2.47	13118	49.0	144.6	551	3998	0	29.4	21.9	75.3	1038	54	434	187	2.37	0.	11	44	3.5	36
14.0	1176	869	2.66	13617	50.8	139.4	586	4191	0	26.8	19.9	76.6	1127	49	452	176	2.23	0.	12	46	3.7	39
15.0	1260	931	2.85	14098	52.6	134.7	618	4358	0	24.6	18.2	77.7	1216	44	469	167	2.11	0.	13	49	3.9	42
16.0	1344	993	3.04	14565	54.3	130.4	649	4505	0	22.7	16.8	78.6	1304	40	485	159	2.01	0.	14	51	4.1	45
17.0	1428	1055	3.23	15017	56.0	126.5	679	4634	0	21.1	15.6	79.4	1391	37	501	152	1.93	0.	14	54	4.3	48
18.0	1512	1118	3.42	15456	57.6	122.9	707	4749	0	19.7	14.6	80.1	1478	34	515	146	1.85	0.	15	56	4.4	50
19.0	1596	1180	3.62	15884	59.2	119.6	735	4852	0	18.5	13.7	80.7	1564	32	530	141	1.78	0.	16	59	4.6	53
20.0	1680	1242	3.81	16301	60.7	116.6	761	4944	0	17.4	12.9	81.3	1650	30	544	136	1.72	0.	17	61	4.8	56
25.0	2100	1552	4.76	18249	67.9	104.3	881	5296	0	13.5	10.0	83.2	2078	22	609	117	1.49	0.	20	72	5.5	67
30.0	2520	1863	5.71	20018	74.4	95.2	986	5530	0	11.0	8.2	84.5	2502	18	669	105	1.33	0.	24	83	6.2	77
35.0	2940	2173	6.66	21650	80.3	88.2	1081	5697	0	9.3	6.9	85.3	2925	15	726	96	1.21	0.	27	93	6.8	
40.0	3360	2483	7.61	23175	85.9	82.5	1168	5822	0	8.1	6.0	86.0	3347	13	781	88	1.12	0.	31	103	7.3	
45.0	3780	2794	8.56	24614	91.1	77.7	1249	5919	0	7.1	5.3	86.4	3769	11	834	83	1.05	0.	34	112	7.8	
50.0	4200	3104	9.51	25979	96.0	73.8	1326	5997	0	6.4	4.7	86.8	4190	10	885	78	0.99	0.	37	121	8.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 84 Kr

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#305 109 Ag on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 6. ZC= 53.(J)
NEUTRON NUMBERS: NP= 62. NT= 6. NC= 68.

AP**1/3= 4.777 AT**1/3= 2.289 ELSCAT < 6 deg
REDUCED MASS NUMBER= 10.81 AP+AT=AC=121.

INTERACTION RADIUS RINT=10.78 fm RO= 1.53 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 2.12 CT+CP= 7.46 C= 1.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 2.52

COULOMB RADII [fm]:
RCP= 5.35 RCT= 2.51 RC=RCP+RCT= 7.86

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 69.77 MeV K= .05265 n=2.835
VC(RINT)= 37.6 MeV

FISSION-TKE= 83. MeV
ASYMM. FISSION-TKE= 33. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.926 MeV/fm**2 PROX-FACTOR= 17.67 MeV
L-RLD= 90 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: 0.0
COMPOUND NUCLEUS: -86.2

FUSION RELATED PARAMETERS:
R-BARRIER= 9.75 fm V(RB)= 38.7 MeV
Q-VALUE= -2.5 MeV
L-CRITICAL= 49.

109 Ag on 12 C

109 Ag on 12 C

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	11	0.29	4706	2.4	44.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	22	0.57	6657	3.3	31.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	32	0.86	8155	4.1	25.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	43	1.15	9420	4.7	22.2	18	523	312	101.0	6.3	39.5	343	93	344	62	6.79	383.	0	0	1.6	3
4.5	491	49	1.29	9992	5.0	20.9	26	889	609	78.4	6.0	50.8	421	70	416	44	4.84	431.	0	0	1.7	3
5.0	545	54	1.44	10534	5.3	19.9	31	1178	846	64.7	5.4	57.7	489	56	478	36	3.96	474.	5	16	1.8	4
5.5	600	59	1.58	11050	5.5	18.9	36	1412	1041	55.3	4.9	62.4	553	46	536	31	3.43	522.	6	19	1.9	4
6.0	654	65	1.72	11543	5.8	18.1	40	1607	1203	48.3	4.4	65.8	615	39	590	28	3.07	569.	6	21	2.0	4
6.5	709	70	1.87	12016	6.0	17.4	44	1770	1340	43.0	4.0	68.5	675	34	642	26	2.81	611.	7	22	2.1	5
7.0	763	76	2.01	12471	6.3	16.8	48	1910	1457	38.7	3.6	70.6	733	30	693	24	2.60	659.	8	24	2.2	5
7.5	818	81	2.15	12910	6.5	16.2	51	2031	1559	35.2	3.3	72.4	791	27	743	22	2.43	699.	8	26	2.3	6
8.0	872	86	2.30	13335	6.7	15.7	54	2137	1648	32.3	3.1	73.8	848	24	793	21	2.29	746.	9	28	2.4	6
8.5	927	92	2.44	13748	6.9	15.2	57	2230	1670	29.9	2.9	75.1	904	22	842	20	2.18	793.	9	29	2.4	6
9.0	981	97	2.59	14148	7.1	14.8	60	2312	1578	27.8	2.7	76.1	961	20	890	19	2.08	832.	10	31	2.5	7
9.5	1036	103	2.73	14538	7.3	14.4	63	2385	1495	26.0	2.5	77.0	1017	19	938	18	1.99	878.	10	32	2.6	7
10.0	1090	108	2.87	14917	7.5	14.0	65	2452	1420	24.4	2.4	77.8	1073	17	986	17	1.91	925.	11	34	2.6	7
10.5	1145	114	3.02	15288	7.7	13.7	67	2511	1352	23.0	2.2	78.5	1128	16	1034	17	1.84	962.	11	35	2.7	8
11.0	1199	119	3.16	15650	7.8	13.4	70	2565	1291	21.7	2.1	79.2	1184	15	1082	16	1.78	1008.	12	37	2.8	8
11.5	1254	124	3.30	16004	8.0	13.1	72	2615	1235	20.6	2.0	79.7	1239	14	1129	16	1.72	1054.	12	38	2.8	8
12.0	1308	130	3.45	16350	8.2	12.8	74	2660	1183	19.6	1.9	80.2	1295	13	1176	15	1.67	1100.	13	39	2.9	8
13.0	1417	141	3.74	17022	8.5	12.3	79	2740	1092	17.8	1.7	81.1	1405	12	1271	14	1.58	1181.	14	42	3.0	9
14.0	1526	151	4.02	17669	8.8	11.9	83	2808	1014	16.3	1.6	81.8	1515	11	1364	14	1.50	1260.	15	45	3.1	10
15.0	1635	162	4.31	18294	9.2	11.5	86	2867	946	15.1	1.5	82.4	1625	10	1458	13	1.44	1350.	16	48	3.2	10
16.0	1744	173	4.60	18899	9.5	11.1	90	2918	887	14.0	1.4	83.0	1735	9	1551	13	1.38	1427.	17	50	3.4	11
17.0	1853	184	4.88	19486	9.7	10.8	94	2964	835	13.1	1.3	83.4	1844	9	1644	12	1.33	1517.	18	53	3.5	11
18.0	1962	195	5.17	20057	10.0	10.5	97	3004	789	12.3	1.2	83.8	1954	8	1737	12	1.28	1591.	19	55	3.6	12
19.0	2071	205	5.46	20612	10.3	10.2	100	3040	747	11.6	1.1	84.2	2063	8	1830	11	1.24	1680.	20	58	3.7	12
20.0	2180	216	5.75	21153	10.6	9.9	104	3072	710	11.0	1.1	84.5	2173	7	1923	11	1.20	1752.	21	60	3.8	13
25.0	2725	270	7.18	23681	11.8	8.9	118	3194	568	8.6	0.8	85.7	2720	5	2384	10	1.05	2129.	26	72	4.2	16
30.0	3270	324	8.62	25975	13.0	8.1	131	3275	473	7.1	0.7	86.5	3266	4	2843	9	0.95	2506.	31	84	4.6	18
35.0	3815	378	10.06	28094	14.0	7.5	143	3332	405	6.0	0.6	87.0	3811	4	3300	8	0.87	2867.	36	95	5.0	
40.0	4360	432	11.49	30073	15.0	7.0	154	3375	355	5.2	0.5	87.4	4357	3	3757	7	0.81	3244.	41	105	5.3	
45.0	4905	486	12.93	31939	15.9	6.6	164	3408	315	4.6	0.5	87.7	4902	3	4212	7	0.76	3576.	46	116	5.7	
50.0	5450	540	14.37	33711	16.7	6.3	174	3435	284	4.1	0.4	87.9	5447	3	4667	7	0.71	3893.	51	126	6.0	

#306 109 Ag on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 8. ZC= 55.(Cs)
NEUTRON NUMBERS: NP= 62. NT= 8. NC= 70.

AP**1/3= 4.777 AT**1/3= 2.520 ELSCAT < 8 deg
REDUCED MASS NUMBER= 13.95 AP+AT=AC=125.

INTERACTION RADIUS RINT=11.03 fm RO= 1.51 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 2.42 CT+CP= 7.76 C= 1.67

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 2.78

COULOMB RADII [fm]:
RCP= 5.35 RCT= 2.78 RC=RCP+RCT= 8.13

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 90.85 MeV K= .07959 n=2.731
VC(RINT)= 49.0 MeV

FISSION-TKE= 87. MeV
ASYMM. FISSION-TKE= 43. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.927 MeV/fm**2 PROX-FACTOR= 19.43 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.93 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -4.7
COMPOUND NUCLEUS: -83.7

FUSION RELATED PARAMETERS:
R-BARRIER= 9.93 fm V(RB)= 50.7 MeV
Q-VALUE= -9.7 MeV
L-CRITICAL= 60.

109 Ag on 16 O

109 Ag on 16 O

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGNAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	14	0.28	4706	3.1	59.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	28	0.57	6657	4.3	41.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	42	0.85	8155	5.3	34.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	56	1.14	9420	6.1	29.6	23	502	282	103.4	8.4	38.3	316	120	317	85	7.18	371.	0	0	1.7	3
4.5	491	63	1.28	9992	6.5	27.9	33	886	595	79.8	8.0	50.1	400	90	395	60	5.03	414.	0	0	1.8	4
5.0	545	70	1.42	10534	6.8	26.5	41	1190	845	65.7	7.2	57.1	473	72	459	49	4.10	460.	5	17	2.0	4
5.5	600	77	1.57	11050	7.2	25.2	47	1437	1050	56.1	6.4	62.0	540	59	517	42	3.54	502.	6	19	2.1	5
6.0	654	84	1.71	11543	7.5	24.2	53	1642	1221	49.0	5.8	65.5	604	50	572	38	3.17	547.	6	21	2.2	5
6.5	709	91	1.85	12016	7.8	23.2	58	1815	1366	43.5	5.2	68.2	665	44	623	34	2.89	588.	7	23	2.3	6
7.0	763	98	1.99	12471	8.1	22.4	63	1963	1490	39.2	4.8	70.4	725	38	674	32	2.67	633.	7	25	2.4	6
7.5	818	105	2.13	12910	8.4	21.6	67	2091	1597	35.7	4.4	72.2	783	34	722	30	2.50	678.	8	27	2.5	6
8.0	872	112	2.28	13335	8.6	20.9	71	2203	1545	32.7	4.0	73.6	841	31	771	28	2.36	717.	9	29	2.6	7
8.5	927	119	2.42	13748	8.9	20.3	75	2301	1454	30.2	3.8	74.9	898	28	818	27	2.23	762.	9	31	2.6	7
9.0	981	126	2.56	14148	9.2	19.7	79	2388	1373	28.1	3.5	75.9	955	26	865	25	2.13	800.	10	32	2.7	8
9.5	1036	133	2.70	14538	9.4	19.2	82	2466	1301	26.3	3.3	76.9	1012	24	911	24	2.04	845.	10	34	2.8	8
10.0	1090	140	2.85	14917	9.6	18.7	86	2537	1236	24.6	3.1	77.7	1068	22	957	23	1.96	882.	11	35	2.9	9
10.5	1145	146	2.99	15288	9.9	18.3	89	2600	1177	23.2	2.9	78.4	1124	21	1003	22	1.89	926.	11	37	3.0	9
11.0	1199	153	3.13	15650	10.1	17.9	92	2657	1124	21.9	2.8	79.0	1180	19	1049	22	1.82	970.	12	38	3.0	9
11.5	1254	160	3.27	16004	10.3	17.5	95	2710	1075	20.8	2.6	79.6	1235	18	1094	21	1.77	1005.	12	40	3.1	10
12.0	1308	167	3.42	16350	10.6	17.1	98	2758	1030	19.8	2.5	80.1	1291	17	1140	20	1.71	1049.	13	41	3.2	10
13.0	1417	181	3.70	17022	11.0	16.4	104	2843	951	18.0	2.3	81.0	1402	15	1230	19	1.62	1126.	14	44	3.3	11
14.0	1526	195	3.99	17669	11.4	15.8	109	2915	883	16.5	2.1	81.7	1512	14	1320	18	1.54	1202.	15	47	3.4	12
15.0	1635	209	4.27	18294	11.8	15.3	114	2978	824	15.3	1.9	82.4	1622	13	1409	17	1.47	1288.	16	50	3.6	12
16.0	1744	223	4.55	18899	12.2	14.8	119	3033	772	14.2	1.8	82.9	1732	12	1498	17	1.41	1362.	17	52	3.7	13
17.0	1853	237	4.84	19486	12.6	14.4	124	3081	727	13.3	1.7	83.4	1842	11	1586	16	1.36	1434.	18	55	3.8	14
18.0	1962	251	5.12	20057	12.9	14.0	128	3124	686	12.4	1.6	83.8	1952	10	1675	16	1.31	1518.	19	58	3.9	14
19.0	2071	265	5.41	20612	13.3	13.6	132	3163	650	11.7	1.5	84.1	2061	10	1763	15	1.27	1588.	20	60	4.0	15
20.0	2180	279	5.69	21153	13.6	13.2	137	3197	618	11.1	1.4	84.5	2171	9	1851	15	1.23	1672.	21	63	4.2	15
25.0	2725	349	7.12	23681	15.3	11.8	156	3328	494	8.7	1.1	85.7	2718	7	2289	13	1.08	2033.	26	75	4.7	18
30.0	3270	419	8.54	25975	16.7	10.8	173	3414	412	7.1	0.9	86.4	3264	6	2725	12	0.97	2371.	31	87	5.1	21
35.0	3815	488	9.96	28094	18.1	10.0	189	3475	353	6.1	0.8	87.0	3810	5	3158	11	0.89	2713.	36	98	5.5	
40.0	4360	558	11.39	30073	19.3	9.4	203	3521	309	5.3	0.7	87.4	4356	4	3591	10	0.83	3040.	41	110	5.9	
45.0	4905	628	12.81	31939	20.5	8.8	217	3557	274	4.7	0.6	87.7	4901	4	4022	9	0.77	3351.	46	120	6.3	
50.0	5450	698	14.23	33711	21.6	8.4	230	3585	247	4.2	0.5	87.9	5447	3	4452	9	0.73	3648.	51	131	6.6	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#307 109 Ag on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 13. ZC= 60.(Nd)
NEUTRON NUMBERS: NP= 62. NT= 14. NC= 76.

AP**1/3= 4.777 AT**1/3= 3.000 ELSCAT <14 deg
REDUCED MASS NUMBER= 21.64 AP+AT=AC=136.

INTERACTION RADIUS RINT=11.56 fm R0= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 3.05 CT+CP= 8.39 C= 1.94

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 3.35

COULOMB RADII [fm]:
RCP= 5.35 RCT= 3.32 RC=RCP+RCT= 8.67

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 140.39 MeV K= .14405 n=2.594
VC(RINT)= 76.0 MeV

FISSION-TKE= 97. MeV
ASYMM. FISSION-TKE= 66. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.928 MeV/fm**2 PROX-FACTOR= 22.63 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 9.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -20.6
COMPOUND NUCLEUS: -78.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.38 fm V(RB)= 79.2 MeV
Q-VALUE= -30.7 MeV
L-CRITICAL= 82.

109 Ag on 27 Al — 109 Ag on 27 Al

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	SIGP-CN	SIGP-LP	SIGP-LT	SIGP-QP	SIGT-QT	SIGMIX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	22	0.28	4706	4.7	96.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	218	43	0.57	6657	6.7	68.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	327	65	0.85	8155	8.2	55.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	436	87	1.14	9420	9.5	48.1	38	533	288	103.4	14.3	38.3	265	171	265	138	7.52	339.	0	1.8	4
4.5	491	97	1.28	9992	10.0	45.4	54	950	632	79.8	13.1	50.1	362	129	351	97	5.27	378.	0	2.0	5
5.0	545	108	1.42	10534	10.6	43.0	67	1282	907	65.7	11.6	57.1	443	102	419	79	4.29	420.	5	18	2.1	5
5.5	600	119	1.57	11050	11.1	41.0	77	1552	1132	56.1	10.2	62.0	515	84	477	68	3.71	459.	5	21	2.3	6
6.0	654	130	1.71	11543	11.6	39.3	86	1777	1319	49.0	9.1	65.5	582	72	531	61	3.32	497.	6	23	2.4	7
6.5	709	141	1.85	12016	12.1	37.7	94	1967	1478	43.5	8.2	68.2	646	62	580	56	3.03	536.	7	25	2.5	7
7.0	763	151	1.99	12471	12.5	36.4	102	2129	1378	39.2	7.5	70.4	708	55	627	52	2.80	575.	7	27	2.7	8
7.5	818	162	2.13	12910	13.0	35.1	109	2269	1286	35.7	6.9	72.2	769	49	673	48	2.62	611.	8	29	2.8	9
8.0	872	173	2.28	13335	13.4	34.0	116	2392	1205	32.7	6.3	73.6	828	44	717	45	2.47	652.	9	31	2.9	9
8.5	927	184	2.42	13748	13.8	33.0	122	2500	1135	30.2	5.9	74.9	886	40	761	43	2.34	698.	9	33	3.0	10
9.0	981	195	2.56	14148	14.2	32.1	128	2596	1071	28.1	5.5	75.9	944	37	804	41	2.23	728.	10	35	3.1	10
9.5	1036	206	2.70	14538	14.6	31.2	134	2682	1015	26.3	5.1	76.9	1001	34	846	39	2.14	762.	10	36	3.2	11
10.0	1090	216	2.85	14917	15.0	30.4	139	2760	964	24.6	4.8	77.7	1058	32	887	38	2.05	796.	11	38	3.3	12
10.5	1145	227	2.99	15288	15.3	29.7	145	2829	918	23.2	4.5	78.4	1115	29	929	36	1.98	836.	11	40	3.4	12
11.0	1199	238	3.13	15650	15.7	29.0	150	2893	877	21.9	4.3	79.0	1171	28	970	35	1.91	869.	12	41	3.5	13
11.5	1254	249	3.27	16004	16.1	28.4	155	2951	838	20.8	4.1	79.6	1227	26	1010	34	1.85	908.	12	43	3.6	13
12.0	1308	260	3.42	16350	16.4	27.8	159	3004	803	19.8	3.9	80.1	1283	25	1051	33	1.79	940.	13	45	3.7	14
13.0	1417	281	3.70	17022	17.1	26.7	168	3097	742	18.0	3.5	81.0	1395	22	1131	31	1.70	1010.	14	48	3.8	15
14.0	1526	303	3.99	17669	17.7	25.7	177	3178	689	16.5	3.3	81.7	1506	20	1211	30	1.61	1078.	15	51	4.0	16
15.0	1635	325	4.27	18294	18.3	24.8	185	3247	643	15.3	3.0	82.4	1617	18	1290	28	1.54	1156.	16	54	4.2	16
16.0	1744	346	4.55	18899	18.9	24.1	193	3308	602	14.2	2.8	82.9	1727	17	1368	27	1.48	1222.	17	56	4.3	17
17.0	1853	368	4.84	19486	19.5	23.3	201	3361	567	13.3	2.6	83.4	1837	16	1446	26	1.42	1288.	18	59	4.5	18
18.0	1962	390	5.12	20057	20.1	22.7	208	3409	535	12.4	2.5	83.8	1947	15	1524	25	1.37	1352.	19	62	4.6	19
19.0	2071	411	5.41	20612	20.6	22.1	215	3451	507	11.7	2.3	84.1	2057	14	1602	24	1.33	1415.	20	65	4.7	20
20.0	2180	433	5.69	21153	21.2	21.5	222	3490	482	11.1	2.2	84.5	2167	13	1679	24	1.29	1477.	21	67	4.9	21
25.0	2725	541	7.12	23681	23.7	19.2	254	3635	385	8.7	1.7	85.7	2715	10	2063	21	1.13	1797.	26	80	5.5	24
30.0	3270	649	8.54	25975	25.9	17.6	282	3731	321	7.1	1.4	86.4	3262	8	2443	19	1.02	2080.	31	93	6.0	28
35.0	3815	757	9.96	28094	28.0	16.3	307	3799	275	6.1	1.2	87.0	3808	7	2820	17	0.93	2359.	35	105	6.5	
40.0	4360	866	11.39	30073	29.9	15.2	330	3851	241	5.3	1.0	87.4	4354	6	3195	16	0.87	2619.	40	116	7.0	
45.0	4905	974	12.81	31939	31.8	14.3	352	3890	214	4.7	0.9	87.7	4900	5	3569	15	0.81	2889.	45	127	7.4	
50.0	5450	1082	14.23	33711	33.5	13.6	373	3922	192	4.2	0.8	87.9	5445	5	3941	14	0.77	3114.	50	138	7.9	

#308 109 Ag on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 20. ZC= 67.(Ho)
NEUTRON NUMBERS: NP= 62. NT= 20. NC= 82.

AP**1/3= 4.777 AT**1/3= 3.420 ELSCAT <21 deg
REDUCED MASS NUMBER= 29.26 AP+AT=AC=149.

INTERACTION RADIUS RINT=12.02 fm R0= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 3.59 CT+CP= 8.93 C= 2.15

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 3.95

COULOMB RADII [fm]:
RCP= 5.35 RCT= 3.84 RC=RCP+RCT= 9.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 205.79 MeV K= .22646 n=2.506
VC(RINT)= 112.5 MeV

FISSION-TKE= 113. MeV
ASYMM. FISSION-TKE= 95. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.935 MeV/fm**2 PROX-FACTOR= 25.22 MeV
L-RLD= 76 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.82 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -33.0
COMPOUND NUCLEUS: -63.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.79 fm V(RB)= 118.0 MeV
Q-VALUE= -58.2 MeV
L-CRITICAL= 95.

109 Ag on 40 Ca — 109 Ag on 40 Ca

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SIGMAR	SIGFUS	SIGP-CN	SIGP-LP	SIGP-LT	SIGP-QP	SIGT-QT	SIGMIX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	29	0.26	4706	6.4	148.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	218	59	0.52	6657	9.1	104.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	327	88	0.78	8155	11.1	85.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	436	117	1.04	9420	12.8	74.0	30	183	0	136.1	19.1	22.0	141	295	148	375	14.00	0.	3	12	1.8	4
4.5	491	132	1.17	9992	13.6	69.8	62	677	380	96.7	20.8	41.6	275	215	269	183	6.74	347.	3	12	2.0	5
5.0	545	146	1.30	10534	14.3	66.2	82	1069	707	77.5	18.4	51.3	377	168	354	138	5.07	382.	4	17	2.2	6
5.5	600	161	1.43	11050	15.0	63.1	99	1389	975	65.1	16.1	57.4	463	136	422	115	4.23	421.	5	20	2.3	6
6.0	654	176	1.56	11543	15.7	60.4	113	1655	1177	56.4	14.2	61.8	539	115	480	101	3.70	456.	6	23	2.5	7
6.5	709	190	1.69	12016	16.3	58.1	125	1879	1086	49.8	12.8	65.1	610	98	531	91	3.34	490.	6	25	2.7	8
7.0	763	205	1.82	12471	16.9	55.9	137	2072	1008	44.6	11.5	67.7	677	86	579	83	3.06	524.	7	28	2.8	9
7.5	818	219	1.95	12910	17.5	54.0	147	2238	941	40.4	10.5	69.8	741	77	623	77	2.84	558.	8	30	2.9	10
8.0	872	234	2.08	13335	18.1	52.3	157	2394	882	36.9	9.7	71.5	803	69	666	73	2.67	590.	8	32	3.1	11
8.5	927	249	2.21	13748	18.7	50.8	166	2512	830	34.0	9.0	73.0	864	62	707	69	2.52	627.	9	34	3.2	11
9.0	981	263	2.34	14148	19.2	49.3	175	2626	784	31.6	8.3	74.2	924	57	747	65	2.39	659.	9	36	3.3	12
9.5	1036	278	2.47	14538	19.7	48.0	183	2728	743	29.4	7.8	75.3	983	53	786	62	2.29	691.	10	38	3.4	13
10.0	1090	293	2.60	14917	20.2	46.8	191	2819	706	27.6	7.3	76.2	1041	49	824	60	2.19	727.	11	39	3.5	13
10.5	1145	307	2.73	15288	20.7	45.7	198	2902	672	25.9	6.9	77.0	1099	45	862	57	2.11	758.	11	41	3.7	14
11.0	1199	322	2.86	15650	21.2	44.6	206	2977	642	24.5	6.5	77.8	1157	42	899	55	2.03	788.	12	43	3.8	15
11.5	1254	337	2.99	16004	21.7	43.6	213	3046	614	23.2	6.2	78.4	1214	40	936	53	1.96	824.	12	44	3.9	15
12.0	1308	351	3.12	16350	22.2	42.7	220	3109	588	22.0	5.9	79.0	1271	37	973	52	1.90	854.	13	46	4.0	16
13.0	1417	380	3.38	17022	23.1	41.1	233	3220	543	20.0	5.3	80.0	1383	34	1044	49	1.80	918.	14	49	4.2	17
14.0	1526	410	3.64	17669	23.9	39.6	245	3316	504	18.3	4.9	80.8	1496	30	1115	46	1.71	981.	15	52	4.3	18
15.0	1635	439	3.90	18294	24.8	38.2	257	3398	470	16.9	4.5	81.5	1607	28	1186	44	1.63	1035.	16	55	4.5	20
16.0	1744	468	4.16	18899	25.6	37.0	268	3470	441	15.7	4.2	82.1	1718	26	1255	42	1.56	1095.	17	58	4.7	21
17.0	1853	497	4.42	19486	26.4	35.9	279	3534	415	14.7	3.9	82.7	1829	24	1324	41	1.50	1155.	18	61	4.9	22
18.0	1962	527	4.68	20057	27.2	34.9	289	3591	392	13.8	3.7	83.1	1940	22	1393	39	1.44	1213.	19	64	5.0	23
19.0	2071	556	4.94	20612	27.9	34.0	299	3641	371	12.9	3.5	83.5	2050	21	1461	38	1.40	1270.	20	67	5.2	24
20.0	2180	585	5.20	21153	28.6	33.1	309	3687	353	12.2	3.3	83.9	2161	19	1528	37	1.35	1326.	21	70	5.3	25
25.0	2725	732	6.50	23681	32.0	29.6	354	3859	282	9.6	2.6	85.2	2710	15	1863	32	1.18	1604.	25	83	6.0	29
30.0	3270	878	7.80	25975	35.1	27.0	393	3974	235	7.9	2.1	86.1	3258	12	2193	29	1.06	1861.	30	95	6.6	33
35.0	3815	1024	9.10	28094	37.9	25.0	429	4056	201	6.7	1.8	86.7	3805	10	2519	27	0.97	2097.	35	108	7.2	
40.0	4360	1170	10.40	30073	40.5	23.4	462	4117	176	5.8	1.6	87.1	4351	9	2843	25	0.90	2332.	39	119	7.7	
45.0	4905	1317	11.71	31939	42.9	22.1	493	4165	156	5.1	1.4	87.4	4897	8	3165	23	0.85	2527.	44	131	8.2	
50.0	5450	1463	13.01	33711	45.3	20.9	522	4203	141	4.6	1.2	87.7	5443	7	3484	22	0.80	2754.	48	142	8.7	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#309 109 Ag on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 26. ZC= 73.(Ta)
NEUTRON NUMBERS: NP= 62. NT= 30. NC= 92.

AP**1/3= 4.777 AT**1/3= 3.826 ELSCAT <31 deg
REDUCED MASS NUMBER= 36.99 AP+AT=AC=165.

INTERACTION RADIUS RINT=12.46 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 4.12 CT+CP= 9.46 C= 2.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 4.35

COULOMB RADII [fm]:
RCP= 5.35 RCT= 4.27 RC=RCP+RCT= 9.62

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 256.59 MeV K= .27493 n=2.471
VC(RINT)= 141.1 MeV

FISSION-TKE= 126. MeV
ASYMM. FISSION-TKE= 116. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 27.14 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -61.4
COMPOUND NUCLEUS: -46.1

FUSION RELATED PARAMETERS:
R-BARRIER=11.19 fm V(RB)= 147.8 MeV
Q-VALUE= -104.0 MeV
L-CRITICAL= 111.

109 Ag on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	37	0.26	4706	8.1	192.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	218	74	0.52	6657	11.4	136.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	327	111	0.79	8155	14.0	111.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	436	148	1.05	9420	16.2	96.2	43	232	5	131.8	30.2	24.1	110	326	114	445	13.20	283.	0	1.5	3
4.5	491	166	1.18	9992	17.2	90.7	83	757	441	94.9	28.2	42.5	252	239	238	232	6.82	314.	3	13	1.7	5
5.0	545	185	1.31	10534	18.1	86.1	110	1174	791	76.3	24.0	51.9	359	186	323	177	5.18	347.	4	18	2.0	6
5.5	600	203	1.44	11050	19.0	82.0	131	1514	1076	64.2	20.7	57.9	448	152	389	148	4.34	379.	5	21	2.2	7
6.0	654	222	1.57	11543	19.8	78.6	149	1797	996	55.6	18.2	62.2	526	128	444	130	3.81	411.	6	24	2.4	8
6.5	709	240	1.70	12016	20.6	75.5	165	2036	920	49.1	16.2	65.4	599	110	493	117	3.44	439.	6	26	2.6	10
7.0	763	259	1.84	12471	21.4	72.7	180	2241	854	44.0	14.6	68.0	667	96	537	108	3.16	473.	7	29	2.7	10
7.5	818	277	1.97	12910	22.2	70.3	193	2418	797	39.9	13.3	70.0	732	85	578	100	2.94	500.	8	31	2.9	12
8.0	872	296	2.10	13335	22.9	68.0	206	2574	747	36.5	12.2	71.7	795	77	616	94	2.75	534.	8	33	3.1	12
8.5	927	314	2.23	13748	23.6	66.0	218	2710	703	33.7	11.3	73.2	857	70	653	89	2.60	563.	9	35	3.2	13
9.0	981	333	2.36	14148	24.3	64.1	229	2832	664	31.2	10.5	74.4	917	64	689	84	2.47	593.	9	37	3.3	14
9.5	1036	351	2.49	14538	24.9	62.4	240	2940	629	29.1	9.8	75.4	977	59	724	81	2.36	621.	10	38	3.5	15
10.0	1090	370	2.62	14917	25.6	60.8	251	3038	598	27.3	9.2	76.4	1036	54	758	77	2.27	650.	10	40	3.6	16
10.5	1145	388	2.75	15288	26.2	59.4	261	3127	569	25.7	8.7	77.2	1094	51	791	74	2.18	678.	11	42	3.7	17
11.0	1199	407	2.88	15650	26.8	58.0	270	3207	543	24.2	8.2	77.9	1152	47	824	72	2.10	705.	11	44	3.8	18
11.5	1254	425	3.02	16004	27.4	56.7	279	3280	520	23.0	7.7	78.5	1209	45	856	69	2.03	737.	12	45	3.9	18
12.0	1308	444	3.15	16350	28.0	55.5	288	3347	498	21.8	7.4	79.1	1266	42	888	67	1.97	764.	12	47	4.1	19
13.0	1417	481	3.41	17022	29.2	53.4	305	3466	460	19.8	6.7	80.1	1379	38	951	63	1.86	816.	13	50	4.3	21
14.0	1526	518	3.67	17669	30.3	51.4	322	3568	427	18.2	6.1	80.9	1492	34	1013	60	1.77	873.	14	53	4.5	22
15.0	1635	555	3.93	18294	31.3	49.7	337	3656	398	16.8	5.7	81.6	1604	31	1074	58	1.68	922.	15	57	4.7	24
16.0	1744	592	4.20	18899	32.4	48.1	352	3733	373	15.6	5.3	82.2	1715	29	1134	55	1.61	977.	16	59	4.9	25
17.0	1853	629	4.46	19486	33.4	46.7	366	3801	351	14.5	4.9	82.7	1826	27	1193	53	1.55	1031.	17	62	5.0	26
18.0	1962	666	4.72	20057	34.3	45.4	380	3862	332	13.6	4.6	83.2	1937	25	1252	51	1.50	1083.	18	65	5.2	27
19.0	2071	703	4.98	20612	35.3	44.1	393	3916	314	12.8	4.3	83.6	2048	23	1311	49	1.45	1127.	19	68	5.4	29
20.0	2180	740	5.25	21153	36.2	43.0	405	3964	299	12.1	4.1	83.9	2158	22	1369	48	1.40	1178.	20	71	5.6	30
25.0	2725	925	6.56	23681	40.5	38.5	464	4149	239	9.5	3.2	85.3	2708	17	1655	42	1.22	1417.	25	84	6.3	35
30.0	3270	1110	7.87	25975	44.3	35.1	516	4272	199	7.8	2.6	86.1	3256	14	1936	38	1.10	1636.	29	97	7.0	40
35.0	3815	1295	9.18	28094	47.9	32.5	563	4359	170	6.6	2.2	86.7	3804	11	2212	34	1.01	1832.	34	109	7.6	
40.0	4360	1480	10.49	30073	51.2	30.4	606	4425	149	5.7	1.9	87.1	4350	10	2486	32	0.94	2024.	38	121	8.2	
45.0	4905	1665	11.80	31939	54.3	28.7	647	4476	132	5.1	1.7	87.5	4896	9	2758	30	0.88	2218.	43	132	8.7	
50.0	5450	1850	13.11	33711	57.2	27.2	685	4516	119	4.5	1.5	87.7	5442	8	3027	28	0.83	2377.	47	143	9.2	

#310 109 Ag on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 29. ZC= 76.(Os)
NEUTRON NUMBERS: NP= 62. NT= 34. NC= 96.

AP**1/3= 4.777 AT**1/3= 3.979 ELSCAT <35 deg
REDUCED MASS NUMBER= 39.92 AP+AT=AC=172.

INTERACTION RADIUS RINT=12.62 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 4.31 CT+CP= 9.65 C= 2.39

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 4.53

COULOMB RADII [fm]:
RCP= 5.35 RCT= 4.45 RC=RCP+RCT= 9.80

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 281.43 MeV K= .29663 n=2.460
VC(RINT)= 155.3 MeV

FISSION-TKE= 133. MeV
ASYMM. FISSION-TKE= 126. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 27.85 MeV
L-RLD= 75 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.08 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -65.2
COMPOUND NUCLEUS: -37.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.34 fm V(RB)= 162.7 MeV
Q-VALUE= -116.5 MeV
L-CRITICAL= 113.

109 Ag on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	40	0.26	4706	8.7	214.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	218	80	0.51	6657	12.3	151.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	327	120	0.77	8155	15.1	123.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	436	160	1.03	9420	17.5	107.3	36	140	0	143.0	32.9	18.5	72	364	78	644	17.51	0.	2	1.4	3
4.5	491	180	1.16	9992	18.5	101.2	86	690	380	99.4	32.2	40.3	226	265	212	275	7.33	302.	2	13	1.7	5
5.0	545	200	1.29	10534	19.5	96.0	116	1127	746	79.2	27.1	50.4	339	206	303	204	5.43	333.	4	17	2.0	6
5.5	600	220	1.41	11050	20.5	91.5	140	1483	979	66.5	23.3	56.8	432	167	371	169	4.50	364.	5	21	2.2	7
6.0	654	240	1.54	11543	21.4	87.6	160	1780	897	57.4	20.4	61.3	514	140	427	148	3.93	393.	5	24	2.4	9
6.5	709	260	1.67	12016	22.3	84.2	178	2030	828	50.6	18.1	64.7	588	120	476	133	3.54	423.	6	26	2.6	10
7.0	763	279	1.80	12471	23.1	81.1	194	2245	769	45.3	16.3	67.3	658	105	520	122	3.24	452.	7	28	2.8	11
7.5	818	299	1.93	12910	23.9	78.4	209	2430	718	41.0	14.8	69.5	724	93	560	113	3.01	482.	7	31	2.9	12
8.0	872	319	2.06	13335	24.7	75.9	223	2593	673	37.5	13.6	71.2	788	84	598	106	2.82	511.	8	33	3.1	13
8.5	927	339	2.19	13748	25.5	73.6	237	2736	633	34.6	12.5	72.7	851	76	634	100	2.66	539.	9	35	3.2	14
9.0	981	359	2.31	14148	26.2	71.5	249	2863	598	32.0	11.6	74.0	912	69	669	95	2.53	567.	9	37	3.4	15
9.5	1036	379	2.44	14538	26.9	69.6	261	2977	566	29.9	10.9	75.1	972	64	702	91	2.41	595.	10	39	3.5	16
10.0	1090	399	2.57	14917	27.6	67.9	272	3080	538	28.0	10.2	76.0	1031	59	735	87	2.31	622.	10	40	3.6	17
10.5	1145	419	2.70	15288	28.3	66.2	283	3172	512	26.3	9.6	76.8	1089	55	767	83	2.22	649.	11	42	3.8	18
11.0	1199	439	2.83	15650	29.0	64.7	294	3256	489	24.8	9.0	77.6	1148	51	798	80	2.14	675.	11	44	3.9	19
11.5	1254	459	2.96	16004	29.6	63.3	304	3333	468	23.5	8.6	78.2	1205	48	829	78	2.07	702.	12	46	4.0	20
12.0	1308	479	3.09	16350	30.2	62.0	314	3404	448	22.3	8.1	78.8	1262	46	859	75	2.00	732.	12	47	4.1	20
13.0	1417	519	3.34	17022	31.5	59.5	333	3528	414	20.3	7.4	79.9	1376	41	919	71	1.89	783.	13	50	4.3	22
14.0	1526	559	3.60	17669	32.7	57.4	350	3635	384	18.6	6.8	80.7	1489	37	978	67	1.80	832.	14	54	4.5	24
15.0	1635	599	3.86	18294	33.8	55.4	367	3727	359	17.2	6.3	81.4	1601	34	1035	64	1.71	885.	15	57	4.7	25
16.0	1744	639	4.11	18899	34.9	53.7	384	3808	336	15.9	5.8	82.0	1713	31	1092	62	1.64	938.	16	60	4.9	26
17.0	1853	679	4.37	19486	36.0	52.1	399	3879	316	14.9	5.4	82.6	1824	29	1148	59	1.58	983.	17	63	5.1	28
18.0	1962	719	4.63	20057	37.0	50.6	414	3943	299	13.9	5.1	83.0	1935	27	1204	57	1.52	1033.	18	65	5.3	29
19.0	2071	759	4.89	20612	38.1	49.2	428	3999	283	13.1	4.8	83.4	2046	25	1259	55	1.47	1083.	19	68	5.5	30
20.0	2180	798	5.14	21153	39.1	48.0	442	4050	269	12.4	4.5	83.8	2156	24	1314	53	1.42	1124.	20	71	5.6	32
25.0	2725	998	6.43	23681	43.7	42.9	506	4244	215	9.7	3.5	85.2	2707	18	1583	47	1.24	1345.	24	84	6.4	38
30.0	3270	1198	7.71	25975	47.8	39.2	563	4372	179	8.0	2.9	86.0	3255	15	1847	42	1.12	1553.	29	97	7.1	43
35.0	3815	1397	9.00	28094	51.7	36.3	615	4464	153	6.8	2.5	86.6	3803	12	2106	38	1.02	1742.	33	109	7.7	
40.0	4360	1597	10.29	30073	55.2	33.9	662	4533	134	5.9	2.1	87.1	4349	11	2363	36	0.95	1927.	38	121	8.3	
45.0	4905	1797	11.57	31939	58.6	32.0	707	4586	119	5.2	1.9	87.4	4896	9	2616	33	0.89	2095.	42	132	8.8	
50.0	5450	1996	12.86	33711	61.7	30.4	749	4629	107	4.6	1.7	87.7	5442	8	2868	32	0.84	2268.	46	143	9.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#311 109 Ag on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 42. ZC= 89.(Ac)
NEUTRON NUMBERS: NP= 62. NT= 50. NC=112.

AP**1/3= 4.777 AT**1/3= 4.514 ELSCAT <57 des
REDUCED MASS NUMBER= 49.89 AP+AT=AC=201.

INTERACTION RADIUS RINT=13.20 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 5.00 CT+CP=10.34 C= 2.58

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 5.20

COULOMB RADII [fm]:
RCP= 5.35 RCT= 5.08 RC=RCP+RCT=10.43

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 383.83 MeV K= .36561 n=2.440
VC(RINT)= 215.0 MeV

FISSION-TKE= 167. MeV
ASYMM. FISSION-TKE= 166. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.929 MeV/fm**2 PROX-FACTOR= 30.17 MeV
L-RLD= 63 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.12 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -87.5
COMPOUND NUCLEUS: 19.5

FUSION RELATED PARAMETERS:
R-BARRIER=11.83 fm V(RB)= 225.6 MeV
Q-VALUE= -195.7 MeV
L-CRITICAL= 105.

109 Ag on 92 Mo — 109 Ag on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	109	50	0.23	4706	10.9	310.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	100	0.46	6657	15.4	219.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	150	0.70	8155	18.9	179.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	200	0.93	9420	21.8	155.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	225	1.04	9992	23.1	146.5	62	233	0	134.1	35.7	23.0	78	413	75	711	13.85	0.	0	0	1.1	2
5.0	545	249	1.16	10534	24.4	139.0	119	764	419	98.7	43.7	40.6	233	312	203	374	7.21	289.	3	15	1.5	4
5.5	600	274	1.28	11050	25.6	132.5	157	1196	539	80.4	36.1	49.8	352	248	291	285	5.48	315.	4	19	1.8	6
6.0	654	299	1.39	11543	26.7	126.9	187	1556	494	68.3	30.9	55.9	449	205	358	239	4.60	342.	5	22	2.0	7
6.5	709	324	1.51	12016	27.8	121.9	213	1859	456	59.6	27.0	60.2	535	174	412	210	4.04	367.	6	25	2.3	9
7.0	763	349	1.62	12471	28.9	117.5	236	2120	423	52.9	24.0	63.5	613	150	458	189	3.64	393.	6	28	2.5	10
7.5	818	374	1.74	12910	29.9	113.5	257	2345	395	47.6	21.7	66.2	685	132	499	174	3.35	417.	7	30	2.7	12
8.0	872	399	1.86	13335	30.9	109.9	277	2542	370	43.3	19.7	68.3	754	118	536	162	3.11	442.	8	32	2.8	13
8.5	927	424	1.97	13748	31.8	106.6	295	2716	348	39.8	18.1	70.1	820	106	570	152	2.92	467.	8	34	3.0	14
9.0	981	449	2.09	14148	32.7	103.6	312	2870	329	36.8	16.8	71.6	884	97	602	144	2.76	489.	9	36	3.2	16
9.5	1036	474	2.20	14538	33.6	100.8	328	3009	312	34.2	15.6	72.9	947	89	633	136	2.62	514.	9	38	3.3	17
10.0	1090	499	2.32	14917	34.5	98.3	344	3133	296	31.9	14.6	74.0	1008	82	662	130	2.50	538.	10	40	3.5	18
10.5	1145	524	2.44	15288	35.4	95.9	358	3245	282	30.0	13.7	75.0	1069	76	690	125	2.40	562.	10	42	3.6	19
11.0	1199	549	2.55	15650	36.2	93.7	373	3347	269	28.2	12.9	75.9	1128	71	718	120	2.31	585.	11	43	3.7	20
11.5	1254	574	2.67	16004	37.0	91.7	386	3441	257	26.7	12.2	76.7	1187	66	744	116	2.23	605.	11	45	3.9	22
12.0	1308	599	2.79	16350	37.8	89.7	399	3526	247	25.3	11.6	77.3	1246	62	770	112	2.15	628.	12	47	4.0	23
13.0	1417	649	3.02	17022	39.3	86.2	425	3677	228	23.0	10.5	78.5	1361	56	821	105	2.03	672.	13	50	4.2	25
14.0	1526	698	3.25	17669	40.8	83.1	448	3807	211	21.0	9.6	79.5	1476	50	870	100	1.92	716.	14	53	4.5	27
15.0	1635	748	3.48	18294	42.3	80.3	471	3919	197	19.3	8.8	80.3	1589	46	918	95	1.83	758.	15	56	4.7	29
16.0	1744	798	3.71	18899	43.6	77.7	493	4017	185	17.9	8.2	81.0	1702	42	965	91	1.75	799.	16	59	4.9	31
17.0	1853	848	3.95	19486	45.0	75.4	513	4104	174	16.7	7.6	81.6	1814	39	1011	87	1.68	844.	16	62	5.1	32
18.0	1962	898	4.18	20057	46.3	73.3	533	4181	164	15.7	7.2	82.2	1926	36	1057	84	1.61	883.	17	65	5.3	34
19.0	2071	948	4.41	20612	47.6	71.3	552	4249	156	14.7	6.7	82.6	2037	34	1102	81	1.56	927.	18	68	5.5	35
20.0	2180	998	4.64	21153	48.8	69.5	571	4311	148	13.9	6.4	83.1	2148	32	1146	78	1.51	964.	19	70	5.7	37
25.0	2725	1247	5.80	23681	54.6	62.2	655	4546	118	10.8	5.0	84.6	2701	24	1363	68	1.31	1154.	23	84	6.5	44
30.0	3270	1497	6.96	25975	59.8	56.7	730	4703	98	8.9	4.1	85.6	3251	19	1573	61	1.18	1331.	28	96	7.2	50
35.0	3815	1746	8.12	28094	64.6	52.5	798	4815	84	7.5	3.4	86.2	3799	16	1778	56	1.08	1492.	32	108	7.9	
40.0	4360	1996	9.28	30073	69.0	49.1	861	4899	74	6.5	3.0	86.7	4346	14	1979	52	1.00	1646.	36	119	8.5	
45.0	4905	2245	10.44	31939	73.2	46.3	919	4964	65	5.8	2.6	87.1	4893	12	2178	49	0.94	1785.	40	131	9.0	
50.0	5450	2495	11.60	33711	77.2	44.0	974	5016	59	5.2	2.4	87.4	5439	11	2375	46	0.88	1925.	44	141	9.6	

#312 109 Ag on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 47. ZC= 94.(Pu)
NEUTRON NUMBERS: NP= 62. NT= 61. NC=123.

AP**1/3= 4.777 AT**1/3= 4.762 ELSCAT <82 des
REDUCED MASS NUMBER= 54.25 AP+AT=AC=217.

INTERACTION RADIUS RINT=13.47 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 5.32 CT+CP=10.66 C= 2.67

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 5.50

COULOMB RADII [fm]:
RCP= 5.35 RCT= 5.34 RC=RCP+RCT=10.69

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 419.17 MeV K= .37777 n=2.439
VC(RINT)= 235.8 MeV

FISSION-TKE= 180. MeV
ASYMM. FISSION-TKE= 180. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.921 MeV/fm**2 PROX-FACTOR= 30.86 MeV
L-RLD= 60 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.80 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -87.6
COMPOUND NUCLEUS: 37.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.07 fm V(RB)= 246.9 MeV
Q-VALUE= -213.6 MeV
L-CRITICAL= 104.

109 Ag on 108 Ag — 109 Ag on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	109	54	0.23	4706	11.9	347.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	108	0.46	6657	16.8	246.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	163	0.69	8155	20.6	200.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	217	0.92	9420	23.7	173.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	244	1.04	9992	25.2	164.0	62	194	0	138.8	68.7	20.6	61	430	55	886	15.81	0.	0	0	1.1	2
5.0	545	271	1.15	10534	26.5	155.6	129	751	410	100.8	50.1	39.6	222	323	185	430	7.57	269.	3	15	1.5	4
5.5	600	298	1.27	11050	27.8	148.3	171	1205	443	81.8	40.7	49.1	343	257	274	324	5.68	293.	4	19	1.8	6
6.0	654	325	1.38	11543	29.1	142.0	205	1562	406	69.4	34.5	55.3	442	212	340	270	4.75	316.	5	22	2.0	8
6.5	709	353	1.50	12016	30.3	136.4	234	1901	375	60.4	30.1	59.8	529	179	393	237	4.16	339.	6	25	2.3	10
7.0	763	380	1.61	12471	31.4	131.5	260	2174	348	53.6	26.7	63.2	608	155	438	214	3.74	362.	6	27	2.5	12
7.5	818	407	1.73	12910	32.5	127.0	284	2411	325	48.2	24.0	65.9	681	137	477	196	3.43	386.	7	30	2.7	13
8.0	872	434	1.84	13335	33.6	123.0	305	2618	304	43.9	21.8	68.1	750	122	512	182	3.19	407.	8	32	2.9	15
8.5	927	461	1.96	13748	34.6	119.3	326	2801	286	40.2	20.0	69.9	817	110	544	171	2.99	429.	8	34	3.0	17
9.0	981	488	2.07	14148	35.6	115.9	345	2963	270	37.2	18.5	71.4	881	100	574	161	2.83	452.	9	36	3.2	18
9.5	1036	515	2.19	14538	36.6	112.9	363	3108	256	34.6	17.2	72.7	944	91	602	153	2.69	474.	9	38	3.3	19
10.0	1090	542	2.30	14917	37.5	110.0	380	3238	243	32.3	16.1	73.9	1006	84	630	146	2.56	494.	10	40	3.5	21
10.5	1145	570	2.42	15288	38.4	107.3	396	3356	232	30.3	15.1	74.8	1066	78	656	140	2.46	516.	10	41	3.6	22
11.0	1199	597	2.53	15650	39.4	104.9	412	3464	221	28.5	14.2	75.7	1126	73	681	135	2.36	538.	11	43	3.8	23
11.5	1254	624	2.65	16004	40.2	102.6	427	3562	212	27.0	13.4	76.5	1185	68	705	130	2.28	560.	11	45	3.9	24
12.0	1308	651	2.76	16350	41.1	100.4	442	3651	203	25.6	12.7	77.2	1244	64	729	126	2.20	578.	12	47	4.0	26
13.0	1417	705	2.99	17022	42.8	96.5	470	3810	187	23.2	11.5	78.4	1360	57	776	118	2.07	620.	13	50	4.3	28
14.0	1526	759	3.22	17669	44.4	93.0	497	3946	174	21.2	10.6	79.4	1474	52	820	112	1.96	660.	14	53	4.5	30
15.0	1635	814	3.45	18294	46.0	89.8	522	4064	162	19.5	9.7	80.2	1588	47	864	107	1.87	700.	14	56	4.7	32
16.0	1744	868	3.68	18899	47.5	87.0	546	4167	152	18.1	9.0	80.9	1701	43	907	102	1.79	738.	15	59	4.9	34
17.0	1853	922	3.91	19486	48.9	84.4	569	4258	143	16.9	8.4	81.6	1813	40	948	98	1.71	776.	16	62	5.1	36
18.0	1962	976	4.14	20057	50.3	82.0	591	4339	135	15.8	7.9	82.1	1925	37	989	94	1.65	812.	17	64	5.3	38
19.0	2071	1031	4.37	20612	51.7	79.8	612	4411	128	14.9	7.4	82.6	2036	35	1030	91	1.59	848.	18	67	5.5	40
20.0	2180	1085	4.60	21153	53.1	77.8	632	4476	121	14.0	7.0	83.0	2148	32	1070	88	1.54	888.	19	70	5.7	41
25.0	2725	1356	5.75	23681	59.3	69.6	726	4723	97	10.9	5.4	84.5	2700	25	1264	77	1.34	1059.	23	83	6.5	49
30.0	3270	1627	6.90	25975	65.0	63.5	810	4888	81	9.0	4.5	85.5	3250	20	1451	69	1.20	1218.	27	95	7.2	56
35.0	3815	1899	8.05	28094	70.2	58.8	885	5005	69	7.6	3.8	86.2	3798	17	1634	63	1.10	1368.	31	107	7.9	
40.0	4360	2170	9.20	30073	75.0	55.0	955	5093	60	6.6	3.3	86.7	4346	14	1813	58	1.02	1503.	35	118	8.5	
45.0	4905	2441	10.35	31939	79.6	51.9	1019	5162	54	5.8	2.9	87.1	4892	13	1989	55	0.96	1634.	39	129	9.1	
50.0	5450	2712	11.50	33711	83.9	49.2	1080	5216	48	5.2	2.6	87.4	5439	11	2163	51	0.90	1752.	43	140	9.6	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#313 109 Ag on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 58. ZC=105.( )
NEUTRON NUMBERS: NP= 62. NT= 82. NC=144.

AP**1/3= 4.777 AT**1/3= 5.192
REDUCED MASS NUMBER= 61.29 AP+AT=AC=249.

INTERACTION RADIUS RINT=13.94 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 5.87 CT+CP=11.22 C= 2.80

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.04

COULOMB RADII [fm]:
RCP= 5.35 RCT= 5.82 RC=RCP+RCT=11.16

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 494.87 MeV K= .39640 n=2.443
VC(RINT)= 281.2 MeV

FISSION-TKE= 210. MeV
ASYMM. FISSION-TKE= 208. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.910 MeV/fm**2 PROX-FACTOR= 31.99 MeV
L-RLD= 42 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.39 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -88.2
COMPOUND NUCLEUS: 100.2

FUSION RELATED PARAMETERS:
R-BARRIER=12.46 fm V(RB)= 293.7 MeV
Q-VALUE= -277.1 MeV
L-CRITICAL= 71.

109 Ag on 140 Ce — 109 Ag on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	61	0.22	4706	13.4	429.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	123	0.44	6657	19.0	303.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	184	0.65	8155	23.2	247.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	245	0.87	9420	26.8	214.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	276	0.98	9992	28.4	202.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	306	1.09	10534	30.0	192.0	119	503	182	116.4	69.6	31.8	157	388	123	669	9.90	237.	2	13	1.0	2
5.5	600	337	1.20	11050	31.4	183.0	178	1016	165	91.7	53.1	44.2	296	304	225	450	6.62	257.	3	17	1.4	5
6.0	654	368	1.31	11543	32.8	175.2	222	1443	151	76.7	44.0	51.7	406	248	298	361	5.32	278.	4	21	1.7	7
6.5	709	398	1.42	12016	34.2	168.4	258	1803	140	66.3	37.8	56.9	500	208	354	310	4.57	298.	5	24	2.0	10
7.0	763	429	1.53	12471	35.5	162.2	290	2112	130	58.5	33.2	60.8	584	179	400	276	4.06	318.	6	26	2.2	12
7.5	818	460	1.63	12910	36.7	156.7	318	2380	121	52.4	29.7	63.8	661	157	438	252	3.70	338.	7	29	2.4	14
8.0	872	490	1.74	13335	37.9	151.8	345	2614	113	47.5	26.9	66.2	733	139	472	232	3.42	357.	7	31	2.6	16
8.5	927	521	1.85	13748	39.1	147.2	369	2820	107	43.5	24.6	68.3	801	125	503	217	3.19	376.	8	33	2.8	18
9.0	981	552	1.96	14148	40.2	143.1	392	3003	101	40.1	22.6	70.0	868	113	531	204	3.00	396.	8	35	3.0	19
9.5	1036	582	2.07	14538	41.3	139.3	414	3167	95	37.2	21.0	71.4	932	104	558	194	2.85	415.	9	37	3.1	21
10.0	1090	613	2.18	14917	42.4	135.7	434	3315	91	34.7	19.6	72.6	995	95	582	185	2.71	433.	9	39	3.3	23
10.5	1145	643	2.29	15288	43.4	132.5	454	3448	86	32.5	18.3	73.7	1056	88	606	177	2.59	452.	10	41	3.4	24
11.0	1199	674	2.40	15650	44.5	129.4	473	3570	82	30.6	17.3	74.7	1117	82	628	170	2.49	470.	10	42	3.6	26
11.5	1254	705	2.51	16004	45.5	126.6	491	3680	79	28.9	16.3	75.5	1177	77	650	163	2.40	489.	11	44	3.7	27
12.0	1308	735	2.62	16350	46.4	123.9	508	3782	75	27.4	15.4	76.3	1236	72	671	158	2.32	506.	11	46	3.8	29
13.0	1417	797	2.83	17022	48.3	119.0	542	3962	70	24.8	14.0	77.6	1353	64	711	148	2.17	540.	12	49	4.1	32
14.0	1526	858	3.05	17669	50.2	114.7	573	4115	65	22.6	12.7	78.7	1468	58	750	140	2.06	576.	13	52	4.3	34
15.0	1635	919	3.27	18294	51.9	110.8	603	4249	60	20.8	11.7	79.6	1582	53	787	133	1.95	609.	14	55	4.5	37
16.0	1744	981	3.49	18899	53.6	107.3	631	4365	56	19.3	10.9	80.3	1696	48	824	127	1.87	643.	15	58	4.8	39
17.0	1853	1042	3.70	19486	55.3	104.1	658	4468	53	18.0	10.1	81.0	1808	45	859	122	1.79	677.	16	60	5.0	41
18.0	1962	1103	3.92	20057	56.9	101.2	684	4560	50	16.8	9.5	81.6	1921	41	894	117	1.72	707.	17	63	5.2	44
19.0	2071	1164	4.14	20612	58.4	98.5	709	4641	47	15.8	8.9	82.1	2032	39	928	113	1.66	739.	17	66	5.3	46
20.0	2180	1226	4.36	21153	59.9	96.0	733	4715	45	14.9	8.4	82.5	2144	36	961	109	1.61	770.	18	68	5.5	48
25.0	2725	1532	5.45	23681	67.0	85.8	844	4994	36	11.6	6.5	84.2	2698	27	1123	95	1.40	919.	22	81	6.4	57
30.0	3270	1839	6.54	25975	73.4	78.4	942	5180	30	9.5	5.4	85.2	3248	22	1277	85	1.25	1057.	26	93	7.1	65
35.0	3815	2145	7.63	28094	79.3	72.6	1030	5313	26	8.1	4.5	86.0	3796	19	1426	78	1.14	1186.	30	105	7.7	
40.0	4360	2451	8.72	30073	84.8	67.9	1112	5413	22	7.0	3.9	86.5	4344	16	1572	72	1.06	1310.	34	116	8.4	
45.0	4905	2758	9.81	31939	89.9	64.0	1188	5490	20	6.2	3.5	86.9	4891	14	1715	68	0.99	1422.	38	126	8.9	
50.0	5450	3064	10.90	33711	94.8	60.7	1259	5552	18	5.5	3.1	87.2	5438	12	1856	64	0.94	1522.	42	137	9.5	

#314 109 Ag on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 62. ZC=109.( )
NEUTRON NUMBERS: NP= 62. NT= 92. NC=154.

AP**1/3= 4.777 AT**1/3= 5.360
REDUCED MASS NUMBER= 63.83 AP+AT=AC=263.

INTERACTION RADIUS RINT=14.12 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 6.09 CT+CP=11.43 C= 2.85

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.25

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.00 RC=RCP+RCT=11.34

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 520.42 MeV K= .39720 n=2.446
VC(RINT)= 296.7 MeV

FISSION-TKE= 221. MeV
ASYMM. FISSION-TKE= 217. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 32.25 MeV
L-RLD= 35 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.27 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -72.1
COMPOUND NUCLEUS: 127.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.62 fm V(RB)= 309.4 MeV
Q-VALUE= -288.1 MeV
L-CRITICAL= 50.

109 Ag on 154 Sm — 109 Ag on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	109	64	0.22	4706	14.0	458.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	128	0.43	6657	19.7	324.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	191	0.65	8155	24.2	264.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	255	0.86	9420	27.9	229.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	287	0.97	9992	29.6	216.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	319	1.08	10534	31.2	205.2	116	439	83	121.2	77.5	29.4	144	401	108	775	10.88	223.	2	13	1.0	3
5.5	600	351	1.18	11050	32.7	195.6	181	973	75	94.4	57.7	42.8	286	313	212	498	6.95	243.	3	17	1.4	6
6.0	654	383	1.29	11543	34.2	187.3	229	1416	69	78.7	47.3	50.7	399	255	286	395	5.51	263.	4	21	1.7	8
6.5	709	415	1.40	12016	35.6	180.0	268	1791	64	67.8	40.5	56.1	494	214	342	337	4.70	281.	5	24	2.0	11
7.0	763	447	1.51	12471	36.9	173.4	302	2112	59	59.8	35.5	60.1	579	184	388	299	4.17	300.	6	26	2.2	13
7.5	818	479	1.61	12910	38.2	167.5	332	2390	55	53.5	31.7	63.3	657	161	426	272	3.79	319.	7	29	2.4	15
8.0	872	511	1.72	13335	39.5	162.2	361	2634	52	48.5	28.6	65.8	729	143	459	251	3.49	338.	7	31	2.6	17
8.5	927	543	1.83	13748	40.7	157.4	387	2848	49	44.3	26.1	67.8	799	128	489	234	3.26	356.	8	33	2.8	19
9.0	981	574	1.94	14148	41.9	152.9	411	3039	46	40.8	24.1	69.6	865	116	517	220	3.06	374.	8	35	3.0	21
9.5	1036	606	2.04	14538	43.0	148.9	434	3209	43	37.9	22.3	71.1	930	104	542	208	2.90	391.	9	37	3.1	23
10.0	1090	638	2.15	14917	44.1	145.1	456	3363	41	35.3	20.8	72.3	993	97	566	198	2.76	409.	9	38	3.3	25
10.5	1145	670	2.26	15288	45.2	141.6	477	3502	39	33.1	19.5	73.5	1054	90	588	190	2.64	427.	10	40	3.4	26
11.0	1199	702	2.37	15650	46.3	138.3	497	3628	37	31.1	18.3	74.4	1115	84	609	182	2.53	444.	10	42	3.5	28
11.5	1254	734	2.47	16004	47.3	135.3	516	3743	36	29.4	17.3	75.3	1175	78	630	175	2.44	460.	11	44	3.7	30
12.0	1308	766	2.58	16350	48.4	132.5	534	3848	34	27.9	16.4	76.1	1234	74	650	169	2.36	478.	11	45	3.8	31
13.0	1417	830	2.80	17022	50.3	127.3	569	4035	32	25.2	14.8	77.4	1352	65	688	159	2.21	511.	12	48	4.1	34
14.0	1526	894	3.01	17669	52.2	122.6	603	4195	29	23.0	13.5	78.5	1467	59	725	150	2.09	543.	13	51	4.3	37
15.0	1635	957	3.23	18294	54.1	118.5	634	4334	27	21.2	12.4	79.4	1581	54	760	143	1.99	577.	14	54	4.5	39
16.0	1744	1021	3.44	18899	55.8	114.7	664	4455	26	19.6	11.5	80.2	1695	49	794	136	1.90	607.	15	57	4.7	42
17.0	1853	1085	3.66	19486	57.6	111.3	693	4562	24	18.3	10.7	80.9	1808	45	827	131	1.82	639.	16	60	4.9	44
18.0	1962	1149	3.87	20057	59.2	108.1	720	4657	23	17.1	10.0	81.5	1920	42	859	126	1.75	667.	16	63	5.1	47
19.0	2071	1213	4.09	20612	60.8	105.3	747	4742	21	16.1	9.4	82.0	2032	39	891	121	1.69	698.	17	65	5.3	49
20.0	2180	1277	4.30	21153	62.4	102.6	772	4819	20	15.1	8.9	82.4	2143	37	922	117	1.63	728.	18	68	5.5	51
25.0	2725	1596	5.38	23681	69.8	91.8	889	5109	16	11.8	6.9	84.1	2697	28	1072	102	1.42	867.	22	80	6.3	61
30.0	3270	1915	6.45	25975	76.5	83.8	992	5303	13	9.7	5.7	85.2	3248	22	1215	91	1.27	999.	26	92	7.0	69
35.0	3815	2234	7.53	28094	82.6	77.6	1086	5441	11	8.2	4.8	85.9	3796	19	1353	83	1.16	1118.	30	103	7.7	
40.0	4360	2553	8.60	30073	88.3	72.5	1172	5545	10	7.1	4.1	86.5	4344	16	1487	77	1.07	1229.	34	114	8.3	
45.0	4905	2872	9.68	31939	93.6	68.4	1252	5625	9	6.3	3.7	86.9	4891	14	1619	72	1.01	1336.	38	125	8.9	
50.0	5450	3191	10.75	33711	98.7	64.9	1327	5690	8	5.6	3.3	87.2	5437	13	1749	68	0.95	1433.	41	135	9.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#315 109 Ag on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 67. ZC=114.( )
NEUTRON NUMBERS: NP= 62. NT= 98. NC=160.

AP**1/3= 4.777 AT**1/3= 5.485
REDUCED MASS NUMBER= 65.64 AP+AT=AC=274.

INTERACTION RADIUS RINT=14.26 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 6.25 CT+CP=11.59 C= 2.88

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.41

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.15 RC=RCP+RCT=11.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 554.46 MeV K= .40461 n=2.450
VC(RINT)= 317.6 MeV

FISSION-TKE= 236. MeV
ASYMM. FISSION-TKE= 229. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.904 MeV/fm**2 PROX-FACTOR= 32.71 MeV
L-RLD= 18 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.18 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -63.7
COMPOUND NUCLEUS: 163.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.72 fm V(RB)= 331.3 MeV
Q-VALUE= -315.8 MeV
L-CRITICAL= 0.

109 As on 165 Ho — 109 As on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	109	66	0.21	4706	14.4	495.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	131	0.41	6657	20.3	350.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	197	0.62	8155	24.9	286.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	263	0.83	9420	28.7	247.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	295	0.93	9992	30.5	233.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	328	1.03	10534	32.1	221.7	80	202	0	140.1	99.5	19.9	84	461	57	1237	16.40	0.	1	11	0.6	1
5.5	600	361	1.14	11050	33.7	211.4	166	769	0	103.9	66.6	38.1	243	356	178	610	7.97	0.	3	16	1.1	4
6.0	654	394	1.24	11543	35.2	202.4	220	1240	0	85.3	53.3	47.4	367	287	261	460	6.00	0.	4	20	1.5	7
6.5	709	427	1.34	12016	36.6	194.5	263	1638	0	72.9	45.0	53.5	469	240	323	385	5.01	0.	5	23	1.8	10
7.0	763	459	1.45	12471	38.0	187.4	300	1978	0	63.9	39.2	58.0	558	205	372	337	4.39	0.	6	25	2.0	12
7.5	818	492	1.55	12910	39.3	181.1	333	2273	0	57.0	34.8	61.5	639	178	413	304	3.96	0.	6	28	2.3	14
8.0	872	525	1.65	13335	40.6	175.3	363	2531	0	51.5	31.4	64.3	714	158	448	279	3.63	0.	7	30	2.5	16
8.5	927	558	1.76	13748	41.9	170.1	391	2759	0	47.0	28.6	66.5	785	141	479	259	3.37	0.	8	32	2.7	18
9.0	981	591	1.86	14148	43.1	165.3	417	2961	0	43.2	26.2	68.4	853	128	507	243	3.16	0.	8	34	2.8	20
9.5	1036	624	1.96	14538	44.2	160.9	442	3142	0	40.0	24.3	70.0	919	116	532	230	2.99	0.	9	36	3.0	22
10.0	1090	656	2.07	14917	45.4	156.8	465	3305	0	37.3	22.6	71.4	983	107	556	218	2.84	0.	9	38	3.2	24
10.5	1145	689	2.17	15288	46.5	153.0	487	3452	0	34.9	21.1	72.5	1046	99	578	208	2.71	0.	10	40	3.3	26
11.0	1199	722	2.27	15650	47.6	149.5	508	3586	0	32.8	19.9	73.6	1107	92	600	200	2.60	0.	10	41	3.4	28
11.5	1254	755	2.38	16004	48.7	146.2	528	3708	0	31.0	18.7	74.5	1168	86	620	192	2.50	0.	11	43	3.6	29
12.0	1308	788	2.48	16350	49.7	143.1	547	3820	0	29.3	17.7	75.3	1228	80	640	185	2.41	0.	11	45	3.7	31
13.0	1417	853	2.69	17022	51.8	137.5	584	4019	0	26.5	16.0	76.8	1346	71	677	174	2.26	0.	12	48	4.0	34
14.0	1526	919	2.89	17669	53.7	132.5	619	4188	0	24.2	14.6	77.9	1462	64	713	164	2.13	0.	13	51	4.2	37
15.0	1635	985	3.10	18294	55.6	128.0	652	4335	0	22.2	13.4	78.9	1577	58	747	156	2.02	0.	14	54	4.4	40
16.0	1744	1050	3.31	18899	57.4	124.0	684	4464	0	20.6	12.4	79.7	1691	53	780	148	1.93	0.	15	56	4.6	42
17.0	1853	1116	3.51	19486	59.2	120.3	714	4578	0	19.1	11.5	80.4	1804	49	811	142	1.85	0.	15	59	4.8	45
18.0	1962	1181	3.72	20057	60.9	116.9	742	4678	0	17.9	10.8	81.1	1917	45	843	137	1.78	0.	16	62	5.0	47
19.0	2071	1247	3.93	20612	62.6	113.8	770	4769	0	16.8	10.1	81.6	2029	42	873	132	1.71	0.	17	65	5.2	49
20.0	2180	1313	4.13	21153	64.2	110.9	797	4850	0	15.8	9.6	82.1	2140	40	903	127	1.66	0.	18	67	5.4	52
25.0	2725	1641	5.17	23681	71.8	99.2	919	5158	0	12.3	7.4	83.8	2695	30	1046	110	1.44	0.	22	80	6.2	62
30.0	3270	1969	6.20	25975	78.6	90.5	1026	5364	0	10.1	6.1	85.0	3246	24	1182	99	1.29	0.	26	91	6.9	71
35.0	3815	2297	7.23	28094	84.9	83.8	1124	5510	0	8.5	5.1	85.7	3795	20	1313	90	1.17	0.	30	103	7.6	
40.0	4360	2626	8.27	30073	90.8	78.4	1213	5620	0	7.4	4.5	86.3	4343	17	1440	84	1.09	0.	33	113	8.2	
45.0	4905	2954	9.30	31939	96.3	73.9	1297	5706	0	6.5	3.9	86.7	4890	15	1565	78	1.02	0.	37	124	8.8	
50.0	5450	3282	10.33	33711	101.5	70.1	1375	5774	0	5.8	3.5	87.1	5436	14	1687	74	0.96	0.	41	134	9.3	

#316 109 Ag on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 73. ZC=120.( )
NEUTRON NUMBERS: NP= 62. NT=108. NC=170.

AP**1/3= 4.777 AT**1/3= 5.657
REDUCED MASS NUMBER= 68.03 AP+AT=AC=290.

INTERACTION RADIUS RINT=14.44 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 6.47 CT+CP=11.81 C= 2.93

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.62

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.35 RC=RCP+RCT=11.70

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 593.24 MeV K= .40772 n=2.457
VC(RINT)= 341.6 MeV

FISSION-TKE= 255. MeV
ASYMM. FISSION-TKE= 243. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 33.14 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.08 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -46.0
COMPOUND NUCLEUS: 212.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.87 fm V(RB)= 356.2 MeV
Q-VALUE= -347.2 MeV
L-CRITICAL= 0.

109 As on 181 Ta — 109 As on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	109	68	0.20	4706	14.9	540.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	136	0.40	6657	21.0	382.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	204	0.60	8155	25.8	311.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	272	0.80	9420	29.8	270.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	306	0.90	9992	31.6	254.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	340	1.00	10534	33.3	241.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	600	374	1.10	11050	34.9	230.4	148	570	0	114.7	78.5	32.6	201	399	142	781	9.51	0.	2	15	0.9	2
6.0	654	408	1.19	11543	36.4	220.6	212	1071	0	92.3	60.6	43.8	335	319	235	546	6.62	0.	4	19	1.3	5
6.5	709	442	1.29	12016	37.9	211.9	261	1495	0	78.2	50.5	50.9	444	264	302	444	5.38	0.	5	22	1.6	8
7.0	763	476	1.39	12471	39.4	204.2	302	1858	0	68.2	43.6	55.9	538	225	355	384	4.65	0.	5	25	1.9	11
7.5	818	510	1.49	12910	40.7	197.3	338	2172	0	60.6	38.5	59.7	622	195	397	343	4.15	0.	6	27	2.1	14
8.0	872	544	1.59	13335	42.1	191.0	370	2447	0	54.6	34.6	62.7	700	172	434	313	3.79	0.	7	29	2.3	16
8.5	927	578	1.69	13748	43.4	185.3	400	2690	0	49.7	31.4	65.2	773	153	465	290	3.50	0.	7	32	2.5	18
9.0	981	612	1.79	14148	44.6	180.1	428	2905	0	45.6	28.8	67.2	843	138	493	271	3.28	0.	8	34	2.7	20
9.5	1036	646	1.89	14538	45.9	175.3	454	3098	0	42.2	26.6	68.9	910	126	519	255	3.09	0.	9	35	2.9	22
10.0	1090	680	1.99	14917	47.1	170.8	479	3271	0	39.2	24.7	70.4	975	115	543	242	2.93	0.	9	37	3.0	24
10.5	1145	714	2.09	15288	48.2	166.7	503	3428	0	36.7	23.1	71.7	1038	106	565	231	2.79	0.	10	39	3.2	26
11.0	1199	748	2.19	15650	49.4	162.9	525	3571	0	34.5	21.6	72.8	1100	99	586	221	2.67	0.	10	41	3.3	28
11.5	1254	782	2.29	16004	50.5	159.3	547	3701	0	32.5	20.4	73.8	1161	92	605	212	2.57	0.	10	42	3.5	30
12.0	1308	816	2.39	16350	51.5	156.0	567	3820	0	30.7	19.3	74.6	1222	86	624	205	2.47	0.	11	44	3.6	32
13.0	1417	884	2.59	17022	53.6	149.8	607	4031	0	27.7	17.4	76.1	1341	76	661	191	2.31	0.	12	47	3.8	35
14.0	1526	952	2.79	17669	55.7	144.4	644	4212	0	25.3	15.8	77.4	1457	69	695	180	2.18	0.	13	50	4.1	38
15.0	1635	1020	2.99	18294	57.6	139.5	679	4369	0	23.2	14.5	78.4	1573	62	727	171	2.07	0.	14	53	4.3	41
16.0	1744	1088	3.19	18899	59.5	135.1	712	4506	0	21.5	13.4	79.3	1687	57	758	163	1.97	0.	14	56	4.5	44
17.0	1853	1157	3.39	19486	61.4	131.0	744	4627	0	20.0	12.5	80.0	1801	52	788	156	1.89	0.	15	59	4.7	47
18.0	1962	1225	3.58	20057	63.1	127.3	774	4734	0	18.7	11.7	80.7	1913	49	818	150	1.81	0.	16	61	4.9	49
19.0	2071	1293	3.78	20612	64.9	123.9	803	4830	0	17.5	11.0	81.2	2026	45	846	144	1.75	0.	17	64	5.1	51
20.0	2180	1361	3.98	21153	66.5	120.8	831	4917	0	16.5	10.3	81.7	2138	42	874	140	1.69	0.	18	66	5.3	54
25.0	2725	1701	4.98	23681	74.4	108.0	960	5245	0	12.8	8.0	83.6	2693	32	1008	121	1.46	0.	22	79	6.1	64
30.0	3270	2041	5.97	25975	81.5	98.6	1074	5464	0	10.5	6.6	84.8	3244	26	1135	108	1.31	0.	25	90	6.8	74
35.0	3815	2381	6.97	28094	88.0	91.3	1176	5620	0	8.9	5.5	85.6	3794	21	1256	99	1.19	0.	29	101	7.5	
40.0	4360	2721	7.97	30073	94.1	85.4	1271	5737	0	7.7	4.8	86.2	4342	18	1374	91	1.10	0.	33	112	8.1	
45.0	4905	3061	8.96	31939	99.8	80.5	1359	5829	0	6.8	4.2	86.6	4889	16	1489	85	1.03	0.	37	122	8.7	
50.0	5450	3402	9.96	33711	105.2	76.4	1441	5901	0	6.1	3.8	87.0	5436	14	1602	81	0.97	0.	40	132	9.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fr	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 109 As

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#317 109 Ag on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 79. ZC=126.( )
NEUTRON NUMBERS: NP= 62. NT=118. NC=180.

AP**1/3= 4.777 AT**1/3= 5.819
REDUCED MASS NUMBER= 70.17 AP+AT=AC=306.

INTERACTION RADIUS RINT=14.62 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 6.68 CT+CP=12.02 C= 2.97

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.83

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.55 RC=RCP+RCT=11.89

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 631.14 MeV K= .40885 n=2.463
VC(RINT)= 365.3 MeV

FISSION-TKE= 275. MeV
ASYMM. FISSION-TKE= 257. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.899 MeV/fm**2 PROX-FACTOR= 33.52 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.99 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -28.6
COMPOUND NUCLEUS: 255.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.00 fm V(RB)= 380.8 MeV
Q-VALUE= -372.6 MeV
L-CRITICAL= 0.

109 Ag on 197 Au — 109 Ag on 197 Au

EL/u	ELAB	ECM	ECM/VC	r	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	109	70	0.19	4706	15.3	584.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	140	0.38	6657	21.7	413.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	211	0.58	8155	26.6	337.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	281	0.77	9420	30.7	292.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	316	0.86	9992	32.6	275.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	351	0.96	10534	34.3	261.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	600	386	1.06	11050	36.0	249.3	120	357	0	128.5	95.0	25.8	154	446	102	1077	12.32	0.	2	13	0.6	1
6.0	654	421	1.15	11543	37.6	238.7	199	890	0	100.3	69.2	39.8	300	354	206	656	7.45	0.	3	18	1.1	4
6.5	709	456	1.25	12016	39.1	229.3	255	1340	0	84.0	56.5	48.0	417	291	281	514	5.82	0.	4	21	1.5	7
7.0	763	491	1.34	12471	40.6	221.0	300	1726	0	72.8	48.3	53.6	517	246	337	436	4.94	0.	5	24	1.8	10
7.5	818	526	1.44	12910	42.0	213.5	339	2060	0	64.4	42.4	57.8	605	213	382	386	4.37	0.	6	26	2.0	13
8.0	872	561	1.54	13335	43.4	206.7	375	2352	0	57.8	37.9	61.1	685	187	420	350	3.96	0.	7	29	2.2	15
8.5	927	596	1.63	13748	44.7	200.5	407	2609	0	52.5	34.3	63.8	760	166	453	322	3.65	0.	7	31	2.4	18
9.0	981	632	1.73	14148	46.0	194.9	437	2838	0	48.1	31.4	65.9	832	149	481	300	3.40	0.	8	33	2.6	20
9.5	1036	667	1.82	14538	47.3	189.7	465	3043	0	44.4	28.9	67.8	900	136	507	282	3.19	0.	8	35	2.8	22
10.0	1090	702	1.92	14917	48.5	184.9	491	3227	0	41.3	26.8	69.4	966	124	531	267	3.02	0.	9	37	2.9	24
10.5	1145	737	2.02	15288	49.7	180.4	516	3393	0	38.6	25.0	70.7	1030	114	553	254	2.87	0.	9	38	3.1	26
11.0	1199	772	2.11	15650	50.9	176.3	540	3545	0	36.2	23.5	71.9	1093	106	574	243	2.75	0.	10	40	3.2	28
11.5	1254	807	2.21	16004	52.0	172.4	563	3683	0	34.1	22.1	73.0	1155	99	593	233	2.64	0.	10	42	3.4	30
12.0	1308	842	2.31	16350	53.2	168.8	584	3810	0	32.2	20.9	73.9	1216	92	612	224	2.54	0.	11	43	3.5	32
13.0	1417	912	2.50	17022	55.3	162.2	626	4034	0	29.0	18.8	75.5	1335	82	647	209	2.37	0.	12	46	3.8	35
14.0	1526	982	2.69	17669	57.4	156.3	665	4226	0	26.4	17.1	76.8	1453	73	679	197	2.23	0.	13	49	4.0	39
15.0	1635	1053	2.88	18294	59.4	151.0	702	4392	0	24.3	15.7	77.9	1569	66	710	187	2.11	0.	13	52	4.2	42
16.0	1744	1123	3.07	18899	61.4	146.2	737	4538	0	22.4	14.5	78.8	1683	61	740	178	2.01	0.	14	55	4.4	45
17.0	1853	1193	3.27	19486	63.3	141.8	770	4666	0	20.9	13.5	79.6	1797	56	769	170	1.93	0.	15	58	4.6	48
18.0	1962	1263	3.46	20057	65.1	137.8	802	4780	0	19.5	12.6	80.3	1910	52	797	163	1.85	0.	16	60	4.8	51
19.0	2071	1333	3.65	20612	66.9	134.1	833	4882	0	18.3	11.8	80.9	2023	48	824	157	1.78	0.	17	63	5.0	53
20.0	2180	1403	3.84	21153	68.6	130.7	863	4974	0	17.2	11.1	81.4	2135	45	850	152	1.72	0.	17	66	5.2	56
25.0	2725	1754	4.80	23681	76.7	116.9	998	5323	0	13.4	8.6	83.3	2691	34	976	131	1.49	0.	21	78	6.0	67
30.0	3270	2105	5.76	25975	84.1	106.7	1117	5556	0	10.9	7.0	84.5	3243	27	1095	117	1.33	0.	25	89	6.7	77
35.0	3815	2456	6.72	28094	90.8	98.8	1224	5722	0	9.2	5.9	85.4	3792	23	1208	107	1.21	0.	29	100	7.4	
40.0	4360	2807	7.68	30073	97.1	92.4	1323	5846	0	8.0	5.1	86.0	4341	19	1318	99	1.12	0.	33	111	8.0	
45.0	4905	3158	8.64	31939	103.0	87.2	1415	5943	0	7.0	4.5	86.5	4888	17	1424	93	1.05	0.	36	121	8.5	
50.0	5450	3509	9.61	33711	108.5	82.7	1501	6020	0	6.3	4.1	86.8	5435	15	1529	87	0.99	0.	40	131	9.1	

#318 109 Ag on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 82. ZC=129.( )
NEUTRON NUMBERS: NP= 62. NT=126. NC=188.

AP**1/3= 4.777 AT**1/3= 5.925
REDUCED MASS NUMBER= 71.52 AP+AT=AC=317.

INTERACTION RADIUS RINT=14.73 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 6.82 CT+CP=12.16 C= 2.99

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.96

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.66 RC=RCP+RCT=12.01

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 648.52 MeV K= .40589 n=2.467
VC(RINT)= 376.2 MeV

FISSION-TKE= 284. MeV
ASYMM. FISSION-TKE= 263. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.893 MeV/fm**2 PROX-FACTOR= 33.60 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.94 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -19.5
COMPOUND NUCLEUS: 287.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.10 fm V(RB)= 391.9 MeV
Q-VALUE= -395.5 MeV
L-CRITICAL= 0.

109 Ag on 208 Pb — 109 Ag on 208 Pb

EL/u	ELAB	ECM	ECM/VC	r	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	109	72	0.19	4706	15.6	606.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	143	0.38	6657	22.1	429.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	215	0.57	8155	27.1	350.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	286	0.76	9420	31.3	303.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	322	0.86	9992	33.2	286.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	358	0.95	10534	35.0	271.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	600	393	1.05	11050	36.7	258.8	111	294	0	133.5	102.7	23.3	143	457	91	1239	13.79	0.	2	13	0.0	0
6.0	654	429	1.14	11543	38.3	247.7	197	842	0	102.9	72.9	38.5	293	361	198	705	7.78	0.	3	17	0.9	4
6.5	709	465	1.24	12016	39.9	238.0	256	1304	0	85.9	59.1	47.1	412	297	274	545	6.00	0.	4	21	1.3	7
7.0	763	501	1.33	12471	41.4	229.4	303	1699	0	74.2	50.4	52.9	513	250	331	460	5.06	0.	5	24	1.6	10
7.5	818	536	1.43	12910	42.8	221.6	344	2042	0	65.5	44.1	57.2	601	216	376	405	4.46	0.	6	26	1.9	12
8.0	872	572	1.52	13335	44.2	214.6	381	2342	0	58.8	39.4	60.6	683	189	414	367	4.03	0.	7	29	2.1	15
8.5	927	608	1.62	13748	45.6	208.1	414	2606	0	53.3	35.6	63.3	758	168	446	337	3.70	0.	7	31	2.3	18
9.0	981	644	1.71	14148	46.9	202.3	445	2841	0	48.9	32.5	65.6	830	151	474	314	3.45	0.	8	33	2.5	20
9.5	1036	679	1.81	14538	48.2	196.9	474	3051	0	45.1	29.9	67.4	898	137	500	295	3.24	0.	8	35	2.7	22
10.0	1090	715	1.90	14917	49.5	191.9	501	3240	0	41.9	27.8	69.1	964	126	523	279	3.06	0.	9	36	2.8	24
10.5	1145	751	2.00	15288	50.7	187.3	527	3411	0	39.1	25.9	70.4	1029	116	545	265	2.91	0.	9	38	3.0	26
11.0	1199	787	2.09	15650	51.9	183.0	552	3566	0	36.7	24.3	71.7	1092	107	565	253	2.78	0.	10	40	3.1	29
11.5	1254	822	2.19	16004	53.0	179.0	575	3708	0	34.6	22.8	72.7	1154	100	584	243	2.67	0.	10	41	3.3	31
12.0	1308	858	2.28	16350	54.2	175.2	598	3838	0	32.7	21.6	73.7	1215	93	602	234	2.57	0.	11	43	3.4	32
13.0	1417	930	2.47	17022	56.4	168.3	641	4068	0	29.4	19.4	75.3	1334	83	636	218	2.40	0.	12	46	3.7	36
14.0	1526	1001	2.66	17669	58.5	162.2	681	4266	0	26.8	17.6	76.6	1452	74	668	205	2.25	0.	12	49	3.9	40
15.0	1635	1073	2.85	18294	60.6	156.7	719	4436	0	24.6	16.2	77.7	1568	67	698	194	2.14	0.	13	52	4.1	43
16.0	1744	1144	3.04	18899	62.6	151.7	755	4586	0	22.7	15.0	78.6	1683	61	726	185	2.03	0.	14	55	4.3	46
17.0	1853	1216	3.23	19486	64.5	147.2	789	4718	0	21.1	13.9	79.4	1797	56	754	177	1.94	0.	15	57	4.6	49
18.0	1962	1287	3.42	20057	66.4	143.0	822	4835	0	19.7	13.0	80.1	1910	52	781	170	1.87	0.	16	60	4.7	52
19.0	2071	1359	3.61	20612	68.2	139.2	854	4940	0	18.5	12.2	80.7	2023	48	807	164	1.80	0.	17	63	4.9	55
20.0	2180	1430	3.80	21153	70.0	135.7	885	5034	0	17.4	11.5	81.3	2135	45	832	158	1.74	0.	17	65	5.1	58
25.0	2725	1788	4.75	23681	78.2	121.4	1024	5392	0	13.5	8.9	83.2	2691	34	953	137	1.50	0.	21	77	5.9	69
30.0	3270	2146	5.70	25975	85.7	110.8	1146	5631	0	11.0	7.3	84.5	3243	27	1066	122	1.34	0.	25	88	6.6	79
35.0	3815	2503	6.65	28094	92.5	102.6	1257	5801	0	9.3	6.1	85.3	3792	23	1174	111	1.22	0.	29	99	7.3	
40.0	4360	2861	7.60	30073	98.9	96.0	1358	5929	0	8.1	5.3	86.0	4340	20	1278	103	1.13	0.	32	110	7.9	
45.0	4905	3218	8.56	31939	104.9	90.5	1453	6028	0	7.1	4.7	86.4	4888	17	1380	96	1.06	0.	36	120	8.4	
50.0	5450	3576	9.51	33711	110.6	85.8	1541	6108	0	6.4	4.2	86.8	5435	15	1479	91	1.00	0.	40	130	9.0	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEN QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#319 109 Ag on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 83. ZC=130.( )
NEUTRON NUMBERS: NP= 62. NT=126. NC=188.

AP**1/3= 4.777 AT**1/3= 5.934
REDUCED MASS NUMBER= 71.64 AP+AT=AC=318.

INTERACTION RADIUS RINT=14.74 fm R0= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 6.83 CT+CP=12.17 C= 3.00

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 6.97

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.68 RC=RCP+RCT=12.03

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 655.40 MeV K= .40744 n=2.468
VC(RINT)= 380.5 MeV

FISSION-TKE= 287. MeV
ASYMM. FISSION-TKE= 265. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 33.71 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.93 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: -16.5
COMPOUND NUCLEUS: 295.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.10 fm V(RB)= 396.6 MeV
Q-VALUE= -400.6 MeV
L-CRITICAL= 0.

109 Ag on 209 Bi — 109 Ag on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	109	72	0.19	4706	15.7	614.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	143	0.38	6657	22.2	434.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	215	0.56	8155	27.1	354.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	287	0.75	9420	31.3	307.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	322	0.85	9992	33.2	289.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	358	0.94	10534	35.0	274.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	600	394	1.04	11050	36.7	261.9	98	230	0	138.8	109.3	20.6	126	473	78	1416	15.65	0.	2	12	0.0	0
6.0	654	430	1.13	11543	38.4	250.8	191	784	0	105.5	75.2	37.3	281	373	189	740	8.07	0.	3	17	0.9	3
6.5	709	466	1.22	12016	39.9	240.9	251	1251	0	87.6	60.6	46.2	402	306	268	563	6.13	0.	4	20	1.3	6
7.0	763	501	1.32	12471	41.5	232.2	300	1651	0	75.6	51.5	52.2	505	258	326	473	5.14	0.	5	23	1.6	9
7.5	818	537	1.41	12910	42.9	224.3	341	1998	0	66.6	45.0	56.7	595	222	373	415	4.51	0.	6	26	1.9	12
8.0	872	573	1.51	13335	44.3	217.2	378	2301	0	59.7	40.1	60.1	677	195	412	375	4.07	0.	7	28	2.1	15
8.5	927	609	1.60	13748	45.7	210.7	412	2568	0	54.2	36.2	62.9	753	173	445	344	3.74	0.	7	31	2.3	17
9.0	981	645	1.69	14148	47.0	204.8	443	2805	0	49.6	33.1	65.2	826	155	473	320	3.47	0.	8	33	2.5	19
9.5	1036	681	1.79	14538	48.3	199.3	472	3018	0	45.8	30.4	67.1	894	141	499	300	3.26	0.	8	34	2.7	22
10.0	1090	716	1.88	14917	49.5	194.2	500	3209	0	42.5	28.2	68.8	961	129	523	284	3.08	0.	9	36	2.8	24
10.5	1145	752	1.98	15288	50.8	189.6	526	3382	0	39.7	26.3	70.2	1026	119	545	270	2.93	0.	9	38	3.0	26
11.0	1199	788	2.07	15650	52.0	185.2	551	3539	0	37.2	24.6	71.4	1089	110	565	258	2.80	0.	10	40	3.1	28
11.5	1254	824	2.17	16004	53.1	181.1	574	3683	0	35.0	23.2	72.5	1151	102	584	247	2.68	0.	10	41	3.3	30
12.0	1308	860	2.26	16350	54.3	177.3	597	3814	0	33.1	21.9	73.5	1212	96	602	238	2.58	0.	11	43	3.4	32
13.0	1417	931	2.45	17022	56.5	170.4	640	4047	0	29.8	19.7	75.1	1333	84	637	222	2.41	0.	12	46	3.7	36
14.0	1526	1003	2.64	17669	58.6	164.2	681	4246	0	27.1	17.9	76.4	1450	76	668	208	2.26	0.	12	49	3.9	39
15.0	1635	1075	2.82	18294	60.7	158.6	719	4419	0	24.9	16.4	77.6	1567	68	699	197	2.14	0.	13	52	4.1	42
16.0	1744	1146	3.01	18899	62.7	153.6	755	4570	0	23.0	15.2	78.5	1682	62	727	188	2.04	0.	14	55	4.3	46
17.0	1853	1218	3.20	19486	64.6	149.0	789	4703	0	21.4	14.1	79.3	1796	57	755	180	1.95	0.	15	57	4.5	49
18.0	1962	1289	3.39	20057	66.5	144.8	823	4822	0	20.0	13.2	80.0	1909	53	782	172	1.87	0.	16	60	4.7	52
19.0	2071	1361	3.58	20612	68.3	140.9	854	4928	0	18.7	12.3	80.6	2022	49	808	166	1.80	0.	17	62	4.9	54
20.0	2180	1433	3.77	21153	70.1	137.4	885	5023	0	17.6	11.6	81.2	2134	46	833	160	1.74	0.	17	65	5.1	57
25.0	2725	1791	4.71	23681	78.3	122.9	1025	5386	0	13.7	9.0	83.2	2690	35	954	138	1.50	0.	21	77	5.9	69
30.0	3270	2149	5.65	25975	85.8	112.1	1148	5627	0	11.2	7.3	84.4	3242	28	1066	124	1.34	0.	25	88	6.6	79
35.0	3815	2507	6.59	28094	92.7	103.8	1258	5799	0	9.4	6.2	85.3	3792	23	1174	113	1.22	0.	29	99	7.3	
40.0	4360	2866	7.53	30073	99.1	97.1	1360	5928	0	8.2	5.4	85.9	4340	20	1278	104	1.13	0.	32	110	7.9	
45.0	4905	3224	8.47	31939	105.1	91.6	1455	6029	0	7.2	4.7	86.4	4888	17	1380	98	1.06	0.	36	120	8.4	
50.0	5450	3582	9.41	33711	110.8	86.9	1544	6109	0	6.4	4.2	86.8	5435	15	1479	92	1.00	0.	40	130	8.9	

#320 109 Ag on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 47. ZT= 92. ZC=139.( )
NEUTRON NUMBERS: NP= 62. NT=146. NC=208.

AP**1/3= 4.777 AT**1/3= 6.197
REDUCED MASS NUMBER= 74.76 AP+AT=AC=347.

INTERACTION RADIUS RINT=15.03 fm R0= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.34 CT= 7.16 CT+CP=12.51 C= 3.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.52 RT= 7.30

COULOMB RADII [fm]:
RCP= 5.35 RCT= 6.98 RC=RCP+RCT=12.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 707.91 MeV K= .40064 n=2.480
VC(RINT)= 413.8 MeV

FISSION-TKE= 317. MeV
ASYMM. FISSION-TKE= 283. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.885 MeV/fm**2 PROX-FACTOR= 34.01 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.82 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -88.7 TARGET: 47.2
COMPOUND NUCLEUS: 396.2

FUSION RELATED PARAMETERS:
R-BARRIER=13.33 fm V(RB)= 431.1 MeV
Q-VALUE= -437.7 MeV
L-CRITICAL= 0.

109 Ag on 238 U — 109 Ag on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	109	75	0.18	4706	16.4	680.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	218	150	0.36	6657	23.1	481.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	327	224	0.54	8155	28.3	393.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	436	299	0.72	9420	32.7	340.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	491	336	0.81	9992	34.7	321.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	545	374	0.90	10534	36.6	304.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	600	411	0.99	11050	38.3	290.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	654	449	1.08	11543	40.1	278.0	166	548	0	118.2	91.0	30.9	239	415	153	999	10.04	0.	3	16	0.5	1
6.5	709	486	1.17	12016	41.7	267.1	240	1054	0	96.0	70.4	42.0	371	337	240	693	6.94	0.	4	19	1.1	5
7.0	763	523	1.26	12471	43.3	257.3	297	1487	0	81.9	58.8	49.1	481	282	304	563	5.63	0.	5	22	1.4	9
7.5	818	561	1.35	12910	44.8	248.6	344	1862	0	71.7	50.9	54.1	576	242	354	486	4.86	0.	6	25	1.7	12
8.0	872	598	1.45	13335	46.2	240.7	385	2190	0	64.0	45.1	58.0	661	211	394	434	4.33	0.	6	27	1.9	15
8.5	927	635	1.54	13748	47.7	233.5	423	2480	0	57.9	40.5	61.1	740	187	428	395	3.95	0.	7	30	2.1	18
9.0	981	673	1.63	14148	49.1	227.0	457	2737	0	52.8	36.9	63.6	814	167	457	366	3.65	0.	8	32	2.3	21
9.5	1036	710	1.72	14538	50.4	220.9	489	2967	0	48.6	33.9	65.7	884	151	483	342	3.42	0.	8	34	2.5	24
10.0	1090	748	1.81	14917	51.7	215.3	519	3174	0	45.1	31.3	67.5	952	138	506	322	3.22	0.	9	35	2.7	26
10.5	1145	785	1.90	15288	53.0	210.1	547	3361	0	42.0	29.1	69.0	1018	127	528	306	3.05	0.	9	37	2.8	28
11.0	1199	822	1.99	15650	54.2	205.3	574	3532	0	39.4	27.3	70.3	1082	117	547	291	2.91	0.	10	39	3.0	30
11.5	1254	860	2.08	16004	55.5	200.8	600	3687	0	37.0	25.6	71.5	1145	109	566	279	2.78	0.	10	40	3.1	32
12.0	1308	897	2.17	16350	56.6	196.5	624	3829	0	34.9	24.1	72.5	1206	102	583	268	2.67	0.	11	42	3.3	35
13.0	1417	972	2.35	17022	59.0	188.8	671	4081	0	31.4	21.7	74.3	1327	90	616	249	2.49	0.	11	45	3.5	39
14.0	1526	1047	2.53	17669	61.2	182.0	715	4297	0	28.6	19.7	75.7	1446	80	646	234	2.34	0.	12	48	3.7	42
15.0	1635	1121	2.71	18294	63.3	175.8	756	4484	0	26.2	18.0	76.9	1563	72	674	221	2.21	0.	13	51	4.0	46
16.0	1744	1196	2.89	18899	65.4	170.2	795	4648	0	24.2	16.6	77.9	1678	66	700	210	2.10	0.	14	53	4.2	49
17.0	1853	1271	3.07	19486	67.4	165.1	832	4792	0	22.5	15.5	78.8	1792	61	726	201	2.01	0.	15	56	4.4	53
18.0	1962	1346	3.25	20057	69.4	160.5	867	4920	0	21.0	14.4	79.5	1906	56	750	193	1.92	0.	16	59	4.6	56
19.0	2071	1420	3.43	20612	71.3	156.2	901	5035	0	19.7	13.5	80.2	2019	52	774	186	1.85	0.	16	61	4.8	59
20.0	2180	1495	3.61	21153	73.1	152.2	934	5138	0	18.5	12.7	80.7	2131	49	797	179	1.79	0.	17	64	4.9	62
25.0	2725	1869	4.52	23681	81.8	136.2	1084	5531	0	14.3	9.8	82.8	2689	36	906	154	1.54	0.	21	76	5.7	75
30.0	3270	2243	5.42	25975	89.6	124.3	1215	5792	0	11.7	8.0	84.2	3241	29	1008	138	1.37	0.	25	87	6.5	86
35.0	3815	2617	6.32	28094	96.7	115.1	1334	5979	0	9.9	6.8	85.1	3791	24	1104	125	1.25	0.	28	97	7.1	
40.0	4360	2990	7.23	30073	103.4	107.7	1442	6119	0	8.5	5.9	85.7	4339	21	1197	116	1.16	0.	32	107	7.7	
45.0	4905	3364	8.13	31939	109.7	101.5	1543	6228	0	7.5	5.2	86.2	4887	18	1287	108	1.08	0.	35	117	8.2	
50.0	5450	3738	9.03	33711	115.6	96.3	1638	6315	0	6.7	4.6	86.6	5434	16	1374	102	1.02	0.	39	127	8.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	ƛ̄	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 109 Ag

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#321 120 Sn on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 6. ZC= 56.(Ba)
NEUTRON NUMBERS: NP= 70. NT= 6. NC= 76.

AP**1/3= 4.932 AT**1/3= 2.289 ELSCAT < 5 deg
REDUCED MASS NUMBER= 10.91 AP+AT=AC=132.

INTERACTION RADIUS RINT=10.95 fm RO= 1.52 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 2.12 CT+CP= 7.66 C= 1.53

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 2.52

COULOMB RADII [fm]:
RCP= 5.51 RCT= 2.51 RC=RCP+RCT= 8.02

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 72.64 MeV K= .04981 n=2.851
VC(RINT)= 39.4 MeV

FISSION-TKE= 88. MeV
ASYMM. FISSION-TKE= 34. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.913 MeV/fm**2 PROX-FACTOR= 17.61 MeV
L-RLD= 95 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.70 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: 0.0
COMPOUND NUCLEUS: -87.9

FUSION RELATED PARAMETERS:
R-BARRIER= 9.90 fm V(RB)= 40.5 MeV
Q-VALUE= -4.0 MeV
L-CRITICAL= 51.

120 Sn on 12 C — 120 Sn on 12 C

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	11	0.28	5181	2.4	47.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	240	22	0.55	7329	3.4	39.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	360	33	0.83	8978	4.1	27.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	480	44	1.11	10370	4.8	23.6	16	406	220	111.2	5.5	34.4	372	108	375	76	8.00	426.	0	1.5	3
4.5	540	49	1.25	11001	5.1	22.3	25	800	538	84.4	5.6	47.8	459	81	457	50	5.27	479.	0	1.7	3
5.0	600	55	1.38	11597	5.3	21.1	31	1110	792	69.0	5.2	55.5	536	64	527	40	4.21	529.	5	16	1.8	4
5.5	660	60	1.52	12165	5.6	20.1	36	1362	1000	58.7	4.6	60.7	608	52	591	34	3.61	581.	6	18	1.8	4
6.0	720	65	1.66	12708	5.8	19.3	40	1570	1173	51.1	4.2	64.4	676	44	652	31	3.21	629.	6	20	1.9	5
6.5	780	71	1.80	13228	6.1	18.5	44	1746	1320	45.3	3.8	67.3	742	38	710	28	2.92	682.	7	22	2.0	5
7.0	840	76	1.94	13729	6.3	17.9	48	1896	1446	40.8	3.5	69.6	806	34	767	26	2.69	728.	7	24	2.1	6
7.5	900	82	2.08	14213	6.5	17.2	51	2026	1555	37.1	3.2	71.5	870	30	823	24	2.51	781.	8	25	2.2	6
8.0	960	87	2.21	14681	6.7	16.7	55	2139	1650	34.0	3.0	73.0	933	27	878	23	2.36	833.	9	27	2.2	6
8.5	1020	93	2.35	15135	7.0	16.2	58	2238	1734	31.4	2.7	74.3	995	25	933	21	2.24	878.	9	29	2.3	7
9.0	1080	98	2.49	15576	7.2	15.7	61	2327	1662	29.1	2.6	75.4	1057	23	987	20	2.13	929.	10	30	2.4	7
9.5	1140	104	2.63	16005	7.4	15.3	63	2406	1575	27.2	2.4	76.4	1119	21	1041	19	2.04	981.	10	32	2.5	7
10.0	1200	109	2.77	16423	7.5	14.9	66	2476	1496	25.5	2.3	77.2	1181	19	1094	19	1.96	1024.	11	33	2.5	8
10.5	1260	115	2.91	16831	7.7	14.6	69	2540	1425	24.0	2.1	78.0	1242	18	1148	18	1.89	1075.	11	35	2.6	8
11.0	1320	120	3.05	17229	7.9	14.2	71	2599	1360	22.7	2.0	78.7	1303	17	1201	17	1.82	1127.	12	36	2.7	8
11.5	1380	125	3.18	17619	8.1	13.9	73	2651	1301	21.5	1.9	79.2	1364	16	1254	17	1.76	1168.	12	37	2.7	9
12.0	1440	131	3.32	18000	8.3	13.6	76	2700	1247	20.4	1.8	79.8	1425	15	1306	16	1.71	1219.	13	39	2.8	9
13.0	1560	142	3.60	18740	8.6	13.1	80	2786	1151	18.6	1.7	80.7	1547	13	1412	15	1.62	1310.	14	42	2.9	10
14.0	1680	153	3.88	19453	8.9	12.6	84	2859	1068	17.1	1.5	81.5	1668	12	1516	15	1.54	1411.	15	44	3.0	10
15.0	1800	164	4.15	20141	9.2	12.2	88	2922	997	15.8	1.4	82.1	1789	11	1621	14	1.47	1499.	16	47	3.1	11
16.0	1920	175	4.43	20807	9.5	11.8	92	2977	935	14.6	1.3	82.7	1910	10	1725	13	1.41	1586.	17	49	3.2	12
17.0	2040	185	4.71	21453	9.8	11.5	96	3026	880	13.7	1.2	83.2	2030	10	1829	13	1.35	1685.	18	52	3.3	12
18.0	2160	196	4.98	22081	10.1	11.1	99	3069	831	12.8	1.2	83.6	2151	9	1932	12	1.31	1769.	19	54	3.4	13
19.0	2280	207	5.26	22692	10.4	10.8	102	3108	787	12.1	1.1	84.0	2272	8	2036	12	1.26	1867.	20	57	3.5	13
20.0	2400	218	5.54	23287	10.7	10.6	106	3142	748	11.4	1.0	84.3	2392	8	2139	12	1.22	1949.	21	59	3.6	14
25.0	3000	273	6.92	26071	11.9	9.4	121	3274	598	8.9	0.8	85.5	2994	6	2655	10	1.07	2395.	26	71	4.0	16
30.0	3600	327	8.30	28597	13.1	8.6	134	3360	498	7.4	0.7	86.3	3595	5	3168	9	0.96	2800.	31	82	4.4	19
35.0	4200	382	9.69	30929	14.1	8.0	146	3422	427	6.2	0.6	86.9	4196	4	3679	8	0.88	3209.	36	93	4.8	
40.0	4800	436	11.07	33108	15.1	7.5	158	3468	374	5.4	0.5	87.3	4796	4	4190	8	0.82	3601.	41	104	5.1	
45.0	5400	491	12.46	35162	16.0	7.0	168	3503	332	4.8	0.4	87.6	5397	3	4699	7	0.77	3977.	46	115	5.4	
50.0	6000	545	13.84	37113	16.9	6.7	178	3532	299	4.3	0.4	87.8	5997	3	5208	7	0.73	4336.	51	125	5.7	

#322 120 Sn on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 8. ZC= 58.(Ce)
NEUTRON NUMBERS: NP= 70. NT= 8. NC= 78.

AP**1/3= 4.932 AT**1/3= 2.520 ELSCAT < 7 deg
REDUCED MASS NUMBER= 14.12 AP+AT=AC=136.

INTERACTION RADIUS RINT=11.20 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 2.42 CT+CP= 7.96 C= 1.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 2.78

COULOMB RADII [fm]:
RCP= 5.51 RCT= 2.78 RC=RCP+RCT= 8.29

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 94.63 MeV K= .07578 n=2.746
VC(RINT)= 51.4 MeV

FISSION-TKE= 92. MeV
ASYMM. FISSION-TKE= 44. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.915 MeV/fm**2 PROX-FACTOR= 19.39 MeV
L-RLD= 93 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -4.7
COMPOUND NUCLEUS: -86.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.09 fm V(RB)= 53.1 MeV
Q-VALUE= -10.4 MeV
L-CRITICAL= 62.

120 Sn on 16 O — 120 Sn on 16 O

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	14	0.27	5181	3.1	63.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	240	28	0.55	7329	4.4	44.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	360	42	0.82	8978	5.3	36.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	480	56	1.10	10370	6.2	31.5	21	387	191	113.4	7.4	33.3	341	139	344	105	8.47	414.	0	1.6	3
4.5	540	64	1.24	11001	6.6	29.7	32	799	525	85.7	7.5	47.2	436	104	433	68	5.47	462.	0	1.8	4
5.0	600	71	1.37	11597	6.9	28.2	40	1124	792	69.9	6.8	55.0	518	82	506	54	4.35	514.	5	16	1.9	4
5.5	660	78	1.51	12165	7.2	26.9	47	1388	1011	59.3	6.1	60.3	593	67	572	46	3.72	561.	6	19	2.0	5
6.0	720	85	1.65	12708	7.6	25.7	53	1607	1193	51.7	5.5	64.2	663	57	632	41	3.30	607.	6	21	2.1	6
6.5	780	92	1.79	13228	7.9	24.7	58	1792	1347	45.8	5.0	67.1	731	49	690	37	3.00	657.	7	23	2.2	6
7.0	840	99	1.92	13729	8.2	23.8	63	1950	1479	41.2	4.6	69.4	797	43	747	34	2.76	708.	7	25	2.3	6
7.5	900	106	2.06	14213	8.5	23.0	68	2087	1594	37.4	4.2	71.3	862	38	801	32	2.58	753.	8	27	2.4	7
8.0	960	113	2.20	14681	8.7	22.3	72	2206	1619	34.3	3.9	72.9	925	35	855	30	2.43	803.	9	28	2.5	7
8.5	1020	120	2.34	15135	9.0	21.6	76	2312	1523	31.6	3.6	74.2	989	31	908	29	2.30	847.	9	30	2.5	8
9.0	1080	127	2.47	15576	9.3	21.0	80	2405	1439	29.4	3.4	75.3	1051	29	961	27	2.19	896.	10	32	2.6	8
9.5	1140	134	2.61	16005	9.5	20.4	84	2488	1363	27.4	3.1	76.3	1113	27	1013	26	2.09	939.	10	33	2.7	9
10.0	1200	141	2.75	16423	9.8	19.9	87	2563	1295	25.7	3.0	77.1	1175	25	1065	25	2.01	988.	11	35	2.8	9
10.5	1260	148	2.89	16831	10.0	19.4	91	2631	1233	24.2	2.8	77.9	1237	23	1116	24	1.93	1029.	11	36	2.8	10
11.0	1320	155	3.02	17229	10.2	19.0	94	2692	1177	22.9	2.6	78.6	1298	22	1167	23	1.87	1078.	12	38	2.9	10
11.5	1380	162	3.16	17619	10.5	18.6	97	2749	1126	21.7	2.5	79.2	1360	20	1218	22	1.81	1127.	12	39	3.0	10
12.0	1440	169	3.30	18000	10.7	18.2	100	2800	1079	20.6	2.4	79.7	1421	19	1269	22	1.75	1167.	13	41	3.1	11
13.0	1560	184	3.57	18740	11.1	17.5	106	2891	996	18.8	2.2	80.6	1543	17	1370	21	1.66	1254.	14	44	3.2	12
14.0	1680	198	3.85	19453	11.6	16.8	111	2968	925	17.2	2.0	81.4	1664	16	1470	20	1.57	1351.	15	46	3.3	12
15.0	1800	212	4.12	20141	12.0	16.3	117	3035	863	15.9	1.9	82.1	1786	14	1570	19	1.50	1436.	16	49	3.4	13
16.0	1920	226	4.40	20807	12.4	15.7	122	3094	809	14.8	1.7	82.6	1907	13	1670	18	1.44	1519.	17	52	3.6	14
17.0	2040	240	4.67	21453	12.7	15.3	126	3146	761	13.8	1.6	83.1	2028	12	1769	17	1.39	1600.	18	54	3.7	15
18.0	2160	254	4.95	22081	13.1	14.8	131	3192	719	12.9	1.5	83.5	2149	11	1868	17	1.34	1695.	19	57	3.8	15
19.0	2280	268	5.22	22692	13.5	14.4	136	3233	681	12.2	1.4	83.9	2269	11	1967	16	1.29	1774.	20	59	3.9	16
20.0	2400	282	5.50	23287	13.8	14.1	140	3269	647	11.5	1.3	84.3	2390	10	2066	16	1.25	1852.	21	62	4.0	17
25.0	3000	353	6.87	26071	15.4	12.6	160	3409	518	9.0	1.1	85.5	2992	8	2558	14	1.10	2256.	26	74	4.5	20
30.0	3600	424	8.25	28597	16.9	11.5	178	3501	431	7.4	0.9	86.3	3594	6	3046	12	0.99	2661.	31	86	4.9	22
35.0	4200	494	9.62	30929	18.3	10.6	194	3567	370	6.3	0.7	86.9	4195	5	3533	11	0.90	3023.	36	97	5.3	
40.0	4800	565	11.00	33108	19.5	10.0	209	3616	323	5.5	0.6	87.3	4795	5	4019	10	0.84	3392.	41	108	5.7	
45.0	5400	635	12.37	35162	20.7	9.4	222	3655	287	4.8	0.6	87.6	5396	4	4503	10	0.79	3746.	46	119	6.1	
50.0	6000	706	13.74	37113	21.8	8.9	235	3685	259	4.3	0.5	87.8	5996	4	4986	9	0.74	4085.	51	129	6.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	aps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#323 120 Sn on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 13. ZC= 63.(Eu)
NEUTRON NUMBERS: NP= 70. NT= 14. NC= 84.

AP**1/3= 4.932 AT**1/3= 3.000 ELSCAT <13 deg
REDUCED MASS NUMBER= 22.04 AP+AT=AC=147.

INTERACTION RADIUS RINT=11.73 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 3.05 CT+CP= 8.59 C= 1.97

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 3.35

COULOMB RADII [fm]:
RCP= 5.51 RCT= 3.32 RC=RCP+RCT= 8.83

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 146.45 MeV K= .13906 n=2.606
VC(RINT)= 79.7 MeV

FISSION-TKE= 103. MeV
ASYMM. FISSION-TKE= 67. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.917 MeV/fm**2 PROX-FACTOR= 22.66 MeV
L-RLD= 88 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -20.6
COMPOUND NUCLEUS: -77.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.54 fm V(RB)= 82.9 MeV
Q-VALUE= -34.9 MeV
L-CRITICAL= 85.

120 Sn on 27 Al — 120 Sn on 27 Al

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	120	22	0.28	5181	4.8	102.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	240	44	0.55	7329	6.8	72.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	360	66	0.83	8978	8.3	59.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	480	88	1.11	10370	9.6	51.2	35	433	208	111.6	12.8	34.2	283	197	286	165	8.61	381.	0	1.7	4
4.5	540	99	1.24	11001	10.2	48.2	53	876	572	84.6	12.4	47.7	393	147	385	109	5.66	426.	0	1.9	5
5.0	600	110	1.38	11597	10.8	45.8	66	1227	864	69.2	11.0	55.4	484	116	462	87	4.52	470.	5	18	2.0	6
5.5	660	121	1.52	12165	11.3	43.6	77	1514	1103	58.8	9.8	60.6	565	95	529	75	3.87	516.	5	20	2.2	6
6.0	720	132	1.66	12708	11.8	41.8	87	1752	1301	51.2	8.7	64.4	639	81	589	66	3.44	559.	6	23	2.3	7
6.5	780	143	1.80	13228	12.3	40.1	96	1953	1470	45.4	7.9	67.3	710	70	645	60	3.12	602.	7	25	2.4	8
7.0	840	154	1.94	13729	12.8	38.7	104	2125	1423	40.8	7.2	69.6	779	61	698	56	2.88	648.	7	27	2.5	8
7.5	900	165	2.07	14213	13.2	37.4	111	2274	1328	37.1	6.6	71.4	845	55	749	52	2.69	689.	8	29	2.7	9
8.0	960	176	2.21	14681	13.6	36.2	118	2405	1245	34.0	6.1	73.0	911	49	800	49	2.53	730.	9	31	2.8	10
8.5	1020	187	2.35	15135	14.1	35.1	125	2519	1172	31.4	5.6	74.3	975	45	849	46	2.40	776.	9	32	2.9	10
9.0	1080	198	2.49	15576	14.5	34.1	131	2621	1107	29.2	5.2	75.4	1039	41	897	44	2.29	815.	10	34	3.0	11
9.5	1140	209	2.63	16005	14.9	33.2	137	2712	1048	27.2	4.9	76.4	1102	38	944	42	2.19	854.	10	36	3.1	12
10.0	1200	220	2.77	16423	15.2	32.4	143	2794	996	25.5	4.6	77.2	1165	35	991	41	2.10	899.	11	38	3.2	12
10.5	1260	231	2.90	16831	15.6	31.6	148	2868	949	24.1	4.4	78.0	1227	33	1038	39	2.02	937.	11	39	3.3	13
11.0	1320	242	3.04	17229	16.0	30.9	154	2936	905	22.7	4.1	78.6	1289	31	1084	38	1.95	974.	12	41	3.4	14
11.5	1380	253	3.18	17619	16.3	30.2	159	2997	866	21.5	3.9	79.2	1351	29	1130	36	1.89	1019.	12	42	3.4	14
12.0	1440	264	3.32	18000	16.7	29.5	164	3053	830	20.5	3.7	79.8	1413	27	1176	35	1.83	1055.	13	44	3.5	15
13.0	1560	287	3.59	18740	17.4	28.4	173	3153	766	18.6	3.4	80.7	1536	24	1267	33	1.73	1134.	14	47	3.7	16
14.0	1680	309	3.87	19453	18.0	27.4	182	3238	711	17.1	3.1	81.5	1658	22	1357	32	1.65	1212.	15	50	3.9	17
15.0	1800	331	4.15	20141	18.7	26.4	191	3311	664	15.8	2.9	82.1	1780	20	1446	30	1.57	1289.	16	53	4.0	18
16.0	1920	353	4.42	20807	19.3	25.6	199	3376	622	14.7	2.7	82.7	1901	19	1535	29	1.51	1364.	17	56	4.2	19
17.0	2040	375	4.70	21453	19.9	24.8	207	3433	586	13.7	2.5	83.2	2023	17	1624	28	1.45	1438.	18	58	4.3	20
18.0	2160	397	4.98	22081	20.5	24.1	214	3483	553	12.8	2.3	83.6	2144	16	1712	27	1.40	1510.	19	61	4.4	21
19.0	2280	419	5.25	22692	21.0	23.5	222	3528	524	12.1	2.2	84.0	2265	15	1800	26	1.35	1582.	20	64	4.6	22
20.0	2400	441	5.53	23287	21.6	22.9	229	3569	498	11.4	2.1	84.3	2386	14	1887	25	1.31	1665.	21	67	4.7	22
25.0	3000	551	6.91	26071	24.1	20.5	261	3722	398	9.0	1.6	85.5	2989	11	2322	22	1.15	2015.	26	79	5.3	26
30.0	3600	661	8.30	28597	26.4	18.7	290	3825	332	7.4	1.4	86.3	3591	9	2753	20	1.03	2338.	31	92	5.8	30
35.0	4200	771	9.68	30929	28.5	17.3	317	3897	284	6.3	1.1	86.9	4193	7	3181	18	0.95	2657.	36	104	6.3	
40.0	4800	882	11.06	33108	30.5	16.2	341	3952	249	5.4	1.0	87.3	4794	6	3607	17	0.88	2957.	40	115	6.8	
45.0	5400	992	12.44	35162	32.3	15.3	364	3994	221	4.8	0.9	87.6	5394	6	4031	16	0.82	3237.	45	126	7.2	
50.0	6000	1102	13.83	37113	34.1	14.5	385	4028	199	4.3	0.8	87.8	5995	5	4454	15	0.78	3496.	50	137	7.6	

#324 120 Sn on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 20. ZC= 70.(Yb)
NEUTRON NUMBERS: NP= 70. NT= 20. NC= 90.

AP**1/3= 4.932 AT**1/3= 3.420 ELSCAT <19 deg
REDUCED MASS NUMBER= 30.00 AP+AT=AC=160.

INTERACTION RADIUS RINT=12.18 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 3.59 CT+CP= 9.13 C= 2.18

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 3.85

COULOMB RADII [fm]:
RCP= 5.51 RCT= 3.84 RC=RCP+RCT= 9.35

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 214.93 MeV K= .22080 n=2.516
VC(RINT)= 118.0 MeV

FISSION-TKE= 119. MeV
ASYMM. FISSION-TKE= 97. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.925 MeV/fm**2 PROX-FACTOR= 25.34 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -33.0
COMPOUND NUCLEUS: -58.0

FUSION RELATED PARAMETERS:
R-BARRIER=10.95 fm V(RB)= 123.6 MeV
Q-VALUE= -66.8 MeV
L-CRITICAL= 98.

120 Sn on 40 Ca — 120 Sn on 40 Ca

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	120	30	0.25	5181	6.6	157.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	240	60	0.51	7329	9.3	111.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	360	90	0.76	8978	11.4	90.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	480	120	1.02	10370	13.1	78.7	20	78	0	151.8	12.6	14.1	141	339	152	613	22.31	0.	4	14	1.6	4
4.5	540	135	1.14	11001	13.9	74.2	60	601	317	102.2	19.3	38.9	295	245	292	209	7.36	392.	4	14	1.8	5
5.0	600	150	1.27	11597	14.7	70.4	82	1014	662	81.1	17.4	49.5	410	190	390	153	5.35	433.	4	17	2.0	6
5.5	660	165	1.40	12165	15.4	67.1	100	1350	944	67.8	15.3	56.1	506	154	467	126	4.41	473.	5	20	2.2	7
6.0	720	180	1.53	12708	16.1	64.3	115	1630	1179	58.5	13.6	60.7	591	129	533	110	3.84	513.	6	23	2.4	8
6.5	780	195	1.65	13228	16.7	61.8	128	1866	1103	51.5	12.2	64.2	669	111	591	98	3.44	552.	6	25	2.5	9
7.0	840	210	1.78	13729	17.4	59.5	140	2069	1024	46.1	11.0	67.0	743	97	645	90	3.15	590.	7	27	2.7	10
7.5	900	225	1.91	14213	18.0	57.5	151	2244	956	41.7	10.1	69.1	814	86	696	83	2.92	628.	8	29	2.8	11
8.0	960	240	2.03	14681	18.6	55.7	161	2397	896	38.1	9.3	70.9	883	77	744	78	2.73	666.	8	32	2.9	12
8.5	1020	255	2.16	15135	19.1	54.0	171	2532	843	35.1	8.6	72.4	950	70	791	74	2.58	707.	9	33	3.1	12
9.0	1080	270	2.29	15576	19.7	52.5	180	2652	796	32.5	8.0	73.7	1016	64	836	70	2.45	744.	9	35	3.2	13
9.5	1140	285	2.41	16005	20.2	51.1	189	2759	754	30.3	7.4	74.8	1082	58	881	67	2.34	780.	10	37	3.3	14
10.0	1200	300	2.54	16423	20.7	49.8	197	2856	717	28.4	7.0	75.8	1146	54	924	64	2.24	821.	11	39	3.4	14
10.5	1260	315	2.67	16831	21.3	48.6	205	2943	683	26.7	6.6	76.7	1210	50	967	61	2.15	856.	11	41	3.5	15
11.0	1320	330	2.80	17229	21.8	47.5	212	3022	652	25.2	6.2	77.4	1273	47	1010	59	2.07	890.	12	42	3.6	16
11.5	1380	345	2.92	17619	22.3	46.4	220	3094	623	23.9	5.9	78.1	1336	44	1052	57	2.00	924.	12	44	3.7	17
12.0	1440	360	3.05	18000	22.7	45.5	227	3161	597	22.6	5.6	78.7	1398	42	1093	55	1.94	965.	13	46	3.8	17
13.0	1560	390	3.30	18740	23.7	43.7	241	3278	551	20.6	5.1	79.7	1523	37	1175	52	1.83	1030.	14	49	4.0	19
14.0	1680	420	3.56	19453	24.6	42.1	254	3378	512	18.8	4.7	80.6	1646	34	1256	50	1.74	1102.	15	52	4.2	20
15.0	1800	450	3.81	20141	25.4	40.7	266	3465	478	17.4	4.3	81.3	1769	31	1336	47	1.66	1172.	16	55	4.4	21
16.0	1920	480	4.07	20807	26.2	39.4	278	3541	448	16.1	4.0	81.9	1892	28	1415	45	1.59	1241.	17	58	4.5	22
17.0	2040	510	4.32	21453	27.1	38.2	289	3608	421	15.1	3.7	82.5	2014	26	1494	44	1.52	1300.	18	61	4.7	24
18.0	2160	540	4.58	22081	27.8	37.1	300	3668	398	14.1	3.5	82.9	2136	24	1572	42	1.47	1366.	19	64	4.9	25
19.0	2280	570	4.83	22692	28.6	36.1	310	3721	377	13.3	3.3	83.4	2257	23	1650	41	1.42	1431.	20	66	5.0	26
20.0	2400	600	5.08	23287	29.3	35.2	320	3769	358	12.5	3.1	83.7	2379	21	1728	39	1.37	1495.	21	69	5.2	27
25.0	3000	750	6.35	26071	32.8	31.5	367	3951	286	9.8	2.4	85.1	2984	16	2110	34	1.20	1799.	25	82	5.8	32
30.0	3600	900	7.63	28597	35.9	28.7	408	4071	239	8.1	2.0	86.0	3587	13	2488	31	1.08	2091.	30	95	6.5	36
35.0	4200	1050	8.90	30929	38.8	26.6	446	4158	204	6.8	1.7	86.6	4189	11	2862	28	0.99	2361.	35	107	7.0	
40.0	4800	1200	10.17	33108	41.5	24.9	480	4222	179	5.9	1.5	87.0	4790	10	3233	26	0.92	2631.	39	119	7.5	
45.0	5400	1350	11.44	35162	44.0	23.5	512	4272	159	5.2	1.3	87.4	5392	8	3602	25	0.86	2859.	44	130	8.0	
50.0	6000	1500	12.71	37113	46.4	22.3	543	4312	143	4.7	1.2	87.6	5992	8	3970	23	0.81	3092.	49	141	8.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#325 120 Sn on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 26. ZC= 76.(Os)
NEUTRON NUMBERS: NP= 70. NT= 30. NC=100.

AP**1/3= 4.932 AT**1/3= 3.826 ELSCAT <27 deg
REDUCED MASS NUMBER= 38.18 AP+AT=AC=176.

INTERACTION RADIUS RINT=12.63 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 4.12 CT+CP= 9.66 C= 2.36

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 4.35

COULOMB RADII [fm]:
RCP= 5.51 RCT= 4.27 RC=RCP+RCT= 9.78

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 268.27 MeV K= .27110 n=2.478
VC(RINT)= 148.1 MeV

FISSION-TKE= 133. MeV
ASYMM. FISSION-TKE= 119. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.920 MeV/fm**2 PROX-FACTOR= 27.31 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.30 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -61.4
COMPOUND NUCLEUS: -41.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.35 fm V(RB)= 154.9 MeV
Q-VALUE= -111.6 MeV
L-CRITICAL= 114.

120 Sn on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	38	0.26	5181	8.4	204.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	76	0.52	7329	11.8	144.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	115	0.77	8978	14.5	118.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	153	1.03	10370	16.7	102.3	36	155	0	141.1	24.7	19.4	110	370	118	585	16.67	0.	3	12	1.4	3
4.5	540	172	1.16	11001	17.7	96.5	83	704	398	98.7	26.4	40.6	270	270	259	259	7.27	358.	3	12	1.7	5
5.0	600	191	1.29	11597	18.7	91.5	111	1139	763	78.8	22.8	50.6	390	210	357	193	5.40	395.	4	17	1.9	6
5.5	660	210	1.42	12165	19.6	87.3	134	1495	1061	66.1	19.7	56.9	490	170	432	161	4.49	432.	5	21	2.1	7
6.0	720	229	1.55	12708	20.5	83.6	153	1790	993	57.2	17.4	61.4	577	143	495	141	3.92	466.	6	23	2.3	9
6.5	780	248	1.68	13228	21.3	80.3	171	2040	917	50.4	15.5	64.8	657	123	550	126	3.53	501.	6	26	2.5	10
7.0	840	267	1.81	13729	22.1	77.4	186	2254	851	45.1	14.0	67.4	733	107	600	116	3.23	537.	7	28	2.7	11
7.5	900	286	1.93	14213	22.9	74.7	201	2440	794	40.9	12.7	69.6	805	95	647	108	3.00	571.	8	30	2.8	12
8.0	960	305	2.06	14681	23.6	72.4	214	2602	745	37.4	11.7	71.3	874	86	691	101	2.81	606.	8	33	3.0	13
8.5	1020	325	2.19	15135	24.3	70.2	227	2745	701	34.4	10.8	72.8	942	78	734	95	2.66	640.	9	35	3.1	14
9.0	1080	344	2.32	15576	25.1	68.2	239	2872	662	31.9	10.0	74.0	1009	71	774	90	2.52	669.	9	36	3.2	16
9.5	1140	363	2.45	16005	25.7	66.4	250	2965	627	29.8	9.4	75.1	1075	65	814	86	2.41	702.	10	38	3.4	17
10.0	1200	382	2.58	16423	26.4	64.7	261	3087	596	27.9	8.8	76.1	1140	60	853	83	2.31	734.	10	40	3.5	18
10.5	1260	401	2.71	16831	27.1	63.2	271	3180	567	26.2	8.3	76.9	1204	56	891	80	2.22	771.	11	42	3.6	18
11.0	1320	420	2.84	17229	27.7	61.7	281	3264	541	24.7	7.8	77.6	1267	53	929	77	2.14	802.	11	44	3.7	19
11.5	1380	439	2.97	17619	28.3	60.4	291	3340	518	23.4	7.4	78.3	1331	49	966	74	2.07	833.	12	45	3.9	20
12.0	1440	458	3.09	18000	28.9	59.1	300	3410	496	22.3	7.0	78.9	1393	47	1003	72	2.00	864.	12	47	4.0	21
13.0	1560	496	3.35	18740	30.1	56.8	318	3535	458	20.2	6.4	79.9	1518	42	1075	68	1.89	930.	13	50	4.2	22
14.0	1680	535	3.61	19453	31.2	54.7	335	3641	425	18.5	5.9	80.7	1642	38	1146	64	1.79	989.	14	53	4.4	24
15.0	1800	573	3.87	20141	32.3	52.9	352	3733	397	17.1	5.4	81.5	1765	35	1216	61	1.71	1052.	15	56	4.6	25
16.0	1920	611	4.13	20807	33.4	51.2	367	3814	372	15.9	5.0	82.1	1888	32	1285	59	1.64	1108.	16	59	4.8	27
17.0	2040	649	4.38	21453	34.4	49.6	382	3885	350	14.8	4.7	82.6	2011	29	1353	57	1.58	1169.	17	62	4.9	28
18.0	2160	687	4.64	22081	35.4	48.2	396	3948	331	13.9	4.4	83.1	2133	27	1421	54	1.52	1221.	18	65	5.1	30
19.0	2280	725	4.90	22692	36.4	47.0	410	4004	313	13.1	4.1	83.5	2254	26	1489	53	1.47	1280.	19	68	5.3	31
20.0	2400	764	5.16	23287	37.3	45.8	423	4055	298	12.3	3.9	83.8	2376	24	1556	51	1.42	1338.	20	71	5.4	32
25.0	3000	955	6.45	26071	41.8	40.9	485	4248	238	9.7	3.1	85.2	2982	18	1886	45	1.24	1603.	25	84	6.2	38
30.0	3600	1145	7.74	28597	45.7	37.4	539	4376	198	7.9	2.5	86.0	3585	15	2211	40	1.12	1854.	29	97	6.9	43
35.0	4200	1336	9.03	30929	49.4	34.6	588	4468	170	6.7	2.1	86.6	4187	13	2531	37	1.02	2081.	34	109	7.5	
40.0	4800	1527	10.32	33108	52.8	32.4	634	4536	149	5.8	1.9	87.1	4789	11	2849	34	0.95	2304.	38	120	8.0	
45.0	5400	1718	11.60	35162	56.0	30.5	676	4590	132	5.2	1.6	87.4	5390	10	3163	32	0.89	2509.	43	132	8.5	
50.0	6000	1909	12.89	37113	59.1	28.9	716	4632	119	4.6	1.5	87.7	5992	8	3476	30	0.84	2695.	47	143	9.0	

#326 120 Sn on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 29. ZC= 79.(Au)
NEUTRON NUMBERS: NP= 70. NT= 34. NC=104.

AP**1/3= 4.932 AT**1/3= 3.979 ELSCAT <31 deg
REDUCED MASS NUMBER= 41.31 AP+AT=AC=183.

INTERACTION RADIUS RINT=12.79 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 4.31 CT+CP= 9.85 C= 2.43

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 4.53

COULOMB RADII [fm]:
RCP= 5.51 RCT= 4.45 RC=RCP+RCT= 9.96

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 294.37 MeV K= .29359 n=2.466
VC(RINT)= 163.0 MeV

FISSION-TKE= 140. MeV
ASYMM. FISSION-TKE= 130. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.920 MeV/fm**2 PROX-FACTOR= 28.04 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.92 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -65.2
COMPOUND NUCLEUS: -30.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.49 fm V(RB)= 170.6 MeV
Q-VALUE= -127.1 MeV
L-CRITICAL= 117.

120 Sn on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	41	0.25	5181	9.0	228.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	83	0.51	7329	12.8	161.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	124	0.76	8978	15.7	131.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	165	1.01	10370	18.1	114.2	26	69	0	154.6	23.2	12.7	68	412	77	978	26.00	0.	3	14	1.3	3
4.5	540	186	1.14	11001	19.2	107.6	86	643	342	103.0	30.1	38.5	242	299	231	307	7.80	344.	3	14	1.6	5
5.0	600	207	1.27	11597	20.2	102.1	118	1097	723	81.5	25.7	49.2	369	231	334	222	5.65	390.	4	17	1.9	6
5.5	660	227	1.39	12165	21.2	97.4	144	1469	966	68.2	22.2	55.9	473	187	412	183	4.65	414.	5	21	2.1	8
6.0	720	248	1.52	12708	22.1	93.2	165	1777	886	58.8	19.4	60.6	563	157	476	159	4.04	449.	5	23	2.3	9
6.5	780	269	1.65	13228	23.0	89.6	185	2038	818	51.8	17.3	64.1	646	134	532	143	3.62	483.	6	26	2.5	10
7.0	840	289	1.77	13729	23.9	86.3	202	2262	759	46.3	15.6	66.9	723	117	582	131	3.31	514.	7	28	2.7	12
7.5	900	310	1.90	14213	24.7	83.4	218	2456	708	41.9	14.1	69.1	796	104	628	121	3.07	548.	7	31	2.8	13
8.0	960	330	2.03	14681	25.6	80.7	233	2625	664	38.3	13.0	70.9	867	93	671	113	2.87	581.	8	33	3.0	14
8.5	1020	351	2.15	15135	26.3	78.3	247	2774	625	35.2	12.0	72.4	936	84	712	107	2.71	614.	9	35	3.1	15
9.0	1080	372	2.28	15576	27.1	76.1	260	2907	590	32.7	11.1	73.7	1003	77	752	102	2.57	646.	9	37	3.3	16
9.5	1140	392	2.41	16005	27.8	74.1	272	3025	559	30.4	10.4	74.8	1069	71	790	97	2.46	678.	10	38	3.4	17
10.0	1200	413	2.53	16423	28.6	72.2	284	3132	531	28.5	9.7	75.8	1134	66	828	93	2.35	709.	10	40	3.5	18
10.5	1260	434	2.66	16831	29.3	70.5	296	3229	506	26.8	9.2	76.6	1199	61	865	89	2.26	740.	11	42	3.7	19
11.0	1320	454	2.79	17229	30.0	68.8	307	3316	483	25.3	8.6	77.4	1263	57	901	86	2.18	771.	11	44	3.8	20
11.5	1380	475	2.91	17619	30.6	67.3	318	3396	462	23.9	8.2	78.0	1326	54	936	83	2.11	801.	12	45	3.9	21
12.0	1440	496	3.04	18000	31.3	65.9	328	3470	443	22.7	7.8	78.6	1390	50	971	80	2.04	830.	12	47	4.0	22
13.0	1560	537	3.29	18740	32.6	63.3	348	3599	409	20.6	7.1	79.7	1515	45	1040	76	1.92	888.	13	50	4.2	24
14.0	1680	578	3.55	19453	33.8	61.0	366	3711	379	18.9	6.5	80.5	1639	41	1107	72	1.82	945.	14	53	4.4	26
15.0	1800	620	3.80	20141	35.0	59.0	384	3807	354	17.4	6.0	81.3	1763	37	1174	69	1.74	1006.	15	56	4.6	27
16.0	1920	661	4.06	20807	36.1	57.1	401	3891	332	16.2	5.6	81.9	1886	34	1240	66	1.67	1059.	16	59	4.8	29
17.0	2040	702	4.31	21453	37.3	55.4	418	3965	312	15.1	5.2	82.4	2008	32	1305	63	1.60	1118.	17	62	5.0	30
18.0	2160	744	4.56	22081	38.3	53.8	433	4031	295	14.2	4.9	82.9	2130	30	1369	61	1.54	1176.	18	65	5.2	31
19.0	2280	785	4.82	22692	39.4	52.4	448	4090	279	13.3	4.6	83.3	2252	28	1433	59	1.49	1225.	19	68	5.4	33
20.0	2400	826	5.07	23287	40.4	51.1	463	4144	265	12.6	4.3	83.7	2374	26	1496	57	1.44	1281.	20	71	5.5	34
25.0	3000	1033	6.34	26071	45.2	45.7	530	4345	212	9.8	3.4	85.1	2980	20	1808	50	1.26	1536.	25	84	6.3	40
30.0	3600	1239	7.60	28597	49.5	41.7	590	4479	177	8.1	2.8	86.0	3584	16	2114	45	1.13	1766.	29	97	7.0	46
35.0	4200	1446	8.87	30929	53.5	38.6	644	4575	151	6.9	2.4	86.6	4186	14	2415	41	1.04	1985.	34	109	7.6	
40.0	4800	1652	10.14	33108	57.1	36.1	694	4647	132	6.0	2.0	87.0	4788	12	2713	38	0.96	2200.	38	121	8.2	
45.0	5400	1859	11.41	35162	60.6	34.0	741	4703	118	5.3	1.8	87.4	5390	10	3009	36	0.90	2379.	42	132	8.7	
50.0	6000	2066	12.67	37113	63.9	32.3	784	4747	106	4.7	1.6	87.6	5991	9	3302	34	0.85	2578.	47	143	9.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#327 120 Sn on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 42. ZC= 92.(U)
NEUTRON NUMBERS: NP= 70. NT= 50. NC=120.

AP**1/3= 4.932 AT**1/3= 4.514 ELSCAT <50 deg
REDUCED MASS NUMBER= 52.08 AP+AT=AC=212.

INTERACTION RADIUS RINT=13.37 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 5.00 CT+CP=10.54 C= 2.63

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 5.20

COULOMB RADII [fm]:
RCP= 5.51 RCT= 5.08 RC=RCP+RCT=10.59

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 402.01 MeV K= .36618 n=2.443
VC(RINT)= 225.8 MeV

FISSION-TKE= 174. MeV
ASYMM. FISSION-TKE= 173. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.922 MeV/fm**2 PROX-FACTOR= 30.46 MeV
L-RLD= 63 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -87.5
COMPOUND NUCLEUS: 27.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.99 fm V(RB)= 236.6 MeV
Q-VALUE= -206.8 MeV
L-CRITICAL= 105.

120 Sn on 92 Mo — 120 Sn on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	52	0.23	5181	11.4	330.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	240	104	0.46	7329	16.1	233.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	360	156	0.69	8978	19.7	190.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	480	208	0.92	10370	22.8	165.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	540	234	1.04	11001	24.2	155.9	61	204	0	137.5	50.0	21.2	79	461	80	817	15.20	0.	0	1.0	2
5.0	600	260	1.15	11597	25.5	147.9	124	752	411	100.2	41.1	39.9	253	347	225	406	7.45	333.	3	15	1.4	4
5.5	660	286	1.27	12165	26.7	141.0	164	1198	498	81.4	34.2	49.3	384	276	324	307	5.62	363.	4	19	1.7	6
6.0	720	312	1.38	12708	27.9	135.0	196	1569	456	69.1	29.3	55.5	493	227	400	256	4.70	392.	5	22	2.0	8
6.5	780	338	1.50	13228	29.0	129.7	224	1882	421	60.2	25.7	59.9	567	193	461	225	4.12	420.	6	25	2.2	10
7.0	840	365	1.61	13729	30.1	125.0	248	2151	391	53.4	22.9	63.3	673	167	514	203	3.71	451.	6	27	2.4	11
7.5	900	391	1.73	14213	31.2	120.7	271	2384	365	48.1	20.7	66.0	753	147	560	186	3.40	478.	7	30	2.6	13
8.0	960	417	1.84	14681	32.2	116.9	291	2587	342	43.7	18.8	68.1	829	131	602	173	3.16	507.	8	32	2.8	14
8.5	1020	443	1.96	15135	33.2	113.4	311	2766	322	40.1	17.3	69.9	902	118	641	162	2.97	533.	8	34	3.0	16
9.0	1080	469	2.08	15576	34.2	110.2	329	2926	304	37.1	16.0	71.5	973	107	678	153	2.80	562.	9	36	3.1	17
9.5	1140	495	2.19	16005	35.1	107.3	346	3069	288	34.5	14.9	72.8	1042	98	713	146	2.66	590.	9	38	3.3	18
10.0	1200	521	2.31	16423	36.0	104.6	362	3197	273	32.2	13.9	73.9	1109	91	747	139	2.54	615.	10	40	3.4	20
10.5	1260	547	2.42	16831	36.9	102.0	378	3313	260	30.2	13.1	74.9	1176	84	780	133	2.44	642.	10	42	3.6	21
11.0	1320	573	2.54	17229	37.8	99.7	393	3418	249	28.5	12.3	75.8	1242	78	811	128	2.34	669.	11	43	3.7	22
11.5	1380	599	2.65	17619	38.6	97.5	408	3515	238	26.9	11.6	76.5	1307	73	842	124	2.26	694.	11	45	3.8	23
12.0	1440	625	2.77	18000	39.5	95.5	422	3603	228	25.5	11.0	77.2	1371	69	872	119	2.19	722.	12	47	4.0	24
13.0	1560	677	3.00	18740	41.1	91.7	448	3759	210	23.1	10.0	78.4	1498	62	931	112	2.06	770.	13	50	4.2	27
14.0	1680	729	3.23	19453	42.6	88.4	473	3893	195	21.1	9.2	79.4	1624	56	998	106	1.95	820.	14	53	4.4	29
15.0	1800	781	3.46	20141	44.1	85.4	497	4008	182	19.5	8.4	80.3	1749	51	1044	101	1.85	869.	15	56	4.7	31
16.0	1920	833	3.69	20807	45.6	82.7	520	4110	171	18.1	7.8	81.0	1874	46	1099	97	1.77	917.	16	59	4.9	33
17.0	2040	885	3.92	21453	47.0	80.2	542	4199	161	16.8	7.3	81.6	1997	43	1153	93	1.70	963.	17	62	5.1	35
18.0	2160	937	4.15	22081	48.3	77.9	563	4279	152	15.8	6.8	82.1	2120	40	1206	89	1.64	1014.	18	65	5.3	36
19.0	2280	989	4.38	22692	49.6	75.9	583	4350	144	14.8	6.4	82.6	2243	37	1258	86	1.58	1059.	18	68	5.4	38
20.0	2400	1042	4.61	23287	50.9	73.9	603	4414	136	14.0	6.1	83.0	2365	35	1310	84	1.53	1101.	19	71	5.6	40
25.0	3000	1302	5.77	26071	56.9	66.1	692	4656	109	10.9	4.7	84.5	2973	27	1564	73	1.33	1321.	24	84	6.4	47
30.0	3600	1562	6.92	28597	62.4	60.4	772	4818	91	8.9	3.9	85.5	3578	22	1810	65	1.19	1518.	28	96	7.2	54
35.0	4200	1823	8.07	30929	67.4	55.9	843	4933	78	7.6	3.3	86.2	4182	18	2051	60	1.09	1703.	32	108	7.8	
40.0	4800	2083	9.22	33108	72.0	52.3	910	5020	69	6.6	2.9	86.7	4784	16	2288	55	1.01	1870.	37	120	8.4	
45.0	5400	2343	10.38	35162	76.4	49.3	971	5087	60	5.8	2.5	87.1	5386	14	2522	52	0.95	2032.	41	131	9.0	
50.0	6000	2604	11.53	37113	80.5	46.8	1029	5141	54	5.2	2.3	87.4	5988	12	2754	49	0.89	2193.	45	142	9.5	

#328 120 Sn on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 47. ZC= 97.(Bk)
NEUTRON NUMBERS: NP= 70. NT= 61. NC=131.

AP**1/3= 4.932 AT**1/3= 4.762 ELSCAT <64 deg
REDUCED MASS NUMBER= 56.84 AP+AT=AC=228.

INTERACTION RADIUS RINT=13.64 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 5.32 CT+CP=10.86 C= 2.71

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 5.50

COULOMB RADII [fm]:
RCP= 5.51 RCT= 5.34 RC=RCP+RCT=10.85

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 439.28 MeV K= .38090 n=2.439
VC(RINT)= 247.7 MeV

FISSION-TKE= 187. MeV
ASYMM. FISSION-TKE= 187. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.914 MeV/fm**2 PROX-FACTOR= 31.18 MeV
L-RLD= 58 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.64 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -87.6
COMPOUND NUCLEUS: 54.6

FUSION RELATED PARAMETERS:
R-BARRIER=12.22 fm V(RB)= 259.0 MeV
Q-VALUE= -234.0 MeV
L-CRITICAL= 102.

120 Sn on 108 Ag — 120 Sn on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	57	0.23	5181	12.4	370.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	240	114	0.46	7329	17.6	261.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	360	171	0.69	8978	21.5	213.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	480	227	0.92	10370	24.9	185.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	540	256	1.03	11001	26.4	174.4	63	183	0	140.5	61.9	19.8	63	477	61	982	16.69	0.	0	0.9	2
5.0	600	284	1.15	11597	27.8	165.5	135	755	416	101.5	47.0	39.3	241	359	207	462	7.73	309.	3	15	1.3	5
5.5	660	313	1.26	12165	29.2	157.8	181	1222	392	82.2	38.5	48.9	375	285	306	346	5.79	336.	4	19	1.7	7
6.0	720	341	1.38	12708	30.5	151.1	217	1609	359	69.7	32.7	55.2	486	234	380	289	4.82	364.	5	22	1.9	9
6.5	780	369	1.49	13228	31.7	145.1	248	1937	332	60.7	28.6	59.7	581	199	440	253	4.22	392.	6	25	2.2	10
7.0	840	398	1.61	13729	32.9	139.9	275	2218	308	53.8	25.4	63.1	668	172	491	228	3.80	419.	6	27	2.4	12
7.5	900	426	1.72	14213	34.0	135.1	300	2461	287	48.4	22.9	65.8	749	151	535	209	3.48	444.	7	30	2.6	14
8.0	960	455	1.84	14681	35.2	130.8	323	2674	269	44.0	20.8	68.0	825	135	575	194	3.23	470.	8	32	2.8	16
8.5	1020	483	1.95	15135	36.2	126.9	345	2862	254	40.4	19.1	69.8	899	121	612	182	3.03	497.	8	34	3.0	17
9.0	1080	512	2.07	15576	37.3	123.3	365	3029	239	37.3	17.6	71.3	970	110	647	172	2.86	521.	9	36	3.1	19
9.5	1140	540	2.18	16005	38.3	120.1	384	3178	227	34.7	16.4	72.7	1039	101	679	163	2.72	544.	9	38	3.3	21
10.0	1200	568	2.29	16423	39.3	117.0	403	3312	215	32.4	15.3	73.8	1107	93	711	156	2.60	570.	10	40	3.4	22
10.5	1260	597	2.41	16831	40.3	114.2	420	3433	205	30.4	14.4	74.8	1174	86	741	149	2.49	596.	10	42	3.6	23
11.0	1320	625	2.52	17229	41.2	111.6	437	3544	196	28.6	13.6	75.7	1239	81	770	144	2.39	618.	11	43	3.7	25
11.5	1380	654	2.64	17619	42.2	109.1	453	3644	187	27.1	12.8	76.5	1305	75	798	138	2.31	643.	11	45	3.8	26
12.0	1440	682	2.75	18000	43.1	106.8	469	3737	179	25.7	12.2	77.2	1369	71	826	134	2.23	668.	12	47	4.0	27
13.0	1560	739	2.98	18740	44.8	102.6	498	3900	166	23.3	11.0	78.4	1497	63	880	126	2.10	713.	13	50	4.2	30
14.0	1680	796	3.21	19453	46.5	98.9	526	4040	154	21.3	10.1	79.4	1623	57	932	119	1.99	760.	14	53	4.4	32
15.0	1800	853	3.44	20141	48.2	95.5	553	4161	143	19.6	9.3	80.2	1748	52	983	113	1.89	806.	15	56	4.7	34
16.0	1920	909	3.67	20807	49.7	92.5	579	4267	134	18.2	8.6	80.9	1872	48	1033	108	1.81	846.	15	59	4.9	37
17.0	2040	966	3.90	21453	51.3	89.7	603	4360	127	16.9	8.0	81.5	1996	44	1082	104	1.74	889.	16	62	5.1	39
18.0	2160	1023	4.13	22081	52.7	87.2	626	4443	119	15.9	7.5	82.1	2119	41	1130	100	1.67	932.	17	65	5.3	41
19.0	2280	1080	4.36	22692	54.2	84.9	649	4518	113	14.9	7.1	82.5	2242	38	1177	97	1.61	978.	18	68	5.4	42
20.0	2400	1137	4.59	23287	55.6	82.7	671	4585	107	14.1	6.7	83.0	2364	36	1224	94	1.56	1019.	19	70	5.6	44
25.0	3000	1421	5.74	26071	62.2	74.0	770	4839	86	11.0	5.2	84.5	2973	27	1452	81	1.36	1211.	23	83	6.5	53
30.0	3600	1705	6.88	28597	68.1	67.6	859	5008	71	9.0	4.3	85.5	3578	22	1673	73	1.22	1395.	28	96	7.2	60
35.0	4200	1989	8.03	30929	73.6	62.5	939	5129	61	7.6	3.6	86.2	4181	19	1888	67	1.11	1570.	32	108	7.8	
40.0	4800	2274	9.18	33108	78.6	58.5	1012	5219	53	6.6	3.1	86.7	4784	16	2100	62	1.03	1727.	36	119	8.5	
45.0	5400	2558	10.33	35162	83.4	55.2	1081	5289	47	5.8	2.8	87.1	5386	14	2309	58	0.97	1869.	40	130	9.0	
50.0	6000	2842	11.47	37113	87.9	52.3	1146	5346	43	5.2	2.5	87.4	5988	12	2515	55	0.91	2007.	44	141	9.6	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#329 120 Sn on 140 Ce

120 Sn on 140 Ce

120 Sn on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 58. ZC=108.( )
NEUTRON NUMBERS: NP= 70. NT= 82. NC=152.

AP**1/3= 4.932 AT**1/3= 5.192
REDUCED MASS NUMBER= 64.62 AP+AT=AC=260.

INTERACTION RADIUS RINT=14.11 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 5.87 CT+CP=11.42 C= 2.85

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.04

COULOMB RADII [fm]:
RCP= 5.51 RCT= 5.82 RC=RCP+RCT=11.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 519.13 MeV K= .40381 n=2.441
VC(RINT)= 295.6 MeV

FISSION-TKE= 218. MeV
ASYMM. FISSION-TKE= 217. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.903 MeV/fm**2 PROX-FACTOR= 32.36 MeV
L-RLD= 37 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -88.2
COMPOUND NUCLEUS: 119.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.61 fm V(RB)= 308.1 MeV
Q-VALUE= -299.4 MeV
L-CRITICAL= 58.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	65	0.22	5181	14.1	456.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	129	0.44	7329	20.0	322.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	194	0.66	8978	24.5	263.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	258	0.87	10370	28.3	228.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	540	291	0.98	11001	30.0	215.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	600	323	1.09	11597	31.6	204.2	129	533	108	115.4	64.6	32.3	174	426	140	700	9.85	275.	2	13	0.9	2
5.5	660	355	1.20	12165	33.1	194.7	191	1056	98	91.0	50.0	44.5	326	334	253	475	6.65	299.	3	18	1.3	5
6.0	720	388	1.31	12708	34.6	186.4	238	1492	90	76.2	41.6	51.9	447	273	334	382	5.35	322.	4	21	1.6	8
6.5	780	420	1.42	13228	36.0	179.1	276	1860	83	65.9	35.8	57.0	551	229	396	329	4.60	346.	5	24	1.9	10
7.0	840	452	1.53	13729	37.4	172.6	310	2175	77	58.2	31.5	60.9	643	197	448	293	4.10	370.	6	27	2.2	12
7.5	900	485	1.64	14213	38.7	166.7	341	2448	72	52.2	28.2	63.9	727	173	492	267	3.73	391.	7	29	2.4	15
8.0	960	517	1.75	14681	40.0	161.4	369	2687	67	47.3	25.6	66.4	806	154	531	247	3.45	414.	7	31	2.6	17
8.5	1020	549	1.86	15135	41.2	156.6	395	2898	63	43.3	23.4	68.4	882	138	566	230	3.22	436.	8	33	2.8	19
9.0	1080	582	1.97	15576	42.4	152.2	419	3085	60	39.9	21.6	70.0	955	125	598	217	3.03	458.	8	35	2.9	21
9.5	1140	614	2.08	16005	43.6	148.2	442	3253	57	37.0	20.0	71.5	1026	114	628	206	2.88	481.	9	37	3.1	22
10.0	1200	646	2.19	16423	44.7	144.4	464	3403	54	34.6	18.7	72.7	1095	105	657	196	2.74	502.	9	39	3.3	24
10.5	1260	678	2.30	16831	45.8	140.9	485	3540	51	32.4	17.5	73.8	1163	97	684	188	2.62	523.	10	41	3.4	26
11.0	1320	711	2.40	17229	46.9	137.7	505	3664	49	30.5	16.4	74.8	1229	91	710	180	2.52	543.	10	43	3.6	28
11.5	1380	743	2.51	17619	47.9	134.7	524	3777	47	28.8	15.5	75.6	1295	85	735	174	2.43	566.	11	44	3.7	29
12.0	1440	775	2.62	18000	49.0	131.8	543	3880	45	27.3	14.7	76.4	1360	80	760	168	2.34	585.	11	46	3.8	31
13.0	1560	840	2.84	18740	51.0	126.6	579	4064	41	24.7	13.3	77.7	1489	71	807	157	2.20	625.	12	49	4.1	34
14.0	1680	905	3.06	19453	52.9	122.0	612	4221	38	22.6	12.2	78.7	1616	64	852	149	2.08	668.	13	52	4.3	36
15.0	1800	969	3.28	20141	54.7	117.9	644	4357	36	20.8	11.2	79.6	1742	58	896	141	1.98	706.	14	55	4.5	39
16.0	1920	1034	3.50	20807	56.5	114.2	674	4476	33	19.2	10.4	80.4	1867	53	938	135	1.89	743.	15	58	4.8	42
17.0	2040	1098	3.72	21453	58.3	110.8	703	4581	31	17.9	9.7	81.0	1991	49	980	130	1.81	782.	16	61	5.0	44
18.0	2160	1163	3.93	22081	60.0	107.6	730	4674	30	16.8	9.0	81.6	2114	46	1021	125	1.74	816.	17	64	5.2	47
19.0	2280	1228	4.15	22692	61.6	104.8	757	4758	28	15.8	8.5	82.1	2237	43	1061	120	1.68	853.	18	66	5.3	49
20.0	2400	1292	4.37	23287	63.2	102.1	783	4833	27	14.9	8.0	82.6	2360	40	1100	116	1.62	890.	18	69	5.5	51
25.0	3000	1615	5.46	26071	70.7	91.3	901	5119	21	11.6	6.2	84.2	2970	30	1291	101	1.41	1059.	23	82	6.4	61
30.0	3600	1938	6.56	28597	77.4	83.4	1005	5309	18	9.5	5.1	85.3	3576	24	1474	91	1.27	1220.	27	94	7.1	69
35.0	4200	2262	7.65	30929	83.6	77.2	1100	5444	15	8.0	4.3	86.0	4180	20	1651	83	1.16	1364.	31	106	7.8	
40.0	4800	2585	8.74	33108	89.4	72.2	1187	5546	13	7.0	3.8	86.5	4782	18	1825	77	1.07	1499.	35	117	8.4	
45.0	5400	2908	9.84	35162	94.8	68.1	1268	5625	12	6.1	3.3	86.9	5385	15	1996	72	1.00	1629.	39	127	9.0	
50.0	6000	3231	10.93	37113	99.9	64.6	1344	5688	10	5.5	3.0	87.2	5986	14	2164	68	0.95	1746.	42	138	9.5	

#330 120 Sn on 154 Sm

120 Sn on 154 Sm

120 Sn on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 62. ZC=112.( )
NEUTRON NUMBERS: NP= 70. NT= 92. NC=162.

AP**1/3= 4.932 AT**1/3= 5.360
REDUCED MASS NUMBER= 67.45 AP+AT=AC=274.

INTERACTION RADIUS RINT=14.29 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 6.09 CT+CP=11.63 C= 2.90

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.25

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.00 RC=RCP+RCT=11.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 546.13 MeV K= .40637 n=2.443
VC(RINT)= 312.0 MeV

FISSION-TKE= 229. MeV
ASYMM. FISSION-TKE= 226. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 32.64 MeV
L-RLD= 29 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.10 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -72.1
COMPOUND NUCLEUS: 150.6

FUSION RELATED PARAMETERS:
R-BARRIER=12.76 fm V(RB)= 324.7 MeV
Q-VALUE= -314.5 MeV
L-CRITICAL= 9.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	67	0.22	5181	14.8	488.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	135	0.43	7329	20.9	345.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	202	0.65	8978	25.6	281.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	270	0.86	10370	29.5	244.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	540	304	0.97	11001	31.3	230.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	600	337	1.08	11597	33.0	218.3	128	480	2	119.2	71.6	30.4	160	440	124	798	10.64	261.	2	13	0.8	2
5.5	660	371	1.19	12165	34.6	208.1	196	1023	2	93.3	54.1	43.3	316	344	239	522	6.93	284.	3	17	1.3	5
6.0	720	405	1.30	12708	36.1	199.3	247	1475	2	77.9	44.7	51.1	440	280	321	416	5.52	306.	4	21	1.6	8
6.5	780	438	1.41	13228	37.6	191.5	298	1857	2	67.2	38.3	56.4	545	235	384	357	4.73	328.	5	24	1.9	11
7.0	840	472	1.51	13729	39.0	184.5	324	2184	2	59.3	33.7	60.4	638	202	435	317	4.20	349.	6	26	2.1	14
7.5	900	506	1.62	14213	40.4	178.2	357	2467	1	53.1	30.1	63.5	723	177	478	288	3.81	371.	7	29	2.4	16
8.0	960	540	1.73	14681	41.7	172.6	387	2715	1	48.1	27.2	66.0	803	157	516	266	3.52	393.	7	31	2.6	18
8.5	1020	573	1.84	15135	43.0	167.4	415	2934	1	44.0	24.9	68.0	879	141	550	248	3.29	414.	8	33	2.7	20
9.0	1080	607	1.95	15576	44.3	162.7	441	3128	1	40.5	22.9	69.7	952	128	581	233	3.09	435.	8	35	2.9	22
9.5	1140	641	2.05	16005	45.5	158.4	465	3302	1	37.6	21.2	71.2	1023	117	610	221	2.93	455.	9	37	3.1	24
10.0	1200	674	2.16	16423	46.6	154.4	488	3458	1	35.1	19.8	72.5	1093	107	638	211	2.79	475.	9	39	3.2	26
10.5	1260	708	2.27	16831	47.8	150.6	511	3599	1	32.9	18.5	73.6	1161	99	664	201	2.67	495.	10	41	3.4	28
11.0	1320	742	2.38	17229	48.9	147.2	532	3728	1	30.9	17.4	74.5	1228	92	688	193	2.56	514.	10	42	3.5	30
11.5	1380	776	2.49	17619	50.0	143.9	552	3845	1	29.2	16.5	75.4	1294	86	712	186	2.47	533.	11	44	3.7	32
12.0	1440	809	2.59	18000	51.1	140.9	572	3953	1	27.7	15.6	76.2	1359	81	736	180	2.38	554.	11	46	3.8	33
13.0	1560	877	2.81	18740	53.2	135.4	610	4143	1	25.0	14.1	77.5	1488	72	780	169	2.23	593.	12	49	4.1	36
14.0	1680	944	3.03	19453	55.2	130.5	645	4306	1	22.9	12.9	78.6	1615	65	823	159	2.11	631.	13	52	4.3	39
15.0	1800	1012	3.24	20141	57.1	126.0	679	4447	0	21.0	11.8	79.5	1741	59	864	152	2.01	0.	14	55	4.5	42
16.0	1920	1079	3.46	20807	59.0	122.0	711	4571	0	19.5	11.0	80.3	1866	54	904	145	1.92	0.	15	58	4.7	45
17.0	2040	1147	3.68	21453	60.8	118.4	741	4680	0	18.1	10.2	80.9	1990	50	943	139	1.84	0.	16	60	4.9	47
18.0	2160	1214	3.89	22081	62.6	115.1	771	4777	0	17.0	9.6	81.5	2114	46	981	133	1.77	0.	17	63	5.1	50
19.0	2280	1281	4.11	22692	64.3	112.0	799	4863	0	16.0	9.0	82.0	2237	43	1018	129	1.70	0.	17	66	5.3	52
20.0	2400	1349	4.32	23287	66.0	109.1	826	4941	0	15.0	8.5	82.5	2359	41	1055	124	1.65	0.	18	68	5.5	54
25.0	3000	1686	5.40	26071	73.8	97.6	951	5237	0	11.7	6.6	84.1	2969	31	1233	108	1.43	0.	22	81	6.3	65
30.0	3600	2023	6.49	28597	80.8	89.1	1062	5435	0	9.6	5.4	85.2	3575	25	1402	97	1.28	0.	26	93	7.1	74
35.0	4200	2361	7.57	30929	87.3	82.5	1162	5575	0	8.1	4.6	85.9	4179	21	1567	89	1.17	0.	30	105	7.7	
40.0	4800	2698	8.65	33108	93.3	77.2	1254	5681	0	7.0	4.0	86.5	4782	18	1727	82	1.09	0.	34	116	8.3	
45.0	5400	3035	9.73	35162	99.0	72.8	1339	5763	0	6.2	3.5	86.9	5384	16	1885	77	1.02	0.	38	126	8.9	
50.0	6000	3372	10.81	37113	104.3	69.0	1420	5829	0	5.6	3.1	87.2	5986	14	2040	72	0.96	0.	42	137	9.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#331 120 Sn on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 67. ZC=117.( )
NEUTRON NUMBERS: NP= 70. NT= 98. NC=168.

AP**1/3= 4.932 AT**1/3= 5.485
REDUCED MASS NUMBER= 69.47 AP+AT=AC=285.

INTERACTION RADIUS RINT=14.42 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 6.25 CT+CP=11.79 C= 2.94

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.41

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.15 RC=RCP+RCT=11.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 581.99 MeV K= .41475 n=2.447
VC(RINT)= 334.0 MeV

FISSION-TKE= 245. MeV
ASYMM. FISSION-TKE= 240. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 33.12 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -63.7
COMPOUND NUCLEUS: 191.1

FUSION RELATED PARAMETERS:
R-BARRIER=12.86 fm V(RB)= 347.7 MeV
Q-VALUE= -346.7 MeV
L-CRITICAL= 0.

120 Sn on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	69	0.21	5181	15.2	527.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	240	139	0.42	7329	21.5	373.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	360	208	0.62	8978	26.3	304.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.0	480	278	0.83	10370	30.4	263.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.5	540	313	0.94	11001	32.2	248.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
5.0	600	347	1.04	11597	34.0	235.9	95	249	0	136.3	89.6	21.9	96	504	70	1201	15.10	0. 1	11	0.1	0
5.5	660	382	1.14	12165	35.6	224.9	182	825	0	102.2	62.1	38.9	270	390	202	634	7.87	0. 3	16	1.0	3
6.0	720	417	1.25	12708	37.2	215.3	239	1304	0	84.1	50.2	48.0	405	315	294	483	5.99	0. 4	20	1.4	6
6.5	780	452	1.35	13228	38.7	206.9	285	1708	0	72.0	42.6	54.0	517	263	363	405	5.02	0. 5	23	1.7	9
7.0	840	486	1.46	13729	40.2	199.4	324	2054	0	63.2	37.1	58.4	615	225	417	356	4.41	0. 6	26	2.0	12
7.5	900	521	1.56	14213	41.6	192.6	359	2355	0	56.4	33.0	61.8	704	196	463	321	3.98	0. 6	28	2.2	15
8.0	960	556	1.66	14681	43.0	186.5	391	2617	0	51.0	29.8	64.5	787	173	503	295	3.65	0. 7	30	2.4	17
8.5	1020	591	1.77	15135	44.3	180.9	421	2848	0	46.5	27.1	66.7	865	155	538	274	3.40	0. 8	33	2.6	19
9.0	1080	625	1.87	15576	45.6	175.8	448	3054	0	42.8	25.0	68.6	940	140	569	258	3.19	0. 8	35	2.8	22
9.5	1140	660	1.98	16005	46.8	171.1	474	3238	0	39.7	23.1	70.2	1012	128	599	243	3.01	0. 9	36	3.0	24
10.0	1200	695	2.08	16423	48.1	166.8	499	3404	0	37.0	21.5	71.5	1082	118	626	231	2.86	0. 9	38	3.1	26
10.5	1260	729	2.18	16831	49.2	162.8	523	3554	0	34.6	20.1	72.7	1151	109	652	221	2.74	0. 10	40	3.3	27
11.0	1320	764	2.29	17229	50.4	159.0	545	3690	0	32.5	18.9	73.7	1219	101	677	212	2.62	0. 10	42	3.4	29
11.5	1380	799	2.39	17619	51.5	155.5	567	3814	0	30.7	17.8	74.7	1286	94	700	204	2.52	0. 11	43	3.6	31
12.0	1440	834	2.50	18000	52.6	152.3	588	3928	0	29.1	16.9	75.5	1352	88	723	197	2.43	0. 11	45	3.7	33
13.0	1560	903	2.70	18740	54.8	146.3	627	4129	0	26.3	15.2	76.9	1481	79	767	184	2.28	0. 12	48	4.0	36
14.0	1680	973	2.91	19453	56.9	141.0	664	4302	0	24.0	13.9	78.0	1609	71	808	174	2.15	0. 13	51	4.2	40
15.0	1800	1042	3.12	20141	58.9	136.2	700	4452	0	22.0	12.8	79.0	1736	64	848	165	2.04	0. 14	54	4.4	43
16.0	1920	1112	3.33	20807	60.8	131.9	733	4582	0	20.4	11.8	79.8	1861	59	887	158	1.95	0. 15	57	4.6	45
17.0	2040	1181	3.54	21453	62.7	127.9	765	4698	0	19.0	11.0	80.5	1986	54	924	151	1.87	0. 16	60	4.8	48
18.0	2160	1251	3.74	22081	64.5	124.3	796	4801	0	17.8	10.3	81.1	2110	50	961	145	1.80	0. 16	63	5.0	50
19.0	2280	1320	3.95	22692	66.2	121.0	826	4892	0	16.7	9.7	81.7	2233	47	997	140	1.73	0. 17	65	5.2	53
20.0	2400	1389	4.16	23287	68.0	118.0	854	4975	0	15.7	9.1	82.1	2356	44	1032	135	1.67	0. 18	68	5.4	55
25.0	3000	1737	5.20	26071	76.0	105.5	985	5289	0	12.2	7.1	83.9	2967	33	1202	117	1.45	0. 22	81	6.2	66
30.0	3600	2084	6.24	28597	83.2	96.3	1100	5498	0	10.0	5.8	85.0	3573	27	1363	105	1.30	0. 26	92	7.0	75
35.0	4200	2432	7.28	30929	89.9	89.2	1204	5647	0	8.5	4.9	85.8	4178	22	1519	96	1.19	0. 30	104	7.6	
40.0	4800	2779	8.32	33108	96.1	83.4	1300	5759	0	7.3	4.3	86.3	4781	19	1672	89	1.10	0. 34	115	8.3	
45.0	5400	3126	9.36	35162	101.9	78.6	1389	5846	0	6.5	3.8	86.8	5383	17	1821	83	1.03	0. 38	125	8.8	
50.0	6000	3474	10.40	37113	107.4	74.6	1473	5915	0	5.8	3.4	87.1	5985	15	1967	78	0.97	0. 41	136	9.4	

#332 120 Sn on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 73. ZC=123.( )
NEUTRON NUMBERS: NP= 70. NT=108. NC=178.

AP**1/3= 4.932 AT**1/3= 5.657
REDUCED MASS NUMBER= 72.16 AP+AT=AC=301.

INTERACTION RADIUS RINT=14.61 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 6.47 CT+CP=12.01 C= 2.98

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.62

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.35 RC=RCP+RCT=11.86

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 622.91 MeV K= .41933 n=2.452
VC(RINT)= 359.3 MeV

FISSION-TKE= 264. MeV
ASYMM. FISSION-TKE= 255. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 33.57 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.91 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -46.0
COMPOUND NUCLEUS: 234.2

FUSION RELATED PARAMETERS:
R-BARRIER=13.01 fm V(RB)= 374.0 MeV
Q-VALUE= -372.0 MeV
L-CRITICAL= 0.

120 Sn on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	120	72	0.20	5181	15.8	574.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
2.0	240	144	0.40	7329	22.3	406.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
3.0	360	216	0.60	8978	27.3	331.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.0	480	289	0.80	10370	31.6	287.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
4.5	540	325	0.90	11001	33.5	270.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0. 0	0	0.0	0
5.0	600	361	1.00	11597	35.3	257.0	28	22	0	167.4	145.2	6.3	32	568	13	3928	53.82	0. 1	9	0.0	0
5.5	660	397	1.10	12165	37.0	245.1	165	636	0	111.9	72.7	34.0	225	435	163	796	9.21	0. 3	15	0.8	2
6.0	720	433	1.21	12708	38.7	234.6	232	1144	0	90.6	56.9	44.7	371	349	265	569	6.56	0. 4	19	1.3	6
6.5	780	469	1.31	13228	40.2	225.4	284	1574	0	76.9	47.6	51.5	491	289	340	466	5.37	0. 5	22	1.6	9
7.0	840	505	1.41	13729	41.8	217.2	327	1942	0	67.1	41.2	56.4	594	246	398	404	4.65	0. 5	25	1.9	11
7.5	900	541	1.51	14213	43.2	209.9	366	2261	0	59.7	36.5	60.1	686	214	446	362	4.17	0. 6	27	2.1	14
8.0	960	577	1.61	14681	44.6	203.2	400	2540	0	53.8	32.8	63.1	771	189	486	331	3.80	0. 7	30	2.3	17
8.5	1020	613	1.71	15135	46.0	197.1	432	2786	0	49.0	29.8	65.5	852	168	522	306	3.52	0. 7	32	2.5	19
9.0	1080	649	1.81	15576	47.3	191.6	462	3005	0	45.0	27.3	67.5	928	152	554	287	3.30	0. 8	34	2.7	21
9.5	1140	686	1.91	16005	48.6	186.5	490	3200	0	41.7	25.2	69.2	1002	138	583	270	3.11	0. 9	36	2.9	24
10.0	1200	722	2.01	16423	49.9	181.7	516	3376	0	38.8	23.5	70.6	1073	127	610	256	2.95	0. 9	38	3.0	26
10.5	1260	758	2.11	16831	51.1	177.4	542	3535	0	36.3	21.9	71.9	1143	117	636	245	2.81	0. 10	39	3.2	28
11.0	1320	794	2.21	17229	52.3	173.3	566	3680	0	34.1	20.6	73.0	1211	109	660	234	2.69	0. 10	41	3.3	30
11.5	1380	830	2.31	17619	53.5	169.5	589	3812	0	32.1	19.4	73.9	1279	101	683	225	2.59	0. 11	43	3.5	32
12.0	1440	866	2.41	18000	54.7	165.9	611	3933	0	30.4	18.3	74.8	1345	95	705	217	2.49	0. 11	44	3.6	34
13.0	1560	938	2.61	18740	56.9	159.4	653	4147	0	27.4	16.6	76.3	1476	84	747	203	2.33	0. 12	48	3.9	37
14.0	1680	1010	2.81	19453	59.1	153.6	692	4331	0	25.0	15.1	77.5	1604	76	787	191	2.20	0. 13	51	4.1	41
15.0	1800	1082	3.01	20141	61.1	148.4	730	4490	0	23.0	13.9	78.5	1731	69	825	182	2.09	0. 14	54	4.3	44
16.0	1920	1155	3.21	20807	63.1	143.7	765	4629	0	21.3	12.8	79.4	1857	63	861	173	1.99	0. 15	56	4.6	47
17.0	2040	1227	3.41	21453	65.1	139.4	799	4751	0	19.8	11.9	80.1	1982	58	897	166	1.91	0. 15	59	4.8	50
18.0	2160	1299	3.62	22081	67.0	135.5	832	4860	0	18.5	11.1	80.8	2106	54	931	159	1.83	0. 16	62	5.0	53
19.0	2280	1371	3.82	22692	68.8	131.9	863	4958	0	17.4	10.5	81.3	2230	50	965	153	1.76	0. 17	65	5.2	55
20.0	2400	1443	4.02	23287	70.6	128.5	894	5046	0	16.4	9.9	81.8	2353	47	998	148	1.70	0. 18	67	5.3	58
25.0	3000	1804	5.02	26071	78.9	114.9	1032	5379	0	12.7	7.7	83.6	2965	35	1157	128	1.48	0. 22	80	6.2	69
30.0	3600	2165	6.03	28597	86.4	104.9	1153	5601	0	10.4	6.3	84.8	3572	28	1308	115	1.32	0. 26	91	6.9	79
35.0	4200	2526	7.03	30929	93.4	97.1	1263	5760	0	8.8	5.3	85.6	4176	24	1453	105	1.21	0. 30	103	7.6	
40.0	4800	2886	8.03	33108	99.8	90.9	1364	5879	0	7.6	4.6	86.2	4780	20	1594	97	1.12	0. 33	113	8.2	
45.0	5400	3247	9.04	35162	105.9	85.7	1459	5971	0	6.7	4.0	86.6	5382	18	1732	91	1.04	0. 37	124	8.7	
50.0	6000	3608	10.04	37113	111.6	81.3	1547	6045	0	6.0	3.6	87.0	5984	16	1867	86	0.98	0. 41	134	9.3	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-k	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#333 120 Sn on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 79. ZC=129.( )
NEUTRON NUMBERS: NP= 70. NT=118. NC=188.

AP**1/3= 4.932 AT**1/3= 5.819
REDUCED MASS NUMBER= 74.57 AP+AT=AC=317.

INTERACTION RADIUS RINT=14.79 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 6.68 CT+CP=12.22 C= 3.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.83

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.55 RC=RCP+RCT=12.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 662.91 MeV K= .42177 n=2.458
VC(RINT)= 384.2 MeV

FISSION-TKE= 284. MeV
ASYMM. FISSION-TKE= 269. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.893 MeV/fm**2 PROX-FACTOR= 33.98 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.82 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -28.6
COMPOUND NUCLEUS: 287.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.14 fm V(RB)= 400.0 MeV
Q-VALUE= -407.8 MeV
L-CRITICAL= 0.

120 Sn on 197 Au — 120 Sn on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	120	75	0.19	5181	16.3	622.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	149	0.39	7329	23.1	439.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	224	0.58	8978	28.3	359.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	298	0.78	10370	32.6	311.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	540	336	0.87	11001	34.6	293.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	600	373	0.97	11597	36.5	278.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	660	410	1.07	12165	38.3	265.2	141	433	0	124.0	86.6	28.0	176	484	121	1054	11.43	0.	2	13	0.2	0
6.0	720	447	1.16	12708	40.0	253.9	221	972	0	97.9	64.5	41.1	335	385	235	675	7.29	0.	3	18	1.0	4
6.5	780	485	1.26	13228	41.6	244.0	279	1428	0	82.3	53.1	48.9	462	318	316	536	5.77	0.	4	21	1.4	7
7.0	840	522	1.36	13729	43.2	235.1	327	1818	0	71.4	45.6	54.3	571	269	378	457	4.93	0.	5	24	1.7	10
7.5	900	559	1.46	14213	44.7	227.1	369	2156	0	63.2	40.1	59.4	667	233	429	406	4.37	0.	6	27	2.0	13
8.0	960	597	1.55	14681	46.1	219.9	407	2452	0	56.8	35.9	61.6	756	204	471	369	3.97	0.	7	29	2.2	16
8.5	1020	634	1.65	15135	47.6	213.3	441	2712	0	51.6	32.5	64.2	838	182	508	340	3.66	0.	7	31	2.4	18
9.0	1080	671	1.75	15576	48.9	207.3	473	2944	0	47.4	29.8	66.3	916	164	540	317	3.41	0.	8	33	2.6	21
9.5	1140	708	1.84	16005	50.3	201.8	503	3151	0	43.8	27.5	68.1	991	149	570	298	3.21	0.	8	35	2.8	23
10.0	1200	746	1.94	16423	51.6	196.7	531	3338	0	40.7	25.5	69.7	1064	136	597	282	3.04	0.	9	37	2.9	25
10.5	1260	783	2.04	16831	52.9	191.9	557	3506	0	38.0	23.8	71.0	1134	126	622	269	2.89	0.	9	39	3.1	28
11.0	1320	820	2.14	17229	54.1	187.5	583	3660	0	35.7	22.3	72.2	1203	117	646	257	2.77	0.	10	41	3.2	30
11.5	1380	858	2.23	17619	55.3	183.4	607	3800	0	33.6	21.0	73.2	1271	109	668	247	2.65	0.	10	42	3.4	32
12.0	1440	895	2.33	18000	56.5	179.5	631	3928	0	31.8	19.8	74.1	1338	102	690	238	2.56	0.	11	44	3.5	34
13.0	1560	969	2.52	18740	58.8	172.5	675	4155	0	28.7	17.9	75.7	1470	90	730	222	2.39	0.	12	47	3.8	38
14.0	1680	1044	2.72	19453	61.0	166.2	717	4349	0	26.1	16.3	76.9	1599	81	769	209	2.25	0.	13	50	4.0	41
15.0	1800	1119	2.91	20141	63.2	160.6	757	4518	0	24.0	14.9	78.0	1727	73	805	198	2.13	0.	14	53	4.2	44
16.0	1920	1193	3.11	20807	65.2	155.5	794	4665	0	22.2	13.8	78.9	1853	67	840	189	2.03	0.	14	56	4.5	48
17.0	2040	1268	3.30	21453	67.3	150.8	830	4795	0	20.6	12.8	79.7	1979	61	874	181	1.94	0.	15	59	4.7	51
18.0	2160	1342	3.49	22081	69.2	146.6	864	4911	0	19.3	12.0	80.4	2103	57	907	174	1.87	0.	16	61	4.9	54
19.0	2280	1417	3.69	22692	71.1	142.7	897	5014	0	18.1	11.2	81.0	2227	53	939	167	1.80	0.	17	64	5.0	57
20.0	2400	1491	3.88	23287	72.9	139.1	929	5107	0	17.0	10.6	81.5	2351	49	970	161	1.74	0.	18	66	5.2	60
25.0	3000	1864	4.85	26071	81.6	124.4	1074	5461	0	13.2	8.2	83.4	2963	37	1119	140	1.50	0.	22	79	6.1	71
30.0	3600	2237	5.82	28597	89.3	113.6	1202	5696	0	10.8	6.7	84.6	3570	30	1260	125	1.34	0.	25	90	6.8	82
35.0	4200	2610	6.79	30929	96.5	105.1	1317	5864	0	9.1	5.7	85.4	4175	25	1396	114	1.22	0.	29	101	7.5	
40.0	4800	2983	7.76	33108	103.2	98.3	1423	5990	0	7.9	4.9	86.0	4779	21	1527	105	1.13	0.	33	112	8.1	
45.0	5400	3356	8.74	35162	109.4	92.7	1522	6088	0	7.0	4.3	86.5	5381	19	1655	99	1.06	0.	37	122	8.6	
50.0	6000	3729	9.71	37113	115.3	88.0	1615	6167	0	6.2	3.9	86.9	5983	17	1781	93	1.00	0.	40	133	9.2	

#334 120 Sn on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 82. ZC=132.( )
NEUTRON NUMBERS: NP= 70. NT=126. NC=196.

AP**1/3= 4.932 AT**1/3= 5.925
REDUCED MASS NUMBER= 76.10 AP+AT=AC=328.

INTERACTION RADIUS RINT=14.90 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 6.82 CT+CP=12.36 C= 3.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.96

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.66 RC=RCP+RCT=12.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 681.31 MeV K= .41977 n=2.461
VC(RINT)= 395.7 MeV

FISSION-TKE= 293. MeV
ASYMM. FISSION-TKE= 276. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 34.07 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -19.5
COMPOUND NUCLEUS: 324.2

FUSION RELATED PARAMETERS:
R-BARRIER=13.23 fm V(RB)= 411.8 MeV
Q-VALUE= -435.5 MeV
L-CRITICAL= 0.

120 Sn on 208 Pb — 120 Sn on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	120	76	0.19	5181	16.6	645.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	152	0.38	7329	23.5	456.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	228	0.58	8978	28.8	372.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	304	0.77	10370	33.3	322.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	540	342	0.87	11001	35.3	304.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	600	380	0.96	11597	37.2	288.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	660	419	1.06	12165	39.0	275.3	134	378	0	128.0	92.8	26.0	165	495	110	1178	12.43	0.	2	13	0.0	0
6.0	720	457	1.15	12708	40.8	263.6	221	931	0	100.1	67.8	40.0	328	392	226	722	7.56	0.	3	18	0.7	2
6.5	780	495	1.25	13228	42.4	253.2	282	1398	0	83.8	55.5	48.1	457	323	308	566	5.92	0.	4	21	1.2	6
7.0	840	533	1.35	13729	44.0	244.0	332	1798	0	72.6	47.5	53.7	567	273	371	481	5.03	0.	5	24	1.5	10
7.5	900	571	1.44	14213	45.6	235.7	376	2144	0	64.2	41.7	57.9	664	236	421	426	4.45	0.	6	27	1.8	13
8.0	960	609	1.54	14681	47.1	228.2	415	2447	0	57.7	37.2	61.2	753	207	463	386	4.03	0.	7	29	2.1	16
8.5	1020	647	1.63	15135	48.5	221.4	450	2715	0	52.4	33.7	63.8	836	184	500	355	3.71	0.	7	31	2.3	19
9.0	1080	685	1.73	15576	49.9	215.2	483	2952	0	48.0	30.8	66.0	914	166	532	331	3.46	0.	8	33	2.5	21
9.5	1140	723	1.83	16005	51.3	209.5	514	3165	0	44.4	28.4	67.8	989	151	561	311	3.25	0.	8	35	2.6	24
10.0	1200	761	1.92	16423	52.6	204.2	543	3356	0	41.2	26.4	69.4	1062	138	597	295	3.08	0.	9	37	2.8	26
10.5	1260	799	2.02	16831	53.9	199.2	571	3529	0	38.5	24.6	70.8	1133	127	612	280	2.93	0.	9	39	3.0	28
11.0	1320	837	2.12	17229	55.2	194.7	597	3686	0	36.1	23.1	71.9	1202	118	635	268	2.80	0.	10	40	3.1	30
11.5	1380	875	2.21	17619	56.4	190.4	622	3829	0	34.0	21.7	73.0	1270	110	657	257	2.69	0.	10	42	3.3	33
12.0	1440	913	2.31	18000	57.7	186.4	646	3961	0	32.2	20.5	73.9	1337	103	678	248	2.58	0.	11	44	3.4	35
13.0	1560	989	2.50	18740	60.0	179.1	692	4194	0	29.0	18.5	75.5	1469	91	718	231	2.41	0.	12	47	3.7	39
14.0	1680	1065	2.69	19453	62.3	172.5	735	4393	0	26.4	16.8	76.8	1599	81	755	218	2.27	0.	13	50	3.9	42
15.0	1800	1141	2.88	20141	64.5	166.7	776	4566	0	24.2	15.4	77.9	1726	74	790	206	2.15	0.	13	53	4.1	46
16.0	1920	1218	3.08	20807	66.6	161.4	815	4717	0	22.4	14.2	78.8	1853	67	824	196	2.05	0.	14	55	4.4	49
17.0	2040	1294	3.27	21453	68.6	156.6	852	4850	0	20.8	13.2	79.6	1978	62	856	188	1.96	0.	15	58	4.6	52
18.0	2160	1370	3.46	22081	70.6	152.2	887	4969	0	19.5	12.4	80.3	2103	57	888	180	1.88	0.	16	61	4.8	55
19.0	2280	1446	3.65	22692	72.5	148.1	921	5075	0	18.3	11.6	80.9	2227	53	919	174	1.81	0.	17	63	5.0	58
20.0	2400	1522	3.85	23287	74.4	144.4	954	5170	0	17.2	10.9	81.4	2350	50	949	168	1.75	0.	18	66	5.1	61
25.0	3000	1902	4.81	26071	83.2	129.1	1103	5532	0	13.3	8.5	83.3	2962	38	1092	145	1.51	0.	21	78	6.0	74
30.0	3600	2283	5.77	28597	91.2	117.9	1235	5774	0	10.9	6.9	84.5	3570	30	1227	130	1.35	0.	25	90	6.7	84
35.0	4200	2663	6.73	30929	98.5	109.1	1354	5946	0	9.2	5.8	85.4	4175	25	1356	118	1.23	0.	29	101	7.4	
40.0	4800	3044	7.69	33108	105.3	102.1	1463	6075	0	8.0	5.1	86.0	4778	22	1481	109	1.14	0.	33	111	8.0	
45.0	5400	3424	8.65	35162	111.7	96.2	1564	6176	0	7.0	4.5	86.5	5381	19	1603	102	1.07	0.	36	122	8.5	
50.0	6000	3805	9.62	37113	117.7	91.3	1660	6256	0	6.3	4.0	86.9	5983	17	1723	96	1.01	0.	40	132	9.1	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#335 120 Sn on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 83. ZC=133.( )
NEUTRON NUMBERS: NP= 70. NT=126. NC=196.

AP**1/3= 4.932 AT**1/3= 5.934
REDUCED MASS NUMBER= 76.23 AP+AT=AC=329.

INTERACTION RADIUS RINT=14.91 fm R0= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 6.83 CT+CP=12.37 C= 3.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 6.97

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.68 RC=RCP+RCT=12.19

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 688.54 MeV K= .42131 n=2.462
VC(RINT)= 400.2 MeV

FISSION-TKE= 297. MeV
ASYMM. FISSION-TKE= 278. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 34.19 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.77 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: -16.5
COMPOUND NUCLEUS: 333.4

FUSION RELATED PARAMETERS:
R-BARRIER=13.24 fm V(RB)= 416.7 MeV
Q-VALUE= -441.7 MeV
L-CRITICAL= 0.

120 Sn on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	120	76	0.19	5181	16.7	653.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	152	0.38	7329	23.6	462.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	229	0.57	8978	28.9	377.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	305	0.76	10370	33.3	326.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	540	343	0.86	11001	35.4	308.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	600	381	0.95	11597	37.3	292.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	660	419	1.05	12165	39.1	278.6	123	314	0	132.5	97.9	23.7	147	513	96	1308	13.68	0.	2	13	0.0	0
6.0	720	457	1.14	12708	40.8	266.8	214	873	0	102.5	69.8	38.8	314	406	216	755	7.82	0.	3	17	0.6	2
6.5	780	496	1.24	13228	42.5	256.3	277	1345	0	85.5	56.8	47.2	447	333	302	585	6.05	0.	4	21	1.1	6
7.0	840	534	1.33	13729	44.1	247.0	328	1750	0	73.9	48.5	53.0	559	281	366	494	5.11	0.	5	24	1.5	10
7.5	900	572	1.43	14213	45.7	238.6	372	2100	0	65.3	42.5	57.3	657	243	418	436	4.50	0.	6	26	1.8	13
8.0	960	610	1.52	14681	47.2	231.0	412	2406	0	58.6	37.9	60.7	747	213	461	394	4.07	0.	7	29	2.0	16
8.5	1020	648	1.62	15135	48.6	224.1	448	2677	0	53.2	34.3	63.4	831	189	498	362	3.74	0.	7	31	2.2	18
9.0	1080	686	1.71	15576	50.0	217.8	481	2917	0	48.7	31.3	65.6	910	170	531	337	3.48	0.	8	33	2.4	21
9.5	1140	724	1.81	16005	51.4	212.0	512	3132	0	45.0	28.9	67.5	985	155	560	317	3.27	0.	8	35	2.6	23
10.0	1200	762	1.90	16423	52.7	206.6	541	3325	0	41.8	26.8	69.1	1059	141	587	300	3.10	0.	9	37	2.8	25
10.5	1260	800	2.00	16831	54.0	201.7	569	3500	0	39.0	25.0	70.5	1130	130	612	285	2.94	0.	9	39	3.0	28
11.0	1320	839	2.10	17229	55.3	197.0	596	3659	0	36.6	23.4	71.7	1199	121	635	273	2.81	0.	10	40	3.1	30
11.5	1380	877	2.19	17619	56.5	192.7	621	3804	0	34.5	22.0	72.8	1268	112	658	261	2.70	0.	10	42	3.3	32
12.0	1440	915	2.29	18000	57.8	188.6	646	3937	0	32.6	20.8	73.7	1335	105	679	252	2.60	0.	11	43	3.4	34
13.0	1560	991	2.48	18740	60.1	181.2	692	4172	0	29.4	18.7	75.3	1467	93	718	235	2.42	0.	12	47	3.7	38
14.0	1680	1067	2.67	19453	62.4	174.6	735	4374	0	26.7	17.0	76.6	1597	83	755	221	2.28	0.	13	50	3.9	42
15.0	1800	1143	2.86	20141	64.6	168.7	776	4548	0	24.5	15.6	77.7	1725	75	791	209	2.16	0.	13	53	4.1	45
16.0	1920	1220	3.05	20807	66.7	163.4	815	4701	0	22.7	14.4	78.7	1851	69	824	199	2.06	0.	14	55	4.3	49
17.0	2040	1296	3.24	21453	68.7	158.5	852	4836	0	21.1	13.4	79.5	1977	63	857	191	1.97	0.	15	58	4.6	52
18.0	2160	1372	3.43	22081	70.7	154.0	887	4956	0	19.7	12.5	80.2	2101	59	889	183	1.89	0.	16	61	4.8	55
19.0	2280	1448	3.62	22692	72.7	149.9	922	5063	0	18.5	11.8	80.8	2226	54	919	176	1.82	0.	17	63	4.9	58
20.0	2400	1525	3.81	23287	74.6	146.1	955	5159	0	17.4	11.1	81.3	2349	51	950	170	1.76	0.	18	66	5.1	61
25.0	3000	1906	4.76	26071	83.4	130.7	1105	5526	0	13.5	8.6	83.3	2962	38	1093	147	1.52	0.	21	78	6.0	73
30.0	3600	2287	5.71	28597	91.3	119.3	1237	5770	0	11.0	7.0	84.5	3569	31	1227	131	1.36	0.	25	90	6.7	84
35.0	4200	2668	6.67	30929	98.6	110.5	1356	5944	0	9.3	5.9	85.3	4174	26	1356	120	1.24	0.	29	101	7.4	
40.0	4800	3049	7.62	33108	105.5	103.3	1465	6075	0	8.1	5.1	86.0	4778	22	1481	111	1.14	0.	33	111	8.0	
45.0	5400	3430	8.57	35162	111.8	97.4	1567	6176	0	7.1	4.5	86.4	5381	19	1603	104	1.07	0.	36	121	8.5	
50.0	6000	3812	9.52	37113	117.9	92.4	1663	6258	0	6.4	4.0	86.8	5983	17	1722	98	1.01	0.	40	131	9.1	

#336 120 Sn on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 50. ZT= 92. ZC=142.( )
NEUTRON NUMBERS: NP= 70. NT=146. NC=216.

AP**1/3= 4.932 AT**1/3= 6.197
REDUCED MASS NUMBER= 79.78 AP+AT=AC=358.

INTERACTION RADIUS RINT=15.19 fm R0= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.54 CT= 7.16 CT+CP=12.71 C= 3.12

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.72 RT= 7.30

COULOMB RADII [fm]:
RCP= 5.51 RCT= 6.98 RC=RCP+RCT=12.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 744.07 MeV K= .41655 n=2.473
VC(RINT)= 435.3 MeV

FISSION-TKE= 326. MeV
ASYMM. FISSION-TKE= 298. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.879 MeV/fm**2 PROX-FACTOR= 34.52 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.65 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -91.9 TARGET: 47.2
COMPOUND NUCLEUS: 430.9

FUSION RELATED PARAMETERS:
R-BARRIER=13.46 fm V(RB)= 453.2 MeV
Q-VALUE= -475.5 MeV
L-CRITICAL= 0.

120 Sn on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	120	80	0.18	5181	17.4	724.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	240	160	0.37	7329	24.7	512.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	360	239	0.55	8978	30.2	418.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	480	319	0.73	10370	34.9	362.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	540	359	0.82	11001	37.0	341.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	600	399	0.92	11597	39.0	323.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	660	439	1.01	12165	40.9	308.8	50	49	0	161.5	144.5	9.3	87	573	42	3495	36.21	0.	1	11	0.0	0
6.0	720	479	1.10	12708	42.7	295.7	194	655	0	113.4	83.4	33.3	271	449	178	983	9.38	0.	3	16	0.3	0
6.5	780	519	1.19	13228	44.5	284.1	270	1165	0	92.9	65.6	43.5	415	365	272	709	6.75	0.	4	20	1.0	5
7.0	840	558	1.28	13729	46.2	273.8	329	1601	0	79.6	55.2	50.2	533	307	342	583	5.54	0.	5	23	1.4	9
7.5	900	598	1.37	14213	47.8	264.5	378	1979	0	69.9	47.9	55.0	637	263	396	507	4.82	0.	6	26	1.7	12
8.0	960	638	1.47	14681	49.4	256.1	422	2310	0	62.5	42.5	58.8	730	230	441	454	4.31	0.	6	28	1.9	16
8.5	1020	678	1.56	15135	50.9	248.4	462	2602	0	56.5	38.3	61.7	816	204	479	415	3.94	0.	7	30	2.1	19
9.0	1080	718	1.65	15576	52.3	241.4	499	2861	0	51.7	34.9	64.2	897	183	512	385	3.65	0.	8	32	2.3	22
9.5	1140	758	1.74	16005	53.8	235.0	533	3093	0	47.6	32.1	66.2	974	166	541	360	3.42	0.	8	34	2.5	25
10.0	1200	798	1.83	16423	55.2	229.0	565	3302	0	44.2	29.7	67.9	1049	151	567	340	3.23	0.	9	36	2.7	28
10.5	1260	838	1.92	16831	56.5	223.5	595	3490	0	41.2	27.7	69.4	1121	139	592	323	3.06	0.	9	38	2.8	30
11.0	1320	878	2.02	17229	57.9	218.4	624	3662	0	38.6	25.9	70.7	1192	128	614	308	2.92	0.	10	39	3.0	33
11.5	1380	917	2.11	17619	59.2	213.6	651	3819	0	36.3	24.3	71.8	1261	119	635	295	2.80	0.	10	41	3.1	35
12.0	1440	957	2.20	18000	60.4	209.1	678	3962	0	34.3	23.0	72.9	1328	112	655	283	2.69	0.	11	43	3.3	37
13.0	1560	1037	2.38	18740	62.9	200.9	728	4216	0	30.9	20.6	74.6	1462	98	693	264	2.50	0.	12	46	3.5	41
14.0	1680	1117	2.57	19453	65.3	193.6	775	4434	0	28.1	18.7	76.0	1592	88	728	248	2.35	0.	12	49	3.8	45
15.0	1800	1197	2.75	20141	67.6	187.0	819	4622	0	25.7	17.2	77.1	1720	80	761	234	2.22	0.	13	51	4.0	49
16.0	1920	1276	2.93	20807	69.8	181.1	861	4787	0	23.8	15.9	78.1	1847	73	792	223	2.12	0.	14	54	4.2	53
17.0	2040	1356	3.12	21453	71.9	175.7	900	4933	0	22.1	14.7	79.0	1973	67	822	213	2.02	0.	15	57	4.4	56
18.0	2160	1436	3.30	22081	74.0	170.7	939	5062	0	20.6	13.7	79.7	2098	62	851	205	1.94	0.	16	60	4.6	60
19.0	2280	1516	3.48	22692	76.1	166.2	975	5178	0	19.3	12.9	80.3	2223	57	879	197	1.87	0.	16	62	4.8	63
20.0	2400	1596	3.66	23287	78.0	162.0	1011	5282	0	18.2	12.1	80.9	2346	54	907	190	1.80	0.	17	65	5.0	66
25.0	3000	1994	4.58	26071	87.2	144.9	1172	5677	0	14.1	9.4	83.0	2960	40	1036	164	1.55	0.	21	77	5.8	79
30.0	3600	2393	5.50	28597	95.6	132.2	1313	5941	0	11.5	7.7	84.2	3568	32	1157	146	1.39	0.	25	88	6.5	91
35.0	4200	2792	6.41	30929	103.2	122.4	1441	6129	0	9.7	6.5	85.1	4173	27	1272	133	1.26	0.	29	99	7.2	
40.0	4800	3191	7.33	33108	110.4	114.5	1558	6270	0	8.4	5.6	85.8	4777	23	1384	123	1.17	0.	32	109	7.8	
45.0	5400	3590	8.25	35162	117.0	108.0	1667	6380	0	7.4	4.9	86.3	5380	20	1492	115	1.09	0.	36	119	8.3	
50.0	6000	3989	9.16	37113	123.4	102.4	1769	6468	0	6.6	4.4	86.7	5982	18	1598	109	1.03	0.	39	129	8.9	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-F	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nms	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 120 Sn

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#337 136 Xe on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 6. ZC= 60.(Nd)
NEUTRON NUMBERS: NP= 82. NT= 6. NC= 88.

AP**1/3= 5.143 AT**1/3= 2.289 ELSCAT < 5 deg
REDUCED MASS NUMBER= 11.03 AP+AT=AC=148.

INTERACTION RADIUS RINT=11.17 fm RO= 1.50 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 2.12 CT+CP= 7.93 C= 1.55

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 2.52

COULOMB RADII [fm]:
RCP= 5.72 RCT= 2.51 RC=RCP+RCT= 8.24

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 76.25 MeV K= .04621 n=2.871
VC(RINT)= 41.7 MeV

FISSION-TKE= 95. MeV
ASYMM. FISSION-TKE= 34. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 17.41 MeV
L-RLD=100 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.51 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: 0.0
COMPOUND NUCLEUS: -76.6

FUSION RELATED PARAMETERS:
R-BARRIER=10.11 fm V(RB)= 42.8 MeV
Q-VALUE= -9.7 MeV
L-CRITICAL= 53.

136 Xe on 12 C — 136 Xe on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	136	11	0.26	5872	2.4	51.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	272	22	0.53	8306	3.4	36.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	408	33	0.79	10175	4.2	29.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	544	44	1.06	11753	4.8	25.5	12	245	95	127.9	4.2	26.1	413	131	418	109	10.92	486.	4	12	1.4	4
4.5	612	50	1.19	12467	5.1	24.0	23	678	441	93.1	5.1	43.4	516	96	515	60	5.98	547.	4	12	1.5	4
5.0	680	55	1.32	13144	5.4	22.8	30	1018	718	75.1	4.8	52.5	605	75	598	46	4.59	603.	4	12	1.6	5
5.5	748	61	1.45	13787	5.7	21.8	35	1293	945	63.3	4.3	58.3	687	61	672	39	3.86	664.	6	18	1.7	5
6.0	816	66	1.59	14402	5.9	20.8	40	1521	1134	54.9	3.9	62.6	764	52	742	34	3.40	719.	6	20	1.7	6
6.5	884	72	1.72	14992	6.1	20.0	44	1713	1294	48.5	3.6	65.7	840	44	810	31	3.07	779.	7	21	1.8	6
7.0	952	77	1.85	15560	6.4	19.3	48	1876	1431	43.5	3.3	68.2	913	39	875	28	2.82	839.	7	23	1.9	6
7.5	1020	83	1.98	16108	6.6	18.6	52	2018	1549	39.5	3.0	70.3	985	35	940	26	2.62	892.	8	25	2.0	7
8.0	1088	88	2.12	16639	6.8	18.0	55	2142	1653	36.1	2.8	71.9	1057	31	1003	25	2.46	952.	9	26	2.1	7
8.5	1156	94	2.25	17153	7.0	17.5	59	2251	1745	33.3	2.6	73.4	1128	28	1066	23	2.33	1004.	9	28	2.1	8
9.0	1224	99	2.38	17653	7.2	17.0	62	2347	1768	30.9	2.4	74.6	1198	26	1128	22	2.21	1063.	10	29	2.2	8
9.5	1292	105	2.51	18139	7.4	16.6	64	2433	1675	28.8	2.3	75.6	1268	24	1190	21	2.11	1122.	10	31	2.3	8
10.0	1360	110	2.64	18613	7.6	16.1	67	2511	1591	27.0	2.1	76.5	1338	22	1252	20	2.03	1173.	11	32	2.3	9
10.5	1428	116	2.78	19075	7.8	15.7	70	2581	1516	25.4	2.0	77.3	1407	21	1313	20	1.95	1232.	11	34	2.4	9
11.0	1496	121	2.91	19526	8.0	15.4	72	2644	1447	24.0	1.9	78.0	1477	19	1374	19	1.88	1281.	12	35	2.5	10
11.5	1564	127	3.04	19968	8.2	15.0	75	2702	1384	22.7	1.8	78.6	1546	18	1435	18	1.82	1339.	12	37	2.5	10
12.0	1632	132	3.17	20400	8.4	14.7	77	2755	1326	21.6	1.7	79.2	1615	17	1496	18	1.76	1397.	13	38	2.6	10
13.0	1768	143	3.44	21239	8.7	14.1	82	2849	1224	19.6	1.6	80.2	1753	15	1617	17	1.66	1503.	14	41	2.7	11
14.0	1904	154	3.70	22046	9.0	13.6	86	2929	1137	18.0	1.4	81.0	1890	14	1738	16	1.58	1607.	15	43	2.8	12
15.0	2040	165	3.97	22826	9.3	13.2	90	2998	1061	16.6	1.3	81.7	2027	13	1858	15	1.51	1722.	16	46	2.9	12
16.0	2176	176	4.23	23581	9.6	12.8	94	3059	994	15.4	1.2	82.3	2164	12	1978	15	1.45	1823.	17	48	3.0	13
17.0	2312	187	4.50	24313	9.9	12.4	98	3112	936	14.4	1.2	82.8	2301	11	2098	14	1.39	1922.	18	51	3.1	14
18.0	2448	198	4.76	25025	10.2	12.0	102	3159	884	13.5	1.1	83.3	2438	10	2217	14	1.34	2035.	19	53	3.2	14
19.0	2584	210	5.02	25717	10.5	11.7	105	3201	837	12.7	1.0	83.6	2575	9	2337	13	1.30	2133.	20	56	3.3	15
20.0	2720	221	5.29	26392	10.8	11.4	109	3239	795	12.0	1.0	84.0	2711	9	2456	13	1.25	2228.	21	58	3.4	16
25.0	3400	276	6.61	29547	12.1	10.2	124	3383	636	9.4	0.8	85.3	3393	7	3050	11	1.10	2743.	26	70	3.8	18
30.0	4080	331	7.93	32410	13.2	9.3	138	3478	530	7.7	0.6	86.1	4074	6	3642	10	0.99	3215.	31	81	4.2	21
35.0	4760	386	9.26	35053	14.3	8.6	151	3545	454	6.6	0.5	86.7	4755	5	4232	9	0.90	3663.	36	92	4.5	
40.0	5440	441	10.58	37522	15.3	8.1	162	3595	397	5.7	0.5	87.2	5436	4	4821	8	0.84	4118.	41	102	4.8	
45.0	6120	496	11.90	39851	16.2	7.6	173	3634	353	5.0	0.4	87.5	6116	4	5409	8	0.79	4557.	46	113	5.1	
50.0	6800	551	13.22	42061	17.1	7.2	183	3665	318	4.5	0.4	87.7	6797	3	5996	8	0.74	4979.	51	123	5.4	

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PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 8. ZC= 62.(Sm)
NEUTRON NUMBERS: NP= 82. NT= 8. NC= 90.

AP**1/3= 5.143 AT**1/3= 2.520 ELSCAT < 6 deg
REDUCED MASS NUMBER= 14.32 AP+AT=AC=152.

INTERACTION RADIUS RINT=11.43 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 2.42 CT+CP= 8.23 C= 1.71

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 2.78

COULOMB RADII [fm]:
RCP= 5.72 RCT= 2.78 RC=RCP+RCT= 8.51

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 99.43 MeV K= .07082 n=2.766
VC(RINT)= 54.4 MeV

FISSION-TKE= 99. MeV
ASYMM. FISSION-TKE= 45. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 19.22 MeV
L-RLD= 97 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.58 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -4.7
COMPOUND NUCLEUS: -74.5

FUSION RELATED PARAMETERS:
R-BARRIER=10.30 fm V(RB)= 56.1 MeV
Q-VALUE= -16.6 MeV
L-CRITICAL= 64.

136 Xe on 16 O — 136 Xe on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	136	14	0.26	5872	3.1	68.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	272	29	0.53	8306	4.4	48.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	408	43	0.79	10175	5.4	39.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	544	57	1.05	11753	6.3	34.0	16	229	67	129.8	5.6	25.1	376	168	382	151	11.62	474.	4	12	1.5	4
4.5	612	64	1.19	12467	6.6	32.1	30	680	429	94.0	6.7	43.0	489	123	488	81	6.19	529.	4	12	1.6	5
5.0	680	72	1.32	13144	7.0	30.4	39	1034	720	75.7	6.3	52.2	584	96	574	62	4.72	588.	4	12	1.7	5
5.5	748	79	1.45	13787	7.3	29.0	47	1321	957	63.8	5.7	58.1	669	79	650	52	3.97	642.	5	18	1.8	6
6.0	816	86	1.58	14402	7.7	27.8	53	1560	1155	55.3	5.2	62.4	750	66	721	46	3.49	701.	6	20	1.9	6
6.5	884	93	1.71	14992	8.0	26.7	59	1761	1322	48.8	4.7	65.6	827	57	788	41	3.15	754.	7	22	2.0	7
7.0	952	100	1.84	15560	8.3	25.7	64	1939	1466	43.8	4.3	68.1	902	50	853	38	2.89	806.	7	24	2.1	8
7.5	1020	107	1.98	16108	8.6	24.8	69	2082	1590	39.7	3.9	70.2	976	44	917	35	2.69	864.	8	26	2.2	8
8.0	1088	115	2.11	16639	8.9	24.0	73	2212	1699	36.3	3.6	71.8	1048	40	979	33	2.52	915.	9	28	2.3	9
8.5	1156	122	2.24	17153	9.1	23.3	78	2326	1608	33.5	3.4	73.3	1120	36	1040	31	2.38	972.	9	29	2.4	9
9.0	1224	129	2.37	17653	9.4	22.7	82	2428	1519	31.1	3.2	74.5	1191	33	1101	30	2.27	1022.	10	31	2.4	10
9.5	1292	136	2.50	18139	9.7	22.1	85	2519	1439	29.0	3.0	75.5	1262	30	1161	28	2.16	1079.	10	32	2.5	10
10.0	1360	143	2.63	18613	9.9	21.5	89	2600	1367	27.2	2.8	76.4	1332	28	1221	27	2.08	1136.	11	34	2.6	10
10.5	1428	150	2.77	19075	10.1	21.0	93	2674	1302	25.5	2.6	77.2	1402	26	1280	26	2.00	1184.	11	35	2.7	11
11.0	1496	157	2.90	19526	10.4	20.5	96	2741	1243	24.1	2.5	77.9	1471	25	1339	25	1.93	1241.	12	37	2.7	11
11.5	1564	165	3.03	19968	10.6	20.1	99	2802	1189	22.8	2.4	78.6	1541	23	1398	25	1.86	1288.	12	38	2.8	12
12.0	1632	172	3.16	20400	10.8	19.6	102	2858	1139	21.7	2.2	79.1	1610	22	1457	24	1.80	1344.	13	40	2.9	12
13.0	1768	186	3.42	21239	11.3	18.9	109	2956	1051	19.7	2.0	80.1	1748	20	1574	22	1.70	1446.	14	43	3.0	13
14.0	1904	200	3.69	22046	11.7	18.2	114	3041	976	18.1	1.9	81.0	1886	18	1690	21	1.62	1546.	15	45	3.1	14
15.0	2040	215	3.95	22826	12.1	17.6	120	3114	911	16.7	1.7	81.7	2024	16	1806	20	1.54	1644.	16	48	3.2	15
16.0	2176	229	4.21	23581	12.5	17.0	125	3178	854	15.5	1.6	82.3	2161	15	1921	19	1.48	1741.	17	51	3.3	16
17.0	2312	243	4.48	24313	12.9	16.5	130	3234	804	14.5	1.5	82.8	2298	14	2036	19	1.42	1850.	18	53	3.5	16
18.0	2448	258	4.74	25025	13.3	16.0	135	3284	759	13.6	1.4	83.2	2435	13	2151	18	1.37	1944.	19	56	3.6	17
19.0	2584	272	5.00	25717	13.6	15.6	139	3329	719	12.8	1.3	83.6	2572	12	2266	17	1.33	2037.	20	58	3.7	18
20.0	2720	286	5.27	26392	14.0	15.2	144	3369	683	12.1	1.3	84.0	2709	11	2380	17	1.28	2128.	21	61	3.8	19
25.0	3400	358	6.58	29547	15.7	13.6	165	3521	546	9.4	1.0	85.3	3391	9	2950	15	1.12	2600.	26	73	4.2	22
30.0	4080	429	7.90	32410	17.2	12.4	183	3622	455	7.8	0.8	86.1	4073	7	3517	13	1.01	3048.	31	84	4.7	25
35.0	4760	501	9.22	35053	18.5	11.5	200	3694	390	6.6	0.7	86.7	4754	6	4081	12	0.93	3472.	36	96	5.0	
40.0	5440	573	10.53	37522	19.8	10.8	215	3747	341	5.7	0.6	87.1	5435	5	4644	11	0.86	3904.	41	106	5.4	
45.0	6120	644	11.85	39851	21.0	10.1	230	3789	303	5.1	0.5	87.5	6116	4	5206	11	0.81	4284.	46	117	5.7	
50.0	6800	716	13.17	42061	22.1	9.6	243	3822	273	4.5	0.5	87.7	6796	4	5767	10	0.76	4680.	51	127	6.1	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

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136 Xe on 27 Al

136 Xe on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 13. ZC= 67.(Ho)
NEUTRON NUMBERS: NP= 82. NT= 14. NC= 96.

AP**1/3= 5.143 AT**1/3= 3.000 ELSCAT <11 deg
REDUCED MASS NUMBER= 22.53 AP+AT=AC=163.

INTERACTION RADIUS RINT=11.95 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 3.05 CT+CP= 8.86 C= 2.00

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 3.35

COULOMB RADII [fm]:
RCP= 5.72 RCT= 3.32 RC=RCP+RCT= 9.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 154.13 MeV K= .13202 n=2.622
VC(RINT)= 84.4 MeV

FISSION-TKE= 110. MeV
ASYMM. FISSION-TKE= 69. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 22.56 MeV
L-RLD= 91 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.76 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -20.6
COMPOUND NUCLEUS: -65.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.76 fm V(RB)= 87.7 MeV
Q-VALUE= -41.3 MeV
L-CRITICAL= 88.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	136	23	0.27	5872	4.9	110.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	272	45	0.53	8306	7.0	78.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	408	68	0.80	10175	8.5	63.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	544	90	1.07	11753	9.9	55.3	29	296	98	124.2	10.5	27.9	309	235	316	221	10.89	442.	4 13	1.5	4
4.5	612	101	1.20	12467	10.5	52.1	51	774	491	91.4	11.3	44.3	439	173	434	128	6.26	495.	4 13	1.7	5
5.0	680	113	1.33	13144	11.0	49.4	66	1153	806	73.9	10.2	53.1	544	136	526	99	4.84	546.	4 17	1.9	6
5.5	748	124	1.47	13787	11.6	47.1	78	1462	1063	62.4	9.2	58.8	637	111	604	84	4.09	597.	5 20	2.0	7
6.0	816	135	1.60	14402	12.1	45.1	88	1719	1278	54.2	8.2	62.9	723	93	674	74	3.61	647.	6 22	2.1	8
6.5	884	146	1.73	14992	12.6	43.4	98	1936	1459	47.9	7.4	66.1	803	81	739	67	3.26	696.	7 24	2.3	9
7.0	952	158	1.87	15560	13.0	41.8	106	2121	1476	43.0	6.7	68.5	881	71	801	61	3.00	745.	7 26	2.4	10
7.5	1020	169	2.00	16108	13.5	40.4	114	2282	1377	39.0	6.2	70.5	957	63	861	57	2.79	798.	8 28	2.5	10
8.0	1088	180	2.13	16639	13.9	39.1	121	2422	1291	35.7	5.7	72.2	1031	57	920	54	2.62	846.	9 30	2.6	11
8.5	1156	191	2.27	17153	14.4	37.9	128	2546	1215	32.9	5.3	73.5	1105	51	977	51	2.48	893.	9 32	2.7	12
9.0	1224	203	2.40	17653	14.8	36.8	135	2656	1148	30.6	4.9	74.7	1177	47	1033	48	2.36	939.	10 34	2.8	13
9.5	1292	214	2.53	18139	15.2	35.9	141	2754	1087	28.5	4.6	75.7	1249	43	1089	46	2.25	985.	10 35	2.9	14
10.0	1360	225	2.67	18613	15.6	35.0	147	2842	1033	26.7	4.3	76.6	1320	40	1144	44	2.16	1037.	11 37	3.0	14
10.5	1428	237	2.80	19075	16.0	34.1	153	2922	984	25.1	4.1	77.4	1391	37	1198	43	2.08	1081.	11 39	3.1	15
11.0	1496	248	2.93	19526	16.3	33.3	159	2995	939	23.7	3.9	78.1	1461	35	1253	41	2.01	1133.	12 40	3.2	15
11.5	1564	259	3.07	19968	16.7	32.6	164	3061	898	22.5	3.7	78.8	1531	33	1306	40	1.94	1176.	12 42	3.3	16
12.0	1632	270	3.20	20400	17.1	31.9	169	3121	861	21.4	3.5	79.3	1601	31	1360	38	1.88	1227.	13 43	3.4	16
13.0	1768	293	3.47	21239	17.8	30.7	179	3229	794	19.4	3.2	80.3	1740	28	1466	36	1.78	1311.	14 46	3.5	18
14.0	1904	315	3.73	22046	18.4	29.5	189	3320	738	17.8	2.9	81.1	1879	25	1571	35	1.69	1403.	15 49	3.7	19
15.0	2040	338	4.00	22826	19.1	28.5	198	3400	688	16.4	2.7	81.8	2017	23	1676	33	1.61	1492.	16 52	3.8	20
16.0	2176	360	4.27	23581	19.7	27.6	206	3469	645	15.3	2.5	82.4	2155	21	1780	32	1.54	1581.	17 55	4.0	21
17.0	2312	383	4.53	24313	20.3	26.8	214	3531	607	14.3	2.3	82.9	2292	20	1884	30	1.49	1668.	18 58	4.1	22
18.0	2448	405	4.80	25025	20.9	26.1	222	3585	574	13.4	2.2	83.3	2430	18	1987	29	1.43	1753.	19 60	4.2	23
19.0	2584	428	5.07	25717	21.5	25.4	230	3634	543	12.6	2.1	83.7	2567	17	2090	28	1.38	1837.	20 63	4.4	24
20.0	2720	451	5.34	26392	22.0	24.7	237	3677	516	11.9	2.0	84.1	2704	16	2193	27	1.34	1920.	21 66	4.5	25
25.0	3400	563	6.67	29547	24.6	22.1	271	3843	413	9.3	1.5	85.3	3388	12	2703	24	1.17	2313.	26 78	5.1	30
30.0	4080	676	8.00	32410	27.0	20.2	302	3953	344	7.7	1.3	86.2	4070	10	3209	22	1.06	2713.	31 90	5.6	33
35.0	4760	788	9.34	35053	29.1	18.7	329	4032	295	6.5	1.1	86.8	4752	8	3712	20	0.97	3068.	36 102	6.1	
40.0	5440	901	10.67	37522	31.2	17.5	355	4091	258	5.6	0.9	87.2	5433	7	4212	18	0.90	3423.	41 114	6.5	
45.0	6120	1014	12.00	39851	33.1	16.5	378	4136	229	5.0	0.8	87.5	6114	6	4711	17	0.84	3757.	45 125	6.9	
50.0	6800	1126	13.34	42061	34.8	15.6	401	4173	206	4.5	0.7	87.8	6794	6	5209	16	0.79	4070.	50 135	7.3	

#340 136 Xe on 40 Ca

136 Xe on 40 Ca

136 Xe on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 20. ZC= 74.(W)
NEUTRON NUMBERS: NP= 82. NT= 20. NC=102.

AP**1/3= 5.143 AT**1/3= 3.420 ELSCAT <17 deg
REDUCED MASS NUMBER= 30.91 AP+AT=AC=176.

INTERACTION RADIUS RINT=12.41 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 3.59 CT+CP= 9.40 C= 2.22

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 3.85

COULOMB RADII [fm]:
RCP= 5.72 RCT= 3.84 RC=RCP+RCT= 9.57

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 226.52 MeV K= .21184 n=2.530
VC(RINT)= 125.1 MeV

FISSION-TKE= 127. MeV
ASYMM. FISSION-TKE= 100. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 25.35 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -33.0
COMPOUND NUCLEUS: -49.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.17 fm V(RB)= 130.8 MeV
Q-VALUE= -69.8 MeV
L-CRITICAL= 102.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	136	31	0.25	5872	6.8	170.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	272	62	0.49	8306	9.6	120.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	408	93	0.74	10175	11.7	98.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	544	124	0.99	11753	13.5	85.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	612	139	1.11	12467	14.3	80.2	56	498	233	110.1	17.1	35.0	323	289	326	253	8.40	457.	0 0	1.8	6
5.0	680	155	1.24	13144	15.1	76.1	82	939	602	85.9	16.0	47.0	458	222	442	174	5.77	504.	0 0	2.0	7
5.5	748	170	1.36	13787	15.9	72.5	101	1298	903	71.4	14.3	54.3	569	179	534	141	4.67	551.	5 19	2.1	8
6.0	816	185	1.48	14402	16.6	69.4	117	1597	1154	61.3	12.7	59.3	667	149	611	122	4.02	598.	6 22	2.3	9
6.5	884	201	1.61	14992	17.2	66.7	131	1850	1118	53.9	11.4	63.1	757	127	680	109	3.59	644.	6 25	2.4	10
7.0	952	216	1.73	15560	17.9	64.3	144	2066	1038	48.1	10.4	66.0	841	111	743	99	3.27	689.	7 27	2.6	11
7.5	1020	232	1.85	16108	18.5	62.1	156	2253	969	43.5	9.5	68.3	922	98	803	92	3.02	734.	8 29	2.7	12
8.0	1088	247	1.98	16639	19.1	60.1	167	2416	908	39.7	8.7	70.2	1000	88	860	86	2.83	778.	8 31	2.8	13
8.5	1156	263	2.10	17153	19.7	58.3	177	2561	855	36.5	8.1	71.8	1076	80	914	81	2.66	822.	9 33	3.0	14
9.0	1224	278	2.22	17653	20.3	56.7	187	2689	807	33.8	7.5	73.1	1151	73	968	76	2.52	865.	9 35	3.1	15
9.5	1292	294	2.35	18139	20.8	55.2	196	2803	765	31.5	7.0	74.3	1225	67	1020	73	2.40	907.	10 37	3.2	16
10.0	1360	309	2.47	18613	21.4	53.8	205	2906	727	29.5	6.6	75.3	1298	62	1071	70	2.30	949.	11 38	3.3	17
10.5	1428	325	2.59	19075	21.9	52.5	213	2999	692	27.7	6.2	76.2	1371	57	1122	67	2.21	990.	11 40	3.4	18
11.0	1496	340	2.72	19526	22.4	51.3	221	3084	661	26.1	5.8	76.9	1442	54	1172	64	2.13	1037.	12 42	3.5	18
11.5	1564	355	2.84	19968	22.9	50.1	229	3161	632	24.7	5.5	77.6	1514	50	1221	62	2.06	1077.	12 43	3.6	19
12.0	1632	371	2.96	20400	23.4	49.1	237	3232	605	23.4	5.3	78.3	1585	47	1270	60	1.99	1117.	13 45	3.7	20
13.0	1768	402	3.21	21239	24.4	47.2	251	3357	559	21.3	4.8	79.4	1726	42	1367	57	1.88	1202.	14 48	3.9	21
14.0	1904	433	3.46	22046	25.3	45.4	265	3465	519	19.5	4.4	80.3	1866	38	1463	54	1.78	1278.	15 51	4.1	23
15.0	2040	464	3.71	22826	26.2	43.9	278	3557	484	18.0	4.1	81.0	2005	35	1557	51	1.70	1361.	16 54	4.2	24
16.0	2176	495	3.95	23581	27.0	42.5	290	3639	454	16.7	3.8	81.7	2144	32	1651	49	1.62	1442.	17 57	4.4	25
17.0	2312	525	4.20	24313	27.9	41.2	302	3710	427	15.6	3.5	82.2	2282	30	1745	47	1.56	1522.	18 60	4.6	26
18.0	2448	556	4.45	25025	28.7	40.1	313	3774	403	14.6	3.3	82.7	2420	28	1837	46	1.50	1590.	19 63	4.7	28
19.0	2584	587	4.69	25717	29.5	39.0	324	3831	382	13.7	3.1	83.1	2558	26	1930	44	1.45	1667.	20 66	4.8	29
20.0	2720	618	4.94	26392	30.2	38.0	335	3882	363	12.9	2.9	83.5	2696	24	2021	43	1.41	1742.	21 68	5.0	30
25.0	3400	773	6.18	29547	33.8	34.0	384	4076	290	10.1	2.3	84.9	3381	19	2476	37	1.23	2104.	26 81	5.7	35
30.0	4080	927	7.41	32410	37.0	31.0	427	4205	242	8.3	1.9	85.8	4065	15	2925	33	1.10	2435.	30 94	6.2	40
35.0	4760	1082	8.65	35053	40.0	28.7	467	4298	207	7.0	1.6	86.5	4747	13	3370	31	1.01	2757.	35 106	6.8	
40.0	5440	1236	9.88	37522	42.8	26.9	503	4367	181	6.1	1.4	86.9	5429	11	3812	28	0.94	3055.	40 118	7.3	
45.0	6120	1391	11.12	39851	45.4	25.4	537	4420	161	5.4	1.2	87.3	6110	10	4251	27	0.88	3330.	44 129	7.7	
50.0	6800	1545	12.35	42061	47.8	24.0	569	4463	145	4.8	1.1	87.6	6791	9	4689	25	0.83	3610.	49 140	8.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nPS	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#341 136 Xe on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 26. ZC= 80.(Hg)
NEUTRON NUMBERS: NP= 82. NT= 30. NC=112.

AP**1/3= 5.143 AT**1/3= 3.826 ELSCAT <24 deg
REDUCED MASS NUMBER= 39.67 AP+AT=AC=192.

INTERACTION RADIUS RINT=12.85 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 4.12 CT+CP= 9.93 C= 2.41

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 4.35

COULOMB RADII [fm]:
RCP= 5.72 RCT= 4.27 RC=RCP+RCT=10.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 283.14 MeV K= .26379 n=2.489
VC(RINT)= 157.1 MeV

FISSION-TKE= 141. MeV
ASYMM. FISSION-TKE= 124. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.905 MeV/fm**2 PROX-FACTOR= 27.39 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -61.4
COMPOUND NUCLEUS: -30.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.56 fm V(RB)= 164.0 MeV
Q-VALUE= -117.3 MeV
L-CRITICAL= 118.

136 Xe on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	40	0.25	5872	8.7	221.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	272	79	0.51	8306	12.3	156.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	408	119	0.76	10175	15.0	127.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	544	159	1.01	11753	17.4	110.5	21	50	0	158.6	13.7	10.7	110	434	124	1103	31.01	0.	4	15	1.3	4
4.5	612	179	1.14	12467	18.4	104.2	82	632	341	103.9	23.9	38.1	298	314	293	301	7.95	422.	4	15	1.6	5
5.0	680	198	1.26	13144	19.4	98.9	113	1094	727	82.1	21.1	48.9	437	243	408	217	5.71	464.	4	17	1.8	7
5.5	748	218	1.39	13787	20.3	94.3	138	1470	1043	68.6	18.4	55.7	552	196	496	178	4.69	507.	5	20	2.0	8
6.0	816	238	1.52	14402	21.3	90.3	159	1783	983	59.1	16.3	60.4	652	164	570	155	4.07	548.	6	23	2.2	10
6.5	884	258	1.64	14992	22.1	86.7	178	2047	907	52.1	14.5	64.0	743	141	635	139	3.65	590.	6	26	2.4	11
7.0	952	278	1.77	15560	23.0	83.6	194	2274	843	46.5	13.1	66.7	829	123	694	127	3.34	632.	7	28	2.6	12
7.5	1020	298	1.89	16108	23.8	80.7	210	2470	786	42.1	11.9	68.9	911	109	749	117	3.09	669.	8	30	2.7	14
8.0	1088	317	2.02	16639	24.5	78.2	224	2641	737	38.5	11.0	70.8	990	98	802	110	2.89	710.	8	32	2.9	15
8.5	1156	337	2.15	17153	25.3	75.8	237	2793	694	35.4	10.1	72.3	1068	88	852	104	2.73	750.	9	34	3.0	16
9.0	1224	357	2.27	17653	26.0	73.7	250	2927	655	32.8	9.4	73.6	1143	81	900	98	2.59	790.	9	36	3.2	17
9.5	1292	377	2.40	18139	26.7	71.7	262	3047	621	30.6	8.8	74.7	1218	74	948	94	2.47	829.	10	38	3.3	18
10.0	1360	397	2.53	18613	27.4	69.9	274	3155	590	28.6	8.2	75.7	1291	69	994	90	2.37	867.	10	40	3.4	19
10.5	1428	417	2.65	19075	28.1	68.2	285	3253	562	26.9	7.8	76.5	1364	64	1039	86	2.27	906.	11	41	3.5	20
11.0	1496	436	2.78	19526	28.8	66.7	296	3342	536	25.4	7.3	77.3	1436	60	1084	83	2.19	943.	11	43	3.6	21
11.5	1564	456	2.90	19968	29.4	65.2	306	3423	513	24.0	7.0	78.0	1508	56	1128	81	2.12	980.	12	45	3.8	22
12.0	1632	476	3.03	20400	30.1	63.8	316	3497	491	22.8	6.6	78.6	1579	53	1172	78	2.05	1017.	13	46	3.9	23
13.0	1768	516	3.28	21239	31.3	61.3	335	3629	453	20.7	6.0	79.6	1721	47	1258	74	1.93	1089.	14	50	4.1	25
14.0	1904	555	3.54	22046	32.5	59.1	353	3742	421	19.0	5.5	80.5	1861	43	1343	70	1.83	1158.	15	53	4.3	27
15.0	2040	595	3.79	22826	33.6	57.1	370	3839	393	17.5	5.1	81.2	2001	39	1426	67	1.75	1226.	16	56	4.5	29
16.0	2176	635	4.04	23581	34.7	55.3	387	3924	368	16.3	4.7	81.9	2140	36	1509	64	1.68	1300.	17	59	4.6	30
17.0	2312	674	4.29	24313	35.8	53.6	403	4000	347	15.2	4.4	82.4	2279	33	1591	61	1.61	1364.	17	62	4.8	32
18.0	2448	714	4.55	25025	36.8	52.1	418	4066	327	14.2	4.1	82.9	2417	31	1673	59	1.55	1435.	18	65	5.0	33
19.0	2584	754	4.80	25717	37.8	50.7	432	4126	310	13.4	3.9	83.3	2555	29	1753	57	1.50	1496.	19	67	5.1	35
20.0	2720	793	5.05	26392	38.8	49.4	447	4180	295	12.6	3.7	83.7	2693	27	1834	55	1.45	1564.	20	70	5.3	36
25.0	3400	992	6.31	29547	43.4	44.2	511	4384	236	9.9	2.9	85.1	3379	21	2231	48	1.27	1880.	25	83	6.0	42
30.0	4080	1190	7.58	32410	47.5	40.4	569	4520	196	8.1	2.4	85.9	4063	17	2621	43	1.14	2166.	30	96	6.7	48
35.0	4760	1388	8.84	35053	51.3	37.4	621	4617	168	6.9	2.0	86.6	4746	14	3007	40	1.04	2439.	34	108	7.3	
40.0	5440	1587	10.10	37522	54.9	35.0	669	4690	147	6.0	1.7	87.0	5428	12	3390	37	0.97	2688.	39	120	7.8	
45.0	6120	1785	11.36	39851	58.2	33.0	714	4746	131	5.3	1.5	87.4	6109	11	3770	35	0.91	2933.	43	131	8.3	
50.0	6800	1983	12.63	42061	61.3	31.3	757	4791	118	4.7	1.4	87.6	6790	10	4147	33	0.86	3159.	48	143	8.8	

#342 136 Xe on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 29. ZC= 83.(Bi)
NEUTRON NUMBERS: NP= 82. NT= 34. NC=116.

AP**1/3= 5.143 AT**1/3= 3.979 ELSCAT <27 deg
REDUCED MASS NUMBER= 43.06 AP+AT=AC=199.

INTERACTION RADIUS RINT=13.02 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 4.31 CT+CP=10.12 C= 2.48

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 4.53

COULOMB RADII [fm]:
RCP= 5.72 RCT= 4.45 RC=RCP+RCT=10.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 310.84 MeV K= .28695 n=2.475
VC(RINT)= 173.0 MeV

FISSION-TKE= 149. MeV
ASYMM. FISSION-TKE= 135. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.905 MeV/fm**2 PROX-FACTOR= 28.16 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.73 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -65.2
COMPOUND NUCLEUS: -20.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.71 fm V(RB)= 180.6 MeV
Q-VALUE= -131.5 MeV
L-CRITICAL= 120.

136 Xe on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	43	0.25	5872	9.4	246.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
2.0	272	86	0.50	8306	13.3	174.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
3.0	408	129	0.75	10175	16.3	142.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.0	544	172	1.00	11753	18.8	123.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0
4.5	612	194	1.12	12467	20.0	116.2	85	579	291	107.8	27.2	36.1	266	346	261	355	8.52	407.	0	0	1.6	5
5.0	680	215	1.24	13144	21.1	110.3	121	1059	692	84.6	23.8	47.7	414	266	382	249	5.95	448.	4	17	1.8	7
5.5	748	237	1.37	13787	22.1	105.1	149	1450	944	70.4	20.7	54.8	533	215	474	202	4.84	490.	5	20	2.1	8
6.0	816	258	1.49	14402	23.1	100.7	172	1776	865	60.6	18.2	59.7	636	180	549	175	4.19	529.	5	23	2.3	10
6.5	884	280	1.62	14992	24.0	96.7	193	2051	799	53.2	16.2	63.4	730	154	615	156	3.74	570.	6	26	2.4	11
7.0	952	301	1.74	15560	24.9	93.2	212	2287	742	47.5	14.6	66.2	818	134	674	143	3.41	608.	7	28	2.6	13
7.5	1020	323	1.87	16108	25.8	90.0	229	2491	692	43.0	13.3	68.5	901	119	728	132	3.16	648.	7	30	2.8	14
8.0	1088	344	1.99	16639	26.6	87.2	245	2670	649	39.2	12.2	70.4	982	106	779	124	2.95	683.	8	32	2.9	16
8.5	1156	366	2.12	17153	27.5	84.6	259	2827	611	36.1	11.2	71.9	1060	96	828	116	2.78	722.	9	34	3.1	17
9.0	1224	387	2.24	17653	28.3	82.2	274	2967	577	33.4	10.4	73.3	1136	88	875	110	2.64	760.	9	36	3.2	18
9.5	1292	409	2.36	18139	29.0	80.0	287	3092	546	31.2	9.7	74.4	1211	81	921	105	2.52	798.	10	38	3.3	19
10.0	1360	431	2.49	18613	29.8	78.0	300	3205	519	29.2	9.1	75.4	1285	75	966	101	2.41	836.	10	40	3.5	20
10.5	1428	452	2.61	19075	30.5	76.1	312	3307	494	27.4	8.6	76.3	1359	69	1010	97	2.31	872.	11	42	3.6	21
11.0	1496	474	2.74	19526	31.2	74.3	324	3399	472	25.9	8.1	77.1	1431	65	1053	93	2.23	909.	11	43	3.7	22
11.5	1564	495	2.86	19968	31.9	72.7	335	3484	451	24.5	7.7	77.8	1503	61	1095	90	2.15	939.	12	45	3.8	24
12.0	1632	517	2.99	20400	32.6	71.2	346	3561	432	23.2	7.3	78.4	1575	57	1137	87	2.08	975.	12	47	3.9	25
13.0	1768	560	3.24	21239	34.0	68.4	367	3698	399	21.1	6.6	79.5	1717	51	1219	82	1.96	1044.	13	50	4.1	27
14.0	1904	603	3.49	22046	35.2	65.9	387	3815	371	19.3	6.1	80.3	1858	46	1300	78	1.86	1111.	14	53	4.4	29
15.0	2040	646	3.73	22826	36.5	63.7	406	3917	346	17.8	5.6	81.1	1998	42	1380	74	1.78	1183.	15	56	4.5	30
16.0	2176	689	3.98	23581	37.7	61.6	424	4006	324	16.5	5.2	81.7	2137	39	1459	71	1.70	1247.	16	59	4.7	32
17.0	2312	732	4.23	24313	38.8	59.8	442	4084	305	15.4	4.9	82.3	2276	36	1537	68	1.63	1309.	17	62	4.9	34
18.0	2448	775	4.48	25025	40.0	58.1	458	4154	288	14.5	4.6	82.8	2414	34	1614	66	1.57	1378.	18	65	5.1	35
19.0	2584	818	4.73	25717	41.0	56.6	475	4216	273	13.6	4.3	83.2	2553	31	1691	64	1.52	1437.	19	68	5.3	37
20.0	2720	861	4.98	26392	42.1	55.1	490	4272	259	12.8	4.1	83.6	2691	29	1768	62	1.47	1503.	20	71	5.4	38
25.0	3400	1076	6.22	29547	47.1	49.3	562	4485	207	10.0	3.2	85.0	3377	23	2144	54	1.29	1797.	25	84	6.2	45
30.0	4080	1292	7.47	32410	51.6	45.0	625	4626	173	8.2	2.6	85.9	4062	18	2513	48	1.16	2072.	29	97	6.8	51
35.0	4760	1507	8.71	35053	55.7	41.7	682	4727	148	7.0	2.2	86.5	4745	15	2878	44	1.06	2336.	34	109	7.4	
40.0	5440	1722	9.96	37522	59.6	39.0	735	4803	129	6.1	1.9	87.0	5427	13	3239	41	0.98	2577.	38	120	8.0	
45.0	6120	1937	11.20	39851	63.2	36.8	785	4862	115	5.4	1.7	87.3	6108	12	3597	39	0.92	2794.	43	132	8.5	
50.0	6800	2153	12.45	42061	66.6	34.9	831	4909	103	4.8	1.5	87.6	6790	10	3953	36	0.87	3011.	47	143	9.0	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#343 136 Xe on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 42. ZC= 96.(Cm)
NEUTRON NUMBERS: NP= 82. NT= 50. NC=132.

AP**1/3= 5.143 AT**1/3= 4.514 ELSCAT <42 deg
REDUCED MASS NUMBER= 54.88 AP+AT=AC=228.

INTERACTION RADIUS RINT=13.60 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 5.00 CT+CP=10.81 C̄= 2.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 5.20

COULOMB RADII [fm]:
RCP= 5.72 RCT= 5.08 RC=RCP+RCT=10.80

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 425.20 MeV K= .36286 n=2.449
VC(RINT)= 239.8 MeV

FISSION-TKE= 184. MeV
ASYMM. FISSION-TKE= 181. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 30.72 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.76 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -87.5
COMPOUND NUCLEUS: 47.0

FUSION RELATED PARAMETERS:
R-BARRIER=12.19 fm V(RB)= 250.7 MeV
Q-VALUE= -220.9 MeV
L-CRITICAL= 104.

136 Xe on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	55	0.23	5872	12.0	357.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	272	110	0.46	8306	17.0	252.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	408	165	0.69	10175	20.8	206.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	544	220	0.92	11753	24.0	178.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	612	247	1.03	12447	25.5	168.3	58	167	0	142.2	41.7	18.9	85	527	92	989	17.41	0.	0	0	1.0	2
5.0	680	274	1.14	13144	26.8	159.7	129	738	403	102.1	37.6	38.9	284	396	259	450	7.78	396.	2	14	1.4	5
5.5	748	302	1.26	13787	28.1	152.3	173	1202	440	82.7	31.7	48.7	434	314	375	336	5.80	432.	4	19	1.7	7
6.0	816	329	1.37	14402	29.4	145.8	208	1589	404	70.0	27.3	55.0	557	259	463	280	4.82	467.	5	22	2.0	9
6.5	884	357	1.49	14992	30.6	140.1	238	1916	373	61.0	24.0	59.5	665	219	535	245	4.22	502.	6	25	2.2	11
7.0	952	384	1.60	15560	31.8	135.0	264	2196	346	54.1	21.4	63.0	763	189	596	220	3.80	535.	6	27	2.4	13
7.5	1020	412	1.72	16108	32.9	130.4	289	2438	323	48.6	19.3	65.7	853	167	651	202	3.48	571.	7	30	2.6	14
8.0	1088	439	1.83	16639	33.9	126.3	311	2650	303	44.2	17.6	67.9	940	148	701	187	3.23	603.	8	32	2.8	16
8.5	1156	466	1.95	17153	35.0	122.5	332	2837	285	40.6	16.2	69.7	1022	134	748	176	3.03	635.	8	34	2.9	18
9.0	1224	494	2.06	17653	36.0	119.0	351	3003	269	37.5	15.0	71.3	1102	122	792	166	2.86	669.	9	36	3.1	19
9.5	1292	521	2.17	18139	37.0	115.9	370	3152	255	34.8	13.9	72.6	1181	111	833	158	2.72	699.	9	38	3.2	21
10.0	1360	549	2.29	18613	38.0	112.9	387	3286	242	32.5	13.0	73.7	1257	103	874	151	2.59	733.	10	40	3.4	22
10.5	1428	576	2.40	19075	38.9	110.2	404	3407	230	30.5	12.2	74.7	1333	95	913	144	2.49	762.	10	42	3.5	24
11.0	1496	604	2.52	19526	39.8	107.7	420	3517	220	28.7	11.5	75.6	1407	89	951	139	2.39	794.	11	43	3.7	25
11.5	1564	631	2.63	19968	40.7	105.3	436	3617	210	27.2	10.9	76.4	1481	83	988	134	2.30	826.	12	45	3.8	26
12.0	1632	659	2.75	20400	41.6	103.1	451	3709	202	25.8	10.4	77.1	1554	78	1024	129	2.23	853.	12	47	3.9	28
13.0	1768	713	2.98	21239	43.3	99.0	479	3872	186	23.3	9.4	78.3	1698	70	1096	122	2.09	915.	13	50	4.2	30
14.0	1904	768	3.20	22046	44.9	95.4	506	4011	173	21.3	8.6	79.3	1841	63	1165	115	1.98	976.	14	53	4.4	32
15.0	2040	823	3.43	22826	46.5	92.2	532	4132	161	19.7	7.9	80.2	1983	57	1232	110	1.89	1035.	15	56	4.6	34
16.0	2176	878	3.66	23581	48.0	89.3	557	4238	151	18.2	7.3	80.9	2123	53	1299	105	1.80	1087.	16	59	4.8	37
17.0	2312	933	3.89	24313	49.5	86.6	580	4331	142	17.0	6.8	81.5	2263	49	1364	100	1.73	1142.	17	62	5.0	39
18.0	2448	988	4.12	25025	50.9	84.2	603	4414	134	15.9	6.4	82.0	2403	45	1429	97	1.67	1203.	18	65	5.2	40
19.0	2584	1043	4.35	25717	52.3	81.9	624	4488	127	15.0	6.0	82.5	2542	42	1493	93	1.61	1257.	19	68	5.4	42
20.0	2720	1098	4.58	26392	53.7	79.9	645	4554	121	14.1	5.7	82.9	2681	39	1556	90	1.56	1309.	20	71	5.5	44
25.0	3400	1372	5.72	29547	60.0	71.4	741	4807	97	11.0	4.4	84.5	3370	30	1866	79	1.35	1565.	24	84	6.4	52
30.0	4080	1646	6.87	32410	65.7	65.2	826	4976	80	9.0	3.6	85.5	4056	24	2168	71	1.21	1792.	28	97	7.1	60
35.0	4760	1921	8.01	35053	71.0	60.4	903	5096	69	7.6	3.1	86.2	4740	20	2464	65	1.11	2016.	33	109	7.7	
40.0	5440	2195	9.15	37522	75.9	56.5	974	5186	60	6.6	2.7	86.7	5422	18	2755	60	1.03	2219.	37	120	8.3	
45.0	6120	2469	10.30	39851	80.5	53.2	1041	5257	53	5.9	2.4	87.1	6105	15	3044	56	0.96	2416.	41	132	8.9	
50.0	6800	2744	11.44	42061	84.9	50.5	1103	5313	48	5.2	2.1	87.4	6786	14	3329	53	0.91	2596.	46	143	9.4	

#344 136 Xe on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 47. ZC=101.(Md)
NEUTRON NUMBERS: NP= 82. NT= 61. NC=143.

AP**1/3= 5.143 AT**1/3= 4.762 ELSCAT <52 deg
REDUCED MASS NUMBER= 60.20 AP+AT=AC=244.

INTERACTION RADIUS RINT=13.87 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 5.32 CT+CP=11.13 C̄= 2.78

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 5.50

COULOMB RADII [fm]:
RCP= 5.72 RCT= 5.34 RC=RCP+RCT=11.06

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 464.99 MeV K= .38083 n=2.443
VC(RINT)= 263.1 MeV

FISSION-TKE= 197. MeV
ASYMM. FISSION-TKE= 196. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 31.47 MeV
L-RLD= 55 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.45 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -87.6
COMPOUND NUCLEUS: 76.1

FUSION RELATED PARAMETERS:
R-BARRIER=12.42 fm V(RB)= 274.4 MeV
Q-VALUE= -249.9 MeV
L-CRITICAL= 98.

136 Xe on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	60	0.23	5872	13.2	399.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	272	120	0.46	8306	18.6	282.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	408	181	0.69	10175	22.8	230.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	544	241	0.92	11753	26.3	199.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	612	271	1.03	12467	27.9	188.4	64	170	0	142.4	52.6	18.8	71	541	73	1114	17.88	0.	0	0	0.8	2
5.0	680	301	1.14	13144	29.4	178.7	144	764	356	102.2	43.0	38.9	273	407	241	504	7.95	371.	3	14	1.3	5
5.5	748	331	1.26	13787	30.9	170.4	194	1247	324	82.7	35.6	48.6	426	322	355	376	5.92	405.	4	19	1.6	7
6.0	816	361	1.37	14402	32.3	163.1	233	1649	297	70.1	30.4	55.0	551	265	441	313	4.92	438.	5	22	1.9	9
6.5	884	391	1.49	14992	33.6	156.7	266	1989	274	61.0	26.6	59.5	659	225	511	274	4.30	468.	6	25	2.2	12
7.0	952	421	1.60	15560	34.8	151.0	296	2280	254	54.1	23.7	62.9	758	194	570	246	3.87	500.	6	28	2.4	14
7.5	1020	451	1.72	16108	36.1	145.9	323	2532	237	48.7	21.4	65.7	849	171	623	226	3.55	531.	7	30	2.6	16
8.0	1088	482	1.83	16639	37.2	141.3	348	2753	222	44.2	19.5	67.9	936	152	670	210	3.29	561.	8	32	2.8	18
8.5	1156	512	1.94	17153	38.4	137.1	371	2947	209	40.6	17.9	69.7	1019	137	714	197	3.09	594.	8	34	2.9	19
9.0	1224	542	2.06	17653	39.5	133.2	393	3120	198	37.5	16.5	71.3	1099	125	795	186	2.92	623.	9	36	3.1	21
9.5	1292	572	2.17	18139	40.6	129.7	413	3275	187	34.8	15.4	72.6	1178	114	795	176	2.77	652.	9	38	3.2	23
10.0	1360	602	2.29	18613	41.6	126.4	433	3414	178	32.5	14.4	73.7	1255	105	832	168	2.64	683.	10	40	3.4	24
10.5	1428	632	2.40	19075	42.7	123.3	452	3540	169	30.5	13.5	74.7	1330	98	868	161	2.53	711.	10	42	3.5	26
11.0	1496	662	2.52	19526	43.7	120.5	470	3654	162	28.8	12.7	75.6	1405	91	904	155	2.44	738.	11	43	3.7	28
11.5	1564	692	2.63	19968	44.6	117.8	487	3759	154	27.2	12.0	76.4	1479	85	938	150	2.35	768.	11	45	3.8	29
12.0	1632	722	2.75	20400	45.6	115.4	504	3854	148	25.8	11.4	77.1	1552	80	972	145	2.27	797.	12	47	3.9	30
13.0	1768	783	2.97	21239	47.5	110.8	536	4024	137	23.4	10.3	78.3	1697	71	1037	136	2.14	852.	13	50	4.2	33
14.0	1904	843	3.20	22046	49.3	106.8	566	4169	127	21.4	9.4	79.3	1839	65	1100	129	2.02	904.	14	53	4.4	36
15.0	2040	903	3.43	22826	51.0	103.2	595	4294	118	19.7	8.7	80.2	1981	59	1162	123	1.92	959.	15	56	4.6	38
16.0	2176	963	3.66	23581	52.7	99.9	623	4404	111	18.2	8.1	80.9	2122	54	1223	117	1.84	1008.	16	59	4.8	41
17.0	2312	1023	3.89	24313	54.3	96.9	649	4501	104	17.0	7.5	81.5	2262	50	1283	112	1.77	1061.	17	62	5.0	43
18.0	2448	1084	4.12	25025	55.9	94.2	674	4587	99	15.9	7.0	82.0	2402	46	1341	108	1.70	1112.	17	65	5.2	45
19.0	2584	1144	4.35	25717	57.4	91.7	698	4664	93	15.0	6.6	82.5	2541	43	1400	104	1.64	1162.	18	68	5.4	47
20.0	2720	1204	4.58	26392	58.9	89.4	722	4734	89	14.1	6.2	82.9	2679	41	1457	101	1.59	1211.	19	71	5.6	49
25.0	3400	1505	5.72	29547	65.8	79.9	829	4997	71	11.0	4.9	84.5	3369	31	1737	88	1.38	1444.	24	84	6.4	58
30.0	4080	1806	6.86	32410	72.1	73.0	924	5173	59	9.0	4.0	85.5	4055	25	2009	79	1.24	1658.	28	96	7.1	66
35.0	4760	2107	8.01	35053	77.9	67.6	1011	5298	50	7.6	3.4	86.2	4739	21	2276	72	1.13	1858.	32	108	7.8	
40.0	5440	2408	9.15	37522	83.3	63.2	1090	5392	44	6.6	2.9	86.7	5422	18	2538	67	1.05	2049.	36	120	8.4	
45.0	6120	2709	10.29	39851	88.3	59.6	1164	5465	39	5.9	2.6	87.1	6104	16	2796	63	0.98	2221.	41	131	9.0	
50.0	6800	3010	11.44	42061	93.1	56.5	1233	5523	35	5.2	2.3	87.4	6786	14	3052	59	0.93	2391.	45	142	9.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#345 136 Xe on 140 Ce

136 Xe on 140 Ce

136 Xe on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 58. ZC=112.( )
NEUTRON NUMBERS: NP= 82. NT= 82. NC=164.

AP**1/3= 5.143 AT**1/3= 5.192
REDUCED MASS NUMBER= 68.99 AP+AT=AC=276.

INTERACTION RADIUS RINT=14.34 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 5.87 CT+CP=11.69 C̄= 2.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.04

COULOMB RADII [fm]:
RCP= 5.72 RCT= 5.82 RC=RCP+RCT=11.54

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 550.21 MeV K= .40915 n=2.440
VC(RINT)= 314.2 MeV

FISSION-TKE= 229. MeV
ASYMM. FISSION-TKE= 228. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 32.73 MeV
L-RLD= 30 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.04 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -88.2
COMPOUND NUCLEUS: 152.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.80 fm V(RB)= 326.7 MeV
Q-VALUE= -326.9 MeV
L-CRITICAL= 19.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	136	69	0.22	5872	15.1	493.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	272	138	0.44	8306	21.3	348.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	408	207	0.66	10175	26.1	284.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	544	276	0.88	11753	30.2	246.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	612	310	0.99	12467	32.0	232.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	680	345	1.10	13144	33.7	220.5	143	576	11	113.9	58.2	33.0	202	478	169	739	9.77	332.	2	13	0.7	2
5.5	748	379	1.21	13787	35.4	210.3	210	1114	10	90.2	45.9	44.9	373	375	297	507	6.69	362.	3	18	1.2	5
6.0	816	414	1.32	14402	37.0	201.3	260	1561	9	75.6	38.4	52.2	510	306	369	410	5.40	390.	4	21	1.6	8
6.5	884	448	1.43	14992	38.5	193.4	301	1940	8	65.4	33.2	57.3	626	258	462	354	4.65	418.	5	24	1.9	11
7.0	952	483	1.54	15560	39.9	186.4	338	2264	8	57.8	29.3	61.1	730	222	521	315	4.15	445.	6	27	2.1	14
7.5	1020	517	1.65	16108	41.3	180.1	371	2544	7	51.8	26.3	64.1	825	195	573	287	3.78	473.	7	29	2.3	16
8.0	1088	552	1.76	16639	42.7	174.4	401	2790	7	47.0	23.9	66.5	915	173	619	266	3.49	499.	7	32	2.6	19
8.5	1156	586	1.87	17153	44.0	169.2	429	3007	6	43.0	21.8	68.5	1001	155	660	248	3.27	526.	8	34	2.7	21
9.0	1224	621	1.98	17653	45.3	164.4	456	3199	6	39.7	20.1	70.2	1083	141	699	234	3.08	553.	8	36	2.9	23
9.5	1292	655	2.09	18139	46.5	160.0	481	3371	5	36.8	18.7	71.6	1163	129	735	222	2.92	579.	9	38	3.1	25
10.0	1360	690	2.20	18613	47.7	156.0	504	3526	5	34.4	17.4	72.8	1241	119	769	211	2.78	604.	10	39	3.2	27
10.5	1428	724	2.31	19075	48.9	152.2	527	3666	5	32.2	16.3	73.9	1318	110	802	202	2.66	629.	10	41	3.4	29
11.0	1496	759	2.42	19526	50.0	148.7	549	3794	5	30.3	15.4	74.8	1394	102	833	194	2.55	657.	11	43	3.5	30
11.5	1564	793	2.53	19968	51.2	145.4	570	3910	4	28.6	14.5	75.7	1468	96	864	187	2.46	681.	11	45	3.7	32
12.0	1632	828	2.63	20400	52.3	142.4	590	4016	4	27.1	13.8	76.4	1542	90	893	181	2.38	705.	12	46	3.8	34
13.0	1768	897	2.85	21239	54.4	136.8	628	4205	4	24.6	12.5	77.7	1688	80	951	170	2.23	754.	12	50	4.1	37
14.0	1904	966	3.07	22046	56.5	131.8	665	4366	4	22.4	11.4	78.8	1832	72	1006	160	2.11	802.	13	53	4.3	40
15.0	2040	1035	3.29	22826	58.4	127.3	699	4506	3	20.7	10.5	79.7	1974	66	1059	153	2.01	848.	14	56	4.5	43
16.0	2176	1104	3.51	23581	60.4	123.3	732	4629	3	19.1	9.7	80.4	2116	60	1111	146	1.92	893.	15	59	4.7	46
17.0	2312	1173	3.73	24313	62.2	119.6	763	4737	3	17.8	9.0	81.1	2257	55	1163	140	1.84	936.	16	61	5.0	49
18.0	2448	1242	3.95	25025	64.0	116.2	793	4833	3	16.7	8.5	81.7	2397	51	1213	134	1.77	983.	17	64	5.1	51
19.0	2584	1311	4.17	25717	65.8	113.1	822	4919	2	15.7	8.0	82.2	2536	48	1262	130	1.71	1024.	18	67	5.3	54
20.0	2720	1380	4.39	26392	67.5	110.3	850	4996	2	14.8	7.5	82.6	2675	45	1311	125	1.65	1068.	19	70	5.5	56
25.0	3400	1725	5.49	29547	75.4	98.6	978	5289	2	11.5	5.8	84.2	3366	34	1547	109	1.43	1274.	23	83	6.4	66
30.0	4080	2070	6.59	32410	82.6	90.0	1091	5485	1	9.4	4.8	85.3	4052	28	1775	98	1.29	1456.	27	95	7.1	76
35.0	4760	2414	7.69	35053	89.3	83.4	1193	5624	1	8.0	4.1	86.0	4737	23	1996	89	1.17	1631.	31	107	7.8	
40.0	5440	2759	8.78	37522	95.4	78.0	1288	5729	1	6.9	3.5	86.5	5420	20	2213	83	1.09	1796.	35	118	8.4	
45.0	6120	3104	9.88	39851	101.2	73.5	1376	5810	1	6.1	3.1	86.9	6103	17	2427	78	1.02	1944.	39	129	9.0	
50.0	6800	3449	10.98	42061	106.7	69.7	1458	5875	1	5.5	2.8	87.3	6784	16	2637	73	0.96	2087.	43	140	9.5	

#346 136 Xe on 154 Sm

136 Xe on 154 Sm

136 Xe on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 62. ZC=116.( )
NEUTRON NUMBERS: NP= 82. NT= 92. NC=174.

AP**1/3= 5.143 AT**1/3= 5.360
REDUCED MASS NUMBER= 72.22 AP+AT=AC=290.

INTERACTION RADIUS RINT=14.52 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 6.09 CT+CP=11.90 C̄= 2.97

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.25

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.00 RC=RCP+RCT=11.72

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 579.11 MeV K= .41415 n=2.441
VC(RINT)= 331.6 MeV

FISSION-TKE= 240. MeV
ASYMM. FISSION-TKE= 239. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 33.03 MeV
L-RLD= 19 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.91 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -72.1
COMPOUND NUCLEUS: 188.1

FUSION RELATED PARAMETERS:
R-BARRIER=12.96 fm V(RB)= 344.4 MeV
Q-VALUE= -346.6 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGNAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	136	72	0.22	5872	15.8	527.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	272	144	0.44	8306	22.3	372.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	408	217	0.65	10175	27.4	304.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	544	289	0.87	11753	31.6	263.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	612	325	0.98	12467	33.5	248.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	680	361	1.09	13144	35.3	235.8	145	540	0	116.7	64.1	31.7	189	491	153	825	10.35	0.	2	13	0.6	1
5.5	748	397	1.20	13787	37.0	224.8	218	1096	0	91.8	49.6	44.1	364	384	282	553	6.91	0.	3	18	1.2	5
6.0	816	433	1.31	14402	38.7	215.2	272	1558	0	76.8	41.2	51.6	502	314	375	444	5.54	0.	4	21	1.5	9
6.5	884	469	1.42	14992	40.3	206.8	316	1950	0	66.4	35.5	56.8	620	264	447	382	4.76	0.	5	24	1.8	12
7.0	952	506	1.52	15560	41.8	199.3	355	2285	0	58.6	31.3	60.7	725	227	506	340	4.24	0.	6	27	2.1	15
7.5	1020	542	1.63	16108	43.3	192.5	391	2575	0	52.5	28.0	63.8	821	199	557	309	3.85	0.	7	29	2.3	17
8.0	1088	578	1.74	16639	44.7	186.4	423	2829	0	47.6	25.3	66.2	912	176	601	286	3.56	0.	7	31	2.5	20
8.5	1156	614	1.85	17153	46.1	180.8	453	3053	0	43.5	23.2	68.2	998	158	641	267	3.32	0.	8	33	2.7	22
9.0	1224	650	1.96	17653	47.4	175.7	481	3252	0	40.1	21.4	69.9	1080	144	679	251	3.13	0.	8	35	2.9	24
9.5	1292	686	2.07	18139	48.7	171.0	508	3430	0	37.2	19.8	71.4	1161	131	713	238	2.96	0.	9	37	3.1	27
10.0	1360	722	2.18	18613	50.0	166.7	533	3590	0	34.7	18.5	72.6	1239	121	746	227	2.82	0.	9	39	3.2	29
10.5	1428	758	2.29	19075	51.2	162.7	557	3735	0	32.6	17.3	73.7	1316	112	777	217	2.70	0.	10	41	3.4	31
11.0	1496	794	2.40	19526	52.4	158.9	580	3866	0	30.6	16.3	74.7	1392	104	807	208	2.59	0.	10	43	3.5	33
11.5	1564	831	2.50	19968	53.6	155.5	602	3987	0	28.9	15.4	75.5	1467	97	836	201	2.50	0.	11	44	3.7	35
12.0	1632	867	2.61	20400	54.7	152.2	624	4097	0	27.4	14.6	76.3	1541	91	864	194	2.41	0.	11	46	3.8	36
13.0	1768	939	2.83	21239	57.0	146.2	665	4292	0	24.8	13.2	77.6	1687	81	919	182	2.26	0.	12	49	4.0	40
14.0	1904	1011	3.05	22046	59.1	140.9	703	4459	0	22.7	12.0	78.7	1831	73	971	172	2.14	0.	13	52	4.3	43
15.0	2040	1083	3.27	22826	61.2	136.1	740	4604	0	20.9	11.1	79.6	1973	67	1021	163	2.04	0.	14	55	4.5	47
16.0	2176	1156	3.48	23581	63.2	131.8	774	4730	0	19.3	10.3	80.3	2115	61	1070	156	1.94	0.	15	58	4.7	49
17.0	2312	1228	3.70	24313	65.1	127.9	808	4842	0	18.0	9.6	81.0	2256	56	1118	150	1.86	0.	16	61	4.9	52
18.0	2448	1300	3.92	25025	67.0	124.3	839	4941	0	16.8	8.9	81.6	2396	52	1165	144	1.79	0.	17	64	5.1	55
19.0	2584	1372	4.14	25717	68.9	120.9	870	5030	0	15.8	8.4	82.1	2535	49	1212	139	1.73	0.	18	67	5.3	57
20.0	2720	1444	4.36	26392	70.6	117.9	900	5110	0	14.9	7.9	82.5	2674	46	1257	134	1.67	0.	19	69	5.5	60
25.0	3400	1806	5.44	29547	79.0	105.4	1036	5413	0	11.6	6.2	84.2	3365	35	1478	117	1.45	0.	23	82	6.3	71
30.0	4080	2167	6.53	32410	86.5	96.2	1156	5616	0	9.5	5.1	85.2	4052	28	1689	105	1.30	0.	27	94	7.1	81
35.0	4760	2528	7.62	35053	93.5	89.1	1264	5760	0	8.1	4.3	86.0	4737	23	1895	96	1.19	0.	31	106	7.8	
40.0	5440	2889	8.71	37522	99.9	83.4	1364	5868	0	7.0	3.7	86.5	5420	20	2096	89	1.10	0.	35	117	8.4	
45.0	6120	3250	9.80	39851	106.0	78.6	1458	5952	0	6.2	3.3	86.9	6102	18	2294	83	1.03	0.	39	128	8.9	
50.0	6800	3611	10.89	42061	111.7	74.6	1545	6019	0	5.5	2.9	87.2	6784	16	2489	78	0.97	0.	43	138	9.5	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nes	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#347 136 Xe on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 67. ZC=121.( )
NEUTRON NUMBERS: NP= 82. NT= 98. NC=180.

AP**1/3= 5.143 AT**1/3= 5.485
REDUCED MASS NUMBER= 74.55 AP+AT=AC=301.

INTERACTION RADIUS RINT=14.65 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 6.25 CT+CP=12.06 C= 3.01

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.41

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.15 RC=RCP+RCT=11.88

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 617.32 MeV K= .42356 n=2.444
VC(RINT)= 355.1 MeV

FISSION-TKE= 256. MeV
ASYMM. FISSION-TKE= 253. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 33.55 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.83 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -63.7
COMPOUND NUCLEUS: 221.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.05 fm V(RB)= 369.0 MeV
Q-VALUE= -371.6 MeV
L-CRITICAL= 0.

136 Xe on 165 Ho — 136 Xe on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	75	0.21	5872	16.3	569.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	272	149	0.42	8306	23.1	402.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	408	224	0.63	10175	28.2	328.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	544	298	0.84	11753	32.6	284.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	612	335	0.94	12467	34.6	268.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	680	373	1.05	13144	36.5	254.8	115	317	0	131.5	77.8	24.3	120	560	94	1170	13.79	0.	1	11	0.2	0
5.5	748	410	1.15	13787	38.2	242.9	204	905	0	99.9	56.5	40.1	314	434	242	664	7.75	0.	3	16	1.0	4
6.0	816	447	1.26	14402	39.9	232.6	265	1394	0	82.5	46.1	48.7	464	352	345	512	5.97	0.	4	20	1.4	7
6.5	884	485	1.36	14992	41.6	223.5	314	1807	0	70.8	39.3	54.6	590	294	423	432	5.04	0.	5	23	1.7	10
7.0	952	522	1.47	15560	43.1	215.3	357	2161	0	62.2	34.4	58.9	700	252	486	381	4.44	0.	6	26	2.0	13
7.5	1020	559	1.57	16108	44.7	208.0	395	2468	0	55.6	30.7	62.2	800	220	539	344	4.01	0.	6	29	2.2	16
8.0	1088	596	1.68	16639	46.1	201.4	429	2736	0	50.3	27.7	64.9	894	194	585	317	3.69	0.	7	31	2.4	19
8.5	1156	634	1.78	17153	47.5	195.4	461	2973	0	45.9	25.3	67.1	982	174	627	295	3.43	0.	8	33	2.6	21
9.0	1224	671	1.89	17653	48.9	189.9	491	3183	0	42.3	23.3	68.9	1066	158	664	277	3.22	0.	8	35	2.8	24
9.5	1292	708	1.99	18139	50.3	184.8	520	3371	0	39.2	21.5	70.4	1148	144	699	262	3.05	0.	9	37	3.0	26
10.0	1360	746	2.10	18613	51.6	180.2	546	3541	0	36.5	20.1	71.8	1228	132	732	249	2.90	0.	9	39	3.2	28
10.5	1428	783	2.20	19075	52.8	175.8	572	3694	0	34.2	18.8	72.9	1306	122	763	238	2.77	0.	10	41	3.3	30
11.0	1496	820	2.31	19526	54.1	171.8	596	3833	0	32.1	17.7	73.9	1382	114	793	228	2.65	0.	10	42	3.5	32
11.5	1564	857	2.41	19968	55.3	168.0	620	3960	0	30.3	16.7	74.8	1458	106	822	219	2.55	0.	11	44	3.6	34
12.0	1632	895	2.52	20400	56.5	164.5	642	4077	0	28.7	15.8	75.6	1533	99	849	212	2.46	0.	11	46	3.7	36
13.0	1768	969	2.73	21239	58.8	158.0	685	4282	0	26.0	14.3	77.0	1680	88	902	198	2.31	0.	12	49	4.0	40
14.0	1904	1044	2.94	22046	61.0	152.3	726	4459	0	23.7	13.0	78.2	1825	79	953	187	2.18	0.	13	52	4.2	43
15.0	2040	1118	3.15	22826	63.2	147.1	764	4612	0	21.8	12.0	79.1	1968	72	1002	178	2.07	0.	14	55	4.5	47
16.0	2176	1193	3.36	23581	65.2	142.4	801	4746	0	20.2	11.1	79.9	2110	66	1049	170	1.98	0.	15	58	4.7	50
17.0	2312	1267	3.57	24313	67.2	138.2	836	4864	0	18.8	10.3	80.6	2251	61	1095	163	1.89	0.	16	61	4.9	53
18.0	2448	1342	3.78	25025	69.2	134.3	869	4969	0	17.6	9.6	81.2	2391	57	1141	157	1.82	0.	17	63	5.1	56
19.0	2584	1416	3.99	25717	71.1	130.7	901	5063	0	16.5	9.1	81.7	2531	53	1185	151	1.76	0.	18	66	5.3	58
20.0	2720	1491	4.20	26392	72.9	127.4	932	5147	0	15.6	8.5	82.2	2671	49	1229	146	1.70	0.	18	69	5.5	61
25.0	3400	1864	5.25	29547	81.5	113.9	1075	5468	0	12.1	6.6	83.9	3363	37	1440	127	1.47	0.	22	82	6.3	72
30.0	4080	2237	6.30	32410	89.3	104.0	1200	5681	0	9.9	5.4	85.0	4050	30	1642	113	1.32	0.	27	94	7.0	82
35.0	4760	2609	7.35	35053	96.5	96.3	1314	5834	0	8.4	4.6	85.8	4735	25	1837	104	1.20	0.	30	105	7.7	
40.0	5440	2982	8.40	37522	103.1	90.1	1418	5948	0	7.3	4.0	86.4	5418	22	2028	96	1.12	0.	34	116	8.3	
45.0	6120	3355	9.45	39851	109.4	84.9	1515	6037	0	6.4	3.5	86.8	6101	19	2216	90	1.04	0.	38	127	8.9	
50.0	6800	3728	10.50	42061	115.3	80.6	1607	6108	0	5.7	3.1	87.1	6783	17	2401	85	0.99	0.	42	137	9.4	

#348 136 Xe on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 73. ZC=127.( )
NEUTRON NUMBERS: NP= 82. NT=108. NC=190.

AP**1/3= 5.143 AT**1/3= 5.657
REDUCED MASS NUMBER= 77.65 AP+AT=AC=317.

INTERACTION RADIUS RINT=14.84 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 6.47 CT+CP=12.28 C= 3.06

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.62

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.35 RC=RCP+RCT=12.08

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 661.01 MeV K= .43003 n=2.448
VC(RINT)= 382.0 MeV

FISSION-TKE= 276. MeV
ASYMM. FISSION-TKE= 269. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.885 MeV/fm**2 PROX-FACTOR= 34.04 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.72 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -46.0
COMPOUND NUCLEUS: 274.0

FUSION RELATED PARAMETERS:
R-BARRIER=13.19 fm V(RB)= 397.1 MeV
Q-VALUE= -406.3 MeV
L-CRITICAL= 0.

136 Xe on 181 Ta — 136 Xe on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	78	0.20	5872	17.0	620.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	272	155	0.41	8306	24.0	438.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	408	233	0.61	10175	29.4	358.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	544	311	0.81	11753	34.0	310.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	612	349	0.91	12467	36.0	292.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	680	388	1.02	13144	38.0	277.6	68	105	0	152.3	106.1	13.9	52	628	33	2193	24.69	0.	1	9	0.0	0
5.5	748	427	1.12	13787	39.8	264.7	191	729	0	108.4	65.3	35.8	266	482	200	815	8.86	0.	3	15	0.7	2
6.0	816	466	1.22	14402	41.6	253.4	261	1247	0	88.3	52.0	45.9	428	398	313	597	6.47	0.	4	19	1.2	6
6.5	884	505	1.32	14992	43.3	243.5	316	1685	0	75.2	43.8	52.4	562	322	397	494	5.35	0.	5	23	1.6	10
7.0	952	544	1.42	15560	44.9	234.6	363	2060	0	65.8	38.1	57.1	677	275	464	430	4.66	0.	6	25	1.9	13
7.5	1020	582	1.52	16108	46.5	226.7	404	2365	0	58.6	33.8	60.7	781	239	519	386	4.18	0.	6	28	2.1	16
8.0	1088	621	1.63	16639	48.0	219.5	442	2670	0	52.8	30.4	63.6	877	211	566	354	3.83	0.	7	30	2.3	19
8.5	1156	660	1.73	17153	49.5	212.9	476	2920	0	48.2	27.7	65.9	967	189	608	328	3.55	0.	8	32	2.5	21
9.0	1224	699	1.83	17653	51.0	206.9	509	3143	0	44.3	25.4	67.9	1054	170	646	307	3.32	0.	8	34	2.7	24
9.5	1292	738	1.93	18139	52.3	201.4	539	3342	0	41.0	23.5	69.5	1137	155	680	290	3.14	0.	9	36	2.9	26
10.0	1360	777	2.03	18613	53.7	196.3	568	3522	0	38.1	21.9	70.9	1218	142	713	275	2.98	0.	9	38	3.1	28
10.5	1428	815	2.13	19075	55.0	191.6	595	3684	0	35.7	20.5	72.2	1297	131	743	263	2.84	0.	10	40	3.2	31
11.0	1496	854	2.24	19526	56.3	187.2	621	3831	0	33.5	19.2	73.2	1374	122	772	252	2.72	0.	10	42	3.4	33
11.5	1564	893	2.34	19968	57.6	183.0	646	3966	0	31.6	18.1	74.2	1450	114	800	242	2.62	0.	11	43	3.5	35
12.0	1632	932	2.44	20400	58.8	179.2	670	4089	0	29.9	17.1	75.0	1525	107	827	233	2.52	0.	11	45	3.6	37
13.0	1768	1009	2.64	21239	61.2	172.2	716	4307	0	27.0	15.5	76.5	1673	95	878	218	2.36	0.	12	48	3.9	41
14.0	1904	1087	2.85	22046	63.5	165.9	759	4495	0	24.7	14.1	77.7	1819	85	926	206	2.23	0.	13	51	4.1	44
15.0	2040	1165	3.05	22826	65.8	160.3	800	4657	0	22.7	13.0	78.7	1963	77	973	196	2.11	0.	14	54	4.4	48
16.0	2176	1242	3.25	23581	67.9	155.2	839	4798	0	21.0	12.0	79.5	2105	71	1018	186	2.02	0.	15	57	4.6	51
17.0	2312	1320	3.46	24313	70.0	150.5	876	4923	0	19.5	11.2	80.2	2247	65	1062	179	1.93	0.	16	60	4.8	55
18.0	2448	1398	3.66	25025	72.1	146.3	911	5035	0	18.2	10.4	80.9	2388	60	1104	172	1.86	0.	16	63	5.0	58
19.0	2584	1475	3.86	25717	74.0	142.4	945	5134	0	17.1	9.8	81.4	2528	56	1146	165	1.79	0.	17	65	5.2	61
20.0	2720	1553	4.07	26392	76.0	138.8	978	5223	0	16.1	9.2	81.9	2667	53	1188	160	1.73	0.	18	68	5.4	63
25.0	3400	1941	5.08	29547	84.9	124.1	1129	5563	0	12.5	7.2	83.7	3360	40	1385	139	1.50	0.	22	81	6.2	75
30.0	4080	2330	6.10	32410	93.0	113.3	1262	5790	0	10.3	5.9	84.9	4048	32	1574	124	1.34	0.	26	93	7.0	86
35.0	4760	2718	7.11	35053	100.5	104.9	1382	5951	0	8.7	5.0	85.7	4733	27	1756	113	1.22	0.	30	104	7.6	
40.0	5440	3106	8.13	37522	107.4	98.1	1492	6073	0	7.5	4.3	86.2	5417	23	1933	105	1.13	0.	34	115	8.3	
45.0	6120	3494	9.15	39851	113.9	92.5	1595	6167	0	6.6	3.8	86.7	6100	20	2107	98	1.06	0.	38	126	8.8	
50.0	6800	3883	10.16	42061	120.1	87.8	1692	6242	0	5.9	3.4	87.0	6782	18	2278	92	1.00	0.	42	136	9.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	ab	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#349 136 Xe on 197 Au

136 Xe on 197 Au

136 Xe on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 79. ZC=133.( )
NEUTRON NUMBERS: NP= 82. NT=118. NC=200.

AP**1/3= 5.143 AT**1/3= 5.819
REDUCED MASS NUMBER= 80.46 AP+AT=AC=333.

INTERACTION RADIUS RINT=15.01 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 6.68 CT+CP=12.49 C̄= 3.11

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.83

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.55 RC=RCP+RCT=12.27

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 703.74 MeV K= .43416 n=2.454
VC(RINT)= 408.6 MeV

FISSION-TKE= 296. MeV
ASYMM. FISSION-TKE= 285. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.883 MeV/fm**2 PROX-FACTOR= 34.48 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.63 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -28.6
COMPOUND NUCLEUS: 338.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.32 fm V(RB)= 424.8 MeV
Q-VALUE= -453.3 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	80	0.20	5872	17.6	671.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	272	161	0.39	8306	24.9	475.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	408	241	0.59	10175	30.5	387.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	544	322	0.79	11753	35.2	335.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	612	362	0.89	12467	37.3	316.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	680	402	0.98	13144	39.3	300.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	748	443	1.08	13787	41.3	286.4	170	540	0	118.6	76.4	30.7	214	534	155	1035	10.54	0.	2	14	0.0	0
6.0	816	483	1.18	14402	43.1	274.2	253	1088	0	94.7	58.6	42.7	389	427	280	700	7.10	0.	3	18	0.8	3
6.5	884	523	1.28	14992	44.9	263.5	314	1551	0	80.0	48.7	50.0	531	353	371	563	5.71	0.	5	22	1.3	8
7.0	952	563	1.38	15560	46.6	253.9	366	1947	0	69.6	42.0	55.2	653	299	442	485	4.91	0.	5	25	1.6	11
7.5	1020	603	1.48	16108	48.2	245.3	411	2291	0	61.7	37.1	59.1	761	259	499	432	4.37	0.	6	27	1.9	15
8.0	1088	644	1.58	16639	49.8	237.5	451	2591	0	55.5	33.3	62.2	860	228	548	393	3.98	0.	7	30	2.1	18
8.5	1156	684	1.67	17153	51.3	230.4	488	2856	0	50.5	30.2	64.7	952	204	591	363	3.67	0.	7	32	2.4	21
9.0	1224	724	1.77	17653	52.8	223.9	523	3092	0	46.4	27.7	66.8	1041	183	629	339	3.43	0.	8	34	2.6	23
9.5	1292	764	1.87	18139	54.2	217.9	555	3302	0	42.9	25.5	68.6	1125	167	664	319	3.23	0.	9	36	2.7	26
10.0	1360	805	1.97	18613	55.6	212.4	586	3492	0	39.9	23.7	70.1	1207	153	696	303	3.06	0.	9	38	2.9	28
10.5	1428	845	2.07	19075	57.0	207.3	615	3663	0	37.3	22.2	71.4	1287	141	726	288	2.92	0.	10	39	3.1	31
11.0	1496	885	2.17	19526	58.4	202.5	643	3819	0	35.0	20.8	72.5	1365	131	754	276	2.79	0.	10	41	3.2	33
11.5	1564	925	2.26	19968	59.7	198.1	669	3961	0	33.0	19.6	73.5	1442	122	781	265	2.68	0.	11	43	3.4	35
12.0	1632	965	2.36	20400	61.0	193.9	695	4092	0	31.2	18.5	74.4	1518	114	807	255	2.58	0.	11	45	3.5	37
13.0	1768	1046	2.56	21239	63.4	186.3	743	4322	0	28.1	16.7	75.9	1667	101	857	239	2.41	0.	12	48	3.8	41
14.0	1904	1126	2.76	22046	65.8	179.5	789	4520	0	25.6	15.2	77.2	1813	91	904	225	2.27	0.	13	51	4.0	45
15.0	2040	1207	2.95	22826	68.2	173.4	832	4691	0	23.6	14.0	78.2	1958	82	948	213	2.16	0.	14	54	4.3	49
16.0	2176	1287	3.15	23581	70.4	167.9	873	4841	0	21.8	12.9	79.1	2101	75	991	203	2.05	0.	15	57	4.5	52
17.0	2312	1368	3.35	24313	72.6	162.9	912	4973	0	20.3	12.0	79.9	2243	69	1033	195	1.97	0.	15	59	4.7	56
18.0	2448	1448	3.54	25025	74.7	158.3	949	5091	0	18.9	11.2	80.5	2384	64	1073	187	1.89	0.	16	62	4.9	59
19.0	2584	1529	3.74	25717	76.7	154.1	985	5196	0	17.8	10.5	81.1	2524	60	1113	180	1.82	0.	17	65	5.1	62
20.0	2720	1609	3.94	26392	78.7	150.2	1020	5291	0	16.7	9.9	81.6	2664	56	1152	174	1.76	0.	18	67	5.3	65
25.0	3400	2011	4.92	29547	88.0	134.3	1179	5650	0	13.0	7.7	83.5	3358	42	1338	150	1.52	0.	22	80	6.1	78
30.0	4080	2414	5.91	32410	96.4	122.6	1319	5989	0	10.6	6.3	84.7	4046	34	1515	135	1.36	0.	26	92	6.9	89
35.0	4760	2816	6.89	35053	104.1	113.5	1445	6060	0	9.0	5.3	85.5	4732	28	1685	123	1.24	0.	30	103	7.5	
40.0	5440	3218	7.88	37522	111.3	106.2	1561	6188	0	7.8	4.6	86.1	5416	24	1851	114	1.15	0.	34	114	8.2	
45.0	6120	3621	8.86	39851	118.0	100.1	1669	6288	0	6.9	4.1	86.6	6099	21	2013	106	1.07	0.	37	124	8.7	
50.0	6800	4023	9.84	42061	124.4	95.0	1771	6368	0	6.1	3.6	86.9	6781	19	2173	100	1.01	0.	41	135	9.3	

#350 136 Xe on 208 Pb

136 Xe on 208 Pb

136 Xe on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 82. ZC=136.( )
NEUTRON NUMBERS: NP= 82. NT=126. NC=208.

AP**1/3= 5.143 AT**1/3= 5.925
REDUCED MASS NUMBER= 82.23 AP+AT=AC=344.

INTERACTION RADIUS RINT=15.13 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 6.82 CT+CP=12.63 C̄= 3.14

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.96

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.66 RC=RCP+RCT=12.39

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 723.47 MeV K= .43362 n=2.456
VC(RINT)= 420.9 MeV

FISSION-TKE= 305. MeV
ASYMM. FISSION-TKE= 292. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.877 MeV/fm**2 PROX-FACTOR= 34.58 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.58 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -19.5
COMPOUND NUCLEUS: 371.6

FUSION RELATED PARAMETERS:
R-BARRIER=13.42 fm V(RB)= 437.5 MeV
Q-VALUE= -477.4 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	82	0.20	5872	18.0	697.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	272	164	0.39	8306	25.4	493.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	408	247	0.59	10175	31.2	402.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	544	329	0.78	11753	36.0	348.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	612	370	0.88	12467	38.2	328.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	680	411	0.98	13144	40.2	311.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	748	452	1.07	13787	42.2	297.3	167	496	0	121.5	81.2	29.3	204	544	143	1129	11.17	0.	2	14	0.0	0
6.0	816	493	1.17	14402	44.1	284.6	254	1057	0	96.4	61.4	41.8	382	434	271	743	7.31	0.	3	18	0.6	2
6.5	884	535	1.27	14992	45.9	273.5	319	1530	0	81.2	50.8	49.4	526	358	362	593	5.83	0.	4	22	1.2	6
7.0	952	576	1.37	15560	47.6	263.5	373	1936	0	70.5	43.7	54.7	648	304	433	508	5.00	0.	5	25	1.5	10
7.5	1020	617	1.47	16108	49.3	254.6	419	2287	0	62.5	38.5	58.7	757	263	491	452	4.44	0.	6	27	1.8	14
8.0	1088	658	1.56	16639	50.9	246.5	461	2595	0	56.2	34.5	61.9	857	231	539	411	4.03	0.	7	29	2.0	18
8.5	1156	699	1.66	17153	52.4	239.1	500	2866	0	51.1	31.3	64.4	950	206	581	379	3.72	0.	7	32	2.3	21
9.0	1224	740	1.76	17653	54.0	232.4	536	3107	0	46.9	28.6	66.5	1039	185	619	354	3.47	0.	8	34	2.5	24
9.5	1292	781	1.86	18139	55.4	226.2	569	3323	0	43.4	26.4	68.3	1123	169	653	333	3.27	0.	8	36	2.7	26
10.0	1360	822	1.95	18613	56.9	220.5	601	3516	0	40.3	24.5	69.8	1206	154	685	316	3.10	0.	9	37	2.8	29
10.5	1428	863	2.05	19075	58.3	215.2	631	3692	0	37.7	22.9	71.2	1286	142	714	301	2.95	0.	10	39	3.0	31
11.0	1496	905	2.15	19526	59.7	210.2	659	3851	0	35.4	21.5	72.3	1364	132	742	287	2.82	0.	10	41	3.2	34
11.5	1564	946	2.25	19968	61.0	205.6	687	3997	0	33.3	20.2	73.3	1441	123	768	276	2.71	0.	10	43	3.3	36
12.0	1632	987	2.34	20400	62.3	201.3	713	4130	0	31.5	19.1	74.2	1517	115	793	266	2.61	0.	11	44	3.4	38
13.0	1768	1069	2.54	21239	64.8	193.4	764	4367	0	28.4	17.2	75.8	1666	102	841	248	2.44	0.	12	47	3.7	43
14.0	1904	1151	2.74	22046	67.3	186.3	811	4569	0	25.9	15.7	77.1	1813	91	887	234	2.30	0.	13	50	4.0	47
15.0	2040	1233	2.93	22826	69.7	180.0	855	4744	0	23.8	14.4	78.1	1957	83	930	222	2.18	0.	14	53	4.2	50
16.0	2176	1316	3.13	23581	71.9	174.3	897	4897	0	22.0	13.3	79.0	2100	76	971	211	2.07	0.	15	56	4.4	54
17.0	2312	1398	3.32	24313	74.2	169.1	938	5033	0	20.4	12.4	79.8	2242	70	1011	202	1.99	0.	15	59	4.6	58
18.0	2448	1480	3.52	25025	76.3	164.3	976	5153	0	19.1	11.6	80.4	2384	64	1050	194	1.91	0.	16	62	4.8	61
19.0	2584	1562	3.71	25717	78.4	160.0	1013	5261	0	17.9	10.9	81.0	2524	60	1089	187	1.84	0.	17	64	5.0	64
20.0	2720	1645	3.91	26392	80.4	155.9	1049	5357	0	16.9	10.2	81.5	2664	56	1126	181	1.77	0.	18	67	5.2	67
25.0	3400	2056	4.88	29547	89.9	139.4	1213	5725	0	13.1	7.9	83.4	3358	42	1305	156	1.53	0.	22	79	6.1	81
30.0	4080	2467	5.86	32410	98.5	127.3	1357	5970	0	10.7	6.5	84.6	4046	34	1474	140	1.37	0.	26	91	6.8	92
35.0	4760	2878	6.84	35053	106.4	117.9	1487	6145	0	9.1	5.5	85.5	4732	28	1636	128	1.25	0.	30	102	7.5	
40.0	5440	3289	7.81	37522	113.8	110.2	1607	6276	0	7.8	4.7	86.1	5416	24	1794	118	1.16	0.	33	113	8.1	
45.0	6120	3700	8.79	39851	120.7	103.9	1718	6378	0	6.9	4.2	86.5	6099	21	1949	110	1.08	0.	37	124	8.7	
50.0	6800	4112	9.77	42061	127.2	98.6	1823	6460	0	6.2	3.7	86.9	6781	19	2101	104	1.02	0.	41	134	9.2	
MeV/u	MeV	MeV	—	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#351 136 Xe on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 83. ZC=137.( )
NEUTRON NUMBERS: NP= 82. NT=126. NC=208.

AP**1/3= 5.143 AT**1/3= 5.934
REDUCED MASS NUMBER= 82.39 AP+AT=AC=345.

INTERACTION RADIUS RINT=15.14 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 6.83 CT+CP=12.64 C̄= 3.14

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 6.97

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.68 RC=RCP+RCT=12.40

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 731.16 MeV K= .43503 n=2.457
VC(RINT)= 425.8 MeV

FISSION-TKE= 309. MeV
ASYMM. FISSION-TKE= 295. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.880 MeV/fm**2 PROX-FACTOR= 34.71 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.58 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: -16.5
COMPOUND NUCLEUS: 379.9

FUSION RELATED PARAMETERS:
R-BARRIER=13.42 fm V(RB)= 442.7 MeV
Q-VALUE= -482.7 MeV
L-CRITICAL= 0.

136 Xe on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	82	0.19	5872	18.0	705.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	272	165	0.39	8306	25.5	499.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	408	247	0.58	10175	31.2	407.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	544	330	0.77	11753	36.0	352.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	612	371	0.87	12467	38.2	332.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	680	412	0.97	13144	40.3	315.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	748	453	1.06	13787	42.3	300.9	156	432	0	125.3	84.9	27.4	184	564	128	1224	11.99	0.	2	13	0.0	0
6.0	816	494	1.16	14402	44.1	288.1	248	999	0	98.6	63.1	40.7	368	448	261	774	7.53	0.	3	18	0.5	1
6.5	884	536	1.26	14992	45.9	276.8	314	1478	0	82.8	52.0	48.6	515	369	355	611	5.94	0.	4	21	1.1	6
7.0	952	577	1.35	15560	47.7	266.7	369	1888	0	71.8	44.6	54.1	639	313	428	521	5.07	0.	5	24	1.5	10
7.5	1020	618	1.45	16108	49.3	257.7	416	2243	0	63.6	39.2	58.2	750	270	487	462	4.49	0.	6	27	1.8	13
8.0	1088	659	1.55	16639	51.0	249.5	459	2554	0	57.1	35.1	61.4	851	237	537	419	4.07	0.	7	29	2.0	17
8.5	1156	700	1.64	17153	52.5	242.1	497	2828	0	51.9	31.8	64.1	945	211	579	387	3.75	0.	7	31	2.2	20
9.0	1224	741	1.74	17653	54.1	235.2	534	3072	0	47.6	29.1	66.2	1034	190	618	361	3.50	0.	8	34	2.4	23
9.5	1292	783	1.84	18139	55.5	229.0	567	3290	0	44.0	26.9	68.0	1119	173	652	339	3.29	0.	8	35	2.6	26
10.0	1360	824	1.94	18613	57.0	223.2	599	3486	0	40.9	24.9	69.6	1202	158	684	321	3.12	0.	9	37	2.8	28
10.5	1428	865	2.03	19075	58.4	217.8	630	3663	0	38.2	23.3	70.9	1282	146	714	306	2.97	0.	9	39	3.0	31
11.0	1496	906	2.13	19526	59.8	212.8	658	3824	0	35.8	21.8	72.1	1361	135	742	292	2.84	0.	10	41	3.1	33
11.5	1564	947	2.23	19968	61.1	208.1	686	3972	0	33.7	20.5	73.1	1438	126	768	280	2.72	0.	10	43	3.3	36
12.0	1632	989	2.32	20400	62.4	203.7	713	4106	0	31.9	19.4	74.0	1514	118	794	270	2.62	0.	11	44	3.4	38
13.0	1768	1071	2.52	21239	65.0	195.7	763	4345	0	28.8	17.5	75.6	1664	104	842	252	2.45	0.	12	47	3.7	42
14.0	1904	1153	2.71	22046	67.4	188.6	810	4550	0	26.2	15.9	76.9	1811	93	887	237	2.30	0.	13	50	3.9	46
15.0	2040	1236	2.90	22826	69.8	182.2	855	4727	0	24.1	14.6	78.0	1955	85	930	225	2.18	0.	14	53	4.2	50
16.0	2176	1318	3.10	23581	72.1	176.4	898	4882	0	22.2	13.5	78.9	2099	77	972	214	2.08	0.	14	56	4.4	54
17.0	2312	1401	3.29	24313	74.3	171.2	938	5019	0	20.7	12.6	79.7	2241	71	1012	205	1.99	0.	15	59	4.6	57
18.0	2448	1483	3.48	25025	76.5	166.3	977	5140	0	19.3	11.7	80.3	2382	66	1051	197	1.91	0.	16	62	4.8	60
19.0	2584	1565	3.68	25717	78.5	161.9	1014	5249	0	18.1	11.0	80.9	2523	61	1089	190	1.84	0.	17	64	5.0	63
20.0	2720	1648	3.87	26392	80.6	157.8	1050	5347	0	17.1	10.4	81.5	2663	57	1127	183	1.78	0.	18	67	5.2	66
25.0	3400	2060	4.84	29547	90.1	141.1	1215	5719	0	13.3	9.0	83.4	3357	43	1305	158	1.54	0.	22	79	6.0	90
30.0	4080	2472	5.81	32410	98.7	128.8	1359	5966	0	10.8	6.6	84.6	4045	35	1474	142	1.37	0.	26	91	6.8	92
35.0	4760	2884	6.77	35053	106.6	119.3	1490	6143	0	9.2	5.5	85.4	4731	29	1636	129	1.25	0.	30	102	7.5	
40.0	5440	3296	7.74	37522	114.0	111.6	1610	6276	0	7.9	4.8	86.0	5415	25	1794	120	1.16	0.	33	113	8.1	
45.0	6120	3707	8.71	39851	120.9	105.2	1721	6379	0	7.0	4.2	86.5	6098	22	1948	112	1.08	0.	37	124	8.6	
50.0	6800	4119	9.68	42061	127.4	99.8	1826	6461	0	6.3	3.8	86.9	6781	19	2099	105	1.02	0.	41	134	9.2	

#352 136 Xe on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 54. ZT= 92. ZC=146.( )
NEUTRON NUMBERS: NP= 82. NT=146. NC=228.

AP**1/3= 5.143 AT**1/3= 6.197
REDUCED MASS NUMBER= 86.55 AP+AT=AC=374.

INTERACTION RADIUS RINT=15.42 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 5.81 CT= 7.16 CT+CP=12.98 C̄= 3.21

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 5.98 RT= 7.30

COULOMB RADII [fm]:
RCP= 5.72 RCT= 6.98 RC=RCP+RCT=12.70

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 790.63 MeV K= .43327 n=2.465
VC(RINT)= 463.2 MeV

FISSION-TKE= 339. MeV
ASYMM. FISSION-TKE= 316. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.870 MeV/fm**2 PROX-FACTOR= 35.08 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.46 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -86.3 TARGET: 47.2
COMPOUND NUCLEUS: 483.1

FUSION RELATED PARAMETERS:
R-BARRIER=13.63 fm V(RB)= 481.8 MeV
Q-VALUE= -522.2 MeV
L-CRITICAL= 0.

136 Xe on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	136	87	0.19	5872	18.9	782.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	272	173	0.37	8306	26.8	553.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	408	260	0.56	10175	32.8	451.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	544	346	0.75	11753	37.9	391.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	612	389	0.84	12467	40.2	368.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	680	433	0.93	13144	42.3	349.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	748	476	1.03	13787	44.4	333.6	109	195	0	143.7	111.6	18.2	123	625	73	2037	18.59	0.	2	12	0.0	0
6.0	816	519	1.12	14402	46.4	319.4	234	805	0	107.6	74.3	36.2	324	492	220	972	8.71	0.	3	17	0.0	0
6.5	884	563	1.21	14992	48.3	306.8	312	1320	0	89.1	59.6	45.5	481	403	323	730	6.53	0.	4	20	0.9	5
7.0	952	606	1.31	15560	50.1	295.7	374	1761	0	76.7	50.5	51.7	613	339	400	609	5.44	0.	5	23	1.3	9
7.5	1020	649	1.40	16108	51.8	285.6	427	2143	0	67.5	44.1	56.2	728	292	462	536	4.77	0.	6	26	1.6	14
8.0	1088	692	1.49	16639	53.5	276.6	474	2477	0	60.5	39.3	59.8	833	255	513	481	4.29	0.	6	29	1.9	17
8.5	1156	736	1.59	17153	55.2	268.3	517	2771	0	54.8	35.5	62.6	929	227	556	441	3.93	0.	7	31	2.1	21
9.0	1224	779	1.68	17653	56.8	260.8	557	3033	0	50.2	32.4	64.9	1020	204	594	410	3.65	0.	8	33	2.3	24
9.5	1292	822	1.77	18139	58.3	253.8	594	3268	0	46.3	29.8	66.9	1107	185	628	384	3.43	0.	8	35	2.5	27
10.0	1360	865	1.87	18613	59.9	247.4	629	3478	0	42.9	27.6	68.5	1191	169	659	363	3.24	0.	9	37	2.7	30
10.5	1428	909	1.96	19075	61.3	241.4	662	3669	0	40.1	25.7	70.0	1273	155	686	345	3.08	0.	9	38	2.9	33
11.0	1496	952	2.06	19526	62.8	235.9	693	3843	0	37.6	24.1	71.2	1352	144	715	329	2.94	0.	10	40	3.0	36
11.5	1564	995	2.15	19968	64.2	230.7	723	4001	0	35.4	22.7	72.3	1430	134	741	316	2.81	0.	10	42	3.2	38
12.0	1632	1039	2.24	20400	65.6	225.8	752	4146	0	33.4	21.4	73.3	1507	125	765	303	2.71	0.	11	43	3.3	41
13.0	1768	1125	2.43	21239	68.3	217.0	807	4402	0	30.1	19.2	75.0	1658	110	810	283	2.52	0.	12	47	3.6	46
14.0	1904	1212	2.62	22046	70.8	209.1	858	4622	0	27.4	17.5	76.3	1805	99	853	266	2.37	0.	13	49	3.8	50
15.0	2040	1298	2.80	22826	73.3	202.0	906	4813	0	25.1	16.0	77.4	1951	89	893	252	2.25	0.	13	52	4.1	54
16.0	2176	1385	2.99	23581	75.7	195.6	952	4980	0	23.2	14.8	78.4	2094	82	931	240	2.14	0.	14	55	4.3	58
17.0	2312	1471	3.18	24313	78.0	189.7	996	5127	0	21.6	13.8	79.2	2237	75	968	229	2.04	0.	15	58	4.5	62
18.0	2448	1558	3.36	25025	80.3	184.4	1038	5257	0	20.1	12.8	79.9	2379	69	1004	220	1.96	0.	16	61	4.7	65
19.0	2584	1644	3.55	25717	82.5	179.5	1078	5374	0	18.9	12.0	80.5	2520	64	1039	212	1.89	0.	17	63	4.9	69
20.0	2720	1731	3.74	26392	84.7	174.9	1117	5479	0	17.8	11.3	81.1	2660	60	1073	204	1.82	0.	18	66	5.1	72
25.0	3400	2164	4.67	29547	94.6	156.5	1294	5879	0	13.8	8.8	83.1	3355	45	1235	176	1.57	0.	21	78	5.9	87
30.0	4080	2596	5.60	32410	103.7	142.8	1449	6145	0	11.3	7.2	84.4	4044	36	1387	158	1.40	0.	25	90	6.7	99
35.0	4760	3029	6.54	35053	112.0	132.2	1589	6336	0	9.5	6.1	85.2	4730	30	1532	144	1.28	0.	29	101	7.3	
40.0	5440	3462	7.47	37522	119.7	123.7	1718	6478	0	8.2	5.2	85.9	5414	26	1673	133	1.18	0.	33	111	7.9	
45.0	6120	3895	8.41	39851	127.0	116.6	1838	6589	0	7.3	4.6	86.4	6097	23	1811	124	1.11	0.	36	121	8.5	
50.0	6800	4327	9.34	42061	133.8	110.6	1950	6678	0	6.5	4.1	86.8	6780	20	1945	117	1.04	0.	40	131	9.0	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 136 Xe

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#353 152 Sm on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 6. ZC= 68.(Er)
NEUTRON NUMBERS: NP= 90. NT= 6. NC= 96.

AP**1/3= 5.337 AT**1/3= 2.289 ELSCAT < 4 deg
REDUCED MASS NUMBER= 11.12 AP+AT=AC=164.

INTERACTION RADIUS RINT=11.38 fm RO= 1.49 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 2.12 CT+CP= 8.18 C̄= 1.57

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 2.52

COULOMB RADII [fm]:
RCP= 5.98 RCT= 2.51 RC=RCP+RCT= 8.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 84.48 MeV K= .04051 n=2.933
VC(RINT)= 47.0 MeV

FISSION-TKE= 113. MeV
ASYMM. FISSION-TKE= 36. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 17.83 MeV
L-RLD= 89 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.36 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: 0.0
COMPOUND NUCLEUS: -65.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.29 fm V(RB)= 48.3 MeV
Q-VALUE= -9.2 MeV
L-CRITICAL= 56.

152 Sm on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	11	0.24	6562	2.4	58.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	22	0.47	9283	3.4	41.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	33	0.71	11373	4.2	33.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	44	0.95	13135	4.9	29.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	50	1.07	13934	5.2	27.6	14	279	116	125.0	3.9	27.5	538	146	545	112	9.91	618.	5	13	1.4	4
5.0	760	56	1.18	14690	5.4	26.2	24	680	437	94.3	4.5	42.8	649	111	649	67	5.87	687.	5	13	1.5	4
5.5	836	61	1.30	15409	5.7	25.0	31	1001	700	77.3	4.3	51.3	747	89	740	52	4.57	755.	5	13	1.6	4
6.0	912	67	1.42	16096	6.0	23.9	37	1267	919	66.0	4.0	57.0	839	73	823	44	3.87	819.	5	13	1.7	5
6.5	988	72	1.54	16756	6.2	23.0	42	1491	1104	57.7	3.7	61.2	926	62	902	39	3.42	887.	7	20	1.8	5
7.0	1064	78	1.66	17391	6.4	22.1	46	1682	1263	51.3	3.4	64.3	1010	54	978	35	3.09	949.	7	22	1.8	6
7.5	1140	83	1.78	18003	6.7	21.4	50	1847	1400	46.3	3.1	66.9	1092	48	1052	32	2.85	1017.	8	24	1.9	6
8.0	1216	89	1.89	18596	6.9	20.7	54	1991	1520	42.1	2.9	68.9	1173	43	1125	30	2.65	1078.	8	26	2.0	7
8.5	1292	95	2.01	19171	7.1	20.1	57	2118	1627	38.7	2.7	70.7	1254	38	1197	28	2.49	1146.	9	27	2.0	7
9.0	1368	100	2.13	19730	7.3	19.5	60	2230	1721	35.8	2.5	72.1	1333	35	1268	27	2.36	1205.	10	29	2.1	8
9.5	1444	106	2.25	20273	7.5	19.0	64	2330	1784	33.3	2.3	73.4	1412	32	1339	26	2.24	1272.	10	30	2.2	8
10.0	1520	111	2.37	20802	7.7	18.5	67	2421	1695	31.1	2.2	74.4	1490	30	1409	24	2.14	1339.	11	31	2.2	8
10.5	1596	117	2.49	21319	7.9	18.1	69	2502	1614	29.2	2.1	75.4	1568	28	1479	23	2.06	1397.	11	33	2.3	9
11.0	1672	122	2.60	21824	8.1	17.7	72	2576	1541	27.5	2.0	76.2	1646	26	1548	23	1.98	1464.	12	34	2.3	9
11.5	1748	128	2.72	22317	8.2	17.3	75	2643	1474	26.0	1.9	77.0	1724	24	1618	22	1.91	1520.	12	36	2.4	10
12.0	1824	133	2.84	22800	8.4	16.9	77	2705	1412	24.7	1.8	77.6	1801	23	1687	21	1.85	1586.	13	37	2.5	10
13.0	1976	145	3.08	23737	8.8	16.2	82	2814	1304	22.4	1.6	78.8	1956	20	1824	20	1.74	1708.	14	40	2.6	11
14.0	2128	156	3.31	24640	9.1	15.7	87	2906	1211	20.5	1.5	79.7	2110	18	1961	19	1.65	1827.	15	42	2.7	12
15.0	2280	167	3.55	25512	9.4	15.1	91	2988	1130	18.9	1.4	80.6	2263	17	2098	18	1.57	1957.	16	45	2.8	12
16.0	2432	178	3.79	26355	9.7	14.6	95	3059	1059	17.5	1.3	81.2	2417	15	2234	17	1.50	2074.	17	47	2.9	13
17.0	2584	189	4.02	27174	10.0	14.2	99	3121	997	16.3	1.2	81.8	2570	14	2370	16	1.44	2189.	18	50	3.0	14
18.0	2736	200	4.26	27969	10.3	13.8	103	3176	941	15.3	1.1	82.3	2723	13	2505	16	1.39	2318.	19	52	3.1	14
19.0	2888	211	4.50	28743	10.6	13.4	106	3225	892	14.4	1.0	82.8	2876	12	2641	15	1.34	2430.	20	55	3.1	15
20.0	3040	222	4.73	29497	10.9	13.1	110	3269	847	13.6	1.0	83.2	3028	12	2776	15	1.30	2541.	21	57	3.2	16
25.0	3800	278	5.92	33023	12.2	11.7	126	3437	678	10.6	0.8	84.7	3791	9	3450	13	1.13	3133.	26	68	3.6	18
30.0	4560	334	7.10	36223	13.3	10.7	141	3548	565	8.7	0.6	85.6	4553	7	4121	12	1.01	3683.	31	79	4.0	21
35.0	5320	389	8.28	39177	14.4	9.9	154	3626	484	7.4	0.5	86.3	5314	6	4791	11	0.93	4237.	36	90	4.3	
40.0	6080	445	9.47	41937	15.4	9.3	166	3685	423	6.4	0.5	86.8	6075	5	5459	10	0.86	4739.	41	101	4.6	
45.0	6840	500	10.65	44539	16.3	8.7	177	3731	376	5.7	0.4	87.2	6835	5	6127	9	0.81	5254.	46	111	4.9	
50.0	7600	556	11.83	47010	17.2	8.3	187	3767	339	5.1	0.4	87.5	7596	4	6793	9	0.76	5752.	51	121	5.2	

#354 152 Sm on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 8. ZC= 70.(Yb)
NEUTRON NUMBERS: NP= 90. NT= 8. NC= 98.

AP**1/3= 5.337 AT**1/3= 2.520 ELSCAT < 6 deg
REDUCED MASS NUMBER= 14.48 AP+AT=AC=168.

INTERACTION RADIUS RINT=11.64 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 2.42 CT+CP= 8.48 C̄= 1.73

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 2.78

COULOMB RADII [fm]:
RCP= 5.98 RCT= 2.78 RC=RCP+RCT= 8.76

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 110.31 MeV K= .06370 n=2.819
VC(RINT)= 61.3 MeV

FISSION-TKE= 117. MeV
ASYMM. FISSION-TKE= 47. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.905 MeV/fm**2 PROX-FACTOR= 19.68 MeV
L-RLD= 86 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.43 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -4.7
COMPOUND NUCLEUS: -60.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.47 fm V(RB)= 63.3 MeV
Q-VALUE= -18.4 MeV
L-CRITICAL= 67.

152 Sm on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	14	0.24	6562	3.2	78.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	29	0.47	9283	4.5	55.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	43	0.71	11373	5.5	45.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	58	0.94	13135	6.3	39.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	65	1.06	13934	6.7	36.8	19	274	95	125.8	5.2	27.1	497	187	506	151	10.30	604.	5	14	1.5	4
5.0	760	72	1.18	14690	7.1	34.9	32	688	430	94.8	6.0	42.6	618	142	618	89	6.03	667.	5	14	1.6	5
5.5	836	80	1.30	15409	7.4	33.3	41	1023	704	77.7	5.7	51.2	723	113	713	69	4.69	733.	5	14	1.7	5
6.0	912	87	1.42	16096	7.8	31.9	49	1300	933	66.2	5.3	56.9	818	94	798	59	3.97	795.	6	19	1.8	6
6.5	988	94	1.54	16756	8.1	30.6	55	1534	1126	57.9	4.8	61.1	908	80	878	52	3.50	861.	7	21	1.9	6
7.0	1064	101	1.65	17391	8.4	29.5	61	1733	1292	51.5	4.4	64.3	995	69	954	47	3.17	922.	7	23	2.0	7
7.5	1140	109	1.77	18003	8.7	28.5	67	1906	1436	46.4	4.1	66.8	1079	61	1027	43	2.91	988.	8	25	2.1	7
8.0	1216	116	1.89	18596	9.0	27.6	71	2057	1561	42.3	3.8	68.9	1162	54	1099	40	2.71	1047.	8	27	2.2	8
8.5	1292	123	2.01	19171	9.2	26.8	76	2189	1672	38.8	3.5	70.6	1243	49	1170	38	2.55	1113.	9	28	2.2	8
9.0	1368	130	2.13	19730	9.5	26.0	80	2307	1591	35.9	3.3	72.1	1323	45	1240	36	2.41	1171.	10	30	2.3	9
9.5	1444	138	2.24	20273	9.8	25.3	85	2412	1508	33.4	3.0	73.3	1403	41	1309	34	2.29	1236.	10	32	2.4	9
10.0	1520	145	2.36	20802	10.0	24.7	88	2507	1432	31.2	2.9	74.4	1482	38	1377	33	2.19	1293.	11	33	2.5	10
10.5	1596	152	2.48	21319	10.3	24.1	92	2592	1364	29.3	2.7	75.4	1561	35	1445	31	2.10	1357.	11	35	2.5	10
11.0	1672	159	2.60	21824	10.5	23.5	96	2670	1302	27.6	2.6	76.2	1639	33	1513	30	2.02	1413.	12	36	2.6	11
11.5	1748	166	2.72	22317	10.7	23.0	99	2741	1245	26.1	2.4	76.9	1717	31	1580	29	1.95	1468.	12	37	2.7	12
12.0	1824	174	2.83	22800	11.0	22.5	103	2806	1193	24.8	2.3	77.6	1795	29	1647	28	1.89	1531.	13	39	2.7	12
13.0	1976	188	3.07	23737	11.4	21.7	109	2920	1102	22.5	2.1	78.8	1950	26	1780	26	1.78	1648.	14	42	2.8	13
14.0	2128	203	3.31	24640	11.8	20.9	115	3018	1023	20.6	1.9	79.7	2105	23	1913	25	1.68	1764.	15	44	3.0	14
15.0	2280	217	3.54	25512	12.3	20.2	121	3103	955	18.9	1.8	80.5	2259	21	2045	24	1.60	1878.	16	47	3.1	15
16.0	2432	232	3.78	26355	12.7	19.5	126	3177	895	17.6	1.7	81.2	2412	20	2176	23	1.53	1990.	17	50	3.2	16
17.0	2584	246	4.02	27174	13.1	18.9	132	3243	842	16.4	1.5	81.8	2566	18	2307	22	1.47	2114.	18	52	3.3	16
18.0	2736	261	4.25	27969	13.4	18.4	137	3301	795	15.3	1.4	82.3	2719	17	2438	21	1.42	2224.	19	55	3.4	17
19.0	2888	275	4.49	28743	13.8	17.9	142	3352	754	14.4	1.4	82.8	2872	16	2569	20	1.37	2332.	20	57	3.5	18
20.0	3040	290	4.72	29497	14.2	17.5	146	3399	716	13.6	1.3	83.2	3025	15	2699	20	1.33	2454.	21	60	3.6	18
25.0	3800	362	5.91	33023	15.8	15.6	168	3576	573	10.6	1.0	84.7	3789	11	3348	17	1.15	2986.	26	72	4.0	22
30.0	4560	434	7.09	36223	17.3	14.3	187	3693	477	8.7	0.8	85.6	4551	9	3994	15	1.04	3510.	31	83	4.4	25
35.0	5320	507	8.27	39177	18.7	13.2	204	3776	409	7.4	0.7	86.3	5312	8	4638	14	0.95	4009.	36	94	4.8	
40.0	6080	579	9.45	41937	20.0	12.3	220	3839	358	6.4	0.6	86.8	6073	7	5280	13	0.88	4516.	41	105	5.2	
45.0	6840	651	10.63	44539	21.2	11.6	235	3887	318	5.7	0.5	87.2	6834	6	5920	12	0.82	4970.	46	115	5.5	
50.0	7600	724	11.81	47010	22.4	11.0	249	3925	286	5.1	0.5	87.5	7595	5	6560	12	0.78	5440.	51	126	5.8	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#355 152 Sm on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 13. ZC= 75.(Re)
NEUTRON NUMBERS: NP= 90. NT= 14. NC=104.

AP**1/3= 5.337 AT**1/3= 3.000 ELSCAT <10 deg
REDUCED MASS NUMBER= 22.93 AP+AT=AC=179.

INTERACTION RADIUS RINT=12.16 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 3.05 CT+CP= 9.11 C= 2.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 3.35

COULOMB RADII [fm]:
RCP= 5.98 RCT= 3.32 RC=RCP+RCT= 9.30

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 171.44 MeV K= .12371 n=2.662
VC(RINT)= 95.3 MeV

FISSION-TKE= 129. MeV
ASYMM. FISSION-TKE= 74. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.907 MeV/fm**2 PROX-FACTOR= 23.12 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -20.6
COMPOUND NUCLEUS: -45.2

FUSION RELATED PARAMETERS:
R-BARRIER=10.96 fm V(RB)= 99.0 MeV
Q-VALUE= -49.9 MeV
L-CRITICAL= 90.

152 Sm on 27 Al

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	23	0.24	6562	5.0	126.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	46	0.48	9283	7.1	89.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	69	0.72	11373	8.7	73.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	92	0.96	13135	10.0	63.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	103	1.08	13934	10.6	59.8	36	370	151	118.6	9.7	30.7	425	259	433	216	9.45	568.	0	0	1.5	4
5.0	760	115	1.20	14690	11.2	56.8	56	808	513	90.9	10.1	44.5	562	198	557	138	6.01	627.	0	0	1.7	5
5.5	836	126	1.32	15409	11.8	54.1	71	1164	809	75.0	9.3	52.5	677	159	657	109	4.75	686.	0	0	1.8	6
6.0	912	138	1.44	16096	12.3	51.8	83	1459	1056	64.1	8.4	57.9	780	132	744	93	4.06	744.	6	21	2.0	7
6.5	988	149	1.56	16756	12.8	49.8	93	1709	1265	56.2	7.6	61.9	876	112	823	83	3.60	801.	6	23	2.1	8
7.0	1064	160	1.68	17391	13.3	48.0	103	1922	1444	50.0	7.0	65.0	966	98	897	75	3.26	858.	7	25	2.2	9
7.5	1140	172	1.80	18003	13.7	46.3	111	2107	1386	45.2	6.4	67.4	1054	86	968	69	3.01	913.	8	27	2.3	10
8.0	1216	183	1.92	18596	14.2	44.9	120	2268	1300	41.2	5.9	69.4	1139	77	1037	65	2.81	974.	8	29	2.4	10
8.5	1292	195	2.05	19171	14.6	43.5	127	2410	1223	37.8	5.5	71.1	1222	70	1104	61	2.64	1029.	9	31	2.5	11
9.0	1368	206	2.17	19730	15.0	42.3	134	2536	1155	35.0	5.1	72.5	1305	63	1169	58	2.50	1083.	10	33	2.6	12
9.5	1444	218	2.29	20273	15.5	41.2	141	2649	1094	32.6	4.8	73.7	1386	58	1234	55	2.38	1136.	10	34	2.7	13
10.0	1520	229	2.41	20802	15.9	40.1	147	2751	1040	30.5	4.5	74.8	1466	54	1298	52	2.28	1196.	11	36	2.8	13
10.5	1596	241	2.53	21319	16.2	39.2	154	2843	990	28.6	4.2	75.7	1546	50	1361	50	2.18	1249.	11	38	2.9	14
11.0	1672	252	2.65	21824	16.6	38.3	160	2926	945	27.0	4.0	76.5	1625	47	1424	49	2.10	1300.	12	39	3.0	15
11.5	1748	264	2.77	22317	17.0	37.4	165	3002	904	25.5	3.8	77.2	1704	44	1486	47	2.03	1359.	12	41	3.1	15
12.0	1824	275	2.89	22800	17.4	36.6	171	3072	866	24.2	3.6	77.9	1783	41	1547	45	1.96	1410.	13	42	3.2	16
13.0	1976	298	3.13	23737	18.1	35.2	181	3195	800	22.0	3.3	79.0	1939	37	1670	43	1.85	1518.	14	45	3.3	17
14.0	2128	321	3.37	24640	18.8	33.9	191	3301	743	20.1	3.0	79.9	2095	33	1791	40	1.75	1614.	15	48	3.5	19
15.0	2280	344	3.61	25512	19.4	32.8	201	3392	693	18.5	2.8	80.7	2250	30	1912	39	1.67	1719.	16	51	3.6	20
16.0	2432	367	3.85	26355	20.1	31.7	210	3472	650	17.2	2.6	81.4	2404	28	2032	37	1.60	1822.	17	54	3.8	21
17.0	2584	390	4.09	27174	20.7	30.8	219	3543	611	16.0	2.4	82.0	2558	26	2152	35	1.54	1923.	18	56	3.9	22
18.0	2736	413	4.33	27969	21.3	29.9	227	3605	577	15.0	2.3	82.5	2712	24	2271	34	1.48	2024.	19	59	4.0	23
19.0	2888	436	4.57	28743	21.9	29.1	235	3661	547	14.1	2.1	82.9	2866	22	2389	33	1.43	2122.	20	62	4.2	24
20.0	3040	459	4.81	29497	22.4	28.4	243	3711	520	13.3	2.0	83.3	3019	21	2508	32	1.38	2220.	21	64	4.3	25
25.0	3800	573	6.02	33023	25.1	25.4	278	3902	416	10.4	1.6	84.8	3784	16	3095	28	1.20	2702.	26	77	4.8	29
30.0	4560	688	7.22	36223	27.5	23.2	310	4029	346	8.5	1.3	85.7	4547	13	3678	25	1.08	3156.	31	89	5.3	33
35.0	5320	802	8.42	39177	29.7	21.5	339	4120	297	7.2	1.1	86.4	5309	11	4258	23	0.99	3582.	36	101	5.8	
40.0	6080	917	9.62	41937	31.7	20.1	365	4188	260	6.3	0.9	86.9	6071	9	4835	21	0.92	3978.	41	112	6.2	
45.0	6840	1032	10.83	44539	33.6	18.9	390	4240	231	5.6	0.8	87.2	6832	8	5410	20	0.86	4378.	46	123	6.6	
50.0	7600	1146	12.03	47010	35.5	17.9	413	4282	208	5.0	0.8	87.5	7593	7	5984	19	0.81	4756.	50	134	7.0	

#356 152 Sm on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 20. ZC= 82.(Pb)
NEUTRON NUMBERS: NP= 90. NT= 20. NC=110.

AP**1/3= 5.337 AT**1/3= 3.420 ELSCAT <15 deg
REDUCED MASS NUMBER= 31.67 AP+AT=AC=192.

INTERACTION RADIUS RINT=12.62 fm RO= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 3.59 CT+CP= 9.65 C= 2.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 3.85

COULOMB RADII [fm]:
RCP= 5.98 RCT= 3.84 RC=RCP+RCT= 9.82

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 252.68 MeV K= .20750 n=2.555
VC(RINT)= 141.3 MeV

FISSION-TKE= 147. MeV
ASYMM. FISSION-TKE= 108. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.916 MeV/fm**2 PROX-FACTOR= 25.95 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.32 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -33.0
COMPOUND NUCLEUS: -23.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.35 fm V(RB)= 147.8 MeV
Q-VALUE= -84.3 MeV
L-CRITICAL= 101.

152 Sm on 40 Ca

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	32	0.22	6562	6.9	195.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	63	0.45	9283	9.8	138.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	95	0.67	11373	12.0	112.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	127	0.90	13135	13.9	97.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	143	1.01	13934	14.7	92.0	16	42	0	160.4	6.7	9.8	246	438	266	991	31.34	0.	5	16	1.6	5
5.0	760	158	1.12	14690	15.5	87.3	64	551	268	107.7	15.2	36.2	433	327	436	266	7.82	583.	5	16	1.8	6
5.5	836	174	1.23	15409	16.2	83.3	89	961	612	86.3	14.5	46.9	578	258	561	192	5.62	637.	5	16	1.9	7
6.0	912	190	1.34	16096	17.0	79.7	108	1303	898	72.7	13.1	53.6	700	212	662	157	4.61	691.	5	20	2.1	8
6.5	988	206	1.46	16756	17.7	76.6	125	1591	1038	63.1	11.8	58.4	809	179	749	137	4.00	745.	6	23	2.3	9
7.0	1064	222	1.57	17391	18.3	73.8	139	1837	964	55.9	10.7	62.1	910	154	827	123	3.59	798.	7	26	2.4	10
7.5	1140	238	1.68	18003	19.0	71.3	152	2051	900	50.2	9.8	64.9	1005	135	900	112	3.28	850.	7	28	2.5	11
8.0	1216	253	1.79	18596	19.6	69.0	164	2237	843	45.6	9.0	67.2	1096	120	968	104	3.04	902.	8	30	2.7	12
8.5	1292	269	1.91	19171	20.2	67.0	176	2402	794	41.8	8.3	69.1	1184	108	1034	97	2.84	953.	9	32	2.8	13
9.0	1368	285	2.02	19730	20.8	65.1	186	2548	750	38.5	7.7	70.7	1270	98	1098	92	2.68	1003.	9	34	2.9	14
9.5	1444	301	2.13	20273	21.3	63.3	196	2679	710	35.8	7.2	72.1	1354	90	1160	87	2.54	1053.	10	36	3.0	15
10.0	1520	317	2.24	20802	21.9	61.7	206	2796	675	33.4	6.8	73.3	1437	83	1220	83	2.43	1102.	10	37	3.1	16
10.5	1596	333	2.35	21319	22.4	60.3	215	2903	643	31.3	6.4	74.3	1519	77	1280	79	2.32	1151.	11	39	3.2	17
11.0	1672	348	2.47	21824	23.0	58.9	223	2999	613	29.5	6.0	75.2	1600	72	1338	76	2.23	1199.	12	41	3.3	18
11.5	1748	364	2.58	22317	23.5	57.6	232	3087	587	27.9	5.7	76.1	1681	67	1396	74	2.15	1253.	12	42	3.4	18
12.0	1824	380	2.69	22800	24.0	56.4	240	3168	562	26.4	5.4	76.8	1761	63	1454	71	2.08	1300.	13	44	3.5	19
13.0	1976	412	2.91	23737	25.0	54.2	255	3311	519	23.9	4.9	78.0	1920	56	1567	67	1.95	1392.	14	47	3.7	21
14.0	2128	443	3.14	24640	25.9	52.2	270	3433	482	21.9	4.5	79.1	2077	51	1678	63	1.85	1491.	15	50	3.9	22
15.0	2280	475	3.36	25512	26.8	50.4	284	3539	450	20.2	4.2	79.9	2234	46	1789	60	1.76	1578.	16	53	4.0	24
16.0	2432	507	3.59	26355	27.7	48.8	297	3632	421	18.7	3.9	80.7	2390	42	1898	57	1.68	1674.	17	56	4.2	25
17.0	2584	538	3.81	27174	28.6	47.4	309	3714	397	17.4	3.6	81.3	2545	39	2007	55	1.61	1757.	18	59	4.3	27
18.0	2736	570	4.03	27969	29.4	46.0	322	3786	375	16.3	3.4	81.9	2700	36	2115	53	1.55	1849.	19	62	4.5	28
19.0	2888	602	4.26	28743	30.2	44.8	333	3851	355	15.3	3.2	82.3	2854	34	2223	51	1.50	1940.	20	65	4.6	29
20.0	3040	633	4.48	29497	31.0	43.7	345	3910	337	14.4	3.0	82.8	3008	32	2330	50	1.45	2029.	21	67	4.8	30
25.0	3800	792	5.60	33023	34.6	39.1	396	4132	270	11.3	2.3	84.4	3776	24	2859	43	1.26	2443.	26	80	5.4	36
30.0	4560	950	6.72	36223	37.9	35.6	442	4279	225	9.2	1.9	85.4	4541	19	3382	39	1.13	2856.	30	93	6.0	40
35.0	5320	1108	7.85	39177	41.0	33.0	483	4384	192	7.8	1.6	86.1	5304	16	3901	35	1.03	3223.	35	105	6.5	
40.0	6080	1267	8.97	41937	43.8	30.9	521	4463	168	6.8	1.4	86.6	6066	14	4416	33	0.96	3583.	40	116	7.0	
45.0	6840	1425	10.09	44539	46.5	29.1	557	4524	150	6.0	1.2	87.0	6828	12	4929	31	0.90	3918.	45	128	7.5	
50.0	7600	1583	11.21	47010	49.0	27.6	590	4573	135	5.4	1.1	87.3	7589	11	5439	29	0.85	4228.	49	139	7.9	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	--MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#357 152 Sm on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 26. ZC= 88.(Ra)
NEUTRON NUMBERS: NP= 90. NT= 30. NC=120.

AP**1/3= 5.337 AT**1/3= 3.826 ELSCAT <21 deg
REDUCED MASS NUMBER= 40.92 AP+AT=AC=208.

INTERACTION RADIUS RINT=13.06 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 4.12 CT+CP=10.18 C= 2.45

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 4.35

COULOMB RADII [fm]:
RCP= 5.98 RCT= 4.27 RC=RCP+RCT=10.25

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 316.36 MeV K= .26330 n=2.508
VC(RINT)= 177.4 MeV

FISSION-TKE= 162. MeV
ASYMM. FISSION-TKE= 135. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.912 MeV/fm**2 PROX-FACTOR= 28.08 MeV
L-RLD= 71 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -61.4
COMPOUND NUCLEUS: 2.3

FUSION RELATED PARAMETERS:
R-BARRIER=11.74 fm V(RB)= 185.4 MeV
Q-VALUE= -138.2 MeV
L-CRITICAL= 113.

152 Sm on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	41	0.23	6562	9.0	253.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	82	0.46	9283	12.7	179.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	123	0.69	11373	15.5	146.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	164	0.92	13135	17.9	126.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	184	1.04	13934	19.0	119.7	47	197	0	137.5	18.9	21.3	216	468	232	627	14.84	0.	4	15	1.3	4
5.0	760	205	1.15	14690	20.0	113.5	95	721	405	100.2	21.2	39.9	408	352	399	311	7.28	542.	4	15	1.6	5
5.5	836	225	1.27	15409	21.0	108.2	126	1147	762	81.4	19.0	49.3	556	280	521	235	5.49	590.	4	18	1.8	7
6.0	912	246	1.38	16096	21.9	103.6	151	1502	856	69.1	16.9	55.5	681	231	618	197	4.59	640.	5	22	2.0	8
6.5	988	266	1.50	16756	22.8	99.6	172	1801	790	60.2	15.1	59.9	793	195	702	173	4.02	687.	6	24	2.2	10
7.0	1064	286	1.61	17391	23.7	95.9	191	2058	733	53.4	13.6	63.3	895	169	776	156	3.62	736.	7	27	2.4	11
7.5	1140	307	1.73	18003	24.5	92.7	208	2280	684	48.1	12.4	66.0	991	149	844	143	3.32	785.	7	29	2.5	12
8.0	1216	327	1.85	18596	25.3	89.7	224	2474	642	43.7	11.4	68.1	1083	133	908	133	3.09	828.	8	31	2.7	14
8.5	1292	348	1.96	19171	26.1	87.1	238	2645	604	40.1	10.5	69.9	1172	120	969	124	2.90	876.	9	33	2.8	15
9.0	1368	368	2.08	19730	26.9	84.6	252	2797	570	37.1	9.7	71.5	1259	109	1027	118	2.74	922.	9	35	3.0	16
9.5	1444	389	2.19	20273	27.6	82.4	266	2933	540	34.5	9.1	72.8	1344	100	1084	112	2.60	968.	10	37	3.1	17
10.0	1520	409	2.31	20802	28.3	80.3	278	3056	513	32.2	8.5	73.9	1428	92	1139	107	2.48	1014.	10	39	3.2	18
10.5	1596	430	2.42	21319	29.0	78.3	290	3166	489	30.2	8.0	74.9	1511	85	1193	102	2.38	1059.	11	41	3.3	19
11.0	1672	450	2.54	21824	29.7	76.5	302	3267	467	28.5	7.6	75.8	1592	80	1246	98	2.29	1104.	11	42	3.5	20
11.5	1748	471	2.65	22317	30.4	74.8	313	3359	446	26.9	7.2	76.5	1674	74	1298	95	2.21	1142.	12	44	3.6	22
12.0	1824	491	2.77	22800	31.0	73.3	324	3443	428	25.5	6.8	77.2	1754	70	1350	92	2.13	1191.	12	46	3.7	22
13.0	1976	532	3.00	23737	32.3	70.4	344	3592	395	23.1	6.2	78.4	1914	62	1452	86	2.01	1277.	14	49	3.9	24
14.0	2128	573	3.23	24640	33.5	67.8	363	3719	366	21.1	5.6	79.4	2072	56	1552	82	1.90	1360.	15	52	4.1	26
15.0	2280	614	3.46	25512	34.7	65.5	382	3830	342	19.5	5.2	80.3	2229	51	1651	78	1.81	1441.	16	55	4.3	28
16.0	2432	655	3.69	26355	35.8	63.5	399	3926	321	18.1	4.8	81.0	2385	47	1748	74	1.73	1520.	17	58	4.5	30
17.0	2584	696	3.92	27174	36.9	61.6	416	4012	302	16.8	4.5	81.6	2540	44	1845	71	1.66	1606.	18	61	4.6	31
18.0	2736	737	4.15	27969	38.0	59.8	432	4087	285	15.8	4.2	82.1	2696	40	1941	69	1.60	1681.	19	64	4.8	33
19.0	2888	778	4.38	28743	39.0	58.2	448	4155	270	14.8	4.0	82.6	2850	38	2036	66	1.54	1754.	19	67	5.0	35
20.0	3040	818	4.61	29497	40.0	56.8	463	4216	256	14.0	3.8	83.0	3005	35	2131	64	1.49	1836.	20	69	5.1	36
25.0	3800	1023	5.77	33023	44.8	50.8	531	4447	205	10.9	2.9	84.5	3773	27	2599	56	1.30	2202.	25	83	5.8	43
30.0	4560	1228	6.92	36223	49.0	46.3	592	4601	171	8.9	2.4	85.5	4538	22	3059	50	1.17	2546.	30	95	6.5	49
35.0	5320	1432	8.07	39177	53.0	42.9	647	4711	146	7.6	2.0	86.2	5302	18	3515	46	1.07	2877.	35	108	7.1	
40.0	6080	1637	9.23	41937	56.6	40.1	698	4793	128	6.6	1.8	86.7	6064	16	3966	43	0.99	3181.	39	119	7.6	
45.0	6840	1842	10.38	44539	60.0	37.8	746	4857	114	5.8	1.6	87.1	6826	14	4414	40	0.93	3482.	44	131	8.1	
50.0	7600	2046	11.53	47010	63.3	35.9	790	4908	102	5.2	1.4	87.4	7588	12	4860	38	0.87	3736.	48	142	8.6	

#358 152 Sm on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 29. ZC= 91.(Pa)
NEUTRON NUMBERS: NP= 90. NT= 34. NC=124.

AP**1/3= 5.337 AT**1/3= 3.979 ELSCAT <24 deg
REDUCED MASS NUMBER= 44.54 AP+AT=AC=215.

INTERACTION RADIUS RINT=13.23 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 4.31 CT+CP=10.37 C= 2.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 4.53

COULOMB RADII [fm]:
RCP= 5.98 RCT= 4.45 RC=RCP+RCT=10.42

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 347.57 MeV K= .28929 n=2.492
VC(RINT)= 195.4 MeV

FISSION-TKE= 170. MeV
ASYMM. FISSION-TKE= 148. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.912 MeV/fm**2 PROX-FACTOR= 28.87 MeV
L-RLD= 68 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.58 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -65.2
COMPOUND NUCLEUS: 16.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.88 fm V(RB)= 204.3 MeV
Q-VALUE= -156.3 MeV
L-CRITICAL= 113.

152 Sm on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	45	0.23	6562	9.7	283.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	89	0.46	9283	13.8	200.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	134	0.68	11373	16.9	163.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	178	0.91	13135	19.5	141.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	200	1.03	13934	20.7	133.5	42	137	0	145.0	19.8	17.5	169	515	186	845	18.31	0.	4	15	1.3	3
5.0	760	223	1.14	14690	21.8	126.6	100	681	366	103.2	24.0	38.4	373	387	365	362	7.68	524.	4	15	1.6	5
5.5	836	245	1.25	15409	22.8	120.7	136	1123	736	83.4	21.4	48.3	530	306	492	268	5.69	571.	4	18	1.8	7
6.0	912	267	1.37	16096	23.9	115.6	163	1491	716	70.6	19.0	54.7	660	252	593	223	4.72	620.	5	22	2.0	8
6.5	988	290	1.48	16756	24.8	111.0	187	1801	661	61.4	16.9	59.3	775	213	677	195	4.12	666.	6	24	2.2	10
7.0	1064	312	1.60	17391	25.8	107.0	208	2068	614	54.4	15.2	62.8	880	184	752	175	3.71	710.	7	27	2.4	12
7.5	1140	334	1.71	18003	26.7	103.4	227	2298	573	48.9	13.8	65.5	978	162	820	160	3.39	757.	7	29	2.6	13
8.0	1216	356	1.82	18596	27.6	100.1	245	2500	537	44.5	12.6	67.8	1072	144	883	149	3.15	803.	8	31	2.7	14
8.5	1292	379	1.94	19171	28.4	97.1	261	2677	505	40.8	11.6	69.6	1162	130	942	140	2.95	845.	9	33	2.9	16
9.0	1368	401	2.05	19730	29.2	94.4	277	2835	477	37.7	10.8	71.2	1250	118	1000	132	2.79	890.	9	35	3.0	17
9.5	1444	423	2.17	20273	30.0	91.9	291	2976	452	35.0	10.1	72.5	1336	108	1055	125	2.65	935.	10	37	3.2	18
10.0	1520	445	2.28	20802	30.8	89.5	305	3103	429	32.7	9.4	73.7	1420	100	1108	120	2.53	979.	10	39	3.3	19
10.5	1596	468	2.39	21319	31.6	87.4	318	3218	409	30.7	8.9	74.7	1503	93	1161	115	2.42	1018.	11	41	3.4	21
11.0	1672	490	2.51	21824	32.3	85.4	331	3323	390	28.9	8.4	75.6	1586	86	1212	110	2.33	1060.	11	43	3.5	22
11.5	1748	512	2.62	22317	33.0	83.5	344	3418	373	27.3	7.9	76.3	1667	81	1263	106	2.24	1103.	12	44	3.6	23
12.0	1824	534	2.73	22800	33.7	81.7	355	3505	358	25.9	7.5	77.1	1748	76	1313	103	2.17	1145.	12	46	3.8	24
13.0	1976	579	2.96	23737	35.1	78.5	378	3660	330	23.5	6.8	78.3	1908	68	1410	96	2.04	1227.	13	49	4.0	26
14.0	2128	624	3.19	24640	36.5	75.7	399	3792	307	21.5	6.2	79.3	2067	61	1507	91	1.93	1308.	14	52	4.2	28
15.0	2280	668	3.42	25512	37.7	73.1	420	3907	286	19.8	5.8	80.1	2224	56	1601	87	1.84	1386.	15	56	4.4	30
16.0	2432	713	3.65	26355	39.0	70.8	439	4007	268	18.3	5.3	80.8	2381	51	1695	83	1.76	1463.	16	58	4.5	32
17.0	2584	757	3.87	27174	40.2	68.7	458	4096	252	17.1	5.0	81.5	2537	47	1787	80	1.68	1545.	17	61	4.7	33
18.0	2736	802	4.10	27969	41.3	66.7	475	4174	238	16.0	4.7	82.0	2692	44	1879	77	1.62	1618.	18	64	4.9	35
19.0	2888	846	4.33	28743	42.5	65.0	493	4245	226	15.0	4.4	82.5	2847	41	1970	74	1.57	1689.	19	67	5.1	37
20.0	3040	891	4.56	29497	43.6	63.3	509	4308	214	14.2	4.1	82.9	3002	38	2060	72	1.51	1768.	20	70	5.2	38
25.0	3800	1113	5.70	33023	48.7	56.6	585	4548	171	11.1	3.2	84.5	3771	29	2506	62	1.32	2123.	25	83	6.0	45
30.0	4560	1336	6.84	36223	53.4	51.7	652	4708	143	9.1	2.7	85.5	4536	24	2943	56	1.18	2443.	30	96	6.6	52
35.0	5320	1559	7.98	39177	57.6	47.9	713	4822	122	7.7	2.2	86.2	5300	20	3375	51	1.08	2762.	34	108	7.2	
40.0	6080	1782	9.12	41937	61.6	44.8	769	4908	107	6.7	2.0	86.7	6063	17	3803	47	1.00	3057.	39	120	7.8	
45.0	6840	2004	10.26	44539	65.3	42.2	821	4974	95	5.9	1.7	87.1	6825	15	4228	44	0.94	3327.	43	131	8.3	
50.0	7600	2227	11.40	47010	68.9	40.0	870	5027	85	5.3	1.5	87.4	7587	13	4650	42	0.89	3571.	48	142	8.8	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fr	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#359 152 Sm on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 42. ZC=104.( )
NEUTRON NUMBERS: NP= 90. NT= 50. NC=140.

AP**1/3= 5.337 AT**1/3= 4.514 ELSCAT <37 deg
REDUCED MASS NUMBER= 57.31 AP+AT=AC=244.

INTERACTION RADIUS RINT=13.81 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 5.00 CT+CP=11.06 C̄= 2.74

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 5.20

COULOMB RADII [fm]:
RCP= 5.98 RCT= 5.08 RC=RCP+RCT=11.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 476.76 MeV K= .37941 n=2.454
VC(RINT)= 271.1 MeV

FISSION-TKE= 208. MeV
ASYMM. FISSION-TKE= 200. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.915 MeV/fm**2 PROX-FACTOR= 31.50 MeV
L-RLD= 42 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -87.5
COMPOUND NUCLEUS: 94.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.35 fm V(RB)= 283.7 MeV
Q-VALUE= -256.5 MeV
L-CRITICAL= 70.

152 Sm on 92 Mo

152 Sm on 92 Mo

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	57	0.21	6562	12.5	410.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	304	115	0.42	9283	17.7	289.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	456	172	0.63	11373	21.7	236.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	608	229	0.85	13135	25.1	205.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	684	258	0.95	13934	26.6	193.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	760	287	1.06	14690	28.0	183.4	89	323	47	128.3	37.2	25.8	182	578	185	790	12.17	469.	0	1.0	2
5.5	836	315	1.16	15409	29.4	174.8	151	843	183	98.3	33.3	40.9	387	449	355	467	7.15	510.	0	1.4	5
6.0	912	344	1.27	16096	30.7	167.4	195	1275	168	81.4	28.8	49.3	548	364	478	364	5.56	551.	4	20	1.7	7
6.5	988	373	1.37	16756	32.0	160.8	230	1640	155	70.0	25.2	55.0	683	305	575	308	4.70	592.	5	23	2.0	9
7.0	1064	401	1.48	17391	33.2	155.0	260	1952	144	61.5	22.4	59.2	803	261	657	272	4.15	633.	6	26	2.2	11
7.5	1140	430	1.59	18003	34.3	149.7	288	2223	134	55.0	20.2	62.5	912	228	727	246	3.76	672.	7	29	2.4	13
8.0	1216	458	1.69	18596	35.5	145.0	313	2460	126	49.7	18.4	65.1	1014	202	791	227	3.46	711.	7	31	2.6	15
8.5	1292	487	1.80	19171	36.5	140.6	336	2669	118	45.4	16.8	67.3	1111	181	850	211	3.22	752.	8	33	2.8	16
9.0	1368	516	1.90	19730	37.6	136.7	357	2855	112	41.8	15.6	69.1	1204	164	904	198	3.02	789.	9	35	2.9	18
9.5	1444	544	2.01	20273	38.6	133.0	378	3021	106	38.8	14.4	70.6	1294	150	956	188	2.86	825.	9	37	3.1	20
10.0	1520	573	2.11	20802	39.6	129.7	397	3170	100	36.2	13.5	71.9	1382	138	1006	179	2.72	865.	10	39	3.2	21
10.5	1596	602	2.22	21319	40.6	126.5	416	3305	96	33.9	12.7	73.1	1469	127	1054	171	2.60	900.	10	41	3.4	23
11.0	1672	630	2.33	21824	41.6	123.6	433	3428	91	31.9	11.9	74.1	1554	118	1100	164	2.50	939.	11	43	3.5	24
11.5	1748	659	2.43	22317	42.5	120.9	450	3540	87	30.1	11.3	75.0	1638	110	1145	158	2.40	972.	11	45	3.6	26
12.0	1824	688	2.54	22800	43.4	118.4	467	3643	84	28.5	10.7	75.8	1720	104	1189	152	2.32	1010.	12	46	3.8	27
13.0	1976	745	2.75	23737	45.2	113.7	498	3824	77	25.7	9.7	77.1	1884	92	1275	143	2.17	1084.	13	50	4.0	29
14.0	2128	802	2.96	24640	46.9	109.6	527	3980	72	23.5	8.8	78.3	2045	83	1359	135	2.05	1151.	14	53	4.2	32
15.0	2280	860	3.17	25512	48.5	105.9	555	4115	67	21.6	8.1	79.2	2205	75	1440	128	1.95	1222.	15	56	4.4	34
16.0	2432	917	3.38	26355	50.1	102.5	581	4233	63	20.0	7.5	80.0	2363	69	1520	122	1.86	1294.	16	59	4.7	37
17.0	2584	974	3.59	27174	51.7	99.4	606	4337	59	18.6	7.0	80.7	2520	64	1599	117	1.78	1352.	17	62	4.9	39
18.0	2736	1032	3.80	27969	53.2	96.6	630	4430	56	17.4	6.6	81.3	2677	59	1677	113	1.71	1417.	18	65	5.0	41
19.0	2888	1089	4.02	28743	54.6	94.1	654	4512	53	16.4	6.2	81.8	2833	55	1754	109	1.65	1481.	19	68	5.2	43
20.0	3040	1146	4.23	29497	56.1	91.7	676	4587	50	15.4	5.8	82.3	2988	52	1830	105	1.60	1544.	20	71	5.4	45
25.0	3800	1433	5.28	33023	62.7	82.0	779	4870	40	12.0	4.5	84.0	3761	39	2202	91	1.39	1852.	24	84	6.2	53
30.0	4560	1719	6.34	36223	68.7	74.9	870	5058	33	9.8	3.7	85.1	4529	31	2565	82	1.24	2129.	29	97	6.9	61
35.0	5320	2006	7.40	39177	74.2	69.3	952	5192	28	8.3	3.1	85.8	5294	26	2921	75	1.14	2389.	33	109	7.6	
40.0	6080	2292	8.46	41937	79.3	64.8	1028	5293	25	7.2	2.7	86.4	6057	23	3272	69	1.05	2637.	37	121	8.2	
45.0	6840	2579	9.51	44539	84.1	61.1	1099	5371	22	6.4	2.4	86.8	6820	20	3619	65	0.98	2862.	42	132	8.7	
50.0	7600	2866	10.57	47010	88.6	58.0	1165	5434	20	5.7	2.1	87.1	7582	18	3963	61	0.93	3083.	46	143	9.2	

#360 152 Sm on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 47. ZC=109.( )
NEUTRON NUMBERS: NP= 90. NT= 61. NC=151.

AP**1/3= 5.337 AT**1/3= 4.762 ELSCAT <45 deg
REDUCED MASS NUMBER= 63.14 AP+AT=AC=260.

INTERACTION RADIUS RINT=14.08 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 5.32 CT+CP=11.38 C̄= 2.83

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 5.50

COULOMB RADII [fm]:
RCP= 5.98 RCT= 5.34 RC=RCP+RCT=11.31

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 521.75 MeV K= .40083 n=2.446
VC(RINT)= 297.6 MeV

FISSION-TKE= 222. MeV
ASYMM. FISSION-TKE= 217. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.907 MeV/fm**2 PROX-FACTOR= 32.31 MeV
L-RLD= 33 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.30 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -87.6
COMPOUND NUCLEUS: 127.6

FUSION RELATED PARAMETERS:
R-BARRIER=12.58 fm V(RB)= 310.6 MeV
Q-VALUE= -289.7 MeV
L-CRITICAL= 39.

152 Sm on 108 Ag

152 Sm on 108 Ag

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	63	0.21	6562	13.8	458.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	304	126	0.42	9283	19.5	324.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	456	189	0.64	11373	23.9	264.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	608	253	0.85	13135	27.6	229.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	684	284	0.95	13934	29.3	216.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	760	316	1.06	14690	30.9	205.2	103	356	51	126.7	44.7	26.6	170	590	167	858	12.02	441.	0	0.9	2
5.5	836	347	1.17	15409	32.4	195.6	172	894	46	97.4	37.8	41.3	377	459	334	517	7.21	479.	3	16	1.3	5
6.0	912	379	1.27	16096	33.8	187.3	220	1341	42	80.8	32.2	49.6	540	372	455	405	5.63	516.	4	20	1.7	8
6.5	988	410	1.38	16756	35.2	180.0	259	1719	39	69.5	28.1	55.3	676	312	550	343	4.77	555.	5	24	1.9	10
7.0	1064	442	1.49	17391	36.5	173.4	294	2043	36	61.1	24.9	59.4	797	267	629	303	4.22	593.	6	26	2.2	12
7.5	1140	474	1.59	18003	37.8	167.5	324	2323	34	54.7	22.3	62.7	907	233	697	275	3.82	630.	7	29	2.4	14
8.0	1216	505	1.70	18596	39.1	162.2	352	2568	32	49.5	20.3	65.3	1009	207	758	253	3.52	667.	7	31	2.6	16
8.5	1292	537	1.80	19171	40.3	157.4	378	2784	30	45.2	18.6	67.4	1107	185	813	236	3.27	703.	8	33	2.8	18
9.0	1368	568	1.91	19730	41.4	152.9	402	2977	28	41.6	17.1	69.2	1200	168	865	222	3.08	738.	9	35	2.9	20
9.5	1444	600	2.02	20273	42.6	148.9	425	3149	27	38.6	15.9	70.7	1291	153	914	210	2.91	772.	9	37	3.1	22
10.0	1520	631	2.12	20802	43.7	145.1	447	3303	25	36.0	14.8	72.0	1379	141	960	200	2.77	806.	10	39	3.2	24
10.5	1596	663	2.23	21319	44.7	141.6	467	3443	24	33.7	13.9	73.1	1466	130	1005	191	2.65	843.	10	41	3.4	25
11.0	1672	695	2.33	21824	45.8	138.3	487	3570	23	31.7	13.1	74.1	1551	121	1048	183	2.54	875.	11	43	3.5	27
11.5	1748	726	2.44	22317	46.8	135.3	506	3686	22	29.9	12.4	75.0	1635	113	1090	176	2.44	911.	11	45	3.7	28
12.0	1824	758	2.55	22800	47.8	132.5	525	3793	21	28.3	11.7	75.8	1718	106	1131	170	2.36	943.	12	46	3.8	30
13.0	1976	821	2.76	23737	49.8	127.3	559	3981	19	25.6	10.6	77.2	1882	94	1211	159	2.21	1008.	13	50	4.0	33
14.0	2128	884	2.97	24640	51.7	122.6	592	4142	18	23.4	9.7	78.3	2043	85	1288	151	2.09	1076.	14	53	4.3	35
15.0	2280	947	3.18	25512	53.5	118.5	623	4282	17	21.5	8.9	79.2	2203	77	1363	143	1.99	1137.	15	56	4.5	38
16.0	2432	1010	3.39	26355	55.2	114.7	653	4404	16	19.9	8.3	80.0	2361	71	1437	137	1.90	1197.	16	59	4.7	41
17.0	2584	1073	3.61	27174	56.9	111.3	681	4512	15	18.6	7.7	80.7	2519	65	1509	131	1.82	1260.	17	62	4.9	43
18.0	2736	1136	3.82	27969	58.6	108.1	709	4608	14	17.4	7.2	81.3	2675	61	1580	126	1.75	1322.	18	65	5.1	45
19.0	2888	1200	4.03	28743	60.2	105.3	735	4694	13	16.3	6.8	81.8	2832	56	1650	121	1.68	1382.	19	68	5.3	47
20.0	3040	1263	4.24	29497	61.8	102.6	760	4771	12	15.4	6.4	82.3	2987	53	1726	117	1.63	1441.	19	71	5.5	49
25.0	3800	1578	5.30	33023	69.0	91.8	876	5064	10	12.0	5.0	84.0	3760	40	2059	102	1.41	1716.	24	84	6.3	59
30.0	4560	1894	6.36	36223	75.6	83.8	978	5259	8	9.8	4.1	85.1	4528	32	2388	91	1.27	1978.	28	97	7.0	67
35.0	5320	2210	7.43	39177	81.7	77.6	1070	5398	7	8.3	3.4	85.9	5293	27	2710	83	1.16	2212.	33	109	7.7	
40.0	6080	2526	8.49	41937	87.3	72.5	1155	5503	6	7.2	3.0	86.4	6057	23	3028	77	1.07	2432.	37	120	8.3	
45.0	6840	2841	9.55	44539	92.6	68.4	1234	5584	5	6.3	2.6	86.8	6820	20	3341	72	1.00	2644.	41	131	8.9	
50.0	7600	3157	10.61	47010	97.6	64.9	1308	5649	5	5.7	2.4	87.2	7582	18	3652	68	0.95	2835.	45	143	9.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#361 152 Sm on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 58. ZC=120.( )
NEUTRON NUMBERS: NP= 90. NT= 82. NC=172.

AP**1/3= 5.337 AT**1/3= 5.192 ELSCAT <67 deg
REDUCED MASS NUMBER= 72.88 AP+AT=AC=292.

INTERACTION RADIUS RINT=14.55 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 5.87 CT+CP=11.94 C= 2.98

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.04

COULOMB RADII [fm]:
RCP= 5.98 RCT= 5.82 RC=RCP+RCT=11.79

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 618.27 MeV K= .43767 n=2.439
VC(RINT)= 355.5 MeV

FISSION-TKE= 255. MeV
ASYMM. FISSION-TKE= 254. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 33.66 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.89 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -88.2
COMPOUND NUCLEUS: 212.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.95 fm V(RB)= 370.3 MeV
Q-VALUE= -375.0 MeV
L-CRITICAL= 0.

152 Sm on 140 Ce — 152 Sm on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	152	73	0.20	6562	15.9	566.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	146	0.41	9283	22.5	400.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	219	0.61	11373	27.6	326.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	292	0.82	13135	31.9	283.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	328	0.92	13934	33.8	266.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	364	1.02	14690	35.6	253.2	79	156	0	145.4	65.2	17.3	68	692	67	1622	19.34	0.	0	0	0.0	0
5.5	836	401	1.13	15409	37.4	241.4	182	752	0	106.0	49.9	37.0	304	532	257	718	8.38	0.	3	15	0.8	2
6.0	912	437	1.23	16096	39.0	231.2	245	1246	0	86.7	41.1	46.7	483	429	389	535	6.23	0.	4	19	1.3	6
6.5	988	474	1.33	16756	40.6	222.1	295	1663	0	74.0	35.2	53.0	631	357	489	445	5.17	0.	5	23	1.6	9
7.0	1064	510	1.43	17391	42.2	214.0	337	2021	0	64.8	30.9	57.6	759	305	570	389	4.52	0.	6	26	1.9	12
7.5	1140	547	1.54	18003	43.7	206.8	375	2330	0	57.7	27.6	61.1	875	265	638	350	4.07	0.	6	28	2.2	14
8.0	1216	583	1.64	18596	45.1	200.2	409	2601	0	52.1	24.9	63.9	982	234	698	320	3.73	0.	7	31	2.4	17
8.5	1292	619	1.74	19171	46.5	194.2	441	2840	0	47.6	22.7	66.2	1082	210	751	298	3.46	0.	8	33	2.6	19
9.0	1368	656	1.84	19730	47.8	188.7	470	3052	0	43.7	20.9	68.1	1179	189	800	279	3.24	0.	8	35	2.8	22
9.5	1444	692	1.95	20273	49.1	183.7	498	3242	0	40.5	19.4	69.8	1271	173	846	263	3.06	0.	9	37	2.9	24
10.0	1520	729	2.05	20802	50.4	179.1	524	3413	0	37.7	18.0	71.1	1362	158	888	250	2.91	0.	9	39	3.1	26
10.5	1596	765	2.15	21319	51.7	174.7	549	3568	0	35.3	16.9	72.4	1450	146	929	239	2.78	0.	10	41	3.3	28
11.0	1672	802	2.25	21824	52.9	170.7	573	3708	0	33.2	15.9	73.4	1536	136	969	229	2.66	0.	11	43	3.4	30
11.5	1748	838	2.36	22317	54.1	167.0	596	3837	0	31.3	15.0	74.4	1621	127	1006	220	2.56	0.	11	44	3.6	32
12.0	1824	875	2.46	22800	55.2	163.5	618	3954	0	29.6	14.2	75.2	1705	119	1043	212	2.47	0.	12	46	3.7	33
13.0	1976	947	2.66	23737	57.5	157.0	660	4162	0	26.7	12.8	76.6	1870	106	1114	199	2.31	0.	13	49	4.0	37
14.0	2128	1020	2.87	24640	59.6	151.3	700	4340	0	24.4	11.7	77.8	2033	95	1182	187	2.18	0.	13	53	4.2	40
15.0	2280	1093	3.07	25512	61.7	146.2	737	4495	0	22.4	10.7	78.8	2194	86	1247	178	2.07	0.	14	56	4.4	44
16.0	2432	1166	3.28	26355	63.8	141.6	773	4630	0	20.8	9.9	79.6	2353	79	1311	170	1.97	0.	15	59	4.7	47
17.0	2584	1239	3.48	27174	65.7	137.3	807	4749	0	19.3	9.3	80.3	2511	73	1374	163	1.89	0.	16	62	4.9	49
18.0	2736	1312	3.69	27969	67.6	133.5	840	4855	0	18.1	8.7	81.0	2669	67	1435	156	1.82	0.	17	64	5.1	52
19.0	2888	1385	3.89	28743	69.5	129.9	871	4949	0	17.0	8.1	81.5	2825	63	1496	151	1.75	0.	18	67	5.3	54
20.0	3040	1458	4.10	29497	71.3	126.6	901	5035	0	16.0	7.7	82.0	2981	59	1555	146	1.69	0.	19	70	5.4	57
25.0	3800	1822	5.12	33023	79.7	113.2	1040	5358	0	12.4	6.0	83.8	3756	44	1844	126	1.47	0.	23	83	6.3	68
30.0	4560	2186	6.15	36223	87.3	103.4	1162	5574	0	10.2	4.9	84.9	4524	36	2122	113	1.31	0.	27	95	7.0	78
35.0	5320	2551	7.17	39177	94.3	95.7	1272	5728	0	8.6	4.1	85.7	5290	30	2393	103	1.20	0.	32	107	7.7	
40.0	6080	2915	8.20	41937	100.8	89.5	1374	5844	0	7.5	3.6	86.3	6054	26	2658	96	1.11	0.	36	119	8.3	
45.0	6840	3279	9.22	44539	106.9	84.4	1468	5933	0	6.6	3.2	86.7	6818	22	2920	89	1.04	0.	40	130	8.9	
50.0	7600	3644	10.25	47010	112.7	80.1	1557	6005	0	5.9	2.8	87.1	7580	20	3178	84	0.98	0.	44	141	9.5	

#362 152 Sm on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 62. ZC=124.( )
NEUTRON NUMBERS: NP= 90. NT= 92. NC=182.

AP**1/3= 5.337 AT**1/3= 5.360
REDUCED MASS NUMBER= 76.50 AP+AT=AC=306.

INTERACTION RADIUS RINT=14.73 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 6.09 CT+CP=12.15 C= 3.04

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.25

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.00 RC=RCP+RCT=11.97

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 651.03 MeV K= .44461 n=2.439
VC(RINT)= 375.3 MeV

FISSION-TKE= 267. MeV
ASYMM. FISSION-TKE= 267. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 34.00 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.76 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -72.1
COMPOUND NUCLEUS: 240.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.10 fm V(RB)= 390.6 MeV
Q-VALUE= -387.4 MeV
L-CRITICAL= 0.

152 Sm on 154 Sm — 152 Sm on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	152	76	0.20	6562	16.7	605.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	153	0.41	9283	23.7	428.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	229	0.61	11373	29.0	349.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	306	0.82	13135	33.5	302.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	344	0.92	13934	35.5	285.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	382	1.02	14690	37.4	270.7	73	122	0	149.9	76.4	15.0	51	709	47	1981	22.56	0.	0	0	0.0	0
5.5	836	421	1.12	15409	39.2	258.1	189	735	0	107.6	54.3	36.2	291	545	240	786	8.69	0.	3	15	0.9	3
6.0	912	459	1.22	16096	41.0	247.1	257	1244	0	87.8	44.2	46.1	474	438	373	579	6.39	0.	4	19	1.4	6
6.5	988	497	1.32	16756	42.7	237.4	310	1674	0	74.8	37.7	52.6	623	345	479	490	5.29	0.	5	23	1.7	10
7.0	1064	535	1.43	17391	44.3	228.8	356	2043	0	65.5	33.0	57.3	753	311	553	418	4.61	0.	6	26	2.0	13
7.5	1140	574	1.53	18003	45.8	221.0	396	2362	0	58.3	29.4	60.9	870	270	620	376	4.14	0.	6	28	2.2	16
8.0	1216	612	1.63	18596	47.3	214.0	433	2641	0	52.6	26.5	63.7	977	239	678	344	3.79	0.	7	31	2.4	18
8.5	1292	650	1.73	19171	48.8	207.6	467	2888	0	48.0	24.1	66.0	1079	213	730	319	3.52	0.	8	33	2.6	21
9.0	1368	688	1.83	19730	50.2	201.8	498	3107	0	44.1	22.2	68.0	1175	193	777	299	3.29	0.	8	35	2.8	23
9.5	1444	727	1.94	20273	51.6	196.4	528	3302	0	40.8	20.6	69.6	1268	176	821	282	3.11	0.	9	37	3.0	26
10.0	1520	765	2.04	20802	52.9	191.4	556	3479	0	38.0	19.1	71.0	1359	161	863	268	2.95	0.	9	39	3.1	28
10.5	1596	803	2.14	21319	54.2	186.8	582	3638	0	35.6	17.9	72.2	1447	149	902	256	2.82	0.	10	41	3.3	30
11.0	1672	841	2.24	21824	55.5	182.5	608	3783	0	33.4	16.8	73.3	1534	138	939	245	2.70	0.	10	42	3.4	32
11.5	1748	880	2.34	22317	56.7	178.5	632	3915	0	31.5	15.9	74.2	1619	129	976	236	2.59	0.	11	44	3.6	34
12.0	1824	918	2.45	22800	58.0	174.7	656	4036	0	29.8	15.0	75.1	1703	121	1011	227	2.50	0.	11	46	3.7	36
13.0	1976	994	2.65	23737	60.3	167.9	701	4251	0	26.9	13.6	76.5	1869	107	1078	213	2.34	0.	12	49	4.0	40
14.0	2128	1071	2.85	24640	62.6	161.8	743	4434	0	24.6	12.4	77.7	2032	96	1142	201	2.21	0.	13	52	4.2	43
15.0	2280	1147	3.06	25512	64.8	156.3	783	4594	0	22.6	11.4	78.7	2193	87	1204	191	2.10	0.	14	55	4.5	47
16.0	2432	1224	3.26	26355	66.9	151.3	820	4733	0	20.9	10.5	79.6	2352	80	1264	182	2.00	0.	15	58	4.7	50
17.0	2584	1300	3.46	27174	69.0	146.8	857	4856	0	19.4	9.8	80.3	2510	74	1323	174	1.92	0.	16	61	4.9	53
18.0	2736	1377	3.67	27969	71.0	142.7	891	4965	0	18.2	9.2	80.9	2668	68	1381	167	1.84	0.	17	64	5.1	56
19.0	2888	1453	3.87	28743	72.9	138.9	925	5063	0	17.1	8.6	81.5	2824	64	1438	161	1.77	0.	18	67	5.3	58
20.0	3040	1530	4.08	29497	74.8	135.3	957	5151	0	16.1	8.1	82.0	2980	60	1494	156	1.71	0.	19	70	5.5	61
25.0	3800	1912	5.10	33023	83.7	121.1	1104	5485	0	12.5	6.3	83.7	3755	45	1764	135	1.49	0.	23	83	6.3	73
30.0	4560	2295	6.11	36223	91.6	110.5	1234	5707	0	10.2	5.2	84.9	4524	36	2024	121	1.33	0.	27	95	7.1	83
35.0	5320	2677	7.13	39177	99.0	102.3	1352	5866	0	8.7	4.4	85.7	5290	30	2277	110	1.21	0.	31	107	7.7	
40.0	6080	3060	8.15	41937	105.8	95.7	1460	5985	0	7.5	3.8	86.2	6054	26	2524	102	1.12	0.	35	118	8.4	
45.0	6840	3442	9.17	44539	112.2	90.2	1560	6078	0	6.6	3.3	86.7	6817	23	2767	96	1.05	0.	39	129	8.9	
50.0	7600	3825	10.19	47010	118.3	85.6	1655	6152	0	5.9	3.0	87.0	7580	20	3007	90	0.99	0.	43	140	9.5	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	sec	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#363 152 Sm on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 67. ZC=129.( )
NEUTRON NUMBERS: NP= 90. NT= 98. NC=188.

AP**1/3= 5.337 AT**1/3= 5.485
REDUCED MASS NUMBER= 79.12 AP+AT=AC=317.

INTERACTION RADIUS RINT=14.86 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 6.25 CT+CP=12.31 C= 3.08

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.41

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.15 RC=RCP+RCT=12.13

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 694.41 MeV K= .45883 n=2.439
VC(RINT)= 401.9 MeV

FISSION-TKE= 284. MeV
ASYMM. FISSION-TKE= 283. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.893 MeV/fm**2 PROX-FACTOR= 34.53 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.68 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -63.7
COMPOUND NUCLEUS: 287.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.19 fm V(RB)= 418.7 MeV
Q-VALUE= -425.5 MeV
L-CRITICAL= 0.

152 Sm on 165 Ho — 152 Sm on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	79	0.20	6562	17.3	654.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	158	0.39	9283	24.5	462.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	237	0.59	11373	30.0	377.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	316	0.79	13135	34.6	327.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	356	0.89	13934	36.7	308.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	396	0.98	14690	38.7	292.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	836	435	1.08	15409	40.6	278.9	165	528	0	118.7	63.3	30.7	218	618	178	1010	10.45	0.	2	13	0.5	1
6.0	912	475	1.18	16096	42.4	267.0	246	1065	0	94.7	49.9	42.6	419	493	328	682	7.03	0.	3	18	1.1	5
6.5	988	514	1.28	16756	44.1	256.6	306	1519	0	80.0	42.0	50.0	580	408	438	549	5.65	0.	4	22	1.5	8
7.0	1064	554	1.38	17391	45.8	247.2	356	1907	0	69.6	36.4	55.2	718	346	524	472	4.86	0.	5	25	1.8	12
7.5	1140	593	1.48	18003	47.4	238.8	400	2244	0	61.7	32.3	59.1	840	300	596	420	4.33	0.	6	28	2.1	14
8.0	1216	633	1.57	18596	48.9	231.3	439	2538	0	55.6	29.0	62.2	952	264	657	383	3.94	0.	7	30	2.3	17
8.5	1292	672	1.67	19171	50.5	224.4	475	2798	0	50.6	26.4	64.7	1057	235	710	354	3.64	0.	8	32	2.5	20
9.0	1368	712	1.77	19730	51.9	218.0	509	3029	0	46.4	24.2	66.8	1156	212	759	330	3.40	0.	8	34	2.7	22
9.5	1444	752	1.87	20273	53.3	212.2	540	3236	0	42.9	22.4	68.6	1251	193	804	311	3.20	0.	9	36	2.9	25
10.0	1520	791	1.97	20802	54.7	206.8	570	3421	0	39.9	20.8	70.1	1343	177	845	295	3.03	0.	9	38	3.0	27
10.5	1596	831	2.07	21319	56.1	201.9	598	3589	0	37.3	19.4	71.4	1433	163	884	281	2.89	0.	10	40	3.2	29
11.0	1672	870	2.17	21824	57.4	197.2	625	3742	0	35.0	18.2	72.5	1521	151	922	269	2.76	0.	10	42	3.4	32
11.5	1748	910	2.26	22317	58.7	192.9	651	3882	0	33.0	17.2	73.5	1607	141	958	258	2.65	0.	11	44	3.5	34
12.0	1824	949	2.36	22800	59.9	188.8	676	4009	0	31.2	16.3	74.4	1692	132	992	249	2.56	0.	11	45	3.6	36
13.0	1976	1029	2.56	23737	62.4	181.4	723	4236	0	28.2	14.7	75.9	1859	117	1058	232	2.39	0.	12	49	3.9	40
14.0	2128	1108	2.76	24640	64.7	174.8	768	4429	0	25.7	13.4	77.2	2023	105	1121	219	2.25	0.	13	52	4.1	43
15.0	2280	1187	2.95	25512	67.0	168.9	810	4597	0	23.6	12.3	78.2	2185	95	1181	208	2.13	0.	14	55	4.4	47
16.0	2432	1266	3.15	26355	69.2	163.5	850	4744	0	21.8	11.3	79.1	2345	87	1240	198	2.03	0.	15	58	4.6	50
17.0	2584	1345	3.35	27174	71.3	158.6	888	4874	0	20.3	10.6	79.9	2504	80	1297	189	1.95	0.	16	61	4.8	53
18.0	2736	1424	3.54	27969	73.4	154.2	924	4989	0	18.9	9.9	80.5	2662	74	1352	182	1.87	0.	17	64	5.0	56
19.0	2888	1503	3.74	28743	75.4	150.1	959	5092	0	17.8	9.3	81.1	2819	69	1407	175	1.80	0.	18	66	5.2	59
20.0	3040	1582	3.94	29497	77.4	146.3	993	5185	0	16.8	8.7	81.6	2976	64	1461	169	1.74	0.	19	69	5.4	62
25.0	3800	1978	4.92	33023	86.5	130.8	1148	5537	0	13.0	6.8	83.5	3751	49	1720	147	1.51	0.	23	82	6.3	74
30.0	4560	2374	5.91	36223	94.8	119.4	1284	5771	0	10.6	5.5	84.7	4521	39	1968	131	1.35	0.	27	94	7.0	85
35.0	5320	2769	6.89	39177	102.4	110.6	1407	5939	0	9.0	4.7	85.5	5287	33	2209	120	1.23	0.	31	106	7.7	
40.0	6080	3165	7.87	41937	109.4	103.4	1520	6065	0	7.8	4.1	86.1	6052	28	2445	111	1.14	0.	35	117	8.3	
45.0	6840	3560	8.86	44539	116.1	97.5	1625	6162	0	6.9	3.6	86.6	6815	25	2676	104	1.06	0.	39	128	8.9	
50.0	7600	3956	9.84	47010	122.4	92.5	1724	6240	0	6.1	3.2	86.9	7578	22	2904	98	1.00	0.	43	139	9.4	

#364 152 Sm on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 73. ZC=135.( )
NEUTRON NUMBERS: NP= 90. NT=108. NC=198.

AP**1/3= 5.337 AT**1/3= 5.657
REDUCED MASS NUMBER= 82.62 AP+AT=AC=333.

INTERACTION RADIUS RINT=15.05 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 6.47 CT+CP=12.53 C= 3.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.62

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.35 RC=RCP+RCT=12.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 744.02 MeV K= .46962 n=2.441
VC(RINT)= 432.5 MeV

FISSION-TKE= 304. MeV
ASYMM. FISSION-TKE= 302. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.891 MeV/fm**2 PROX-FACTOR= 35.04 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.57 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -46.0
COMPOUND NUCLEUS: 352.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.32 fm V(RB)= 450.9 MeV
Q-VALUE= -473.0 MeV
L-CRITICAL= 0.

152 Sm on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	83	0.19	6562	18.1	712.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	165	0.38	9283	25.6	503.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	248	0.57	11373	31.3	411.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	330	0.76	13135	36.1	356.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	372	0.86	13934	38.3	336.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	413	0.96	14690	40.4	318.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	836	454	1.05	15409	42.4	303.9	138	339	0	131.1	76.4	24.5	149	687	116	1385	13.39	0.	2	12	0.0	0
6.0	912	496	1.15	16096	44.3	290.9	237	907	0	101.7	57.0	39.1	368	544	282	815	7.81	0.	3	17	0.7	2
6.5	988	537	1.24	16756	46.1	279.5	305	1386	0	85.0	47.1	47.5	540	448	402	634	6.07	0.	4	21	1.2	7
7.0	1064	578	1.34	17391	47.8	269.4	361	1797	0	73.5	40.5	53.2	686	378	494	536	5.13	0.	5	24	1.6	10
7.5	1140	620	1.43	18003	49.5	260.2	409	2152	0	65.0	35.7	57.5	814	326	569	474	4.53	0.	6	27	1.9	14
8.0	1216	661	1.53	18596	51.1	252.0	452	2464	0	58.3	31.9	60.8	930	286	632	429	4.10	0.	7	29	2.1	17
8.5	1292	702	1.62	19171	52.7	244.4	491	2738	0	52.9	29.0	63.5	1037	255	686	394	3.77	0.	7	32	2.3	20
9.0	1368	744	1.72	19730	54.2	237.6	527	2982	0	48.5	26.5	65.7	1139	229	736	367	3.51	0.	8	34	2.5	22
9.5	1444	785	1.81	20273	55.7	231.2	561	3200	0	44.8	24.5	67.6	1236	208	780	345	3.30	0.	9	36	2.7	25
10.0	1520	826	1.91	20802	57.1	225.4	593	3396	0	41.6	22.7	69.2	1330	190	822	326	3.12	0.	9	38	2.9	27
10.5	1596	867	2.01	21319	58.6	219.9	624	3574	0	38.9	21.2	70.6	1421	175	880	311	2.97	0.	10	40	3.1	30
11.0	1672	909	2.10	21824	59.9	214.9	653	3735	0	36.5	19.9	71.8	1510	162	897	297	2.84	0.	10	42	3.2	32
11.5	1748	950	2.20	22317	61.3	210.2	680	3883	0	34.3	18.7	72.8	1597	151	932	285	2.72	0.	11	43	3.4	34
12.0	1824	991	2.29	22800	62.6	205.7	707	4018	0	32.5	17.7	73.8	1683	141	965	274	2.62	0.	11	45	3.5	36
13.0	1976	1074	2.48	23737	65.2	197.7	757	4257	0	29.3	15.9	75.4	1851	125	1029	256	2.44	0.	12	48	3.8	41
14.0	2128	1157	2.67	24640	67.6	190.5	805	4461	0	26.6	14.5	76.7	2016	112	1090	241	2.30	0.	13	51	4.1	44
15.0	2280	1239	2.87	25512	70.0	184.0	849	4639	0	24.4	13.3	77.8	2179	101	1147	228	2.18	0.	14	54	4.3	48
16.0	2432	1322	3.06	26355	72.3	178.2	892	4794	0	22.6	12.3	78.7	2339	93	1203	217	2.07	0.	15	57	4.5	52
17.0	2584	1405	3.25	27174	74.5	172.8	932	4931	0	21.0	11.4	79.5	2499	85	1257	208	1.98	0.	16	60	4.7	55
18.0	2736	1487	3.44	27969	76.7	168.0	971	5053	0	19.6	10.7	80.2	2657	79	1310	199	1.90	0.	17	63	4.9	58
19.0	2888	1570	3.63	28743	78.8	163.5	1009	5161	0	18.4	10.0	80.8	2815	73	1362	192	1.83	0.	17	66	5.1	61
20.0	3040	1652	3.82	29497	80.8	159.4	1045	5259	0	17.3	9.4	81.3	2971	69	1413	185	1.77	0.	18	69	5.3	64
25.0	3800	2065	4.78	33023	90.4	142.5	1209	5631	0	13.5	7.3	83.3	3748	52	1657	160	1.53	0.	23	81	6.2	77
30.0	4560	2479	5.73	36223	99.0	130.1	1353	5879	0	11.0	6.0	84.5	4519	41	1889	143	1.37	0.	27	94	6.9	88
35.0	5320	2892	6.69	39177	106.9	120.5	1483	6056	0	9.3	5.0	85.4	5285	35	2114	131	1.25	0.	31	105	7.6	
40.0	6080	3305	7.64	41937	114.3	112.7	1603	6189	0	8.0	4.4	86.0	6050	30	2334	121	1.15	0.	35	116	8.2	
45.0	6840	3718	8.60	44539	121.2	106.2	1715	6292	0	7.1	3.9	86.5	6814	26	2549	113	1.08	0.	38	127	8.8	
50.0	7600	4131	9.55	47010	127.8	100.8	1819	6375	0	6.3	3.4	86.8	7577	23	2761	107	1.02	0.	42	138	9.4	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#365 152 Sm on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 79. ZC=141.( )
NEUTRON NUMBERS: NP= 90. NT=118. NC=208.

AP**1/3= 5.337 AT**1/3= 5.819
REDUCED MASS NUMBER= 85.80 AP+AT=AC=349.

INTERACTION RADIUS RINT=15.22 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 6.68 CT+CP=12.74 C= 3.18

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.83

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.55 RC=RCP+RCT=12.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 792.57 MeV K= .47771 n=2.444
VC(RINT)= 462.7 MeV

FISSION-TKE= 325. MeV
ASYMM. FISSION-TKE= 320. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 35.50 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.48 MeV/I**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -28.6
COMPOUND NUCLEUS: 413.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.45 fm V(RB)= 482.8 MeV
Q-VALUE= -516.9 MeV
L-CRITICAL= 0.

152 Sm on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	NULT
1.0	152	86	0.19	6562	18.8	771.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	172	0.37	9283	26.5	545.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	257	0.56	11373	32.5	445.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	343	0.74	13135	37.5	385.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	386	0.83	13934	39.8	363.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	429	0.93	14690	42.0	344.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	836	472	1.02	15409	44.0	328.9	91	136	0	149.2	99.7	15.4	72	764	48	2353	21.70	0.	1	10	0.0	0
6.0	912	515	1.11	16096	46.0	314.9	221	735	0	109.8	65.3	35.1	312	600	234	990	8.88	0.	3	16	0.0	0
6.5	988	558	1.21	16756	47.8	302.5	300	1241	0	90.5	52.7	44.7	498	490	365	733	6.56	0.	4	20	1.0	4
7.0	1064	601	1.30	17391	49.7	291.5	361	1674	0	77.8	44.8	51.1	652	412	463	608	5.44	0.	5	23	1.4	8
7.5	1140	643	1.39	18003	51.4	281.6	414	2049	0	68.4	39.2	55.8	785	355	542	531	4.75	0.	6	26	1.7	12
8.0	1216	686	1.48	18596	53.1	272.7	461	2377	0	61.2	35.0	59.4	906	310	608	478	4.27	0.	6	29	2.0	15
8.5	1292	729	1.58	19171	54.7	264.5	503	2666	0	55.5	31.6	62.3	1017	275	664	438	3.91	0.	7	31	2.2	19
9.0	1368	772	1.67	19730	56.3	257.1	542	2923	0	50.7	28.9	64.6	1121	247	714	406	3.63	0.	8	33	2.4	22
9.5	1444	815	1.76	20273	57.8	250.2	578	3153	0	46.8	26.6	66.6	1220	224	759	381	3.40	0.	8	35	2.6	25
10.0	1520	858	1.85	20802	59.3	243.9	613	3360	0	43.4	24.6	68.3	1316	204	800	359	3.21	0.	9	37	2.8	27
10.5	1596	901	1.95	21319	60.8	238.0	645	3548	0	40.5	23.0	69.8	1408	188	839	341	3.05	0.	10	39	3.0	30
11.0	1672	944	2.04	21824	62.2	232.5	676	3718	0	38.0	21.5	71.0	1498	174	875	326	2.91	0.	10	41	3.1	32
11.5	1748	987	2.13	22317	63.6	227.4	706	3873	0	35.7	20.2	72.1	1586	162	909	312	2.79	0.	11	43	3.3	35
12.0	1824	1030	2.23	22800	65.0	222.6	734	4015	0	33.7	19.1	73.1	1673	151	942	300	2.68	0.	11	44	3.4	37
13.0	1976	1115	2.41	23737	67.7	213.9	788	4267	0	30.4	17.2	74.8	1843	133	1004	280	2.50	0.	12	48	3.7	41
14.0	2128	1201	2.60	24640	70.2	206.1	838	4483	0	27.6	15.6	76.2	2009	119	1063	263	2.35	0.	13	51	4.0	45
15.0	2280	1287	2.78	25512	72.7	199.1	885	4670	0	25.4	14.3	77.3	2172	108	1118	249	2.22	0.	14	54	4.2	49
16.0	2432	1373	2.97	26355	75.1	192.8	930	4834	0	23.4	13.2	78.3	2333	99	1172	237	2.11	0.	15	57	4.4	53
17.0	2584	1459	3.15	27174	77.4	187.1	973	4978	0	21.8	12.3	79.1	2493	91	1223	226	2.02	0.	16	60	4.6	56
18.0	2736	1544	3.34	27969	79.6	181.8	1014	5106	0	20.3	11.5	79.8	2652	84	1274	217	1.94	0.	16	63	4.9	60
19.0	2888	1630	3.52	28743	81.8	176.9	1054	5221	0	19.1	10.8	80.5	2810	78	1323	209	1.87	0.	17	65	5.1	63
20.0	3040	1716	3.71	29497	83.9	172.5	1092	5325	0	18.0	10.1	81.0	2967	73	1371	202	1.80	0.	18	68	5.2	66
25.0	3800	2145	4.64	33023	93.8	154.2	1265	5717	0	13.9	7.9	83.0	3745	55	1602	174	1.55	0.	22	81	6.1	80
30.0	4560	2574	5.56	36223	102.8	140.8	1417	5978	0	11.4	6.4	84.3	4516	44	1821	155	1.39	0.	26	93	6.9	92
35.0	5320	3003	6.49	39177	111.0	130.4	1554	6165	0	9.6	5.4	85.2	5283	37	2032	142	1.27	0.	30	104	7.5	
40.0	6080	3432	7.42	41937	118.7	121.9	1680	6305	0	8.3	4.7	85.8	6049	31	2237	131	1.17	0.	34	115	8.2	
45.0	6840	3861	8.34	44539	125.9	115.0	1798	6414	0	7.3	4.1	86.3	6813	27	2438	123	1.09	0.	38	126	8.8	
50.0	7600	4290	9.27	47010	132.7	109.1	1908	6501	0	6.5	3.7	86.7	7576	24	2636	115	1.03	0.	42	136	9.3	

#366 152 Sm on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 82. ZC=144.( )
NEUTRON NUMBERS: NP= 90. NT=126. NC=216.

AP**1/3= 5.337 AT**1/3= 5.925
REDUCED MASS NUMBER= 87.82 AP+AT=AC=360.

INTERACTION RADIUS RINT=15.34 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 6.82 CT+CP=12.88 C= 3.21

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.96

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.66 RC=RCP+RCT=12.64

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 814.98 MeV K= .47797 n=2.446
VC(RINT)= 476.6 MeV

FISSION-TKE= 334. MeV
ASYMM. FISSION-TKE= 328. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 35.63 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.43 MeV/I**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -19.5
COMPOUND NUCLEUS: 448.2

FUSION RELATED PARAMETERS:
R-BARRIER=13.53 fm V(RB)= 497.3 MeV
Q-VALUE= -542.1 MeV
L-CRITICAL= 0.

152 Sm on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	NULT
1.0	152	88	0.18	6562	19.2	800.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	176	0.37	9283	27.2	566.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	263	0.55	11373	33.3	462.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	351	0.74	13135	38.4	400.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	395	0.83	13934	40.7	377.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	439	0.92	14690	43.0	358.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	836	483	1.01	15409	45.0	341.3	75	91	0	155.1	112.6	12.5	58	778	34	2971	27.06	0.	1	10	0.0	0
6.0	912	527	1.11	16096	47.1	326.8	222	703	0	111.7	68.8	34.1	302	610	222	1058	9.22	0.	3	16	0.0	0
6.5	988	571	1.20	16756	49.0	314.0	304	1220	0	91.8	55.0	44.1	491	497	354	773	6.72	0.	4	20	0.8	3
7.0	1064	615	1.29	17391	50.8	302.6	369	1662	0	78.8	46.7	50.6	646	418	453	638	5.54	0.	5	23	1.3	8
7.5	1140	659	1.38	18003	52.6	292.3	423	2045	0	69.2	40.7	55.4	781	359	532	556	4.83	0.	6	26	1.6	12
8.0	1216	703	1.47	18596	54.3	283.0	472	2380	0	61.9	36.3	59.0	902	314	597	499	4.33	0.	6	29	1.9	15
8.5	1292	746	1.57	19171	56.0	274.6	516	2676	0	56.1	32.8	62.0	1014	278	653	457	3.96	0.	7	31	2.1	19
9.0	1368	790	1.66	19730	57.6	266.8	556	2939	0	51.2	29.9	64.4	1118	250	702	424	3.67	0.	8	33	2.3	22
9.5	1444	834	1.75	20273	59.2	259.7	594	3174	0	47.2	27.5	66.4	1218	226	747	397	3.44	0.	8	35	2.5	25
10.0	1520	878	1.84	20802	60.7	253.1	630	3385	0	43.8	25.5	68.1	1314	206	787	374	3.25	0.	9	37	2.7	28
10.5	1596	922	1.93	21319	62.2	247.0	663	3576	0	40.9	23.8	69.6	1406	190	825	355	3.08	0.	9	39	2.9	31
11.0	1672	966	2.03	21824	63.7	241.4	695	3750	0	38.3	22.2	70.8	1496	176	861	339	2.94	0.	10	41	3.1	33
11.5	1748	1010	2.12	22317	65.1	236.1	726	3909	0	36.0	20.9	72.0	1585	163	894	325	2.82	0.	10	43	3.2	36
12.0	1824	1054	2.21	22800	66.5	231.1	755	4054	0	34.0	19.7	73.0	1672	152	926	312	2.71	0.	11	44	3.4	38
13.0	1976	1142	2.40	23737	69.3	222.0	810	4312	0	30.6	17.8	74.7	1841	135	986	291	2.52	0.	12	48	3.7	42
14.0	2128	1230	2.58	24640	71.9	213.9	862	4532	0	27.9	16.1	76.1	2008	120	1043	273	2.37	0.	13	51	3.9	47
15.0	2280	1317	2.76	25512	74.4	206.7	911	4723	0	25.6	14.8	77.2	2171	109	1097	259	2.24	0.	14	54	4.2	51
16.0	2432	1405	2.95	26355	76.8	200.1	958	4891	0	23.6	13.7	78.2	2333	99	1148	246	2.13	0.	15	57	4.4	55
17.0	2584	1493	3.13	27174	79.2	194.2	1002	5038	0	21.9	12.7	79.0	2493	91	1198	235	2.04	0.	16	59	4.6	58
18.0	2736	1581	3.32	27969	81.5	188.7	1044	5169	0	20.5	11.9	79.8	2652	84	1247	226	1.96	0.	16	62	4.8	62
19.0	2888	1669	3.50	28743	83.7	183.7	1085	5287	0	19.2	11.1	80.4	2810	78	1294	217	1.88	0.	17	65	5.0	65
20.0	3040	1756	3.68	29497	85.9	179.0	1124	5392	0	18.1	10.5	81.0	2967	73	1341	210	1.82	0.	18	68	5.2	68
25.0	3800	2196	4.61	33023	96.0	160.1	1303	5793	0	14.0	8.1	83.0	3745	55	1562	181	1.57	0.	22	80	6.1	83
30.0	4560	2635	5.53	36223	105.2	146.2	1460	6060	0	11.4	6.6	84.3	4516	44	1772	161	1.40	0.	26	92	6.8	95
35.0	5320	3074	6.45	39177	113.6	135.3	1602	6251	0	9.7	5.6	85.2	5283	37	1974	147	1.28	0.	30	104	7.5	
40.0	6080	3513	7.37	41937	121.5	126.6	1732	6394	0	8.4	4.8	85.8	6048	32	2170	136	1.18	0.	34	115	8.1	
45.0	6840	3952	8.29	44539	128.9	119.3	1853	6505	0	7.4	4.3	86.3	6812	28	2362	127	1.10	0.	38	125	8.7	
50.0	7600	4391	9.21	47010	135.8	113.2	1967	6594	0	6.6	3.8	86.7	7576	24	2551	120	1.04	0.	42	136	9.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	sec	MeV	--MeV--	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR BINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#367 152 Sm on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 83. ZC=145.( )
NEUTRON NUMBERS: NP= 90. NT=126. NC=216.

AP**1/3= 5.337 AT**1/3= 5.934
REDUCED MASS NUMBER= 88.00 AP+AT=AC=361.

INTERACTION RADIUS RINT=15.35 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 6.83 CT+CP=12.89 C̄= 3.21

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 6.97

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.68 RC=RCP+RCT=12.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 823.73 MeV K= .48057 n=2.446
VC(RINT)= 482.1 MeV

FISSION-TKE= 338. MeV
ASYMM. FISSION-TKE= 331. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 35.75 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.42 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: -16.5
COMPOUND NUCLEUS: 457.9

FUSION RELATED PARAMETERS:
R-BARRIER=13.54 fm V(RB)= 503.3 MeV
Q-VALUE= -548.8 MeV
L-CRITICAL= 0.

152 Sm on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	88	0.18	6562	19.2	810.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	176	0.37	9283	27.2	573.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	264	0.55	11373	33.3	467.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	352	0.73	13135	38.5	405.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	396	0.82	13934	40.8	382.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	440	0.91	14690	43.0	362.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	836	484	1.00	15409	45.1	345.5	35	20	0	168.4	141.4	5.8	29	807	10	5571	58.29	0.	1	9	0.0	0
6.0	912	528	1.10	16096	47.1	330.8	212	640	0	114.7	71.2	32.6	281	631	206	1122	9.68	0.	3	15	0.0	0
6.5	988	572	1.19	16756	49.1	317.8	297	1162	0	93.8	56.5	43.1	475	513	343	802	6.89	0.	4	20	0.7	2
7.0	1064	616	1.28	17391	50.9	306.3	364	1610	0	80.2	47.7	49.9	633	431	445	657	5.64	0.	5	23	1.2	7
7.5	1140	660	1.37	18003	52.7	295.9	419	1997	0	70.4	41.6	54.8	770	370	526	570	4.89	0.	6	26	1.6	11
8.0	1216	704	1.46	18596	54.4	286.5	468	2336	0	62.9	37.0	58.5	893	323	593	510	4.38	0.	6	28	1.9	15
8.5	1292	748	1.55	19171	56.1	277.9	513	2635	0	56.9	33.3	61.5	1006	286	650	466	4.00	0.	7	31	2.1	18
9.0	1368	792	1.64	19730	57.7	270.1	554	2900	0	52.0	30.4	64.0	1112	256	700	432	3.70	0.	8	33	2.3	21
9.5	1444	836	1.73	20273	59.3	262.9	592	3138	0	47.9	28.0	66.1	1212	232	745	404	3.46	0.	8	35	2.5	24
10.0	1520	880	1.83	20802	60.9	256.2	628	3351	0	44.4	25.9	67.8	1308	212	786	381	3.27	0.	9	37	2.7	27
10.5	1596	924	1.92	21319	62.4	250.1	661	3545	0	41.4	24.1	69.3	1401	195	824	362	3.10	0.	9	39	2.9	30
11.0	1672	968	2.01	21824	63.8	244.3	694	3721	0	38.8	22.6	70.6	1492	180	860	345	2.96	0.	10	41	3.0	33
11.5	1748	1012	2.10	22317	65.3	238.9	724	3881	0	36.5	21.2	71.7	1581	167	894	330	2.83	0.	10	42	3.2	35
12.0	1824	1056	2.19	22800	66.7	233.9	754	4028	0	34.5	20.0	72.8	1668	156	926	317	2.72	0.	11	44	3.4	37
13.0	1976	1144	2.37	23737	69.4	224.7	810	4288	0	31.0	18.0	74.5	1838	138	986	295	2.53	0.	12	47	3.6	42
14.0	2128	1232	2.56	24640	72.0	216.6	862	4511	0	28.2	16.4	75.9	2005	123	1043	278	2.38	0.	13	51	3.9	46
15.0	2280	1320	2.74	25512	74.5	209.2	911	4704	0	25.9	15.0	77.1	2169	111	1097	263	2.25	0.	14	54	4.1	50
16.0	2432	1408	2.92	26355	77.0	202.6	958	4873	0	23.9	13.9	78.1	2330	102	1149	250	2.14	0.	15	57	4.4	54
17.0	2584	1496	3.10	27174	79.4	196.5	1002	5022	0	22.2	12.9	78.9	2491	93	1199	239	2.05	0.	15	59	4.6	58
18.0	2736	1584	3.29	27969	81.7	191.0	1045	5155	0	20.7	12.0	79.6	2650	86	1248	229	1.96	0.	16	62	4.8	61
19.0	2888	1672	3.47	28743	83.9	185.9	1086	5273	0	19.4	11.3	80.3	2808	80	1295	220	1.89	0.	17	65	5.0	65
20.0	3040	1760	3.65	29497	86.1	181.2	1125	5380	0	18.3	10.6	80.9	2965	75	1341	213	1.82	0.	18	68	5.2	68
25.0	3800	2200	4.56	33023	96.2	162.1	1305	5785	0	14.2	8.2	82.9	3744	56	1563	183	1.57	0.	22	80	6.0	82
30.0	4560	2640	5.48	36223	105.4	147.9	1463	6056	0	11.6	6.7	84.2	4515	45	1772	164	1.40	0.	26	92	6.8	94
35.0	5320	3080	6.39	39177	113.9	137.0	1605	6248	0	9.8	5.6	85.1	5282	38	1973	149	1.28	0.	30	104	7.5	
40.0	6080	3520	7.30	41937	121.7	128.1	1736	6393	0	8.4	4.9	85.8	6048	32	2169	138	1.18	0.	34	115	8.1	
45.0	6840	3960	8.21	44539	129.1	120.8	1857	6505	0	7.4	4.3	86.3	6812	28	2361	129	1.10	0.	38	125	8.7	
50.0	7600	4400	9.13	47010	136.1	114.6	1971	6595	0	6.7	3.9	86.7	7575	25	2549	121	1.04	0.	42	135	9.2	

#368 152 Sm on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 62. ZT= 92. ZC=154.( )
NEUTRON NUMBERS: NP= 90. NT=146. NC=236.

AP**1/3= 5.337 AT**1/3= 6.197
REDUCED MASS NUMBER= 92.76 AP+AT=AC=390.

INTERACTION RADIUS RINT=15.63 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.06 CT= 7.16 CT+CP=13.22 C̄= 3.28

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.22 RT= 7.30

COULOMB RADII [fm]:
RCP= 5.98 RCT= 6.98 RC=RCP+RCT=12.95

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 891.35 MeV K= .48214 n=2.453
VC(RINT)= 524.7 MeV

FISSION-TKE= 370. MeV
ASYMM. FISSION-TKE= 356. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.877 MeV/fm**2 PROX-FACTOR= 36.17 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.31 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -74.5 TARGET: 47.2
COMPOUND NUCLEUS: 566.0

FUSION RELATED PARAMETERS:
R-BARRIER=13.74 fm V(RB)= 548.4 MeV
Q-VALUE= -593.2 MeV
L-CRITICAL= 0.

152 Sm on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	152	93	0.18	6562	20.3	898.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	304	186	0.35	9283	28.7	635.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	456	278	0.53	11373	35.1	518.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	608	371	0.71	13135	40.6	449.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	684	417	0.80	13934	43.0	423.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	760	464	0.88	14690	45.4	401.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	836	510	0.97	15409	47.6	383.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	912	557	1.06	16096	49.7	366.7	184	435	0	126.7	87.1	26.6	219	693	148	1533	12.19	0.	2	14	0.0	0
6.5	988	603	1.15	16756	51.7	352.3	290	994	0	101.1	65.5	39.5	428	560	298	978	7.73	0.	3	19	0.4	1
7.0	1064	649	1.24	17391	53.7	339.5	367	1473	0	85.6	54.3	47.2	597	467	407	775	6.12	0.	5	22	1.1	6
7.5	1140	696	1.33	18003	55.6	328.0	430	1898	0	74.7	46.9	52.7	741	399	493	662	5.22	0.	5	25	1.4	11
8.0	1216	742	1.41	18596	57.4	317.5	485	2251	0	66.5	41.4	56.8	869	347	562	587	4.62	0.	6	28	1.7	15
8.5	1292	788	1.50	19171	59.1	308.1	534	2571	0	60.0	37.2	60.0	985	307	620	533	4.20	0.	7	30	2.0	19
9.0	1368	835	1.59	19730	60.9	299.4	579	2855	0	54.7	33.8	62.7	1094	274	671	491	3.87	0.	8	32	2.2	22
9.5	1444	881	1.68	20273	62.5	291.4	621	3110	0	50.3	31.0	64.9	1196	248	715	458	3.61	0.	8	34	2.4	26
10.0	1520	928	1.77	20802	64.2	284.0	660	3339	0	46.5	28.7	66.7	1294	226	756	431	3.39	0.	9	36	2.6	29
10.5	1596	974	1.86	21319	65.7	277.2	697	3546	0	43.3	26.7	68.3	1389	207	793	408	3.21	0.	9	38	2.8	32
11.0	1672	1020	1.94	21824	67.3	270.8	733	3734	0	40.6	24.9	69.7	1481	191	828	389	3.06	0.	10	40	3.0	35
11.5	1748	1067	2.03	22317	68.8	264.9	766	3906	0	38.1	23.4	70.9	1570	178	860	372	2.93	0.	10	42	3.1	38
12.0	1824	1113	2.12	22800	70.3	259.3	798	4064	0	36.0	22.1	72.0	1658	166	891	357	2.81	0.	11	43	3.3	40
13.0	1976	1206	2.30	23737	73.2	249.1	859	4342	0	32.3	19.8	73.8	1830	146	949	331	2.61	0.	12	47	3.5	45
14.0	2128	1299	2.47	24640	75.9	240.0	916	4581	0	29.4	18.0	75.3	1998	130	1002	311	2.45	0.	13	50	3.8	50
15.0	2280	1391	2.65	25512	78.6	231.9	969	4788	0	26.9	16.5	76.5	2163	117	1053	294	2.31	0.	14	53	4.0	54
16.0	2432	1484	2.83	26355	81.2	224.5	1020	4969	0	24.8	15.2	77.6	2325	107	1101	279	2.20	0.	14	56	4.3	59
17.0	2584	1577	3.01	27174	83.7	217.8	1068	5129	0	23.1	14.1	78.5	2486	98	1147	267	2.10	0.	15	58	4.5	63
18.0	2736	1670	3.18	27969	86.1	211.7	1114	5271	0	21.5	13.2	79.2	2645	91	1192	256	2.01	0.	16	61	4.7	66
19.0	2888	1762	3.36	28743	88.4	206.1	1158	5398	0	20.2	12.3	79.9	2804	84	1235	246	1.94	0.	17	64	4.9	70
20.0	3040	1855	3.54	29497	90.7	200.8	1201	5512	0	19.0	11.6	80.5	2961	79	1278	237	1.87	0.	18	66	5.1	73
25.0	3800	2319	4.42	33023	101.4	179.6	1395	5946	0	14.7	9.0	82.7	3741	59	1479	204	1.61	0.	22	79	5.9	89
30.0	4560	2783	5.30	36223	111.1	164.0	1565	6235	0	12.0	7.3	84.0	4513	47	1669	182	1.43	0.	26	91	6.7	102
35.0	5320	3247	6.19	39177	120.0	151.8	1718	6442	0	10.1	6.2	84.9	5281	39	1850	166	1.31	0.	29	102	7.4	
40.0	6080	3710	7.07	41937	128.3	142.0	1858	6597	0	8.7	5.3	85.6	6046	34	2026	153	1.21	0.	33	113	8.0	
45.0	6840	4174	7.96	44539	136.1	133.9	1989	6717	0	7.7	4.7	86.1	6811	29	2198	143	1.13	0.	37	123	8.6	
50.0	7600	4638	8.84	47010	143.5	127.0	2112	6814	0	6.9	4.2	86.6	7574	26	2366	135	1.06	0.	41	133	9.1	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 152 Sm

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#369 165 Ho on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 6. ZC= 73.(Ta)
NEUTRON NUMBERS: NP= 98. NT= 6. NC=104.

AP**1/3= 5.485 AT**1/3= 2.289 ELSCAT < 4 deg
REDUCED MASS NUMBER= 11.19 AP+AT=AC=177.

INTERACTION RADIUS RINT=11.54 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 2.12 CT+CP= 8.37 C̄= 1.58

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 2.52

COULOMB RADII [fm]:
RCP= 6.15 RCT= 2.51 RC=RCP+RCT= 8.67

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 89.21 MeV K= .03734 n=2.964
VC(RINT)= 50.1 MeV

FISSION-TKE= 124. MeV
ASYMM. FISSION-TKE= 37. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.900 MeV/fm**2 PROX-FACTOR= 17.92 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.26 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: 0.0
COMPOUND NUCLEUS: -50.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.43 fm V(RB)= 51.5 MeV
Q-VALUE= -13.5 MeV
L-CRITICAL= 57.

165 Ho on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	165	11	0.22	7124	2.4	63.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	22	0.45	10077	3.5	44.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	34	0.67	12345	4.2	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	45	0.89	14259	4.9	31.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	50	1.01	15126	5.2	29.8	4	27	0	165.5	1.1	7.3	558	185	569	410	38.80	0.	5	14	1.3	3
5.0	825	56	1.12	15946	5.5	28.3	20	478	273	108.6	4.0	35.7	687	138	692	87	7.25	751.	5	14	1.4	4
5.5	908	62	1.23	16727	5.7	27.0	29	830	559	86.9	4.1	46.6	799	108	796	63	5.17	826.	5	14	1.5	4
6.0	990	67	1.34	17473	6.0	25.8	35	1121	797	73.2	3.9	53.4	901	89	890	51	4.24	896.	5	14	1.6	5
6.5	1073	73	1.45	18189	6.2	24.8	40	1366	999	63.5	3.6	58.3	997	75	978	44	3.67	971.	6	20	1.6	5
7.0	1155	78	1.56	18878	6.5	23.9	45	1574	1172	56.2	3.3	61.9	1090	65	1062	40	3.29	1040.	7	22	1.7	6
7.5	1238	84	1.68	19543	6.7	23.1	49	1754	1322	50.4	3.1	64.8	1181	57	1144	36	3.00	1114.	8	23	1.8	6
8.0	1320	89	1.79	20187	6.9	22.4	53	1912	1453	45.8	2.8	67.1	1269	51	1225	34	2.78	1181.	8	25	1.9	7
8.5	1403	95	1.90	20811	7.1	21.7	57	2050	1568	42.0	2.6	69.0	1357	45	1304	32	2.60	1255.	9	26	1.9	7
9.0	1485	101	2.01	21417	7.3	21.1	60	2173	1671	38.7	2.5	70.6	1444	41	1382	30	2.46	1321.	10	28	2.0	8
9.5	1568	106	2.12	22007	7.5	20.5	63	2282	1763	36.0	2.3	72.0	1530	38	1460	28	2.33	1394.	10	29	2.0	8
10.0	1650	112	2.23	22582	7.7	20.0	66	2381	1769	33.6	2.2	73.2	1615	35	1537	27	2.22	1468.	11	31	2.1	8
10.5	1733	117	2.35	23142	7.9	19.5	69	2470	1684	31.5	2.0	74.3	1700	32	1613	26	2.13	1532.	11	32	2.2	9
11.0	1815	123	2.46	23690	8.1	19.1	72	2550	1608	29.6	1.9	75.2	1785	30	1690	25	2.04	1605.	12	34	2.2	9
11.5	1898	129	2.57	24226	8.3	18.7	75	2624	1538	28.0	1.8	76.0	1869	28	1766	24	1.97	1668.	12	35	2.3	10
12.0	1980	134	2.68	24750	8.5	18.3	77	2691	1474	26.6	1.7	76.7	1954	26	1841	23	1.90	1740.	13	36	2.3	10
13.0	2145	145	2.90	25767	8.8	17.6	82	2811	1360	24.0	1.6	78.0	2121	24	1992	22	1.79	1874.	14	39	2.4	11
14.0	2310	157	3.13	26747	9.2	16.9	87	2912	1263	22.0	1.5	79.0	2289	21	2142	21	1.69	2018.	15	42	2.5	11
15.0	2475	168	3.35	27693	9.5	16.3	92	3001	1179	20.2	1.3	79.9	2456	19	2292	20	1.61	2149.	16	44	2.6	12
16.0	2640	179	3.57	28609	9.8	15.8	96	3077	1105	18.7	1.3	80.6	2622	18	2441	19	1.54	2279.	17	47	2.7	13
17.0	2805	190	3.80	29498	10.1	15.4	100	3145	1040	17.5	1.2	81.3	2789	16	2590	18	1.48	2407.	18	49	2.8	14
18.0	2970	201	4.02	30361	10.4	14.9	104	3205	982	16.4	1.1	81.8	2955	15	2739	17	1.42	2548.	19	51	2.9	14
19.0	3135	213	4.24	31201	10.7	14.5	108	3259	931	15.4	1.0	82.3	3121	14	2887	17	1.37	2673.	20	54	3.0	15
20.0	3300	224	4.47	32020	10.9	14.2	111	3307	884	14.5	1.0	82.8	3287	13	3035	16	1.33	2796.	21	56	3.1	16
25.0	4125	280	5.59	35847	12.2	12.7	128	3490	707	11.3	0.8	84.3	4115	10	3774	14	1.15	3430.	26	67	3.5	19
30.0	4950	336	6.70	39321	13.4	11.6	143	3612	589	9.3	0.6	85.4	4942	8	4510	13	1.03	4038.	31	78	3.8	22
35.0	5775	392	7.82	42527	14.5	10.7	156	3698	505	7.8	0.5	86.1	5768	7	5244	11	0.94	4651.	36	89	4.1	
40.0	6600	447	8.94	45523	15.5	10.0	168	3762	442	6.8	0.5	86.6	6594	6	5977	11	0.88	5211.	41	99	4.4	
45.0	7425	503	10.05	48348	16.4	9.4	180	3812	393	6.0	0.4	87.0	7420	5	6709	10	0.82	5784.	46	109	4.7	
50.0	8250	559	11.17	51030	17.3	9.0	191	3852	353	5.4	0.4	87.3	8245	5	7440	9	0.77	6340.	51	119	5.0	

#370 165 Ho on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 8. ZC= 75.(Re)
NEUTRON NUMBERS: NP= 98. NT= 8. NC=106.

AP**1/3= 5.485 AT**1/3= 2.520 ELSCAT < 5 deg
REDUCED MASS NUMBER= 14.59 AP+AT=AC=181.

INTERACTION RADIUS RINT=11.80 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 2.42 CT+CP= 8.67 C̄= 1.75

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 2.78

COULOMB RADII [fm]:
RCP= 6.15 RCT= 2.78 RC=RCP+RCT= 8.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 116.57 MeV K= .05942 n=2.847
VC(RINT)= 65.3 MeV

FISSION-TKE= 129. MeV
ASYMM. FISSION-TKE= 49. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.902 MeV/fm**2 PROX-FACTOR= 19.79 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.33 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -4.7
COMPOUND NUCLEUS: -44.4

FUSION RELATED PARAMETERS:
R-BARRIER=10.63 fm V(RB)= 67.5 MeV
Q-VALUE= -24.1 MeV
L-CRITICAL= 68.

165 Ho on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CH	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	165	15	0.22	7124	3.2	84.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	29	0.45	10077	4.5	59.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	44	0.67	12345	5.5	48.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	58	0.89	14259	6.4	42.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	66	1.00	15126	6.8	39.8	5	22	0	166.7	1.4	6.6	506	236	521	584	43.32	0.	5	14	1.4	4
5.0	825	73	1.12	15946	7.1	37.7	27	485	264	108.8	5.4	35.6	649	176	655	117	7.43	735.	5	14	1.5	4
5.5	908	80	1.23	16727	7.5	36.0	38	850	562	87.0	5.5	46.5	769	139	764	84	5.29	804.	5	14	1.6	5
6.0	990	88	1.34	17473	7.8	34.5	46	1152	811	73.3	5.2	53.4	876	114	861	68	4.33	872.	5	14	1.7	6
6.5	1073	95	1.45	18189	8.1	33.1	53	1407	1022	63.6	4.8	58.2	977	96	951	59	3.76	945.	6	21	1.8	6
7.0	1155	102	1.56	18878	8.4	31.9	60	1624	1202	56.2	4.4	61.9	1072	83	1036	53	3.36	1012.	7	23	1.9	7
7.5	1238	109	1.67	19543	8.7	30.8	65	1812	1358	50.5	4.0	64.8	1165	73	1118	49	3.07	1084.	8	24	1.9	7
8.0	1320	117	1.79	20187	9.0	29.8	71	1976	1495	45.8	3.7	67.1	1255	65	1197	45	2.85	1149.	8	26	2.0	8
8.5	1403	124	1.90	20811	9.3	28.9	75	2121	1616	42.0	3.5	69.0	1344	58	1276	42	2.66	1221.	9	28	2.1	8
9.0	1485	131	2.01	21417	9.6	28.1	80	2249	1645	38.8	3.2	70.6	1432	53	1352	40	2.51	1286.	10	29	2.2	9
9.5	1568	139	2.12	22007	9.8	27.4	84	2364	1559	36.0	3.0	72.0	1519	48	1429	38	2.38	1357.	10	31	2.2	9
10.0	1650	146	2.23	22582	10.1	26.7	88	2467	1481	33.6	2.8	73.2	1606	44	1504	36	2.27	1420.	11	32	2.3	10
10.5	1733	153	2.34	23142	10.3	26.0	92	2560	1410	31.5	2.7	74.2	1691	41	1579	34	2.18	1491.	11	34	2.4	10
11.0	1815	160	2.46	23690	10.6	25.4	96	2644	1346	29.7	2.5	75.2	1777	38	1653	33	2.09	1553.	12	35	2.5	11
11.5	1898	168	2.57	24226	10.8	24.9	100	2721	1287	28.0	2.4	76.0	1862	36	1727	32	2.01	1624.	12	37	2.5	11
12.0	1980	175	2.68	24750	11.1	24.4	103	2792	1234	26.6	2.3	76.7	1946	34	1801	31	1.95	1684.	13	38	2.6	12
13.0	2145	190	2.90	25767	11.5	23.4	110	2917	1139	24.1	2.1	78.0	2115	30	1947	29	1.83	1814.	14	41	2.7	13
14.0	2310	204	3.13	26747	11.9	22.6	116	3023	1057	22.0	1.9	79.0	2283	27	2093	27	1.73	1942.	15	44	2.8	14
15.0	2475	219	3.35	27693	12.4	21.8	122	3116	987	20.2	1.8	79.9	2450	25	2238	26	1.65	2068.	16	46	2.9	15
16.0	2640	233	3.57	28609	12.8	21.1	128	3197	925	18.8	1.6	80.6	2617	23	2383	25	1.57	2193.	17	49	3.0	16
17.0	2805	248	3.80	29498	13.2	20.5	133	3268	871	17.5	1.5	81.3	2784	21	2527	24	1.51	2330.	18	51	3.1	16
18.0	2970	263	4.02	30361	13.5	19.9	138	3331	822	16.4	1.4	81.8	2951	19	2671	23	1.45	2452.	19	54	3.2	17
19.0	3135	277	4.24	31201	13.9	19.4	143	3387	779	15.4	1.3	82.3	3117	18	2815	22	1.40	2572.	20	56	3.3	18
20.0	3300	292	4.47	32020	14.3	18.9	148	3438	740	14.5	1.3	82.7	3283	17	2958	21	1.35	2691.	21	59	3.4	19
25.0	4125	365	5.58	35847	16.0	16.9	170	3631	592	11.3	1.0	84.3	4112	13	3671	19	1.18	3281.	26	71	3.9	23
30.0	4950	438	6.70	39321	17.5	15.4	190	3758	493	9.3	0.8	85.4	4940	10	4382	17	1.06	3862.	31	82	4.3	26
35.0	5775	510	7.81	42527	18.9	14.3	208	3849	423	7.9	0.7	86.1	5766	9	5089	15	0.97	4418.	36	93	4.6	
40.0	6600	583	8.93	45523	20.2	13.3	224	3917	370	6.8	0.6	86.6	6592	8	5795	14	0.90	4983.	41	103	5.0	
45.0	7425	656	10.05	48348	21.4	12.6	240	3970	329	6.0	0.5	87.0	7418	7	6500	13	0.84	5494.	46	114	5.3	
50.0	8250	729	11.16	51030	22.6	11.9	254	4012	296	5.4	0.5	87.3	8244	6	7204	13	0.79	6021.	51	124	5.6	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#371 165 Ho on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 13. ZC= 80.(Hg)
NEUTRON NUMBERS: NP= 98. NT= 14. NC=112.

AP**1/3= 5.485 AT**1/3= 3.000 ELSCAT < 9 deg
REDUCED MASS NUMBER= 23.20 AP+AT=AC=192.

INTERACTION RADIUS RINT=12.32 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 3.05 CT+CP= 9.30 C= 2.05

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 3.35

COULOMB RADII [fm]:
RCP= 6.15 RCT= 3.32 RC=RCP+RCT= 9.47

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 181.44 MeV K= .11782 n=2.684
VC(RINT)= 101.6 MeV

FISSION-TKE= 141. MeV
ASYMM. FISSION-TKE= 77. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.905 MeV/fm**2 PROX-FACTOR= 23.29 MeV
L-RLD= 82 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.51 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -20.6
COMPOUND NUCLEUS: -30.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.11 fm V(RB)= 105.6 MeV
Q-VALUE= -54.0 MeV
L-CRITICAL= 92.

165 Ho on 27 Al

165 Ho on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	23	0.23	7124	5.1	137.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	46	0.46	10077	7.2	97.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	70	0.68	12345	8.8	79.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	93	0.91	14259	10.1	68.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	104	1.03	15126	10.8	64.7	21	133	0	143.8	6.4	18.1	418	324	435	396	16.48	0.	5	15	1.4	4
5.0	825	116	1.14	15946	11.3	61.3	49	610	348	102.7	9.4	38.6	582	243	504	174	7.11	690.	5	15	1.6	5
5.5	908	128	1.26	16727	11.9	58.5	66	996	668	83.1	9.1	48.5	715	193	702	130	5.28	755.	5	15	1.8	6
6.0	990	139	1.37	17473	12.4	56.0	79	1316	936	70.3	8.3	54.8	831	159	802	108	4.39	819.	5	15	1.9	7
6.5	1073	151	1.48	18189	12.9	53.8	91	1586	1162	61.2	7.6	59.4	938	134	892	94	3.83	883.	6	22	2.0	8
7.0	1155	162	1.60	18878	13.4	51.8	101	1817	1356	54.3	6.9	62.9	1039	116	976	85	3.45	945.	7	25	2.1	9
7.5	1238	174	1.71	19543	13.9	50.1	110	2017	1400	48.8	6.3	65.6	1135	102	1056	78	3.16	1007.	8	27	2.2	10
8.0	1320	186	1.83	20187	14.4	48.5	119	2192	1313	44.4	5.8	67.8	1229	91	1132	72	2.93	1075.	8	28	2.3	10
8.5	1403	197	1.94	20811	14.8	47.0	127	2346	1235	40.7	5.4	69.7	1321	82	1207	68	2.75	1136.	9	30	2.4	11
9.0	1485	209	2.05	21417	15.2	45.7	134	2483	1167	37.6	5.0	71.2	1411	74	1280	64	2.59	1196.	9	32	2.5	12
9.5	1568	220	2.17	22007	15.6	44.5	141	2605	1105	34.9	4.7	72.5	1499	68	1352	61	2.46	1255.	10	34	2.6	13
10.0	1650	232	2.28	22582	16.0	43.4	148	2715	1050	32.6	4.4	73.7	1587	63	1423	58	2.35	1321.	11	35	2.7	13
10.5	1733	244	2.40	23142	16.4	42.3	155	2815	1000	30.6	4.2	74.7	1674	58	1493	55	2.25	1379.	11	37	2.8	14
11.0	1815	255	2.51	23690	16.8	41.4	161	2905	955	28.8	3.9	75.6	1761	54	1562	53	2.17	1437.	12	38	2.9	15
11.5	1898	267	2.63	24226	17.2	40.4	167	2987	913	27.3	3.7	76.4	1847	51	1631	51	2.09	1494.	12	40	3.0	16
12.0	1980	278	2.74	24750	17.6	39.6	173	3063	875	25.8	3.6	77.1	1932	48	1699	50	2.02	1559.	13	42	3.1	16
13.0	2145	302	2.97	25767	18.3	38.0	184	3196	808	23.4	3.2	78.3	2102	43	1835	47	1.90	1670.	14	45	3.2	18
14.0	2310	325	3.20	26747	19.0	36.7	194	3311	750	21.4	3.0	79.3	2271	39	1969	44	1.80	1788.	15	47	3.4	19
15.0	2475	348	3.42	27693	19.7	35.4	204	3410	700	19.7	2.7	80.1	2440	35	2103	42	1.71	1904.	16	50	3.5	20
16.0	2640	371	3.65	28609	20.3	34.3	213	3496	656	18.3	2.5	80.9	2608	32	2236	40	1.64	2019.	17	53	3.6	21
17.0	2805	394	3.88	29498	20.9	33.3	222	3572	617	17.0	2.4	81.5	2775	30	2368	39	1.57	2133.	18	56	3.8	22
18.0	2970	418	4.11	30361	21.5	32.3	231	3640	583	15.9	2.2	82.0	2942	28	2500	37	1.51	2232.	19	58	3.9	24
19.0	3135	441	4.34	31201	22.1	31.5	239	3701	552	15.0	2.1	82.5	3109	26	2631	36	1.46	2342.	20	61	4.0	25
20.0	3300	464	4.57	32020	22.7	30.7	247	3755	525	14.1	2.0	82.9	3276	24	2762	35	1.41	2450.	21	64	4.1	26
25.0	4125	580	5.71	35847	25.4	27.4	284	3962	420	11.0	1.5	84.5	4107	18	3413	30	1.23	2971.	26	76	4.7	31
30.0	4950	696	6.85	39321	27.8	25.0	317	4100	350	9.0	1.3	85.5	4935	15	4059	27	1.10	3476.	31	88	5.2	35
35.0	5775	812	7.99	42527	30.0	23.2	346	4198	300	7.7	1.1	86.2	5763	12	4701	25	1.01	3952.	36	100	5.6	
40.0	6600	928	9.13	45523	32.1	21.7	373	4271	262	6.7	0.9	86.7	6589	11	5341	23	0.93	4428.	41	111	6.0	
45.0	7425	1044	10.27	48348	34.0	20.4	399	4328	233	5.9	0.8	87.1	7416	9	5978	22	0.87	4849.	46	122	6.4	
50.0	8250	1160	11.42	51030	35.9	19.4	422	4374	210	5.3	0.7	87.4	8242	8	6614	20	0.83	5277.	50	133	6.8	

#372 165 Ho on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 20. ZC= 87.(Fr)
NEUTRON NUMBERS: NP= 98. NT= 20. NC=118.

AP**1/3= 5.485 AT**1/3= 3.420 ELSCAT <14 deg
REDUCED MASS NUMBER= 32.20 AP+AT=AC=205.

INTERACTION RADIUS RINT=12.78 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 3.59 CT+CP= 9.84 C= 2.28

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 3.85

COULOMB RADII [fm]:
RCP= 6.15 RCT= 3.84 RC=RCP+RCT= 9.99

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 267.81 MeV K= .20168 n=2.571
VC(RINT)= 150.8 MeV

FISSION-TKE= 160. MeV
ASYMM. FISSION-TKE= 113. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.913 MeV/fm**2 PROX-FACTOR= 26.17 MeV
L-RLD= 72 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -33.0
COMPOUND NUCLEUS: -0.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.50 fm V(RB)= 157.7 MeV
Q-VALUE= -95.9 MeV
L-CRITICAL= 100.

165 Ho on 40 Ca

165 Ho on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	32	0.21	7124	7.0	211.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	64	0.43	10077	10.0	149.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	97	0.64	12345	12.2	121.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	129	0.85	14259	14.1	105.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	145	0.96	15126	14.9	99.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	161	1.07	15946	15.7	94.4	50	333	84	123.9	13.1	28.0	421	404	435	374	10.35	647.	0	0	1.6	5
5.5	908	177	1.17	16727	16.5	90.0	81	776	454	95.9	13.9	42.0	593	315	586	233	6.42	709.	0	0	1.8	6
6.0	990	193	1.28	17473	17.2	86.1	103	1144	762	79.8	12.9	50.1	734	256	706	184	5.05	765.	0	0	1.9	8
6.5	1073	209	1.39	18189	18.0	82.8	121	1454	1000	68.7	11.7	55.7	858	214	807	157	4.29	825.	6	22	2.1	9
7.0	1155	225	1.49	18878	18.6	79.7	137	1720	928	60.5	10.7	59.8	971	184	897	139	3.80	884.	7	25	2.2	10
7.5	1238	241	1.60	19543	19.3	77.0	151	1950	866	54.1	9.8	63.0	1077	161	980	126	3.45	942.	7	27	2.4	11
8.0	1320	258	1.71	20187	19.9	74.6	164	2151	812	49.0	9.0	65.5	1178	142	1058	116	3.18	1000.	8	29	2.5	12
8.5	1403	274	1.82	20811	20.5	72.4	176	2328	764	44.8	8.3	67.6	1275	128	1132	108	2.96	1057.	9	31	2.6	13
9.0	1485	290	1.92	21417	21.1	70.3	187	2485	722	41.2	7.7	69.4	1369	116	1203	102	2.78	1113.	9	33	2.8	14
9.5	1568	306	2.03	22007	21.7	68.5	197	2626	684	38.2	7.2	70.9	1462	106	1273	96	2.63	1169.	10	35	2.9	15
10.0	1650	322	2.14	22582	22.3	66.7	207	2753	650	35.7	6.7	72.2	1553	97	1341	91	2.51	1224.	10	37	3.0	16
10.5	1733	338	2.24	23142	22.8	65.1	217	2867	619	33.4	6.3	73.3	1643	90	1407	87	2.40	1278.	11	38	3.1	17
11.0	1815	354	2.35	23690	23.4	63.6	226	2971	590	31.4	6.0	74.3	1731	84	1473	84	2.30	1332.	12	40	3.2	18
11.5	1898	370	2.46	24226	23.9	62.2	235	3066	565	29.7	5.7	75.2	1819	78	1538	81	2.21	1392.	12	42	3.3	18
12.0	1980	386	2.56	24750	24.4	60.9	243	3153	541	28.1	5.4	75.9	1907	73	1602	78	2.14	1445.	13	43	3.4	19
13.0	2145	419	2.78	25767	25.4	58.5	259	3307	500	25.4	4.9	77.3	2080	65	1728	73	2.00	1549.	14	47	3.5	21
14.0	2310	451	2.99	26747	26.3	56.4	275	3439	464	23.2	4.5	78.4	2251	59	1853	69	1.89	1659.	15	50	3.7	22
15.0	2475	483	3.20	27693	27.3	54.5	289	3553	433	21.3	4.1	79.3	2422	53	1976	66	1.80	1758.	16	53	3.9	24
16.0	2640	515	3.42	28609	28.2	52.7	303	3653	406	19.8	3.8	80.1	2591	49	2098	63	1.72	1865.	17	55	4.0	25
17.0	2805	547	3.63	29498	29.0	51.2	316	3741	382	18.4	3.6	80.8	2760	45	2219	60	1.65	1959.	18	58	4.2	27
18.0	2970	580	3.84	30361	29.9	49.7	328	3819	361	17.2	3.3	81.4	2928	42	2340	58	1.58	2063.	19	61	4.3	28
19.0	3135	612	4.06	31201	30.7	48.4	341	3889	342	16.2	3.1	81.9	3096	39	2460	56	1.53	2153.	20	64	4.5	30
20.0	3300	644	4.27	32020	31.5	47.2	352	3952	325	15.3	3.0	82.4	3263	37	2579	54	1.48	2253.	21	67	4.6	31
25.0	4125	805	5.34	35847	35.2	42.2	406	4191	260	11.9	2.3	84.1	4097	28	3170	47	1.28	2719.	26	80	5.3	37
30.0	4950	966	6.41	39321	38.6	38.5	453	4350	216	9.7	1.9	85.1	4928	22	3753	42	1.15	3166.	31	92	5.8	42
35.0	5775	1127	7.47	42527	41.7	35.7	496	4463	185	8.2	1.6	85.9	5756	19	4332	38	1.05	3603.	35	104	6.3	
40.0	6600	1288	8.54	45523	44.5	33.4	535	4548	162	7.1	1.4	86.4	6584	16	4907	36	0.97	3988.	40	115	6.8	
45.0	7425	1449	9.61	48348	47.2	31.5	571	4614	144	6.3	1.2	86.8	7411	14	5480	33	0.91	4370.	45	127	7.3	
50.0	8250	1610	10.68	51030	49.8	29.8	606	4667	130	5.6	1.1	87.2	8237	13	6050	31	0.86	4726.	50	138	7.7	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#373 165 Ho on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 26. ZC= 93.(Np)
NEUTRON NUMBERS: NP= 98. NT= 30. NC=128.

AP**1/3= 5.485 AT**1/3= 3.826 ELSCAT <19 deg
REDUCED MASS NUMBER= 41.81 AP+AT=AC=221.

INTERACTION RADIUS RINT=13.22 fm R0= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 4.12 CT+CP=10.37 C= 2.48

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 4.35

COULOMB RADII [fm]:
RCP= 6.15 RCT= 4.27 RC=RCP+RCT=10.42

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 335.66 MeV K= .25891 n=2.521
VC(RINT)= 189.4 MeV

FISSION-TKE= 175. MeV
ASYMM. FISSION-TKE= 141. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 28.35 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -61.4
COMPOUND NUCLEUS: 27.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.89 fm V(RB)= 197.9 MeV
Q-VALUE= -152.9 MeV
L-CRITICAL= 111.

165 Ho on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	165	42	0.22	7124	9.1	274.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	330	84	0.44	10077	12.9	194.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	495	125	0.66	12345	15.8	158.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	660	167	0.88	14259	18.3	137.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	743	188	0.99	15126	19.4	129.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	825	209	1.10	15946	20.4	122.7	82	522	236	112.3	19.8	33.9	395	430	398	400	8.78	602.	0 0	1.4	5
5.5	908	230	1.21	16727	21.4	117.0	119	979	618	89.2	18.7	45.4	569	338	546	279	6.09	659.	0 0	1.7	6
6.0	990	251	1.32	17473	22.4	112.0	146	1358	788	74.9	16.7	52.6	713	277	661	226	4.94	712.	5 21	1.9	8
6.5	1073	272	1.43	18189	23.3	107.6	169	1679	728	64.8	15.0	57.6	839	233	758	195	4.27	768.	6 24	2.1	9
7.0	1155	293	1.55	18878	24.2	103.7	190	1954	676	57.3	13.6	61.4	954	201	844	175	3.81	819.	7 26	2.2	11
7.5	1238	314	1.66	19543	25.0	100.2	208	2192	631	51.4	12.3	64.3	1061	176	922	159	3.47	873.	7 28	2.4	12
8.0	1320	334	1.77	20187	25.9	97.0	225	2400	591	46.6	11.3	66.7	1164	156	995	147	3.21	923.	8 31	2.6	14
8.5	1403	355	1.88	20811	26.7	94.1	241	2583	556	42.7	10.4	68.7	1262	141	1064	138	3.00	975.	9 33	2.7	15
9.0	1485	376	1.99	21417	27.4	91.4	255	2746	525	39.4	9.7	70.3	1357	128	1130	130	2.83	1028.	9 35	2.8	16
9.5	1568	397	2.10	22007	28.2	89.0	269	2892	498	36.6	9.0	71.7	1451	117	1194	123	2.68	1080.	10 36	3.0	17
10.0	1650	418	2.21	22582	28.9	86.7	283	3023	473	34.1	8.5	72.9	1543	107	1256	117	2.56	1131.	10 38	3.1	18
10.5	1733	439	2.32	23142	29.6	84.6	295	3141	450	32.0	7.9	74.0	1633	100	1317	112	2.45	1176.	11 40	3.2	20
11.0	1815	460	2.43	23690	30.3	82.7	307	3249	430	30.1	7.5	74.9	1722	93	1377	108	2.35	1226.	11 42	3.3	21
11.5	1898	481	2.54	24226	31.0	80.9	319	3347	411	28.4	7.1	75.8	1811	87	1436	104	2.27	1275.	12 43	3.4	22
12.0	1980	502	2.65	24750	31.7	79.2	330	3438	394	27.0	6.7	76.5	1899	81	1494	100	2.19	1324.	12 45	3.6	23
13.0	2145	544	2.87	25767	33.0	76.1	352	3597	364	24.4	6.1	77.8	2072	73	1608	94	2.06	1419.	14 48	3.8	25
14.0	2310	585	3.09	26747	34.2	73.3	372	3734	338	22.3	5.6	78.9	2245	65	1721	89	1.94	1513.	15 52	4.0	27
15.0	2475	627	3.31	27693	35.4	70.8	391	3852	315	20.5	5.2	79.7	2416	59	1832	85	1.85	1604.	16 55	4.1	29
16.0	2640	669	3.53	28609	36.6	68.6	409	3955	295	19.0	4.8	80.5	2585	55	1941	81	1.77	1694.	17 58	4.3	31
17.0	2805	711	3.75	29498	37.7	66.5	427	4047	278	17.7	4.5	81.1	2755	50	2050	78	1.69	1790.	18 60	4.5	32
18.0	2970	753	3.97	30361	38.8	64.7	444	4128	262	16.6	4.2	81.7	2923	47	2158	75	1.63	1875.	19 63	4.7	34
19.0	3135	794	4.19	31201	39.9	62.9	460	4200	249	15.6	3.9	82.2	3091	44	2265	72	1.57	1958.	20 66	4.8	36
20.0	3300	836	4.41	32020	40.9	61.3	476	4266	236	14.7	3.7	82.7	3259	41	2372	70	1.52	2050.	21 69	5.0	37
25.0	4125	1045	5.52	35847	45.7	54.9	547	4513	189	11.5	2.9	84.3	4094	31	2898	61	1.32	2465.	25 82	5.7	44
30.0	4950	1254	6.62	39321	50.1	50.1	610	4678	157	9.4	2.4	85.3	4925	25	3415	54	1.18	2858.	30 95	6.3	50
35.0	5775	1463	7.73	42527	54.1	46.4	667	4796	135	7.9	2.0	86.0	5754	21	3927	50	1.08	3217.	35 107	6.9	
40.0	6600	1672	8.83	45523	57.8	43.4	720	4884	118	6.9	1.7	86.6	6582	18	4435	46	1.00	3565.	39 119	7.4	
45.0	7425	1881	9.93	48348	61.3	40.9	769	4953	105	6.1	1.5	87.0	7409	16	4940	43	0.94	3886.	44 130	7.9	
50.0	8250	2090	11.04	51030	64.7	38.8	815	5008	94	5.4	1.4	87.3	8236	14	5442	41	0.89	4206.	49 141	8.4	

#374 165 Ho on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 29. ZC= 96.(Cm)
NEUTRON NUMBERS: NP= 98. NT= 34. NC=132.

AP**1/3= 5.485 AT**1/3= 3.979 ELSCAT <22 deg
REDUCED MASS NUMBER= 45.59 AP+AT=AC=228.

INTERACTION RADIUS RINT=13.39 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 4.31 CT+CP=10.56 C= 2.55

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 4.53

COULOMB RADII [fm]:
RCP= 6.15 RCT= 4.45 RC=RCP+RCT=10.60

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 368.94 MeV K= .28595 n=2.503
VC(RINT)= 208.7 MeV

FISSION-TKE= 184. MeV
ASYMM. FISSION-TKE= 155. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 29.17 MeV
L-RLD= 62 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -65.2
COMPOUND NUCLEUS: 47.0

FUSION RELATED PARAMETERS:
R-BARRIER=12.02 fm V(RB)= 218.1 MeV
Q-VALUE= -175.9 MeV
L-CRITICAL= 109.

165 Ho on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	165	46	0.22	7124	10.0	305.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	330	91	0.44	10077	14.1	216.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	495	137	0.66	12345	17.3	176.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	660	182	0.87	14259	19.9	153.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	743	205	0.98	15126	21.2	144.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	825	228	1.09	15946	22.3	136.8	86	481	197	115.5	22.4	32.2	353	472	358	470	9.37	584.	0 0	1.4	5
5.5	908	251	1.20	16727	23.4	130.5	128	954	592	91.1	21.0	44.4	537	370	512	318	6.32	636.	0 0	1.6	7
6.0	990	274	1.31	17473	24.4	124.9	159	1348	636	76.3	18.8	51.8	688	302	632	256	5.09	691.	5 21	1.9	8
6.5	1073	296	1.42	18189	25.4	120.0	185	1680	587	66.0	16.8	57.0	818	254	731	221	4.37	742.	6 24	2.1	10
7.0	1155	319	1.53	18878	26.4	115.6	208	1964	545	58.2	15.1	60.9	936	219	817	197	3.89	795.	6 26	2.2	11
7.5	1238	342	1.64	19543	27.3	111.7	228	2210	508	52.2	13.7	63.9	1046	192	895	179	3.54	844.	7 29	2.4	13
8.0	1320	365	1.75	20187	28.2	108.2	247	2426	477	47.3	12.6	66.3	1150	170	967	165	3.28	896.	8 31	2.6	14
8.5	1403	388	1.86	20811	29.1	104.9	264	2616	448	43.3	11.6	68.3	1250	153	1035	154	3.06	943.	8 33	2.7	16
9.0	1485	410	1.97	21417	29.9	102.0	281	2785	424	39.9	10.7	70.0	1346	139	1100	145	2.88	994.	9 35	2.9	17
9.5	1568	433	2.08	22007	30.7	99.3	296	2936	401	37.1	10.0	71.5	1441	127	1163	138	2.73	1044.	10 37	3.0	18
10.0	1650	456	2.18	22582	31.5	96.7	311	3071	381	34.6	9.4	72.7	1533	117	1224	131	2.60	1089.	10 39	3.1	20
10.5	1733	479	2.29	23142	32.3	94.4	325	3194	363	32.4	8.8	73.8	1625	108	1283	126	2.49	1138.	11 40	3.3	21
11.0	1815	502	2.40	23690	33.1	92.2	338	3306	346	30.5	8.3	74.7	1715	100	1341	121	2.39	1186.	11 42	3.4	22
11.5	1898	524	2.51	24226	33.8	90.2	351	3408	331	28.8	7.9	75.6	1804	94	1398	116	2.30	1234.	12 44	3.5	23
12.0	1980	547	2.62	24750	34.5	88.3	364	3501	318	27.3	7.4	76.3	1892	88	1454	112	2.22	1281.	12 46	3.6	24
13.0	2145	593	2.84	25767	36.0	84.9	387	3666	293	24.7	6.8	77.6	2066	79	1565	105	2.09	1374.	13 49	3.8	26
14.0	2310	638	3.06	26747	37.3	81.8	410	3808	272	22.6	6.2	78.7	2239	71	1673	100	1.97	1458.	14 52	4.0	29
15.0	2475	684	3.28	27693	38.6	79.0	431	3930	254	20.8	5.7	79.6	2411	64	1780	95	1.88	1547.	15 55	4.2	31
16.0	2640	729	3.50	28609	39.9	76.5	451	4037	238	19.2	5.3	80.4	2581	59	1885	91	1.79	1641.	16 58	4.4	32
17.0	2805	775	3.71	29498	41.1	74.2	471	4132	224	17.9	4.9	81.0	2751	54	1989	87	1.72	1726.	17 61	4.6	34
18.0	2970	821	3.93	30361	42.3	72.1	489	4216	212	16.8	4.6	81.6	2919	51	2092	84	1.65	1809.	18 64	4.8	36
19.0	3135	866	4.15	31201	43.5	70.2	507	4291	200	15.8	4.3	82.1	3088	47	2195	81	1.59	1889.	19 67	4.9	38
20.0	3300	912	4.37	32020	44.6	68.4	524	4359	190	14.9	4.1	82.6	3256	44	2297	78	1.54	1978.	20 69	5.1	39
25.0	4125	1140	5.46	35847	49.9	61.2	603	4616	152	11.6	3.2	84.2	4091	34	2799	68	1.34	2368.	25 83	5.8	47
30.0	4950	1368	6.55	39321	54.6	55.9	673	4787	127	9.5	2.6	85.3	4923	27	3292	61	1.20	2732.	30 95	6.5	54
35.0	5775	1596	7.65	42527	59.0	51.7	736	4909	109	8.0	2.2	86.0	5752	23	3780	55	1.10	3096.	34 108	7.1	
40.0	6600	1824	8.74	45523	63.1	48.4	795	5000	95	7.0	1.9	86.5	6581	19	4263	51	1.02	3413.	39 119	7.6	
45.0	7425	2052	9.83	48348	66.9	45.6	849	5071	84	6.2	1.7	86.9	7408	17	4743	48	0.95	3721.	44 131	8.1	
50.0	8250	2280	10.92	51030	70.5	43.3	900	5128	76	5.5	1.5	87.2	8235	15	5220	45	0.90	4030.	48 142	8.6	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	%	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#375 165 Ho on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 42. ZC=109.( )
NEUTRON NUMBERS: NP= 98. NT= 50. NC=148.

AP**1/3= 5.485 AT**1/3= 4.514 ELSCAT <33 deg
REDUCED MASS NUMBER= 59.07 AP+AT=AC=257.

INTERACTION RADIUS RINT=13.97 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 5.00 CT+CP=11.25 C̄= 2.78

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 5.20

COULOMB RADII [fm]:
RCP= 6.15 RCT= 5.08 RC=RCP+RCT=11.23

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 506.84 MeV K= .38202 n=2.460
VC(RINT)= 289.6 MeV

FISSION-TKE= 222. MeV
ASYMM. FISSION-TKE= 211. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.913 MeV/fm**2 PROX-FACTOR= 31.87 MeV
L-RLD= 30 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.51 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -87.5
COMPOUND NUCLEUS: 127.8

FUSION RELATED PARAMETERS:
R-BARRIER=12.48 fm V(RB)= 302.9 MeV
Q-VALUE= -279.1 MeV
L-CRITICAL= 34.

165 Ho on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	59	0.20	7124	12.9	443.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	118	0.41	10077	18.3	313.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	177	0.61	12345	22.4	255.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	236	0.82	14259	25.8	221.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	266	0.92	15126	27.4	208.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	295	1.02	15946	28.9	198.2	54	115	0	149.4	28.6	15.3	119	706	140	1427	21.03	0.	3	15	0.7	1
5.5	908	325	1.12	16727	30.3	188.9	139	668	43	107.4	32.6	36.3	365	542	349	574	8.22	573.	3	15	1.2	4
6.0	990	354	1.22	17473	31.6	180.9	188	1126	39	87.7	28.6	46.2	554	436	498	423	6.05	620.	4	19	1.5	6
6.5	1073	384	1.33	18189	32.9	173.8	228	1513	36	74.7	25.1	52.6	709	363	614	351	5.01	667.	5	22	1.8	8
7.0	1155	413	1.43	18878	34.2	167.5	261	1845	33	65.4	22.4	57.3	845	310	709	306	4.37	712.	6	25	2.0	10
7.5	1238	443	1.53	19543	35.4	161.8	290	2132	31	58.2	20.1	60.9	968	269	792	275	3.93	757.	7	28	2.3	12
8.0	1320	473	1.63	20187	36.5	156.7	317	2384	29	52.6	18.3	63.7	1082	238	866	252	3.59	801.	7	30	2.5	14
8.5	1403	502	1.73	20811	37.7	152.0	342	2605	27	47.9	16.8	66.0	1190	213	933	234	3.33	844.	8	33	2.6	16
9.0	1485	532	1.84	21417	38.8	147.7	365	2802	26	44.1	15.5	68.0	1293	192	996	219	3.12	886.	9	35	2.8	18
9.5	1568	561	1.94	22007	39.8	143.8	387	2978	24	40.8	14.4	69.6	1393	175	1056	207	2.95	927.	9	37	3.0	20
10.0	1650	591	2.04	22582	40.9	140.1	407	3137	23	38.0	13.4	71.0	1489	161	1113	196	2.80	972.	10	39	3.1	21
10.5	1733	620	2.14	23142	41.9	136.7	427	3280	22	35.5	12.6	72.2	1584	148	1167	187	2.67	1012.	10	41	3.3	23
11.0	1815	650	2.24	23690	42.8	133.6	445	3410	21	33.4	11.8	73.3	1677	138	1220	179	2.56	1056.	11	43	3.4	24
11.5	1898	679	2.35	24226	43.8	130.7	463	3529	20	31.5	11.2	74.3	1769	128	1272	173	2.46	1094.	11	44	3.5	26
12.0	1980	709	2.45	24750	44.8	127.9	481	3638	19	29.8	10.6	75.1	1860	120	1322	166	2.37	1137.	12	46	3.7	27
13.0	2145	768	2.65	25767	46.6	122.9	513	3831	18	26.9	9.6	76.5	2038	107	1420	156	2.22	1216.	13	49	3.9	30
14.0	2310	827	2.86	26747	48.3	118.4	544	3996	16	24.6	8.7	77.7	2214	96	1515	147	2.10	1298.	14	53	4.1	32
15.0	2475	886	3.06	27693	50.0	114.4	573	4139	15	22.6	8.0	78.7	2388	87	1608	139	1.99	1372.	15	56	4.3	35
16.0	2640	945	3.26	28609	51.7	110.8	601	4265	14	20.9	7.4	79.6	2560	80	1699	133	1.90	1443.	16	59	4.6	38
17.0	2805	1004	3.47	29498	53.3	107.5	628	4375	13	19.4	6.9	80.3	2732	73	1789	127	1.82	1520.	17	62	4.8	40
18.0	2970	1063	3.67	30361	54.8	104.4	653	4473	13	18.2	6.5	80.9	2902	68	1877	122	1.75	1594.	18	65	4.9	42
19.0	3135	1122	3.87	31201	56.3	101.7	678	4561	12	17.1	6.1	81.5	3072	63	1964	118	1.68	1667.	19	68	5.1	44
20.0	3300	1181	4.08	32020	57.8	99.1	701	4640	11	16.1	5.7	82.0	3241	59	2051	114	1.63	1738.	20	70	5.3	46
25.0	4125	1477	5.10	35847	64.6	88.6	809	4940	9	12.5	4.5	83.7	4080	45	2475	99	1.41	2080.	24	84	6.1	55
30.0	4950	1772	6.12	39321	70.8	80.9	904	5140	7	10.2	3.7	84.9	4914	36	2888	88	1.26	2398.	29	97	6.8	63
35.0	5775	2067	7.14	42527	76.4	74.9	990	5283	6	8.7	3.1	85.7	5745	30	3294	81	1.15	2696.	33	109	7.5	
40.0	6600	2363	8.16	45523	81.7	70.1	1069	5390	5	7.5	2.7	86.3	6574	26	3694	75	1.07	2966.	38	120	8.1	
45.0	7425	2658	9.18	48348	86.7	66.1	1143	5473	5	6.6	2.4	86.7	7402	23	4090	70	1.00	3226.	42	132	8.6	
50.0	8250	2953	10.20	51030	91.4	62.7	1212	5539	4	5.9	2.1	87.0	8230	20	4483	66	0.94	3460.	47	143	9.1	

#376 165 Ho on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 47. ZC=114.( )
NEUTRON NUMBERS: NP= 98. NT= 61. NC=159.

AP**1/3= 5.485 AT**1/3= 4.762 ELSCAT <40 deg
REDUCED MASS NUMBER= 65.27 AP+AT=AC=273.

INTERACTION RADIUS RINT=14.24 fm R0= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 5.32 CT+CP=11.57 C̄= 2.87

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 5.50

COULOMB RADII [fm]:
RCP= 6.15 RCT= 5.34 RC=RCP+RCT=11.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 554.96 MeV K= .40574 n=2.450
VC(RINT)= 318.0 MeV

FISSION-TKE= 237. MeV
ASYMM. FISSION-TKE= 229. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 32.71 MeV
L-RLD= 17 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.20 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -87.6
COMPOUND NUCLEUS: 164.0

FUSION RELATED PARAMETERS:
R-BARRIER=12.71 fm V(RB)= 331.8 MeV
Q-VALUE= -315.3 MeV
L-CRITICAL= 0.

165 Ho on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	65	0.21	7124	14.3	495.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	131	0.41	10077	20.2	350.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	196	0.62	12345	24.7	286.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	261	0.82	14259	28.6	247.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	294	0.92	15126	30.3	233.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	326	1.03	15946	31.9	221.7	71	160	0	144.5	39.1	17.8	109	716	123	1384	18.43	0.	0	0	0.6	1
5.5	908	359	1.13	16727	33.5	211.4	160	730	0	105.6	37.4	37.2	356	551	329	626	8.16	0.	0	0	1.1	4
6.0	990	392	1.23	17473	35.0	202.4	215	1202	0	86.5	32.1	46.8	546	444	475	467	6.08	0.	4	19	1.5	7
6.5	1073	424	1.33	18189	36.4	194.5	259	1602	0	73.8	28.0	53.1	703	370	588	389	5.06	0.	5	23	1.8	9
7.0	1155	457	1.44	18878	37.8	187.4	296	1944	0	64.7	24.8	57.7	839	316	680	340	4.42	0.	6	26	2.0	12
7.5	1238	490	1.54	19543	39.1	181.1	329	2241	0	57.6	22.3	61.2	963	275	760	306	3.98	0.	7	28	2.3	14
8.0	1320	522	1.64	20187	40.4	175.3	359	2500	0	52.0	20.2	64.0	1077	243	830	280	3.64	0.	7	31	2.5	16
8.5	1403	555	1.74	20811	41.6	170.1	387	2729	0	47.5	18.5	66.3	1185	217	895	260	3.38	0.	8	33	2.6	18
9.0	1485	587	1.85	21417	42.8	165.3	413	2932	0	43.6	17.0	68.2	1289	196	954	244	3.17	0.	9	35	2.8	20
9.5	1568	620	1.95	22007	44.0	160.9	437	3114	0	40.4	15.8	69.8	1389	179	1011	230	2.99	0.	9	37	3.0	22
10.0	1650	653	2.05	22582	45.1	156.8	460	3277	0	37.6	14.7	71.2	1486	164	1064	219	2.85	0.	10	39	3.1	24
10.5	1733	685	2.16	23142	46.3	153.0	482	3425	0	35.2	13.8	72.4	1581	152	1115	209	2.72	0.	10	41	3.3	25
11.0	1815	718	2.26	23690	47.4	149.5	503	3560	0	33.1	13.0	73.4	1674	141	1165	200	2.60	0.	11	43	3.4	27
11.5	1898	751	2.36	24226	48.4	146.2	523	3682	0	31.2	12.3	74.4	1766	131	1213	193	2.50	0.	11	45	3.6	29
12.0	1980	783	2.46	24750	49.5	143.1	543	3795	0	29.6	11.6	75.2	1857	123	1260	186	2.41	0.	12	46	3.7	31
13.0	2145	849	2.67	25767	51.5	137.5	579	3994	0	26.7	10.5	76.6	2036	109	1351	174	2.26	0.	13	50	4.0	34
14.0	2310	914	2.87	26747	53.4	132.5	614	4164	0	24.4	9.6	77.8	2212	98	1439	164	2.13	0.	14	53	4.2	36
15.0	2475	979	3.08	27693	55.3	128.0	647	4312	0	22.4	8.8	78.8	2386	89	1525	156	2.02	0.	15	56	4.4	39
16.0	2640	1044	3.28	28609	57.1	124.0	678	4441	0	20.7	8.2	79.6	2558	82	1609	149	1.93	0.	16	59	4.6	42
17.0	2805	1110	3.49	29498	58.9	120.3	708	4555	0	19.3	7.6	80.4	2730	75	1691	142	1.85	0.	17	62	4.8	44
18.0	2970	1175	3.69	30361	60.6	116.9	736	4657	0	18.0	7.1	81.0	2900	70	1773	137	1.78	0.	18	65	5.0	47
19.0	3135	1240	3.90	31201	62.2	113.8	764	4747	0	16.9	6.7	81.5	3070	65	1853	132	1.71	0.	19	68	5.2	49
20.0	3300	1305	4.11	32020	63.8	110.9	791	4829	0	16.0	6.3	82.0	3239	61	1932	127	1.66	0.	20	71	5.4	51
25.0	4125	1632	5.13	35847	71.4	99.2	912	5139	0	12.4	4.9	83.8	4079	46	2320	111	1.44	0.	24	84	6.2	61
30.0	4950	1958	6.16	39321	78.2	90.5	1019	5345	0	10.2	4.0	84.9	4913	37	2697	99	1.28	0.	28	97	6.9	70
35.0	5775	2285	7.18	42527	84.5	83.8	1116	5492	0	8.6	3.4	85.7	5744	31	3066	90	1.17	0.	33	109	7.6	
40.0	6600	2611	8.21	45523	90.3	78.4	1205	5603	0	7.4	2.9	86.3	6573	27	3429	84	1.09	0.	37	120	8.2	
45.0	7425	2937	9.24	48348	95.8	73.9	1288	5689	0	6.6	2.6	86.7	7402	23	3789	78	1.02	0.	41	132	8.8	
50.0	8250	3264	10.26	51030	101.0	70.1	1366	5757	0	5.9	2.3	87.1	8229	21	4145	74	0.96	0.	46	143	9.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#377 165 Ho on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 58. ZC=125.( )
NEUTRON NUMBERS: NP= 98. NT= 82. NC=180.

AP**1/3= 5.485 AT**1/3= 5.192 ELSCAT <58 deg
REDUCED MASS NUMBER= 75.74 AP+AT=AC=305.

INTERACTION RADIUS RINT=14.71 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 5.87 CT+CP=12.13 C= 3.03

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.04

COULOMB RADII [fm]:
RCP= 6.15 RCT= 5.82 RC=RCP+RCT=11.97

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 658.27 MeV K= .44771 n=2.440
VC(RINT)= 380.0 MeV

FISSION-TKE= 271. MeV
ASYMM. FISSION-TKE= 269. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.897 MeV/fm**2 PROX-FACTOR= 34.12 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.79 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -88.2
COMPOUND NUCLEUS: 248.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.07 fm V(RB)= 395.9 MeV
Q-VALUE= -400.4 MeV
L-CRITICAL= 0.

165 Ho on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	76	0.20	7124	16.6	611.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	330	151	0.40	10077	23.4	432.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	495	227	0.60	12345	28.7	353.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	660	303	0.80	14259	33.1	305.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	743	341	0.90	15126	35.1	288.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	825	379	1.00	15946	37.0	273.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	908	417	1.10	16727	38.8	260.9	168	595	0	114.4	50.0	32.8	271	637	240	881	9.63	0.	2 13	0.7	1
6.0	990	454	1.20	17473	40.6	249.8	241	1115	0	92.1	41.2	43.9	480	510	399	617	6.73	0.	4 19	1.2	5
6.5	1073	492	1.30	18189	42.2	240.0	296	1554	0	78.1	35.2	51.0	650	423	519	502	5.47	0.	5 22	1.6	8
7.0	1155	530	1.40	18878	43.8	231.3	342	1929	0	68.1	30.9	56.0	796	359	614	435	4.73	0.	6 25	1.8	11
7.5	1238	568	1.49	19543	45.4	223.4	383	2255	0	60.5	27.5	59.8	926	312	694	388	4.23	0.	6 28	2.1	14
8.0	1320	606	1.59	20187	46.9	216.3	420	2540	0	54.5	24.8	62.8	1045	275	764	354	3.85	0.	7 30	2.3	16
8.5	1403	644	1.69	20811	48.3	209.9	454	2791	0	49.6	22.6	65.2	1157	245	826	328	3.57	0.	8 33	2.5	19
9.0	1485	682	1.79	21417	49.7	204.0	486	3014	0	45.6	20.8	67.2	1264	221	883	307	3.33	0.	8 35	2.7	21
9.5	1568	720	1.89	22007	51.1	198.5	515	3214	0	42.1	19.3	68.9	1366	201	936	289	3.14	0.	9 37	2.9	24
10.0	1650	757	1.99	22582	52.4	193.5	543	3393	0	39.2	17.9	70.4	1466	184	985	274	2.98	0.	9 39	3.1	26
10.5	1733	795	2.09	23142	53.7	188.8	570	3556	0	36.7	16.8	71.7	1562	170	1032	261	2.84	0.	10 41	3.2	28
11.0	1815	833	2.19	23690	54.9	184.5	596	3704	0	34.4	15.8	72.8	1657	158	1078	250	2.72	0.	11 42	3.4	30
11.5	1898	871	2.29	24226	56.2	180.4	620	3838	0	32.5	14.9	73.8	1750	147	1121	240	2.61	0.	11 44	3.5	32
12.0	1980	909	2.39	24750	57.4	176.6	643	3962	0	30.7	14.1	74.6	1842	138	1163	232	2.52	0.	12 46	3.7	34
13.0	2145	985	2.59	25767	59.7	169.7	688	4181	0	27.7	12.7	76.1	2023	122	1245	217	2.35	0.	13 49	3.9	38
14.0	2310	1060	2.79	26747	62.0	163.5	730	4368	0	25.3	11.6	77.4	2200	110	1323	204	2.22	0.	14 53	4.2	41
15.0	2475	1136	2.99	27693	64.2	158.0	769	4530	0	23.2	10.6	78.4	2376	99	1398	194	2.11	0.	15 56	4.4	45
16.0	2640	1212	3.19	28609	66.3	153.0	807	4672	0	21.5	9.8	79.3	2549	91	1472	185	2.01	0.	15 59	4.6	48
17.0	2805	1288	3.39	29498	68.3	148.4	843	4798	0	20.0	9.2	80.0	2721	84	1544	177	1.92	0.	16 62	4.8	51
18.0	2970	1363	3.59	30361	70.3	144.2	878	4909	0	18.7	8.6	80.7	2892	78	1614	170	1.85	0.	17 64	5.0	54
19.0	3135	1439	3.79	31201	72.2	140.4	911	5009	0	17.5	8.0	81.2	3063	72	1684	164	1.78	0.	18 67	5.2	56
20.0	3300	1515	3.99	32020	74.1	136.8	943	5098	0	16.5	7.6	81.7	3232	68	1752	158	1.72	0.	19 70	5.4	59
25.0	4125	1893	4.98	35847	82.8	122.4	1089	5439	0	12.8	5.9	83.6	4074	51	2084	137	1.49	0.	23 83	6.3	70
30.0	4950	2272	5.98	39321	90.7	111.7	1217	5666	0	10.5	4.8	84.8	4909	41	2405	122	1.33	0.	28 96	7.0	81
35.0	5775	2651	6.98	42527	98.0	103.4	1334	5828	0	8.9	4.1	85.6	5741	34	2717	112	1.21	0.	32 108	7.7	
40.0	6600	3030	7.97	45523	104.8	96.7	1441	5949	0	7.7	3.5	86.2	6571	29	3024	103	1.12	0.	36 119	8.3	
45.0	7425	3408	8.97	48348	111.1	91.2	1540	6043	0	6.8	3.1	86.6	7399	26	3326	97	1.05	0.	40 130	8.9	
50.0	8250	3787	9.97	51030	117.1	86.5	1634	6119	0	6.1	2.8	87.0	8227	23	3625	91	0.99	0.	44 141	9.4	

#378 165 Ho on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 62. ZC=129.( )
NEUTRON NUMBERS: NP= 98. NT= 92. NC=190.

AP**1/3= 5.485 AT**1/3= 5.360 ELSCAT <69 deg
REDUCED MASS NUMBER= 79.66 AP+AT=AC=319.

INTERACTION RADIUS RINT=14.89 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 6.09 CT+CP=12.34 C= 3.08

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.25

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.00 RC=RCP+RCT=12.15

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 693.36 MeV K= .45628 n=2.439
VC(RINT)= 401.2 MeV

FISSION-TKE= 283. MeV
ASYMM. FISSION-TKE= 283. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.890 MeV/fm**2 PROX-FACTOR= 34.49 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.66 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -72.1
COMPOUND NUCLEUS: 290.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.21 fm V(RB)= 417.8 MeV
Q-VALUE= -426.1 MeV
L-CRITICAL= 0.

165 Ho on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	80	0.20	7124	17.4	654.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	330	159	0.40	10077	24.6	462.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	495	239	0.60	12345	30.2	377.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	660	319	0.79	14259	34.8	327.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	743	358	0.89	15126	37.0	308.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	825	398	0.99	15946	39.0	292.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	908	438	1.09	16727	40.9	278.9	175	584	0	115.7	54.7	32.1	258	650	221	962	9.97	0.	2 13	0.5	1
6.0	990	478	1.19	17473	42.7	267.0	254	1118	0	92.9	44.4	43.5	470	520	382	667	6.88	0.	3 18	1.1	6
6.5	1073	518	1.29	18189	44.4	256.6	313	1570	0	78.7	37.7	50.7	642	430	501	541	5.58	0.	5 22	1.5	9
7.0	1155	558	1.39	18878	46.1	247.2	363	1957	0	68.5	32.9	55.7	789	366	596	467	4.81	0.	5 25	1.8	12
7.5	1238	597	1.49	19543	47.7	238.8	406	2291	0	60.9	29.3	59.6	920	317	674	417	4.30	0.	6 28	2.1	15
8.0	1320	637	1.59	20187	49.3	231.3	446	2584	0	54.8	26.4	62.6	1041	279	743	380	3.92	0.	7 30	2.3	18
8.5	1403	677	1.69	20811	50.8	224.4	482	2843	0	49.9	24.0	65.0	1153	249	803	352	3.62	0.	8 33	2.5	21
9.0	1485	717	1.79	21417	52.3	218.0	516	3073	0	45.8	22.1	67.1	1260	225	858	329	3.38	0.	8 35	2.7	23
9.5	1568	757	1.89	22007	53.7	212.2	548	3278	0	42.4	20.4	68.8	1363	204	909	310	3.19	0.	9 37	2.9	26
10.0	1650	797	1.99	22582	55.1	206.8	577	3463	0	39.4	19.0	70.3	1463	187	957	294	3.02	0.	9 39	3.0	28
10.5	1733	836	2.08	23142	56.5	201.9	606	3630	0	36.9	17.8	71.6	1560	173	1002	280	2.88	0.	10 41	3.2	30
11.0	1815	876	2.18	23690	57.8	197.2	633	3782	0	34.6	16.7	72.7	1655	160	1046	268	2.76	0.	10 42	3.4	32
11.5	1898	916	2.28	24226	59.1	192.9	659	3921	0	32.6	15.7	73.7	1748	150	1087	257	2.65	0.	11 44	3.5	34
12.0	1980	956	2.38	24750	60.4	188.8	684	4048	0	30.9	14.9	74.6	1840	140	1128	248	2.55	0.	11 46	3.6	37
13.0	2145	1036	2.58	25767	62.8	181.4	732	4273	0	27.9	13.4	76.1	2021	124	1205	232	2.39	0.	12 49	3.9	40
14.0	2310	1115	2.78	26747	65.2	174.8	776	4466	0	25.4	12.2	77.3	2199	111	1279	218	2.25	0.	13 52	4.2	44
15.0	2475	1195	2.98	27693	67.5	168.9	818	4633	0	23.3	11.3	78.3	2374	101	1351	207	2.13	0.	14 55	4.4	48
16.0	2640	1274	3.18	28609	69.7	163.5	859	4779	0	21.6	10.4	79.2	2548	92	1420	198	2.03	0.	15 58	4.6	51
17.0	2805	1354	3.37	29498	71.8	158.6	897	4908	0	20.1	9.7	80.0	2720	85	1488	189	1.95	0.	16 61	4.8	54
18.0	2970	1434	3.57	30361	73.9	154.2	934	5022	0	18.8	9.1	80.6	2891	79	1555	182	1.87	0.	17 64	5.0	57
19.0	3135	1513	3.77	31201	75.9	150.1	969	5125	0	17.6	8.5	81.2	3062	73	1620	175	1.80	0.	18 67	5.2	60
20.0	3300	1593	3.97	32020	77.9	146.3	1003	5217	0	16.6	8.0	81.7	3231	69	1685	169	1.74	0.	19 70	5.4	63
25.0	4125	1991	4.96	35847	87.1	130.8	1159	5567	0	12.9	6.2	83.6	4073	52	1997	146	1.51	0.	23 83	6.3	75
30.0	4950	2390	5.96	39321	95.4	119.4	1296	5801	0	10.5	5.1	84.7	4908	42	2297	131	1.35	0.	27 95	7.0	86
35.0	5775	2788	6.95	42527	103.1	110.6	1420	5968	0	8.9	4.3	85.5	5740	35	2589	119	1.23	0.	32 107	7.7	
40.0	6600	3186	7.94	45523	110.2	103.4	1533	6093	0	7.7	3.7	86.1	6570	30	2875	111	1.14	0.	36 119	8.3	
45.0	7425	3584	8.93	48348	116.9	97.5	1639	6190	0	6.8	3.3	86.6	7399	26	3157	103	1.06	0.	40 130	8.9	
50.0	8250	3983	9.93	51030	123.2	92.5	1739	6267	0	6.1	2.9	87.0	8227	23	3435	98	1.00	0.	44 140	9.4	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#379 165 Ho on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 67. ZC=134.( )
NEUTRON NUMBERS: NP= 98. NT= 98. NC=196.

INTERACTION RADIUS RINT=15.02 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 6.25 CT+CP=12.50 C= 3.13

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.41

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.15 RC=RCP+RCT=12.30

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 739.81 MeV K= .47284 n=2.438
VC(RINT)= 429.7 MeV

FISSION-TKE= 300. MeV
ASYMM. FISSION-TKE= 300. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 35.02 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.57 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -63.7
COMPOUND NUCLEUS: 341.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.30 fm V(RB)= 448.0 MeV
Q-VALUE= -469.3 MeV
L-CRITICAL= 0.

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EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	83	0.19	7124	18.0	706.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	165	0.38	10077	25.5	499.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	248	0.58	12345	31.3	408.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	330	0.77	14259	36.1	353.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	371	0.86	15126	38.3	333.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	413	0.96	15946	40.3	316.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	908	454	1.06	16727	42.3	301.4	145	372	0	128.7	64.4	25.6	170	738	146	1310	12.73	0.	1	11	0.0	0
6.0	990	495	1.15	17473	44.2	288.6	240	935	0	100.5	50.2	39.8	405	585	328	795	7.67	0.	3	17	0.8	3
6.5	1073	536	1.25	18189	46.0	277.2	307	1410	0	84.1	42.1	47.9	591	481	459	622	5.99	0.	4	21	1.3	7
7.0	1155	578	1.34	18878	47.7	267.2	362	1817	0	72.8	36.4	53.6	748	407	562	528	5.08	0.	5	24	1.6	11
7.5	1238	619	1.44	19543	49.4	258.1	410	2170	0	64.4	32.2	57.8	886	352	646	467	4.49	0.	6	27	1.9	14
8.0	1320	660	1.54	20187	51.0	249.9	452	2479	0	57.8	28.9	61.1	1011	309	717	423	4.07	0.	7	30	2.2	17
8.5	1403	701	1.63	20811	52.6	242.4	491	2751	0	52.5	26.3	63.7	1128	275	780	390	3.75	0.	7	32	2.4	20
9.0	1485	743	1.73	21417	54.1	235.6	527	2993	0	48.2	24.1	65.9	1238	247	837	363	3.49	0.	8	34	2.6	22
9.5	1568	784	1.82	22007	55.6	229.3	561	3209	0	44.5	22.2	67.8	1343	224	888	341	3.28	0.	9	36	2.8	25
10.0	1650	825	1.92	22582	57.1	223.5	593	3404	0	41.3	20.7	69.3	1445	205	937	323	3.11	0.	9	38	2.9	27
10.5	1733	866	2.02	23142	58.5	218.1	623	3580	0	38.6	19.3	70.7	1543	189	982	307	2.95	0.	10	40	3.1	30
11.0	1815	908	2.11	23690	59.8	213.1	652	3740	0	36.2	18.1	71.9	1640	175	1025	294	2.82	0.	10	42	3.3	32
11.5	1898	949	2.21	24226	61.2	208.4	680	3886	0	34.1	17.1	72.9	1734	163	1067	282	2.71	0.	11	44	3.4	34
12.0	1980	990	2.30	24750	62.5	204.0	706	4020	0	32.2	16.1	73.9	1827	153	1107	271	2.61	0.	11	45	3.6	36
13.0	2145	1073	2.50	25767	65.1	196.0	756	4257	0	29.1	14.5	75.5	2010	135	1183	253	2.43	0.	12	49	3.8	40
14.0	2310	1155	2.69	26747	67.5	188.9	803	4460	0	26.5	13.2	76.8	2189	121	1255	238	2.29	0.	13	52	4.1	44
15.0	2475	1238	2.88	27693	69.9	182.5	848	4635	0	24.3	12.1	77.9	2365	110	1325	226	2.17	0.	14	55	4.3	48
16.0	2640	1320	3.07	28609	72.2	176.7	890	4789	0	22.5	11.2	78.8	2540	100	1392	215	2.07	0.	15	58	4.5	51
17.0	2805	1403	3.26	29498	74.4	171.4	931	4925	0	20.9	10.4	79.6	2713	92	1458	206	1.98	0.	16	61	4.8	55
18.0	2970	1485	3.46	30361	76.6	166.6	969	5046	0	19.5	9.8	80.2	2885	85	1522	198	1.90	0.	17	64	5.0	58
19.0	3135	1568	3.65	31201	78.7	162.2	1006	5154	0	18.3	9.2	80.8	3056	79	1586	190	1.83	0.	18	67	5.2	61
20.0	3300	1650	3.84	32020	80.7	158.1	1042	5251	0	17.2	8.6	81.4	3226	74	1648	184	1.77	0.	19	69	5.4	64
25.0	4125	2063	4.80	35847	90.2	141.4	1206	5620	0	13.4	6.7	83.3	4069	56	1947	159	1.53	0.	23	83	6.2	77
30.0	4950	2475	5.76	39321	98.8	129.1	1349	5866	0	10.9	5.5	84.5	4905	45	2234	142	1.36	0.	27	95	7.0	88
35.0	5775	2888	6.72	42527	106.8	119.5	1479	6041	0	9.2	4.6	85.4	5738	37	2513	130	1.24	0.	31	107	7.7	
40.0	6600	3300	7.68	45523	114.1	111.8	1599	6173	0	8.0	4.0	86.0	6568	32	2786	120	1.15	0.	35	118	8.3	
45.0	7425	3713	8.64	48348	121.0	105.4	1710	6275	0	7.1	3.5	86.5	7397	28	3055	112	1.08	0.	39	129	8.9	
50.0	8250	4125	9.60	51030	127.6	100.0	1814	6357	0	6.3	3.2	86.8	8225	25	3319	106	1.02	0.	43	140	9.4	

#380 165 Ho on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 73. ZC=140.( )
NEUTRON NUMBERS: NP= 98. NT=108. NC=206.

AP**1/3= 5.485 AT**1/3= 5.657
REDUCED MASS NUMBER= 86.32 AP+AT=AC=346.

INTERACTION RADIUS RINT=15.21 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 6.47 CT+CP=12.72 C= 3.18

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.62

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.35 RC=RCP+RCT=12.51

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 792.97 MeV K= .48613 n=2.439
VC(RINT)= 462.5 MeV

FISSION-TKE= 321. MeV
ASYMM. FISSION-TKE= 321. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.890 MeV/fm**2 PROX-FACTOR= 35.56 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -46.0
COMPOUND NUCLEUS: 402.4

FUSION RELATED PARAMETERS:
R-BARRIER=13.43 fm V(RB)= 482.7 MeV
Q-VALUE= -512.1 MeV
L-CRITICAL= 0.

165 Ho on 181 Ta — 165 Ho on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	86	0.19	7124	18.9	770.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	173	0.37	10077	26.7	544.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	259	0.56	12345	32.7	444.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	345	0.75	14259	37.8	385.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	388	0.84	15126	40.0	363.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	432	0.93	15946	42.2	344.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	908	475	1.03	16727	44.3	328.4	106	182	0	144.4	80.4	17.8	87	821	72	2044	18.70	0.	1	10	0.0	0
6.0	990	518	1.12	17473	46.2	314.4	229	776	0	107.9	57.6	36.0	344	646	273	961	8.63	0.	3	16	0.4	0
6.5	1073	561	1.21	18189	48.1	302.1	306	1277	0	89.3	47.3	45.4	544	528	417	721	6.45	0.	4	20	1.1	5
7.0	1155	604	1.31	18878	49.9	291.1	367	1707	0	76.8	40.5	51.6	710	445	526	601	5.38	0.	5	24	1.5	9
7.5	1238	647	1.40	19543	51.7	281.2	420	2078	0	67.7	35.6	56.2	855	383	614	526	4.71	0.	6	27	1.8	13
8.0	1320	691	1.49	20187	53.4	272.3	466	2404	0	60.6	31.8	59.7	985	335	688	474	4.24	0.	7	29	2.0	16
8.5	1403	734	1.59	20811	55.0	264.2	508	2691	0	54.9	28.8	62.5	1105	298	753	434	3.88	0.	7	32	2.3	20
9.0	1485	777	1.68	21417	56.6	256.7	547	2946	0	50.2	26.4	64.9	1218	267	810	404	3.61	0.	8	34	2.5	22
9.5	1568	820	1.77	22007	58.2	249.9	584	3174	0	46.3	24.3	66.8	1325	242	862	378	3.38	0.	9	36	2.7	25
10.0	1650	863	1.87	22582	59.7	243.5	618	3379	0	43.0	22.5	68.5	1429	221	910	357	3.19	0.	9	38	2.8	28
10.5	1733	906	1.96	23142	61.2	237.7	651	3564	0	40.1	21.0	69.9	1529	204	955	340	3.03	0.	10	40	3.0	30
11.0	1815	949	2.05	23690	62.6	232.2	682	3733	0	37.6	19.7	71.2	1627	188	997	324	2.90	0.	10	42	3.2	33
11.5	1898	993	2.15	24226	64.0	227.1	711	3887	0	35.4	18.6	72.3	1722	175	1038	311	2.78	0.	11	43	3.3	35
12.0	1980	1036	2.24	24750	65.4	222.3	740	4028	0	33.5	17.5	73.3	1816	164	1077	299	2.67	0.	11	45	3.5	37
13.0	2145	1122	2.43	25767	68.1	213.6	793	4278	0	30.1	15.8	74.9	2000	145	1150	279	2.49	0.	12	48	3.8	42
14.0	2310	1208	2.61	26747	70.6	205.8	844	4492	0	27.4	14.4	76.3	2181	129	1220	262	2.34	0.	13	52	4.0	46
15.0	2475	1295	2.80	27693	73.1	198.8	891	4678	0	25.2	13.2	77.4	2358	117	1287	248	2.22	0.	14	55	4.3	50
16.0	2640	1381	2.99	28609	75.5	192.5	936	4840	0	23.2	12.2	78.4	2533	107	1351	236	2.11	0.	15	58	4.5	53
17.0	2805	1467	3.17	29498	77.8	186.8	979	4983	0	21.6	11.3	79.2	2707	98	1414	226	2.02	0.	16	61	4.7	57
18.0	2970	1554	3.36	30361	80.1	181.5	1021	5110	0	20.2	10.6	79.9	2879	91	1475	217	1.93	0.	17	63	4.9	60
19.0	3135	1640	3.55	31201	82.3	176.7	1060	5224	0	18.9	9.9	80.5	3050	85	1535	209	1.86	0.	18	66	5.1	63
20.0	3300	1726	3.73	32020	84.4	172.2	1098	5327	0	17.8	9.3	81.1	3221	79	1594	201	1.80	0.	19	69	5.3	66
25.0	4125	2158	4.67	35847	94.4	154.0	1272	5716	0	13.8	7.2	83.1	4066	59	1876	174	1.55	0.	23	82	6.2	80
30.0	4950	2589	5.60	39321	103.4	140.6	1425	5975	0	11.3	5.9	84.4	4902	48	2146	155	1.39	0.	27	94	6.9	92
35.0	5775	3021	6.53	42527	111.7	130.2	1563	6160	0	9.5	5.0	85.2	5735	40	2407	141	1.26	0.	31	106	7.6	
40.0	6600	3453	7.47	45523	119.4	121.8	1690	6299	0	8.2	4.3	85.9	6566	34	2662	131	1.17	0.	35	117	8.2	
45.0	7425	3884	8.40	48348	126.6	114.8	1808	6407	0	7.3	3.8	86.4	7395	30	2912	122	1.09	0.	39	128	8.8	
50.0	8250	4316	9.33	51030	133.5	108.9	1918	6493	0	6.5	3.4	86.8	8224	26	3159	115	1.03	0.	43	139	9.4	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-h	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#381 165 Ho on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 79. ZC=146.( )
NEUTRON NUMBERS: NP= 98. NT=118. NC=216.

AP**1/3= 5.485 AT**1/3= 5.819
REDUCED MASS NUMBER= 89.79 AP+AT=AC=362.

INTERACTION RADIUS RINT=15.38 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 6.68 CT+CP=12.93 C= 3.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.83

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.55 RC=RCP+RCT=12.70

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 845.01 MeV K= .49655 n=2.441
VC(RINT)= 494.8 MeV

FISSION-TKE= 343. MeV
ASYMM. FISSION-TKE= 340. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 36.04 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.38 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -28.6
COMPOUND NUCLEUS: 466.6

FUSION RELATED PARAMETERS:
R-BARRIER=13.55 fm V(RB)= 517.1 MeV
Q-VALUE= -559.0 MeV
L-CRITICAL= 0.

165 Ho on 197 Au — 165 Ho on 197 Au

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	90	0.18	7124	19.6	833.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	330	180	0.36	10077	27.8	589.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	495	269	0.54	12345	34.0	481.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	660	359	0.73	14259	39.3	416.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	743	404	0.82	15126	41.7	392.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	825	449	0.91	15946	43.9	372.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	908	494	1.00	16727	46.1	355.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	990	539	1.09	17473	48.1	340.2	210	604	0	116.7	66.5	31.7	278	712	216	1191	10.01	0.	2	15	0.0	0
6.5	1073	584	1.18	18189	50.1	326.9	299	1131	0	95.0	53.0	42.5	494	579	372	838	7.02	0.	4	19	0.7	2
7.0	1155	629	1.27	18878	52.0	315.0	368	1583	0	81.1	44.9	49.4	670	485	490	683	5.71	0.	5	23	1.2	7
7.5	1238	673	1.36	19543	53.8	304.3	425	1975	0	71.2	39.2	54.4	822	416	583	591	4.94	0.	6	26	1.6	11
8.0	1320	718	1.45	20187	55.5	294.7	476	2317	0	63.5	34.9	58.2	957	363	660	528	4.41	0.	6	29	1.9	15
8.5	1403	763	1.54	20811	57.3	285.9	522	2619	0	57.4	31.5	61.3	1081	321	727	482	4.03	0.	7	31	2.1	18
9.0	1485	808	1.63	21417	58.9	277.8	564	2887	0	52.5	28.7	63.8	1197	288	785	446	3.73	0.	8	33	2.3	21
9.5	1568	853	1.72	22007	60.5	270.4	603	3127	0	48.3	26.4	65.8	1307	260	837	417	3.49	0.	8	35	2.5	24
10.0	1650	898	1.81	22582	62.1	263.6	640	3343	0	44.8	24.5	67.6	1412	238	886	393	3.29	0.	9	37	2.7	27
10.5	1733	943	1.91	23142	63.6	257.2	674	3538	0	41.8	22.8	69.1	1514	218	930	373	3.12	0.	10	39	2.9	30
11.0	1815	988	2.00	23690	65.1	251.3	707	3716	0	39.1	21.4	70.4	1613	202	972	356	2.97	0.	10	41	3.1	33
11.5	1898	1033	2.09	24226	66.6	245.8	739	3878	0	36.8	20.1	71.6	1710	188	1012	341	2.84	0.	11	43	3.2	35
12.0	1980	1078	2.18	24750	68.0	240.6	769	4027	0	34.7	19.0	72.6	1805	175	1050	327	2.73	0.	11	45	3.4	38
13.0	2145	1167	2.36	25767	70.8	231.2	826	4289	0	31.3	17.0	74.4	1991	154	1122	305	2.54	0.	12	48	3.7	42
14.0	2310	1257	2.54	26747	73.5	222.7	890	4515	0	28.4	15.5	75.8	2172	138	1189	286	2.39	0.	13	51	3.9	47
15.0	2475	1347	2.72	27693	76.1	215.2	930	4710	0	26.0	14.2	77.0	2350	125	1254	271	2.26	0.	14	54	4.2	51
16.0	2640	1437	2.90	28609	78.6	208.4	978	4881	0	24.0	13.1	78.0	2526	114	1316	257	2.15	0.	15	57	4.4	54
17.0	2805	1526	3.09	29498	81.0	202.1	1024	5031	0	22.3	12.2	78.8	2701	104	1376	246	2.05	0.	16	60	4.6	58
18.0	2970	1616	3.27	30361	83.3	196.4	1067	5165	0	20.9	11.4	79.6	2873	97	1434	236	1.97	0.	17	63	4.8	62
19.0	3135	1706	3.45	31201	85.6	191.2	1109	5285	0	19.6	10.7	80.2	3045	90	1491	227	1.89	0.	17	66	5.0	65
20.0	3300	1796	3.63	32020	87.8	186.4	1150	5393	0	18.4	10.0	80.8	3216	84	1547	219	1.83	0.	18	68	5.2	68
25.0	4125	2245	4.54	35847	98.2	166.7	1334	5802	0	14.2	7.8	82.9	4062	63	1814	189	1.58	0.	22	81	6.1	83
30.0	4950	2694	5.44	39321	107.6	152.2	1495	6075	0	11.6	6.3	84.2	4900	50	2068	168	1.41	0.	27	93	6.9	95
35.0	5775	3143	6.35	42527	116.2	140.9	1640	6270	0	9.8	5.3	85.1	5733	42	2314	153	1.28	0.	31	105	7.6	
40.0	6600	3592	7.26	45523	124.2	131.8	1774	6416	0	8.5	4.6	85.8	6564	36	2553	142	1.18	0.	35	116	8.2	
45.0	7425	4041	8.17	48348	131.7	124.2	1898	6530	0	7.5	4.1	86.3	7394	31	2787	133	1.11	0.	38	127	8.8	
50.0	8250	4490	9.07	51030	138.9	117.9	2015	6620	0	6.7	3.6	86.7	8222	28	3018	125	1.04	0.	42	138	9.3	

#382 165 Ho on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 82. ZC=149.( )
NEUTRON NUMBERS: NP= 98. NT=126. NC=224.

AP**1/3= 5.485 AT**1/3= 5.925
REDUCED MASS NUMBER= 92.01 AP+AT=AC=373.

INTERACTION RADIUS RINT=15.50 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 6.82 CT+CP=13.07 C= 3.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.96

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.66 RC=RCP+RCT=12.81

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 869.06 MeV K= .49772 n=2.442
VC(RINT)= 509.8 MeV

FISSION-TKE= 353. MeV
ASYMM. FISSION-TKE= 349. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.883 MeV/fm**2 PROX-FACTOR= 36.18 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.33 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -19.5
COMPOUND NUCLEUS: 503.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.64 fm V(RB)= 532.7 MeV
Q-VALUE= -587.1 MeV
L-CRITICAL= 0.

165 Ho on 208 Pb — 165 Ho on 208 Pb

EL/u	ELAB	ECN	ECN/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	92	0.18	7124	20.1	865.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	330	184	0.36	10077	28.5	611.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	495	276	0.54	12345	34.9	499.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	660	368	0.72	14259	40.2	432.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	743	414	0.81	15126	42.7	407.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	825	460	0.90	15946	45.0	386.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	908	506	0.99	16727	47.2	368.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	990	552	1.08	17473	49.3	353.2	210	575	0	118.6	70.3	30.7	268	722	203	1276	10.42	0.	2	15	0.0	0
6.5	1073	598	1.17	18189	51.3	339.3	304	1113	0	96.2	55.4	41.9	486	586	361	883	7.18	0.	4	19	0.5	1
7.0	1155	644	1.26	18878	53.2	327.0	376	1574	0	82.0	46.7	49.0	664	491	479	716	5.81	0.	5	23	1.1	6
7.5	1238	690	1.35	19543	55.1	315.9	436	1974	0	71.9	40.7	54.1	817	421	572	618	5.02	0.	6	26	1.5	10
8.0	1320	736	1.44	20187	56.9	305.9	488	2323	0	64.1	36.2	57.9	953	367	649	552	4.47	0.	6	28	1.8	14
8.5	1403	782	1.53	20811	58.7	296.7	536	2631	0	57.9	32.6	61.0	1078	325	714	503	4.08	0.	7	31	2.0	18
9.0	1485	828	1.62	21417	60.4	288.4	580	2905	0	52.9	29.7	63.5	1194	291	772	465	3.77	0.	8	33	2.3	21
9.5	1568	874	1.71	22007	62.0	280.7	620	3150	0	48.7	27.3	65.6	1305	263	824	435	3.52	0.	8	35	2.5	25
10.0	1650	920	1.80	22582	63.6	273.6	658	3370	0	45.1	25.3	67.4	1410	240	871	410	3.32	0.	9	37	2.7	28
10.5	1733	966	1.90	23142	65.2	267.0	694	3569	0	42.1	23.6	69.0	1512	220	915	388	3.15	0.	9	39	2.9	31
11.0	1815	1012	1.99	23690	66.7	260.9	728	3751	0	39.4	22.1	70.3	1611	204	956	370	3.00	0.	10	41	3.0	33
11.5	1898	1058	2.08	24226	68.2	255.1	761	3916	0	37.1	20.7	71.5	1708	189	995	354	2.87	0.	11	43	3.2	36
12.0	1980	1104	2.17	24750	69.7	249.7	792	4068	0	35.0	19.6	72.5	1803	177	1032	340	2.76	0.	11	44	3.3	39
13.0	2145	1196	2.35	25767	72.6	239.9	851	4336	0	31.5	17.6	74.3	1989	156	1102	317	2.57	0.	12	48	3.6	44
14.0	2310	1288	2.53	26747	75.3	231.2	907	4566	0	28.6	16.0	75.7	2171	139	1167	297	2.41	0.	13	51	3.9	48
15.0	2475	1380	2.71	27693	77.9	223.4	959	4765	0	26.2	14.7	76.9	2349	126	1230	281	2.28	0.	14	54	4.1	52
16.0	2640	1472	2.89	28609	80.5	216.3	1008	4939	0	24.2	13.5	77.9	2525	115	1290	267	2.17	0.	15	57	4.4	56
17.0	2805	1564	3.07	29498	83.0	209.8	1055	5093	0	22.5	12.6	78.8	2700	105	1347	256	2.07	0.	16	60	4.6	60
18.0	2970	1656	3.25	30361	85.4	203.9	1101	5230	0	21.0	11.7	79.5	2873	97	1404	245	1.99	0.	16	63	4.8	64
19.0	3135	1748	3.43	31201	87.7	198.5	1144	5352	0	19.7	11.0	80.2	3045	90	1459	236	1.91	0.	17	65	5.0	67
20.0	3300	1840	3.61	32020	90.0	193.4	1186	5462	0	18.5	10.3	80.7	3216	84	1513	227	1.84	0.	18	68	5.2	71
25.0	4125	2300	4.51	35847	100.6	173.0	1376	5880	0	14.3	8.0	82.8	4062	63	1770	196	1.59	0.	22	81	6.1	86
30.0	4950	2760	5.41	39321	110.2	157.9	1542	6158	0	11.7	6.5	84.2	4899	51	2013	175	1.42	0.	26	93	6.8	99
35.0	5775	3220	6.32	42527	119.1	146.2	1693	6357	0	9.9	5.5	85.1	5733	42	2249	159	1.29	0.	30	104	7.5	
40.0	6600	3680	7.22	45523	127.3	136.8	1831	6506	0	8.5	4.8	85.7	6564	36	2478	147	1.19	0.	34	116	8.1	
45.0	7425	4140	8.12	48348	135.0	129.0	1959	6622	0	7.5	4.2	86.2	7393	32	2702	138	1.12	0.	38	126	8.7	
50.0	8250	4601	9.02	51030	142.3	122.3	2079	6715	0	6.7	3.8	86.6	8222	28	2922	130	1.05	0.	42	137	9.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#383 165 Ho on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 83. ZC=150.( )
NEUTRON NUMBERS: NP= 98. NT=126. NC=224.

AP**1/3= 5.485 AT**1/3= 5.934
REDUCED MASS NUMBER= 92.21 AP+AT=AC=374.

INTERACTION RADIUS RINT=15.51 fm R0= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 6.83 CT+CP=13.08 C̄= 3.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 6.97

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.68 RC=RCP+RCT=12.83

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 878.43 MeV K= .50079 n=2.443
VC(RINT)= 515.6 MeV

FISSION-TKE= 357. MeV
ASYMM. FISSION-TKE= 353. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.885 MeV/fm**2 PROX-FACTOR= 36.30 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.32 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: -16.5
COMPOUND NUCLEUS: 512.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.64 fm V(RB)= 539.2 MeV
Q-VALUE= -593.0 MeV
L-CRITICAL= 0.

165 Ho on 209 Bi

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	92	0.18	7124	20.2	875.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	184	0.36	10077	28.5	619.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	277	0.54	12345	34.9	505.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	369	0.72	14259	40.3	437.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	415	0.80	15126	42.8	412.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	461	0.89	15946	45.1	391.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	908	507	0.98	16727	47.3	373.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	990	553	1.07	17473	49.4	357.5	198	510	0	122.0	73.0	29.0	243	747	193	1371	11.08	0.	2	14	0.0	0
6.5	1073	599	1.16	18189	51.4	343.5	297	1054	0	98.3	56.9	40.8	467	605	347	919	7.39	0.	3	19	0.4	0
7.0	1155	645	1.25	18878	53.4	331.0	370	1520	0	83.6	47.8	48.2	649	506	469	738	5.93	0.	5	22	1.1	5
7.5	1238	692	1.34	19543	55.2	319.7	431	1924	0	73.1	41.5	53.4	805	433	564	634	5.09	0.	5	25	1.5	10
8.0	1320	738	1.43	20187	57.0	309.6	485	2277	0	65.1	36.9	57.4	943	377	643	564	4.53	0.	6	28	1.8	14
8.5	1403	784	1.52	20811	58.8	300.3	533	2588	0	58.8	33.2	60.6	1069	334	710	514	4.12	0.	7	31	2.0	18
9.0	1485	830	1.61	21417	60.5	291.9	577	2865	0	53.7	30.2	63.2	1186	299	769	474	3.80	0.	8	33	2.3	21
9.5	1568	876	1.70	22007	62.2	284.1	618	3112	0	49.4	27.8	65.3	1298	270	821	443	3.55	0.	8	35	2.5	24
10.0	1650	922	1.79	22582	63.8	276.9	656	3335	0	45.8	25.7	67.1	1404	246	869	417	3.34	0.	9	37	2.7	27
10.5	1733	968	1.88	23142	65.3	270.2	692	3537	0	42.6	23.9	68.7	1507	226	913	395	3.17	0.	9	39	2.8	30
11.0	1815	1014	1.97	23690	66.9	264.0	727	3720	0	39.9	22.4	70.0	1606	209	955	377	3.02	0.	10	41	3.0	33
11.5	1898	1060	2.06	24226	68.4	258.2	760	3887	0	37.5	21.1	71.2	1704	194	994	360	2.89	0.	10	43	3.2	36
12.0	1980	1106	2.15	24750	69.9	252.8	791	4040	0	35.4	19.9	72.3	1799	181	1031	346	2.77	0.	11	44	3.3	38
13.0	2145	1199	2.32	25767	72.7	242.9	851	4311	0	31.9	17.9	74.1	1986	159	1102	322	2.58	0.	12	48	3.6	43
14.0	2310	1291	2.50	26747	75.5	234.0	906	4544	0	29.0	16.2	75.5	2168	142	1168	302	2.42	0.	13	51	3.9	48
15.0	2475	1383	2.68	27693	78.1	226.1	959	4745	0	26.5	14.9	76.7	2346	129	1230	285	2.29	0.	14	54	4.1	52
16.0	2640	1475	2.86	28609	80.7	218.9	1009	4921	0	24.5	13.7	77.8	2523	117	1290	271	2.17	0.	15	57	4.3	56
17.0	2805	1568	3.04	29498	83.2	212.4	1056	5077	0	22.7	12.7	78.6	2697	108	1348	259	2.08	0.	16	60	4.6	60
18.0	2970	1660	3.22	30361	85.6	206.4	1101	5215	0	21.2	11.9	79.4	2871	99	1404	249	1.99	0.	16	63	4.8	63
19.0	3135	1752	3.40	31201	87.9	200.9	1145	5338	0	19.9	11.1	80.0	3043	92	1459	239	1.92	0.	17	65	5.0	67
20.0	3300	1844	3.58	32020	90.2	195.8	1187	5450	0	18.7	10.5	80.6	3214	86	1513	231	1.85	0.	18	68	5.2	70
25.0	4125	2305	4.47	35847	100.8	175.1	1378	5872	0	14.5	8.1	82.8	4060	65	1770	199	1.59	0.	22	81	6.1	85
30.0	4950	2766	5.36	39321	110.5	159.9	1545	6153	0	11.8	6.6	84.1	4898	52	2013	177	1.42	0.	26	93	6.8	98
35.0	5775	3227	6.26	42527	119.3	148.0	1696	6354	0	10.0	5.6	85.0	5732	43	2248	161	1.29	0.	30	104	7.5	
40.0	6600	3688	7.15	45523	127.5	138.5	1834	6505	0	8.6	4.8	85.7	6563	37	2476	149	1.20	0.	34	115	8.1	
45.0	7425	4149	8.05	48348	135.3	130.5	1963	6622	0	7.6	4.3	86.2	7393	32	2700	139	1.12	0.	38	126	8.7	
50.0	8250	4610	8.94	51030	142.6	123.8	2084	6716	0	6.8	3.8	86.6	8221	29	2920	131	1.05	0.	42	137	9.3	

#384 165 Ho on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 67. ZT= 92. ZC=159.( )
NEUTRON NUMBERS: NP= 98. NT=146. NC=244.

AP**1/3= 5.485 AT**1/3= 6.197
REDUCED MASS NUMBER= 97.44 AP+AT=AC=403.

INTERACTION RADIUS RINT=15.79 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.25 CT= 7.16 CT+CP=13.41 C̄= 3.34

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.41 RT= 7.30

COULOMB RADII [fm]:
RCP= 6.15 RCT= 6.98 RC=RCP+RCT=13.13

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 950.99 MeV K= .50504 n=2.448
VC(RINT)= 561.3 MeV

FISSION-TKE= 389. MeV
ASYMM. FISSION-TKE= 379. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.876 MeV/fm**2 PROX-FACTOR= 36.76 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.21 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -63.7 TARGET: 47.2
COMPOUND NUCLEUS: 626.4

FUSION RELATED PARAMETERS:
R-BARRIER=13.84 fm V(RB)= 587.9 MeV
Q-VALUE= -643.0 MeV
L-CRITICAL= 0.

165 Ho on 238 U

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA′	TAU	E-ER	EN--EN	TEMP	MULT
1.0	165	97	0.17	7124	21.3	970.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	330	195	0.35	10077	30.1	686.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	495	292	0.52	12345	36.9	560.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	660	390	0.69	14259	42.6	485.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	743	438	0.78	15126	45.2	457.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	825	487	0.87	15946	47.7	434.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	908	536	0.95	16727	50.0	413.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	990	585	1.04	17473	52.2	396.2	162	308	0	135.4	91.6	22.3	170	820	115	1981	14.80	0.	2	13	0.0	0
6.5	1073	633	1.13	18189	54.3	380.7	288	889	0	105.8	66.3	37.1	413	660	295	1128	8.34	0.	3	18	0.0	0
7.0	1155	682	1.22	18878	56.4	366.8	374	1387	0	88.9	54.6	45.5	607	548	425	872	6.43	0.	4	22	0.9	4
7.5	1238	731	1.30	19543	58.4	354.4	443	1818	0	77.3	46.9	51.3	770	467	526	736	5.42	0.	5	25	1.3	9
8.0	1320	780	1.39	20187	60.3	343.2	503	2195	0	68.6	41.4	55.7	914	406	608	648	4.78	0.	6	27	1.6	14
8.5	1403	828	1.48	20811	62.1	332.9	556	2528	0	61.8	37.1	59.1	1045	358	676	586	4.32	0.	7	30	1.9	18
9.0	1485	877	1.56	21417	63.9	323.5	605	2824	0	56.3	33.7	61.9	1166	319	735	539	3.97	0.	7	32	2.2	22
9.5	1568	926	1.65	22007	65.7	314.9	650	3098	0	51.7	30.9	64.2	1290	288	788	502	3.70	0.	8	34	2.4	26
10.0	1650	974	1.74	22582	67.4	306.9	692	3326	0	47.8	28.5	66.1	1388	262	835	471	3.47	0.	9	36	2.6	29
10.5	1733	1023	1.82	23142	69.1	299.5	732	3541	0	44.5	26.5	67.8	1492	240	878	446	3.28	0.	9	38	2.7	32
11.0	1815	1072	1.91	23690	70.7	292.6	770	3737	0	41.6	24.7	69.2	1593	222	918	424	3.12	0.	10	40	2.9	35
11.5	1898	1121	2.00	24226	72.3	286.2	806	3915	0	39.1	23.2	70.4	1692	206	956	405	2.98	0.	10	42	3.1	38
12.0	1980	1169	2.08	24750	73.8	280.2	840	4079	0	36.9	21.9	71.6	1788	192	992	389	2.86	0.	11	44	3.2	41
13.0	2145	1267	2.26	25767	76.8	269.2	905	4369	0	33.1	19.6	73.4	1976	169	1059	361	2.66	0.	12	47	3.5	46
14.0	2310	1364	2.43	26747	79.7	259.4	966	4617	0	30.1	17.8	75.0	2160	150	1121	338	2.49	0.	13	50	3.8	51
15.0	2475	1462	2.60	27693	82.5	250.6	1023	4832	0	27.5	16.3	76.2	2339	136	1179	319	2.35	0.	14	53	4.0	56
16.0	2640	1559	2.78	28609	85.3	242.6	1077	5020	0	25.4	15.0	77.3	2517	123	1235	303	2.23	0.	14	56	4.3	60
17.0	2805	1657	2.95	29498	87.9	235.4	1128	5186	0	23.6	14.0	78.2	2692	113	1289	290	2.13	0.	15	59	4.5	64
18.0	2970	1754	3.13	30361	90.4	228.8	1177	5334	0	22.0	13.0	79.0	2865	105	1341	277	2.04	0.	16	62	4.7	68
19.0	3135	1851	3.30	31201	92.9	222.7	1224	5466	0	20.6	12.2	79.7	3038	97	1392	267	1.96	0.	17	64	4.9	72
20.0	3300	1949	3.47	32020	95.3	217.0	1270	5584	0	19.4	11.5	80.3	3209	91	1441	257	1.89	0.	18	67	5.1	76
25.0	4125	2436	4.34	35847	106.6	194.1	1476	6036	0	15.0	8.9	82.5	4057	68	1676	221	1.63	0.	22	80	6.0	92
30.0	4950	2923	5.21	39321	116.7	177.2	1657	6336	0	12.2	7.2	83.9	4896	54	1896	197	1.45	0.	26	92	6.7	106
35.0	5775	3411	6.08	42527	126.1	164.1	1820	6551	0	10.3	6.1	84.8	5730	45	2108	179	1.32	0.	30	103	7.4	
40.0	6600	3898	6.94	45523	134.8	153.5	1969	6712	0	8.9	5.3	85.5	6561	39	2314	166	1.22	0.	34	114	8.0	
45.0	7425	4385	7.81	48348	143.0	144.7	2108	6837	0	7.9	4.6	86.1	7391	34	2515	155	1.14	0.	37	124	8.6	
50.0	8250	4872	8.68	51030	150.7	137.3	2239	6937	0	7.0	4.1	86.5	8220	30	2712	146	1.07	0.	41	135	9.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 165 Ho

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#385 181 Ta on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 6. ZC= 79.(Au)
NEUTRON NUMBERS: NP=108. NT= 6. NC=114.

AP**1/3= 5.657 AT**1/3= 2.289 ELSCAT < 3 deg
REDUCED MASS NUMBER= 11.25 AP+AT=AC=193.

INTERACTION RADIUS RINT=11.73 fm RO= 1.48 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 2.12 CT+CP= 8.59 C= 1.60

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 2.52

COULOMB RADII [fm]:
RCP= 6.35 RCT= 2.51 RC=RCP+RCT= 8.87

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 94.70 MeV K= .03396 n=3.000
VC(RINT)= 53.7 MeV

FISSION-TKE= 138. MeV
ASYMM. FISSION-TKE= 39. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 18.00 MeV
L-RLD= 85 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.16 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: 0.0
COMPOUND NUCLEUS: -31.3

FUSION RELATED PARAMETERS:
R-BARRIER=10.60 fm V(RB)= 55.2 MeV
Q-VALUE= -14.7 MeV
L-CRITICAL= 59.

181 Ta on 12 C

181 Ta on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	11	0.21	7815	2.5	69.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	362	23	0.42	11054	3.5	48.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	543	34	0.63	13542	4.3	39.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	724	45	0.84	15642	4.9	34.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	815	51	0.94	16593	5.2	32.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	905	56	1.05	17493	5.5	30.8	14	222	69	132.3	2.9	23.8	728	177	739	144	11.23	831.	5 15	1.3	4
5.5	996	62	1.15	18349	5.8	29.4	25	615	384	100.3	3.8	39.9	859	137	862	81	6.24	914.	5 15	1.4	4
6.0	1086	68	1.26	19167	6.0	28.2	32	937	646	82.8	3.7	48.6	975	111	970	62	4.80	991.	5 15	1.5	5
6.5	1177	73	1.36	19953	6.3	27.1	38	1207	867	71.0	3.5	54.5	1084	93	1070	52	4.04	1074.	5 15	1.6	5
7.0	1267	79	1.47	20708	6.5	26.1	43	1437	1057	62.4	3.3	58.8	1188	79	1165	46	3.56	1151.	7 21	1.6	6
7.5	1358	84	1.57	21438	6.7	25.2	48	1636	1222	55.7	3.0	62.1	1288	69	1257	42	3.21	1233.	8 23	1.7	6
8.0	1448	90	1.68	22144	7.0	24.4	52	1809	1366	50.4	2.8	64.8	1387	61	1347	38	2.95	1308.	8 24	1.8	7
8.5	1539	96	1.78	22829	7.2	23.7	56	1962	1493	46.0	2.6	67.0	1484	55	1435	36	2.75	1390.	9 26	1.8	7
9.0	1629	101	1.89	23494	7.4	23.0	59	2097	1606	42.4	2.4	68.8	1579	50	1522	34	2.58	1463.	9 27	1.9	8
9.5	1720	107	1.99	24141	7.6	22.4	63	2218	1708	39.3	2.3	70.4	1674	45	1608	32	2.44	1545.	10 29	2.0	8
10.0	1810	113	2.10	24771	7.8	21.8	66	2327	1799	36.6	2.1	71.7	1768	42	1694	30	2.32	1626.	11 30	2.0	8
10.5	1901	118	2.20	25386	8.0	21.3	69	2425	1766	34.3	2.0	72.9	1862	38	1779	29	2.22	1698.	11 32	2.1	9
11.0	1991	124	2.31	25987	8.2	20.8	72	2514	1685	32.2	1.9	73.9	1955	36	1863	28	2.13	1779.	12 33	2.1	9
11.5	2082	129	2.41	26575	8.3	20.3	75	2595	1612	30.4	1.8	74.8	2048	33	1948	27	2.05	1850.	12 34	2.2	10
12.0	2172	135	2.52	27150	8.5	19.9	78	2670	1545	28.8	1.7	75.6	2141	31	2032	26	1.97	1930.	13 36	2.2	10
13.0	2353	146	2.72	28266	8.9	19.1	83	2801	1426	26.0	1.6	77.0	2325	28	2199	24	1.85	2080.	14 38	2.3	11
14.0	2534	158	2.93	29341	9.2	18.4	88	2913	1324	23.7	1.4	78.1	2509	25	2365	23	1.75	2227.	15 41	2.4	12
15.0	2715	169	3.14	30379	9.5	17.8	92	3010	1236	21.8	1.3	79.1	2692	23	2531	22	1.66	2386.	16 43	2.5	12
16.0	2896	180	3.35	31384	9.8	17.2	97	3095	1159	20.2	1.2	79.9	2875	21	2696	21	1.58	2531.	17 46	2.6	13
17.0	3077	191	3.56	32358	10.1	16.7	101	3170	1090	18.8	1.2	80.6	3058	19	2861	20	1.52	2675.	18 48	2.7	14
18.0	3258	203	3.77	33305	10.4	16.3	105	3237	1030	17.6	1.1	81.2	3240	18	3026	19	1.46	2816.	19 50	2.8	15
19.0	3439	214	3.98	34227	10.7	15.8	109	3296	976	16.5	1.0	81.7	3422	17	3191	18	1.41	2973.	20 53	2.9	15
20.0	3620	225	4.19	35125	11.0	15.4	113	3349	927	15.6	1.0	82.2	3604	16	3355	18	1.36	3112.	21 55	3.0	16
25.0	4525	281	5.24	39323	12.3	13.8	130	3551	741	12.1	0.7	83.9	4513	12	4174	15	1.18	3824.	26 66	3.3	19
30.0	5430	338	6.29	43133	13.5	12.6	145	3685	618	9.9	0.6	85.0	5421	9	4989	14	1.06	4509.	31 77	3.7	22
35.0	6335	394	7.34	46651	14.6	11.7	159	3780	529	8.4	0.5	85.8	6327	8	5803	13	0.96	5168.	36 88	4.0	
40.0	7240	450	8.38	49938	15.6	10.9	171	3851	463	7.3	0.5	86.4	7233	7	6616	12	0.89	5801.	41 98	4.2	
45.0	8145	506	9.43	53036	16.5	10.3	183	3906	412	6.4	0.4	86.8	8139	6	7427	11	0.84	6447.	46 108	4.5	
50.0	9050	563	10.48	55978	17.4	9.8	194	3950	370	5.8	0.4	87.1	9045	5	8237	10	0.79	7032.	51 118	4.8	

#386 181 Ta on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 8. ZC= 81.(Tl)
NEUTRON NUMBERS: NP=108. NT= 8. NC=116.

AP**1/3= 5.657 AT**1/3= 2.520 ELSCAT < 5 deg
REDUCED MASS NUMBER= 14.70 AP+AT=AC=197.

INTERACTION RADIUS RINT=11.98 fm RO= 1.47 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 2.42 CT+CP= 8.89 C= 1.76

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 2.78

COULOMB RADII [fm]:
RCP= 6.35 RCT= 2.78 RC=RCP+RCT= 9.14

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 123.85 MeV K= .05476 n=2.879
VC(RINT)= 70.1 MeV

FISSION-TKE= 143. MeV
ASYMM. FISSION-TKE= 51. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 19.90 MeV
L-RLD= 84 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -4.7
COMPOUND NUCLEUS: -26.7

FUSION RELATED PARAMETERS:
R-BARRIER=10.81 fm V(RB)= 72.4 MeV
Q-VALUE= -24.0 MeV
L-CRITICAL= 70.

181 Ta on 16 O

181 Ta on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	15	0.21	7815	3.2	92.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	362	29	0.42	11054	4.5	65.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	543	44	0.63	13542	5.6	53.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	724	59	0.84	15642	6.4	46.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	815	66	0.94	16593	6.8	43.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	905	74	1.05	17493	7.2	41.1	18	228	56	131.9	4.0	24.1	680	225	693	191	11.38	814.	5 15	1.4	4
5.5	996	81	1.15	18349	7.5	39.2	33	633	385	100.1	5.1	40.0	821	175	824	107	6.36	891.	5 15	1.5	5
6.0	1086	88	1.26	19167	7.9	37.5	43	966	658	82.7	5.0	48.7	945	141	937	83	4.89	967.	5 15	1.6	6
6.5	1177	96	1.36	19953	8.2	36.1	51	1246	890	70.9	4.6	54.5	1058	118	1039	70	4.12	1047.	5 15	1.7	6
7.0	1267	103	1.47	20708	8.5	34.8	57	1486	1088	62.3	4.3	58.8	1166	101	1135	62	3.63	1122.	7 22	1.8	7
7.5	1358	110	1.57	21438	8.8	33.6	64	1692	1260	55.6	4.0	62.2	1269	88	1228	56	3.28	1202.	8 24	1.9	7
8.0	1448	118	1.68	22144	9.1	32.5	69	1873	1411	50.3	3.7	64.8	1370	78	1317	51	3.02	1276.	8 25	1.9	8
8.5	1539	125	1.78	22829	9.4	31.5	74	2032	1543	46.0	3.4	67.0	1469	70	1405	48	2.81	1355.	9 27	2.0	8
9.0	1629	132	1.89	23494	9.6	30.7	79	2173	1662	42.3	3.2	68.8	1566	63	1491	45	2.64	1427.	9 29	2.1	9
9.5	1720	140	1.99	24141	9.9	29.8	84	2299	1616	39.2	3.0	70.4	1662	58	1576	42	2.49	1499.	10 30	2.2	10
10.0	1810	147	2.10	24771	10.2	29.1	88	2412	1535	36.5	2.8	71.7	1757	53	1660	40	2.37	1578.	11 32	2.2	10
10.5	1901	154	2.20	25386	10.4	28.4	92	2514	1462	34.2	2.7	72.9	1851	49	1743	38	2.26	1648.	11 33	2.3	11
11.0	1991	162	2.31	25987	10.7	27.7	96	2607	1396	32.2	2.5	73.9	1945	46	1826	37	2.17	1726.	12 35	2.4	11
11.5	2082	169	2.41	26575	10.9	27.1	100	2692	1335	30.4	2.4	74.8	2039	43	1908	35	2.09	1795.	12 36	2.4	12
12.0	2172	176	2.52	27150	11.1	26.5	104	2770	1279	28.7	2.3	75.6	2132	40	1990	34	2.02	1873.	13 37	2.5	12
13.0	2353	191	2.73	28266	11.6	25.5	111	2907	1181	26.0	2.1	77.0	2317	36	2159	32	1.89	2018.	14 40	2.6	13
14.0	2534	206	2.94	29341	12.0	24.6	117	3025	1096	23.7	1.9	78.1	2502	32	2315	30	1.78	2161.	15 43	2.7	14
15.0	2715	221	3.15	30379	12.5	23.7	123	3126	1023	21.8	1.7	79.1	2686	29	2477	29	1.69	2303.	16 45	2.8	15
16.0	2896	235	3.36	31384	12.9	23.0	129	3215	959	20.2	1.6	79.9	2869	27	2638	27	1.62	2443.	17 48	2.9	16
17.0	3077	250	3.57	32358	13.3	22.3	135	3293	903	18.8	1.5	80.6	3053	24	2798	26	1.55	2582.	18 50	3.0	17
18.0	3258	265	3.78	33305	13.6	21.7	140	3363	853	17.6	1.4	81.2	3235	23	2958	25	1.49	2718.	19 53	3.1	18
19.0	3439	279	3.99	34227	14.0	21.1	145	3425	808	16.5	1.3	81.7	3418	21	3117	24	1.44	2869.	20 55	3.2	18
20.0	3620	294	4.20	35125	14.4	20.6	150	3481	767	15.6	1.3	82.2	3600	20	3277	24	1.39	3003.	21 58	3.3	19
25.0	4525	368	5.24	39323	16.1	18.4	173	3693	614	12.1	1.0	83.9	4510	15	4070	20	1.20	3670.	26 69	3.7	23
30.0	5430	441	6.29	43133	17.6	16.8	194	3833	511	9.9	0.8	85.0	5418	12	4859	18	1.08	4303.	31 81	4.1	27
35.0	6335	515	7.34	46651	19.0	15.5	212	3933	438	8.4	0.7	85.8	6325	10	5646	17	0.99	4931.	36 91	4.5	
40.0	7240	588	8.39	49938	20.3	14.5	229	4008	383	7.3	0.6	86.4	7231	9	6431	15	0.91	5534.	41 102	4.8	
45.0	8145	662	9.44	53036	21.6	13.7	244	4066	341	6.4	0.5	86.8	8137	8	7215	14	0.85	6112.	46 112	5.1	
50.0	9050	735	10.49	55978	22.7	13.0	259	4113	307	5.7	0.5	87.1	9043	7	7997	14	0.81	6707.	51 122	5.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fs	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#387 181 Ta on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 13. ZC= 86.(Rn)
NEUTRON NUMBERS: NP=108. NT= 14. NC=122.

AP**1/3= 5.657 AT**1/3= 3.000 ELSCAT < 8 deg
REDUCED MASS NUMBER= 23.50 AP+AT=AC=208.

INTERACTION RADIUS RINT=12.51 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 3.05 CT+CP= 9.52 C= 2.07

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 3.35

COULOMB RADII [fm]:
RCP= 6.35 RCT= 3.32 RC=RCP+RCT= 9.68

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 193.07 MeV K= .11105 n=2.710
VC(RINT)= 109.1 MeV

FISSION-TKE= 156. MeV
ASYMM. FISSION-TKE= 80. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 23.46 MeV
L-RLD= 78 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.41 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -20.6
COMPOUND NUCLEUS: -8.6

FUSION RELATED PARAMETERS:
R-BARRIER=11.28 fm V(RB)= 113.3 MeV
Q-VALUE= -58.0 MeV
L-CRITICAL= 93.

181 Ta on 27 Al

181 Ta on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	23	0.22	7815	5.1	149.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	362	47	0.43	11054	7.3	105.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	543	70	0.65	13542	8.9	86.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	724	94	0.86	15642	10.3	74.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	815	106	0.97	16593	10.9	70.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	905	117	1.08	17493	11.5	66.8	38	364	142	120.6	7.9	29.7	596	309	610	250	9.55	768.	0 0	1.5	5
5.5	996	129	1.18	18349	12.1	63.7	59	787	493	94.1	8.6	42.9	754	241	752	161	6.13	841.	0 0	1.7	6
6.0	1086	141	1.29	19167	12.6	61.0	75	1137	785	78.5	8.1	50.8	890	196	870	128	4.87	913.	0 0	1.8	7
6.5	1177	153	1.40	19953	13.1	58.6	87	1432	1032	67.7	7.4	56.2	1012	165	974	110	4.16	984.	6 21	1.9	8
7.0	1267	164	1.51	20708	13.6	56.5	99	1685	1244	59.6	6.8	60.2	1126	141	1071	97	3.69	1054.	7 24	2.0	9
7.5	1358	176	1.62	21438	14.1	54.6	109	1904	1412	53.4	6.3	63.3	1234	124	1162	88	3.35	1124.	8 26	2.1	10
8.0	1448	188	1.72	22144	14.5	52.8	118	2095	1324	48.4	5.8	65.8	1338	110	1249	82	3.09	1199.	8 28	2.2	10
8.5	1539	200	1.83	22829	15.0	51.3	126	2263	1246	44.2	5.4	67.9	1440	98	1333	76	2.88	1267.	9 30	2.3	11
9.0	1629	211	1.94	23494	15.4	49.8	134	2412	1177	40.8	5.0	69.6	1540	89	1415	72	2.71	1335.	9 31	2.4	12
9.5	1720	223	2.05	24141	15.8	48.5	142	2546	1115	37.8	4.7	71.1	1638	82	1496	68	2.57	1402.	10 33	2.5	13
10.0	1810	235	2.15	24771	16.3	47.3	149	2666	1059	35.3	4.4	72.4	1735	75	1576	65	2.45	1468.	11 35	2.6	14
10.5	1901	247	2.26	25386	16.7	46.1	156	2775	1009	33.0	4.1	73.5	1831	69	1654	62	2.34	1542.	11 36	2.7	14
11.0	1991	258	2.37	25987	17.0	45.1	162	2874	963	31.1	3.9	74.5	1926	65	1732	59	2.24	1607.	12 38	2.8	15
11.5	2082	270	2.48	26575	17.4	44.1	168	2964	921	29.3	3.7	75.3	2021	60	1810	57	2.16	1671.	12 39	2.9	16
12.0	2172	282	2.58	27150	17.8	43.1	174	3046	883	27.8	3.5	76.1	2115	57	1886	55	2.09	1744.	13 41	2.9	16
13.0	2353	305	2.80	28266	18.5	41.4	186	3192	815	25.2	3.2	77.4	2303	50	2038	52	1.96	1869.	14 44	3.1	18
14.0	2534	329	3.02	29341	19.2	39.9	197	3317	756	23.0	2.9	78.5	2489	45	2189	49	1.85	2002.	15 47	3.2	19
15.0	2715	352	3.23	30379	19.9	38.6	207	3426	706	21.1	2.7	79.4	2674	41	2339	46	1.76	2134.	16 49	3.4	20
16.0	2896	376	3.45	31384	20.6	37.4	217	3520	662	19.6	2.5	80.2	2858	38	2488	44	1.68	2252.	17 52	3.5	22
17.0	3077	399	3.66	32358	21.2	36.2	226	3604	623	18.2	2.3	80.9	3042	35	2636	43	1.61	2380.	18 55	3.6	23
18.0	3258	423	3.88	33305	21.8	35.2	235	3678	588	17.1	2.2	81.5	3226	32	2784	41	1.55	2506.	19 57	3.7	24
19.0	3439	446	4.09	34227	22.4	34.3	244	3744	557	16.0	2.1	82.0	3409	30	2931	39	1.49	2631.	20 60	3.9	25
20.0	3620	470	4.31	35125	23.0	33.4	252	3804	529	15.1	1.9	82.4	3592	28	3077	38	1.44	2755.	21 63	4.0	26
25.0	4525	587	5.38	39323	25.7	29.9	290	4030	423	11.8	1.5	84.1	4504	21	3806	33	1.25	3330.	26 75	4.5	32
30.0	5430	705	6.46	43133	28.1	27.3	324	4180	353	9.6	1.2	85.2	5413	17	4530	30	1.12	3905.	31 87	5.0	36
35.0	6335	822	7.54	46651	30.4	25.3	354	4287	302	8.2	1.1	85.9	6321	14	5249	27	1.03	4450.	36 98	5.4	
40.0	7240	940	8.62	49938	32.5	23.6	382	4368	264	7.1	0.9	86.5	7228	12	5966	25	0.95	4964.	41 110	5.8	
45.0	8145	1057	9.69	53036	34.5	22.3	408	4430	235	6.2	0.8	86.9	8134	11	6681	24	0.89	5449.	46 120	6.2	
50.0	9050	1175	10.77	55978	36.3	21.1	433	4480	211	5.6	0.7	87.2	9040	10	7394	22	0.84	5941.	51 131	6.6	

#388 181 Ta on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 20. ZC= 93.(Np)
NEUTRON NUMBERS: NP=108. NT= 20. NC=128.

AP**1/3= 5.657 AT**1/3= 3.420 ELSCAT <12 deg
REDUCED MASS NUMBER= 32.76 AP+AT=AC=221.

INTERACTION RADIUS RINT=12.97 fm R0= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 3.59 CT+CP=10.06 C= 2.31

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 3.85

COULOMB RADII [fm]:
RCP= 6.35 RCT= 3.84 RC=RCP+RCT=10.20

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 285.43 MeV K= .19434 n=2.590
VC(RINT)= 161.9 MeV

FISSION-TKE= 175. MeV
ASYMM. FISSION-TKE= 118. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.909 MeV/fm**2 PROX-FACTOR= 26.39 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 6.12 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -33.0
COMPOUND NUCLEUS: 27.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.67 fm V(RB)= 169.3 MeV
Q-VALUE= -106.8 MeV
L-CRITICAL= 99.

181 Ta on 40 Ca

181 Ta on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPGMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	33	0.20	7815	7.2	229.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	362	66	0.40	11054	10.1	162.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	543	98	0.61	13542	12.4	132.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	724	131	0.81	15642	14.3	114.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	815	147	0.91	16593	15.2	108.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	905	164	1.01	17493	16.0	102.8	21	60	0	156.7	6.2	11.6	390	515	419	953	25.75	0.	5 18	1.4	5
5.5	996	180	1.11	18349	16.8	98.0	69	546	259	109.7	12.7	35.2	601	395	609	308	7.89	793.	5 18	1.6	6
6.0	1086	197	1.21	19167	17.6	93.9	95	946	594	89.1	12.4	45.4	769	317	754	223	5.72	861.	5 18	1.8	7
6.5	1177	213	1.32	19953	18.3	90.2	116	1283	877	75.8	11.5	52.1	913	263	874	184	4.71	928.	5 18	2.0	8
7.0	1267	229	1.42	20708	19.0	86.9	133	1572	881	66.3	10.5	56.9	1043	224	980	160	4.09	990.	6 24	2.1	10
7.5	1358	246	1.52	21438	19.6	83.9	148	1822	822	59.0	9.6	60.5	1162	195	1076	144	3.67	1056.	7 26	2.2	11
8.0	1448	262	1.62	22144	20.3	81.3	162	2040	771	53.2	8.9	63.4	1276	172	1166	131	3.36	1121.	8 28	2.4	12
8.5	1539	278	1.72	22829	20.9	78.9	175	2233	725	48.5	8.2	65.8	1385	154	1251	122	3.11	1185.	9 30	2.5	13
9.0	1629	295	1.82	23494	21.5	76.6	187	2404	685	44.6	7.6	67.7	1490	139	1332	114	2.91	1249.	9 32	2.6	14
9.5	1720	311	1.92	24141	22.1	74.6	198	2557	649	41.2	7.1	69.4	1593	126	1411	108	2.75	1312.	10 34	2.7	15
10.0	1810	328	2.02	24771	22.7	72.7	209	2695	616	38.4	6.7	70.8	1694	116	1488	102	2.61	1374.	10 36	2.8	16
10.5	1901	344	2.12	25386	23.2	70.9	219	2819	587	35.9	6.3	72.0	1793	107	1564	98	2.49	1436.	11 38	2.9	17
11.0	1991	360	2.23	25987	23.8	69.3	229	2932	560	33.7	5.9	73.1	1892	99	1638	93	2.38	1497.	11 39	3.0	18
11.5	2082	377	2.33	26575	24.3	67.8	238	3035	536	31.8	5.6	74.1	1989	93	1712	90	2.29	1557.	12 41	3.1	19
12.0	2172	393	2.43	27150	24.8	66.4	247	3130	514	30.1	5.3	74.9	2085	87	1784	87	2.21	1617.	13 43	3.2	20
13.0	2353	426	2.63	28266	25.8	63.8	264	3297	474	27.2	4.8	76.4	2276	77	1927	81	2.07	1743.	14 46	3.4	21
14.0	2534	459	2.83	29341	26.8	61.4	280	3440	440	24.8	4.4	77.6	2465	69	2068	76	1.95	1858.	15 49	3.6	23
15.0	2715	491	3.04	30379	27.8	59.4	295	3564	411	22.8	4.1	78.6	2652	63	2207	72	1.85	1971.	16 52	3.7	25
16.0	2896	524	3.24	31384	28.7	57.5	309	3673	385	21.1	3.8	79.5	2839	57	2365	69	1.76	2092.	17 55	3.9	26
17.0	3077	557	3.44	32358	29.5	55.8	323	3769	362	19.6	3.5	80.2	3024	53	2482	66	1.69	2199.	18 58	4.0	28
18.0	3258	590	3.64	33305	30.4	54.2	336	3854	342	18.3	3.3	80.8	3209	49	2618	64	1.62	2317.	19 60	4.2	29
19.0	3439	622	3.84	34227	31.2	52.7	348	3930	324	17.2	3.1	81.4	3393	46	2753	61	1.56	2433.	20 63	4.3	30
20.0	3620	655	4.05	35125	32.0	51.4	360	3998	308	16.2	2.9	81.9	3577	43	2888	59	1.51	2534.	21 66	4.5	32
25.0	4525	819	5.06	39323	35.8	46.0	416	4258	246	12.6	2.3	83.7	4493	32	3555	51	1.31	3067.	26 79	5.1	38
30.0	5430	983	6.07	43133	39.2	42.0	465	4431	205	10.3	1.9	84.8	5404	26	4214	46	1.17	3560.	31 91	5.6	44
35.0	6335	1147	7.08	46651	42.4	38.9	509	4554	176	8.7	1.6	85.6	6313	22	4867	42	1.07	4036.	36 103	6.1	
40.0	7240	1310	8.09	49938	45.3	36.3	550	4647	154	7.6	1.4	86.2	7221	19	5518	39	0.99	4505.	40 114	6.6	
45.0	8145	1474	9.11	53036	48.1	34.3	588	4718	137	6.7	1.2	86.7	8129	16	6165	36	0.93	4947.	45 126	7.0	
50.0	9050	1638	10.12	55978	50.7	32.5	624	4776	123	6.0	1.1	87.0	9035	15	6809	34	0.87	5363.	50 137	7.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#389 181 Ta on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 26. ZC= 99.(Es)
NEUTRON NUMBERS: NP=108. NT= 30. NC=138.

AP**1/3= 5.657 AT**1/3= 3.826 ELSCAT <18 deg
REDUCED MASS NUMBER= 42.77 AP+AT=AC=237.

INTERACTION RADIUS RINT=13.41 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 4.12 CT+CP=10.59 C̄= 2.52

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 4.35

COULOMB RADII [fm]:
RCP= 6.35 RCT= 4.27 RC=RCP+RCT=10.63

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 358.15 MeV K= .25271 n=2.536
VC(RINT)= 203.5 MeV

FISSION-TKE= 192. MeV
ASYMM. FISSION-TKE= 149. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 28.64 MeV
L-RLD= 58 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.75 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -61.4
COMPOUND NUCLEUS: 63.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.05 fm V(RB)= 212.5 MeV
Q-VALUE= -171.1 MeV
L-CRITICAL= 107.

181 Ta on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	43	0.21	7815	9.4	298.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	362	86	0.42	11054	13.2	211.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	543	128	0.63	13542	16.2	172.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	724	171	0.84	15642	18.7	149.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	815	192	0.95	16593	19.8	140.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	905	214	1.05	17493	20.9	133.7	61	274	28	131.1	16.3	24.5	364	541	384	609	12.51	679.	4	16	1.2	4
5.5	996	235	1.16	18349	21.9	127.4	108	769	440	99.7	17.8	40.2	576	420	568	347	7.07	744.	4	16	1.5	5
6.0	1086	257	1.26	19167	22.9	122.0	139	1180	703	82.4	16.4	48.8	746	340	708	268	5.46	804.	4	16	1.7	7
6.5	1177	278	1.37	19953	23.8	117.2	165	1526	649	70.7	14.8	54.6	892	284	824	226	4.60	864.	5	23	1.9	9
7.0	1267	299	1.47	20708	24.7	113.0	188	1823	603	62.1	13.4	58.9	1024	243	925	200	4.06	922.	6	25	2.1	11
7.5	1358	321	1.58	21438	25.6	109.1	207	2080	563	55.5	12.2	62.3	1145	212	1016	181	3.67	984.	7	28	2.2	12
8.0	1448	342	1.68	22144	26.5	105.7	226	2305	527	50.2	11.2	64.9	1260	188	1100	166	3.37	1040.	8	30	2.4	14
8.5	1539	364	1.79	22829	27.3	102.5	242	2503	496	45.8	10.3	67.1	1370	168	1180	155	3.14	1100.	8	32	2.5	15
9.0	1629	385	1.89	23494	28.1	99.6	258	2679	469	42.2	9.6	68.9	1477	152	1256	145	2.95	1159.	9	34	2.7	16
9.5	1720	406	2.00	24141	28.8	97.0	273	2836	444	39.1	8.9	70.4	1580	139	1329	137	2.79	1218.	10	36	2.8	17
10.0	1810	428	2.10	24771	29.6	94.5	287	2978	422	36.5	8.4	71.8	1682	128	1401	131	2.65	1271.	10	38	2.9	19
10.5	1901	449	2.21	25386	30.3	92.2	300	3106	402	34.1	7.9	72.9	1782	118	1470	125	2.53	1328.	11	39	3.1	20
11.0	1991	470	2.31	25987	31.0	90.1	313	3223	383	32.1	7.4	74.0	1881	110	1538	120	2.43	1385.	11	41	3.2	21
11.5	2082	492	2.42	26575	31.7	88.1	326	3329	367	30.3	7.0	74.9	1979	103	1606	115	2.34	1441.	12	43	3.3	22
12.0	2172	513	2.52	27150	32.4	86.3	337	3426	351	28.7	6.7	75.7	2076	96	1672	111	2.25	1497.	12	45	3.4	23
13.0	2353	556	2.73	28266	33.7	82.9	360	3599	324	25.9	6.0	77.0	2267	86	1802	104	2.11	1599.	14	48	3.6	26
14.0	2534	599	2.94	29341	35.0	79.9	381	3746	301	23.7	5.5	78.2	2457	77	1930	98	2.00	1706.	15	51	3.8	28
15.0	2715	642	3.15	30379	36.2	77.2	401	3874	281	21.8	5.1	79.1	2645	70	2057	93	1.90	1810.	16	54	4.0	30
16.0	2896	684	3.36	31384	37.4	74.7	420	3986	263	20.2	4.7	79.9	2832	64	2181	89	1.81	1912.	17	57	4.2	32
17.0	3077	727	3.57	32358	38.6	72.5	439	4084	248	18.8	4.4	80.6	3018	59	2305	85	1.73	2022.	18	60	4.3	33
18.0	3258	770	3.78	33305	39.7	70.4	456	4172	234	17.6	4.1	81.2	3203	55	2428	82	1.67	2119.	19	63	4.5	35
19.0	3439	813	3.99	34227	40.8	68.6	473	4250	222	16.5	3.9	81.8	3388	51	2550	79	1.61	2215.	20	65	4.7	37
20.0	3620	855	4.20	35125	41.8	66.8	490	4321	211	15.5	3.7	82.2	3572	48	2671	77	1.55	2320.	21	68	4.8	38
25.0	4525	1069	5.25	39323	46.8	59.8	564	4589	168	12.1	2.8	84.0	4489	36	3270	66	1.35	2783.	25	81	5.5	46
30.0	5430	1283	6.30	43133	51.2	54.6	630	4767	140	9.9	2.3	85.1	5401	29	3859	59	1.21	3235.	30	94	6.1	52
35.0	6335	1497	7.35	46651	55.3	50.5	690	4894	120	8.4	2.0	85.8	6311	24	4443	54	1.10	3652.	35	106	6.7	
40.0	7240	1711	8.41	49938	59.2	47.3	745	4990	105	7.3	1.7	86.4	7219	21	5022	50	1.02	4034.	40	118	7.2	
45.0	8145	1925	9.46	53036	62.7	44.6	796	5064	93	6.4	1.5	86.8	8127	18	5597	47	0.96	4407.	44	129	7.7	
50.0	9050	2138	10.51	55978	66.1	42.3	844	5123	84	5.7	1.4	87.1	9034	16	6170	44	0.90	4751.	49	140	8.1	

#390 181 Ta on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 29. ZC=102.(No)
NEUTRON NUMBERS: NP=108. NT= 34. NC=142.

AP**1/3= 5.657 AT**1/3= 3.979 ELSCAT <20 deg
REDUCED MASS NUMBER= 46.73 AP+AT=AC=244.

INTERACTION RADIUS RINT=13.58 fm R0= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 4.31 CT+CP=10.78 C̄= 2.59

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 4.53

COULOMB RADII [fm]:
RCP= 6.35 RCT= 4.45 RC=RCP+RCT=10.80

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 393.84 MeV K= .28072 n=2.517
VC(RINT)= 224.2 MeV

FISSION-TKE= 201. MeV
ASYMM. FISSION-TKE= 163. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.906 MeV/fm**2 PROX-FACTOR= 29.47 MeV
L-RLD= 51 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.37 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -65.2
COMPOUND NUCLEUS: 80.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.19 fm V(RB)= 234.2 MeV
Q-VALUE= -191.5 MeV
L-CRITICAL= 102.

181 Ta on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	47	0.21	7815	10.2	333.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	362	93	0.42	11054	14.5	235.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	543	140	0.63	13542	17.7	192.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	724	187	0.83	15642	20.4	166.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	815	210	0.94	16593	21.7	157.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	905	234	1.04	17493	22.9	149.1	61	234	0	135.2	18.0	22.4	312	593	334	742	13.87	0.	4	16	1.2	4
5.5	996	257	1.15	18349	24.0	142.1	116	745	414	101.7	20.1	39.2	537	459	528	398	7.36	720.	4	16	1.5	6
6.0	1086	280	1.25	19167	25.0	136.1	152	1169	536	83.8	18.4	48.1	715	371	674	304	5.61	782.	4	16	1.7	7
6.5	1177	304	1.35	19953	26.1	130.7	181	1527	494	71.8	16.6	54.1	867	310	793	256	4.71	840.	5	23	1.9	9
7.0	1267	327	1.46	20708	27.0	126.0	206	1834	459	63.0	15.0	58.5	1002	265	895	225	4.14	897.	6	25	2.1	11
7.5	1358	351	1.56	21438	28.0	121.7	228	2100	428	56.2	13.6	61.9	1127	231	986	203	3.74	953.	7	28	2.3	13
8.0	1448	374	1.67	22144	28.9	117.9	248	2332	402	50.8	12.5	64.6	1244	204	1070	186	3.43	1012.	8	30	2.4	14
8.5	1539	397	1.77	22829	29.8	114.3	267	2537	378	46.4	11.5	66.8	1356	183	1149	173	3.19	1066.	8	32	2.6	16
9.0	1629	421	1.88	23494	30.7	111.1	284	2719	357	42.7	10.6	68.6	1464	165	1224	163	3.00	1124.	9	34	2.7	17
9.5	1720	444	1.98	24141	31.5	108.2	301	2881	338	39.6	9.9	70.2	1569	151	1296	154	2.83	1181.	10	36	2.9	18
10.0	1810	467	2.08	24771	32.3	105.4	316	3028	321	36.9	9.3	71.6	1671	139	1366	146	2.69	1232.	10	38	3.0	20
10.5	1901	491	2.19	25386	33.1	102.9	331	3160	306	34.5	8.7	72.7	1772	128	1434	140	2.57	1288.	11	40	3.1	21
11.0	1991	514	2.29	25987	33.9	100.5	345	3280	292	32.4	8.2	73.8	1872	119	1500	134	2.47	1343.	11	42	3.3	22
11.5	2082	537	2.40	26575	34.7	98.3	359	3390	279	30.6	7.8	74.7	1970	111	1566	129	2.37	1391.	12	43	3.4	24
12.0	2172	561	2.50	27150	35.4	96.2	372	3491	268	29.0	7.4	75.5	2068	104	1630	124	2.29	1445.	12	45	3.5	25
13.0	2353	608	2.71	28266	36.9	92.5	397	3669	247	26.2	6.7	76.9	2260	93	1756	116	2.14	1551.	13	48	3.7	27
14.0	2534	654	2.92	29341	38.2	89.1	421	3821	229	23.9	6.1	78.0	2451	83	1880	110	2.02	1655.	14	51	3.9	29
15.0	2715	701	3.13	30379	39.6	86.1	443	3954	214	22.0	5.6	79.0	2639	76	2001	104	1.92	1749.	16	54	4.1	32
16.0	2896	748	3.33	31384	40.9	83.3	464	4069	201	20.3	5.2	79.8	2827	69	2122	100	1.83	1848.	17	57	4.3	34
17.0	3077	794	3.54	32358	42.1	80.8	485	4171	189	18.9	4.9	80.5	3013	64	2241	95	1.76	1945.	18	60	4.4	36
18.0	3258	841	3.75	33305	43.4	78.6	504	4262	178	17.7	4.5	81.1	3199	59	2359	92	1.69	2049.	19	63	4.6	37
19.0	3439	888	3.96	34227	44.6	76.5	523	4343	169	16.6	4.3	81.7	3384	55	2476	88	1.63	2142.	19	66	4.8	39
20.0	3620	935	4.17	35125	45.7	74.5	541	4416	160	15.7	4.0	82.2	3568	52	2592	85	1.57	2233.	20	69	4.9	41
25.0	4525	1168	5.21	39323	51.1	66.7	624	4693	128	12.2	3.1	83.9	4486	39	3165	74	1.37	2681.	25	82	5.7	49
30.0	5430	1402	6.25	43133	56.0	60.9	697	4877	107	10.0	2.6	85.0	5398	32	3729	66	1.22	3102.	30	95	6.3	56
35.0	6335	1636	7.29	46651	60.5	56.3	763	5009	91	8.5	2.2	85.8	6309	26	4286	61	1.12	3503.	35	107	6.9	
40.0	7240	1869	8.34	49938	64.6	52.7	823	5107	80	7.3	1.9	86.3	7217	23	4839	56	1.03	3872.	39	119	7.4	
45.0	8145	2103	9.38	53036	68.6	49.7	880	5184	71	6.5	1.7	86.8	8125	20	5388	53	0.97	4232.	44	130	7.9	
50.0	9050	2337	10.42	55978	72.3	47.1	933	5245	64	5.8	1.5	87.1	9032	18	5934	50	0.91	4564.	49	141	8.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#391 181 Ta on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 42. ZC=115.( )
NEUTRON NUMBERS: NP=108. NT= 50. NC=158.

AP**1/3= 5.657 AT**1/3= 4.514 ELSCAT <30 deg
REDUCED MASS NUMBER= 61.00 AP+AT=AC=273.

INTERACTION RADIUS RINT=14.16 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 5.00 CT+CP=11.47 C̄= 2.82

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 5.20

COULOMB RADII [fm]:
RCP= 6.35 RCT= 5.08 RC=RCP+RCT=11.43

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 541.97 MeV K= .38266 n=2.468
VC(RINT)= 311.4 MeV

FISSION-TKE= 241. MeV
ASYMM. FISSION-TKE= 223. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.910 MeV/fm**2 PROX-FACTOR= 32.25 MeV
L-RLD= 8 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.40 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -87.5
COMPOUND NUCLEUS: 171.9

FUSION RELATED PARAMETERS:
R-BARRIER=12.63 fm V(RB)= 325.5 MeV
Q-VALUE= -305.4 MeV
L-CRITICAL= 0.

181 Ta on 92 Mo — 181 Ta on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	181	61	0.20	7815	13.3	482.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	362	122	0.39	11054	18.9	341.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	543	183	0.59	13542	23.1	278.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	724	244	0.78	15642	26.7	241.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	815	274	0.88	16593	28.3	227.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	905	305	0.98	17493	29.8	215.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	996	335	1.08	18349	31.3	205.9	118	452	0	120.5	30.5	29.7	325	671	329	769	10.28	0.	0	0.9	2
6.0	1086	366	1.18	19167	32.7	197.1	178	942	0	95.8	28.1	42.1	551	535	514	510	6.79	0.	0	1.3	5
6.5	1177	396	1.27	19953	34.0	189.4	223	1356	0	80.8	24.9	49.6	735	442	655	409	5.43	0.	5	1.6	8
7.0	1267	427	1.37	20708	35.3	182.5	260	1711	0	70.2	22.2	54.9	892	375	771	351	4.66	0.	6	1.9	10
7.5	1358	457	1.47	21438	36.5	176.3	292	2018	0	62.3	20.0	58.9	1033	324	869	312	4.14	0.	6	2.1	12
8.0	1448	488	1.57	22144	37.7	170.7	321	2287	0	56.0	18.2	62.0	1163	285	956	284	3.77	0.	7	2.3	14
8.5	1539	518	1.66	22829	38.9	165.6	348	2524	0	50.9	16.6	64.5	1284	254	1036	262	3.48	0.	8	2.5	16
9.0	1629	549	1.76	23494	40.0	160.9	372	2735	0	46.7	15.4	66.6	1400	229	1109	245	3.25	0.	9	2.7	18
9.5	1720	579	1.86	24141	41.1	156.6	396	2923	0	43.2	14.2	68.4	1511	208	1179	230	3.06	0.	9	2.8	20
10.0	1810	610	1.96	24771	42.2	152.7	418	3092	0	40.2	13.3	69.9	1619	191	1245	218	2.90	0.	10	3.0	21
10.5	1901	640	2.06	25386	43.2	149.0	438	3246	0	37.5	12.4	71.2	1725	176	1308	208	2.76	0.	10	3.1	23
11.0	1991	671	2.15	25987	44.2	145.6	458	3385	0	35.2	11.7	72.4	1828	163	1369	199	2.64	0.	11	3.3	25
11.5	2082	701	2.25	26575	45.2	142.4	477	3512	0	33.2	11.1	73.4	1930	152	1429	191	2.53	0.	11	3.4	26
12.0	2172	732	2.35	27150	46.2	139.4	496	3629	0	31.4	10.5	74.3	2030	142	1487	184	2.44	0.	12	3.5	28
13.0	2353	793	2.55	28266	48.1	133.9	530	3835	0	28.3	9.5	75.8	2227	126	1600	172	2.28	0.	13	3.8	31
14.0	2534	854	2.74	29341	49.9	129.0	563	4012	0	25.8	8.6	77.1	2421	113	1710	162	2.15	0.	14	4.0	34
15.0	2715	915	2.94	30379	51.7	124.7	594	4165	0	23.7	7.9	78.1	2613	102	1817	153	2.04	0.	15	4.2	36
16.0	2896	976	3.13	31384	53.4	120.7	623	4298	0	21.9	7.3	79.0	2802	94	1922	146	1.94	0.	16	4.4	39
17.0	3077	1037	3.33	32358	55.0	117.1	651	4417	0	20.4	6.8	79.8	2991	86	2026	140	1.86	0.	17	4.6	41
18.0	3258	1098	3.53	33305	56.6	113.8	678	4522	0	19.1	6.4	80.5	3178	80	2128	134	1.78	0.	18	4.8	43
19.0	3439	1159	3.72	34227	58.2	110.8	704	4615	0	17.9	6.0	81.1	3365	74	2228	130	1.72	0.	19	5.0	46
20.0	3620	1220	3.92	35125	59.7	108.0	729	4700	0	16.9	5.7	81.6	3551	69	2328	125	1.66	0.	20	5.2	48
25.0	4525	1525	4.90	39323	66.7	96.6	842	5021	0	13.1	4.4	83.5	4473	52	2818	108	1.44	0.	25	6.0	58
30.0	5430	1830	5.88	43133	73.1	88.1	942	5235	0	10.7	3.6	84.7	5388	42	3295	97	1.28	0.	29	6.7	66
35.0	6335	2135	6.86	46651	78.9	81.6	1033	5387	0	9.0	3.0	85.5	6300	35	3764	88	1.17	0.	34	109	7.3
40.0	7240	2440	7.83	49938	84.4	76.3	1116	5502	0	7.8	2.6	86.1	7210	30	4227	82	1.08	0.	38	120	7.9
45.0	8145	2745	8.81	53036	89.5	72.0	1193	5591	0	6.9	2.3	86.5	8119	26	4686	76	1.01	0.	43	132	8.5
50.0	9050	3050	9.79	55978	94.3	68.3	1265	5662	0	6.2	2.1	86.9	9027	23	5141	72	0.96	0.	47	143	9.0

#392 181 Ta on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 47. ZC=120.( )
NEUTRON NUMBERS: NP=108. NT= 61. NC=169.

AP**1/3= 5.657 AT**1/3= 4.762 ELSCAT <36 deg
REDUCED MASS NUMBER= 67.64 AP+AT=AC=289.

INTERACTION RADIUS RINT=14.43 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 5.32 CT+CP=11.79 C̄= 2.92

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 5.50

COULOMB RADII [fm]:
RCP= 6.35 RCT= 5.34 RC=RCP+RCT=11.69

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 593.77 MeV K= .40888 n=2.457
VC(RINT)= 342.0 MeV

FISSION-TKE= 255. MeV
ASYMM. FISSION-TKE= 243. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.903 MeV/fm**2 PROX-FACTOR= 33.13 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.09 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -87.6
COMPOUND NUCLEUS: 213.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.85 fm V(RB)= 356.7 MeV
Q-VALUE= -347.0 MeV
L-CRITICAL= 0.

181 Ta on 108 Ag — 181 Ta on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CM	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	181	68	0.20	7815	14.8	540.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	362	135	0.40	11054	20.9	382.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	543	203	0.59	13542	25.6	311.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	724	271	0.79	15642	29.6	270.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	815	304	0.89	16593	31.4	254.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	905	338	0.99	17493	33.1	241.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	996	372	1.09	18349	34.7	230.4	141	527	0	117.0	36.1	31.5	318	678	310	811	9.87	0.	0	0.8	2
6.0	1086	406	1.19	19167	36.2	220.6	207	1031	0	93.7	31.8	43.1	544	542	491	556	6.74	0.	3	1.3	5
6.5	1177	440	1.29	19953	37.7	211.9	256	1457	0	79.3	27.8	50.4	728	448	629	450	5.44	0.	5	1.6	8
7.0	1267	473	1.38	20708	39.1	204.2	297	1821	0	69.0	24.7	55.5	886	381	740	388	4.69	0.	6	1.9	11
7.5	1358	507	1.48	21438	40.5	197.3	333	2137	0	61.3	22.1	59.4	1028	330	835	346	4.18	0.	6	2.1	13
8.0	1448	541	1.58	22144	41.8	191.0	366	2413	0	55.1	20.1	62.4	1158	290	919	315	3.81	0.	7	2.3	16
8.5	1539	575	1.68	22829	43.1	185.3	396	2657	0	50.2	18.3	64.9	1279	259	995	291	3.52	0.	8	2.5	18
9.0	1629	609	1.78	23494	44.4	180.1	423	2874	0	46.1	16.9	67.0	1395	234	1064	272	3.29	0.	8	2.7	20
9.5	1720	643	1.88	24141	45.6	175.3	450	3067	0	42.6	15.7	68.7	1507	212	1130	256	3.10	0.	9	2.9	22
10.0	1810	676	1.98	24771	46.8	170.8	474	3241	0	39.6	14.6	70.2	1615	195	1192	243	2.94	0.	10	3.0	24
10.5	1901	710	2.08	25386	47.9	166.7	498	3399	0	37.0	13.7	71.5	1721	180	1252	232	2.80	0.	10	3.2	26
11.0	1991	744	2.18	25987	49.1	162.9	520	3542	0	34.8	12.9	72.6	1824	167	1310	222	2.68	0.	11	3.3	28
11.5	2082	778	2.27	26575	50.2	159.3	541	3673	0	32.8	12.1	73.6	1926	155	1366	213	2.57	0.	11	3.5	29
12.0	2172	812	2.37	27150	51.2	156.0	562	3793	0	31.0	11.5	74.5	2027	145	1420	205	2.48	0.	12	3.6	31
13.0	2353	879	2.57	28266	53.3	149.8	601	4005	0	28.0	10.4	76.0	2224	129	1526	192	2.32	0.	13	3.8	34
14.0	2534	947	2.77	29341	55.4	144.4	638	4187	0	25.5	9.5	77.2	2418	116	1628	181	2.18	0.	14	4.1	38
15.0	2715	1015	2.97	30379	57.3	139.5	673	4344	0	23.4	8.7	78.3	2610	105	1727	171	2.07	0.	15	4.3	41
16.0	2896	1082	3.16	31384	59.2	135.1	706	4482	0	21.7	8.1	79.2	2800	96	1824	163	1.97	0.	16	4.5	43
17.0	3077	1150	3.36	32358	61.0	131.0	737	4603	0	20.2	7.5	79.9	2989	88	1920	156	1.89	0.	17	4.7	46
18.0	3258	1218	3.56	33305	62.8	127.3	768	4711	0	18.8	7.0	80.6	3176	82	2014	150	1.81	0.	18	4.9	49
19.0	3439	1285	3.76	34227	64.5	123.9	797	4808	0	17.7	6.6	81.2	3363	76	2107	145	1.75	0.	19	5.1	51
20.0	3620	1353	3.96	35125	66.2	120.8	825	4895	0	16.7	6.2	81.7	3549	71	2200	140	1.69	0.	20	5.3	53
25.0	4525	1691	4.94	39323	74.0	108.0	953	5225	0	12.9	4.8	83.5	4471	54	2649	121	1.46	0.	24	6.1	64
30.0	5430	2029	5.93	43133	81.0	98.6	1066	5445	0	10.6	3.9	84.7	5387	43	3086	108	1.31	0.	29	6.8	73
35.0	6335	2367	6.92	46651	87.5	91.3	1168	5602	0	8.9	3.3	85.5	6299	36	3515	99	1.19	0.	33	109	7.5
40.0	7240	2706	7.91	49938	93.6	85.4	1261	5719	0	7.7	2.9	86.1	7209	31	3938	91	1.10	0.	38	120	8.1
45.0	8145	3044	8.90	53036	99.2	80.5	1349	5811	0	6.8	2.6	86.6	8118	27	4357	85	1.03	0.	42	132	8.6
50.0	9050	3382	9.89	55978	104.6	76.4	1431	5884	0	6.1	2.3	86.9	9026	24	4771	81	0.97	0.	46	143	9.2
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	-K	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#393 181 Ta on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 58. ZC=131.( )
NEUTRON NUMBERS: NP=108. NT= 82. NC=190.

AP**1/3= 5.657 AT**1/3= 5.192 ELSCAT <50 deg
REDUCED MASS NUMBER= 78.94 AP+AT=AC=321.

INTERACTION RADIUS RINT=14.89 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 5.87 CT+CP=12.35 C̄= 3.08

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.04

COULOMB RADII [fm]:
RCP= 6.35 RCT= 5.82 RC=RCP+RCT=12.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 705.06 MeV K= .45651 n=2.443
VC(RINT)= 408.9 MeV

FISSION-TKE= 291. MeV
ASYMM. FISSION-TKE= 287. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.894 MeV/fm**2 PROX-FACTOR= 34.61 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.68 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -88.2
COMPOUND NUCLEUS: 307.7

FUSION RELATED PARAMETERS:
R-BARRIER=13.21 fm V(RB)= 426.2 MeV
Q-VALUE= -441.9 MeV
L-CRITICAL= 0.

181 Ta on 140 Ce — 181 Ta on 140 Ce

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	181	79	0.19	7815	17.3	666.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	362	158	0.39	11054	24.4	471.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	543	237	0.58	13542	29.9	384.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	724	316	0.77	15642	34.5	333.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	815	355	0.87	16593	36.6	314.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	905	395	0.97	17493	38.6	298.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	996	434	1.06	18349	40.5	284.3	144	403	0	126.2	49.0	26.9	216	779	206	1177	12.01	0.	0 0	0.0	0
6.0	1086	474	1.16	19167	42.3	272.2	232	954	0	99.1	41.0	40.4	467	619	405	736	7.46	0.	3 17	0.9	3
6.5	1177	513	1.26	19953	44.0	261.5	295	1418	0	83.2	35.1	48.4	667	510	551	580	5.87	0.	4 21	1.3	7
7.0	1267	553	1.35	20708	45.7	252.0	346	1816	0	72.1	30.7	54.0	836	431	666	494	5.00	0.	5 25	1.7	10
7.5	1358	592	1.45	21438	47.3	243.4	391	2161	0	63.8	27.4	58.1	985	373	762	438	4.43	0.	6 27	1.9	13
8.0	1448	632	1.54	22144	48.8	235.7	431	2462	0	57.3	24.7	61.3	1120	328	845	397	4.01	0.	7 30	2.2	16
8.5	1539	671	1.64	22829	50.3	228.7	468	2728	0	52.1	22.5	64.0	1247	292	918	366	3.70	0.	8 32	2.4	19
9.0	1629	710	1.74	23494	51.8	222.2	502	2964	0	47.7	20.6	66.1	1367	262	985	341	3.45	0.	8 34	2.6	21
9.5	1720	750	1.83	24141	53.2	216.3	534	3176	0	44.1	19.1	68.0	1481	238	1047	321	3.24	0.	9 37	2.8	24
10.0	1810	789	1.93	24771	54.6	210.8	564	3366	0	41.0	17.8	69.5	1592	218	1106	304	3.07	0.	9 39	2.9	26
10.5	1901	829	2.03	25386	55.9	205.7	593	3538	0	38.3	16.6	70.9	1699	201	1161	289	2.92	0.	10 40	3.1	28
11.0	1991	868	2.12	25987	57.3	201.0	620	3694	0	35.9	15.6	72.0	1805	186	1214	276	2.79	0.	11 42	3.3	31
11.5	2082	908	2.22	26575	58.6	196.6	646	3837	0	33.8	14.7	73.1	1908	174	1265	265	2.68	0.	11 44	3.4	33
12.0	2172	947	2.32	27150	59.8	192.5	671	3968	0	32.0	13.9	74.0	2010	162	1314	255	2.58	0.	12 46	3.5	35
13.0	2353	1026	2.51	28266	62.3	184.9	719	4199	0	28.9	12.5	75.6	2209	144	1409	238	2.41	0.	13 49	3.8	39
14.0	2534	1105	2.70	29341	64.6	178.2	763	4398	0	26.3	11.4	76.9	2405	129	1500	224	2.27	0.	14 52	4.1	42
15.0	2715	1184	2.90	30379	66.9	172.1	805	4570	0	24.1	10.5	77.9	2598	117	1588	213	2.15	0.	15 56	4.3	46
16.0	2896	1263	3.09	31384	69.1	166.7	846	4720	0	22.3	9.7	78.8	2789	107	1674	203	2.05	0.	16 59	4.5	49
17.0	3077	1342	3.28	32358	71.2	161.7	884	4853	0	20.7	9.0	79.6	2979	98	1758	194	1.96	0.	16 62	4.7	52
18.0	3258	1421	3.48	33305	73.3	157.1	920	4970	0	19.4	8.4	80.3	3167	91	1840	186	1.88	0.	17 65	4.9	55
19.0	3439	1500	3.67	34227	75.3	152.9	956	5076	0	18.2	7.9	80.9	3355	84	1921	179	1.81	0.	18 67	5.1	58
20.0	3620	1579	3.86	35125	77.2	149.1	990	5171	0	17.1	7.5	81.4	3541	79	2001	173	1.75	0.	19 70	5.3	61
25.0	4525	1974	4.83	39323	86.3	133.3	1145	5531	0	13.3	5.8	83.4	4465	60	2390	150	1.51	0.	24 84	6.2	73
30.0	5430	2368	5.79	43133	94.6	121.7	1281	5772	0	10.9	4.7	84.6	5382	48	2764	134	1.35	0.	28 96	6.9	84
35.0	6335	2763	6.76	46651	102.1	112.7	1404	5943	0	9.2	4.0	85.4	6295	40	3130	122	1.23	0.	32 108	7.6	
40.0	7240	3158	7.72	49938	109.2	105.4	1517	6072	0	7.9	3.5	86.0	7206	34	3490	113	1.14	0.	36 120	8.2	
45.0	8145	3552	8.69	53036	115.8	99.4	1622	6172	0	7.0	3.1	86.5	8115	30	3845	106	1.07	0.	41 131	8.8	
50.0	9050	3947	9.65	55978	122.1	94.3	1721	6251	0	6.3	2.7	86.9	9023	27	4195	100	1.01	0.	45 142	9.3	

#394 181 Ta on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 62. ZC=135.( )
NEUTRON NUMBERS: NP=108. NT= 92. NC=200.

AP**1/3= 5.657 AT**1/3= 5.360 ELSCAT <58 deg
REDUCED MASS NUMBER= 83.21 AP+AT=AC=335.

INTERACTION RADIUS RINT=15.07 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 6.09 CT+CP=12.56 C̄= 3.14

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.25

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.00 RC=RCP+RCT=12.35

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 742.91 MeV K= .46699 n=2.441
VC(RINT)= 431.8 MeV

FISSION-TKE= 303. MeV
ASYMM. FISSION-TKE= 301. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 35.00 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.55 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -72.1
COMPOUND NUCLEUS: 354.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.35 fm V(RB)= 449.9 MeV
Q-VALUE= -472.4 MeV
L-CRITICAL= 0.

181 Ta on 154 Sm — 181 Ta on 154 Sm

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	181	83	0.19	7815	18.2	712.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	362	166	0.39	11054	25.7	503.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	543	250	0.58	13542	31.5	411.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	724	333	0.77	15642	36.4	356.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	815	374	0.87	16593	38.6	336.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	905	416	0.96	17493	40.7	318.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	996	458	1.06	18349	42.7	303.9	151	400	0	127.1	54.3	26.5	203	793	187	1279	12.36	0.	0 0	0.0	0
6.0	1086	499	1.16	19167	44.6	290.9	246	964	0	99.6	44.3	40.2	457	629	386	792	7.60	0.	3 17	0.8	3
6.5	1177	541	1.25	19953	46.4	279.5	313	1441	0	83.5	37.6	48.3	656	518	531	623	5.97	0.	4 21	1.3	7
7.0	1267	582	1.35	20708	48.1	269.4	368	1849	0	72.3	32.8	53.8	829	438	646	530	5.07	0.	5 24	1.6	11
7.5	1358	624	1.45	21438	49.8	260.2	416	2203	0	64.0	29.1	58.0	979	379	740	469	4.49	0.	6 27	1.9	15
8.0	1448	666	1.54	22144	51.5	252.0	459	2513	0	57.5	26.2	61.3	1115	333	821	425	4.07	0.	7 30	2.1	18
8.5	1539	707	1.64	22829	53.1	244.4	499	2786	0	52.2	23.9	63.9	1242	296	893	392	3.75	0.	8 32	2.4	20
9.0	1629	749	1.73	23494	54.6	237.6	535	3028	0	47.9	21.9	66.1	1362	267	958	365	3.49	0.	8 34	2.6	23
9.5	1720	790	1.83	24141	56.1	231.2	569	3245	0	44.2	20.2	67.9	1477	242	1018	343	3.29	0.	9 36	2.8	26
10.0	1810	832	1.93	24771	57.5	225.4	601	3440	0	41.1	18.8	69.5	1588	222	1075	325	3.11	0.	9 38	2.9	28
10.5	1901	874	2.02	25386	59.0	219.9	632	3617	0	38.4	17.6	70.8	1696	204	1128	309	2.96	0.	10 40	3.1	31
11.0	1991	915	2.12	25987	60.4	214.9	661	3777	0	36.0	16.5	72.0	1802	189	1179	296	2.83	0.	10 42	3.3	33
11.5	2082	957	2.22	26575	61.7	210.2	689	3924	0	33.9	15.6	73.0	1905	176	1227	284	2.71	0.	11 44	3.4	35
12.0	2172	998	2.31	27150	63.0	205.7	716	4058	0	32.1	14.7	74.0	2007	165	1275	273	2.61	0.	12 46	3.5	37
13.0	2353	1082	2.51	28266	65.6	197.7	766	4296	0	28.9	13.3	75.5	2207	146	1365	255	2.44	0.	13 49	3.8	42
14.0	2534	1165	2.70	29341	68.1	190.5	814	4500	0	26.3	12.1	76.8	2403	131	1452	240	2.30	0.	14 52	4.1	45
15.0	2715	1248	2.89	30379	70.5	184.0	859	4676	0	24.2	11.1	77.9	2597	118	1535	228	2.18	0.	14 55	4.3	49
16.0	2896	1331	3.08	31384	72.8	178.2	902	4830	0	22.4	10.3	78.8	2788	108	1617	217	2.07	0.	15 59	4.5	53
17.0	3077	1415	3.28	32358	75.0	172.8	942	4966	0	20.8	9.5	79.6	2978	99	1696	207	1.98	0.	16 61	4.7	56
18.0	3258	1498	3.47	33305	77.2	168.0	982	5088	0	19.4	8.9	80.3	3166	92	1774	199	1.90	0.	17 64	4.9	59
19.0	3439	1581	3.66	34227	79.3	163.5	1019	5196	0	18.2	8.4	80.9	3353	86	1851	192	1.83	0.	18 67	5.1	62
20.0	3620	1664	3.85	35125	81.4	159.4	1055	5293	0	17.2	7.9	81.4	3540	80	1926	185	1.77	0.	19 70	5.3	65
25.0	4525	2080	4.82	39323	91.0	142.5	1221	5663	0	13.3	6.1	83.3	4465	60	2292	160	1.53	0.	23 83	6.2	78
30.0	5430	2496	5.78	43133	99.7	130.1	1366	5910	0	10.9	5.0	84.6	5382	48	2644	143	1.37	0.	28 96	7.0	90
35.0	6335	2912	6.74	46651	107.7	120.5	1498	6086	0	9.2	4.2	85.4	6295	40	2987	131	1.25	0.	32 108	7.6	
40.0	7240	3328	7.71	49938	115.1	112.7	1618	6218	0	8.0	3.7	86.0	7205	35	3324	121	1.16	0.	36 119	8.3	
45.0	8145	3744	8.67	53036	122.1	106.2	1731	6321	0	7.0	3.2	86.5	8115	30	3655	113	1.08	0.	40 130	8.8	
50.0	9050	4160	9.63	55978	128.7	100.8	1836	6403	0	6.3	2.9	86.9	9023	27	3983	106	1.02	0.	44 141	9.4	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	Å	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	mrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#395 181 Ta on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 67. ZC=140.( )
NEUTRON NUMBERS: NP=108. NT= 98. NC=206.

AP**1/3= 5.657 AT**1/3= 5.485 ELSCAT <65 deg
REDUCED MASS NUMBER= 86.32 AP+AT=AC=346.

INTERACTION RADIUS RINT=15.21 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 6.25 CT+CP=12.72 C= 3.18

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.41

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.15 RC=RCP+RCT=12.51

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 792.97 MeV K= .48613 n=2.439
VC(RINT)= 462.5 MeV

FISSION-TKE= 321. MeV
ASYMM. FISSION-TKE= 321. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.890 MeV/fm**2 PROX-FACTOR= 35.56 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.47 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -63.7
COMPOUND NUCLEUS: 402.4

FUSION RELATED PARAMETERS:
R-BARRIER=13.43 fm V(RB)= 482.7 MeV
Q-VALUE= -512.1 MeV
L-CRITICAL= 0.

181 Ta on 165 Ho — 181 Ta on 165 Ho

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	181	86	0.19	7815	18.9	770.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	362	173	0.37	11054	26.7	544.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	543	259	0.56	13542	32.7	444.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	724	345	0.75	15642	37.8	385.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	815	388	0.84	16593	40.0	363.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	905	432	0.93	17493	42.2	344.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	996	475	1.03	18349	44.3	328.4	106	182	0	144.4	64.0	17.8	95	900	94	2044	18.70	0.	0	0	0.0	0
6.0	1086	518	1.12	19167	46.2	314.4	229	776	0	107.9	50.3	36.0	378	708	319	961	8.63	0.	3	16	0.4	0
6.5	1177	561	1.21	19953	48.1	302.1	306	1277	0	89.3	42.0	45.4	597	580	480	721	6.45	0.	4	20	1.1	5
7.0	1267	604	1.31	20708	49.9	291.1	367	1707	0	76.8	36.3	51.6	779	488	605	601	5.38	0.	5	24	1.5	9
7.5	1358	647	1.40	21438	51.7	281.2	420	2078	0	67.7	32.1	56.2	938	420	705	526	4.71	0.	6	27	1.8	13
8.0	1448	691	1.49	22144	53.4	272.3	466	2404	0	60.6	28.7	59.7	1080	368	791	474	4.24	0.	7	29	2.0	16
8.5	1539	734	1.59	22829	55.0	264.2	508	2691	0	54.9	26.1	62.5	1212	326	866	434	3.88	0.	7	32	2.3	20
9.0	1629	777	1.68	23494	56.6	256.7	547	2946	0	50.2	23.9	64.9	1336	293	933	404	3.61	0.	8	34	2.5	22
9.5	1720	820	1.77	24141	58.2	249.9	584	3174	0	46.3	22.0	66.8	1454	266	994	378	3.38	0.	9	36	2.7	25
10.0	1810	863	1.87	24771	59.7	243.5	618	3379	0	43.0	20.5	68.5	1567	243	1051	357	3.19	0.	9	38	2.8	28
10.5	1901	906	1.96	25386	61.2	237.7	651	3564	0	40.1	19.1	69.9	1677	223	1104	340	3.03	0.	10	40	3.0	30
11.0	1991	949	2.05	25987	62.6	232.2	682	3733	0	37.6	17.9	71.2	1784	207	1155	324	2.90	0.	10	42	3.2	33
11.5	2082	993	2.15	26575	64.0	227.1	711	3887	0	35.4	16.9	72.3	1889	192	1203	311	2.78	0.	11	44	3.3	35
12.0	2172	1036	2.24	27150	65.4	222.3	740	4028	0	33.5	15.9	73.3	1992	180	1250	299	2.67	0.	11	45	3.5	37
13.0	2353	1122	2.43	28266	68.1	213.6	793	4278	0	30.1	14.4	74.9	2194	159	1340	279	2.49	0.	12	49	3.8	42
14.0	2534	1208	2.61	29341	70.6	205.8	844	4492	0	27.4	13.1	76.3	2392	142	1424	262	2.34	0.	13	52	4.0	46
15.0	2715	1295	2.80	30379	73.1	198.8	891	4678	0	25.2	12.0	77.4	2587	128	1506	248	2.22	0.	14	55	4.3	50
16.0	2896	1381	2.99	31384	75.5	192.5	936	4840	0	23.2	11.1	78.4	2779	117	1585	236	2.11	0.	15	58	4.5	53
17.0	3077	1467	3.17	32358	77.8	186.8	979	4983	0	21.6	10.3	79.2	2969	108	1662	226	2.02	0.	16	61	4.7	57
18.0	3258	1554	3.36	33305	80.1	181.5	1021	5110	0	20.2	9.6	79.9	3158	100	1738	217	1.93	0.	17	64	4.9	60
19.0	3439	1640	3.55	34227	82.3	176.7	1060	5224	0	18.9	9.0	80.5	3346	93	1812	209	1.86	0.	18	67	5.1	63
20.0	3620	1726	3.73	35125	84.4	172.2	1098	5327	0	17.8	8.5	81.1	3533	87	1885	201	1.80	0.	19	70	5.3	66
25.0	4525	2158	4.67	39323	94.4	154.0	1272	5716	0	13.8	6.6	83.1	4460	65	2236	174	1.55	0.	23	83	6.2	80
30.0	5430	2589	5.60	43133	103.4	140.6	1425	5975	0	11.3	5.4	84.4	5378	52	2574	155	1.39	0.	27	95	6.9	92
35.0	6335	3021	6.53	46651	111.7	130.2	1563	6160	0	9.5	4.5	85.2	6291	44	2902	141	1.26	0.	32	107	7.6	
40.0	7240	3453	7.47	49938	119.4	121.8	1690	6299	0	8.2	3.9	85.9	7203	37	3224	131	1.17	0.	36	119	8.2	
45.0	8145	3884	8.40	53036	126.6	114.8	1808	6407	0	7.3	3.5	86.4	8112	33	3540	122	1.09	0.	40	130	8.8	
50.0	9050	4316	9.33	55978	133.5	108.9	1918	6493	0	6.5	3.1	86.8	9021	29	3852	115	1.03	0.	44	141	9.4	

#396 181 Ta on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 73. ZC=146.( )
NEUTRON NUMBERS: NP=108. NT=108. NC=216.

INTERACTION RADIUS RINT=15.39 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 6.47 CT+CP=12.94 C= 3.24

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.62

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.35 RC=RCP+RCT=12.71

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 850.31 MeV K= .50227 n=2.438
VC(RINT)= 497.8 MeV

FISSION-TKE= 343. MeV
ASYMM. FISSION-TKE= 343. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 36.12 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.36 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -46.0
COMPOUND NUCLEUS: 466.6

FUSION RELATED PARAMETERS:
R-BARRIER=13.56 fm V(RB)= 520.3 MeV
Q-VALUE= -558.6 MeV
L-CRITICAL= 0.

181 Ta on 181 Ta — 181 Ta on 181 Ta

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPSMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	181	91	0.18	7815	19.8	839.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	362	181	0.36	11054	28.0	593.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	543	272	0.55	13542	34.3	484.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	724	362	0.73	15642	39.6	419.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	815	407	0.82	16593	42.0	395.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	905	453	0.91	17493	44.3	375.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	996	498	1.00	18349	46.4	357.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1086	543	1.09	19167	48.5	342.6	214	617	0	116.1	58.0	32.0	304	782	253	1187	9.92	0.	2	15	0.0	0
6.5	1177	588	1.18	19953	50.5	329.1	304	1144	0	94.6	47.3	42.7	541	636	429	939	6.99	0.	4	19	0.8	3
7.0	1267	634	1.27	20708	52.4	317.2	372	1596	0	80.9	40.4	49.6	734	533	562	685	5.70	0.	5	23	1.3	8
7.5	1358	679	1.36	21438	54.2	306.4	430	1987	0	70.9	35.5	54.5	900	457	668	593	4.93	0.	6	26	1.6	12
8.0	1448	724	1.45	22144	56.0	296.7	481	2329	0	63.3	31.7	56.3	1049	399	757	531	4.41	0.	6	29	1.9	15
8.5	1539	769	1.55	22829	57.7	287.8	527	2631	0	57.3	28.6	61.4	1185	353	833	485	4.02	0.	7	31	2.2	19
9.0	1629	815	1.64	23494	59.4	279.7	569	2899	0	52.3	26.2	63.8	1312	317	901	449	3.72	0.	8	33	2.4	22
9.5	1720	860	1.73	24141	61.0	272.2	609	3139	0	48.2	24.1	65.9	1433	287	963	420	3.48	0.	8	36	2.6	25
10.0	1810	905	1.82	24771	62.6	265.3	646	3355	0	44.7	22.3	67.7	1549	261	1020	396	3.28	0.	9	38	2.8	28
10.5	1901	950	1.91	25386	64.1	259.0	681	3550	0	41.6	20.8	69.2	1660	240	1073	375	3.12	0.	10	40	2.9	31
11.0	1991	996	2.00	25987	65.6	253.0	714	3728	0	39.0	19.5	70.5	1769	222	1123	358	2.97	0.	10	41	3.1	33
11.5	2082	1041	2.09	26575	67.1	247.4	746	3890	0	36.7	18.4	71.6	1875	206	1170	343	2.84	0.	11	43	3.3	36
12.0	2172	1086	2.18	27150	68.6	242.2	776	4038	0	34.7	17.3	72.7	1979	193	1216	329	2.73	0.	11	45	3.4	38
13.0	2353	1177	2.36	28266	71.4	232.7	834	4301	0	31.2	15.6	74.4	2183	170	1303	306	2.54	0.	12	48	3.7	43
14.0	2534	1267	2.55	29341	74.1	224.3	888	4526	0	28.3	14.2	75.8	2382	152	1385	288	2.39	0.	13	52	4.0	47
15.0	2715	1358	2.73	30379	76.7	216.7	939	4721	0	26.0	13.0	77.0	2578	137	1463	272	2.26	0.	14	55	4.2	51
16.0	2896	1448	2.91	31384	79.2	209.8	987	4892	0	24.0	12.0	78.0	2771	125	1539	259	2.15	0.	15	58	4.4	55
17.0	3077	1539	3.09	32358	81.6	203.5	1033	5042	0	22.3	11.1	78.9	2962	115	1612	247	2.05	0.	16	61	4.7	59
18.0	3258	1629	3.27	33305	84.0	197.8	1077	5176	0	20.8	10.4	79.6	3152	106	1684	237	1.97	0.	17	64	4.9	62
19.0	3439	1720	3.45	34227	86.3	192.5	1119	5296	0	19.5	9.8	80.2	3340	99	1754	228	1.89	0.	18	66	5.1	66
20.0	3620	1810	3.64	35125	88.5	187.6	1160	5404	0	18.4	9.2	80.8	3528	92	1823	220	1.83	0.	19	69	5.3	69
25.0	4525	2263	4.54	39323	99.0	167.8	1345	5813	0	14.2	7.1	82.9	4456	69	2156	190	1.58	0.	23	82	6.1	83
30.0	5430	2715	5.45	43133	108.4	153.2	1508	6086	0	11.6	5.8	84.2	5375	55	2473	170	1.41	0.	27	95	6.9	96
35.0	6335	3168	6.36	46651	117.1	141.8	1655	6281	0	9.8	4.9	85.1	6289	46	2781	154	1.28	0.	31	107	7.6	
40.0	7240	3620	7.27	49938	125.2	132.7	1790	6427	0	8.5	4.2	85.8	7200	40	3083	143	1.19	0.	35	118	8.2	
45.0	8145	4073	8.18	53036	132.8	125.1	1915	6540	0	7.5	3.7	86.3	8110	35	3379	134	1.11	0.	39	129	8.8	
50.0	9050	4525	9.09	55978	140.0	118.7	2032	6631	0	6.7	3.3	86.7	9019	31	3670	126	1.04	0.	43	140	9.4	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-h	ab	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#397 181 Ta on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 79. ZC=152.( )
NEUTRON NUMBERS: NP=108. NT=118. NC=226.

AP**1/3= 5.657 AT**1/3= 5.819
REDUCED MASS NUMBER= 94.33 AP+AT=AC=378.

INTERACTION RADIUS RINT=15.57 fm R0= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 6.68 CT+CP=13.15 C= 3.29

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.83

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.55 RC=RCP+RCT=12.90

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 906.47 MeV K= .51540 n=2.439
VC(RINT)= 532.7 MeV

FISSION-TKE= 364. MeV
ASYMM. FISSION-TKE= 364. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 36.62 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.28 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -28.6
COMPOUND NUCLEUS: 534.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.67 fm V(RB)= 557.7 MeV
Q-VALUE= -609.1 MeV
L-CRITICAL= 0.

181 Ta on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	94	0.18	7815	20.6	908.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	362	189	0.35	11054	29.2	642.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	543	283	0.53	13542	35.7	524.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	724	377	0.71	15642	41.3	454.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	815	424	0.80	16593	43.8	428.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	905	472	0.89	17493	46.1	406.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	996	519	0.97	18349	48.4	387.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	1086	566	1.06	19167	50.5	370.7	189	444	0	126.0	67.7	27.0	226	860	183	1528	11.97	0.	2	13	0.0	0
6.5	1177	613	1.15	19953	52.6	356.2	295	998	0	100.6	53.2	39.7	481	696	376	983	7.65	0.	3	18	0.3	0
7.0	1267	660	1.24	20708	54.6	343.2	373	1472	0	85.3	44.9	47.4	687	580	519	781	6.07	0.	4	22	1.0	5
7.5	1358	707	1.33	21438	56.5	331.6	436	1883	0	74.5	39.1	52.8	862	496	631	667	5.18	0.	5	25	1.4	10
8.0	1448	755	1.42	22144	58.4	321.1	492	2242	0	66.3	34.7	56.9	1016	432	724	592	4.60	0.	6	28	1.8	14
8.5	1539	802	1.51	22829	60.2	311.5	542	2559	0	59.8	31.3	60.1	1157	381	803	538	4.17	0.	7	31	2.0	18
9.0	1629	849	1.59	23494	61.9	302.7	568	2841	0	54.5	28.5	62.7	1288	341	872	496	3.85	0.	8	33	2.3	21
9.5	1720	896	1.68	24141	63.6	294.6	630	3093	0	50.1	26.2	64.9	1411	308	934	463	3.59	0.	8	35	2.5	24
10.0	1810	943	1.77	24771	65.2	287.2	670	3319	0	46.4	24.3	66.8	1529	281	991	435	3.38	0.	9	37	2.7	27
10.5	1901	990	1.86	25386	66.9	280.2	707	3524	0	43.2	22.6	68.4	1643	258	1044	412	3.20	0.	9	39	2.8	30
11.0	1991	1038	1.95	25987	68.4	273.8	743	3711	0	40.5	21.1	69.8	1753	238	1094	392	3.04	0.	10	41	3.0	33
11.5	2082	1085	2.04	26575	70.0	267.8	777	3881	0	38.0	19.9	71.0	1861	221	1141	375	2.91	0.	11	43	3.2	36
12.0	2172	1132	2.13	27150	71.5	262.1	809	4037	0	35.9	18.7	72.1	1966	206	1185	360	2.79	0.	11	45	3.3	39
13.0	2353	1226	2.30	28266	74.4	251.9	871	4313	0	32.3	16.8	73.9	2172	181	1270	335	2.60	0.	12	48	3.6	44
14.0	2534	1321	2.48	29341	77.2	242.7	928	4549	0	29.3	15.3	75.3	2372	162	1349	314	2.44	0.	13	51	3.9	48
15.0	2715	1415	2.66	30379	79.9	234.5	982	4754	0	26.9	14.0	76.6	2569	146	1425	297	2.30	0.	14	54	4.1	52
16.0	2896	1509	2.83	31384	82.5	227.0	1033	4934	0	24.8	12.9	77.6	2763	133	1498	282	2.19	0.	15	57	4.4	56
17.0	3077	1604	3.01	32358	85.1	220.2	1082	5092	0	23.0	12.0	78.5	2955	122	1568	270	2.09	0.	16	60	4.6	60
18.0	3258	1698	3.19	33305	87.5	214.0	1129	5232	0	21.5	11.2	79.3	3145	113	1637	258	2.00	0.	17	63	4.8	64
19.0	3439	1792	3.36	34227	89.9	208.3	1173	5358	0	20.1	10.5	79.9	3334	105	1704	248	1.93	0.	18	66	5.0	68
20.0	3620	1887	3.54	35125	92.3	203.1	1217	5471	0	18.9	9.9	80.5	3522	98	1770	240	1.86	0.	18	69	5.2	71
25.0	4525	2358	4.43	39323	103.2	181.6	1413	5901	0	14.6	7.6	82.7	4452	73	2065	206	1.60	0.	23	82	6.1	86
30.0	5430	2830	5.31	43133	113.0	165.8	1565	6188	0	11.9	6.2	84.0	5371	59	2385	184	1.43	0.	27	94	6.9	99
35.0	6335	3302	6.20	46651	122.1	153.5	1740	6392	0	10.1	5.3	85.0	6286	49	2676	168	1.30	0.	31	106	7.5	
40.0	7240	3773	7.08	49938	130.5	143.6	1883	6546	0	8.7	4.5	85.6	7198	42	2959	155	1.20	0.	35	117	8.2	
45.0	8145	4245	7.97	53036	138.4	135.4	2015	6665	0	7.7	4.0	86.2	8108	37	3237	145	1.12	0.	39	128	8.8	
50.0	9050	4717	8.85	55978	145.9	128.4	2139	6760	0	6.9	3.6	86.6	9018	32	3510	136	1.06	0.	43	139	9.3	

#398 181 Ta on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 82. ZC=155.( )
NEUTRON NUMBERS: NP=108. NT=126. NC=234.

AP**1/3= 5.657 AT**1/3= 5.925
REDUCED MASS NUMBER= 96.78 AP+AT=AC=389.

INTERACTION RADIUS RINT=15.68 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 6.82 CT+CP=13.29 C= 3.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.96

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.66 RC=RCP+RCT=13.01

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 932.46 MeV K= .51771 n=2.440
VC(RINT)= 548.8 MeV

FISSION-TKE= 375. MeV
ASYMM. FISSION-TKE= 373. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.882 MeV/fm**2 PROX-FACTOR= 36.78 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -19.5
COMPOUND NUCLEUS: 573.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.76 fm V(RB)= 574.7 MeV
Q-VALUE= -639.0 MeV
L-CRITICAL= 0.

181 Ta on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	97	0.18	7815	21.2	942.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	362	194	0.35	11054	29.9	666.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	543	290	0.53	13542	36.7	544.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	724	387	0.71	15642	42.3	471.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	815	436	0.79	16593	44.9	444.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	905	484	0.88	17493	47.3	421.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	996	532	0.97	18349	49.6	401.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	1086	581	1.06	19167	51.9	384.8	188	419	0	127.8	72.0	26.1	214	872	169	1643	12.50	0.	2	13	0.0	0
6.5	1177	629	1.15	19953	54.0	369.7	301	984	0	101.7	55.7	39.2	472	704	363	1035	7.82	0.	3	18	0.0	0
7.0	1267	677	1.23	20708	56.0	356.3	382	1467	0	86.0	46.7	47.0	680	587	506	818	6.17	0.	4	22	0.9	4
7.5	1358	726	1.32	21438	58.0	344.2	448	1886	0	75.1	40.6	52.5	856	501	619	697	5.25	0.	5	25	1.3	9
8.0	1448	774	1.41	22144	59.9	333.2	506	2252	0	66.7	36.0	56.6	1012	436	711	618	4.65	0.	6	28	1.7	13
8.5	1539	823	1.50	22829	61.7	323.3	558	2575	0	60.2	32.4	59.9	1153	385	789	560	4.22	0.	7	31	1.9	17
9.0	1629	871	1.59	23494	63.5	314.2	605	2862	0	54.9	29.5	62.6	1285	344	858	517	3.89	0.	8	33	2.2	21
9.5	1720	919	1.68	24141	65.2	305.8	649	3119	0	50.5	27.1	64.8	1409	311	919	482	3.63	0.	8	35	2.4	25
10.0	1810	968	1.76	24771	66.9	298.1	690	3350	0	46.7	25.1	66.6	1527	283	975	453	3.41	0.	9	37	2.6	28
10.5	1901	1016	1.85	25386	68.6	290.9	729	3559	0	43.5	23.3	68.2	1641	260	1027	429	3.23	0.	9	39	2.8	31
11.0	1991	1065	1.94	25987	70.2	284.2	766	3749	0	40.7	21.8	69.6	1751	240	1075	408	3.07	0.	10	41	3.0	34
11.5	2082	1113	2.03	26575	71.8	277.9	801	3922	0	38.3	20.5	70.9	1859	223	1121	390	2.94	0.	11	43	3.1	37
12.0	2172	1161	2.12	27150	73.3	272.1	835	4081	0	36.1	19.3	71.9	1964	208	1165	375	2.82	0.	11	44	3.3	40
13.0	2353	1258	2.29	28266	76.3	261.4	898	4362	0	32.4	17.4	73.8	2170	183	1247	348	2.62	0.	12	48	3.6	45
14.0	2534	1355	2.47	29341	79.2	251.9	958	4603	0	29.5	15.8	75.3	2371	163	1325	327	2.46	0.	13	51	3.8	50
15.0	2715	1452	2.65	30379	82.0	243.4	1014	4812	0	27.0	14.5	76.5	2568	147	1398	309	2.32	0.	14	54	4.1	54
16.0	2896	1549	2.82	31384	84.7	235.6	1067	4995	0	24.9	13.3	77.5	2762	134	1468	293	2.21	0.	15	57	4.3	58
17.0	3077	1645	3.00	32358	87.3	228.6	1117	5156	0	23.1	12.4	78.4	2954	123	1537	280	2.11	0.	16	60	4.5	62
18.0	3258	1742	3.17	33305	89.8	222.2	1165	5299	0	21.6	11.6	79.2	3144	114	1603	268	2.02	0.	17	63	4.8	66
19.0	3439	1839	3.35	34227	92.3	216.2	1212	5427	0	20.2	10.8	79.9	3333	106	1668	258	1.94	0.	18	66	5.0	70
20.0	3620	1936	3.53	35125	94.7	210.8	1256	5543	0	19.0	10.2	80.5	3521	99	1731	249	1.87	0.	18	68	5.2	74
25.0	4525	2420	4.41	39323	105.8	188.5	1459	5981	0	14.7	7.9	82.6	4451	74	2035	214	1.61	0.	23	81	6.1	89
30.0	5430	2903	5.29	43133	115.9	172.1	1637	6273	0	12.0	6.4	84.0	5371	59	2323	191	1.44	0.	27	94	6.8	103
35.0	6335	3387	6.17	46651	125.2	159.3	1798	6481	0	10.1	5.4	84.9	6286	49	2601	174	1.31	0.	31	105	7.5	
40.0	7240	3871	7.05	49938	133.9	149.0	1945	6638	0	8.8	4.7	85.6	7198	42	2873	161	1.21	0.	35	117	8.2	
45.0	8145	4355	7.94	53036	142.0	140.5	2082	6759	0	7.7	4.1	86.1	8108	37	3139	150	1.13	0.	39	127	8.7	
50.0	9050	4839	8.82	55978	149.7	133.3	2210	6856	0	6.9	3.7	86.5	9017	33	3401	142	1.07	0.	43	138	9.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	mrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#399 181 Ta on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 83. ZC=156.( )
NEUTRON NUMBERS: NP=108. NT=126. NC=234.

AP**1/3= 5.657 AT**1/3= 5.934
REDUCED MASS NUMBER= 97.00 AP+AT=AC=390.

INTERACTION RADIUS RINT=15.69 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 6.83 CT+CP=13.30 C̄= 3.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 6.97

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.68 RC=RCP+RCT=13.03

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 942.56 MeV K= .52129 n=2.440
VC(RINT)= 555.2 MeV

FISSION-TKE= 379. MeV
ASYMM. FISSION-TKE= 377. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 36.90 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: -16.5
COMPOUND NUCLEUS: 583.0

FUSION RELATED PARAMETERS:
R-BARRIER=13.76 fm V(RB)= 581.8 MeV
Q-VALUE= -645.4 MeV
L-CRITICAL= 0.

181 Ta on 209 Bi

181 Ta on 209 Bi

EL/u	ELAB	ECN	ECN/VC	r	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	97	0.17	7815	21.2	954.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	362	194	0.35	11054	30.0	674.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	543	291	0.52	13542	36.7	550.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	724	388	0.70	15642	42.4	477.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	815	436	0.79	16593	45.0	449.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	905	485	0.87	17493	47.4	426.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	996	533	0.96	18349	49.8	406.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1086	582	1.05	19167	52.0	389.5	173	351	0	132.2	75.3	23.9	183	903	144	1814	13.68	0.	2	12	0.0	0
6.5	1177	630	1.14	19953	54.1	374.2	292	922	0	104.1	57.3	38.0	449	727	346	1083	8.09	0.	3	18	0.0	0
7.0	1267	679	1.22	20708	56.1	360.6	375	1411	0	87.7	47.8	46.1	662	605	494	844	6.30	0.	4	22	0.8	3
7.5	1358	727	1.31	21438	58.1	348.4	443	1834	0	76.4	41.4	51.8	841	516	609	716	5.34	0.	5	25	1.3	8
8.0	1448	776	1.40	22144	60.0	337.3	502	2204	0	67.8	36.7	56.1	999	449	704	632	4.71	0.	6	28	1.6	13
8.5	1539	824	1.49	22829	61.9	327.2	554	2530	0	61.1	33.0	59.4	1143	396	784	573	4.26	0.	7	30	1.9	17
9.0	1629	873	1.57	23494	63.6	318.0	602	2820	0	55.7	30.0	62.2	1275	354	853	527	3.92	0.	8	33	2.2	20
9.5	1720	921	1.66	24141	65.4	309.5	646	3080	0	51.2	27.6	64.4	1400	319	916	491	3.66	0.	8	35	2.4	24
10.0	1810	970	1.75	24771	67.1	301.7	688	3313	0	47.4	25.5	66.3	1520	290	973	461	3.43	0.	9	37	2.6	27
10.5	1901	1018	1.83	25386	68.7	294.4	727	3524	0	44.1	23.7	68.0	1634	266	1025	437	3.25	0.	9	39	2.8	30
11.0	1991	1067	1.92	25987	70.4	287.7	764	3716	0	41.2	22.2	69.4	1745	246	1074	415	3.09	0.	10	41	2.9	33
11.5	2082	1115	2.01	26575	71.9	281.3	800	3892	0	38.8	20.8	70.6	1853	228	1120	397	2.95	0.	10	43	3.1	36
12.0	2172	1164	2.10	27150	73.5	275.4	834	4052	0	36.6	19.6	71.7	1959	213	1164	381	2.83	0.	11	44	3.3	39
13.0	2353	1261	2.27	28266	76.5	264.6	898	4336	0	32.8	17.6	73.6	2166	187	1247	354	2.63	0.	12	48	3.6	44
14.0	2534	1358	2.45	29341	79.4	255.0	957	4580	0	29.8	16.0	75.1	2367	167	1325	332	2.47	0.	13	51	3.8	49
15.0	2715	1455	2.62	30379	82.2	246.3	1014	4791	0	27.3	14.7	76.3	2564	151	1398	313	2.33	0.	14	54	4.1	53
16.0	2896	1552	2.80	31384	84.9	238.5	1067	4976	0	25.2	13.5	77.4	2759	137	1469	298	2.21	0.	15	57	4.3	58
17.0	3077	1649	2.97	32358	87.5	231.4	1118	5139	0	23.4	12.5	78.3	2951	126	1537	284	2.11	0.	16	60	4.5	62
18.0	3258	1746	3.14	33305	90.0	224.9	1166	5283	0	21.8	11.7	79.1	3142	116	1603	272	2.03	0.	17	63	4.8	66
19.0	3439	1843	3.32	34227	92.5	218.9	1213	5413	0	20.5	11.0	79.8	3331	108	1668	262	1.95	0.	17	66	5.0	69
20.0	3620	1940	3.49	35125	94.9	213.3	1258	5530	0	19.3	10.3	80.4	3519	101	1732	252	1.88	0.	18	68	5.2	73
25.0	4525	2425	4.37	39323	106.1	190.8	1462	5972	0	14.9	8.0	82.6	4450	75	2035	217	1.62	0.	23	81	6.0	89
30.0	5430	2910	5.24	43133	116.2	174.2	1640	6267	0	12.1	6.5	83.9	5370	60	2323	194	1.44	0.	27	94	6.8	102
35.0	6335	3395	6.12	46651	125.5	161.3	1801	6478	0	10.2	5.5	84.9	6285	50	2601	176	1.31	0.	31	105	7.5	
40.0	7240	3880	6.99	49938	134.2	150.8	1949	6636	0	8.9	4.7	85.6	7197	43	2871	163	1.21	0.	35	116	8.1	
45.0	8145	4365	7.86	53036	142.3	142.2	2086	6759	0	7.8	4.2	86.1	8108	37	3137	152	1.13	0.	39	127	8.7	
50.0	9050	4850	8.74	55978	150.0	134.9	2215	6857	0	7.0	3.7	86.5	9017	33	3398	143	1.07	0.	43	138	9.3	

#400 181 Ta on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 73. ZT= 92. ZC=165.( )
NEUTRON NUMBERS: NP=108. NT=146. NC=254.

AP**1/3= 5.657 AT**1/3= 6.197
REDUCED MASS NUMBER=102.81 AP+AT=AC=419.

INTERACTION RADIUS RINT=15.98 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.47 CT= 7.16 CT+CP=13.64 C̄= 3.40

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.62 RT= 7.30

COULOMB RADII [fm]:
RCP= 6.35 RCT= 6.98 RC=RCP+RCT=13.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1020.97 MeV K= .52883 n=2.444
VC(RINT)= 604.4 MeV

FISSION-TKE= 412. MeV
ASYMM. FISSION-TKE= 406. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.875 MeV/fm**2 PROX-FACTOR= 37.39 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.10 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -46.0 TARGET: 47.2
COMPOUND NUCLEUS: 697.9

FUSION RELATED PARAMETERS:
R-BARRIER=13.95 fm V(RB)= 634.9 MeV
Q-VALUE= -696.7 MeV
L-CRITICAL= 0.

181 Ta on 238 U

181 Ta on 238 U

EL/u	ELAB	ECN	ECN/VC	r	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	181	103	0.17	7815	22.5	1057.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	362	206	0.34	11054	31.8	747.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	543	308	0.51	13542	38.9	610.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	724	411	0.68	15642	45.0	528.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	815	463	0.77	16593	47.7	498.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	905	514	0.85	17493	50.3	472.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	996	565	0.94	18349	52.7	450.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1086	617	1.02	19167	55.1	431.7	121	154	0	148.7	100.2	15.7	98	988	64	3040	21.44	0.	1	11	0.0	0
6.5	1177	668	1.11	19953	57.3	414.8	281	762	0	111.7	67.2	34.2	386	791	284	1342	9.22	0.	3	17	0.0	0
7.0	1267	720	1.19	20708	59.5	399.7	379	1283	0	93.0	54.7	43.5	612	655	443	999	6.85	0.	4	21	0.7	2
7.5	1358	771	1.28	21438	61.6	386.1	456	1733	0	80.5	46.8	49.8	802	556	564	831	5.69	0.	5	24	1.2	8
8.0	1448	822	1.36	22144	63.6	373.9	522	2127	0	71.2	41.2	54.4	967	481	662	726	4.97	0.	6	27	1.6	13
8.5	1539	874	1.45	22829	65.6	362.7	581	2475	0	64.0	36.8	58.0	1115	424	744	653	4.47	0.	7	30	1.8	17
9.0	1629	925	1.53	23494	67.5	352.5	634	2783	0	58.1	33.4	60.9	1251	378	814	599	4.09	0.	7	32	2.1	21
9.5	1720	977	1.62	24141	69.3	343.1	683	3060	0	53.3	30.6	63.3	1379	340	877	556	3.80	0.	8	34	2.3	25
10.0	1810	1028	1.70	24771	71.1	334.4	729	3308	0	49.3	28.2	65.3	1501	309	933	521	3.56	0.	9	36	2.5	29
10.5	1901	1080	1.79	25386	72.9	326.4	772	3533	0	45.8	26.2	67.1	1618	283	984	492	3.36	0.	9	38	2.7	32
11.0	1991	1131	1.87	25987	74.6	318.8	812	3738	0	42.9	24.5	68.6	1730	261	1032	467	3.20	0.	10	40	2.9	36
11.5	2082	1182	1.96	26575	76.3	311.8	851	3924	0	40.2	23.0	69.9	1840	242	1076	446	3.05	0.	10	42	3.0	39
12.0	2172	1234	2.04	27150	77.9	305.3	888	4095	0	37.9	21.6	71.0	1947	225	1119	427	2.92	0.	11	44	3.2	42
13.0	2353	1337	2.21	28266	81.1	293.3	958	4398	0	34.0	19.4	73.0	2155	198	1198	396	2.71	0.	12	47	3.5	48
14.0	2534	1439	2.38	29341	84.1	282.6	1023	4657	0	30.9	17.6	74.6	2358	176	1271	371	2.54	0.	13	50	3.8	53
15.0	2715	1542	2.55	30379	87.1	273.0	1085	4882	0	28.3	16.1	75.9	2556	159	1340	350	2.39	0.	14	53	4.0	58
16.0	2896	1645	2.72	31384	89.9	264.4	1143	5079	0	26.1	14.8	77.0	2752	144	1406	332	2.27	0.	15	56	4.3	62
17.0	3077	1748	2.89	32358	92.7	256.5	1198	5232	0	24.2	13.8	77.9	2945	132	1469	317	2.17	0.	15	59	4.5	67
18.0	3258	1851	3.06	33305	95.4	249.3	1251	5406	0	22.5	12.8	78.7	3136	122	1531	304	2.08	0.	16	62	4.7	71
19.0	3439	1953	3.23	34227	98.0	242.6	1301	5544	0	21.1	12.0	79.4	3326	113	1591	292	2.00	0.	17	65	4.9	75
20.0	3620	2056	3.40	35125	100.6	236.5	1350	5668	0	19.9	11.3	80.1	3514	106	1649	281	1.92	0.	18	68	5.1	79
25.0	4525	2570	4.25	39323	112.4	211.5	1571	6140	0	15.3	8.7	82.3	4446	79	1927	242	1.65	0.	22	80	6.0	96
30.0	5430	3084	5.10	43133	123.2	193.1	1764	6454	0	12.5	7.1	83.8	5367	63	2189	215	1.47	0.	26	92	6.8	111
35.0	6335	3598	5.95	46651	133.0	178.8	1939	6678	0	10.5	6.0	84.7	6283	52	2440	196	1.34	0.	30	104	7.4	
40.0	7240	4112	6.80	49938	142.2	167.2	2099	6847	0	9.1	5.2	85.4	7195	45	2685	181	1.24	0.	34	115	8.1	
45.0	8145	4627	7.65	53036	150.8	157.6	2247	6978	0	8.0	4.6	86.0	8106	39	2924	169	1.16	0.	38	126	8.7	
50.0	9050	5141	8.50	55978	159.0	149.6	2386	7092	0	7.2	4.1	86.4	9015	35	3159	159	1.09	0.	42	136	9.2	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 181 Ta

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#401 208 Pb on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 6. ZC= 88.(Ra)
NEUTRON NUMBERS: NP=126. NT= 6. NC=132.

AP**1/3= 5.925 AT**1/3= 2.289 ELSCAT < 3 deg
REDUCED MASS NUMBER= 11.35 AP+AT=AC=220.

INTERACTION RADIUS RINT=12.02 fm RO= 1.46 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 2.12 CT+CP= 8.94 C= 1.62

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 2.52

COULOMB RADII [fm]:
RCP= 6.66 RCT= 2.51 RC=RCP+RCT= 9.17

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 102.44 MeV K= .02966 n=3.045
VC(RINT)= 58.9 MeV

FISSION-TKE= 160. MeV
ASYMM. FISSION-TKE= 41. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.884 MeV/fm**2 PROX-FACTOR= 17.98 MeV
L-RLD= 80 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 17.02 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: 0.0
COMPOUND NUCLEUS: 10.8

FUSION RELATED PARAMETERS:
R-BARRIER=10.86 fm V(RB)= 60.4 MeV
Q-VALUE= -30.3 MeV
L-CRITICAL= 61.

208 Pb on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EM-EM	TEMP	MULT
1.0	208	11	0.19	8980	2.5	77.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	23	0.39	12703	3.5	54.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	34	0.58	15563	4.3	44.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	45	0.77	17975	5.0	38.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	51	0.87	19068	5.3	36.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	57	0.96	20102	5.5	34.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	62	1.06	21086	5.8	33.0	16	284	119	126.9	2.7	26.5	955	189	968	139	9.83	1061.	6	16	1.1	4
6.0	1248	68	1.16	22026	6.1	31.6	27	656	418	99.5	3.3	40.3	1098	150	1101	86	6.06	1158.	6	16	1.2	4
6.5	1352	74	1.25	22929	6.3	30.4	34	966	671	83.4	3.3	48.3	1229	123	1223	68	4.76	1248.	6	16	1.3	5
7.0	1456	79	1.35	23798	6.6	29.3	40	1230	888	72.3	3.1	53.9	1351	105	1336	58	4.04	1338.	6	16	1.3	6
7.5	1560	85	1.45	24636	6.8	28.3	45	1458	1075	64.0	2.9	58.0	1470	90	1445	51	3.58	1434.	6	16	1.4	6
8.0	1664	91	1.54	25448	7.0	27.4	50	1656	1240	57.5	2.7	61.3	1585	79	1551	46	3.25	1529.	8	23	1.5	6
8.5	1768	96	1.64	26234	7.2	26.6	54	1831	1365	52.2	2.5	63.9	1697	71	1655	43	2.99	1617.	9	25	1.6	7
9.0	1872	102	1.73	26998	7.4	25.8	58	1986	1514	47.9	2.4	66.1	1808	64	1757	40	2.79	1713.	9	26	1.6	7
9.5	1976	108	1.83	27742	7.6	25.1	62	2125	1629	44.2	2.2	67.9	1918	58	1858	37	2.62	1799.	10	28	1.7	8
10.0	2080	113	1.93	28466	7.8	24.5	65	2249	1733	41.1	2.1	69.5	2027	53	1958	35	2.48	1894.	11	29	1.7	8
10.5	2184	119	2.02	29173	8.0	23.9	69	2361	1826	38.4	2.0	70.8	2135	49	2057	34	2.36	1979.	11	31	1.8	9
11.0	2288	125	2.12	29864	8.2	23.4	72	2463	1902	36.0	1.9	72.0	2243	45	2156	32	2.26	2073.	12	32	1.9	9
11.5	2392	130	2.22	30539	8.4	22.8	75	2556	1723	33.9	1.8	73.0	2350	42	2255	31	2.16	2157.	12	33	1.9	10
12.0	2496	136	2.31	31200	8.6	22.4	78	2641	1652	32.1	1.7	74.0	2457	39	2352	30	2.08	2251.	13	35	2.0	10
13.0	2704	147	2.51	32483	8.9	21.5	83	2792	1525	28.9	1.5	75.5	2669	35	2547	28	1.95	2427.	14	37	2.1	11
14.0	2912	159	2.70	33718	9.3	20.7	89	2920	1416	26.3	1.4	76.8	2881	31	2741	26	1.83	2601.	15	40	2.2	12
15.0	3120	170	2.89	34911	9.6	20.0	93	3031	1321	24.2	1.3	77.9	3092	28	2934	25	1.74	2774.	16	42	2.3	13
16.0	3328	182	3.08	36065	9.9	19.4	98	3129	1239	22.3	1.2	78.8	3302	26	3127	24	1.65	2959.	17	44	2.3	13
17.0	3536	193	3.28	37185	10.2	18.8	102	3214	1166	20.8	1.1	79.6	3512	24	3319	23	1.58	3128.	18	47	2.4	14
18.0	3744	204	3.47	38273	10.5	18.3	107	3290	1101	19.4	1.0	80.3	3722	22	3511	22	1.52	3296.	19	49	2.5	15
19.0	3952	216	3.66	39332	10.8	17.8	111	3358	1043	18.2	1.0	80.9	3932	20	3703	21	1.46	3463.	20	51	2.6	16
20.0	4160	227	3.86	40365	11.1	17.3	115	3419	991	17.2	0.9	81.4	4141	19	3894	20	1.41	3645.	21	54	2.7	16
25.0	5200	284	4.82	45189	12.4	15.5	133	3651	793	13.3	0.7	83.3	5186	14	4848	17	1.22	4467.	26	65	3.0	20
30.0	6240	340	5.78	49568	13.6	14.1	149	3804	660	10.9	0.6	84.6	6228	12	5798	16	1.09	5280.	31	75	3.4	23
35.0	7280	397	6.75	53610	14.7	13.1	163	3913	566	9.2	0.5	85.4	7270	10	6747	14	1.00	6066.	36	86	3.7	
40.0	8320	454	7.71	57387	15.7	12.2	176	3995	495	8.0	0.4	86.0	8312	8	7693	13	0.92	6825.	41	96	3.9	
45.0	9360	511	8.67	60948	16.6	11.5	188	4058	440	7.0	0.4	86.5	9353	7	8639	12	0.86	7558.	46	106	4.2	
50.0	10400	567	9.64	64329	17.5	11.0	200	4109	396	6.3	0.3	86.9	10394	6	9584	12	0.81	8308.	51	115	4.4	

#402 208 Pb on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 8. ZC= 90.(Th)
NEUTRON NUMBERS: NP=126. NT= 8. NC=134.

AP**1/3= 5.925 AT**1/3= 2.520 ELSCAT < 4 deg
REDUCED MASS NUMBER= 14.86 AP+AT=AC=224.

INTERACTION RADIUS RINT=12.27 fm RO= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 2.42 CT+CP= 9.24 C= 1.79

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 2.78

COULOMB RADII [fm]:
RCP= 6.66 RCT= 2.78 RC=RCP+RCT= 9.44

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 134.10 MeV K= .04858 n=2.920
VC(RINT)= 76.9 MeV

FISSION-TKE= 165. MeV
ASYMM. FISSION-TKE= 53. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 19.91 MeV
L-RLD= 77 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 13.09 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -4.7
COMPOUND NUCLEUS: 21.4

FUSION RELATED PARAMETERS:
R-BARRIER=11.09 fm V(RB)= 79.3 MeV
Q-VALUE= -45.7 MeV
L-CRITICAL= 73.

208 Pb on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EM-EM	TEMP	MULT
1.0	208	15	0.19	8980	3.2	103.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	30	0.39	12703	4.6	73.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	45	0.58	15563	5.6	59.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	59	0.77	17975	6.5	51.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	67	0.87	19068	6.9	48.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	74	0.97	20102	7.3	46.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	82	1.06	21086	7.6	44.0	23	301	115	125.7	3.7	27.1	904	240	919	181	9.81	1043.	6	16	1.1	4
6.0	1248	89	1.16	22026	8.0	42.2	36	683	428	98.8	4.4	40.6	1057	191	1060	114	6.13	1132.	6	16	1.2	5
6.5	1352	97	1.26	22929	8.3	40.5	46	1004	692	83.0	4.3	48.5	1195	157	1186	90	4.83	1221.	6	16	1.3	6
7.0	1456	104	1.35	23798	8.6	39.0	54	1277	918	71.9	4.1	54.0	1323	133	1302	76	4.11	1315.	6	16	1.4	6
7.5	1560	111	1.45	24636	8.9	37.7	61	1513	1114	63.7	3.8	58.2	1445	115	1413	68	3.64	1402.	6	16	1.5	7
8.0	1664	119	1.55	25448	9.2	36.5	67	1719	1286	57.2	3.6	61.4	1563	101	1519	61	3.30	1489.	8	24	1.6	8
8.5	1768	126	1.64	26234	9.5	35.4	73	1900	1437	52.0	3.3	64.0	1678	90	1622	57	3.05	1582.	9	26	1.7	8
9.0	1872	134	1.74	26998	9.7	34.4	78	2061	1572	47.7	3.1	66.2	1791	81	1724	53	2.84	1667.	9	28	1.8	9
9.5	1976	141	1.84	27742	10.0	33.5	83	2205	1692	44.0	2.9	68.0	1902	74	1824	50	2.67	1760.	10	29	1.8	9
10.0	2080	149	1.93	28466	10.3	32.7	88	2334	1616	40.9	2.7	69.5	2013	67	1922	47	2.53	1844.	11	31	1.9	10
10.5	2184	156	2.03	29173	10.5	31.9	92	2451	1539	38.2	2.6	70.9	2122	62	2020	45	2.41	1936.	11	32	2.0	10
11.0	2288	163	2.13	29864	10.8	31.1	96	2557	1469	35.9	2.4	72.1	2230	58	2117	43	2.30	2019.	12	34	2.1	11
11.5	2392	171	2.22	30539	11.0	30.5	100	2653	1405	33.8	2.3	73.1	2338	54	2214	41	2.21	2101.	12	35	2.1	12
12.0	2496	178	2.32	31200	11.3	29.8	104	2742	1347	31.9	2.2	74.0	2446	50	2310	40	2.13	2192.	13	36	2.2	12
13.0	2704	193	2.51	32483	11.7	28.6	112	2898	1243	28.8	2.0	75.6	2660	44	2501	37	1.98	2364.	14	39	2.3	13
14.0	2912	208	2.71	33718	12.2	27.6	118	3032	1154	26.2	1.8	76.9	2872	40	2690	35	1.87	2533.	15	42	2.4	14
15.0	3120	223	2.90	34911	12.6	26.7	125	3148	1077	24.1	1.7	78.0	3084	36	2879	33	1.77	2701.	16	44	2.5	15
16.0	3328	238	3.09	36065	13.0	25.8	131	3250	1010	22.3	1.6	78.9	3295	33	3067	31	1.69	2868.	17	47	2.6	16
17.0	3536	253	3.29	37185	13.4	25.1	137	3339	951	20.7	1.5	79.6	3506	30	3255	30	1.61	3032.	18	49	2.7	17
18.0	3744	267	3.48	38273	13.8	24.3	143	3418	898	19.3	1.4	80.3	3716	28	3442	29	1.55	3195.	19	52	2.8	18
19.0	3952	282	3.67	39332	14.2	23.7	148	3489	850	18.2	1.3	80.9	3926	26	3628	28	1.49	3356.	20	54	2.9	19
20.0	4160	297	3.87	40365	14.5	23.1	154	3553	808	17.1	1.2	81.4	4136	24	3814	27	1.44	3516.	21	56	3.0	20
25.0	5200	371	4.83	45189	16.2	20.7	178	3795	646	13.3	0.9	83.4	5182	18	4742	23	1.25	4309.	26	68	3.4	24
30.0	6240	446	5.80	49568	17.8	18.9	199	3955	538	10.8	0.8	84.6	6225	15	5666	21	1.11	5067.	31	79	3.8	28
35.0	7280	520	6.77	53610	19.2	17.5	218	4069	461	9.2	0.7	85.4	7268	12	6587	19	1.02	5791.	36	90	4.1	
40.0	8320	594	7.73	57387	20.6	16.3	235	4155	404	7.9	0.6	86.0	8309	11	7506	18	0.94	6515.	41	100	4.4	
45.0	9360	669	8.70	60948	21.8	15.4	252	4221	359	7.0	0.5	86.5	9351	9	8423	16	0.88	7213.	46	110	4.7	
50.0	10400	743	9.67	64329	23.0	14.6	267	4274	323	6.3	0.4	86.9	10392	8	9339	15	0.83	7885.	51	120	5.0	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	N	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#403 208 Pb on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 13. ZC= 95.(Am)
NEUTRON NUMBERS: NP=126. NT= 14. NC=140.

AP**1/3= 5.925 AT**1/3= 3.000 ELSCAT < 7 deg
REDUCED MASS NUMBER= 23.90 AP+AT=AC=235.

INTERACTION RADIUS RINT=12.80 fm RO= 1.43 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 3.05 CT+CP= 9.86 C= 2.11

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 3.35

COULOMB RADII [fm]:
RCP= 6.66 RCT= 3.32 RC=RCP+RCT= 9.98

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 209.49 MeV K= .10134 n=2.744
VC(RINT)= 119.8 MeV

FISSION-TKE= 179. MeV
ASYMM. FISSION-TKE= 84. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.889 MeV/fm**2 PROX-FACTOR= 23.54 MeV
L-RLD= 70 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.27 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -20.6
COMPOUND NUCLEUS: 45.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.56 fm V(RB)= 124.2 MeV
Q-VALUE= -85.9 MeV
L-CRITICAL= 96.

208 Pb on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	24	0.20	8980	5.2	167.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	48	0.40	12703	7.4	118.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	72	0.60	15563	9.1	96.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	96	0.80	17975	10.5	83.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	108	0.90	19068	11.1	79.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	119	1.00	20102	11.7	75.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	131	1.10	21086	12.3	71.6	46	471	231	114.0	7.1	33.0	817	327	830	240	8.33	995.	0	0	1.2	4
6.0	1248	143	1.20	22026	12.8	68.5	66	868	561	91.9	7.4	44.1	986	262	981	169	5.84	1076.	0	0	1.4	6
6.5	1352	155	1.30	22929	13.3	65.8	81	1203	841	77.9	7.0	51.1	1135	217	1111	138	4.75	1160.	0	0	1.5	7
7.0	1456	167	1.40	23798	13.8	63.4	94	1489	1080	67.9	6.5	56.0	1271	185	1229	119	4.11	1244.	0	0	1.7	8
7.5	1560	179	1.50	24636	14.3	61.3	105	1736	1288	60.4	6.1	59.8	1400	160	1340	106	3.67	1327.	7	25	1.8	9
8.0	1664	191	1.60	25448	14.8	59.3	116	1952	1339	54.4	5.6	62.8	1523	141	1444	97	3.35	1409.	8	27	1.9	10
8.5	1768	203	1.70	26234	15.2	57.6	125	2143	1260	49.5	5.2	65.2	1642	126	1545	90	3.10	1491.	9	28	2.0	11
9.0	1872	215	1.80	26998	15.7	56.0	134	2312	1190	45.5	4.8	67.3	1758	114	1644	84	2.90	1571.	9	30	2.1	12
9.5	1976	227	1.90	27742	16.1	54.5	142	2463	1127	42.1	4.5	69.0	1872	104	1740	79	2.73	1651.	10	32	2.2	13
10.0	2080	239	2.00	28466	16.5	53.1	149	2599	1071	39.1	4.3	70.4	1985	95	1834	75	2.59	1730.	10	34	2.3	14
10.5	2184	251	2.10	29173	16.9	51.8	157	2722	1020	36.6	4.0	71.7	2096	88	1928	72	2.47	1817.	11	35	2.4	14
11.0	2288	263	2.20	29864	17.3	50.6	164	2834	973	34.4	3.8	72.8	2207	81	2020	69	2.37	1895.	12	37	2.5	15
11.5	2392	275	2.29	30539	17.7	49.5	170	2935	931	32.4	3.6	73.8	2316	76	2111	66	2.27	1972.	12	38	2.5	16
12.0	2496	287	2.39	31200	18.1	48.5	177	3029	892	30.7	3.4	74.7	2425	71	2202	63	2.19	2048.	13	40	2.6	17
13.0	2704	311	2.59	32483	18.8	46.6	189	3194	824	27.7	3.1	76.2	2641	63	2382	59	2.05	2209.	14	43	2.8	18
14.0	2912	335	2.79	33718	19.6	44.9	201	3335	765	25.2	2.8	77.4	2856	56	2560	56	1.93	2357.	15	45	2.9	20
15.0	3120	358	2.99	34911	20.2	43.3	211	3458	714	23.2	2.6	78.4	3069	51	2737	53	1.83	2513.	16	48	3.0	21
16.0	3328	382	3.19	36065	20.9	42.0	222	3565	669	21.4	2.4	79.3	3281	47	2913	51	1.75	2668.	17	51	3.2	22
17.0	3536	406	3.39	37185	21.6	40.7	232	3659	630	19.9	2.3	80.0	3493	43	3088	48	1.67	2808.	18	54	3.3	24
18.0	3744	430	3.59	38273	22.2	39.6	241	3743	595	18.6	2.1	80.7	3704	40	3263	47	1.61	2959.	19	56	3.4	25
19.0	3952	454	3.79	39332	22.8	38.5	250	3818	563	17.5	2.0	81.2	3915	37	3436	45	1.55	3109.	20	59	3.5	26
20.0	4160	478	3.99	40365	23.4	37.5	259	3886	535	16.5	1.9	81.8	4125	35	3610	43	1.50	3241.	21	61	3.7	28
25.0	5200	597	4.99	45189	26.1	33.6	299	4142	428	12.8	1.5	83.6	5174	26	4471	38	1.29	3954.	26	74	4.2	33
30.0	6240	717	5.99	49568	28.6	30.6	334	4312	357	10.5	1.2	84.8	6219	21	5327	34	1.16	4627.	31	85	4.6	38
35.0	7280	836	6.98	53610	30.9	28.4	366	4433	306	8.9	1.0	85.6	7262	18	6178	31	1.06	5261.	36	97	5.1	
40.0	8320	956	7.98	57387	33.1	26.5	396	4524	267	7.7	0.9	86.2	8305	15	7026	28	0.98	5888.	41	108	5.4	
45.0	9360	1075	8.98	60948	35.1	25.0	423	4595	238	6.8	0.8	86.6	9347	13	7872	27	0.92	6483.	46	118	5.8	
50.0	10400	1195	9.98	64329	37.0	23.7	449	4651	214	6.1	0.7	87.0	10388	12	8717	25	0.86	7046.	51	129	6.1	

#404 208 Pb on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 20. ZC=102.(No)
NEUTRON NUMBERS: NP=126. NT= 20. NC=146.

AP**1/3= 5.925 AT**1/3= 3.420 ELSCAT <11 deg
REDUCED MASS NUMBER= 33.55 AP+AT=AC=248.

INTERACTION RADIUS RINT=13.26 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 3.59 CT+CP=10.41 C= 2.35

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 3.85

COULOMB RADII [fm]:
RCP= 6.66 RCT= 3.84 RC=RCP+RCT=10.50

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 310.34 MeV K= .18207 n=2.617
VC(RINT)= 177.9 MeV

FISSION-TKE= 200. MeV
ASYMM. FISSION-TKE= 126. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.898 MeV/fm**2 PROX-FACTOR= 26.55 MeV
L-RLD= 54 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.98 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -33.0
COMPOUND NUCLEUS: 81.2

FUSION RELATED PARAMETERS:
R-BARRIER=11.93 fm V(RB)= 185.7 MeV
Q-VALUE= -133.7 MeV
L-CRITICAL= 97.

208 Pb on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	34	0.19	8980	7.3	258.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	67	0.38	12703	10.4	182.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	101	0.57	15563	12.7	149.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	134	0.75	17975	14.7	129.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	151	0.85	19068	15.6	121.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	168	0.94	20102	16.4	115.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	185	1.04	21086	17.2	110.1	43	201	0	137.8	8.6	21.1	605	539	636	580	13.71	0.	5	18	1.3	5
6.0	1248	201	1.13	22026	18.0	105.4	81	652	346	105.0	11.1	37.5	823	425	829	309	7.21	1021.	5	18	1.5	6
6.5	1352	218	1.23	22929	18.7	101.3	106	1031	664	87.3	10.8	46.4	1003	349	984	236	5.49	1097.	5	18	1.6	8
7.0	1456	235	1.32	23798	19.4	97.6	127	1355	807	75.3	10.1	52.4	1162	294	1118	198	4.61	1176.	5	18	1.8	9
7.5	1560	252	1.41	24636	20.1	94.3	144	1636	754	66.4	9.3	56.8	1307	253	1237	174	4.05	1255.	7	25	2.0	10
8.0	1664	268	1.51	25448	20.8	91.3	160	1881	706	59.5	8.6	60.2	1442	222	1347	157	3.65	1333.	8	27	2.1	11
8.5	1768	285	1.60	26234	21.4	88.6	174	2097	665	54.0	8.0	63.0	1571	197	1451	144	3.36	1404.	8	29	2.2	13
9.0	1872	302	1.70	26998	22.0	86.1	187	2289	628	49.5	7.4	65.3	1695	177	1550	134	3.12	1481.	9	31	2.3	14
9.5	1976	319	1.79	27742	22.6	83.8	199	2461	595	45.6	6.9	67.2	1815	161	1645	126	2.93	1556.	10	33	2.4	15
10.0	2080	335	1.89	28466	23.2	81.7	211	2615	565	42.4	6.5	68.8	1933	147	1738	119	2.77	1631.	10	35	2.6	16
10.5	2184	352	1.98	29173	23.8	79.7	222	2755	538	39.6	6.1	70.2	2049	135	1829	113	2.63	1705.	11	37	2.7	17
11.0	2288	369	2.07	29864	24.3	77.9	232	2882	514	37.1	5.7	71.5	2163	125	1918	108	2.51	1779.	11	38	2.8	18
11.5	2392	386	2.17	30539	24.9	76.1	242	2998	491	34.9	5.4	72.5	2275	117	2006	104	2.41	1851.	12	40	2.9	19
12.0	2496	403	2.26	31200	25.4	74.5	252	3104	471	33.0	5.2	73.5	2387	109	2093	100	2.32	1923.	13	42	2.9	20
13.0	2704	436	2.45	32483	26.5	71.6	270	3291	435	29.7	4.7	75.1	2608	96	2264	93	2.16	2065.	14	45	3.1	22
14.0	2912	470	2.64	33718	27.5	69.0	287	3452	403	27.1	4.3	76.5	2826	86	2432	88	2.03	2205.	15	48	3.3	24
15.0	3120	503	2.83	34911	28.4	66.7	303	3591	377	24.8	3.9	77.6	3042	78	2598	83	1.93	2341.	16	51	3.5	26
16.0	3328	537	3.02	36065	29.4	64.6	318	3713	353	22.9	3.6	78.5	3257	71	2763	79	1.83	2486.	17	54	3.6	27
17.0	3536	570	3.21	37185	30.3	62.6	333	3821	332	21.3	3.4	79.3	3470	66	2926	76	1.75	2617.	18	56	3.8	29
18.0	3744	604	3.39	38273	31.1	60.9	347	3916	314	19.9	3.2	80.0	3683	61	3089	72	1.68	2746.	19	59	3.9	31
19.0	3952	637	3.58	39332	32.0	59.2	360	4001	297	18.7	3.0	80.7	3896	56	3250	70	1.62	2885.	20	62	4.0	32
20.0	4160	671	3.77	40365	32.8	57.7	373	4078	282	17.6	2.8	81.2	4107	53	3411	67	1.56	3009.	21	64	4.2	34
25.0	5200	839	4.72	45189	36.7	51.6	432	4370	226	13.6	2.2	83.2	5160	40	4208	58	1.35	3638.	26	77	4.8	41
30.0	6240	1006	5.66	49568	40.2	47.1	483	4564	188	11.1	1.8	84.4	6208	32	4995	52	1.21	4239.	31	90	5.3	47
35.0	7280	1174	6.60	53610	43.4	43.6	530	4702	161	9.4	1.5	85.3	7253	27	5777	47	1.10	4823.	36	101	5.8	
40.0	8320	1342	7.54	57387	46.4	40.8	573	4806	141	8.2	1.3	85.9	8297	23	6555	44	1.02	5371.	41	113	6.2	
45.0	9360	1510	8.49	60948	49.2	38.5	613	4887	125	7.2	1.2	86.4	9340	20	7330	41	0.95	5884.	45	124	6.7	
50.0	10400	1677	9.43	64329	51.9	36.5	650	4951	113	6.4	1.0	86.8	10382	18	8102	39	0.90	6397.	50	135	7.1	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#405 208 Pb on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 26. ZC=108.( )
NEUTRON NUMBERS: NP=126. NT= 30. NC=156.

AP**1/3= 5.925 AT**1/3= 3.826 ELSCAT <15 deg
REDUCED MASS NUMBER= 44.12 AP+AT=AC=264.

INTERACTION RADIUS RINT=13.70 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 4.12 CT+CP=10.93 C̄= 2.57

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 4.35

COULOMB RADII [fm]:
RCP= 6.66 RCT= 4.27 RC=RCP+RCT=10.93

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 390.03 MeV K= .24106 n=2.559
VC(RINT)= 223.8 MeV

FISSION-TKE= 217. MeV
ASYMM. FISSION-TKE= 159. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 28.88 MeV
L-RLD= 40 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.61 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -61.4
COMPOUND NUCLEUS: 121.3

FUSION RELATED PARAMETERS:
R-BARRIER=12.31 fm V(RB)= 233.3 MeV
Q-VALUE= -202.2 MeV
L-CRITICAL= 100.

208 Pb on 56 Fe

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	44	0.20	8980	9.7	335.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	416	88	0.39	12703	13.6	237.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	624	132	0.59	15563	16.7	193.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	832	176	0.79	17975	19.3	167.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	936	199	0.89	19068	20.5	158.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	1040	221	0.99	20102	21.6	150.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	1144	243	1.08	21086	22.6	143.1	86	463	184	118.1	15.2	30.9	581	563	598	513	9.54	887.	0 0	1.1	4
6.0	1248	265	1.18	22026	23.6	137.1	127	920	565	94.4	15.3	42.8	799	449	784	348	6.45	960.	0 0	1.4	6
6.5	1352	287	1.28	22929	24.6	131.7	158	1306	531	79.7	14.2	50.1	981	371	933	281	5.20	1032.	0 0	1.6	8
7.0	1456	309	1.38	23798	25.5	126.9	183	1636	493	69.4	13.0	55.3	1141	315	1060	242	4.47	1103.	6 24	1.8	10
7.5	1560	331	1.48	24636	26.4	122.6	206	1922	460	61.6	11.9	59.2	1287	273	1174	215	3.98	1177.	7 27	2.0	11
8.0	1664	353	1.58	25448	27.3	118.7	226	2172	431	55.4	10.9	62.3	1423	241	1278	196	3.62	1246.	8 29	2.1	13
8.5	1768	375	1.68	26234	28.1	115.1	245	2393	406	50.4	10.0	64.8	1554	214	1376	181	3.35	1318.	8 31	2.3	14
9.0	1872	397	1.77	26998	29.0	111.9	262	2589	383	46.3	9.3	66.9	1679	193	1469	169	3.13	1385.	9 33	2.4	16
9.5	1976	419	1.87	27742	29.7	108.9	278	2764	363	42.8	8.7	68.6	1800	176	1558	160	2.95	1456.	10 35	2.6	17
10.0	2080	441	1.97	28466	30.5	106.2	293	2922	345	39.8	8.1	70.1	1919	161	1645	151	2.79	1520.	10 37	2.7	19
10.5	2184	463	2.07	29173	31.3	103.6	308	3064	328	37.2	7.6	71.4	2035	149	1730	144	2.66	1589.	11 38	2.8	20
11.0	2288	485	2.17	29864	32.0	101.2	322	3194	313	34.9	7.2	72.5	2150	138	1812	138	2.55	1651.	11 40	2.9	22
11.5	2392	507	2.27	30539	32.7	99.0	335	3312	300	32.9	6.8	73.5	2264	128	1894	132	2.44	1719.	12 42	3.0	23
12.0	2496	529	2.37	31200	33.4	96.9	348	3421	287	31.1	6.5	74.4	2376	120	1974	128	2.35	1787.	12 44	3.1	24
13.0	2704	574	2.56	32483	34.8	93.1	372	3612	265	28.1	5.9	76.0	2597	107	2131	119	2.20	1919.	14 47	3.4	26
14.0	2912	618	2.76	33718	36.1	89.7	395	3777	246	25.6	5.3	77.2	2816	96	2286	112	2.07	2041.	15 50	3.5	29
15.0	3120	662	2.96	34911	37.4	86.7	416	3919	230	23.5	4.9	78.2	3033	87	2439	107	1.97	2168.	16 53	3.7	31
16.0	3328	706	3.15	36065	38.6	83.9	437	4043	215	21.7	4.6	79.1	3249	79	2589	102	1.87	2293.	17 56	3.9	33
17.0	3536	750	3.35	37185	39.8	81.4	456	4153	203	20.2	4.2	79.9	3463	73	2739	97	1.79	2415.	18 59	4.1	35
18.0	3744	794	3.55	38273	40.9	79.1	475	4251	191	18.9	4.0	80.5	3676	68	2887	93	1.72	2535.	19 62	4.2	37
19.0	3952	838	3.75	39332	42.1	77.0	493	4338	181	17.7	3.7	81.1	3889	63	3034	90	1.66	2652.	20 64	4.4	39
20.0	4160	882	3.94	40365	43.2	75.1	511	4416	172	16.7	3.5	81.6	4101	59	3181	87	1.60	2767.	21 67	4.5	41
25.0	5200	1103	4.93	45189	48.3	67.1	590	4715	138	13.0	2.7	83.5	5156	44	3904	75	1.39	3335.	26 80	5.2	49
30.0	6240	1324	5.91	49568	52.9	61.3	660	4913	115	10.6	2.2	84.7	6204	36	4617	67	1.24	3871.	30 93	5.8	56
35.0	7280	1544	6.90	53610	57.1	56.7	723	5055	98	9.0	1.9	85.5	7250	30	5323	61	1.13	4364.	35 105	6.4	
40.0	8320	1765	7.89	57387	61.0	53.1	781	5161	86	7.8	1.6	86.1	8294	26	6024	57	1.05	4839.	40 116	6.9	
45.0	9360	1985	8.87	60948	64.7	50.0	835	5244	76	6.9	1.5	86.6	9338	22	6722	53	0.98	5304.	45 128	7.4	
50.0	10400	2206	9.86	64329	68.2	47.5	886	5309	69	6.1	1.3	86.9	10380	20	7416	50	0.92	5707.	49 139	7.8	

#406 208 Pb on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 29. ZC=111.( )
NEUTRON NUMBERS: NP=126. NT= 34. NC=160.

AP**1/3= 5.925 AT**1/3= 3.979 ELSCAT <17 deg
REDUCED MASS NUMBER= 48.35 AP+AT=AC=271.

INTERACTION RADIUS RINT=13.87 fm R0= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 4.31 CT+CP=11.13 C̄= 2.64

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 4.53

COULOMB RADII [fm]:
RCP= 6.66 RCT= 4.45 RC=RCP+RCT=11.11

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 429.18 MeV K= .26978 n=2.537
VC(RINT)= 246.6 MeV

FISSION-TKE= 226. MeV
ASYMM. FISSION-TKE= 175. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.896 MeV/fm**2 PROX-FACTOR= 29.75 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.23 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -65.2
COMPOUND NUCLEUS: 143.4

FUSION RELATED PARAMETERS:
R-BARRIER=12.44 fm V(RB)= 257.1 MeV
Q-VALUE= -228.1 MeV
L-CRITICAL= 90.

208 Pb on 63 Cu

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	48	0.20	8980	10.6	374.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	416	97	0.39	12703	15.0	264.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	624	145	0.59	15563	18.3	216.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	832	193	0.78	17975	21.2	187.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	936	218	0.88	19068	22.4	176.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	1040	242	0.98	20102	23.6	167.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	1144	266	1.08	21086	24.8	159.7	92	442	162	120.1	17.2	29.9	531	613	549	592	10.00	865.	0 0	1.1	4
6.0	1248	290	1.18	22026	25.9	152.9	139	913	385	95.6	17.3	42.2	759	489	742	395	6.63	936.	0 0	1.4	6
6.5	1352	314	1.27	22929	27.0	146.9	173	1310	356	80.6	15.9	49.7	948	404	896	316	5.31	1006.	0 0	1.6	8
7.0	1456	338	1.37	23798	28.0	141.5	202	1650	330	70.1	14.5	55.0	1113	343	1025	272	4.56	1076.	6 24	1.8	10
7.5	1560	363	1.47	24636	29.0	136.7	227	1945	308	62.1	13.2	58.9	1263	297	1140	242	4.05	1144.	7 27	2.0	12
8.0	1664	387	1.57	25448	29.9	132.4	249	2202	289	55.9	12.1	62.0	1403	261	1244	220	3.69	1210.	8 29	2.2	14
8.5	1768	411	1.67	26234	30.8	128.4	270	2429	272	50.9	11.2	64.6	1535	233	1342	203	3.40	1281.	8 31	2.3	15
9.0	1872	435	1.76	26998	31.7	124.8	289	2631	257	46.7	10.3	66.7	1662	210	1434	190	3.18	1346.	9 33	2.5	17
9.5	1976	459	1.86	27742	32.6	121.5	307	2812	243	43.1	9.6	68.4	1785	191	1522	179	2.99	1415.	9 35	2.6	18
10.0	2080	484	1.96	28466	33.4	118.4	324	2974	231	40.1	9.0	69.9	1905	175	1607	169	2.83	1478.	10 37	2.7	20
10.5	2184	508	2.06	29173	34.3	115.6	341	3121	220	37.5	8.5	71.3	2023	161	1690	161	2.70	1545.	11 39	2.9	21
11.0	2288	532	2.16	29864	35.1	112.9	356	3255	210	35.2	8.0	72.4	2139	149	1771	154	2.58	1606.	11 41	3.0	23
11.5	2392	556	2.25	30539	35.9	110.4	371	3376	201	33.2	7.5	73.4	2253	139	1850	148	2.48	1672.	12 42	3.1	24
12.0	2496	580	2.35	31200	36.6	108.1	385	3488	192	31.4	7.1	74.3	2366	130	1928	143	2.39	1738.	12 44	3.2	25
13.0	2704	629	2.55	32483	38.1	103.9	412	3686	178	28.3	6.5	75.9	2589	115	2081	133	2.23	1860.	13 47	3.4	28
14.0	2912	677	2.75	33718	39.6	100.1	437	3855	165	25.8	5.9	77.1	2809	103	2231	126	2.10	1978.	14 50	3.6	31
15.0	3120	725	2.94	34911	41.0	96.7	461	4001	154	23.7	5.4	78.2	3026	94	2379	119	1.99	2102.	16 54	3.8	33
16.0	3328	774	3.14	36065	42.3	93.6	484	4130	144	21.9	5.0	79.1	3242	86	2525	113	1.90	2223.	17 57	4.0	35
17.0	3536	822	3.33	37185	43.6	90.8	506	4243	136	20.4	4.7	79.8	3457	79	2669	109	1.82	2342.	18 59	4.2	37
18.0	3744	870	3.53	38273	44.9	88.3	527	4343	128	19.0	4.4	80.5	3671	73	2812	104	1.75	2459.	19 62	4.4	39
19.0	3952	919	3.73	39332	46.1	85.9	547	4433	121	17.9	4.1	81.1	3884	68	2954	100	1.68	2573.	20 65	4.5	41
20.0	4160	967	3.92	40365	47.3	83.7	566	4514	115	16.8	3.9	81.6	4096	64	3095	97	1.62	2685.	21 68	4.7	43
25.0	5200	1209	4.90	45189	52.9	74.9	654	4821	92	13.1	3.0	83.5	5152	48	3791	84	1.41	3223.	25 81	5.4	52
30.0	6240	1451	5.88	49568	57.9	68.4	732	5026	77	10.7	2.5	84.7	6201	39	4476	75	1.26	3727.	30 94	6.0	60
35.0	7280	1692	6.86	53610	62.6	63.3	802	5172	66	9.0	2.1	85.5	7248	32	5153	68	1.15	4204.	35 106	6.6	
40.0	8320	1934	7.84	57387	66.9	59.2	866	5282	57	7.8	1.8	86.1	8292	28	5826	63	1.06	4663.	40 118	7.1	
45.0	9360	2176	8.82	60948	70.9	55.8	926	5367	51	6.9	1.6	86.6	9336	24	6494	59	0.99	5087.	44 129	7.6	
50.0	10400	2418	9.80	64329	74.8	53.0	983	5435	46	6.2	1.4	86.9	10379	21	7159	56	0.94	5505.	49 140	8.0	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fi	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nrs	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#407 208 Pb on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 42. ZC=124.( )
NEUTRON NUMBERS: NP=126. NT= 50. NC=176.

AP**1/3= 5.925 AT**1/3= 4.514 ELSCAT <26 deg
REDUCED MASS NUMBER= 63.79 AP+AT=AC=300.

INTERACTION RADIUS RINT=14.45 fm R0= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 5.00 CT+CP=11.82 C= 2.89

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 5.20

COULOMB RADII [fm]:
RCP= 6.66 RCT= 5.08 RC=RCP+RCT=11.74

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 591.94 MeV K= .37729 n=2.481
VC(RINT)= 342.8 MeV

FISSION-TKE= 268. MeV
ASYMM. FISSION-TKE= 240. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.901 MeV/fm**2 PROX-FACTOR= 32.66 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.26 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -87.5
COMPOUND NUCLEUS: 241.1

FUSION RELATED PARAMETERS:
R-BARRIER=12.87 fm V(RB)= 357.8 MeV
Q-VALUE= -348.1 MeV
L-CRITICAL= 0.

208 Pb on 92 Mo

208 Pb on 92 Mo

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	64	0.19	8980	14.0	542.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	128	0.37	12703	19.7	383.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	191	0.56	15563	24.2	313.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	255	0.74	17975	27.9	271.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	287	0.84	19068	29.6	255.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	319	0.93	20102	31.2	242.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	351	1.02	21086	32.7	231.2	70	146	0	146.5	21.1	16.7	252	892	288	1528	18.93	0.	4	18	0.3	0
6.0	1248	383	1.12	22026	34.2	221.4	159	685	0	108.8	26.0	35.6	547	701	538	685	8.30	0.	4	18	1.0	3
6.5	1352	415	1.21	22929	35.6	212.7	213	1140	0	89.9	23.8	45.1	778	574	725	511	6.18	0.	4	18	1.3	6
7.0	1456	447	1.30	23798	36.9	205.0	256	1528	0	77.3	21.5	51.4	973	483	874	425	5.13	0.	5	23	1.6	8
7.5	1560	478	1.40	24636	38.2	198.0	293	1865	0	68.0	19.4	56.0	1145	415	999	372	4.49	0.	6	26	1.9	11
8.0	1664	510	1.49	25448	39.5	191.7	326	2160	0	60.9	17.6	59.6	1301	363	1110	335	4.04	0.	7	29	2.1	13
8.5	1768	542	1.58	26234	40.7	186.0	356	2420	0	55.2	16.2	62.4	1446	322	1209	307	3.70	0.	8	31	2.3	15
9.0	1872	574	1.67	26998	41.9	180.8	383	2651	0	50.5	14.9	64.8	1583	289	1301	285	3.43	0.	8	33	2.5	18
9.5	1976	606	1.77	27742	43.0	175.9	409	2857	0	46.5	13.8	66.7	1714	262	1388	267	3.22	0.	9	36	2.6	20
10.0	2080	638	1.86	28466	44.1	171.5	433	3043	0	43.2	12.9	68.4	1840	240	1469	252	3.04	0.	10	38	2.8	22
10.5	2184	670	1.95	29173	45.2	167.4	456	3211	0	40.3	12.1	69.8	1964	220	1548	240	2.89	0.	10	39	2.9	24
11.0	2288	702	2.05	29864	46.3	163.5	478	3364	0	37.8	11.4	71.1	2084	204	1624	229	2.76	0.	11	41	3.1	75
11.5	2392	734	2.14	30539	47.3	159.9	499	3503	0	35.6	10.7	72.2	2202	190	1697	219	2.64	0.	11	43	3.2	27
12.0	2496	765	2.23	31200	48.3	156.5	519	3631	0	33.6	10.1	73.2	2319	177	1769	211	2.54	0.	12	45	3.3	29
13.0	2704	829	2.42	32483	50.3	150.4	556	3857	0	30.3	9.2	74.9	2547	157	1908	196	2.37	0.	13	48	3.6	32
14.0	2912	893	2.61	33718	52.2	144.9	592	4051	0	27.5	8.4	76.2	2772	140	2043	185	2.23	0.	14	52	3.8	35
15.0	3120	957	2.79	34911	54.0	140.0	625	4218	0	25.2	7.7	77.4	2993	127	2175	175	2.11	0.	15	55	4.0	38
16.0	3328	1021	2.98	36065	55.8	135.6	657	4365	0	23.3	7.1	78.3	3212	116	2304	166	2.00	0.	16	58	4.2	41
17.0	3536	1084	3.16	37185	57.5	131.5	687	4495	0	21.7	6.6	79.2	3430	106	2431	159	1.92	0.	17	61	4.4	44
18.0	3744	1148	3.35	38273	59.2	127.8	716	4610	0	20.2	6.2	79.9	3646	98	2557	153	1.84	0.	18	64	4.6	47
19.0	3952	1212	3.54	39332	60.8	124.4	744	4713	0	19.0	5.8	80.5	3861	91	2681	147	1.77	0.	19	67	4.8	49
20.0	4160	1276	3.72	40365	62.4	121.3	771	4805	0	17.9	5.5	81.1	4075	85	2804	142	1.71	0.	20	69	5.0	52
25.0	5200	1595	4.65	45189	69.8	108.5	893	5157	0	13.9	4.2	83.1	5136	64	3407	122	1.47	0.	25	83	5.8	62
30.0	6240	1914	5.58	49568	76.4	99.0	1000	5392	0	11.3	3.5	84.3	6188	52	3995	109	1.32	0.	29	96	6.5	71
35.0	7280	2233	6.51	53610	82.5	91.7	1097	5559	0	9.6	2.9	85.2	7237	43	4575	100	1.20	0.	34	108	7.1	
40.0	8320	2551	7.44	57387	88.2	85.7	1186	5685	0	8.3	2.5	85.9	8283	37	5148	92	1.11	0.	39	120	7.7	
45.0	9360	2870	8.37	60948	93.6	80.8	1269	5782	0	7.3	2.2	86.4	9328	32	5715	86	1.04	0.	43	131	8.2	
50.0	10400	3189	9.30	64329	98.7	76.7	1346	5860	0	6.5	2.0	86.7	10371	29	6279	81	0.98	0.	48	143	8.7	

#408 208 Pb on 108 As

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 47. ZC=129.( )
NEUTRON NUMBERS: NP=126. NT= 61. NC=187.

AP**1/3= 5.925 AT**1/3= 4.762 ELSCAT <31 deg
REDUCED MASS NUMBER= 71.09 AP+AT=AC=316.

INTERACTION RADIUS RINT=14.72 fm R0= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 5.32 CT+CP=12.14 C= 2.99

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 5.50

COULOMB RADII [fm]:
RCP= 6.66 RCT= 5.34 RC=RCP+RCT=12.00

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 649.08 MeV K= .40693 n=2.468
VC(RINT)= 376.6 MeV

FISSION-TKE= 284. MeV
ASYMM. FISSION-TKE= 263. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.895 MeV/fm**2 PROX-FACTOR= 33.59 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.95 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -87.6
COMPOUND NUCLEUS: 286.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.08 fm V(RB)= 392.5 MeV
Q-VALUE= -393.6 MeV
L-CRITICAL= 0.

208 Pb on 108 As

208 Pb on 108 As

EL/u	ELAB	ECM	ECM/VC	ρ	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	71	0.19	8980	15.5	606.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	142	0.38	12703	22.0	429.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	213	0.57	15563	26.9	350.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	284	0.76	17975	31.1	303.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	320	0.85	19068	33.0	286.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	355	0.94	20102	34.8	271.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	391	1.04	21086	36.5	258.8	101	247	0	137.3	29.7	21.4	251	893	275	1349	15.05	0.	0	0	0.0	0
6.0	1248	427	1.13	22026	38.1	247.7	191	797	0	104.8	30.1	37.6	543	705	518	724	7.98	0.	0	0	0.9	3
6.5	1352	462	1.23	22929	39.6	238.0	250	1261	0	87.1	26.8	46.4	774	578	698	553	6.09	0.	4	20	1.3	7
7.0	1456	498	1.32	23798	41.1	229.4	298	1659	0	75.2	23.9	52.4	968	488	843	465	5.11	0.	5	24	1.6	9
7.5	1560	533	1.42	24636	42.6	221.6	339	2003	0	66.3	21.5	56.8	1140	420	964	409	4.49	0.	6	27	1.9	12
8.0	1664	569	1.51	25448	44.0	214.6	376	2305	0	59.5	19.5	60.3	1296	368	1069	369	4.05	0.	7	29	2.1	15
8.5	1768	604	1.60	26234	45.3	208.1	409	2570	0	53.9	17.8	63.0	1441	327	1165	339	3.72	0.	8	32	2.3	17
9.0	1872	640	1.70	26998	46.6	202.3	440	2806	0	49.4	16.4	65.3	1578	294	1252	315	3.46	0.	8	34	2.5	20
9.5	1976	675	1.79	27742	47.9	196.9	469	3017	0	45.6	15.2	67.2	1709	267	1334	296	3.25	0.	9	36	2.7	22
10.0	2080	711	1.89	28466	49.2	191.9	496	3207	0	42.3	14.2	68.8	1836	244	1412	280	3.07	0.	10	38	2.8	24
10.5	2184	746	1.98	29173	50.4	187.3	522	3379	0	39.5	13.3	70.2	1960	224	1486	266	2.92	0.	10	40	3.0	26
11.0	2288	782	2.08	29864	51.6	183.0	546	3536	0	37.0	12.5	71.5	2080	208	1558	254	2.79	0.	11	42	3.1	28
11.5	2392	818	2.17	30539	52.7	179.0	570	3678	0	34.9	11.8	72.6	2199	193	1627	244	2.67	0.	11	44	3.3	30
12.0	2496	853	2.27	31200	53.9	175.2	592	3809	0	33.0	11.1	73.5	2315	181	1694	234	2.57	0.	12	45	3.4	32
13.0	2704	924	2.45	32483	56.1	168.3	635	4040	0	29.7	10.1	75.1	2544	160	1825	219	2.40	0.	13	49	3.7	36
14.0	2912	995	2.64	33718	58.2	162.2	675	4238	0	27.0	9.2	76.5	2769	143	1951	206	2.26	0.	14	52	3.9	39
15.0	3120	1066	2.83	34911	60.2	156.7	712	4410	0	24.8	8.4	77.6	2990	130	2074	195	2.14	0.	15	55	4.1	42
16.0	3328	1137	3.02	36065	62.2	151.7	748	4560	0	22.9	7.8	78.5	3210	118	2195	185	2.03	0.	16	58	4.3	46
17.0	3536	1209	3.21	37185	64.1	147.2	783	4692	0	21.3	7.2	79.3	3427	109	2313	177	1.95	0.	17	61	4.5	49
18.0	3744	1280	3.40	38273	66.0	143.0	815	4810	0	19.9	6.8	80.0	3643	101	2430	170	1.87	0.	18	64	4.7	52
19.0	3952	1351	3.59	39332	67.8	139.2	847	4916	0	18.7	6.4	80.7	3858	94	2545	164	1.80	0.	19	67	4.9	54
20.0	4160	1422	3.78	40365	69.5	135.7	877	5010	0	17.6	6.0	81.2	4073	87	2660	158	1.74	0.	20	70	5.1	57
25.0	5200	1777	4.72	45189	77.7	121.4	1015	5370	0	13.6	4.6	83.2	5134	66	3217	137	1.50	0.	25	84	5.9	69
30.0	6240	2133	5.66	49568	85.2	110.8	1137	5610	0	11.1	3.8	84.4	6187	53	3761	122	1.34	0.	29	96	6.6	79
35.0	7280	2488	6.61	53610	92.0	102.6	1247	5782	0	9.4	3.2	85.3	7236	44	4295	111	1.22	0.	34	109	7.3	
40.0	8320	2844	7.55	57387	98.3	96.0	1348	5910	0	8.1	2.8	85.9	8282	38	4822	103	1.13	0.	38	120	7.9	
45.0	9360	3199	8.49	60948	104.3	90.5	1442	6010	0	7.2	2.5	86.4	9327	33	5343	96	1.06	0.	42	132	8.4	
50.0	10400	3554	9.44	64329	109.9	85.8	1530	6090	0	6.4	2.2	86.8	10371	29	5861	91	1.00	0.	47	143	8.9	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#409 208 Pb on 140 Ce

208 Pb on 140 Ce

208 Pb on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 58. ZC=140.( )
NEUTRON NUMBERS: NP=126. NT= 82. NC=208.

AP**1/3= 5.925 AT**1/3= 5.192 ELSCAT <42 deg
REDUCED MASS NUMBER= 83.68 AP+AT=AC=348.

INTERACTION RADIUS RINT=15.18 fm R0= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 5.87 CT+CP=12.69 C= 3.16

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.04

COULOMB RADII [fm]:
RCP= 6.66 RCT= 5.82 RC=RCP+RCT=12.48

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 771.92 MeV K= .46208 n=2.450
VC(RINT)= 450.5 MeV

FISSION-TKE= 321. MeV
ASYMM. FISSION-TKE= 311. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 35.17 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.54 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -88.2
COMPOUND NUCLEUS: 404.2

FUSION RELATED PARAMETERS:
R-BARRIER=13.42 fm V(RB)= 469.8 MeV
Q-VALUE= -511.9 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	208	84	0.19	8980	18.3	748.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	167	0.37	12703	25.9	529.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	251	0.56	15563	31.7	432.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	335	0.74	17975	36.6	374.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	377	0.84	19068	38.8	353.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	418	0.93	20102	40.9	334.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	460	1.02	21086	42.9	319.3	92	147	0	147.9	39.8	16.1	128	1016	151	2194	20.73	0.	0	0	0.0	0
6.0	1248	502	1.11	22026	44.8	305.7	217	743	0	109.3	39.2	35.4	450	798	415	954	8.79	0.	0	0	0.0	0
6.5	1352	544	1.21	22929	46.7	293.7	293	1245	0	90.2	34.0	44.9	699	653	606	709	6.52	0.	4	20	0.9	3
7.0	1456	586	1.30	23798	48.4	283.0	353	1674	0	77.5	29.8	51.2	907	549	756	589	5.41	0.	5	24	1.3	7
7.5	1560	628	1.39	24636	50.1	273.5	404	2047	0	68.2	26.6	55.9	1088	472	878	515	4.73	0.	6	27	1.6	11
8.0	1664	669	1.49	25448	51.8	264.8	449	2373	0	61.1	24.0	59.5	1251	413	984	463	4.25	0.	7	29	1.9	15
8.5	1768	711	1.58	26234	53.4	256.9	490	2660	0	55.3	21.8	62.3	1401	367	1077	424	3.89	0.	7	32	2.1	18
9.0	1872	753	1.67	26998	54.9	249.6	528	2915	0	50.6	20.0	64.7	1543	329	1161	394	3.61	0.	8	34	2.4	21
9.5	1976	795	1.76	27742	56.4	243.0	563	3143	0	46.7	18.5	66.7	1678	298	1239	369	3.39	0.	9	36	2.6	24
10.0	2080	837	1.86	28466	57.9	236.8	597	3349	0	43.3	17.2	68.3	1808	272	1312	349	3.20	0.	9	38	2.7	27
10.5	2184	879	1.95	29173	59.3	231.1	628	3535	0	40.4	16.1	69.8	1934	250	1381	331	3.04	0.	10	40	2.9	29
11.0	2288	920	2.04	29864	60.7	225.8	658	3704	0	37.9	15.1	71.1	2056	232	1448	316	2.90	0.	11	42	3.1	31
11.5	2392	962	2.14	30539	62.1	220.8	687	3858	0	35.6	14.2	72.2	2176	216	1511	303	2.78	0.	11	44	3.2	34
12.0	2496	1004	2.23	31200	63.4	216.2	714	3999	0	33.7	13.5	73.2	2295	201	1573	291	2.67	0.	12	46	3.4	36
13.0	2704	1088	2.41	32483	66.0	207.7	766	4250	0	30.3	12.1	74.8	2526	178	1692	271	2.49	0.	13	49	3.6	40
14.0	2912	1171	2.60	33718	68.5	200.1	815	4464	0	27.6	11.0	76.2	2753	159	1805	255	2.34	0.	14	52	3.9	45
15.0	3120	1255	2.79	34911	70.9	193.4	861	4650	0	25.3	10.1	77.3	2976	144	1915	241	2.21	0.	15	55	4.1	48
16.0	3328	1339	2.97	36065	73.2	187.2	905	4812	0	23.4	9.4	78.3	3197	131	2022	230	2.11	0.	16	59	4.4	52
17.0	3536	1423	3.16	37185	75.5	181.6	947	4955	0	21.7	8.7	79.1	3415	121	2127	220	2.01	0.	17	62	4.6	56
18.0	3744	1506	3.34	38273	77.6	176.5	987	5083	0	20.3	8.1	79.9	3632	112	2230	211	1.93	0.	18	64	4.8	59
19.0	3952	1590	3.53	39332	79.8	171.8	1025	5197	0	19.0	7.6	80.5	3848	104	2332	203	1.86	0.	19	67	5.0	62
20.0	4160	1674	3.72	40365	81.8	167.5	1062	5299	0	17.9	7.2	81.0	4063	97	2432	196	1.80	0.	19	70	5.2	65
25.0	5200	2092	4.64	45189	91.5	149.8	1230	5689	0	13.9	5.6	83.1	5127	73	2919	169	1.55	0.	24	84	6.0	79
30.0	6240	2510	5.57	49568	100.2	136.7	1378	5949	0	11.3	4.6	84.3	6182	58	3390	151	1.38	0.	28	96	6.8	91
35.0	7280	2929	6.50	53610	108.3	126.6	1512	6134	0	9.6	3.8	85.2	7231	49	3851	138	1.26	0.	33	108	7.5	
40.0	8320	3347	7.43	57387	115.8	118.4	1635	6273	0	8.3	3.3	85.9	8278	42	4305	127	1.17	0.	37	120	8.1	
45.0	9360	3766	8.36	60948	122.8	111.6	1749	6381	0	7.3	2.9	86.3	9323	37	4753	119	1.09	0.	41	131	8.6	
50.0	10400	4184	9.29	64329	129.4	105.9	1856	6467	0	6.5	2.6	86.7	10368	32	5196	112	1.03	0.	46	143	9.2	

#410 208 Pb on 154 Sm

208 Pb on 154 Sm

208 Pb on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 62. ZC=144.( )
NEUTRON NUMBERS: NP=126. NT= 92. NC=218.

AP**1/3= 5.925 AT**1/3= 5.360 ELSCAT <47 deg
REDUCED MASS NUMBER= 88.49 AP+AT=AC=362.

INTERACTION RADIUS RINT=15.36 fm R0= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 6.09 CT+CP=12.91 C= 3.22

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.25

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.00 RC=RCP+RCT=12.66

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 813.81 MeV K= .47552 n=2.446
VC(RINT)= 475.9 MeV

FISSION-TKE= 334. MeV
ASYMM. FISSION-TKE= 327. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.881 MeV/fm**2 PROX-FACTOR= 35.60 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.41 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -72.1
COMPOUND NUCLEUS: 450.6

FUSION RELATED PARAMETERS:
R-BARRIER=13.56 fm V(RB)= 496.2 MeV
Q-VALUE= -542.2 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN—EN	TEMP	MULT
1.0	208	88	0.19	8980	19.4	800.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	177	0.37	12703	27.4	566.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	265	0.56	15563	33.5	462.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	354	0.74	17975	38.7	400.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	398	0.84	19068	41.1	377.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	442	0.93	20102	43.3	358.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	487	1.02	21086	45.4	341.3	101	159	0	147.0	46.8	16.5	115	1029	132	2291	20.46	0.	0	0	0.0	0
6.0	1248	531	1.12	22026	47.4	326.8	233	767	0	109.0	42.7	35.5	440	808	396	1015	8.86	0.	0	0	0.0	0
6.5	1352	575	1.21	22929	49.3	314.0	314	1280	0	90.0	36.5	45.0	691	661	586	756	6.58	0.	4	20	0.9	4
7.0	1456	619	1.30	23798	51.2	302.6	378	1720	0	77.4	31.9	51.3	900	556	733	629	5.47	0.	5	24	1.3	8
7.5	1560	664	1.39	24636	53.0	292.3	432	2101	0	68.1	28.3	55.9	1082	478	854	550	4.78	0.	6	27	1.6	12
8.0	1664	708	1.49	25448	54.7	283.0	481	2434	0	61.0	25.5	59.5	1245	419	957	494	4.30	0.	7	29	1.9	16
8.5	1768	752	1.58	26234	56.4	274.6	525	2728	0	55.2	23.2	62.4	1396	372	1048	453	3.94	0.	7	32	2.2	19
9.0	1872	796	1.67	26998	58.1	266.8	565	2989	0	50.5	21.2	64.7	1539	333	1130	421	3.65	0.	8	34	2.4	23
9.5	1976	841	1.77	27742	59.7	259.7	603	3223	0	46.6	19.6	66.7	1674	302	1206	394	3.42	0.	9	36	2.6	26
10.0	2080	885	1.86	28466	61.2	253.1	639	3433	0	43.2	18.2	68.4	1804	276	1277	372	3.23	0.	9	38	2.8	29
10.5	2184	929	1.95	29173	62.7	247.0	672	3623	0	40.3	17.0	69.8	1930	254	1343	354	3.07	0.	10	40	2.9	32
11.0	2288	973	2.05	29864	64.2	241.4	705	3796	0	37.8	16.0	71.1	2053	235	1407	338	2.93	0.	10	42	3.1	34
11.5	2392	1018	2.14	30539	65.6	236.1	735	3954	0	35.6	15.1	72.2	2173	219	1468	324	2.81	0.	11	44	3.2	37
12.0	2496	1062	2.23	31200	67.0	231.1	765	4098	0	33.6	14.2	73.2	2292	204	1527	311	2.70	0.	12	46	3.4	39
13.0	2704	1150	2.42	32483	69.8	222.0	821	4354	0	30.3	12.8	74.9	2524	180	1641	290	2.52	0.	13	49	3.7	44
14.0	2912	1239	2.60	33718	72.4	213.9	873	4573	0	27.5	11.7	76.2	2751	161	1750	273	2.37	0.	14	52	3.9	48
15.0	3120	1327	2.79	34911	75.0	206.7	922	4763	0	25.3	10.7	77.4	2974	146	1854	258	2.24	0.	15	55	4.2	52
16.0	3328	1416	2.98	36065	77.4	200.1	969	4930	0	23.3	9.9	78.3	3195	133	1956	246	2.13	0.	16	59	4.4	56
17.0	3536	1504	3.16	37185	79.8	194.2	1013	5076	0	21.7	9.2	79.2	3414	122	2056	235	2.04	0.	16	62	4.6	60
18.0	3744	1593	3.35	38273	82.1	188.7	1056	5207	0	20.3	8.6	79.9	3631	113	2154	225	1.96	0.	17	64	4.8	63
19.0	3952	1681	3.53	39332	84.4	183.7	1097	5323	0	19.0	8.1	80.5	3847	105	2250	217	1.88	0.	18	67	5.0	66
20.0	4160	1770	3.72	40365	86.6	179.0	1137	5428	0	17.9	7.6	81.1	4062	98	2345	209	1.82	0.	19	70	5.2	70
25.0	5200	2212	4.65	45189	96.8	160.1	1317	5627	0	13.9	5.9	83.1	5126	74	2805	181	1.57	0.	24	84	6.1	84
30.0	6240	2655	5.58	49568	106.0	146.2	1475	6092	0	11.3	4.8	84.3	6181	59	3250	161	1.40	0.	28	96	6.8	96
35.0	7280	3097	6.51	53610	114.5	135.3	1618	6282	0	9.6	4.1	85.2	7231	49	3684	147	1.28	0.	32	108	7.5	
40.0	8320	3539	7.44	57387	122.4	126.6	1749	6424	0	8.3	3.5	85.9	8278	42	4110	136	1.18	0.	37	120	8.1	
45.0	9360	3982	8.37	60948	129.8	119.3	1871	6535	0	7.3	3.1	86.4	9323	37	4531	127	1.10	0.	41	131	8.7	
50.0	10400	4424	9.30	64329	136.9	113.2	1986	6623	0	6.5	2.8	86.7	10367	33	4947	120	1.04	0.	45	142	9.3	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	-h	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nes	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#411 208 Pb on 165 Ho

208 Pb on 165 Ho

208 Pb on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 67. ZC=149.( )
NEUTRON NUMBERS: NP=126. NT= 98. NC=224.

AP**1/3= 5.925 AT**1/3= 5.485 ELSCAT <52 des
REDUCED MASS NUMBER= 92.01 AP+AT=AC=373.

INTERACTION RADIUS RINT=15.50 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 6.25 CT+CP=13.07 C̄= 3.26

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.41

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.15 RC=RCP+RCT=12.81

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 869.06 MeV K= .49772 n=2.442
VC(RINT)= 509.8 MeV

FISSION-TKE= 353. MeV
ASYMM. FISSION-TKE= 349. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.883 MeV/fm**2 PROX-FACTOR= 36.18 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.33 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -63.7
COMPOUND NUCLEUS: 503.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.64 fm V(RB)= 532.7 MeV
Q-VALUE= -587.1 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	92	0.18	8980	20.1	865.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	416	184	0.36	12703	28.5	611.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	624	276	0.54	15563	34.9	499.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	832	368	0.72	17975	40.2	432.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	936	414	0.81	19068	42.7	407.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	1040	460	0.90	20102	45.0	386.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	1144	506	0.99	21086	47.2	368.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	1248	552	1.08	22026	49.3	353.2	210	575	0	118.6	48.3	30.7	338	910	308	1276	10.42	0.	0 0	0.0	0
6.5	1352	598	1.17	22929	51.3	339.3	304	1113	0	96.2	40.8	41.9	613	739	520	883	7.18	0.	3 19	0.5	1
7.0	1456	644	1.26	23798	53.2	327.0	376	1574	0	82.0	35.3	49.0	837	619	680	716	5.81	0.	5 23	1.1	6
7.5	1560	690	1.35	24636	55.1	315.9	436	1974	0	71.9	31.2	54.1	1030	530	810	618	5.02	0.	6 26	1.5	10
8.0	1664	736	1.44	25448	56.9	305.9	488	2323	0	64.1	27.9	57.9	1202	462	919	552	4.47	0.	6 29	1.8	14
8.5	1768	782	1.53	26234	58.7	296.7	536	2631	0	57.9	25.3	61.0	1359	409	1013	503	4.08	0.	7 31	2.0	18
9.0	1872	828	1.62	26998	60.4	288.4	580	2905	0	52.9	23.2	63.5	1505	367	1098	465	3.77	0.	8 34	2.3	21
9.5	1976	874	1.71	27742	62.0	280.7	620	3150	0	48.7	21.4	65.6	1644	332	1175	435	3.52	0.	9 36	2.5	25
10.0	2080	920	1.80	28466	63.6	273.6	658	3370	0	45.1	19.8	67.4	1778	302	1247	410	3.32	0.	9 38	2.7	28
10.5	2184	966	1.90	29173	65.2	267.0	694	3569	0	42.1	18.5	69.0	1906	278	1314	388	3.15	0.	10 40	2.9	31
11.0	2288	1012	1.99	29864	66.7	260.8	728	3751	0	39.4	17.3	70.3	2031	257	1378	370	3.00	0.	10 42	3.0	33
11.5	2392	1058	2.08	30539	68.2	255.1	761	3916	0	37.1	16.3	71.5	2154	238	1439	354	2.87	0.	11 43	3.2	36
12.0	2496	1104	2.17	31200	69.7	249.7	792	4068	0	35.0	15.4	72.5	2273	223	1498	340	2.76	0.	11 45	3.3	39
13.0	2704	1196	2.35	32483	72.6	239.9	851	4336	0	31.5	13.9	74.3	2508	196	1610	317	2.57	0.	12 49	3.6	44
14.0	2912	1288	2.53	33718	75.3	231.2	907	4566	0	28.6	12.6	75.7	2737	175	1716	297	2.41	0.	13 52	3.9	48
15.0	3120	1380	2.71	34911	77.9	223.4	959	4765	0	26.2	11.6	76.9	2962	158	1819	281	2.28	0.	14 55	4.1	52
16.0	3328	1472	2.89	36065	80.5	216.3	1008	4939	0	24.2	10.7	77.9	3184	144	1918	267	2.17	0.	15 58	4.4	56
17.0	3536	1564	3.07	37185	83.0	209.8	1055	5093	0	22.5	9.9	78.8	3403	133	2015	256	2.07	0.	16 61	4.6	60
18.0	3744	1656	3.25	38273	85.4	203.9	1101	5230	0	21.0	9.3	79.5	3621	123	2110	245	1.99	0.	17 64	4.8	64
19.0	3952	1748	3.43	39332	87.7	198.5	1144	5352	0	19.7	8.7	80.2	3838	114	2203	236	1.91	0.	18 67	5.0	67
20.0	4160	1840	3.61	40365	90.0	193.4	1186	5462	0	18.5	8.2	80.7	4054	106	2295	227	1.84	0.	19 70	5.2	71
25.0	5200	2300	4.51	45189	100.6	173.0	1376	5880	0	14.3	6.3	82.8	5120	80	2739	196	1.59	0.	24 83	6.1	86
30.0	6240	2760	5.41	49568	110.2	157.9	1542	6158	0	11.7	5.2	84.2	6176	64	3167	175	1.42	0.	28 96	6.8	99
35.0	7280	3220	6.32	53610	119.1	146.2	1693	6357	0	9.9	4.4	85.1	7227	53	3583	159	1.29	0.	32 108	7.5	
40.0	8320	3680	7.22	57387	127.3	136.8	1831	6506	0	8.5	3.8	85.7	8274	46	3991	147	1.19	0.	36 119	8.1	
45.0	9360	4140	8.12	60948	135.0	129.0	1959	6622	0	7.5	3.3	86.2	9320	40	4394	138	1.12	0.	41 131	8.7	
50.0	10400	4601	9.02	64329	142.3	122.3	2079	6715	0	6.7	3.0	86.6	10365	35	4792	130	1.05	0.	45 142	9.3	

#412 208 Pb on 181 Ta

208 Pb on 181 Ta

208 Pb on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 73. ZC=155.( )
NEUTRON NUMBERS: NP=126. NT=108. NC=234.

AP**1/3= 5.925 AT**1/3= 5.657 ELSCAT <60 des
REDUCED MASS NUMBER= 96.78 AP+AT=AC=389.

INTERACTION RADIUS RINT=15.68 fm RO= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 6.47 CT+CP=13.29 C̄= 3.32

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.62

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.35 RC=RCP+RCT=13.01

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 932.46 MeV K= .51771 n=2.440
VC(RINT)= 548.8 MeV

FISSION-TKE= 375. MeV
ASYMM. FISSION-TKE= 373. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.882 MeV/fm**2 PROX-FACTOR= 36.78 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.22 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -46.0
COMPOUND NUCLEUS: 573.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.76 fm V(RB)= 574.7 MeV
Q-VALUE= -639.0 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	208	97	0.18	8980	21.2	942.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	416	194	0.35	12703	29.9	666.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	624	290	0.53	15563	36.7	544.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	832	387	0.71	17975	42.3	471.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	936	436	0.79	19068	44.9	444.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	1040	484	0.88	20102	47.3	421.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	1144	532	0.97	21086	49.6	401.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	1248	581	1.06	22026	51.9	384.8	188	419	0	127.8	55.8	26.1	246	1002	225	1643	12.50	0.	0 0	0.0	0
6.5	1352	629	1.15	22929	54.0	369.7	301	984	0	101.7	46.0	39.2	543	809	455	1035	7.82	0.	3 18	0.0	0
7.0	1456	677	1.23	23798	56.0	356.3	382	1467	0	86.0	39.3	47.0	781	675	627	818	6.17	0.	4 22	0.9	4
7.5	1560	726	1.32	24636	58.0	344.2	448	1886	0	75.1	34.5	52.5	984	576	763	697	5.25	0.	5 25	1.3	9
8.0	1664	774	1.41	25448	59.9	333.2	506	2252	0	66.7	30.8	56.6	1163	501	877	618	4.65	0.	6 28	1.7	13
8.5	1768	823	1.50	26234	61.7	323.3	558	2575	0	60.2	27.8	59.9	1325	443	974	560	4.22	0.	7 31	1.9	17
9.0	1872	871	1.59	26998	63.5	314.2	605	2862	0	54.9	25.4	62.6	1476	396	1060	517	3.89	0.	8 33	2.2	21
9.5	1976	919	1.68	27742	65.2	305.8	649	3119	0	50.5	23.4	64.8	1619	357	1138	482	3.63	0.	8 35	2.4	25
10.0	2080	968	1.76	28466	66.9	298.1	690	3350	0	46.7	21.6	66.6	1755	325	1209	453	3.41	0.	9 37	2.6	28
10.5	2184	1016	1.85	29173	68.6	290.9	729	3559	0	43.5	20.2	68.2	1886	298	1276	429	3.23	0.	10 39	2.8	31
11.0	2288	1065	1.94	29864	70.2	284.2	766	3749	0	40.7	18.9	69.6	2012	276	1339	408	3.07	0.	10 41	3.0	34
11.5	2392	1113	2.03	30539	71.8	277.9	801	3922	0	38.3	17.8	70.9	2134	256	1399	390	2.94	0.	11 43	3.1	37
12.0	2496	1161	2.12	31200	73.3	272.1	835	4081	0	36.1	16.8	71.9	2257	239	1456	375	2.82	0.	11 45	3.3	40
13.0	2704	1258	2.29	32483	76.3	261.4	898	4362	0	32.4	15.1	73.8	2494	210	1565	348	2.62	0.	12 48	3.6	45
14.0	2912	1355	2.47	33718	79.2	251.9	958	4603	0	29.5	13.7	75.3	2724	188	1669	327	2.46	0.	13 52	3.8	50
15.0	3120	1452	2.65	34911	82.0	243.4	1014	4812	0	27.0	12.5	76.5	2951	169	1767	309	2.32	0.	14 55	4.1	54
16.0	3328	1549	2.82	36065	84.7	235.6	1067	4995	0	24.9	11.6	77.5	3174	154	1863	293	2.21	0.	15 58	4.3	58
17.0	3536	1645	3.00	37185	87.3	228.6	1117	5156	0	23.1	10.8	78.4	3395	141	1956	280	2.11	0.	16 61	4.5	62
18.0	3744	1742	3.17	38273	89.8	222.2	1165	5299	0	21.6	10.0	79.2	3613	131	2046	268	2.02	0.	17 64	4.8	66
19.0	3952	1839	3.35	39332	92.3	216.2	1212	5427	0	20.2	9.4	79.9	3831	121	2135	258	1.94	0.	18 67	5.0	70
20.0	4160	1936	3.53	40365	94.7	210.8	1256	5543	0	19.0	8.9	80.5	4047	113	2223	249	1.87	0.	19 70	5.2	74
25.0	5200	2420	4.41	45189	105.8	188.5	1459	5981	0	14.7	6.8	82.6	5115	85	2644	214	1.61	0.	23 83	6.1	89
30.0	6240	2903	5.29	49568	115.9	172.1	1637	6273	0	12.0	5.6	84.0	6172	68	3047	191	1.44	0.	28 95	6.8	103
35.0	7280	3387	6.17	53610	125.2	159.3	1798	6481	0	10.1	4.7	84.9	7224	56	3439	174	1.31	0.	32 107	7.5	
40.0	8320	3871	7.05	57387	133.9	149.0	1945	6638	0	8.8	4.1	85.6	8272	48	3823	161	1.21	0.	36 119	8.2	
45.0	9360	4355	7.94	60948	142.0	140.5	2082	6759	0	7.7	3.6	86.1	9318	42	4201	150	1.13	0.	40 130	8.7	
50.0	10400	4839	8.82	64329	149.7	133.3	2210	6856	0	6.9	3.2	86.5	10362	38	4574	142	1.07	0.	44 141	9.3	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CN=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#413 208 Pb on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 79. ZC=161.( )
NEUTRON NUMBERS: NP=126. NT=118. NC=244.

AP**1/3= 5.925 AT**1/3= 5.819 ELSCAT <71 des
REDUCED MASS NUMBER=101.18 AP+AT=AC=405.

INTERACTION RADIUS RINT=15.86 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 6.68 CT+CP=13.49 C= 3.37

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.83

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.55 RC=RCP+RCT=13.21

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 994.60 MeV K= .53454 n=2.439
VC(RINT)= 587.4 MeV

FISSION-TKE= 397. MeV
ASYMM. FISSION-TKE= 397. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.880 MeV/fm**2 PROX-FACTOR= 37.32 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.13 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -28.6
COMPOUND NUCLEUS: 646.7

FUSION RELATED PARAMETERS:
R-BARRIER=13.86 fm V(RB)= 616.6 MeV
Q-VALUE= -694.9 MeV
L-CRITICAL= 0.

208 Pb on 197 Au — 208 Pb on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	208	101	0.17	8980	22.1	1020.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	416	202	0.34	12703	31.3	721.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	624	304	0.52	15563	38.3	588.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	832	405	0.69	17975	44.3	510.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	936	455	0.78	19068	46.9	480.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	1040	506	0.86	20102	49.5	456.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	1144	556	0.95	21086	51.9	434.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	1248	607	1.03	22026	54.2	416.4	152	250	0	140.0	65.7	20.0	147	1101	136	2313	16.58	0.	0	0.0	0
6.5	1352	658	1.12	22929	56.4	400.1	291	841	0	108.0	51.8	36.0	468	864	388	1224	8.65	0.	3	17	0.0	0
7.0	1456	708	1.21	23798	58.5	385.5	382	1347	0	90.5	43.7	44.8	723	733	573	933	6.58	0.	4	21	0.5	1
7.5	1560	759	1.29	24636	60.6	372.5	456	1785	0	78.5	38.0	50.7	936	624	717	784	5.52	0.	5	25	1.1	7
8.0	1664	809	1.38	25448	62.6	360.6	519	2168	0	69.6	33.7	55.2	1123	541	835	689	4.85	0.	6	28	1.5	12
8.5	1768	860	1.46	26234	64.5	349.9	575	2506	0	62.6	30.4	58.7	1291	477	936	621	4.37	0.	7	30	1.8	16
9.0	1872	911	1.55	26998	66.4	340.0	627	2807	0	57.0	27.6	61.5	1446	426	1024	571	4.02	0.	8	33	2.1	20
9.5	1976	961	1.64	27742	68.2	330.9	674	3076	0	52.3	25.4	63.8	1592	384	1103	531	3.73	0.	8	35	2.3	24
10.0	2080	1012	1.72	28466	70.0	322.6	718	3318	0	48.4	23.5	65.8	1731	349	1174	498	3.50	0.	9	37	2.5	27
10.5	2184	1062	1.81	29173	71.7	314.8	760	3536	0	45.0	21.9	67.5	1864	320	1241	471	3.31	0.	9	39	2.7	31
11.0	2288	1113	1.89	29864	73.4	307.5	799	3735	0	42.1	20.4	69.0	1993	295	1304	448	3.15	0.	10.	41	2.9	34
11.5	2392	1164	1.98	30539	75.0	300.8	837	3917	0	39.5	19.2	70.2	2119	273	1363	427	3.01	0.	11	43	3.0	37
12.0	2496	1214	2.07	31200	76.7	294.5	873	4083	0	37.3	18.1	71.4	2241	255	1419	410	2.88	0.	11	45	3.2	40
13.0	2704	1315	2.24	32483	79.8	282.9	941	4378	0	33.5	16.3	73.3	2480	224	1526	380	2.67	0.	12	48	3.5	45
14.0	2912	1416	2.41	33718	82.8	272.6	1004	4630	0	30.4	14.8	74.8	2712	200	1626	356	2.51	0.	13	51	3.8	50
15.0	3120	1518	2.58	34911	85.7	263.4	1064	4848	0	27.8	13.5	76.1	2940	180	1722	336	2.37	0.	14	55	4.0	55
16.0	3328	1619	2.76	36065	88.5	255.0	1120	5040	0	25.7	12.5	77.2	3164	164	1814	319	2.25	0.	15	58	4.3	60
17.0	3536	1720	2.93	37185	91.2	247.4	1174	5208	0	23.8	11.6	78.1	3386	150	1903	305	2.14	0.	16	61	4.5	64
18.0	3744	1821	3.10	38273	93.9	240.4	1225	5358	0	22.2	10.8	78.9	3605	139	1990	292	2.05	0.	17	64	4.7	68
19.0	3952	1922	3.27	39332	96.5	234.0	1274	5493	0	20.8	10.1	79.6	3823	129	2075	281	1.97	0.	18	66	4.9	72
20.0	4160	2024	3.44	40365	99.0	228.1	1322	5613	0	19.6	9.5	80.2	4040	120	2158	271	1.90	0.	19	69	5.1	76
25.0	5200	2529	4.31	45189	110.6	204.0	1537	6072	0	15.1	7.4	82.4	5110	90	2559	233	1.64	0.	23	82	6.0	93
30.0	6240	3035	5.17	49568	121.2	186.2	1726	6378	0	12.3	6.0	83.8	6168	72	2941	207	1.46	0.	27	95	6.8	107
35.0	7280	3541	6.03	53610	130.9	172.4	1896	6596	0	10.4	5.1	84.8	7220	60	3312	189	1.33	0.	31	107	7.5	
40.0	8320	4047	6.89	57387	140.0	161.3	2052	6760	0	9.0	4.4	85.5	8269	51	3674	174	1.23	0.	36	118	8.1	
45.0	9360	4553	7.75	60948	148.4	152.1	2197	6887	0	7.9	3.9	86.0	9315	45	4030	163	1.15	0.	40	129	8.7	
50.0	10400	5059	8.61	64329	156.5	144.3	2333	6989	0	7.1	3.4	86.5	10360	40	4381	153	1.08	0.	44	140	9.3	

#414 208 Pb on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 82. ZC=164.( )
NEUTRON NUMBERS: NP=126. NT=126. NC=252.

INTERACTION RADIUS RINT=15.97 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 6.82 CT+CP=13.63 C= 3.41

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.96

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.66 RC=RCP+RCT=13.32

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1023.44 MeV K= .53882 n=2.438
VC(RINT)= 605.3 MeV

FISSION-TKE= 408. MeV
ASYMM. FISSION-TKE= 408. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.876 MeV/fm**2 PROX-FACTOR= 37.50 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.08 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -19.5
COMPOUND NUCLEUS: 685.4

FUSION RELATED PARAMETERS:
R-BARRIER=13.94 fm V(RB)= 635.7 MeV
Q-VALUE= -724.4 MeV
L-CRITICAL= 0.

208 Pb on 208 Pb — 208 Pb on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	208	104	0.17	8980	22.7	1058.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	416	208	0.34	12703	32.2	748.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	624	312	0.52	15563	39.4	611.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	832	416	0.69	17975	45.5	529.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	936	468	0.77	19068	48.3	499.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	1040	520	0.86	20102	50.9	473.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	1144	572	0.94	21086	53.3	451.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
6.0	1248	624	1.03	22026	55.7	432.2	151	233	0	141.5	70.8	19.2	136	1112	121	2497	17.40	0.	0	0.0	0
6.5	1352	676	1.12	22929	58.0	415.3	298	835	0	108.7	54.3	35.7	459	893	374	1284	8.81	0.	3	17	0.0	0
7.0	1456	728	1.20	23798	60.2	400.2	393	1349	0	91.0	45.5	44.5	716	740	559	975	6.67	0.	4	21	0.3	0
7.5	1560	780	1.29	24636	62.3	386.6	470	1795	0	78.9	39.4	50.6	930	630	703	817	5.59	0.	5	25	1.0	6
8.0	1664	832	1.37	25448	64.3	374.3	536	2185	0	69.9	35.0	55.0	1118	546	820	717	4.90	0.	6	27	1.4	11
8.5	1768	884	1.46	26234	66.3	363.2	594	2529	0	62.9	31.4	58.6	1287	481	920	647	4.42	0.	7	30	1.8	16
9.0	1872	936	1.55	26998	68.2	352.9	647	2834	0	57.2	28.6	61.4	1443	429	1007	594	4.06	0.	8	33	2.0	20
9.5	1976	988	1.63	27742	70.1	343.5	696	3108	0	52.5	26.3	63.7	1589	387	1084	552	3.77	0.	8	35	2.3	24
10.0	2080	1040	1.72	28466	71.9	334.8	742	3354	0	48.6	24.3	65.7	1728	352	1155	518	3.54	0.	9	37	2.5	28
10.5	2184	1092	1.80	29173	73.7	326.7	785	3576	0	45.2	22.6	67.4	1862	322	1221	489	3.34	0.	9	39	2.7	31
11.0	2288	1144	1.89	29864	75.4	319.2	826	3779	0	42.2	21.1	68.9	1991	297	1282	465	3.18	0.	10	41	2.8	35
11.5	2392	1196	1.98	30539	77.1	312.2	865	3963	0	39.7	19.8	70.2	2117	275	1340	444	3.03	0.	11	43	3.0	38
12.0	2496	1248	2.06	31200	78.8	305.6	903	4133	0	37.4	18.7	71.3	2239	257	1395	426	2.91	0.	11	45	3.2	41
13.0	2704	1352	2.23	32483	82.0	293.6	973	4432	0	33.6	16.8	73.2	2478	226	1499	395	2.70	0.	12	48	3.5	47
14.0	2912	1456	2.41	33718	85.1	283.0	1039	4689	0	30.5	15.2	74.8	2711	201	1596	370	2.53	0.	13	51	3.8	52
15.0	3120	1560	2.58	34911	88.1	273.4	1100	4911	0	27.9	14.0	76.0	2939	181	1689	349	2.38	0.	14	54	4.0	57
16.0	3328	1664	2.75	36065	91.0	264.7	1159	5105	0	25.7	12.9	77.1	3163	165	1778	332	2.26	0.	15	57	4.3	62
17.0	3536	1768	2.92	37185	93.8	256.8	1215	5277	0	23.9	11.9	78.1	3385	151	1865	317	2.16	0.	16	60	4.5	67
18.0	3744	1872	3.09	38273	96.5	249.6	1268	5430	0	22.3	11.1	78.9	3604	140	1949	303	2.07	0.	17	63	4.7	71
19.0	3952	1976	3.26	39332	99.2	242.9	1319	5566	0	20.9	10.4	79.6	3822	130	2031	292	1.99	0.	18	66	4.9	75
20.0	4160	2080	3.44	40365	101.7	236.7	1368	5689	0	19.6	9.8	80.2	4039	121	2112	281	1.92	0.	19	69	5.1	79
25.0	5200	2600	4.30	45189	113.7	211.8	1591	6155	0	15.2	7.6	82.4	5109	91	2498	242	1.65	0.	23	82	6.0	96
30.0	6240	3120	5.15	49568	124.6	193.3	1786	6466	0	12.4	6.2	83.8	6168	72	2866	215	1.47	0.	27	95	6.8	111
35.0	7280	3640	6.01	53610	134.6	179.0	1963	6688	0	10.4	5.2	84.8	7220	60	3223	196	1.34	0.	31	106	7.5	
40.0	8320	4160	6.87	57387	143.9	167.4	2124	6855	0	9.0	4.5	85.5	8269	51	3571	181	1.24	0.	35	118	8.1	
45.0	9360	4680	7.73	60948	152.6	157.8	2274	6984	0	7.9	4.0	86.0	9315	45	3913	169	1.15	0.	39	129	8.7	
50.0	10400	5200	8.59	64329	160.8	149.7	2415	7088	0	7.1	3.5	86.5	10360	40	4250	159	1.09	0.	43	140	9.3	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nrs	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#415 208 Pb on 209 Bi

208 Pb on 209 Bi

208 Pb on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 83. ZC=165.( )
NEUTRON NUMBERS: NP=126. NT=126. NC=252.

AP**1/3= 5.925 AT**1/3= 5.934
REDUCED MASS NUMBER=104.25 AP+AT=AC=417.

INTERACTION RADIUS RINT=15.98 fm R0= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 6.83 CT+CP=13.64 C̄= 3.41

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 6.97

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.68 RC=RCP+RCT=13.34

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1034.58 MeV K= .54288 n=2.439
VC(RINT)= 612.3 MeV

FISSION-TKE= 412. MeV
ASYMM. FISSION-TKE= 412. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.878 MeV/fm**2 PROX-FACTOR= 37.62 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.08 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: -16.5
COMPOUND NUCLEUS: 696.3

FUSION RELATED PARAMETERS:
R-BARRIER=13.94 fm V(RB)= 643.6 MeV
Q-VALUE= -732.2 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	208	104	0.17	8980	22.8	1071.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	208	0.34	12703	32.2	757.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	313	0.51	15563	39.5	618.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	417	0.68	17975	45.6	535.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	469	0.77	19068	48.4	505.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	521	0.85	20102	51.0	479.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	573	0.94	21086	53.5	457.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1248	625	1.02	22026	55.9	437.5	126	162	0	147.9	74.4	16.0	95	1153	88	3011	20.93	0.	0	0	0.0	0
6.5	1352	678	1.11	22929	58.1	420.3	287	770	0	111.4	55.9	34.3	429	923	351	1354	9.19	0.	3	16	0.0	0
7.0	1456	730	1.19	23798	60.3	405.1	386	1290	0	92.8	46.6	43.6	692	764	542	1010	6.83	0.	4	21	0.0	0
7.5	1560	782	1.28	24636	62.4	391.3	464	1740	0	80.3	40.3	49.8	911	649	690	840	5.68	0.	5	24	1.0	5
8.0	1664	834	1.36	25448	64.5	378.9	531	2134	0	71.1	35.6	54.5	1102	562	811	735	4.96	0.	6	27	1.4	10
8.5	1768	886	1.45	26234	66.5	367.6	590	2482	0	63.9	32.0	58.1	1273	495	912	661	4.47	0.	7	30	1.7	15
9.0	1872	938	1.53	26998	68.4	357.2	644	2791	0	58.1	29.1	61.0	1431	441	1001	606	4.09	0.	7	32	2.0	19
9.5	1976	990	1.62	27742	70.3	347.7	693	3067	0	53.3	26.7	63.4	1579	397	1080	563	3.80	0.	8	35	2.2	23
10.0	2080	1042	1.70	28466	72.1	338.9	740	3315	0	49.2	24.7	65.4	1719	361	1151	528	3.56	0.	9	37	2.4	27
10.5	2184	1095	1.79	29173	73.9	330.7	783	3540	0	45.8	22.9	67.1	1854	330	1218	498	3.36	0.	9	39	2.6	31
11.0	2288	1147	1.87	29864	75.6	323.1	825	3745	0	42.8	21.5	68.6	1983	305	1279	473	3.19	0.	10	41	2.8	34
11.5	2392	1199	1.96	30539	77.3	316.0	864	3931	0	40.2	20.1	69.9	2110	282	1338	452	3.05	0.	11	43	3.0	37
12.0	2496	1251	2.04	31200	79.0	309.4	902	4102	0	37.9	19.0	71.1	2233	263	1393	433	2.92	0.	11	44	3.2	40
13.0	2704	1355	2.21	32483	82.2	297.2	972	4405	0	34.0	17.0	73.0	2473	231	1498	401	2.71	0.	12	48	3.5	46
14.0	2912	1459	2.38	33718	85.3	286.4	1039	4664	0	30.8	15.5	74.6	2706	206	1596	376	2.54	0.	13	51	3.7	52
15.0	3120	1564	2.55	34911	88.3	276.7	1101	4889	0	28.2	14.1	75.9	2935	185	1689	355	2.39	0.	14	54	4.0	57
16.0	3328	1668	2.72	36065	91.2	267.9	1159	5085	0	26.0	13.0	77.0	3159	169	1778	337	2.27	0.	15	57	4.2	61
17.0	3536	1772	2.89	37185	94.0	259.9	1215	5259	0	24.1	12.1	77.9	3381	155	1865	321	2.17	0.	16	60	4.5	66
18.0	3744	1876	3.06	38273	96.7	252.6	1269	5413	0	22.5	11.3	78.7	3601	143	1949	308	2.08	0.	17	63	4.7	70
19.0	3952	1981	3.23	39332	99.4	245.9	1320	5551	0	21.1	10.6	79.5	3820	132	2031	296	2.00	0.	18	66	4.9	74
20.0	4160	2085	3.41	40365	102.0	239.6	1369	5675	0	19.9	9.9	80.1	4036	124	2112	285	1.92	0.	19	69	5.1	78
25.0	5200	2606	4.26	45189	114.0	214.3	1594	6146	0	15.3	7.7	82.3	5108	92	2498	245	1.65	0.	23	82	6.0	95
30.0	6240	3127	5.11	49568	124.9	195.7	1790	6460	0	12.5	6.3	83.8	6166	74	2866	218	1.47	0.	27	95	6.8	110
35.0	7280	3649	5.96	53610	134.9	181.1	1967	6685	0	10.5	5.3	84.7	7219	61	3221	199	1.34	0.	31	106	7.5	
40.0	8320	4170	6.81	57387	144.2	169.4	2129	6853	0	9.1	4.6	85.4	8268	52	3569	183	1.24	0.	35	118	8.1	
45.0	9360	4691	7.66	60948	153.0	159.8	2280	6984	0	8.0	4.0	86.0	9314	46	3910	171	1.16	0.	39	129	8.7	
50.0	10400	5212	8.51	64329	161.2	151.6	2421	7089	0	7.2	3.6	86.4	10359	41	4246	161	1.09	0.	43	140	9.3	

#416 208 Pb on 238 U

208 Pb on 238 U

208 Pb on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 82. ZT= 92. ZC=174.( )
NEUTRON NUMBERS: NP=126. NT=146. NC=272.

AP**1/3= 5.925 AT**1/3= 6.197
REDUCED MASS NUMBER=111.00 AP+AT=AC=446.

INTERACTION RADIUS RINT=16.27 fm R0= 1.34 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 6.82 CT= 7.16 CT+CP=13.98 C̄= 3.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 6.96 RT= 7.30

COULOMB RADII [fm]:
RCP= 6.66 RCT= 6.98 RC=RCP+RCT=13.64

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1121.53 MeV K= .55568 n=2.440
VC(RINT)= 666.8 MeV

FISSION-TKE= 447. MeV
ASYMM. FISSION-TKE= 445. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.870 MeV/fm**2 PROX-FACTOR= 38.18 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 1.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: -19.5 TARGET: 47.2
COMPOUND NUCLEUS: 805.7

FUSION RELATED PARAMETERS:
R-BARRIER=14.12 fm V(RB)= 703.3 MeV
Q-VALUE= -778.0 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	208	111	0.17	8980	24.3	1187.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	416	222	0.33	12703	34.3	840.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	624	333	0.50	15563	42.0	685.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	832	444	0.67	17975	48.6	593.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	936	499	0.75	19068	51.5	560.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1040	555	0.83	20102	54.3	531.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1144	610	0.92	21086	56.9	506.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1248	666	1.00	22026	59.5	484.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	1352	721	1.08	22929	61.9	465.9	275	624	0	118.9	66.0	30.5	354	998	276	1693	10.57	0.	2	15	0.0	0
7.0	1456	777	1.17	23798	64.2	449.0	392	1175	0	97.8	53.3	41.1	633	823	480	1193	7.41	0.	4	20	0.0	0
7.5	1560	832	1.25	24636	66.5	433.8	481	1653	0	84.1	45.5	48.0	864	696	636	972	6.04	0.	5	24	1.0	6
8.0	1664	888	1.33	25448	68.7	420.0	556	2070	0	74.1	40.0	53.0	1063	601	760	842	5.22	0.	6	27	1.4	11
8.5	1768	943	1.41	26234	70.8	407.4	623	2438	0	66.4	35.7	56.8	1240	528	864	752	4.67	0.	7	29	1.7	16
9.0	1872	999	1.50	26998	72.8	396.0	682	2765	0	60.3	32.4	59.9	1403	469	953	687	4.26	0.	7	32	2.0	20
9.5	1976	1054	1.58	27742	74.8	385.4	737	3058	0	55.2	29.6	62.4	1554	422	1032	636	3.94	0.	8	34	2.2	25
10.0	2080	1110	1.66	28466	76.8	375.6	788	3321	0	51.0	27.3	64.5	1697	383	1103	595	3.69	0.	9	36	2.4	29
10.5	2184	1165	1.75	29173	78.7	366.6	836	3560	0	47.3	25.4	66.3	1834	350	1168	560	3.47	0.	9	38	2.6	33
11.0	2288	1221	1.83	29864	80.5	358.2	882	3776	0	44.2	23.7	67.9	1965	323	1228	532	3.29	0.	10	40	2.8	36
11.5	2392	1276	1.91	30539	82.3	350.3	925	3974	0	41.5	22.2	69.3	2093	299	1284	507	3.14	0.	10	42	3.0	40
12.0	2496	1332	2.00	31200	84.1	342.9	966	4155	0	39.1	20.9	70.5	2218	278	1338	485	3.01	0.	11	44	3.2	43
13.0	2704	1443	2.16	32483	87.5	329.5	1044	4476	0	35.0	18.7	72.5	2460	244	1438	449	2.78	0.	12	47	3.5	50
14.0	2912	1554	2.33	33718	90.8	317.5	1116	4750	0	31.8	17.0	74.1	2695	217	1530	420	2.60	0.	13	51	3.7	56
15.0	3120	1665	2.50	34911	94.0	306.7	1184	4989	0	29.1	15.5	75.5	2925	195	1618	396	2.45	0.	14	54	4.0	61
16.0	3328	1776	2.66	36065	97.1	297.0	1248	5197	0	26.8	14.3	76.6	3150	178	1702	376	2.33	0.	15	57	4.2	66
17.0	3536	1887	2.83	37185	100.1	288.1	1309	5381	0	24.8	13.3	77.6	3373	163	1782	358	2.22	0.	16	60	4.5	71
18.0	3744	1998	3.00	38273	103.0	280.0	1367	5544	0	23.1	12.4	78.4	3594	150	1861	343	2.12	0.	17	63	4.7	76
19.0	3952	2109	3.16	39332	105.8	272.5	1423	5690	0	21.7	11.6	79.2	3813	139	1937	330	2.04	0.	17	65	4.9	80
20.0	4160	2220	3.33	40365	108.6	265.6	1477	5822	0	20.4	10.9	79.8	4030	130	2011	318	1.97	0.	18	68	5.1	85
25.0	5200	2775	4.16	45189	121.4	237.6	1721	6321	0	15.7	8.4	82.1	5103	97	2366	273	1.69	0.	23	81	6.0	103
30.0	6240	3330	4.99	49568	133.0	216.9	1934	6654	0	12.8	6.8	83.6	6163	77	2702	243	1.50	0.	27	94	6.8	119
35.0	7280	3885	5.83	53610	143.6	200.8	2126	6892	0	10.8	5.8	84.6	7216	64	3026	221	1.37	0.	31	105	7.5	
40.0	8320	4440	6.66	57387	153.5	187.8	2302	7070	0	9.3	5.0	85.3	8265	55	3341	204	1.26	0.	35	117	8.1	
45.0	9360	4995	7.49	60948	162.9	177.1	2466	7209	0	8.2	4.4	85.9	9312	48	3650	190	1.18	0.	39	127	8.7	
50.0	10400	5550	8.32	64329	171.7	168.0	2619	7320	0	7.3	3.9	86.3	10358	42	3954	179	1.11	0.	43	138	9.3	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 208 Pb

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#417 238 U on 12 C

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 6. ZC= 98.(Cf)
NEUTRON NUMBERS: NP=146. NT= 6. NC=152.

AP**1/3= 6.197 AT**1/3= 2.289 ELSCAT < 2 deg
REDUCED MASS NUMBER= 11.42 AP+AT=AC=250.

INTERACTION RADIUS RINT=12.31 fm R0= 1.45 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 2.12 CT+CP= 9.29 C= 1.64

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 2.52

COULOMB RADII [fm]:
RCP= 6.98 RCT= 2.51 RC=RCP+RCT= 9.49

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 110.69 MeV K= .02574 n=3.092
VC(RINT)= 64.5 MeV

FISSION-TKE= 185. MeV
ASYMM. FISSION-TKE= 43. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.873 MeV/fm**2 PROX-FACTOR= 17.96 MeV
L-RLD= 70 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 16.90 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: 0.0
COMPOUND NUCLEUS: 72.3

FUSION RELATED PARAMETERS:
R-BARRIER=11.14 fm V(RB)= 66.0 MeV
Q-VALUE= -25.0 MeV
L-CRITICAL= 64.

238 U on 12 C

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	11	0.18	10275	2.5	86.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	476	23	0.35	14536	3.5	61.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	714	34	0.53	17807	4.3	50.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	952	46	0.71	20567	5.0	43.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	1071	51	0.80	21818	5.3	41.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	1190	57	0.89	23001	5.6	38.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	1309	63	0.97	24127	5.9	37.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	1428	69	1.06	25203	6.1	35.5	18	310	142	125.6	2.4	27.2	1221	207	1236	145	9.40	1331.	6 17	1.2	5
6.5	1547	74	1.15	26236	6.4	34.1	28	668	431	100.4	2.9	39.8	1390	167	1385	94	6.04	1442.	6 17	1.3	5
7.0	1666	80	1.24	27230	6.6	32.9	36	971	679	85.1	2.9	47.4	1527	139	1521	75	4.79	1547.	6 17	1.3	6
7.5	1785	86	1.33	28189	6.8	31.7	42	1232	894	74.3	2.7	52.8	1666	119	1651	64	4.09	1658.	6 17	1.4	6
8.0	1904	91	1.42	29118	7.1	30.7	47	1460	1082	66.2	2.6	56.9	1800	104	1776	57	3.63	1761.	6 17	1.5	7
8.5	2023	97	1.51	30018	7.3	29.8	52	1660	1247	59.7	2.4	60.2	1931	92	1897	51	3.30	1863.	9 24	1.5	8
9.0	2142	103	1.60	30892	7.5	29.0	56	1837	1395	54.4	2.3	62.8	2060	82	2017	47	3.04	1973.	9 25	1.6	8
9.5	2261	109	1.68	31743	7.7	28.2	60	1996	1527	50.1	2.1	65.0	2187	74	2134	44	2.84	2074.	10 27	1.6	9
10.0	2380	114	1.77	32572	7.9	27.5	64	2138	1645	46.4	2.0	66.8	2313	67	2251	42	2.67	2183.	10 28	1.7	9
10.5	2499	120	1.86	33381	8.1	26.8	68	2266	1753	43.2	1.9	68.4	2437	62	2366	39	2.53	2282.	11 30	1.7	10
11.0	2618	126	1.95	34171	8.3	26.2	71	2383	1850	40.4	1.8	69.8	2561	57	2481	38	2.41	2391.	12 31	1.8	10
11.5	2737	131	2.04	34944	8.5	25.6	74	2489	1833	38.0	1.7	71.0	2684	53	2595	36	2.30	2489.	12 32	1.8	11
12.0	2856	137	2.13	35700	8.7	25.1	78	2587	1756	35.9	1.6	72.1	2807	49	2708	34	2.21	2598.	13 34	1.9	11
13.0	3094	149	2.30	37168	9.0	24.1	83	2759	1621	32.2	1.5	73.9	3050	44	2934	32	2.05	2802.	14 36	2.0	12
14.0	3332	160	2.48	38581	9.3	23.2	89	2906	1505	29.3	1.4	75.4	3293	39	3159	30	1.93	3005.	15 39	2.1	13
15.0	3570	171	2.66	39946	9.7	22.4	94	3034	1405	26.8	1.2	76.6	3535	35	3383	28	1.82	3206.	16 41	2.2	14
16.0	3808	183	2.84	41267	10.0	21.7	99	3145	1317	24.8	1.2	77.6	3776	32	3606	27	1.73	3406.	17 43	2.2	15
17.0	4046	194	3.01	42548	10.3	21.1	104	3243	1240	23.0	1.1	78.5	4017	29	3828	26	1.65	3603.	18 46	2.3	16
18.0	4284	206	3.19	43793	10.6	20.5	108	3330	1171	21.5	1.0	79.3	4257	27	4051	25	1.58	3799.	19 48	2.4	17
19.0	4522	217	3.37	45005	10.9	19.9	112	3408	1109	20.1	0.9	79.9	4497	25	4272	24	1.52	4010.	20 50	2.5	17
20.0	4760	228	3.54	46187	11.2	19.4	117	3478	1054	18.9	0.9	80.5	4736	24	4494	23	1.47	4203.	21 52	2.6	18
25.0	5950	286	4.43	51707	12.5	17.4	135	3743	843	14.6	0.7	82.7	5932	18	5598	20	1.27	5163.	26 63	2.9	22
30.0	7140	343	5.32	56717	13.7	15.9	152	3918	702	11.9	0.6	84.0	7126	14	6698	18	1.13	6087.	31 74	3.2	26
35.0	8330	400	6.20	61342	14.8	14.7	167	4044	602	10.1	0.5	85.0	8318	12	7796	16	1.03	7006.	36 84	3.5	
40.0	9520	457	7.09	65664	15.8	13.7	180	4137	527	8.7	0.4	85.6	9510	10	8893	15	0.95	7898.	41 94	3.7	
45.0	10710	514	7.98	69738	16.8	13.0	193	4210	468	7.7	0.4	86.2	10701	9	9988	14	0.89	8763.	46 103	4.0	
50.0	11900	571	8.86	73607	17.7	12.3	205	4267	421	6.9	0.3	86.6	11892	8	11082	13	0.84	9601.	51 113	4.2	

#418 238 U on 16 O

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 8. ZC=100.(Fm)
NEUTRON NUMBERS: NP=146. NT= 8. NC=154.

AP**1/3= 6.197 AT**1/3= 2.520 ELSCAT < 3 deg
REDUCED MASS NUMBER= 14.99 AP+AT=AC=254.

INTERACTION RADIUS RINT=12.57 fm R0= 1.44 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 2.42 CT+CP= 9.59 C= 1.81

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 2.78

COULOMB RADII [fm]:
RCP= 6.98 RCT= 2.78 RC=RCP+RCT= 9.76

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 145.05 MeV K= .04281 n=2.963
VC(RINT)= 84.2 MeV

FISSION-TKE= 191. MeV
ASYMM. FISSION-TKE= 56. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.875 MeV/fm**2 PROX-FACTOR= 19.91 MeV
L-RLD= 66 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 12.97 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -4.7
COMPOUND NUCLEUS: 82.0

FUSION RELATED PARAMETERS:
R-BARRIER=11.37 fm V(RB)= 86.7 MeV
Q-VALUE= -39.5 MeV
L-CRITICAL= 75.

238 U on 16 O

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SIGMAR	SIGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	15	0.18	10275	3.3	115.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
2.0	476	30	0.36	14536	4.6	81.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
3.0	714	45	0.53	17807	5.7	66.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.0	952	60	0.71	20567	6.6	57.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
4.5	1071	67	0.80	21818	7.0	54.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.0	1190	75	0.89	23001	7.3	51.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
5.5	1309	82	0.98	24127	7.7	49.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0 0	0.0	0
6.0	1428	90	1.07	25203	8.0	47.3	25	336	145	123.8	3.3	28.1	1166	262	1183	187	9.27	1311.	6 17	1.3	5
6.5	1547	97	1.16	26236	8.4	45.5	39	704	446	99.4	3.8	40.3	1395	212	1339	129	6.07	1414.	6 17	1.4	6
7.0	1666	105	1.25	27230	8.7	43.8	48	1016	705	84.4	3.8	47.8	1489	177	1490	99	4.84	1517.	6 17	1.4	7
7.5	1785	112	1.34	28189	9.0	42.3	56	1286	928	73.7	3.6	53.1	1633	152	1613	84	4.15	1619.	6 17	1.5	8
8.0	1904	120	1.42	29118	9.3	41.0	64	1520	1124	65.6	3.4	57.2	1772	132	1739	75	3.69	1727.	6 17	1.6	8
8.5	2023	127	1.51	30018	9.6	39.8	70	1727	1297	59.3	3.2	60.4	1906	117	1861	68	3.35	1827.	9 25	1.7	9
9.0	2142	135	1.60	30892	9.8	38.6	76	1911	1450	54.1	3.0	63.0	2038	104	1980	63	3.09	1927.	9 27	1.7	10
9.5	2261	142	1.69	31743	10.1	37.6	81	2075	1588	49.7	2.8	65.1	2167	94	2097	59	2.89	2034.	10 28	1.8	10
10.0	2380	150	1.78	32572	10.4	36.6	86	2222	1690	46.1	2.6	67.0	2294	86	2213	55	2.72	2132.	10 30	1.9	11
10.5	2499	157	1.87	33381	10.6	35.8	91	2355	1609	42.9	2.5	68.5	2420	79	2327	52	2.57	2230.	11 31	1.9	12
11.0	2618	165	1.96	34171	10.9	34.9	96	2476	1536	40.2	2.4	69.9	2545	73	2440	50	2.45	2336.	12 32	2.0	12
11.5	2737	172	2.05	34944	11.1	34.2	100	2587	1469	37.8	2.2	71.1	2669	68	2553	48	2.34	2432.	12 34	2.0	13
12.0	2856	180	2.14	35700	11.4	33.5	104	2688	1408	35.6	2.1	72.2	2793	63	2664	46	2.25	2527.	13 35	2.1	14
13.0	3094	195	2.31	37168	11.8	32.1	112	2866	1300	32.0	1.9	74.0	3038	56	2886	43	2.09	2726.	14 38	2.2	15
14.0	3332	210	2.49	38581	12.3	31.0	119	3019	1207	29.1	1.8	75.4	3282	50	3107	40	1.96	2924.	15 40	2.3	16
15.0	3570	225	2.67	39946	12.7	29.9	126	3151	1126	26.7	1.6	76.7	3525	45	3326	38	1.86	3119.	16 43	2.4	17
16.0	3808	240	2.85	41267	13.1	29.0	133	3267	1056	24.6	1.5	77.7	3767	41	3545	36	1.76	3313.	17 45	2.5	18
17.0	4046	255	3.03	42548	13.5	28.1	139	3369	994	22.9	1.4	78.6	4008	38	3763	34	1.68	3505.	18 48	2.6	19
18.0	4284	270	3.20	43793	13.9	27.3	145	3459	939	21.3	1.3	79.3	4249	35	3980	33	1.62	3696.	19 50	2.7	20
19.0	4522	285	3.38	45005	14.3	26.6	151	3540	889	20.0	1.2	80.0	4490	32	4197	32	1.55	3884.	20 53	2.8	21
20.0	4760	300	3.56	46187	14.7	25.9	156	3613	845	18.8	1.2	80.6	4730	30	4413	31	1.50	4071.	21 55	2.9	22
25.0	5950	375	4.45	51707	16.4	23.2	181	3889	676	14.6	0.9	82.7	5927	23	5491	26	1.29	4980.	26 66	3.2	27
30.0	7140	450	5.34	56717	18.0	21.2	203	4072	563	11.9	0.7	84.1	7122	18	6564	23	1.15	5870.	31 77	3.6	31
35.0	8330	525	6.23	61342	19.4	19.6	223	4202	482	10.0	0.6	85.0	8315	15	7634	21	1.05	6756.	36 88	3.9	
40.0	9520	600	7.12	65664	20.7	18.3	242	4300	422	8.7	0.5	85.7	9507	13	8702	20	0.97	7581.	41 98	4.2	
45.0	10710	675	8.01	69738	22.0	17.3	259	4376	375	7.6	0.5	86.2	10699	11	9769	18	0.91	8410.	46 108	4.5	
50.0	11900	750	8.90	73607	23.2	16.4	275	4436	338	6.8	0.4	86.6	11890	10	10634	17	0.85	9169.	51 118	4.7	

MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#419 238 U on 27 Al

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 13. ZC=105.( )
NEUTRON NUMBERS: NP=146. NT= 14. NC=160.

AP**1/3= 6.197 AT**1/3= 3.000 ELSCAT < 6 deg
REDUCED MASS NUMBER= 24.25 AP+AT=AC=265.

INTERACTION RADIUS RINT=13.09 fm RO= 1.42 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 3.05 CT+CP=10.21 C= 2.14

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 3.35

COULOMB RADII [fm]:
RCP= 6.98 RCT= 3.32 RC=RCP+RCT=10.30

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 227.05 MeV K= .09182 n=2.780
VC(RINT)= 131.3 MeV

FISSION-TKE= 206. MeV
ASYMM. FISSION-TKE= 89. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.879 MeV/fm**2 PROX-FACTOR= 23.61 MeV
L-RLD= 53 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 8.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -20.6
COMPOUND NUCLEUS: 111.8

FUSION RELATED PARAMETERS:
R-BARRIER=11.83 fm V(RB)= 136.0 MeV
Q-VALUE= -85.2 MeV
L-CRITICAL= 97.

238 U on 27 Al

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	24	0.18	10275	5.3	188.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	48	0.37	14536	7.5	133.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	73	0.55	17807	9.2	108.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	97	0.74	20567	10.6	94.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	109	0.83	21818	11.3	88.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	121	0.92	23001	11.9	84.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	133	1.02	24127	12.4	80.3	19	83	0	153.1	3.3	13.5	956	453	890	652	21.39	0.	6	18	1.2	5
6.0	1428	145	1.11	25203	13.0	76.9	53	537	287	111.1	6.3	34.4	1073	355	1087	247	7.80	1253.	6	18	1.3	6
6.5	1547	158	1.20	26236	13.5	73.9	72	917	603	91.4	6.5	44.3	1257	290	1252	181	5.71	1347.	6	18	1.5	8
7.0	1666	170	1.29	27230	14.0	71.2	87	1241	874	78.4	6.2	50.8	1422	244	1397	150	4.72	1445.	6	18	1.6	9
7.5	1785	182	1.38	28189	14.5	68.8	100	1521	1109	69.0	5.8	55.5	1575	210	1531	130	4.11	1542.	6	18	1.7	10
8.0	1904	194	1.48	29118	15.0	66.6	111	1766	1314	61.7	5.4	59.2	1721	183	1657	117	3.69	1638.	8	25	1.8	11
8.5	2023	206	1.57	30018	15.5	64.6	122	1982	1257	55.9	5.0	62.1	1860	163	1778	107	3.38	1734.	9	27	1.9	12
9.0	2142	218	1.66	30892	15.9	62.8	131	2173	1187	51.1	4.7	64.5	1996	146	1894	99	3.13	1828.	9	29	2.0	13
9.5	2261	230	1.75	31743	16.3	61.1	140	2344	1125	47.1	4.4	66.5	2129	132	2008	93	2.93	1922.	10	31	2.1	14
10.0	2380	242	1.85	32572	16.8	59.6	149	2498	1069	43.7	4.1	68.2	2259	121	2120	88	2.77	2015.	10	32	2.2	15
10.5	2499	255	1.94	33381	17.2	58.1	156	2638	1018	40.8	3.9	69.6	2388	111	2230	84	2.63	2108.	11	34	2.3	16
11.0	2618	267	2.03	34171	17.6	56.8	164	2764	971	38.2	3.7	70.9	2515	103	2339	80	2.51	2208.	12	36	2.3	16
11.5	2737	279	2.12	34944	18.0	55.5	171	2880	929	35.9	3.5	72.0	2642	95	2446	76	2.40	2299.	12	37	2.4	17
12.0	2856	291	2.22	35700	18.4	54.4	178	2985	890	33.9	3.3	73.0	2767	89	2553	73	2.31	2389.	13	39	2.5	18
13.0	3094	315	2.40	37168	19.1	52.2	191	3172	822	30.6	3.0	74.7	3015	79	2764	68	2.15	2567.	14	41	2.6	20
14.0	3332	339	2.58	38581	19.8	50.3	203	3332	763	27.8	2.8	76.1	3262	70	2974	64	2.02	2754.	15	44	2.8	21
15.0	3570	364	2.77	39946	20.5	48.6	215	3471	712	25.5	2.5	77.3	3506	64	3181	61	1.91	2926.	16	47	2.9	23
16.0	3808	388	2.95	41267	21.2	47.1	226	3592	668	23.5	2.4	78.2	3750	58	3387	58	1.82	3108.	17	50	3.0	24
17.0	4046	412	3.14	42548	21.9	45.7	236	3699	628	21.9	2.2	79.1	3993	53	3593	55	1.74	3275.	18	52	3.1	26
18.0	4284	436	3.32	43793	22.5	44.4	246	3794	593	20.4	2.1	79.8	4235	49	3797	53	1.67	3453.	19	55	3.3	27
19.0	4522	461	3.51	45005	23.1	43.2	256	3879	562	19.2	1.9	80.4	4476	46	4001	51	1.61	3615.	20	57	3.4	29
20.0	4760	485	3.69	46187	23.7	42.1	265	3955	534	18.0	1.8	81.0	4717	43	4204	49	1.55	3789.	21	60	3.5	30
25.0	5950	606	4.62	51707	26.5	37.7	307	4245	427	14.0	1.4	83.0	5918	32	5214	43	1.34	4615.	26	72	4.0	36
30.0	7140	727	5.54	56717	29.0	34.4	344	4438	356	11.4	1.2	84.3	7114	26	6217	38	1.19	5393.	31	84	4.4	42
35.0	8330	849	6.46	61342	31.4	31.8	378	4576	305	9.6	1.0	85.2	8308	22	7216	35	1.09	6151.	36	95	4.8	
40.0	9520	970	7.38	65664	33.5	29.8	408	4679	267	8.3	0.8	85.8	9502	18	8211	32	1.01	6868.	41	106	5.2	
45.0	10710	1091	8.31	69738	35.6	28.1	437	4759	237	7.4	0.7	86.3	10694	16	9204	30	0.94	7582.	46	116	5.5	
50.0	11900	1212	9.23	73607	37.5	26.6	464	4823	213	6.6	0.7	86.7	11886	14	10195	28	0.89	8263.	51	127	5.8	

#420 238 U on 40 Ca

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 20. ZC=112.( )
NEUTRON NUMBERS: NP=146. NT= 20. NC=166.

AP**1/3= 6.197 AT**1/3= 3.420 ELSCAT < 9 deg
REDUCED MASS NUMBER= 34.24 AP+AT=AC=278.

INTERACTION RADIUS RINT=13.55 fm RO= 1.41 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 3.59 CT+CP=10.76 C= 2.39

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 3.85

COULOMB RADII [fm]:
RCP= 6.98 RCT= 3.84 RC=RCP+RCT=10.82

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 337.01 MeV K= .16937 n=2.647
VC(RINT)= 195.2 MeV

FISSION-TKE= 228. MeV
ASYMM. FISSION-TKE= 134. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.888 MeV/fm**2 PROX-FACTOR= 26.69 MeV
L-RLD= 32 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 5.86 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -33.0
COMPOUND NUCLEUS: 154.7

FUSION RELATED PARAMETERS:
R-BARRIER=12.20 fm V(RB)= 203.5 MeV
Q-VALUE= -140.5 MeV
L-CRITICAL= 93.

238 U on 40 Ca

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	34	0.18	10275	7.5	289.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	68	0.35	14536	10.6	204.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	103	0.53	17807	13.0	167.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	137	0.70	20567	15.0	144.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	154	0.79	21818	15.9	136.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	171	0.88	23001	16.7	129.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	188	0.96	24127	17.6	123.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	205	1.05	25203	18.3	118.3	55	291	44	130.3	8.2	24.9	849	579	862	530	11.35	1195.	6	19	1.4	6
6.5	1547	223	1.14	26236	19.1	113.6	90	718	401	103.1	9.7	38.5	1080	467	1086	324	6.89	1286.	6	19	1.5	8
7.0	1666	240	1.23	27230	19.8	109.5	115	1083	704	87.0	9.4	46.5	1277	389	1256	254	5.39	1374.	6	19	1.7	10
7.5	1785	257	1.32	28189	20.5	105.8	136	1399	657	75.8	8.9	52.1	1453	332	1405	216	4.58	1467.	6	19	1.8	11
8.0	1904	274	1.40	29118	21.2	102.4	154	1674	616	67.4	8.3	56.3	1615	289	1541	191	4.05	1559.	7	26	2.0	12
8.5	2023	291	1.49	30018	21.8	99.4	170	1917	580	60.7	7.7	59.6	1768	255	1667	173	3.67	1644.	8	28	2.1	14
9.0	2142	308	1.58	30892	22.5	96.6	184	2133	548	55.3	7.2	62.3	1914	228	1787	160	3.38	1734.	9	30	2.2	15
9.5	2261	325	1.67	31743	23.1	94.0	198	2326	519	50.9	6.7	64.6	2056	205	1902	149	3.15	1823.	9	32	2.3	16
10.0	2380	342	1.75	32572	23.7	91.6	210	2500	493	47.1	6.3	66.5	2193	187	2013	140	2.96	1912.	10	34	2.4	17
10.5	2499	360	1.84	33381	24.3	89.4	222	2657	469	43.8	5.9	68.1	2327	172	2122	132	2.80	1992.	11	35	2.5	19
11.0	2618	377	1.93	34171	24.8	87.4	233	2800	448	41.0	5.6	69.5	2460	158	2228	126	2.66	2079.	11	37	2.6	20
11.5	2737	394	2.02	34944	25.4	85.4	244	2930	429	38.6	5.3	70.7	2590	147	2333	120	2.55	2165.	12	39	2.7	21
12.0	2856	411	2.10	35700	25.9	83.6	255	3049	411	36.4	5.0	71.8	2719	137	2436	115	2.44	2250.	12	40	2.8	22
13.0	3094	445	2.28	37168	27.0	80.4	274	3260	379	32.7	4.5	73.7	2973	121	2639	107	2.27	2419.	14	44	3.0	24
14.0	3332	479	2.46	38581	28.0	77.4	292	3441	352	29.7	4.2	75.2	3224	108	2838	101	2.13	2584.	15	47	3.1	26
15.0	3570	514	2.63	39946	29.0	74.8	309	3597	328	27.2	3.8	76.4	3473	97	3035	95	2.01	2747.	16	49	3.3	28
16.0	3808	548	2.81	41267	30.0	72.4	326	3734	308	25.1	3.5	77.5	3720	88	3230	90	1.91	2906.	17	52	3.4	30
17.0	4046	582	2.98	42548	30.9	70.3	341	3855	290	23.3	3.3	78.4	3965	81	3424	86	1.82	3076.	18	55	3.6	31
18.0	4284	616	3.16	43793	31.8	68.3	356	3962	274	21.7	3.1	79.1	4209	75	3616	83	1.75	3230.	19	58	3.7	33
19.0	4522	651	3.33	45005	32.6	66.5	370	4058	259	20.4	2.9	79.8	4452	70	3807	79	1.68	3382.	20	60	3.8	35
20.0	4760	685	3.51	46187	33.5	64.8	384	4145	246	19.2	2.7	80.4	4695	65	3998	77	1.62	3531.	21	63	4.0	37
25.0	5950	856	4.39	51707	37.4	57.9	446	4473	197	14.8	2.1	82.6	5901	49	4940	66	1.40	4265.	26	76	4.5	44
30.0	7140	1027	5.26	56717	41.0	52.9	500	4691	164	12.1	1.7	84.0	7101	39	5873	59	1.24	4988.	31	88	5.1	51
35.0	8330	1199	6.14	61342	44.3	49.0	549	4847	140	10.2	1.5	84.9	8298	32	6799	54	1.13	5666.	36	100	5.5	
40.0	9520	1370	7.02	65664	47.4	45.8	594	4963	123	8.8	1.3	85.6	9492	28	7721	49	1.05	6329.	41	111	5.9	
45.0	10710	1541	7.89	69738	50.2	43.2	636	5054	109	7.8	1.1	86.1	10686	24	8639	46	0.98	6956.	46	122	6.3	
50.0	11900	1712	8.77	73607	53.0	41.0	676	5126	98	6.9	1.0	86.5	11879	21	9555	44	0.92	7545.	50	133	6.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fl	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#421 238 U on 56 Fe

238 U on 56 Fe

238 U on 56 Fe

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 26. ZC=118.( )
NEUTRON NUMBERS: NP=146. NT= 30. NC=176.

AP**1/3= 6.197 AT**1/3= 3.826 ELSCAT <13 deg
REDUCED MASS NUMBER= 45.33 AP+AT=AC=294.

INTERACTION RADIUS RINT=13.99 fm RO= 1.40 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 4.12 CT+CP=11.28 C̄= 2.61

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 4.35

COULOMB RADII [fm]:
RCP= 6.98 RCT= 4.27 RC=RCP+RCT=11.25

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 424.19 MeV K= .22818 n=2.583
VC(RINT)= 245.8 MeV

FISSION-TKE= 246. MeV
ASYMM. FISSION-TKE= 169. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 29.10 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.49 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -61.4
COMPOUND NUCLEUS: 200.8

FUSION RELATED PARAMETERS:
R-BARRIER=12.57 fm V(RB)= 255.7 MeV
Q-VALUE= -214.9 MeV
L-CRITICAL= 87.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	238	45	0.18	10275	9.9	376.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	476	91	0.37	14536	14.0	266.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	714	136	0.55	17807	17.2	217.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	952	181	0.74	20567	19.8	188.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	1071	204	0.83	21818	21.0	177.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	1190	227	0.92	23001	22.2	168.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	1309	249	1.01	24127	23.3	160.6	37	84	0	154.0	7.4	13.0	542	767	591	1348	23.73	0.	6	20	1.0	3
6.0	1428	272	1.11	25203	24.3	153.8	105	597	297	111.4	13.5	34.3	927	601	841	495	8.37	1132.	6	20	1.2	6
6.5	1547	295	1.20	26236	25.3	147.7	144	1028	379	91.6	13.3	44.2	1056	491	1036	363	6.11	1218.	6	20	1.5	8
7.0	1666	317	1.29	27230	26.2	142.4	174	1397	352	78.6	12.4	50.7	1254	412	1198	300	5.05	1302.	6	20	1.7	10
7.5	1785	340	1.38	28189	27.2	137.5	200	1716	328	69.1	11.5	55.4	1431	354	1341	261	4.40	1385.	6	25	1.8	12
8.0	1904	363	1.48	29118	28.0	133.2	222	1995	308	61.8	10.6	59.1	1594	310	1470	235	3.95	1472.	7	28	2.0	13
8.5	2023	385	1.57	30018	28.9	129.2	243	2241	289	56.0	9.8	62.0	1748	275	1590	215	3.61	1553.	8	30	2.2	15
9.0	2142	408	1.66	30892	29.7	125.5	262	2460	273	51.2	9.1	64.4	1896	246	1703	199	3.35	1633.	9	32	2.3	17
9.5	2261	431	1.75	31743	30.6	122.2	280	2655	259	47.2	8.5	66.4	2038	223	1811	187	3.14	1717.	9	34	2.4	18
10.0	2380	453	1.84	32572	31.4	119.1	297	2831	246	43.7	7.9	68.1	2176	204	1916	176	2.96	1795.	10	36	2.5	20
10.5	2499	476	1.94	33381	32.1	116.2	312	2990	234	40.8	7.4	69.6	2312	187	2018	167	2.81	1870.	11	37	2.7	22
11.0	2618	499	2.03	34171	32.9	113.6	328	3135	224	38.2	7.0	70.9	2445	173	2117	159	2.68	1952.	11	39	2.8	23
11.5	2737	521	2.12	34944	33.6	111.1	342	3267	214	36.0	6.6	72.0	2576	161	2215	153	2.57	2034.	12	41	2.9	24
12.0	2856	544	2.21	35700	34.3	108.7	356	3388	205	34.0	6.3	73.0	2705	151	2311	147	2.47	2106.	12	43	3.0	26
13.0	3094	589	2.40	37168	35.8	104.5	382	3602	189	30.6	5.7	74.7	2961	133	2500	137	2.30	2265.	13	46	3.2	28
14.0	3332	635	2.58	38581	37.1	100.7	406	3765	176	27.8	5.2	76.1	3213	119	2685	129	2.16	2411.	15	49	3.4	31
15.0	3570	680	2.77	39946	38.4	97.2	429	3944	164	25.5	4.8	77.2	3463	107	2868	122	2.05	2564.	16	52	3.6	33
16.0	3808	725	2.95	41267	39.7	94.2	451	4083	154	23.6	4.4	78.2	3710	98	3048	116	1.95	2704.	17	55	3.7	36
17.0	4046	771	3.14	42548	40.9	91.3	472	4205	144	21.9	4.1	79.0	3956	90	3226	111	1.86	2850.	18	58	3.9	38
18.0	4284	816	3.32	43793	42.1	88.8	492	4314	136	20.5	3.9	79.8	4201	83	3404	106	1.78	2994.	19	61	4.0	40
19.0	4522	861	3.50	45005	43.2	86.4	511	4412	129	19.2	3.6	80.4	4445	77	3580	102	1.72	3136.	20	63	4.2	42
20.0	4760	907	3.69	46187	44.3	84.2	530	4499	123	18.1	3.4	81.0	4688	72	3755	99	1.66	3275.	21	66	4.3	44
25.0	5950	1133	4.61	51707	49.6	75.3	614	4832	98	14.0	2.7	83.0	5696	54	4620	85	1.43	3946.	26	79	5.0	53
30.0	7140	1360	5.53	56717	54.3	68.8	688	5054	82	11.4	2.2	84.3	7096	44	5473	76	1.28	4578.	31	92	5.6	61
35.0	8330	1587	6.46	61342	58.7	63.7	755	5212	70	9.6	1.8	85.2	8294	36	6319	69	1.16	5180.	35	103	6.1	
40.0	9520	1813	7.38	65664	62.7	59.6	816	5330	61	8.3	1.6	85.8	9489	31	7159	64	1.08	5737.	40	115	6.6	
45.0	10710	2040	8.30	69738	66.5	56.1	873	5423	54	7.4	1.4	86.3	10683	27	7995	60	1.01	6277.	45	126	7.0	
50.0	11900	2267	9.22	73607	70.1	53.3	926	5496	49	6.6	1.3	86.7	11876	24	8827	56	0.95	6811.	50	137	7.5	

#422 238 U on 63 Cu

238 U on 63 Cu

238 U on 63 Cu

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 29. ZC=121.( )
NEUTRON NUMBERS: NP=146. NT= 34. NC=180.

AP**1/3= 6.197 AT**1/3= 3.979 ELSCAT <15 deg
REDUCED MASS NUMBER= 49.81 AP+AT=AC=301.

INTERACTION RADIUS RINT=14.16 fm RO= 1.39 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 4.31 CT+CP=11.48 C̄= 2.69

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 4.53

COULOMB RADII [fm]:
RCP= 6.98 RCT= 4.45 RC=RCP+RCT=11.42

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 467.07 MeV K= .25724 n=2.560
VC(RINT)= 270.9 MeV

FISSION-TKE= 256. MeV
ASYMM. FISSION-TKE= 187. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.887 MeV/fm**2 PROX-FACTOR= 30.00 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 4.11 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -65.2
COMPOUND NUCLEUS: 221.5

FUSION RELATED PARAMETERS:
R-BARRIER=12.69 fm V(RB)= 281.9 MeV
Q-VALUE= -239.5 MeV
L-CRITICAL= 66.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	GP-CN	GP-LP	GP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN-EN	TEMP	MULT
1.0	238	50	0.18	10275	10.9	420.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
2.0	476	100	0.37	14536	15.4	297.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
3.0	714	149	0.55	17807	18.9	242.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.0	952	199	0.74	20567	21.8	210.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
4.5	1071	224	0.83	21818	23.1	198.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.0	1190	249	0.92	23001	24.4	187.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0.0	0
5.5	1309	274	1.01	24127	25.6	179.1	36	66	0	157.3	7.7	11.3	476	833	527	1700	27.51	0.	6	20	1.0	3
6.0	1428	299	1.10	25203	26.7	171.5	115	592	197	112.4	15.2	33.8	775	653	790	561	8.60	1106.	6	20	1.3	6
6.5	1547	324	1.20	26236	27.8	164.8	158	1035	182	92.3	15.0	43.9	1015	532	991	408	6.24	1190.	6	20	1.5	8
7.0	1666	349	1.29	27230	28.8	158.8	192	1413	169	79.1	13.9	50.5	1219	447	1157	336	5.14	1273.	6	20	1.7	10
7.5	1785	374	1.38	28189	29.8	153.4	221	1741	158	69.5	12.8	55.3	1401	384	1301	293	4.47	1354.	6	25	1.9	12
8.0	1904	399	1.47	29118	30.8	148.5	247	2028	148	62.1	11.8	58.9	1568	336	1431	263	4.01	1435.	7	28	2.1	14
8.5	2023	423	1.56	30018	31.8	144.1	270	2280	139	56.2	10.9	61.9	1725	298	1551	240	3.66	1514.	8	30	2.2	16
9.0	2142	448	1.65	30892	32.7	140.0	291	2505	131	51.4	10.1	64.3	1875	267	1664	223	3.40	1591.	9	32	2.4	18
9.5	2261	473	1.75	31743	33.6	136.3	311	2706	124	47.4	9.4	66.3	2019	242	1771	209	3.18	1674.	9	34	2.5	19
10.0	2380	498	1.84	32572	34.5	132.8	329	2886	118	43.9	8.8	68.0	2159	221	1874	197	3.00	1749.	10	36	2.6	21
10.5	2499	523	1.93	33381	35.3	129.6	347	3050	112	41.0	8.2	69.5	2296	203	1975	187	2.85	1824.	11	38	2.7	23
11.0	2618	548	2.02	34171	36.1	126.7	364	3198	107	38.4	7.8	70.8	2430	188	2072	178	2.72	1904.	11	40	2.9	24
11.5	2737	573	2.11	34944	36.9	123.9	380	3334	103	36.1	7.3	71.9	2563	174	2168	171	2.60	1976.	12	41	3.0	26
12.0	2856	598	2.21	35700	37.7	121.3	395	3458	98	34.1	6.9	72.9	2693	163	2262	164	2.50	2054.	12	43	3.1	27
13.0	3094	648	2.39	37168	39.3	116.5	424	3678	91	30.7	6.3	74.6	2950	144	2446	153	2.33	2201.	13	46	3.3	30
14.0	3332	697	2.57	38581	40.8	112.3	451	3866	84	27.9	5.7	76.0	3203	129	2626	144	2.19	2344.	14	49	3.5	33
15.0	3570	747	2.76	39946	42.2	108.5	477	4029	79	25.6	5.3	77.2	3454	116	2804	136	2.07	2493.	16	53	3.7	35
16.0	3808	797	2.94	41267	43.6	105.0	501	4172	74	23.7	4.9	78.2	3702	106	2979	129	1.97	2629.	17	56	3.8	38
17.0	4046	847	3.13	42548	44.9	101.9	524	4298	69	22.0	4.6	79.0	3949	97	3152	124	1.88	2772.	18	58	4.0	40
18.0	4284	897	3.31	43793	46.2	99.0	547	4410	65	20.5	4.3	79.7	4194	90	3323	119	1.81	2902.	19	61	4.2	43
19.0	4522	946	3.49	45005	47.5	96.4	568	4510	62	19.3	4.0	80.4	4438	84	3494	114	1.74	3039.	20	64	4.3	45
20.0	4760	996	3.68	46187	48.7	93.9	589	4600	59	18.1	3.8	80.9	4682	78	3663	110	1.68	3174.	21	67	4.5	47
25.0	5950	1245	4.60	51707	54.5	84.0	682	4942	47	14.0	2.9	83.0	5891	59	4499	95	1.45	3811.	26	80	5.2	57
30.0	7140	1494	5.52	56717	59.7	76.7	765	5170	39	11.5	2.4	84.3	7093	47	5322	85	1.29	4424.	30	93	5.8	65
35.0	8330	1743	6.44	61342	64.5	71.0	839	5332	33	9.7	2.0	85.2	8291	39	6136	77	1.18	5008.	35	105	6.3	
40.0	9520	1993	7.35	65664	68.9	66.4	907	5454	29	8.4	1.8	85.8	9486	34	6945	71	1.09	5548.	40	116	6.8	
45.0	10710	2242	8.27	69738	73.1	62.6	970	5549	26	7.4	1.5	86.3	10681	29	7750	67	1.02	6045.	45	128	7.3	
50.0	11900	2491	9.19	73607	77.0	59.4	1030	5624	23	6.6	1.4	86.7	11874	26	8550	63	0.96	6529.	49	139	7.7	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#423 238 U on 92 Mo

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 42. ZC=134.( )
NEUTRON NUMBERS: NP=146. NT= 50. NC=196.

AP**1/3= 6.197 AT**1/3= 4.514 ELSCAT <22 deg
REDUCED MASS NUMBER= 66.35 AP+AT=AC=330.

INTERACTION RADIUS RINT=14.74 fm RO= 1.38 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 5.00 CT+CP=12.17 C= 2.95

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 5.20

COULOMB RADII [fm]:
RCP= 6.98 RCT= 5.08 RC=RCP+RCT=12.05

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 645.59 MeV K= .36902 n=2.497
VC(RINT)= 376.9 MeV

FISSION-TKE= 300. MeV
ASYMM. FISSION-TKE= 259. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.892 MeV/fm**2 PROX-FACTOR= 33.01 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 3.15 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -87.5
COMPOUND NUCLEUS: 341.8

FUSION RELATED PARAMETERS:
R-BARRIER=13.11 fm V(RB)= 393.2 MeV
Q-VALUE= -382.1 MeV
L-CRITICAL= 0.

238 U on 92 Mo

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	66	0.18	10275	14.5	608.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	133	0.35	14536	20.5	430.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	199	0.53	17807	25.1	351.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	265	0.70	20567	29.0	304.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	299	0.79	21818	30.8	286.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	332	0.88	23001	32.5	272.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	365	0.97	24127	34.0	259.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	398	1.06	25203	35.5	248.4	120	361	0	128.6	21.7	25.7	495	933	526	1077	11.93	0.	0	0	0.6	2
6.5	1547	431	1.14	26236	37.0	238.6	193	862	0	102.1	22.4	38.9	794	753	775	672	7.40	0.	0	0	1.1	5
7.0	1666	464	1.23	27230	38.4	230.0	245	1290	0	86.4	20.6	46.8	1039	627	970	530	5.82	0.	0	0	1.4	8
7.5	1785	498	1.32	28189	39.7	222.2	288	1661	0	75.3	18.8	52.4	1249	536	1132	451	4.95	0.	6	25	1.7	12
8.0	1904	531	1.41	29118	41.0	215.1	325	1985	0	67.0	17.2	56.5	1438	466	1272	400	4.38	0.	7	28	1.9	14
8.5	2023	564	1.50	30018	42.3	208.7	359	2271	0	60.4	15.8	59.8	1612	411	1397	362	3.98	0.	8	30	2.1	16
9.0	2142	597	1.58	30892	43.5	202.8	389	2525	0	55.0	14.5	62.5	1774	368	1511	334	3.66	0.	8	32	2.3	19
9.5	2261	630	1.67	31743	44.7	197.4	418	2753	0	50.6	13.5	64.7	1929	332	1618	311	3.41	0.	9	35	2.5	21
10.0	2380	664	1.76	32572	45.9	192.4	444	2957	0	46.8	12.6	66.6	2078	302	1719	293	3.21	0.	10	37	2.6	23
10.5	2499	697	1.85	33381	47.0	187.8	469	3142	0	43.6	11.8	68.2	2222	277	1815	277	3.04	0.	10	39	2.8	25
11.0	2618	730	1.94	34171	48.1	183.4	493	3310	0	40.8	11.1	69.6	2362	256	1908	264	2.89	0.	11	41	2.9	27
11.5	2737	763	2.02	34944	49.2	179.4	516	3464	0	38.4	10.4	70.8	2499	238	1998	252	2.76	0.	11	42	3.0	29
12.0	2856	796	2.11	35700	50.3	175.6	537	3604	0	36.2	9.9	71.9	2634	222	2086	242	2.65	0.	12	44	3.2	31
13.0	3094	863	2.29	37168	52.3	168.7	578	3853	0	32.5	8.9	73.7	2899	195	2256	225	2.47	0.	13	48	3.4	34
14.0	3332	929	2.46	38581	54.3	162.6	617	4066	0	29.5	8.1	75.2	3158	174	2420	211	2.31	0.	14	51	3.6	38
15.0	3570	995	2.64	39946	56.2	157.1	653	4251	0	27.1	7.5	76.5	3413	157	2581	199	2.18	0.	15	54	3.9	41
16.0	3808	1062	2.82	41267	58.0	152.1	687	4413	0	25.0	6.9	77.5	3665	143	2738	189	2.08	0.	16	57	4.1	44
17.0	4046	1128	2.99	42548	59.8	147.6	720	4555	0	23.2	6.4	78.4	3915	131	2893	181	1.98	0.	17	60	4.3	47
18.0	4284	1194	3.17	43793	61.6	143.4	751	4682	0	21.6	6.0	79.2	4163	121	3046	173	1.90	0.	18	63	4.4	50
19.0	4522	1261	3.34	45005	63.3	139.6	781	4795	0	20.3	5.6	79.9	4409	113	3197	167	1.83	0.	19	66	4.6	52
20.0	4760	1327	3.52	46187	64.9	136.0	809	4897	0	19.1	5.3	80.5	4655	105	3347	161	1.76	0.	20	69	4.8	55
25.0	5950	1659	4.40	51707	72.6	121.7	940	5285	0	14.7	4.1	82.6	5871	79	4081	138	1.52	0.	25	82	5.6	67
30.0	7140	1991	5.28	56717	79.5	111.1	1055	5543	0	12.0	3.3	84.0	7077	63	4798	123	1.35	0.	30	95	6.2	77
35.0	8330	2322	6.16	61342	85.9	102.8	1158	5727	0	10.1	2.8	84.9	8278	52	5505	112	1.23	0.	34	107	6.9	
40.0	9520	2654	7.04	65664	91.8	96.2	1253	5866	0	8.8	2.4	85.6	9475	45	6205	104	1.14	0.	39	119	7.4	
45.0	10710	2986	7.92	69738	97.4	90.7	1341	5973	0	7.7	2.2	86.1	10671	39	6899	97	1.06	0.	44	131	7.9	
50.0	11900	3318	8.80	73607	102.6	86.0	1424	6059	0	6.9	1.9	86.5	11865	35	7588	91	1.00	0.	48	142	8.4	

#424 238 U on 108 Ag

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 47. ZC=139.( )
NEUTRON NUMBERS: NP=146. NT= 61. NC=207.

AP**1/3= 6.197 AT**1/3= 4.762 ELSCAT <27 deg
REDUCED MASS NUMBER= 74.29 AP+AT=AC=346.

INTERACTION RADIUS RINT=15.01 fm RO= 1.37 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 5.32 CT+CP=12.49 C= 3.05

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 5.50

COULOMB RADII [fm]:
RCP= 6.98 RCT= 5.34 RC=RCP+RCT=12.31

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 708.50 MeV K= .40158 n=2.481
VC(RINT)= 414.3 MeV

FISSION-TKE= 317. MeV
ASYMM. FISSION-TKE= 284. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.886 MeV/fm**2 PROX-FACTOR= 34.01 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.83 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -87.6
COMPOUND NUCLEUS: 395.7

FUSION RELATED PARAMETERS:
R-BARRIER=13.31 fm V(RB)= 431.7 MeV
Q-VALUE= -436.1 MeV
L-CRITICAL= 0.

238 U on 108 Ag

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	74	0.18	10275	16.2	680.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	149	0.36	14536	23.0	481.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	223	0.54	17807	28.1	393.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	297	0.72	20567	32.5	340.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	334	0.81	21818	34.5	321.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	371	0.90	23001	36.3	304.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	409	0.99	24127	38.1	290.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	446	1.08	25203	39.8	278.0	157	498	0	120.9	26.9	29.5	499	929	513	1046	10.51	0.	0	0	0.5	1
6.5	1547	483	1.17	26236	41.4	267.1	234	1007	0	97.7	25.6	41.2	794	753	753	708	7.09	0.	0	0	1.0	5
7.0	1666	520	1.26	27230	43.0	257.3	290	1442	0	83.1	23.1	48.4	1036	630	940	571	5.70	0.	5	22	1.4	8
7.5	1785	557	1.35	28189	44.5	248.6	338	1820	0	72.7	20.9	53.6	1246	539	1096	491	4.90	0.	6	25	1.7	12
8.0	1904	594	1.43	29118	46.0	240.7	379	2149	0	64.8	19.0	57.6	1434	470	1230	437	4.37	0.	7	28	1.9	15
8.5	2023	631	1.52	30018	47.4	233.5	417	2440	0	58.6	17.4	60.7	1607	416	1350	398	3.97	0.	8	31	2.1	18
9.0	2142	669	1.61	30892	48.7	227.0	451	2699	0	53.4	16.0	63.3	1770	372	1459	368	3.67	0.	8	33	2.3	21
9.5	2261	706	1.70	31743	50.1	220.9	483	2930	0	49.2	14.8	65.4	1925	336	1561	344	3.43	0.	9	35	2.5	23
10.0	2380	743	1.79	32572	51.4	215.3	513	3138	0	45.6	13.8	67.2	2073	307	1657	324	3.23	0.	10	37	2.7	26
10.5	2499	780	1.88	33381	52.7	210.1	541	3327	0	42.5	12.9	68.8	2218	281	1748	307	3.06	0.	10	39	2.8	28
11.0	2618	817	1.97	34171	53.9	205.3	568	3498	0	39.8	12.1	70.1	2358	260	1836	292	2.92	0.	11	41	3.0	30
11.5	2737	854	2.06	34944	55.1	200.8	593	3654	0	37.4	11.5	71.3	2495	242	1922	280	2.79	0.	11	43	3.1	32
12.0	2856	891	2.15	35700	56.3	196.5	618	3797	0	35.3	10.8	72.4	2631	225	2005	269	2.68	0.	12	45	3.2	34
13.0	3094	966	2.33	37168	58.6	188.8	664	4050	0	31.7	9.8	74.1	2895	199	2165	250	2.49	0.	13	48	3.5	38
14.0	3332	1040	2.51	38581	60.8	182.0	708	4267	0	28.8	8.9	75.6	3154	178	2320	235	2.34	0.	14	51	3.7	42
15.0	3570	1114	2.69	39946	62.9	175.8	748	4455	0	26.4	8.2	76.8	3410	160	2470	222	2.21	0.	15	55	4.0	45
16.0	3808	1189	2.87	41267	65.0	170.2	787	4620	0	24.4	7.6	77.8	3662	146	2618	211	2.10	0.	16	58	4.2	49
17.0	4046	1263	3.05	42548	67.0	165.1	824	4765	0	22.7	7.0	78.7	3912	134	2763	201	2.01	0.	17	61	4.4	52
18.0	4284	1337	3.23	43793	68.9	160.5	859	4894	0	21.2	6.6	79.4	4160	124	2906	193	1.93	0.	18	64	4.6	55
19.0	4522	1411	3.41	45005	70.8	156.2	893	5009	0	19.8	6.2	80.1	4407	115	3047	186	1.85	0.	19	67	4.7	58
20.0	4760	1486	3.59	46187	72.7	152.2	926	5113	0	18.7	5.8	80.7	4652	108	3187	179	1.79	0.	20	69	4.9	61
25.0	5950	1857	4.48	51707	81.2	136.2	1075	5508	0	14.4	4.5	82.8	5869	81	3871	154	1.54	0.	25	83	5.7	74
30.0	7140	2229	5.38	56717	89.0	124.3	1205	5770	0	11.8	3.7	84.1	7075	65	4538	138	1.37	0.	29	96	6.4	85
35.0	8330	2600	6.28	61342	96.1	115.1	1323	5958	0	9.9	3.1	85.0	8276	54	5194	126	1.25	0.	34	108	7.1	
40.0	9520	2972	7.17	65664	102.8	107.7	1431	6099	0	8.6	2.7	85.7	9474	46	5842	116	1.16	0.	38	120	7.7	
45.0	10710	3343	8.07	69738	109.0	101.5	1531	6208	0	7.6	2.4	86.2	10670	40	6484	108	1.08	0.	43	131	8.2	
50.0	11900	3714	8.97	73607	114.9	96.3	1625	6295	0	6.8	2.1	86.6	11864	36	7122	102	1.02	0.	47	143	8.7	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#425 238 U on 140 Ce

238 U on 140 Ce

238 U on 140 Ce

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 58. ZC=150.( )
NEUTRON NUMBERS: NP=146. NT= 82. NC=228.

AP**1/3= 6.197 AT**1/3= 5.192 ELSCAT <36 deg
REDUCED MASS NUMBER= 88.15 AP+AT=AC=378.

INTERACTION RADIUS RINT=15.48 fm RO= 1.36 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 5.87 CT+CP=13.04 C= 3.23

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.04

COULOMB RADII [fm]:
RCP= 6.98 RCT= 5.82 RC=RCP+RCT=12.79

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 843.84 MeV K= .46360 n=2.458
VC(RINT)= 495.8 MeV

FISSION-TKE= 355. MeV
ASYMM. FISSION-TKE= 337. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.879 MeV/fm**2 PROX-FACTOR= 35.67 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.42 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -88.2
COMPOUND NUCLEUS: 517.5

FUSION RELATED PARAMETERS:
R-BARRIER=13.64 fm V(RB)= 517.6 MeV
Q-VALUE= -558.5 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	88	0.18	10275	19.3	840.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	176	0.36	14536	27.3	594.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	264	0.53	17807	33.4	485.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	353	0.71	20567	38.6	420.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	397	0.80	21818	40.9	396.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	441	0.89	23001	43.1	375.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	485	0.98	24127	45.2	358.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	529	1.07	25203	47.2	343.0	191	467	0	124.4	36.0	27.8	386	1042	391	1372	11.53	0.	0	0	0.0	0
6.5	1547	573	1.16	26236	49.2	329.6	278	1012	0	99.7	32.8	40.1	704	843	645	898	7.51	0.	0	0	0.6	1
7.0	1666	617	1.24	27230	51.0	317.6	349	1479	0	84.6	29.0	47.7	962	704	839	716	5.98	0.	5	22	1.1	6
7.5	1785	661	1.33	28189	52.8	306.8	408	1883	0	73.9	25.9	53.0	1183	602	997	614	5.12	0.	6	25	1.5	11
8.0	1904	705	1.42	29118	54.5	297.1	459	2237	0	65.8	23.4	57.1	1380	524	1131	545	4.55	0.	6	28	1.8	14
8.5	2023	749	1.51	30018	56.2	288.2	505	2549	0	59.4	21.3	60.3	1560	463	1249	496	4.13	0.	7	31	2.0	18
9.0	2142	793	1.60	30892	57.8	280.1	548	2826	0	54.2	19.5	62.9	1728	414	1355	457	3.81	0.	8	33	2.2	21
9.5	2261	837	1.69	31743	59.4	272.6	587	3074	0	49.8	18.0	65.1	1887	374	1453	427	3.56	0.	9	35	2.4	25
10.0	2380	881	1.78	32572	61.0	265.7	624	3297	0	46.2	16.8	66.9	2039	341	1544	402	3.35	0.	9	38	2.6	28
10.5	2499	926	1.87	33381	62.5	259.3	658	3499	0	43.0	15.7	68.5	2186	313	1630	381	3.17	0.	10	40	2.8	30
11.0	2618	970	1.96	34171	63.9	253.3	691	3683	0	40.3	14.7	69.9	2329	289	1712	362	3.02	0.	11	41	2.9	33
11.5	2737	1014	2.04	34944	65.4	247.8	723	3850	0	37.8	13.8	71.1	2469	268	1791	347	2.89	0.	11	43	3.1	36
12.0	2856	1058	2.13	35700	66.8	242.5	753	4004	0	35.7	13.1	72.1	2606	250	1868	333	2.77	0.	12	45	3.3	38
13.0	3094	1146	2.31	37168	69.5	233.0	810	4275	0	32.1	11.8	73.9	2873	221	2015	309	2.58	0.	13	49	3.5	43
14.0	3332	1234	2.49	38581	72.1	224.6	863	4508	0	29.2	10.7	75.4	3135	197	2155	290	2.42	0.	14	52	3.8	48
15.0	3570	1322	2.67	39946	74.7	216.9	913	4709	0	26.7	9.8	76.6	3392	178	2291	274	2.29	0.	15	55	4.0	52
16.0	3808	1410	2.84	41267	77.1	210.1	961	4886	0	24.7	9.1	77.7	3646	162	2424	261	2.17	0.	16	58	4.2	56
17.0	4046	1499	3.02	42548	79.5	203.8	1006	5042	0	22.9	8.4	78.5	3897	149	2553	249	2.08	0.	17	61	4.5	60
18.0	4284	1587	3.20	43793	81.8	198.0	1049	5180	0	21.4	7.9	79.3	4147	137	2681	239	1.99	0.	18	64	4.7	63
19.0	4522	1675	3.38	45005	84.0	192.8	1091	5304	0	20.0	7.4	80.0	4394	128	2807	230	1.91	0.	19	67	4.9	67
20.0	4760	1763	3.56	46187	86.2	187.9	1131	5415	0	18.9	7.0	80.6	4641	119	2931	222	1.85	0.	20	70	5.0	70
25.0	5950	2204	4.44	51707	96.4	168.0	1313	5838	0	14.6	5.4	82.7	5861	89	3534	191	1.59	0.	24	83	5.9	85
30.0	7140	2644	5.33	56717	105.6	153.4	1473	6120	0	11.9	4.4	84.1	7069	71	4119	170	1.42	0.	29	96	6.6	98
35.0	8330	3085	6.22	61342	114.1	142.0	1617	6321	0	10.0	3.7	85.0	8271	59	4692	155	1.29	0.	33	108	7.3	
40.0	9520	3526	7.11	65664	121.9	132.8	1749	6472	0	8.7	3.2	85.7	9469	51	5256	143	1.19	0.	38	120	7.9	
45.0	10710	3967	8.00	69738	129.3	125.3	1872	6590	0	7.7	2.8	86.2	10665	45	5814	134	1.12	0.	42	132	8.5	
50.0	11900	4407	8.89	73607	136.3	118.8	1987	6683	0	6.8	2.5	86.6	11860	40	6367	126	1.05	0.	46	143	9.0	

#426 238 U on 154 Sm

238 U on 154 Sm

238 U on 154 Sm

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 62. ZC=154.( )
NEUTRON NUMBERS: NP=146. NT= 92. NC=238.

AP**1/3= 6.197 AT**1/3= 5.360 ELSCAT <40 deg
REDUCED MASS NUMBER= 93.50 AP+AT=AC=392.

INTERACTION RADIUS RINT=15.66 fm RO= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 6.09 CT+CP=13.25 C= 3.29

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.25

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.00 RC=RCP+RCT=12.97

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO= 890.11 MeV K= .47985 n=2.453
VC(RINT)= 523.9 MeV

FISSION-TKE= 369. MeV
ASYMM. FISSION-TKE= 355. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.874 MeV/fm**2 PROX-FACTOR= 36.15 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.29 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -72.1
COMPOUND NUCLEUS: 569.1

FUSION RELATED PARAMETERS:
R-BARRIER=13.77 fm V(RB)= 547.2 MeV
Q-VALUE= -593.9 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	94	0.18	10275	20.5	898.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	187	0.36	14536	28.9	635.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	281	0.54	17807	35.4	518.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	374	0.71	20567	40.9	449.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	421	0.80	21818	43.4	423.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	468	0.89	23001	45.7	401.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	514	0.98	24127	48.0	383.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	561	1.07	25203	50.1	366.7	200	506	0	122.8	39.9	28.6	378	1050	372	1425	11.34	0.	0	0	0.0	0
6.5	1547	608	1.16	26236	52.1	352.3	302	1062	0	98.8	35.4	40.6	696	851	624	948	7.50	0.	0	0	0.5	1
7.0	1666	655	1.25	27230	54.1	339.5	378	1537	0	83.9	31.1	48.0	955	711	816	760	6.01	0.	5	22	1.1	7
7.5	1785	701	1.34	28189	56.0	328.0	440	1950	0	73.4	27.6	53.3	1177	608	971	652	5.15	0.	6	26	1.5	11
8.0	1904	748	1.43	29118	57.8	317.5	495	2310	0	65.4	24.9	57.3	1374	530	1102	580	4.58	0.	6	28	1.8	16
8.5	2023	795	1.52	30018	59.6	308.1	544	2628	0	59.0	22.6	60.5	1555	468	1217	528	4.16	0.	7	31	2.0	20
9.0	2142	842	1.61	30892	61.4	299.4	590	2911	0	53.8	20.7	63.1	1723	419	1321	487	3.85	0.	8	33	2.2	23
9.5	2261	888	1.70	31743	63.0	291.4	632	3164	0	49.5	19.1	65.2	1882	379	1416	455	3.59	0.	9	36	2.5	27
10.0	2380	935	1.78	32572	64.7	284.0	671	3391	0	45.9	17.8	67.1	2035	345	1504	428	3.38	0.	9	38	2.6	30
10.5	2499	982	1.87	33381	66.3	277.2	708	3597	0	42.8	16.6	68.6	2182	317	1587	406	3.20	0.	10	40	2.8	33
11.0	2618	1029	1.96	34171	67.8	270.8	743	3784	0	40.0	15.6	70.0	2325	293	1667	387	3.05	0.	10	42	3.0	36
11.5	2737	1075	2.05	34944	69.4	264.9	777	3955	0	37.6	14.6	71.2	2465	272	1743	370	2.92	0.	11	43	3.1	38
12.0	2856	1122	2.14	35700	70.8	259.3	809	4111	0	35.5	13.8	72.2	2602	254	1816	355	2.80	0.	12	45	3.3	41
13.0	3094	1216	2.32	37168	73.7	249.1	870	4388	0	31.9	12.5	74.0	2871	223	1957	330	2.60	0.	13	49	3.6	46
14.0	3332	1309	2.50	38581	76.5	240.0	927	4625	0	29.0	11.3	75.5	3132	200	2092	310	2.44	0.	14	52	3.8	51
15.0	3570	1403	2.68	39946	79.2	231.9	981	4831	0	26.6	10.4	76.7	3390	180	2222	293	2.31	0.	15	55	4.1	56
16.0	3808	1496	2.86	41267	81.8	224.5	1032	5011	0	24.5	9.6	77.7	3644	164	2348	279	2.20	0.	16	58	4.3	60
17.0	4046	1590	3.03	42548	84.3	217.8	1081	5170	0	22.8	8.9	78.6	3895	151	2472	266	2.10	0.	17	61	4.5	64
18.0	4284	1683	3.21	43793	86.8	211.7	1127	5311	0	21.3	8.3	79.4	4145	139	2594	255	2.01	0.	18	64	4.7	68
19.0	4522	1777	3.39	45005	89.1	206.1	1172	5437	0	19.9	7.8	80.0	4393	129	2713	245	1.93	0.	19	67	4.9	71
20.0	4760	1870	3.57	46187	91.5	200.8	1215	5550	0	18.8	7.4	80.6	4639	121	2831	237	1.87	0.	19	70	5.1	75
25.0	5950	2338	4.46	51707	102.3	179.6	1410	5982	0	14.5	5.7	82.7	5859	91	3404	204	1.61	0.	24	84	6.0	90
30.0	7140	2805	5.35	56717	112.0	164.0	1581	6269	0	11.8	4.6	84.1	7068	72	3958	182	1.43	0.	28	96	6.7	104
35.0	8330	3273	6.25	61342	121.0	151.8	1736	6475	0	10.0	3.9	85.0	8270	60	4500	166	1.31	0.	33	108	7.4	
40.0	9520	3740	7.14	65664	129.3	142.0	1878	6629	0	8.6	3.4	85.7	9468	52	5033	153	1.21	0.	37	120	8.0	
45.0	10710	4208	8.03	69738	137.2	133.9	2010	6748	0	7.6	3.0	86.2	10665	45	5559	143	1.13	0.	42	132	8.6	
50.0	11900	4675	8.92	73607	144.6	127.0	2139	6844	0	6.8	2.7	86.6	11860	40	6080	135	1.06	0.	46	143	9.1	
MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#427 238 U on 165 Ho

238 U on 165 Ho

238 U on 165 Ho

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 67. ZC=159.( )
NEUTRON NUMBERS: NP=146. NT= 98. NC=244.

AP**1/3= 6.197 AT**1/3= 5.485 ELSCAT <43 deg
REDUCED MASS NUMBER= 97.44 AP+AT=AC=403.

INTERACTION RADIUS RINT=15.79 fm RO= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 6.25 CT+CP=13.41 C̄= 3.34

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.41

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.15 RC=RCP+RCT=13.13

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0= 950.99 MeV K= .50504 n=2.448
VC(RINT)= 561.3 MeV

FISSION-TKE= 389. MeV
ASYMM. FISSION-TKE= 379. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.876 MeV/fm**2 PROX-FACTOR= 36.76 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.21 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -63.7
COMPOUND NUCLEUS: 626.4

FUSION RELATED PARAMETERS:
R-BARRIER=13.84 fm V(RB)= 587.9 MeV
Q-VALUE= -643.0 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	97	0.17	10275	21.3	970.6	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	195	0.35	14536	30.1	686.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	292	0.52	17807	36.9	560.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	390	0.69	20567	42.6	485.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	438	0.78	21818	45.2	457.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	487	0.87	23001	47.7	434.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	536	0.95	24127	50.0	413.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	585	1.04	25203	52.2	396.2	162	308	0	135.4	43.9	22.3	245	1183	257	1981	14.80	0.	0	0	0.0	0
6.5	1547	633	1.13	26236	54.3	380.7	288	889	0	105.8	39.4	37.1	596	951	538	1128	8.34	0.	0	0	0.0	0
7.0	1666	682	1.22	27230	56.4	366.8	374	1387	0	88.9	34.4	45.5	875	791	747	872	6.43	0.	4	21	0.9	4
7.5	1785	731	1.30	28189	58.4	354.4	443	1818	0	77.3	30.4	51.3	1111	674	914	736	5.42	0.	5	25	1.3	9
8.0	1904	780	1.39	29118	60.3	343.2	503	2195	0	68.6	27.3	55.7	1319	585	1053	648	4.78	0.	6	28	1.6	14
8.5	2023	828	1.48	30018	62.1	332.9	556	2528	0	61.8	24.7	59.1	1507	516	1174	586	4.32	0.	7	30	1.9	18
9.0	2142	877	1.56	30892	63.9	323.5	605	2824	0	56.3	22.6	61.9	1681	461	1281	539	3.97	0.	8	33	2.2	22
9.5	2261	926	1.65	31743	65.7	314.9	650	3088	0	51.7	20.8	64.2	1846	415	1378	502	3.70	0.	8	35	2.4	26
10.0	2380	974	1.74	32572	67.4	306.9	692	3326	0	47.8	19.3	66.1	2002	378	1467	471	3.47	0.	9	37	2.6	29
10.5	2499	1023	1.82	33381	69.1	299.5	732	3541	0	44.5	18.0	67.8	2153	346	1552	446	3.28	0.	10	39	2.7	32
11.0	2618	1072	1.91	34171	70.7	292.6	770	3737	0	41.6	16.9	69.2	2298	320	1631	424	3.12	0.	10	41	2.9	35
11.5	2737	1121	2.00	34944	72.3	286.2	806	3915	0	39.1	15.9	70.4	2440	297	1707	405	2.98	0.	11	43	3.1	38
12.0	2856	1169	2.08	35700	73.8	280.2	840	4079	0	36.9	15.0	71.6	2580	276	1780	389	2.86	0.	11	45	3.2	41
13.0	3094	1267	2.26	37168	76.8	269.2	905	4369	0	33.1	13.5	73.4	2851	243	1920	361	2.66	0.	13	48	3.5	46
14.0	3332	1364	2.43	38581	79.7	259.4	966	4617	0	30.1	12.2	75.0	3115	217	2052	338	2.49	0.	14	52	3.8	51
15.0	3570	1462	2.60	39946	82.5	250.6	1023	4832	0	27.5	11.2	76.2	3374	196	2180	319	2.35	0.	15	55	4.0	56
16.0	3808	1559	2.78	41267	85.3	242.6	1077	5020	0	25.4	10.4	77.3	3630	178	2304	303	2.23	0.	16	58	4.3	60
17.0	4046	1657	2.95	42548	87.9	235.4	1128	5186	0	23.6	9.6	78.2	3883	163	2424	290	2.13	0.	16	61	4.5	64
18.0	4284	1754	3.13	43793	90.4	228.8	1177	5334	0	22.0	9.0	79.0	4133	151	2542	277	2.04	0.	17	64	4.7	68
19.0	4522	1851	3.30	45005	92.9	222.7	1224	5466	0	20.6	8.4	79.7	4382	140	2659	267	1.96	0.	18	67	4.9	72
20.0	4760	1949	3.47	46187	95.3	217.0	1270	5584	0	19.4	7.9	80.3	4629	131	2773	257	1.89	0.	19	70	5.1	76
25.0	5950	2436	4.34	51707	106.6	194.1	1476	6036	0	15.0	6.1	82.5	5652	98	3327	221	1.63	0.	24	83	6.0	92
30.0	7140	2923	5.21	56717	116.7	177.2	1657	6336	0	12.2	5.0	83.9	7062	78	3861	197	1.45	0.	28	96	6.7	106
35.0	8330	3411	6.08	61342	126.1	164.1	1820	6551	0	10.3	4.2	84.8	8265	65	4382	179	1.32	0.	33	108	7.4	
40.0	9520	3898	6.94	65664	134.8	153.5	1969	6712	0	8.9	3.6	85.5	9464	56	4894	166	1.22	0.	37	120	8.0	
45.0	10710	4385	7.81	69738	143.0	144.7	2108	6837	0	7.9	3.2	86.1	10661	49	5399	155	1.14	0.	41	131	8.6	
50.0	11900	4872	8.68	73607	150.7	137.3	2239	6937	0	7.0	2.9	86.5	11857	43	5899	146	1.07	0.	45	142	9.2	

#428 238 U on 181 Ta

238 U on 181 Ta

238 U on 181 Ta

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 73. ZC=165.( )
NEUTRON NUMBERS: NP=146. NT=108. NC=254.

AP**1/3= 6.197 AT**1/3= 5.657 ELSCAT <49 deg
REDUCED MASS NUMBER=102.81 AP+AT=AC=419.

INTERACTION RADIUS RINT=15.98 fm RO= 1.35 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 6.47 CT+CP=13.64 C̄= 3.40

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.62

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.35 RC=RCP+RCT=13.33

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1020.97 MeV K= .52883 n=2.444
VC(RINT)= 604.4 MeV

FISSION-TKE= 412. MeV
ASYMM. FISSION-TKE= 406. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.875 MeV/fm**2 PROX-FACTOR= 37.39 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.10 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -46.0
COMPOUND NUCLEUS: 697.9

FUSION RELATED PARAMETERS:
R-BARRIER=13.95 fm V(RB)= 634.9 MeV
Q-VALUE= -696.7 MeV
L-CRITICAL= 0.

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	103	0.17	10275	22.5	1057.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	206	0.34	14536	31.8	747.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	308	0.51	17807	38.9	610.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	411	0.68	20567	45.0	528.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	463	0.77	21818	47.7	498.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	514	0.85	23001	50.3	472.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	565	0.94	24127	52.7	450.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	617	1.02	25203	55.1	431.7	121	154	0	148.7	48.5	15.7	129	1299	150	3040	21.44	0.	0	0	0.0	0
6.5	1547	668	1.11	26236	57.3	414.8	281	762	0	111.7	44.5	34.2	507	1040	456	1342	9.22	0.	0	0	0.0	0
7.0	1666	720	1.19	27230	59.5	399.7	379	1283	0	93.0	38.4	43.5	805	861	681	999	6.85	0.	4	21	0.7	2
7.5	1785	771	1.28	28189	61.6	386.1	456	1733	0	80.5	33.7	49.8	1054	731	857	831	5.69	0.	5	24	1.2	8
8.0	1904	822	1.36	29118	63.6	373.9	522	2127	0	71.2	30.0	54.4	1271	633	1002	726	4.97	0.	6	27	1.6	13
8.5	2023	874	1.45	30018	65.6	362.7	581	2475	0	64.0	27.1	58.0	1466	557	1125	653	4.47	0.	7	30	1.8	17
9.0	2142	925	1.53	30892	67.5	352.5	634	2783	0	58.1	24.7	60.9	1646	496	1234	599	4.09	0.	8	33	2.1	21
9.5	2261	977	1.62	31743	69.3	343.1	683	3060	0	53.3	22.8	63.3	1814	447	1332	556	3.80	0.	8	35	2.3	25
10.0	2380	1028	1.70	32572	71.1	334.4	729	3308	0	49.3	21.1	65.3	1974	406	1422	521	3.56	0.	9	37	2.5	29
10.5	2499	1080	1.79	33381	72.9	326.4	772	3533	0	45.8	19.6	67.1	2127	372	1506	492	3.36	0.	10	39	2.7	32
11.0	2618	1131	1.87	34171	74.6	318.8	812	3738	0	42.9	18.4	68.6	2275	343	1585	467	3.20	0.	10	41	2.9	36
11.5	2737	1182	1.96	34944	76.3	311.8	851	3924	0	40.2	17.3	69.9	2419	318	1660	446	3.05	0.	11	43	3.0	39
12.0	2856	1234	2.04	35700	77.9	305.3	888	4095	0	37.9	16.3	71.0	2560	296	1732	427	2.92	0.	11	45	3.2	42
13.0	3094	1337	2.21	37168	81.1	293.3	958	4398	0	34.0	14.6	73.0	2834	260	1868	396	2.71	0.	12	48	3.5	48
14.0	3332	1439	2.38	38581	84.1	282.6	1023	4657	0	30.9	13.3	74.6	3100	232	1996	371	2.54	0.	13	52	3.8	53
15.0	3570	1542	2.55	39946	87.1	273.0	1085	4882	0	28.3	12.2	75.9	3361	209	2120	350	2.39	0.	14	55	4.0	58
16.0	3808	1645	2.72	41267	89.9	264.4	1143	5079	0	26.1	11.2	77.0	3618	190	2239	332	2.27	0.	15	58	4.3	62
17.0	4046	1748	2.89	42548	92.7	256.5	1198	5252	0	24.2	10.4	77.9	3872	174	2354	317	2.17	0.	16	61	4.5	67
18.0	4284	1851	3.06	43793	95.4	249.3	1251	5406	0	22.5	9.7	78.7	4123	161	2468	304	2.08	0.	17	64	4.7	71
19.0	4522	1953	3.23	45005	98.0	242.6	1301	5544	0	21.1	9.1	79.4	4373	149	2579	292	2.00	0.	18	67	4.9	75
20.0	4760	2056	3.40	46187	100.6	236.5	1350	5668	0	19.9	8.6	80.1	4621	139	2688	281	1.92	0.	19	70	5.1	79
25.0	5950	2570	4.25	51707	112.4	211.5	1571	6140	0	15.3	6.6	82.3	5846	104	3215	242	1.65	0.	24	83	6.0	96
30.0	7140	3084	5.10	56717	123.2	193.1	1764	6454	0	12.5	5.4	83.8	7057	83	3721	215	1.47	0.	28	96	6.8	111
35.0	8330	3598	5.95	61342	133.0	178.8	1939	6678	0	10.5	4.5	84.7	8261	69	4214	196	1.34	0.	32	108	7.4	
40.0	9520	4112	6.80	65664	142.2	167.2	2099	6847	0	9.1	3.9	85.4	9461	59	4697	181	1.24	0.	37	120	8.1	
45.0	10710	4627	7.65	69738	150.8	157.6	2247	6978	0	8.0	3.5	86.0	10659	51	5174	169	1.16	0.	41	131	8.7	
50.0	11900	5141	8.50	73607	159.0	149.6	2386	7082	0	7.2	3.1	86.4	11854	46	5644	159	1.09	0.	45	142	9.2	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	-MeV-	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB

BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

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#429 238 U on 197 Au

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 79. ZC=171.( )
NEUTRON NUMBERS: NP=146. NT=118. NC=264.

AP**1/3= 6.197 AT**1/3= 5.819 ELSCAT <55 deg
REDUCED MASS NUMBER=107.78 AP+AT=AC=435.

INTERACTION RADIUS RINT=16.15 fm R0= 1.34 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 6.68 CT+CP=13.84 $\bar{C}$= 3.46

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.83

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.55 RC=RCP+RCT=13.52

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1089.59 MeV K= .54940 n=2.441
VC(RINT)= 647.0 MeV

FISSION-TKE= 436. MeV
ASYMM. FISSION-TKE= 433. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.874 MeV/fm**2 PROX-FACTOR= 37.97 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 2.01 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -28.6
COMPOUND NUCLEUS: 768.3

FUSION RELATED PARAMETERS:
R-BARRIER=14.05 fm V(RB)= 681.7 MeV
Q-VALUE= -749.7 MeV
L-CRITICAL= 0.

238 U on 197 Au — 238 U on 197 Au

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	108	0.17	10275	23.6	1144.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	216	0.33	14536	33.3	809.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	323	0.50	17807	40.8	660.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	431	0.67	20567	47.1	572.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	485	0.75	21818	50.0	539.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	539	0.83	23001	52.7	511.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	593	0.92	24127	55.3	488.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	647	1.00	25203	57.7	467.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	1547	701	1.08	26236	60.1	448.9	266	622	0	118.6	50.3	30.7	413	1134	371	1623	10.44	0.	0	0	0.0	0
7.0	1666	754	1.17	27230	62.4	432.5	379	1165	0	97.6	42.6	41.2	731	935	612	1146	7.34	0.	4	20	0.3	0
7.5	1785	808	1.25	28189	64.6	417.9	465	1635	0	83.9	37.1	48.0	994	791	799	935	5.98	0.	5	24	1.0	6
8.0	1904	862	1.33	29118	66.7	404.6	537	2046	0	74.0	32.9	53.0	1221	683	951	810	5.18	0.	6	27	1.4	11
8.5	2023	916	1.42	30018	68.7	392.5	601	2409	0	66.3	29.6	56.8	1423	600	1079	724	4.63	0.	7	30	1.7	16
9.0	2142	970	1.50	30892	70.7	381.5	658	2731	0	60.2	27.0	59.9	1608	534	1190	661	4.22	0.	7	32	2.0	20
9.5	2261	1024	1.58	31743	72.7	371.3	711	3019	0	55.1	24.7	62.4	1781	480	1290	612	3.91	0.	8	34	2.2	24
10.0	2380	1078	1.67	32572	74.5	361.9	761	3279	0	50.9	22.9	64.6	1945	435	1380	572	3.66	0.	9	37	2.5	28
10.5	2499	1132	1.75	33381	76.4	353.2	807	3514	0	47.3	21.3	66.4	2101	398	1464	540	3.45	0.	9	39	2.7	32
11.0	2618	1186	1.83	34171	78.2	345.1	851	3727	0	44.2	19.9	67.9	2251	367	1542	512	3.27	0.	10	41	2.8	36
11.5	2737	1240	1.92	34944	79.9	337.5	892	3922	0	41.4	18.7	69.3	2397	340	1616	488	3.12	0.	11	43	3.0	39
12.0	2856	1293	2.00	35700	81.7	330.4	932	4100	0	39.0	17.6	70.5	2540	316	1687	467	2.98	0.	11	44	3.2	42
13.0	3094	1401	2.17	37168	85.0	317.4	1007	4416	0	35.0	15.8	72.5	2817	277	1820	433	2.76	0.	12	48	3.5	48
14.0	3332	1509	2.33	38581	88.2	305.9	1076	4687	0	31.7	14.3	74.1	3065	247	1946	405	2.58	0.	13	51	3.7	54
15.0	3570	1617	2.50	39946	91.3	295.5	1142	4921	0	29.0	13.1	75.5	3348	222	2065	382	2.44	0.	14	55	4.0	59
16.0	3808	1725	2.67	41267	94.3	286.1	1204	5126	0	26.7	12.1	76.6	3606	202	2180	362	2.31	0.	15	58	4.2	64
17.0	4046	1832	2.83	42548	97.2	277.6	1262	5307	0	24.8	11.2	77.6	3861	185	2292	345	2.20	0.	16	61	4.5	69
18.0	4284	1940	3.00	43793	100.0	269.7	1319	5468	0	23.1	10.5	78.4	4113	171	2401	330	2.11	0.	17	64	4.7	73
19.0	4522	2048	3.17	45005	102.8	262.5	1372	5612	0	21.7	9.8	79.2	4364	158	2507	317	2.03	0.	18	67	4.9	78
20.0	4760	2156	3.33	46187	105.4	255.9	1424	5742	0	20.4	9.2	79.8	4612	148	2612	306	1.95	0.	19	69	5.1	82
25.0	5950	2695	4.16	51707	117.9	228.9	1659	6234	0	15.7	7.1	82.1	5840	110	3115	263	1.68	0.	23	83	6.0	100
30.0	7140	3234	5.00	56717	129.1	208.9	1865	6562	0	12.8	5.8	83.6	7052	88	3596	234	1.49	0.	28	95	6.8	115
35.0	8330	3772	5.83	61342	139.5	193.4	2050	6796	0	10.8	4.9	84.6	8257	73	4064	213	1.36	0.	32	108	7.5	
40.0	9520	4311	6.66	65664	149.1	180.9	2220	6972	0	9.3	4.2	85.3	9458	62	4521	196	1.25	0.	36	119	8.1	
45.0	10710	4850	7.50	69738	158.1	170.6	2378	7109	0	8.2	3.7	85.9	10656	54	4972	183	1.17	0.	40	130	8.7	
50.0	11900	5389	8.33	73607	166.7	161.8	2526	7218	0	7.3	3.3	86.3	11852	48	5416	173	1.10	0.	44	141	9.2	

#430 238 U on 208 Pb

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 82. ZC=174.( )
NEUTRON NUMBERS: NP=146. NT=126. NC=272.

AP**1/3= 6.197 AT**1/3= 5.925 ELSCAT <61 deg
REDUCED MASS NUMBER=111.00 AP+AT=AC=446.

INTERACTION RADIUS RINT=16.27 fm R0= 1.34 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 6.82 CT+CP=13.98 $\bar{C}$= 3.49

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.96

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.66 RC=RCP+RCT=13.64

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=V0-K*r**n for r<RC
V0=1121.53 MeV K= .55568 n=2.440
VC(RINT)= 666.8 MeV

FISSION-TKE= 447. MeV
ASYMM. FISSION-TKE= 445. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.870 MeV/fm**2 PROX-FACTOR= 38.18 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 1.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -19.5
COMPOUND NUCLEUS: 805.7

FUSION RELATED PARAMETERS:
R-BARRIER=14.12 fm V(RB)= 703.3 MeV
Q-VALUE= -778.0 MeV
L-CRITICAL= 0.

238 U on 208 Pb — 238 U on 208 Pb

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CM	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	111	0.17	10275	24.3	1187.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	222	0.33	14536	34.3	840.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	333	0.50	17807	42.0	685.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	444	0.67	20567	48.6	593.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	499	0.75	21818	51.5	560.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	555	0.83	23001	54.3	531.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	610	0.92	24127	56.9	506.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	666	1.00	25203	59.5	484.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	1547	721	1.08	26236	61.9	465.9	275	624	0	118.9	53.0	30.5	405	1142	356	1693	10.57	0.	0	0	0.0	0
7.0	1666	777	1.17	27230	64.2	449.0	392	1175	0	97.8	44.5	41.1	725	941	597	1193	7.41	0.	4	20	0.0	0
7.5	1785	832	1.25	28189	66.5	433.8	481	1653	0	84.1	38.6	48.0	988	797	783	972	6.04	0.	5	24	1.0	6
8.0	1904	888	1.33	29118	68.7	420.0	556	2070	0	74.1	34.1	53.0	1216	688	934	842	5.22	0.	6	27	1.4	11
8.5	2023	943	1.41	30018	70.8	407.4	623	2438	0	66.4	30.7	56.8	1419	604	1060	752	4.67	0.	7	30	1.7	16
9.0	2142	999	1.50	30892	72.8	396.0	682	2765	0	60.3	27.9	59.9	1605	537	1171	687	4.26	0.	7	32	2.0	20
9.5	2261	1054	1.58	31743	74.8	385.4	737	3058	0	55.2	25.6	62.4	1778	483	1269	636	3.94	0.	8	34	2.2	25
10.0	2380	1110	1.66	32572	76.8	375.6	788	3321	0	51.0	23.6	64.5	1942	438	1358	595	3.69	0.	9	37	2.4	29
10.5	2499	1165	1.75	33381	78.7	366.6	836	3560	0	47.3	22.0	66.3	2098	401	1440	560	3.47	0.	9	39	2.6	33
11.0	2618	1221	1.83	34171	80.5	358.2	882	3776	0	44.2	20.5	67.9	2249	369	1517	532	3.29	0.	10	41	2.8	36
11.5	2737	1276	1.91	34944	82.3	350.3	925	3974	0	41.5	19.3	69.3	2395	342	1590	507	3.14	0.	11	43	3.0	40
12.0	2856	1332	2.00	35700	84.1	342.9	966	4155	0	39.1	18.2	70.5	2538	318	1659	485	3.01	0.	11	44	3.2	43
13.0	3094	1443	2.16	37168	87.5	329.5	1044	4476	0	35.0	16.3	72.5	2815	279	1789	449	2.78	0.	12	48	3.5	50
14.0	3332	1554	2.33	38581	90.8	317.5	1116	4750	0	31.8	14.8	74.1	3084	248	1911	420	2.60	0.	13	51	3.7	56
15.0	3570	1665	2.50	39946	94.0	306.7	1184	4989	0	29.1	13.5	75.5	3346	224	2027	396	2.45	0.	14	55	4.0	61
16.0	3808	1776	2.66	41267	97.1	297.0	1248	5197	0	26.8	12.5	76.6	3605	203	2139	376	2.33	0.	15	58	4.2	66
17.0	4046	1887	2.83	42548	100.1	288.1	1309	5381	0	24.8	11.6	77.6	3860	186	2247	358	2.22	0.	16	61	4.5	71
18.0	4284	1998	3.00	43793	103.0	280.0	1367	5544	0	23.1	10.8	78.4	4112	172	2353	343	2.12	0.	17	64	4.7	76
19.0	4522	2109	3.16	45005	105.8	272.5	1423	5690	0	21.7	10.1	79.2	4363	159	2456	330	2.04	0.	18	66	4.9	80
20.0	4760	2220	3.33	46187	108.6	265.6	1477	5822	0	20.4	9.5	79.8	4612	148	2558	318	1.97	0.	19	69	5.1	85
25.0	5950	2775	4.16	51707	121.4	237.6	1721	6321	0	15.7	7.3	82.1	5839	111	3044	273	1.69	0.	23	83	6.0	103
30.0	7140	3330	4.99	56717	133.0	216.9	1934	6654	0	12.8	6.0	83.6	7052	88	3508	243	1.50	0.	28	95	6.8	119
35.0	8330	3885	5.83	61342	143.6	200.8	2126	6892	0	10.8	5.0	84.6	8257	73	3958	221	1.37	0.	32	107	7.5	
40.0	9520	4440	6.66	65664	153.5	187.8	2302	7070	0	9.3	4.3	85.3	9457	63	4399	204	1.26	0.	36	119	8.1	
45.0	10710	4995	7.49	69738	162.9	177.1	2466	7209	0	8.2	3.8	85.9	10655	55	4832	190	1.18	0.	40	130	8.7	
50.0	11900	5550	8.32	73607	171.7	168.0	2619	7320	0	7.3	3.4	86.3	11851	49	5260	179	1.11	0.	44	141	9.3	
MeV/u	MeV	MeV	—	MeV/c	1/fm	—	fm	mb	mb	deg	deg	deg	MeV	MeV	MeV	—	nps	MeV	-MeV-	MeV	—

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 238 U

TABLES. Reaction Parameters for Heavy-Ion Collisions

See page 395 for Explanation of Tables and page 390 for Contents

#431 238 U on 209 Bi

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 83. ZC=175.( )
NEUTRON NUMBERS: NP=146. NT=126. NC=272.

AP**1/3= 6.197 AT**1/3= 5.934 ELSCAT <61 deg
REDUCED MASS NUMBER=111.28 AP+AT=AC=447.

INTERACTION RADIUS RINT=16.28 fm RO= 1.34 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 6.83 CT+CP=13.99 C̄= 3.50

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 6.97

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.68 RC=RCP+RCT=13.65

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO=1133.79 MeV K= .56025 n=2.440
VC(RINT)= 674.5 MeV

FISSION-TKE= 451. MeV
ASYMM. FISSION-TKE= 450. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.872 MeV/fm**2 PROX-FACTOR= 38.30 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 1.96 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: -16.5
COMPOUND NUCLEUS: 816.9

FUSION RELATED PARAMETERS:
R-BARRIER=14.12 fm V(RB)= 712.0 MeV
Q-VALUE= -786.1 MeV
L-CRITICAL= 0.

238 U on 209 Bi — 238 U on 209 Bi

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	111	0.16	10275	24.3	1202.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	223	0.33	14536	34.4	850.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	334	0.49	17807	42.2	694.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	445	0.66	20567	48.7	601.2	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	501	0.74	21818	51.6	566.8	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	556	0.82	23001	54.4	537.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	612	0.91	24127	57.1	512.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	668	0.99	25203	59.6	490.9	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	1547	723	1.07	26236	62.1	471.6	260	556	0	122.3	54.4	28.9	366	1181	325	1816	11.22	0.	0	0	0.0	0
7.0	1666	779	1.15	27230	64.4	454.5	382	1113	0	99.9	45.5	40.1	694	972	575	1241	7.63	0.	3	19	0.0	0
7.5	1785	835	1.24	28189	66.7	439.0	474	1595	0	85.6	39.4	47.2	964	821	766	1003	6.15	0.	5	23	0.9	5
8.0	1904	890	1.32	29118	68.8	425.1	551	2016	0	75.4	34.8	52.3	1196	708	921	864	5.30	0.	6	26	1.4	10
8.5	2023	946	1.40	30018	71.0	412.4	618	2388	0	67.5	31.2	56.3	1402	621	1050	770	4.72	0.	7	29	1.7	15
9.0	2142	1002	1.48	30892	73.0	400.8	678	2719	0	61.2	28.4	59.4	1590	552	1162	701	4.30	0.	7	32	2.0	20
9.5	2261	1057	1.57	31743	75.0	390.1	734	3014	0	56.0	26.0	62.0	1765	496	1262	648	3.97	0.	8	34	2.2	24
10.0	2380	1113	1.65	32572	77.0	380.2	786	3281	0	51.7	24.0	64.2	1930	450	1353	606	3.71	0.	9	36	2.4	28
10.5	2499	1168	1.73	33381	78.9	371.1	834	3521	0	48.0	22.3	66.0	2088	411	1436	571	3.50	0.	9	39	2.6	32
11.0	2618	1224	1.81	34171	80.7	362.5	880	3740	0	44.8	20.9	67.6	2240	378	1513	541	3.31	0.	10	41	2.8	36
11.5	2737	1280	1.90	34944	82.5	354.6	923	3940	0	42.0	19.6	69.0	2387	350	1587	516	3.16	0.	11	42	3.0	39
12.0	2856	1335	1.98	35700	84.3	347.1	965	4123	0	39.6	18.4	70.2	2530	326	1656	493	3.02	0.	11	44	3.1	43
13.0	3094	1447	2.14	37168	87.8	333.5	1043	4447	0	35.5	16.5	72.3	2808	286	1787	456	2.80	0.	12	48	3.4	49
14.0	3332	1558	2.31	38581	91.1	321.3	1116	4724	0	32.1	15.0	73.9	3078	254	1910	427	2.61	0.	13	51	3.7	55
15.0	3570	1669	2.47	39946	94.3	310.4	1184	4965	0	29.4	13.7	75.3	3341	229	2027	402	2.46	0.	14	54	4.0	60
16.0	3808	1780	2.64	41267	97.4	300.6	1249	5175	0	27.1	12.6	76.5	3600	208	2139	381	2.34	0.	15	58	4.2	66
17.0	4046	1892	2.80	42548	100.4	291.6	1310	5361	0	25.1	11.7	77.4	3856	190	2247	364	2.23	0.	16	61	4.4	70
18.0	4284	2003	2.97	43793	103.3	283.4	1369	5526	0	23.4	10.9	78.3	4109	175	2353	348	2.13	0.	17	64	4.7	75
19.0	4522	2114	3.13	45005	106.1	275.8	1425	5674	0	21.9	10.2	79.0	4359	163	2456	334	2.05	0.	18	66	4.9	80
20.0	4760	2226	3.30	46187	108.8	268.9	1479	5806	0	20.6	9.6	79.7	4608	152	2557	322	1.97	0.	19	69	5.1	84
25.0	5950	2782	4.12	51707	121.7	240.5	1724	6311	0	15.9	7.4	82.1	5837	113	3043	276	1.69	0.	23	83	6.0	103
30.0	7140	3338	4.95	56717	133.3	219.5	1938	6648	0	12.9	6.0	83.5	7050	90	3507	246	1.50	0.	28	95	6.8	118
35.0	8330	3895	5.77	61342	144.0	203.2	2131	6888	0	10.9	5.1	84.6	8255	75	3956	224	1.37	0.	32	107	7.5	
40.0	9520	4451	6.60	65664	153.9	190.1	2308	7068	0	9.4	4.4	85.3	9456	64	4396	206	1.26	0.	36	119	8.1	
45.0	10710	5008	7.42	69738	163.3	179.2	2472	7208	0	8.3	3.9	85.9	10654	56	4828	193	1.18	0.	40	130	8.7	
50.0	11900	5564	8.25	73607	172.1	170.0	2626	7320	0	7.4	3.5	86.3	11851	49	5255	181	1.11	0.	44	141	9.2	

#432 238 U on 238 U

PARAMETERS INDEPENDENT OF BOMBARDING ENERGY

ATOMIC NUMBERS: ZP= 92. ZT= 92. ZC=184.( )
NEUTRON NUMBERS: NP=146. NT=146. NC=292.

INTERACTION RADIUS RINT=16.56 fm RO= 1.34 fm

MATTER HALF-DENSITY RADII [fm]:
CP= 7.16 CT= 7.16 CT+CP=14.33 C̄= 3.58

EQUIVALENT SHARP SURFACE RADII [fm]:
RP= 7.30 RT= 7.30

COULOMB RADII [fm]:
RCP= 6.98 RCT= 6.98 RC=RCP+RCT=13.95

BSS-COULOMB POTENTIAL [MeV]:
VC(r)=1.438*ZP*ZT/r for r>RC
VC(r)=VO-K*r**n for r<RC
VO=1230.05 MeV K= .57852 n=2.438
VC(RINT)= 734.9 MeV

FISSION-TKE= 487. MeV
ASYMM. FISSION-TKE= 487. MeV

LIQUID DROP PARAMETERS:
GAMMA= 0.864 MeV/fm**2 PROX-FACTOR= 38.91 MeV
L-RLD= 0 (ROTATING LIQUID DROP LIMIT)
STIFFNESS PARAMETER C= 1.84 MeV/Z**2

MASS EXCESSES [MeV/c**2]:
PROJECTILE: 47.2 TARGET: 47.2
COMPOUND NUCLEUS: 929.6

FUSION RELATED PARAMETERS:
R-BARRIER=14.29 fm V(RB)= 779.2 MeV
Q-VALUE= -835.1 MeV
L-CRITICAL= 0.

238 U on 238 U — 238 U on 238 U

EL/u	ELAB	ECM	ECM/VC	P	k	ETA	LMAX	SGMAR	SGFUS	QP-CN	QP-LP	QP-LT	EP-QP	ET-QT	EPQMX	ETA'	TAU	E-ER	EN--EN	TEMP	MULT
1.0	238	119	0.16	10275	26.0	1332.7	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
2.0	476	238	0.32	14536	36.8	942.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
3.0	714	357	0.49	17807	45.1	769.5	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.0	952	476	0.65	20567	52.1	666.4	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
4.5	1071	536	0.73	21818	55.2	628.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.0	1190	595	0.81	23001	58.2	596.0	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
5.5	1309	655	0.89	24127	61.0	568.3	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.0	1428	714	0.97	25203	63.8	544.1	0	0	0	180.0	180.0	0.0	0	0	0	0	0.00	0.	0	0	0.0	0
6.5	1547	774	1.05	26236	66.4	522.7	243	423	0	130.2	65.1	24.9	274	1273	234	2339	13.31	0.	0	0	0.0	0
7.0	1666	833	1.13	27230	68.9	503.7	390	1011	0	104.6	52.3	37.7	624	1042	500	1468	8.29	0.	3	19	0.0	0
7.5	1785	893	1.21	28189	71.3	486.6	495	1519	0	89.1	44.5	45.5	907	878	700	1158	6.53	0.	4	23	1.0	6
8.0	1904	952	1.30	29118	73.6	471.2	581	1964	0	78.1	39.0	51.0	1149	755	860	987	5.56	0.	5	26	1.4	12
8.5	2023	1012	1.38	30018	75.9	457.1	656	2356	0	69.7	34.9	55.1	1362	661	992	874	4.92	0.	6	29	1.7	17
9.0	2142	1071	1.46	30892	78.1	444.2	723	2705	0	63.1	31.6	58.4	1556	586	1105	793	4.46	0.	7	31	2.0	22
9.5	2261	1131	1.54	31743	80.2	432.4	785	3016	0	57.7	28.8	61.2	1735	526	1205	731	4.11	0.	8	34	2.2	26
10.0	2380	1190	1.62	32572	82.3	421.4	842	3297	0	53.2	26.6	63.4	1903	477	1294	681	3.83	0.	9	36	2.4	31
10.5	2499	1250	1.70	33381	84.3	411.3	896	3551	0	49.3	24.7	65.3	2064	435	1376	641	3.60	0.	9	38	2.6	35
11.0	2618	1309	1.78	34171	86.3	401.8	946	3782	0	46.0	23.0	67.0	2218	400	1452	607	3.41	0.	10	40	2.8	39
11.5	2737	1369	1.86	34944	88.3	393.0	994	3992	0	43.1	21.6	68.4	2367	370	1523	578	3.25	0.	10	42	3.0	42
12.0	2856	1428	1.94	35700	90.2	384.7	1040	4185	0	40.6	20.3	69.7	2512	344	1590	552	3.11	0.	11	44	3.2	46
13.0	3094	1547	2.11	37168	93.8	369.6	1126	4527	0	36.4	18.2	71.8	2793	301	1715	510	2.87	0.	12	47	3.5	53
14.0	3332	1666	2.27	38581	97.4	356.2	1205	4820	0	32.9	16.5	73.5	3064	268	1832	476	2.68	0.	13	51	3.7	59
15.0	3570	1785	2.43	39946	100.8	344.1	1280	5073	0	30.1	15.0	75.0	3329	241	1942	449	2.52	0.	14	54	4.0	65
16.0	3808	1904	2.59	41267	104.1	333.2	1351	5295	0	27.7	13.9	76.1	3590	218	2047	425	2.39	0.	15	57	4.2	71
17.0	4046	2023	2.75	42548	107.3	323.2	1418	5491	0	25.7	12.8	77.2	3846	200	2149	405	2.28	0.	16	60	4.5	76
18.0	4284	2142	2.91	43793	110.4	314.1	1482	5665	0	23.9	12.0	78.0	4100	184	2247	388	2.18	0.	17	63	4.7	81
19.0	4522	2261	3.08	45005	113.5	305.8	1543	5821	0	22.4	11.2	78.8	4351	171	2343	372	2.09	0.	18	66	4.9	86
20.0	4760	2380	3.24	46187	116.4	298.0	1602	5961	0	21.1	10.5	79.5	4601	159	2437	358	2.01	0.	19	69	5.1	91
25.0	5950	2975	4.05	51707	130.1	266.5	1870	6493	0	16.2	8.1	81.9	5832	118	2886	307	1.73	0.	23	82	6.0	111
30.0	7140	3570	4.86	56717	142.6	243.3	2104	6848	0	13.2	6.6	83.4	7046	94	3312	273	1.53	0.	27	94	6.8	128
35.0	8330	4165	5.67	61342	154.0	225.3	2314	7102	0	11.1	5.6	84.4	8252	78	3723	248	1.40	0.	31	106	7.5	
40.0	9520	4760	6.48	65664	164.6	210.7	2507	7292	0	9.6	4.8	85.2	9453	67	4124	229	1.29	0.	35	118	8.1	
45.0	10710	5355	7.29	69738	174.6	198.7	2686	7439	0	8.5	4.2	85.8	10652	58	4517	214	1.20	0.	39	129	8.7	
50.0	11900	5950	8.10	73607	184.0	188.5	2854	7557	0	7.6	3.8	86.2	11848	52	4905	201	1.13	0.	43	140	9.3	

MeV/u	MeV	MeV	--	MeV/c	1/fm	--	ħ	mb	mb	deg	deg	deg	MeV	MeV	MeV	--	nps	MeV	--MeV--	MeV	--

P=PROJECTILE T=TARGET C=COMPOUND OR DINUCLEAR SYSTEM QP=QUARTERPOINT CM=CENTER OF MASS L=LAB BEAM 238 U