

СООБЩЕНИЯ  
ОБЪЕДИНЕННОГО  
ИНСТИТУТА  
ЯДЕРНЫХ  
ИССЛЕДОВАНИЙ  
ДУБНА

E7-85-431

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HALF-LIVES AND KINETIC ENERGIES  
FOR THE SPONTANEOUSLY EMITTED  
HEAVY IONS FROM NUCLEI

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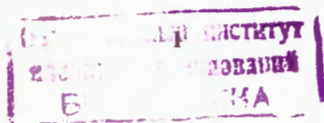
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1985

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## INTRODUCTION

Four methods allowing to predict new decay modes of atomic nuclei by spontaneous emission of heavy ions (HI's) have been reviewed<sup>1,2</sup> since 1980, assuming for the mechanism of these new radioactivities either emission of a preformed cluster, or a very asymmetric fission process. A new peak, due to the  $^{48}\text{Ca}$  emission has been seen<sup>1</sup> in the fission fragment mass distributions, calculated by means of the fragmentation theory<sup>3</sup>. Eight even-even (e-e) HI's ( $^{14}\text{C}$ ,  $^{24}\text{Ne}$ ,  $^{28}\text{Mg}$ ,  $^{32,34}\text{Si}$ ,  $^{46}\text{Ar}$ , and  $^{48,50}\text{Ca}$ ) have been identified<sup>1</sup> in the penetrability spectra of 16 e-e nuclides, various isotopes of the elements Ra, Th, Pu, Cm, Cf, Fm and No, as the most probable emitted clusters from these parents. A numerical supersymmetric fission model derived for binary systems with charge asymmetry different from the mass asymmetry was developed, to compute a measurable quantity - the half-life - and was used to describe the  $\alpha$ -decay process<sup>1,2</sup> and the new decay modes<sup>4,5</sup>.

In a systematic search of the new decay modes, one has to take into consideration a very large number of combinations parent-emitted HI's. For example if we intend to study the stability of 2200 nuclides (given by Wapstra and Audi in the new mass tables<sup>6</sup>), relative to the emission of 200 HI's, various isotopes of the elements with atomic numbers  $Z_e=2$  -26, this number is of the order of  $10^5$ . Hence, analytical relationships are needed to perform the computations in a reasonable time. For this purpose the analytical supersymmetric fission model (ASAFM) was derived<sup>2</sup> and it was extended<sup>7</sup> to account for angular momentum and small excitation

energy effects. It was shown<sup>2,7</sup> that all nuclides of known masses are stable with respect to the emission of  $^2,^3\text{H}$ ,  $^{3,6-9}\text{He}$ ,  $^4\text{Li}$ ,  $^7\text{B}$  and  $^9\text{C}$ , but  $^9\text{Be}$ ,  $^{12}\text{C}$ ,  $^{16}\text{O}$ , etc., are good candidates for the new modes. When  $^5\text{He}$  radioactivity was predicted<sup>7</sup>, a simple rule governing these processes was found: for a given emitted HI, the maximum value of the emission rate (minimum half-life) is obtained when the daughter has magic neutron and proton numbers ( $N_d = 126$ ,  $Z_d = 82$ ) or not very far from these. The rule was confirmed when other emitted HI's with increasing  $Z$  were considered<sup>9,4,5</sup>. A comprehensive list, containing more than 140 predicted new decay modes could be found in the Ref.5. An up-dated version of a review paper<sup>10</sup> describing the early works, will be published soon (see also<sup>11-16</sup>).

Shi and Swiatecki<sup>17</sup> developed a supersymmetric fission model based on the proximity + Coulomb potential, allowing to compute the branching ratio relative to the  $\alpha$  decay, in agreement with that of the two decay modes which have been experimentally discovered in 1984:  $^{14}\text{C}$  and  $^{24}\text{Ne}$  radioactivity. The experimental evidences<sup>18-24</sup> will be presented below, in a special section.

The branching ratios relative to  $\alpha$  decay, or the absolute values of the partial half-lives determined in these experiments, are in agreement (within 1.5 orders of magnitude) with the estimations made in the framework of ASAFM. Due to the fact that the calculated half-life is extremely sensitive to the various parameters of the potential and of the nuclear shapes, this result seems very promising.



Consequently we hope that a table with estimated properties of the most probable HI's spontaneously emitted from parent nuclides, including some "stable" ones could be used as a first guide by the experimentalists or theoreticians working in this new field of research to choose the objects and the means of their future investigations. Even if a different value of the half-life will be found in the experiment, there is a little chance to get another hierarchy of the most probable emitted HI's if the assumed masses are correct. Of course, more accurate mass values for some of the parent or daughter nuclides would help to obtain in some cases estimated half-lives closer to the experimental ones. We expect, also, that the new experimental results could be used to improve the model, as will be shown in the following sections.

#### METHOD OF CALCULATION

The absolute value of the partial half-life,  $T$ , for the spontaneous emission of ions heavier than  ${}^4\text{He}$  is estimated in the framework of the ASAFM. The branching ratios relative to  $\alpha$  decay are calculated by using half-lives,  $T_\alpha$ , taken from a set of about 380 experimental values<sup>25</sup> selected from various original or compilation sources<sup>26-35</sup>. If the parent nucleus is not available on the table<sup>25</sup> of  $T_\alpha$ , a semiempirical formula<sup>2,36</sup> for the  $\alpha$ -decay life-time is used to estimate  $T_\alpha$ , and this fact is mentioned in the table by giving different values of the code number  $C_\alpha$ . The estimated life-times,  $T_\alpha$ , could be used to search for new  $\alpha$ -emitters.

#### Selection of parent nuclides and emitted heavy ions

The ground state of almost all nuclides with atomic number,  $Z$ , smaller than 34 are stable with respect to HI's emission.

For each parent nucleus  $(A, Z)$  with  $Z > 34$  and known mass value<sup>6</sup>, having a total half-life<sup>28</sup>  $T_t$  longer than 1  $\mu\text{s}$ , and the  $\alpha$ -daughter also on the mass table<sup>6</sup>, one takes into considerations all the combinations emitted HI  $(A_e, Z_e)$  - daughter  $(A_d, Z_d)$  such that

$$A = A_d + A_e ; Z = Z_e + Z_d \quad (1)$$

in which besides the  $\alpha$ -particle, the emitted HI is one of the following nuclides:  ${}^5\text{He}$ ;  ${}^{8-10}\text{Be}$ ;  ${}^{11,12}\text{B}$ ;  ${}^{12-16}\text{C}$ ;  ${}^{13-17}\text{N}$ ;  ${}^{15-22}\text{O}$ ;  ${}^{18-23}\text{F}$ ;  ${}^{20-26}\text{Ne}$ ;  ${}^{23-28}\text{Na}$ ;  ${}^{23-30}\text{Mg}$ ;  ${}^{27-32}\text{Al}$ ;  ${}^{28-36}\text{Si}$ ;  ${}^{31-39}\text{P}$ ;  ${}^{32-42}\text{S}$ ;  ${}^{35-44}\text{Cl}$ ;  ${}^{37-46}\text{Ar}$ ;  ${}^{40-49}\text{K}$ ;  ${}^{44-51}\text{Ca}$ ;  ${}^{46-52}\text{Sc}$ ;  ${}^{47-54}\text{Ti}$ ;  ${}^{49-56}\text{V}$ ;  ${}^{50-58}\text{Cr}$ ;  ${}^{53-60}\text{Mn}$ ;  ${}^{54-63}\text{Fe}$ ;  ${}^{55-65}\text{Co}$  and  ${}^{58-69}\text{Ni}$ . If  $Z_e > Z/2$  the search is stopped. For some of the very neutrondeficient or very neutron-rich nuclides,  $T_t$ , is not measured up to now, but there are<sup>28,37,38</sup> estimations of the  $\beta$ -decay half-lives, up-dated recently<sup>39</sup> in case of neutron rich nuclei. The mass value of a daughter which is not available in the table<sup>6</sup>, can be replaced either by extrapolated values calculated with a computer program kindly supplied by J. Jänecke<sup>40</sup>, or by some estimations selected from 1975 mass predictions<sup>41</sup> and from the Ref.42. A code number  $C$ ,  $C_e$  or  $C_d$  specify the source for the mass value of each of the three partners: parent; emitted HI and the daughter, respectively.



For each of the combination mentioned above the Q-value offers a selection possibility. If

$$Q = M(A, Z) - [M(A_d, Z_d) + M(A_e, Z_e)] \quad (2)$$

has a negative value, the nucleus is stable relative to this decay mode. The mass excess M is given in MeV. From our experience, we know that even if  $Q > 0$  but has a small value, let be  $Q < 0.9 Z_e$  MeV, this mode has no chance to compete with the most probable ones, hence it can be skipped. For a total number of modes  $n_Q$  with  $Q > 0.9 Z_e$ , given in the table, one computes the half-life, T in seconds with a formula given below.

Then the  $n_T$  modes with  $\log T < 50$  (of course  $n_T < n_Q$ ) are arranged in the increasing order of T and if  $n_T > 8$  only the first 8 ones are given in the table. If the condition  $T < 10^{50}$  s is not fulfilled for any decay mode with  $A_e > 4$ , this parent is not given in the table even it is a emitter. Due to the above mentioned two conditions (parent on the new mass table and  $\log T < 50$ ), our table begins with  $Z=47$  instead of  $Z=34$ . In fact we made one exception, giving a parent nuclide with the mass value not tabulated by Wapstra and Audi. We know that all nuclides with  $Z > 40$  are metastable with respect to the HI's emission but the life-time is longer than  $10^{50}$  s for those with  $Z < 47$ .

There are many other nuclides with  $\log T < 50$  which are not given in the table as for example the neutron-poor

$^{106}\text{Te}$ ,  $^{155}\text{Lu}$ ,  $^{157}\text{Hf}$ ,  $^{158}\text{Ta}$ , and the neutron rich  $^{219, 220}\text{At}$ ,  $^{222}\text{Rn}$ ,  $^{229-232}\text{Ac}$ ,  $^{232-234}\text{Th}$ ,  $^{233-236}\text{Pa}$ ,  $^{236-239}\text{U}$ ,  $^{237-242}\text{Np}$ ,  $^{242-244}\text{Pu}$ ,  $^{246, 247}\text{Am}$ ,  $^{247-250}\text{Cm}$ ,  $^{248-252}\text{Bk}$ ,  $^{250-254}\text{Cf}$ ,  $^{253-256}\text{Es}$ , etc., due to the uncertainties in the mass values of some daughter nuclides like  $^{98}\text{Cd}$ ,  $^{148}\text{Tb}$ ,  $^{145}\text{Dy}$ ,  $^{146}\text{Ho}$ ,  $^{199}\text{Os}$ ,  $^{200-202}\text{Ir}$ ,  $^{202-205}\text{Pt}$ ,  $^{205-207}\text{Au}$  and  $^{208, 209}\text{Hg}$ .

The analytical relationships for the partial half-life relative to HI's emission

In the framework of ASAFM<sup>2,7</sup> the decimal logarithm of the half-life, T, expressed in seconds, is given by

$$\log T = 0.43429 (K_{ov} + K_s) - \log E_v - 20.8436. \quad (3)$$

where  $K_{ov}$  and  $K_s$  are two terms of the action integral  $K = K_{ov} + K_s$ , corresponding to the overlapping and separated fragments, respectively:

$$K_{ov} = 0.2196 (E_b^0 A_d A_e / A)^{1/2} \left\{ (b^2 - a^2)^{1/2} - \frac{a^2}{b} \ln \left[ \frac{b + (b^2 - a^2)^{1/2}}{a} \right] \right\} \quad (4)$$

$$K_s = 0.4392 \left( \frac{Q' A_d A_e}{A} \right)^{1/2} R_b \tilde{c} \quad (5)$$

They depend on the Coulomb,  $E_c$ , and centrifugal,  $E_l$  interaction contributions to the barrier height:

$$E_i = E_c + E_l ; E_c = \frac{1.44 Z_d Z_e}{R_t}$$

$$E_l = \frac{20.735 \ell(\ell+1)A}{R_t^2 A_d A_e} ; E_b^0 = E_i - Q. \quad (6)$$

All the energies are expressed in MeV and the lengths in fm. There are also, the "exit" and touching points,  $R_b$  and  $R_t$  the lengths  $a$ ,  $b$  and the dimensionless parameters  $r$ ,  $m$ ,  $c$  :

$$R_b = \frac{R_t E_c}{Q'} \left[ \frac{1}{2} + \left( \frac{1}{4} + \frac{Q' E_l}{E_c^2} \right)^{1/2} \right] ; r = \frac{R_t}{R_b} ; R_t = r_0 (A_d^{1/3} + A_e^{1/3}) \quad (7)$$

$$Q' = Q + E_v + E^* ; a = b \left( \frac{Q' - Q}{E_c} \right)^{1/2} ; b = R_t - R_i \quad (8)$$

$$J_{mc} = (c+m-1)^{1/2} - [r(c-r)+m]^{1/2} + \frac{c}{2} \left[ \arcsin \frac{c-2r}{(c^2+4m)^{1/2}} - \right.$$

$$\left. - \arcsin \frac{c-2}{(c^2+4m)^{1/2}} \right] + \sqrt{m} \ln \left\{ \frac{2\sqrt{m} [r(c-r)+m]^{1/2} + cr + 2m}{r [2\sqrt{m} (c+m-1)^{1/2} + c + 2m]} \right\} \quad (9)$$

$$m = \frac{r^2 E_l}{Q'} ; c = \frac{r E_c}{Q'} ; r_0 = 1.2249 \text{ fm} \quad (10)$$

where  $E^*$  is the fraction of the excitation energy, concentrated in the collective mode leading to separation and

$\ell$  is the angular momentum which can be found<sup>7</sup> from the spin and parity conservation laws. In the following we consider only emission from the ground states, hence  $E^*=0$ . A small angular momentum, up to five units of  $\hbar$ , makes an important contribution (hindrance) to the lifetime only for very light emitted particles, as it was shown<sup>5</sup> previously. Consequently in a first approximation we can take  $\ell=0$ .

From a fit with selected set of experimental data<sup>25</sup> on 379  $\alpha$ -emitters and <sup>14</sup>C radioactivity of <sup>223</sup>Ra the following law was found<sup>4,5</sup> for the zero point vibration energy:

$$E_v = Q \left[ 0.056 + 0.039 \exp \left( \frac{4-A_e}{2.5} \right) \right] ; Q > 0 ; A_e \geq 4 \quad (11)$$

including the shell-effects which are present in  $Q$ -values.

When the  $\alpha$ -emitters have been grouped according to even (e) and odd (o) proton and neutron numbers like in case of the semiempirical formula<sup>2,36</sup>, it was shown<sup>4</sup> that the agreement with experimental results is improved if  $E_v/Q$  takes different values in various groups of nuclides, instead of only one (0.095) for all  $\alpha$ -parents regardless their even-odd character. The optimum  $E_v/Q$  values have been: 0.105 for e-e; 0.090 for e-o; 0.095 for o-e and 0.075 for o-o. This means that the  $\alpha$  particle emission rates from o-o, e-o and o-e parents are hindered relative to the emission from e-e nuclides, or equivalently: emission rates from e-e parents are enhanced. A similar odd-even effect, expected<sup>4</sup> for HI's, has been indeed observed<sup>43</sup> for <sup>14</sup>C radioactivity of <sup>222,223,224</sup>Ra and of <sup>225</sup>Ac. For HI's emission we can assume, for the beginning, the same ratios of  $E_v$ . Hence we shall present in the table, two estimations for the half-life:  $T$  and  $T'$  computed by using,  $E_v$ , and



$$E'_V = E_V x \begin{cases} 1.105 & \text{for e-e} \\ 0.947 & \text{for e-o} \\ 1.000 & \text{for o-e} \\ 0.789 & \text{for o-o} \end{cases} \text{ parent.} \quad (12)$$

One can see that the agreement with experimental results for  $^{14}\text{C}$  radioactivity of Ra isotopes improves in this way. It would be interesting to find if a similar even-odd effect in zero point vibration energy is also present for the  $Z_e$ ,  $N_e$  of the emitted HI's of different parities (for example to compare  $^{24}\text{Ne}$  emission with that of  $^{25}\text{Ne}$ ).

#### Semiempirical formula for $\alpha$ -decay half-life

For  $\alpha$ -decay,  $K_{ov}$  is always only a small percent of  $K_s$  and one can<sup>2,36</sup> write

$$\log T_\alpha = 0.43429 K - 20.446 \quad (13)$$

$$K = \chi K_s \quad (14)$$

$$K_s = 2.52956 Z_d (A_d/AQ)^{1/2} [\text{arc cos } \sqrt{x} - \sqrt{x(1-x)}]; \quad x = 0.423 Q (1.5847 + A_d^{1/3}) / Z_d \quad (15)$$

The quantity  $\chi$  is close to unity and has a "saw-tooth" variation versus the neutron number  $N=A-Z$  of the parent nucleus, the maximum values being reached at the magic numbers for even  $N$  and at the magic-plus-one for odd  $N$  nuclides.

It is expressed as a second order polynomial

$$x = B_1 + B_2 y + B_3 z + B_4 y^2 + B_5 zy + B_6 z^2 \quad (16)$$

in the reduced variables  $y$  and  $z$  expressing the distance from the closest magic-plus-one numbers  $N_i$  and  $Z_i$ , in the neighbourhood of  $N$  and  $Z$ :

$$y = (N - N_i) / (N_{i+1} - N_i); \quad N_i < N < N_{i+1}$$

$$N_i = \dots, 29, 51, 83, 127, 185, \dots \quad (17)$$

$$z = (Z - Z_i) / (Z_{i+1} - Z_i); \quad Z_i < Z < Z_{i+1}$$

$$Z_i = \dots, 29, 51, 83, 115, \dots \quad (18)$$

with parameters  $\{B_k\}$ , given in table 1, obtained from a fit with experimental data<sup>25</sup> on 125 e-e, 111 e-o, 84 o-e and 60 o-o nuclides. A computer program<sup>36</sup> allows to improve automatically the parameters  $B_k$ , each time a new set of experimental data (completed with new alpha emitters or more accurate measurements) is available.

Table 1  
 $B_k$  parameter values of semiempirical formula for  $\alpha$ -decay half-life

Group of nuclei	$B_1$	$B_2$	$B_3$	$B_4$	$B_5$	$B_6$
e - e	0.985 911	0.022 841	0.024 584	0.023 279	-0.000 716	-0.022 562
o - e	1.000 560	0.010 783	0.050 671	0.013 919	0.043 657	-0.079 999
e - o	1.017 560	-0.113 054	0.019 057	0.147 320	0.230 300	-0.101 523
o - o	1.007 740	-0.184 136	0.260 268	0.231 900	0.326 025	-0.407 280

Experimental discoveries. Branching ratios relative to the total and single  $\alpha$ -transitions

The first of the 8 new decay modes predicted<sup>1</sup> since 1980 was discovered experimentally by Rose and Jones<sup>18</sup>. With a standard silicon telescope  $\Delta E$ -E detector, they observed 11 events of  $^{14}\text{C}$  emission from  $^{223}\text{Ra}$ , during a run of 189 days and 9 events in a run of 194 days. In a similar experiment performed with a more intense source, Alexandrov et al<sup>19</sup> obtained 7 events in 30 days. A superconducting magnetic solenoid spectrometer used by Gales et al.<sup>20</sup>, allowed to suppress the  $\alpha$  particles in competition with  $^{14}\text{C}$ . They identified the  $^{14}\text{C}$  nuclei with a semiconductor telescope placed in the focal plane of the spectrometer. All three groups<sup>18-20</sup> used  $^{227}\text{Ac}$  source material, with which the emitter  $^{223}\text{Ra}$  was in secular equilibrium.

Price et al.<sup>21</sup> have used the ISOLDE on-line separator to produce sources of  $^{221}\text{Fr}$  and  $^{221}$ ,  $^{222}$ ,  $^{223}$ ,  $^{224}\text{Ra}$  and polycarbonate track-recording films, not sensitive to  $\alpha$  particles. They discovered two new  $^{14}\text{C}$  emitters:  $^{222}\text{Ra}$  (52 events) and  $^{224}\text{Ra}$  (22 events) and confirmed the previously measured branching ratio for the parent  $^{223}\text{Ra}$  (56 events). Recently, Kutschera et al.<sup>22</sup> measured the energy and the mass of  $^{14}\text{C}$  nuclei emitted by  $^{223}\text{Ra}$ , using a strong  $^{227}\text{Th}$  source and an Enge split-pole magnetic spectrograph. In 6 days they recorded 24 events.

$^{24}\text{Ne}$  radioactivity was discovered in  $^{232}\text{U}$  (31 events) by Barwick et al.<sup>23</sup> and in  $^{231}\text{Pa}$  (25 events) by Sandulescu et al.<sup>24</sup> with track-recording films. An interesting assumption has been made<sup>23</sup> concerning some measurements of the spontaneous fission half-lives for  $^{230}$ ,  $^{232}\text{Th}$ ,  $^{231}\text{Pa}$ ,

$^{232-234}\text{U}$ ,  $^{237}\text{Np}$  and  $^{241}\text{Am}$ , performed during the period 1950-1966. According to the Ref. 23 it is possible that the measured quantity, in these experiments, was the spontaneous emission of some HI's and not that of a lower asymmetry spontaneous fission.

The experimentally determined branching ratios are given in table 2. By comparing these ratios with the estimated ones, one has to consider what quantity is measured and what is calculated.

Many of the  $\alpha$ -radioactive nuclides have also other competing decay modes (beta decay, spontaneous fission, etc), hence the partial alpha life-time,  $T_{\alpha}$ , is usually longer than the total disintegration period,  $T_t$ . If, by chance, one gets  $T_{\alpha} < T_t$  which is measured<sup>28</sup>, then one had to take  $T_{\alpha} = T_t$ . Usually there are several  $\alpha$  transitions belonging to a parent nucleus because the process does not take place only between ground states; also different excited states of the daughter are populated.

In our table from all  $\alpha$ -transitions only the strongest ones have been selected<sup>25</sup>: ground state to ground state transitions in e-e nuclides or so-called "favoured" transitions in o-o or odd-mass nuclides, because the partial half-life,  $T_{\alpha}$ , calculated with semiempirical formula refers also to these single-transitions having an intensity  $i_s$  expressed in percent, sometimes different from 100%. Consequently, the total  $\alpha$  decay half-life,  $T_{\alpha}^t$  can be found by using the relationship:

$$T_{\alpha}^t = \frac{i_s}{100} T_{\alpha} \quad (19)$$



Table 2

Experimentally determined branching ratios relative to  $\alpha$ -decay for the spontaneous emission of heavy ions

Emit- ted HI	Parent nu- cleus	Q (MeV)	$E_k$ (MeV)	No. of events	$b_t$	Ref. $i_g$	log T(s)		- log $b_g$				
							% experim.	estimated	Exp.	estimated			
							log T'(s)	log T(s)	-log $b_g$	-log $b'_g$			
$^{14}\text{C}$	$^{221}\text{Fr}$	31.28	29.3	0	$<4.4 \times 10^{-12}$	21	83.3	>13.8	15.0	15.0	>11.3	12.5	12.5
	$^{221}\text{Ra}$	32.39	30.3	0	$<4.4 \times 10^{-12}$	21	34.0	>12.8	13.8	14.1	>10.9	11.9	12.2
	$^{222}\text{Ra}$	33.05	31.0	52	$(3.7 \pm 0.5) \times 10^{-10}$	21	96.9	10.9-11.1	12.6	12.1	9.3-9.5	11.0	10.5
$^{223}\text{Ra}$	31.85	29.8	19	$(8.5 \pm 2.5) \times 10^{-10}$	18	52.5	14.9-15.2	14.8	15.0	8.7-8.9	8.5	8.8	8.8
	56	6.1+0.8	$10^{-10}$	21	15.1-15.3	21	8.9-9.2	8.9-9.0	8.9-9.0	8.9-9.0	8.9-9.0	8.9-9.0	8.9-9.0
$^{224}\text{Ra}$	30.54	28.6	22	$(4.3 \pm 1.1) \times 10^{-11}$	21	95.1	15.8-16.0	17.4	16.9	10.2-10.5	11.8	11.4	11.4
$^{232}\text{U}$	62.31	55.9	31	$(1.0 \pm 0.25) \times 10^{-12}$	23	68.2	21.3-21.5	20.4	19.6	11.7-12.0	10.9	10.1	10.1

In the experiment, the branching ratio relative to the total number of  $\alpha$ -decay lines is determined:

$$b_t = \frac{T_\alpha^t}{T} \quad (20)$$

but in our table (and in similar tables computed with other models) only one of the  $\alpha$ -transitions is taken into account:

$$b_s = \frac{T_\alpha}{T_t} \quad (21)$$

Hence in order to compare the measured,  $b_t$ , with calculated  $b_g$ , one has to do the correction  $b_g = (100/i_g)b_t$ , where  $i_g$  is given in tables for a decay<sup>25-27</sup> half-lives.

In the table 2 the experimentally determined branching ratios are compared with the estimations based on ASAFM, without ( $T$ ,  $b_g$ ) or with ( $T'$ ,  $b'_g$ ) even-odd effect taken into account.

One can see that for the  $^{14}\text{C}$  radioactivity the agreement is improved when the even-odd effect is considered. For  $^{24}\text{Ne}$  radioactivity our estimations seem to be more optimistic than the reality and this trend is observed also for heavier emitted clusters. In the future, when an increased number of experimental data will be available, it will be possible to modify the eqs. (11) and (12) in order to obtain a better fit like for the 379  $\alpha$ -emitters.

EXPLANATION OF TABLE

The table presents calculated Q-values, kinetic energies, half-lives and branching ratios relative to  $\alpha$ -decay for the most probable HI's (including  $^4\text{He}$ ) spontaneously emitted from various isotopes of the elements  $Z=47-106$  with known masses, having total half-lives,  $T_t$ , longer than  $1\mu\text{s}$  and partial half-lives,  $T$ , shorter than  $10^{50}\text{s}$ .

The first line of each data block contains informations about the parent nucleus, its  $\alpha$ -disintegration and the number,  $n_T$ , of decay modes by spontaneous emission of HI's, for which  $T < 10^{50}\text{s}$ . In the following lines (2nd-9th), maximum eight of the most probable emitted HI's are given, one after the other, in the increasing order of  $T$ . If  $n_T < 8$ , the data block is correspondingly shorter. The minimum width of the data block is 2 lines; nuclides with  $n_T=0$  are not listed.

E1	Symbol of the element
$Z, Z_e, Z_d$	Atomic numbers of the parent, emitted HI and of daughter, respectively
$A, A_e$	Mass numbers of the parent and emitted HI, respectively
$N_d$	Neutron number of the daughter. $Z_d$ and $N_d$ illustrate the importance of shell effects, showing how far they are from the magic numbers 28, 50, 82 or 126.
$\log(T_t)$	Decimal logarithm of the total half-life in seconds. Measured values, or estimated ones for

nuclides far off the stability line for  $\beta$ -decay, taken mainly from the Karlsruhe Chart of the Nuclides, 5th edition, 1981 (Ref. 28 above). For the so-called "stable" nuclides, following conventions are adopted:

UNKN	- unknown (half-life not available yet)
UNMA	- unknown; most abundant isotope
$C, C_e, D_d$	Code numbers indicating the source for the masses of the parent emitted HI and daughter, respectively, used to find the Q-values:
Blank, 0	- tabulated by Wapstra and Audi (Ref. 6 above) from measurements and systematics, respectively. The code number 1-9 indicate the authors of the various mass formulae from Ref. 41 above:
1	- Jänecke
2	- Beiner, Lombard and Mas
3	- Liran and Zeldes
4	- v. Groote, Hilf and Takahashi
5	- Myers
6	- Comay and Kelson
7	- Seeger and Howard
8	- Bauer
9	- Jänecke and Eynon
10	- Calculated with a computer program supplied by Dr. J. Jänecke
	Even if they not appear all explicitly, they have been used to find the displayed data.
Q	Released energy, calculated with eq. (2) above.
$E_K$	Kinetic energy of the emitted HI: $E_K = Q \cdot A_e / A$



log (T) Decimal logarithm of the partial half-life in seconds. In the first line of data block,  $T = T_{\alpha}$ .

STAB  $Q_{\alpha} < 0$ , the corresponding nuclide is stable with respect to  $\alpha$  decay. In this case one takes arbitrarily  $\log(T_{\alpha}) = 99$  to calculate the branching ratio. Beginning with the 2nd line of each data block, T is estimated with eqs. (3) - (10) and using a zero point vibration energy given by eq. (11) - the same regardless even or odd character of Z and N.

log (T') The same quantity, calculated by using eq. (12) instead of eq. (11), that means with even-odd effect in the zero point vibration energy.

$\log T_{\alpha}, \log T'_{\alpha}$  Decimal logarithm of the  $b^{-1}$ , where  $b = T_{\alpha}/T$  and  $b' = T'_{\alpha}/T'$  is the branching ratio relative to the  $\alpha$ -decay.

$C_{\alpha}$  Code for the  $\alpha$ -decay half-life,  $T_{\alpha}$ :

M - measured value (see the compilation given in Ref. 25 above)

E - estimated with semiempirical formula, eqs. (13) - (18)

Blank - stability relative to  $\alpha$  decay

$n_Q$  Number of decay modes (others than  $\alpha$ ) with  $Q > 0.9 Z_e$  MeV

$n_T$  Number of decay modes (others than  $\alpha$ ) for which  $\log T < 50$ .

Parent Z EI A	Emitted			Daughter			Q (MeV)	EK (MeV)	log(T) T(s)	log(T')T'(s)	log(T) T(s)	log(T')T'(s)	CA	nq	nT
	EI	A	log(Tt) Tt(s)	EI	Zd	Nd									
47 Ag 93	-1.30	9	He 2 4	Rh 45 44	9	-2.29	0.0	STAB	47.4	-99.0	-99.0	28	1		
			Ar 18 36	Cu 29 28	0	31.96	19.59	47.4							
52 Te 107	-2.44	0	He 2 4	Sn 50 53	0	3.98	3.84	-2.3	40.9	43.0	43.2	M	76	3	
			Be 4 8	Cd 48 51	0	4.54	4.20	40.7	41.9	44.0	44.2				
			C 6 12	Pd 46 49	0	9.64	8.56	41.7	50.1	52.0	52.4				
			Cr 24 50	Ni 28 29	0	45.82	24.41	49.7							
52 Te 108	0.32	0	He 2 4	Sn 50 54	0	3.42	3.30	0.5	34.8	34.8	34.3	M	81	2	
			H 2 2	Pb 82 82	0	10.75	9.56	35.2	47.8	48.2	47.3				
			Fe 26 54	Pb 82 82	0	46.88	23.44	48.7							
52 Te 109	0.61	0	He 2 4	Sn 50 55	0	3.19	3.08	2.0	38.7	36.5	36.7	M	93	2	
			C 6 12	Pd 46 51	0	10.15	9.03	38.5	47.5	45.2	45.5				
			O 8 16	Ru 44 49	0	14.36	12.25	47.2							
52 Te 110	1.27	0	He 2 4	Sn 50 56	0	2.73	2.63	6.4	42.9	37.0	36.5	M	88	2	
			C 6 12	Ru 44 49	0	15.16	12.96	43.4	44.2	38.3	37.8				
			Fe 26 54	Pb 82 82	0	9.16	8.16	44.7							
52 Te 111	1.29	0	He 2 4	Sn 50 57	0	2.47	2.39	8.8	45.6	36.6	36.8	E	102	2	
			C 6 12	Ru 44 51	0	14.72	12.59	45.4	47.7	38.9	39.1				
			O 8 16	Pd 46 53	0	8.72	7.78	47.7							
53 I 110	-0.19	0	He 2 4	Sb 51 57	0	3.57	3.44	0.6	29.0	27.6	28.4	M	102	12	
			C 6 12	Ag 47 51	0	17.22	14.71	37.0	37.9	36.4	37.4				
			O 8 16	Rh 45 49	0	10.15	9.03	38.5	38.3	36.9	37.7				
			Be 4 8	Ir 49 53	0	4.99	4.63	37.5	42.2	40.7	41.6				
			N 7 14	Pd 46 50	0	13.02	11.36	41.3	42.2	42.8	44.6				
			Fe 26 54	Co 27 29	0	51.80	26.37	43.4	45.2	42.8	44.6				
			N 7 13	Rh 45 50	0	14.99	12.95	44.7	45.7	44.1	45.1				
			Fe 26 55	Pd 46 51	0	11.96	10.55	44.7	45.7	44.2	45.1				
			Co 27 28	Co 27 28	0	51.01	25.51	45.1	47.0	44.6	46.4				
53 I 111	0.40	0	He 2 4	Sb 51 56	0	3.27	3.16	2.7	31.7	28.9	28.9	M	104	5	
			C 6 12	Ag 47 52	0	11.79	10.52	31.6	31.7	30.9	30.9				
			O 8 16	Rh 45 50	0	18.11	15.50	33.6	33.6	33.6	33.6				
			Be 4 8	Ir 49 54	0	4.51	4.18	42.6	42.6	39.9	39.9				
			Fe 26 54	Co 27 30	0	50.62	26.00	45.9	45.9	43.1	43.1				
			Mn 25 53	Ni 28 30	0	49.94	26.10	46.8	46.8	44.1	44.1				
53 I 112	0.53	0	He 2 4	Sb 51 57	0	2.98	2.88	4.8	36.4	30.7	31.5	M	115	7	
			C 6 12	Ag 47 53	0	17.26	14.76	32.7	37.7	31.9	32.0				
			O 8 16	Rh 45 51	0	10.15	9.03	38.5	40.9	43.2	45.0				
			Be 4 8	Ir 49 55	0	49.70	25.29	48.0	49.9	43.7	45.5				
			Fe 26 54	Co 27 29	0	49.52	24.76	48.5	50.4	43.2	45.0				
			Mn 25 53	Co 27 31	0	48.97	25.36	49.5	51.4	44.7	46.5				
			Fe 26 55	Ni 28 30	0	48.72	25.66	49.5	51.4	44.7	46.5				
			Co 27 28	Ni 28 30	0	48.66	25.20	49.8	51.7	45.0	46.8				
53 I 113	0.77	0	He 2 4	Sb 51 58	0	2.71	2.61	7.2	40.5	33.3	33.3	M	116	2	
			C 6 12	Ag 47 54	0	10.10	9.02	40.8	40.8	33.5	33.5				
			O 8 16	Rh 45 52	0	16.22	13.92	40.8	47.0	33.8	34.8				
53 I 114	0.32	0	He 2 4	Sb 51 59	0	2.24	2.17	12.2	47.0	33.8	34.8	E	126	2	
			C 6 12	Rh 45 53	0	15.04	12.93	46.0	47.4	34.3	35.2				
			O 8 16	Ag 47 55	0	9.16	8.20	46.5							



Parent		Emitted				Daughter				T <sub>1/2</sub>							
Z	EI A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )
		(s)		(s)				(s)				(MeV)	(MeV)	(s)	(s)	(s)	(s)
54	Xe 110	-0.40	0	He 2	4	4		Te 52	54	0	3.88	3.73	0.4	16.9	17.6	17.3	M 93 10
				Be 4	8	8		Sn 50	52	0	8.11	7.52	17.2	19.2	19.9	19.6	
				C 6	12	12		Cd 48	50	10	15.33	13.66	19.5	32.3	33.2	32.7	
				O 8	16	16		Pd 46	48	0	18.93	16.18	32.8	34.8	36.1	35.2	
				Fe 26	54	54		Ni 28	28	0	58.40	29.73	35.7	37.6	38.0	37.3	
				N 7	13	13		Ag 27	28	0	13.80	12.11	30.8	32.6	33.0	32.3	
				O 8	15	15		Cu 29	29	0	15.54	13.43	44.4	43.9	44.8	44.3	
				Cr 24	50	50		Zn 30	30	0	52.69	28.74	44.5	43.6	44.9	44.0	
54	Xe 111	-0.05	0	He 2	4	4		Te 52	55	0	3.71	3.57	0.5	16.8	18.1	18.2	M 104 18
				Be 4	8	8		Cd 48	51	0	15.61	13.92	18.6	20.0	19.3	19.4	
				C 6	12	12		Sn 50	53	0	7.60	7.05	19.8	20.0	19.3	19.4	
				O 8	16	16		Pd 46	49	0	10.71	17.55	27.7	27.9	27.2	27.4	
				Fe 26	54	54		Ni 28	28	0	57.95	29.72	36.5	36.9	35.9	36.4	
				N 7	13	13		Ag 27	28	0	13.35	11.78	39.7	39.9	39.2	39.4	
				N 7	14	14		Ag 47	50	0	13.66	11.93	40.2	40.4	39.6	39.9	
54	Xe 112	0.43	0	He 2	4	4		Te 52	56	0	3.32	3.20	3.0	22.1	19.5	19.1	M 107 15
				C 6	12	12		Cd 48	52	0	14.43	12.88	22.5	22.1	22.4	22.1	
				Be 4	8	8		Sn 50	54	0	6.95	16.17	25.4	25.1	22.6	22.1	
				O 8	16	16		Pd 46	50	0	10.71	17.55	27.7	27.9	27.2	27.4	
				Fe 26	54	54		Ni 28	30	0	56.59	29.31	39.0	38.1	36.0	35.1	
				N 7	13	13		Ag 27	28	0	14.15	14.15	40.9	41.1	40.0	39.1	
				Fe 26	55	55		Ni 28	29	0	54.63	27.31	43.0	42.1	40.0	39.1	
				Fe 26	55	55		Ni 28	29	0	53.67	27.32	44.8	43.9	41.8	40.9	
				Co 27	55	55		Co 27	30	0	53.49	27.22	45.4	44.5	42.4	41.5	
				O 8	15	15		Pd 46	51	0	15.06	13.05	46.5	46.0	43.5	43.0	
54	Xe 113	0.45		He 2	4	4		Te 52	57	0	3.10	2.99	4.7	25.8	20.9	21.1	M 116 15
				C 6	12	12		Cd 48	53	0	13.26	17.52	27.6	28.1	25.2	24.4	
				Be 4	8	8		Sn 50	55	0	6.20	15.76	28.5	28.7	23.8	24.0	
				O 8	16	16		Pd 46	52	0	19.13	16.44	31.9	31.4	24.8	24.3	
				Fe 26	54	54		Ni 28	30	0	55.44	5.06	34.6	34.3	27.5	27.2	
				N 7	13	13		Ag 27	28	0	22.70	18.72	42.7	42.1	35.6	35.0	
				Fe 26	54	54		Ni 28	32	0	53.81	28.32	44.4	43.5	37.3	36.4	
				Fe 26	56	56		Ni 28	30	0	55.27	28.52	41.0	41.5	36.4	36.8	
				Fe 26	56	56		Ni 28	30	0	53.92	27.43	44.4	43.5	37.3	36.4	
				Mg 12	24	24		Mo 42	48	0	27.19	21.47	48.1	47.4	41.0	40.3	
				Si 14	28	28		Zr 40	46	0	32.56	24.56	48.7	48.1	41.6	41.0	
54	Xe 114	1.00	0	He 2	4	4		Te 52	58	0	2.80	2.71	7.1	28.3	21.6	21.2	E 122 10
				C 6	12	12		Cd 48	55	0	15.70	11.44	28.7	28.3	20.8	21.0	
				Be 4	8	8		Sn 50	56	0	19.13	16.44	31.9	31.4	24.8	24.3	
				O 8	16	16		Pd 46	53	0	18.26	15.72	34.8	35.1	23.2	23.4	
				Fe 26	54	54		Ni 28	32	0	4.76	4.43	41.3	41.5	29.7	29.9	
				Fe 26	55	55		Ni 28	32	0	53.28	27.80	45.7	46.1	34.0	34.5	
				Ne 10	20	20		Ru 44	51	0	21.82	18.03	45.7	46.0	34.1	34.3	
				Fe 26	56	56		Ni 28	31	0	53.09	27.24	46.2	46.6	34.5	35.0	
				Mg 12	24	24		Mo 42	48	0	27.46	21.73	47.1	47.5	37.5	37.6	
				Si 14	28	28		Zr 40	46	0	31.80	27.48	48.7	49.1	37.0	37.5	
54	Xe 115	1.25	0	He 2	4	4		Te 52	59	0	2.38	2.29	11.6	32.6	20.8	21.0	E 134 10
				C 6	12	12		Cd 48	55	0	11.95	10.70	32.4	32.6	20.8	21.0	
				Be 4	8	8		Sn 50	57	0	18.26	15.72	34.8	35.1	23.2	23.4	
				O 8	16	16		Pd 46	53	0	4.76	4.43	41.3	41.5	29.7	29.9	
				Fe 26	54	54		Ni 28	32	0	53.28	27.80	45.7	46.1	34.0	34.5	
				Ne 10	20	20		Ru 44	51	0	21.82	18.03	45.7	46.0	34.1	34.3	
				Fe 26	56	56		Ni 28	31	0	53.09	27.24	46.2	46.6	34.5	35.0	
				Mg 12	24	24		Mo 42	48	0	27.46	21.73	47.1	47.5	37.5	37.6	
				Si 14	28	28		Zr 40	46	0	32.56	24.56	48.7	48.1	41.6	41.0	
54	Xe 116	1.76	0	He 2	4	4		Te 52	60	0	1.85	1.79	19.0	37.0	18.4	18.0	E 132 6
				C 6	12	12		Cd 48	56	0	10.95	9.82	37.4	37.0	18.4	18.0	
				Be 4	8	8		Sn 50	58	0	16.92	14.59	39.9	39.4	20.9	20.4	
				O 8	16	16		Mo 42	50	0	27.72	21.99	46.3	45.6	27.3	26.7	
				Fe 26	56	56		Ni 28	32	0	52.05	26.92	48.4	47.5	29.4	28.5	
				Be 4	8	8		Sn 50	58	0	4.13	3.84	49.0	48.6	30.0	29.6	
				Si 14	28	28		Zr 40	48	0	32.10	24.35	49.9	49.3	31.0	30.3	
54	Xe 117	1.79	0	He 2	4	4		Te 52	61	0	1.60	1.55	23.8	42.8	18.7	18.9	E 138 3
				C 6	12	12		Cd 48	57	0	10.05	9.02	43.6	44.5	20.4	20.6	
				Be 4	8	8		Sn 50	59	0	15.98	13.71	44.2	44.5	26.1	26.5	
				Si 14	28	28		Zr 40	49	0	32.07	24.40	50.0	50.3	26.1	26.5	
54	Xe 118	2.36	0	He 2	4	4		Te 52	62	0	1.28	1.24	32.0	48.5	17.0	16.5	E 137 2
				C 6	12	12		Cd 48	58	0	9.08	8.16	48.9	48.8	17.5	16.8	
				Si 14	28	28		Zr 40	50	0	32.21	24.57	49.5	48.8	17.5	16.8	
55	Cs 113	-0.40	0	He 2	4	4		I 53	56	0	3.73	3.59	1.4	16.3	14.9	14.9	E 115 26
				C 6	12	12		In 49	52	0	16.80	15.02	16.3	16.3	14.9	14.9	
				O 8	16	16		Ag 47	50	0	24.03	20.62	19.9	19.9	19.9	19.9	
				Be 4	8	8		Sb 51	54	0	7.54	7.01	21.3	21.3	19.9	19.9	
				N 7	13	13		Cd 48	52	0	17.35	15.36	25.7	25.7	24.4	24.4	
				F 9	17	17		Pd 46	50	0	22.81	19.38	32.5	32.5	31.2	31.2	
				Co 27	55	55		Ni 28	30	0	62.64	32.15	33.3	33.3	32.0	32.0	
				N 7	14	14		Cd 48	51	0	15.52	13.59	33.9	33.9	32.6	32.6	
				M 10	20	20		Ag 47	51	0	18.60	16.14	38.2	38.2	32.9	32.9	
55	Cs 114	-0.24	0	He 2	4	4		I 53	57	0	3.35	3.24	3.5	20.3	16.0	16.8	M 126 33
				C 6	12	12</											



Parent		Emitted				Daughter				T							
Z	EI A	log(T <sub>1/2</sub> )	C	EI	Zb	Ae	Ce	Q <sub>α</sub>	EK	log(T)	log(T')	log(T)	log(T')	CA	nQ	nT	
		log(T <sub>1/2</sub> )			Zd	Md	Cd	(MeV)	(MeV)	T(s)	T'(s)	T(s)	T'(s)	TA	TA	TA	
55	Cs	117	0.81	He	2	4		2.46	2.38	11.9		27.8	15.9	15.9		140	19
				C	0	8	16	13.36	11.99	27.8		31.6	19.7	19.7			
				Ag	47	54		19.73	17.03	31.6		38.7	26.8	26.8			
				Tc	43	50		31.31	24.89	38.7		39.5	27.6	27.6			
				Bg	4	8		5.08	4.73	39.5		42.5	30.7	30.7			
				Sb	51	58		53.46	29.51	42.5		45.7	30.8	30.8			
				Re	10	27		35.88	27.30	42.5		44.6	32.7	32.7			
				SI	14	28		56.35	29.38	44.6							
				Fe	26	56											
55	Cs	118	1.15	He	2	4		2.19	2.12	15.2		32.9	16.9	17.8		151	20
				C	0	8	16	12.35	11.09	32.1		36.7	20.5	21.5			
				Ag	47	54		18.52	16.01	35.7		44.9	27.4	28.7			
				Tb	43	59		25.85	21.78	42.6		48.7	30.6	31.6			
				Mn	7	14		12.87	11.34	45.8		47.7	30.6	32.6			
				Co	27	58		56.07	28.51	45.8		49.0	31.8	33.8			
				Co	27	59		55.16	28.98	47.0		49.2	32.0	34.0			
				Fe	26	56		53.98	28.58	49.5							
55	Cs	119	1.64	He	2	4		1.68	1.62	24.1		36.8	12.7	12.7		154	7
				C	0	8	16	11.32	10.56	36.9		40.4	18.3	18.3			
				Ag	47	54		17.93	14.88	40.4		44.8	22.4	22.4			
				Nb	41	50		31.80	24.59	46.5		48.8	24.7	24.7			
				Al	13	27		27.75	22.15	48.8		49.2	25.0	25.0			
				Mg	12	24		27.82	23.14	31.6		34.7	25.1	25.1			
				Co	27	59		54.50	27.48	49.2		49.5	25.4	25.4			
				Fe	26	56		53.98	28.58	49.5							
55	Cs	120	1.81	He	2	4		1.32	1.28	32.7		43.3	9.7	10.6		159	4
				C	0	8	16	10.08	9.34	44.4		47.6	13.5	14.9			
				Ag	47	54		16.76	13.36	46.2		48.4	14.3	15.7			
				SI	14	28		34.17	26.20	47.0		48.5	7.7	7.7		157	3
				P	15	31		36.12	26.87	49.0		49.7	8.2	8.2			
56	Ba	117	0.28	0	He	2	4	2.77	2.68	9.1		19.0	9.7	9.9		139	43
				C	0	8	16	16.34	14.66	18.8		22.8	13.5	13.7			
				O	0	8	15	23.50	20.28	22.6		31.7	22.4	22.7			
				Ne	10	20		19.91	17.36	31.5		31.9	22.6	22.8			
				Ne	10	20		27.82	23.14	31.6		34.1	24.8	25.1			
				Ne	12	24		34.27	27.24	33.8		34.7	25.1	25.6			
				Ne	14	28		5.76	5.36	34.5		34.7	25.1	25.6			
				Ne	14	28		63.62	32.62	32.7		37.2	27.6	28.1			
				He	2	4		2.54	2.45	11.4		21.5	10.5	10.1		146	25
				C	0	8	16	15.34	13.78	21.9		24.7	13.8	13.3			
				Ag	47	54		22.49	19.44	25.2		32.5	21.7	21.1			
				Mg	12	24		34.55	27.52	33.1		35.7	24.3	23.7			
				Ne	10	20		26.39	21.92	32.7		32.1	22.9	22.9			
				Ne	14	28		62.71	30.50	36.3		37.3	27.9	27.9			
				Ne	14	28		5.25	4.89	39.3		38.9	27.9	27.6			
				Fe	26	54		60.30	32.71	41.5		40.6	30.1	29.2			
56	Ba	118	0.70	0	He	2	4	2.13	2.05	16.1		27.7	11.5	11.1		160	15
				C	0	8	16	12.24	11.29	31.7		31.2	15.0	14.5			
				Ag	47	54		18.94	16.43	36.0		35.3	19.4	18.7			
				Ru	44	52		39.83	30.54	36.0		39.8	23.8	23.2			
				NI	28	60		31.53	25.23	40.4		41.7	26.0	25.0			
				NI	28	60		60.47	30.23	42.6		43.0	26.9	26.3			
				NI	28	60		23.78	19.82	43.5		45.1	29.1	28.4			
				Mg	12	24		30.31	23.74	43.7		45.0	29.3	28.4			
				Fe	26	56		58.13	31.01	46.0		45.0	29.3	28.4			
56	Ba	120	1.51	0	He	2	4	1.73	1.67	23.8		33.2	9.2	9.4		163	15
				C	0	8	16	12.49	11.25	33.0		36.3	12.2	12.5			
				Ag	47	54		18.94	16.43	36.0		39.9	15.7	16.1			
				Mo	42	50		38.56	29.32	39.5		40.1	16.0	16.3			
				Mo	42	51		38.16	29.33	39.7		45.2	21.1	21.4			
				Ru	44	52		29.90	23.97	44.9		42.9	22.6	23.1			
				Mo	42	50		56.59	29.55	42.4		42.9	23.3	23.7			
				Mo	42	51		40.74	29.97	47.1		47.5	23.3	23.7			
56	Ba	121	1.47	0	He	2	4	1.26	1.22	35.2		37.5	2.7	2.3		165	6
				C	0	8	16	11.47	10.34	37.9		40.9	6.1	5.6			
				Ag	47	54		17.51	15.21	41.4		43.6	9.1	8.3			
				Mo	42	50		36.88	27.81	44.3		47.1	12.6	10.8			
				Mo	42	51		35.54	26.39	49.2		48.9	14.7	13.7			
				Zr	0	30		50.85	28.89	49.9		48.9	9.0	9.4			
56	Ba	123	2.21	0	He	2	4	1.13	1.10	40.3		42.5	2.0	2.2		170	5
				C	0	8	16	10.68	9.64	42.3		45.9	5.4	5.7			
				Ag	47	54		16.47	14.32	45.7		46.9	6.3	6.7			
				Mo	42	51		35.98	27.20	46.6		48.3	9.0	9.4			
				Mo	42	52		35.05	26.18	48.3		49.7	9.0	9.4			
				Zr	0	30		40.09	29.34	49.3		47.0	-9.9	-10.3			
56	Ba	124	2.85	0	He	2	4	0.78	0.76	57.4		47.0	13.4	15.0		203	1
				C	0	8	16	9.83	8.88	47.5		51.4	15.3	15.3			
				Ag	47	54		1.63	1.59	36.3		49.8	17.5	16.5			
				Pr	59	73		40.10	31.25	49.7		45.2	18.2	17.4			
				Pr	59	74		62.09	40.34	49.8		46.4	18.3	17.8			
				Y	39	50		1.54	1.50	34.4		47.1	19.3	18.4			
				Y	39	50		62.09	40.34	49.8		46.4	18.3	17.8			
				Nd	60	74		1.81	1.75	28.7		45.2	17.5	16.5			
				Zr	40	50		65.92	42.99	46.2		46.4	18.2	17.4			
				Cd	48	60		42.35	33.15	46.8		46.4	18.3	17.8			
				Cd	48	60		18.94	16.74	47.0		47.1	19.3	18.4			
				Xe	54	68		68.59	42.75	48.2							
				Sr	38	48											



Parent		Emitted				Daughter				Q		EK		log(T')		log(T)		T'		T			
Z	EI	A	log(Tt)	C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	(MeV)	T(s)	T(s)	log--	log--	CA	nq	nI	
			Tt(s)										(MeV)	(MeV)		T(s)	T(s)	TA	TA	TA	TA		
62 Sm 139	2.19	C 6	12		Ba 56	70	0	11.32	10.34	48.8	48.3	20.1	19.6			48.3	20.1	19.6					
		Si 14	28		Pd 46	58		47.95	31.77	48.3	48.3	21.0	20.2			48.3	21.0	20.2					
		He 2	4		Cd 48	62		40.50	32.28	49.7	48.3	21.0	20.2			48.3	21.0	20.2					
62 Sm 140	2.95	He 2	4		Nd 60	75	0	1.70	1.65	34.1	48.3	13.7	14.2	E 203	3	48.3	13.7	14.2					
		Cr 24	52		Zr 40	50		65.24	42.24	47.8	48.3	14.8	15.3			48.3	14.8	15.3					
		Ti 22	48		Sr 38	49		68.20	42.69	48.9	49.4	15.2	15.7			49.8	15.2	15.7					
62 Sm 150	UNKN	He 2	4		Nd 60	76		1.33	1.30	41.4	47.9	7.5	6.5	E 199	2	47.9	7.5	6.5					
		Cr 24	52		Zr 40	50		64.78	41.65	48.9	48.2	7.9	6.8			48.2	7.9	6.8					
		C 6	12		Sr 38	50		67.92	42.69	49.3	48.2	7.9	6.8			48.2	7.9	6.8					
63 Eu 141	1.60	He 2	4		Nd 60	86		1.45	1.41	35.8	48.3	13.0	12.5	E 199	1	48.3	13.0	12.5					
		Cr 24	52		Ba 56	82		11.21	10.32	48.8	48.3	13.0	12.5			48.3	13.0	12.5					
		C 6	12		Pm 61	75	0	1.64	1.60	40.1	48.3	13.0	12.5			48.3	13.0	12.5					
63 Eu 142	0.38	He 2	4		Zr 40	50		72.58	45.57	44.9	47.0	4.7	9.2			47.0	4.7	9.2					
		Cr 24	52		Y 39	49		71.94	45.73	45.8	48.1	5.7	7.9			48.1	5.7	7.9					
		C 6	12		La 57	72		69.86	44.41	46.8	48.1	5.7	7.9			48.1	5.7	7.9					
63 Eu 143	2.19	He 2	4		Pm 61	77	0	1.13	1.09	60.9	49.5	17.0	17.0	E 204	6	49.5	17.0	17.0					
		Cr 24	52		Y 39	50		70.31	44.75	47.2	51.2	13.2	11.4			51.2	13.2	11.4					
		C 6	12		Nb 41	50		68.08	43.94	46.5	51.4	11.8	9.5			51.4	11.8	9.5					
63 Eu 150	9.05	He 2	4		Sr 38	50		71.88	44.55	49.1	51.4	11.8	9.5			51.4	11.8	9.5					
		Cr 24	52		Zr 40	51		68.50	43.90	49.1	51.4	11.8	9.5			51.4	11.8	9.5					
		C 6	12		La 57	82		66.62	43.49	49.2	51.5	11.6	9.3			51.5	11.6	9.3					
63 Eu 152	8.62	He 2	4		Pm 61	87		1.55	1.51	36.7	50.1	12.4	13.4	E 210	1	50.1	12.4	13.4					
		Cr 24	54		Y 39	50		70.25	43.72	49.5	49.5	12.4	13.4			49.5	12.4	13.4					
		C 6	12		La 57	83		68.23	43.72	49.5	49.5	12.4	13.4			49.5	12.4	13.4					
64 Gd 142	1.95	He 2	4		Sm 62	76	0	1.72	1.68	32.7	40.1	8.4	7.3	E 204	21	40.1	8.4	7.3					
		Cr 24	52		Zr 40	50		76.99	48.80	41.2	43.0	11.0	10.2			43.0	11.0	10.2					
		C 6	12		Sr 38	50		71.93	45.96	49.9	48.8	11.0	10.2			48.8	11.0	10.2					

Parent		Emitted				Daughter				Q		EK		log(T')		log(T)		T'		T			
Z	EI	A	log(Tt)	C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	(MeV)	T(s)	T(s)	log--	log--	CA	nq	nI	
			Tt(s)										(MeV)	(MeV)		T(s)	T(s)	TA	TA	TA	TA		
64 Gd 143	1.59	He 2	4		Sm 62	77		1.18	1.15	55.0	44.3	11.1	11.0			44.3	11.1	11.0					
		Cr 24	52		Zr 40	50		72.57	47.55	43.8	43.7	12.1	11.0			43.7	12.1	11.0					
		C 6	12		Sr 38	50		76.91	47.33	46.8	47.3	12.6	11.4			47.3	12.6	11.4					
64 Gd 144	2.43	He 2	4		Sm 62	78	0	1.04	1.02	56.3	45.4	13.5	12.6			45.4	13.5	12.6					
		Cr 24	54		Zr 40	50		73.76	46.16	47.2	46.3	13.5	12.6			46.3	13.5	12.6					
		C 6	12		Sr 38	50		76.58	46.80	47.5	46.3	13.5	12.6			46.3	13.5	12.6					
64 Gd 150	13.75	He 2	4		Sm 62	84		2.80	2.73	13.7	48.3	35.1	34.6	M 207	1	48.3	35.1	34.6					
		Cr 24	52		Ce 58	80		11.81	10.86	48.8	48.3	35.1	34.6			48.3	35.1	34.6					
		C 6	12		Sm 62	85		12.78	11.78	43.4	43.6	28.3	28.5			43.6	28.3	28.5					
64 Gd 152	21.54	He 2	4		Sm 62	86		2.20	2.14	21.5	39.9	18.8	18.3	M 210	1	39.9	18.8	18.3					
		Cr 24	54		Ce 58	82		13.37	12.31	40.3	48.0	18.8	18.3			48.0	18.8	18.3					
		C 6	12		Sm 62	88		0.92	0.89	60.4	48.0	18.8	18.3			48.0	18.8	18.3					
64 Gd 154	UNKN	He 2	4		Ba 56	82		19.29	17.29	48.5	48.0	18.8	18.3			48.0	18.8	18.3					
		Cr 24	52		Sm 62	88		11.81	10.86	48.8	48.3	35.1	34.6			48.3	35.1	34.6					
		C 6	12		Sm 62	85		12.78	11.78	43.4	43.6	28.3	28.5			43.6	28.3	28.5					
65 Tb 144	0.70	He 2	4		Eu 63	77	0	1.85	1.79	38.9	43.2	1.9	4.3			43.2	1.9	4.3					
		Cr 24	52		Nb 41	51		78.92	50.42	41.7	44.2	2.9	5.1			44.2	2.9	5.1					
		C 6	12		Nb 41	50		78.98	49.91	41.9	44.4	3.0	5.4			44.4	3.0	5.4					
65 Tb 145	1.48	He 2	4		Eu 63	78		1.35	1.32	45.4	46.4	5.0	7.4			46.4	5.0	7.4					
		Cr 24	54		Y 39	50		82.11	50.40	42.3	42.3	3.1	3.1			42.3	3.1	3.1					
		C 6	12		Zr 40	50		80.28	49.83	42.8	42.8	3.1	3.1			42.8	3.1	3.1					
65 Tb 146	1.36	He 2	4		Eu 63	79		1.30	1.27	58.0	48.4	12.0	9.5			48.4	12.0	9.5					
		Cr 24	54		Zr 40	51		77.74	48.45	47.0	49.5	10.9	8.4			49.5	10.9	8.4					
		C 6	12		Y 39	51		79.23	48.84	47.1	49.6	10.9	8.4			49.6	10.9	8.4					



Parent Z E I A	log(Tt) Tt(s)	Emitted				Daughter				Q (MeV)	EK (MeV)	log(Tt) Tt(s)	log(Tt') Tt'(s)	log-- TA	log-- TA	CA	nQ	nT
		EI	Ze	Ae	Ce	EI	Zd	Md	Cd									
Cr 24	54	Nb 41	51	75.52	47.59	48.0	50.4	-10.0	-7.6									
Co 27	58	Sr 38	50	70.90	48.16	48.5	51.0	-9.5	-7.0									
Fe 26	58	Y 39	49	78.59	47.37	48.7	51.2	-9.2	-6.8									
Cr 24	53	Nb 41	52	74.63	47.54	49.3	51.7	-8.7	-6.3									
He 2	4	Eu 63	80	0.99	0.97	61.5	48.1	-13.4	-13.4									2
Fe 26	58	Y 39	50	78.89	47.77	48.1	49.9	-11.6	-11.6									
Co 27	59	Sr 38	50	79.18	47.40	49.9	49.9											
He 2	4	Eu 63	81	2.55	2.48	37.0	52.1	22.7	25.2									
Fe 26	58	Y 39	51	77.97	47.41	49.6												
He 2	4	Eu 63	82	4.08	3.97	5.0	49.9	45.0	45.0									
Co 27	61	Sr 38	50	79.32	46.85	49.9												
He 2	4	Eu 63	83	3.59	3.49	8.8	50.3	40.4	41.4									
C 6	12	Pr 59	79	12.04	11.07	49.3												
He 2	4	Eu 63	84	3.50	3.41	8.8												
Be 4	8	Pr 59	80	6.40	6.06	40.7	40.7	31.9	31.9									
C 6	12	Pr 59	80	13.21	12.16	42.8	42.8	34.0	34.0									
O 8	16	La 57	78	19.78	17.68	48.8	48.8	40.0	40.0									
He 2	4	Eu 63	85	2.97	2.89	14.4	40.7	25.3	26.3									
C 6	12	Pr 59	81	13.83	12.74	39.8	49.0	33.7	34.6									
Be 4	8	Pm 61	83	5.61	5.32	48.1	49.3	33.7	34.6									
O 8	16	La 57	79	19.91	17.81	48.2												
He 2	4	Eu 63	86	2.71	2.64	16.3	35.8	19.5	19.5									
C 6	12	Pr 59	82	14.71	13.56	35.8	45.6	29.4	29.4									
O 8	16	La 57	80	20.55	18.40	45.6	49.4	33.1	33.1									
N 7	15	Ce 58	80	16.16	14.57	49.4												
He 2	4	Eu 63	87	2.21	2.16	24.5	41.5	16.0	17.0									
C 6	12	Pr 59	83	13.64	12.58	40.6	44.6	19.0	20.1									
O 8	16	La 57	81	21.11	18.91	43.5	47.8	22.2	23.3									
N 7	15	Ce 58	81	16.71	15.09	46.6												
C 6	13	Pr 59	82	12.74	11.67	47.6	48.6	23.0	24.0									
He 2	4	Eu 63	88	0.98	0.95	59.7	44.9	-14.9	-14.9									
O 8	16	La 57	82	20.71	18.58	44.9	46.6	-13.1	-13.1									
N 7	15	Ce 58	82	16.73	15.11	46.6												
He 2	4	Gd 64	78	1.90	1.85	31.0	38.1	8.4	7.2									
Fe 26	56	Zr 40	50	86.51	53.33	39.3	40.9	11.1	9.9									
Cr 24	52	Mo 42	52	50.97	22.13	42.0	43.9	13.6	10.6									
Cr 24	34	Mo 42	52	80.78	49.76	42.7	44.5	13.7	12.5									
Cr 24	34	Mo 42	52	86.13	50.73	44.7	43.5	13.7	12.5									
Ni 28	60	Sr 38	48	86.13	50.73	44.7	43.5	13.7	12.5									
Mn 25	55	Nb 41	50	81.49	50.79	44.8	43.6	13.8	12.7									
Cr 24	53	Mo 42	51	79.23	50.47	45.3	44.4	14.3	13.1									
O 8	16	Ce 58	72	21.28	18.95	45.3	44.8	14.4	13.8									
He 2	4	Gd 64	79	1.48	1.44	47.6	43.5	-4.8	-4.2									
Fe 26	57	Zr 40	50	84.38	51.66	42.9	44.0	-2.3	-3.7									
Cr 24	52	Mo 42	51	73.93	51.95	44.1	45.0	-2.1	-1.5									
Cr 24	52	Mo 42	51	79.16	50.08	45.5	46.1	-2.1	-1.5									
Cr 24	52	Mo 42	53	78.55	50.77	46.0	46.6	-1.6	-1.1									

Parent Z E I A	log(Tt) C Tt(s)	Emitted				Daughter				Q (MeV)	EK (MeV)	log(Tt) Tt(s)	log(Tt') Tt'(s)	log-- TA	log-- TA	CA	nQ	nT
		EI	Ze	Ae	Ce	EI	Zd	Md	Cd									
Fe 26	58	Zr 40	49	82.45	49.92	46.3	46.9	-1.3	-0.2									
Ni 28	60	Sr 38	49	84.77	50.17	46.8	47.5	-0.8	-0.2									
Ni 28	59	Sr 38	50	84.50	50.58	47.1	47.7	-0.6	0.1									
He 2	4	Gd 64	80	1.54	1.49	40.4	44.2	5.0	3.8									
Fe 26	58	Zr 40	50	82.94	50.44	45.4	46.1	7.0	5.8									
Ni 28	60	Sr 38	50	84.41	50.19	47.4	46.1	7.0	5.8									
Fe 26	56	Kr 40	52	71.08	20.40	48.1	45.9	7.2	9.5									
Cr 24	52	Mo 42	50	81.95	49.28	49.5	48.3	9.2	7.9									
Ni 28	59	Y 39	50	81.95	49.28	49.5	48.3	9.4	8.1									
Cr 24	52	Mo 42	53	83.28	48.39	49.7	48.5	9.4	8.1									
He 2	4	Gd 64	81	2.63	2.56	23.4	47.2	23.2	23.9									
Fe 26	58	Zr 40	51	82.15	50.17	46.6	48.4	24.4	25.0									
Ni 28	61	Sr 38	50	84.24	49.76	47.7	47.4	24.5	25.2									
Fe 26	59	Zr 40	50	81.54	49.25	47.9	48.5	24.5	25.2									
Fe 26	58	Zr 40	52	80.74	49.86	48.6	49.5	25.4	26.0									
O 8	16	Ce 58	76	20.28	18.12	48.8	48.3	45.7	45.1									
Fe 26	60	Zr 40	50	80.85	48.51	49.3	48.0	46.1	44.9									
He 2	4	Gd 64	83	4.18	4.07	44.3	45.1	40.6	40.9									
C 6	12	Nd 60	79	13.14	12.09	44.9	45.1	43.2	43.9									
Ni 28	63	Sr 38	50	84.53	49.26	47.5	48.1	43.7	43.0									
O 8	16	Ce 58	77	20.49	18.32	47.9	48.2	44.0	44.0									
Ni 28	62	Sr 38	51	84.05	49.54	48.1	48.2	44.7	44.5									
Be 4	8	Sm 62	81	5.68	5.38	49.0	49.2	44.7	44.5									
Fe 26	58	Zr 40	53	80.37	49.50	49.5	50.2	45.3	45.4									
Fe 26	60	Zr 40	51	80.40	48.45	50.0	50.6	45.7	46.4									
He 2	4	Gd 64	84	3.73	3.63	7.2	37.5	30.6	30.2									
Be 4	8	Sm 62	82	6.91	6.54	37.9	38.5	31.7	31.2									
C 6	12	Nd 60	80	14.35	13.22	38.9	38.5	37.7	37.2									
O 8	16	Ce 58	78	21.11	18.89	45.5	45.0	38.3	37.7									
Ni 28	64	Sr 38	50	84.89	49.15	47.0	45.7	39.7	38.4									
He 2	4	Gd 64	85	3.56	3.47	8.9	36.0	26.9	27.1									
C 6	12	Nd 60	81	12.97	13.29	35.6	36.0	26.9	27.1									
Be 4	8	Sm 62	81	6.50	6.23	44.0	44.3	35.1	35.4									
O 8	16	Ce 58	79															



Parent Z EI A	Emitted Z EI Ze Ae Ce			Daughter Z EI Zd Nd Cd			Q (MeV)	EK (MeV)	log(T) T(s)	log(T')	log-- TA	CA	nq	nT		
	log(Tt) Tt(s)	C	EI	Ze	Ae	Ce									EI	Zd
66 Dy 156	UNKN	He 2	4			Gd 64	88	1.76	1.71	32.2	40.5	8.8	8.3	E 213	2	
		B 6	16			Ce 58	82	22.29	20.00	41.1	43.7	12.0	11.5			
		C 6	12			Nd 60	84	13.22	12.20	44.2						
66 Dy 157	4.46	He 2	4			Cd 64	89	1.04	1.01	57.7	46.8	-11.2	-10.9	E 213	1	
		B 6	16			Ce 58	83	20.75	18.63	46.5						
		He 2	4			Tb 65	79	0	2.14	2.09	36.0					
67 Ho 148	0.95	0				He 2	4	80.58	52.83	39.8	42.3	3.8	6.3	E 209	55	
		He 2	4			Ni 28	51	88.24	54.38	40.4	43.9	4.4	7.6			
		He 2	4			Zr 40	50	88.44	54.33	41.0	44.5	5.0	7.5			
		He 2	4			Mn 25	55	86.14	54.37	41.6	44.1	5.7	8.1			
		He 2	4			Mo 42	52	85.60	54.41	41.8	44.4	5.8	8.4			
		He 2	4			Ni 28	59	90.48	54.41	41.8	44.4	5.8	8.4			
		He 2	4			Co 27	57	88.86	54.64	42.0	44.5	6.0	8.5			
		He 2	4			Ni 28	60	90.39	53.75	42.1	44.7	6.2	8.7			
		He 2	4			Tb 65	80	0	1.92	1.87	32.2				E 204	30
		He 2	4			Zr 40	50	89.31	53.95	43.9	43.9	9.6	9.6			
67 Ho 149	1.32	0				Ni 28	60	88.20	52.92	43.5	45.8	23.0	25.6	E 209	28	
		He 2	4			Co 27	58	86.96	53.10	42.0	42.0	10.7	10.7			
		He 2	4			Nb 41	50	84.27	53.16	43.9	43.9	11.7	11.7			
		He 2	4			Mo 42	52	85.96	53.65	44.0	44.0	11.8	11.8			
		He 2	4			Gr 24	54	80.79	52.59	45.9	45.9	13.7	13.7			
		He 2	4			Tc 43	52	81.10	51.71	46.0	46.0	13.8	13.8			
		He 2	4			Cr 24	54	78.57	51.68	46.1	46.1	13.9	13.9			
		He 2	4			Ru 44	54	83.21	51.13	20.2						
		He 2	4			Tb 65	81	0	3.21	3.13	20.2					
		He 2	4			Ni 28	61	88.20	52.92	43.5	45.8	23.0	25.6			
67 Ho 150	1.94	0				Co 27	58	86.38	52.96	43.7	46.3	23.5	26.1	E 209	28	
		He 2	4			Zr 40	50	87.90	53.32	44.5	47.2	24.3	26.9			
		He 2	4			Mo 42	52	88.74	53.24	44.5	47.2	24.3	26.9			
		He 2	4			Y 39	49	88.82	52.11	44.8	47.5	24.6	27.2			
		He 2	4			Zr 40	52	85.17	52.80	45.5	48.0	25.3	27.8			
		He 2	4			Mo 42	52	83.20	52.69	45.6	48.1	25.4	27.9			
		He 2	4			Tc 43	54	80.35	51.62	47.1	47.1	44.8	44.8			
		He 2	4			Tb 65	82	4.73	4.61	2.3					M 212	27
		He 2	4			Y 39	52	91.64	52.63	43.6	43.6	39.5	39.5			
		He 2	4			Pm 61	78	13.72	12.63	32.7	32.7	41.3	41.3			
67 Ho 151	1.56	0				Co 27	61	87.86	52.37	44.1	44.1	41.9	41.9			
		He 2	4			Zr 40	50	87.86	52.37	44.1	44.1	41.9	41.9			
		He 2	4			Pf 59	76	21.84	19.53	44.8	44.8	42.6	42.6			
		He 2	4			Mo 42	52	85.56	52.69	45.0	45.0	42.7	42.7			
		He 2	4			Zr 40	52	86.88	52.93	45.3	45.3	43.0	43.0			
		He 2	4			Mo 42	54	82.70	52.58	46.3	46.3	44.1	44.1			
		He 2	4			Tc 43	54	80.35	51.62	47.1	47.1	44.8	44.8			
		He 2	4			Tb 65	83	4.50	4.39	3.9					M 212	29
		He 2	4			Eu 63	81	6.99	6.87	38.7	39.6	34.8	35.6			
		He 2	4			Pm 61	79	14.67	13.51	39.1	40.0	35.2	36.1			
67 Ho 152	2.16	0				Pf 59	77	22.38	20.02	42.9	44.0	38.9	40.1	E 209	28	
		He 2	4			Y 39	51	89.49	52.99	43.5	46.2	39.6	42.5			
		He 2	4			Y 39	50	89.47	52.39	43.7	46.4	39.8	44.0			
		He 2	4			Co 27	61	87.05	52.11	45.4	48.0	41.4	44.0			
		He 2	4			Fe 26	58	84.78	52.43	46.2	48.7	42.2	44.8			
		He 2	4			Co 27	60	86.36	52.27	46.3	48.9	42.4	45.0			

Parent Z EI A	Emitted Z EI Ze Ae Ce			Daughter Z EI Zd Nd Cd			Q (MeV)	EK (MeV)	log(T) T(s)	log(T')	log-- TA	CA	nq	nT		
	log(Tt) Tt(s)	C	EI	Ze	Ae	Ce									EI	Zd
67 Ho 153	2.08	He 2	4			Tb 65	84	4.05	3.94	5.5	31.2	25.7	25.7	M 213	21	
		B 6	12			Eu 63	82	8.03	7.61	31.2	35.7	30.2	30.2			
		C 6	12			Pm 61	80	15.46	14.24	35.7	37.0	32.9	32.9			
67 Ho 154	2.86	0				Y 39	52	85.78	52.22	43.3	43.3	40.3	40.3			
		He 2	4			Zr 40	52	88.07	52.38	45.7	45.7	41.0	41.0			
		He 2	4			Y 39	52	86.33	51.91	46.5	46.5	41.0	41.0			
		He 2	4			Y 39	52	87.35	52.10	47.5	47.5	42.0	42.0			
		He 2	4			Nb 41	54	83.91	52.10	47.5	47.5	42.1	42.1			
		He 2	4			Tb 65	85	4.04	3.94	6.6					M 214	18
		He 2	4			Pm 61	81	16.43	15.15	31.8	32.7	25.1	26.1			
		He 2	4			Eu 63	83	27.24	27.44	39.8	41.2	36.3	36.3			
		He 2	4			Pf 59	79	21.96	21.84	44.6	47.2	37.9	40.6			
		He 2	4			Y 39	51	88.95	51.98	44.6	47.2	39.4	42.1			
67 Ho 155	3.46	0				Nd 60	80	88.19	50.97	46.0	48.2	40.5	41.6	E 214	8	
		He 2	4			Y 39	52	16.98	15.44	47.1	48.2	40.5	41.6			
		He 2	4			Y 39	52	87.22	51.54	47.3	49.9	40.9	43.3			
		He 2	4			Te 52	70	86.95	51.95	47.5	50.2	40.6	43.5			
		He 2	4			Tb 65	86	3.14	3.06	13.0	30.0	16.9	16.9			
		He 2	4			Pm 61	82	16.20	15.60	30.0	39.9	26.8	26.8			
		He 2	4			Eu 63	84	22.55	21.21	42.0	42.0	29.0	29.0			
		He 2	4			Nd 60	80	18.32	16.54	43.5	43.5	30.4	30.4			
		He 2	4			Y 39	50	87.67	50.34	47.0	47.1	33.9	33.9			
		He 2	4			Y 39	52	87.38	51.30	47.1	47.1	34.0	34.0			
67 Ho 156	2.08	0				Te 52	70	50.58	39.81	49.6	49.6	36.6	36.6	E 215	10	
		He 2	4			Tb 65	87	2.90	2.83	16.5	34.7	17.2	18.2			
		He 2	4			Pm 61	83	23.96	21.46	37.6	38.7	21.1	22.2			
		He 2	4			Eu 63	85	29.87	27.37	42.4	43.5	25.9	26.9			
		He 2	4			Nd 60	81	18.57	16.79	42.8	43.8	26.3	27.3			
		He 2	4			Pm 61	82	14.30	13.11	42.8	43.8	26.3	27.3			
		He 2	4			Nd 60	82	17.56	15.98	44.6	45.6	28.0	29.1			
		He 2	4			Y 39	51	86.98	50.18	48.1	50.8	31.5	34.3			
		He 2	4			Y 39	52	86.80	50.96	48.4	50.1	31.9	33.6			
		He 2	4			Te 52	70	86.40	50.96	48.7	51.4	32.1	34.8			
67 Ho 157	2.88	0				Tb 65	88	2.00	1.95	28.8	37.6	8.8	8.8	E 214	4	
		He 2	4			Pm 61	84	22.07	21.46	37.6	40.1	11.3	11.3			
		He 2	4			Eu 63	86	28.97	27.16	40.8	40.8	12.0	12.0			
		He 2	4			Nd 60	83	18.97	17.16	40.8	49.0	20.2	20.2			
		He 2	4			Te 52	74	46.53	37.64	49.0						
		He 2	4			Tb 65	89	1.54	1.50	41.6	43.7	1.0	2.1			
		He 2	4			Pf 59	83	22.34	20.07	42.6	46.9	4.0	5.0			
		He 2	4			Nd 60	83	13.25	12.24	45.6	46.9	4.2	5.3			
		He 2	4			Y 39										



Parent		Emitted		Daughter		E		log(T)		log(T)		log(T)		log(T)		log(T)	
Z	EI	A	log(Tt)	C	EI	Z	AE	Ce	Q	EK	log(T)	log(T)	log(T)	log(T)	log(T)	log(T)	log(T)
			Tt(s)			Zd	Nd	Cd	(MeV)	(MeV)	(s)	(s)	(s)	(s)	(s)	(s)	(s)
Co	27	59			Nb	41	50		90.84	55.11	43.3	42.1	19.5	18.2			
Cr	24	54			Ru	44	52		84.98	54.39	43.4	42.2	19.5	18.3			
Fe	26	57			Mo	42	51		88.96	55.16	43.5	42.2	19.6	18.4			
Ni	28	62			Zr	40	48		92.35	54.18	43.7	42.4	19.8	18.5			
He	2	4	1.36	0	Dy	66	81		3.65	3.55	13.8	40.7	26.2	26.8	E	208	43
Ni	28	60			Zr	40	51		93.82	56.37	40.8	41.4	26.9	27.6			
Fe	26	58			Mo	42	51		90.96	55.71	41.2	41.9	27.4	28.0			
Fe	26	57			Mo	42	52		90.09	56.08	41.6	42.2	27.7	28.4			
Fe	26	56			Mo	42	53		89.81	56.50	41.8	42.4	27.9	28.6			
Ni	28	62			Zr	40	49		93.11	54.88	42.3	43.0	28.5	29.2			
Cr	24	53			Ru	44	54		85.01	55.17	42.9	43.5	29.1	29.7			
Cr	24	52			Ru	44	55		84.53	55.42	43.4	44.0	29.5	30.2			
He	2	4	0.99		Dy	66	82		4.93	4.81	1.0	38.2	38.4	37.1	M	210	30
He	2	4			Zr	40	50		94.80	58.19	39.5	39.6	39.1	38.6			
C	6	12			Sm	62	79	0	14.79	11.62	40.1	39.6	40.6	40.0			
Fe	26	58			Nd	60	76		23.29	20.84	41.6	41.1	40.6	40.0			
Ni	28	60			Mo	42	52		89.94	55.62	41.9	40.7	40.9	39.6			
Ni	28	61			Zr	40	52		92.31	55.87	43.1	41.8	42.0	40.8			
Fe	26	56			Mo	42	54		88.78	56.07	43.3	42.1	42.3	41.0			
Cr	24	54			Ru	44	54		84.54	54.50	43.8	42.6	42.8	41.6			
Cr	24	52			Ru	44	56		84.01	55.27	44.1	42.9	43.1	41.9			
He	2	4	1.58	0	Dy	66	83	0	4.79	4.67	1.6	37.4	35.6	35.8	M	211	39
He	2	4			Sm	62	81		8.54	6.56	37.2	37.4	35.6	35.8			
C	6	12			Sm	62	79		15.37	14.07	37.9	38.2	36.4	36.6			
Ni	28	62			Zr	40	51		93.97	55.89	40.8	41.4	39.2	39.8			
O	8	16			Nd	60	77		23.47	21.01	41.0	41.2	39.4	39.7			
Ni	28	63			Zr	40	50		93.61	55.07	41.5	42.2	39.9	40.6			
Fe	26	58			Mo	42	53		89.19	55.38	43.0	43.6	41.4	42.1			
Ni	28	61			Zr	40	52		92.01	55.32	43.7	44.3	42.1	42.7			
Fe	26	57			Mo	42	54		88.30	55.40	44.2	44.8	42.6	43.2			
He	2	4	2.36		Dy	66	84		4.28	4.17	4.7	28.9	24.6	24.2	M	212	24
He	2	4			Sm	62	82		8.54	8.09	29.3	30.7	24.3	24.5			
C	6	12			Gd	64	83		17.17	15.84	30.5	31.4	25.1	25.3			
Be	4	8			Gd	64	81		8.20	7.78	31.2	31.4	25.1	25.3			
Ni	28	64			Nd	60	78	0	24.25	21.73	38.4	37.8	33.7	33.2			
Ni	28	62			Zr	40	50		93.24	54.49	42.2	40.8	37.5	36.2			
Ni	28	63			Zr	40	52		92.58	55.31	42.8	41.5	38.1	36.8			
Fe	26	58			Mo	42	54		88.32	55.06	44.3	43.0	39.6	38.3			
Cr	24	54			Ru	44	56		83.23	54.24	45.3	44.1	40.6	39.4			
Si	14	30			Xe	54	70		49.47	39.83	45.3	44.5	40.6	39.8			
He	2	4	2.50		Dy	66	85		4.12	4.01	6.2	28.9	24.6	24.2	M	213	28
C	6	12			Sm	62	81		17.17	15.84	30.5	30.7	24.3	24.5			
Be	4	8			Gd	64	83		8.20	7.78	31.2	31.4	25.1	25.3			
O	8	16			Nd	60	79		24.42	21.90	37.8	38.1	31.6	31.9			
Ni	28	64			Zr	40	51		92.63	54.38	43.0	43.7	36.9	37.5			
Ni	28	62			Zr	40	53		91.50	54.90	44.4	45.1	38.3	38.9			
Fe	26	58			Mo	42	54		88.32	55.06	44.3	43.0	39.6	38.3			
Cr	24	54			Ru	44	56		83.23	54.24	45.3	44.1	40.6	39.4			
Si	14	30			Xe	54	71		49.47	39.83	45.3	44.5	40.6	39.8			
He	2	4	3.05	0	Dy	66	86		3.70	3.61	8.4	27.2	19.2	18.7	E	213	19
C	6	12			Sm	62	82		17.97	16.59	27.6	34.8	26.9	26.4			
O	8	16			Nd	60	80		25.22	22.63	35.3	34.8	26.9	26.4			
Be	4	8			Gd	64	84		7.34	6.96	37.0	36.6	28.6	28.2			

Parent		Emitted		Daughter		E		log(T)		log(T)		log(T)		log(T)		log(T)	
Z	EI	A	log(Tt)	C	EI	Z	AE	Ce	Q	EK	log(T)	log(T)	log(T)	log(T)	log(T)	log(T)	log(T)
			Tt(s)			Zd	Nd	Cd	(MeV)	(MeV)	(s)	(s)	(s)	(s)	(s)	(s)	(s)
Ni	28	64			Zr	40	52		91.55	53.99	44.6	43.3	36.2	34.9			
Si	14	30			Xe	54	72		49.25	38.43	44.9	44.9	35.8	32.6			
Ni	28	66			Zr	40	50		90.80	53.98	46.3	45.5	38.3	37.0			
Ni	28	62			Zr	40	54		90.01	54.24	46.8	45.5	38.3	37.0			
Ti	22	50			Pd	46	60		77.34	52.55	47.1	45.9	38.7	37.5			
He	2	4	3.18		Dy	66	87		3.30	3.22	12.0	30.3	18.1	18.3	E	216	27
C	6	12			Sm	62	83		17.24	15.92	30.1	30.3	22.4	22.6			
C	6	13			Nd	60	81		25.53	22.93	34.4	34.6	22.4	22.6			
C	6	13			Sm	62	82		15.43	14.15	39.2	39.4	27.2	27.4			
Be	4	8			Nd	60	79		19.70	18.39	40.1	41.7	29.4	29.6			
Si	14	30			Xe	54	75		49.17	38.63	47.1	47.1	31.7	29.8			
Ni	28	64			Zr	40	54		89.16	53.05	48.4	47.1	31.7	29.8			
Mg	12	26			Ba	56	76		39.47	32.97	48.5	47.8	31.2	30.5			
Ni	28	66			Zr	40	52		89.28	51.99	48.6	47.3	31.3	30.0			
Ni	28	64			Zr	40	51		90.50	52.46	46.6	45.3	34.6	33.4			
Si	14	29			Xe	54	74		48.33	39.41	46.7	47.1	34.6	35.1			
He	2	4	3.91	0	Dy	66	88		2.77	2.70	17.3	33.9	17.1	16.6	E	213	12
C	6	12			Nd	60	82		25.50	22.91	34.4	33.9	22.4	22.6			
C	6	12			Sm	62	84		15.79	14.59	35.5	35.0	18.2	17.7			
Si	14	31			Xe	54	76		47.07	36.50	47.7	44.9	28.4	27.6			
Si	14	31			Xe	54	75		48.56	38.00	46.8	45.2	20.5	20.9			
Si	14	30			Xe	54	74		48.24	38.83	48.4	46.9	23.0	23.5			
Si	14	29			Xe	54	76		47.20	38.59	49.0	49.4	22.7	23.1			
Mg	12	26			Ba	56	77		39.21	32.80	49.1	49.5	22.8	23.1			
C	6	13			Sm	62	84		13.29	12.21	49.5	49.8	23.2	23.4			
He	2	4	5.01		Dy	66	89		2.05	2.00	28.1	48.4	12.1	11.2	E	212	2
C	6	12</															



Parent		Emitted				Daughter				T <sup>1</sup>						
Z	EI A	log(Tt) C	EI	Zb	Ae	Ce	Q	EK	log(T) T(s)	log(T <sup>1</sup> ) T(s)	log-- TA	log-- TA	CA	nQ	nT	
69	Tm	153	0.20	0	He	2	4	59.53	37.4	40.1	24.9	27.6				
					C	6	12	94.68	59.80	40.8	25.9	28.5				
					Co	27	59	96.52	59.69	38.4	41.0	25.9	28.5			
					Fe	26	57	96.71	58.54	38.5	41.2	26.0	27.1			
					Eu	63	77	94.46	59.03	38.8	41.4	26.3	28.9			
					Ho	67	82	0	5.24	0.2				M	212	69
					Nb	41	50	99.20	59.00	37.2	37.2	36.9	36.9			
					Eu	63	78	15.80	14.56	37.2	37.2	37.0	37.0			
					Mo	42	52	96.46	59.26	38.5	38.5	38.3	38.3			
					Pm	61	76	24.66	22.08	38.9	38.9	38.7	38.7			
					Nb	41	52	97.50	59.26	39.3	39.3	39.1	39.1			
					Ru	44	54	91.75	58.77	39.5	39.5	39.2	39.2			
					Fe	26	56	93.59	58.37	39.6	39.6	39.3	39.3			
					Tc	43	54	93.05	58.37	39.6	39.6	39.4	39.4			
69	Tm	154	0.70	0	He	2	4	5.16	5.03	1.0	32.7	30.9	31.7	M	213	91
					Tb	65	81	8.29	7.86	31.9	32.7	31.6	31.6			
					Eu	63	79	16.96	15.64	32.7	33.6	32.5	32.5			
					Pm	61	77	28.25	22.62	37.1	38.2	36.0	37.2			
					Nb	41	51	98.56	58.88	38.0	40.7	37.0	39.7			
					Mo	42	52	97.52	57.63	39.8	42.5	38.7	41.4			
					Ce	58	53	92.13	58.25	40.2	42.9	39.1	41.8			
					Co	27	60	93.34	58.19	40.4	43.1	39.1	41.8			
					Fe	26	58	93.34	58.19	40.4	43.1	39.4	42.0			
69	Tm	155	1.59		He	2	4	4.57	4.45	3.6	26.6	23.0	23.0	M	214	67
					Tb	65	82	9.21	8.73	26.6	26.6	26.8	26.8			
					Eu	63	80	17.57	16.21	30.4	30.4	26.8	32.8			
					Pm	61	78	25.45	22.82	36.4	36.4	32.8	32.8			
					Nb	41	52	97.44	58.29	40.0	40.0	36.4	36.4			
					Fe	26	58	95.66	57.93	40.7	40.5	37.9	37.9			
					Co	27	61	94.50	57.31	41.7	41.7	38.1	38.1			
					Mo	42	54	94.21	56.35	41.7	41.7	38.1	38.1			
69	Tm	156	1.90		He	2	4	4.35	4.23	5.5	27.6	21.2	22.1	E	214	83
					Eu	63	81	18.68	17.24	26.7	27.6	23.5	24.3			
					Tb	65	83	8.76	8.31	29.1	29.8	23.5	24.3			
					Pm	61	80	26.38	23.49	34.3	35.4	28.7	28.9			
					Nb	41	51	98.74	59.93	41.1	43.2	35.9	36.6			
					Sm	62	80	19.15	17.43	41.6	42.7	36.1	37.2			
					Nb	41	52	95.75	57.08	42.2	45.0	36.7	39.5			
					Ce	55	71	51.80	41.84	42.7	44.5	37.2	39.5			
69	Tm	157	2.30	0	He	2	4	3.81	3.71	8.6	25.0	16.3	16.3	E	214	63
					Eu	63	82	19.21	17.74	25.0	25.0	16.3	16.3			
					Tb	65	83	8.76	8.31	29.1	33.5	24.9	24.9			
					Pm	61	80	26.38	23.49	34.3	35.4	28.7	28.9			
					Nb	41	51	98.74	59.93	41.1	43.2	35.9	36.6			
					Sm	62	80	19.15	17.43	41.6	42.7	36.1	37.2			
					Nb	41	52	95.75	57.08	42.2	45.0	36.7	39.5			
					Ce	55	71	51.80	41.84	42.7	44.5	37.2	39.5			
69	Tm	157	2.30	0	He	2	4	3.81	3.71	8.6	25.0	16.3	16.3	E	214	63
					Eu	63	82	19.21	17.74	25.0	25.0	16.3	16.3			
					Tb	65	83	8.76	8.31	29.1	33.5	24.9	24.9			
					Pm	61	80	26.38	23.49	34.3	35.4	28.7	28.9			
					Nb	41	51	98.74	59.93	41.1	43.2	35.9	36.6			
					Sm	62	80	19.15	17.43	41.6	42.7	36.1	37.2			
					Nb	41	52	95.75	57.08	42.2	45.0	36.7	39.5			
					Ce	55	71	51.80	41.84	42.7	44.5	37.2	39.5			

Parent		Emitted				Daughter				T <sup>1</sup>						
Z	EI A	log(Tt) C	EI	Zb	Ae	Ce	Q	EK	log(T) T(s)	log(T <sup>1</sup> ) T(s)	log-- TA	log-- TA	CA	nQ	nT	
69	Tm	158	2.38	0	He	2	4	3.51	3.42	11.7	28.3	15.7	16.6	E	216	73
					Eu	63	83	18.41	17.02	27.4	32.7	19.9	21.0			
					Pm	61	81	27.11	24.36	31.6	38.2	25.3	26.5			
					Tb	65	85	7.46	7.08	37.9	38.0	25.9	26.8			
					Sm	62	82	16.17	14.84	37.5	38.7	26.0	27.1			
					Ce	55	73	20.72	18.76	37.7	44.6	31.2	32.9			
					Nb	41	53	94.76	56.38	43.7	46.5	32.1	34.8			
69	Tm	159	2.73	0	He	2	4	3.07	2.99	15.2	31.4	16.2	16.2	E	214	36
					Eu	63	82	17.90	16.41	32.4	32.3	20.5	20.5			
					Pm	61	80	26.38	23.49	34.3	35.3	28.1	28.1			
					Sm	62	82	21.30	19.29	35.6	43.3	30.2	30.2			
					Ce	55	74	51.40	41.70	43.3	45.4	30.8	30.8			
					Xe	54	72	54.93	43.53	45.4	46.0	30.8	30.8			
					Nb	41	54	93.31	55.75	46.0	46.2	31.1	31.1			
					I	53	72	58.21	45.76	46.2	46.4	31.2	31.2			
					Xe	54	73	53.73	43.25	46.4	46.4	31.2	31.2			
69	Tm	160	2.74	0	He	2	4	2.65	2.59	21.0	36.5	14.4	15.5	E	216	35
					Pm	61	83	25.70	23.13	35.3	37.8	15.8	16.8			
					Eu	63	85	15.81	14.62	36.8	40.8	18.8	19.9			
					Sm	62	83	20.10	18.21	39.8	46.1	23.4	25.1			
					Ce	55	75	50.83	41.30	44.4	45.6	23.5	24.7			
					Pm	61	82	23.32	20.84	44.5	48.1	25.4	27.1			
					Ce	55	76	49.51	40.54	46.4	47.9	25.5	26.8			
					Pr	59	81	31.29	27.38	46.4	48.7	25.9	27.7			
					Xe	54	73	54.20	43.02	46.8	48.7	25.9	27.7			
69	Tm	161	3.35	0	He	2	4	2.45	2.39	22.9	40.4	17.6	17.6	E	215	18
					Eu	63	84	24.01	21.62	40.4	42.8	19.9	19.9			
					Pm	61	84	14.44	13.37	42.8	44.3	21.5	21.5			
					Sm	62	84	18.88	17.12	44.3	45.0	22.1	22.1			
					Ce	55	76	50.50	41.09	45.0	46.8	23.9	23.9			
					Xe	54	74	54.19	43.08	46.8	47.0	24.1	24.1			
					Pr	59	82	31.06	27.20	47.0	48.1	24.1	24.1			
					La	57	78	13.44	12.76	47.1	48.5	25.7	25.7			
					Ce	55	74	49.61	39.75	48.5	48.5	25.7	25.7			
69	Tm	162	3.11		He	2	4	2.21	2.16	27.9	46.1	17.1	18.3	E	216	15
					Pm	61	85	22.63	20.39	45.0	47.6	18.0	19.7			







Parent		Emitted		Daughter		T <sub>1/2</sub>		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )											
Z	EI	A	log(I <sub>0</sub> /I <sub>t</sub> )	C	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nT		
70	Yb	161	2.40	0	He	2	4		Er	68	89		3.18	3.11	14.4	32.0	17.3	17.5			E	216	55
					C	0	8	16	Sm	62	83		27.59	24.85	31.7	32.0	17.3	17.5					
					Cd	64	85		Gd	64	85		17.32	16.03	32.3	32.0	17.3	17.5					
					Sm	62	82		Ba	56	75		24.97	22.34	40.7	41.0	26.1	26.6					
					Si	14	30		Ba	56	75		53.34	43.40	41.6	42.0	27.1	27.6					
					Si	14	29		Ce	58	76		52.54	43.07	42.4	42.8	28.0	28.4					
					Ne	10	20		Cd	64	84		15.35	14.79	42.5	42.7	28.0	28.3					
					Ne	10	19		Cd	64	84		15.35	14.79	42.5	42.7	28.0	28.3					
					Mg	12	26		Ce	58	77		43.06	36.11	44.2	44.6	29.8	30.1					
70	Yb	162	3.05	0	He	2	4		Er	68	90		3.02	2.95	15.9	35.5	20.1	19.6			E	215	28
					C	0	8	16	Sm	62	84		25.98	23.41	36.1	36.8	21.4	20.9					
					Cd	64	86		Gd	64	86		16.02	14.83	37.3	36.8	21.4	20.9					
					Si	14	30		Ba	56	76		53.14	43.30	41.9	41.0	26.0	26.5					
					Ne	10	20		Nd	60	82		33.25	29.15	42.9	42.2	26.9	26.3					
					Mg	12	26		Ce	58	80		42.76	36.57	44.3	44.9	28.1	27.6					
					Mg	12	25		Ce	58	79		42.76	36.57	44.3	44.9	28.1	27.6					
					S	16	34		Ce	58	74		60.06	47.44	45.1	44.2	29.2	28.2					
					Tl	22	50		Cd	48	64		82.26	56.87	45.1	44.0	29.2	28.0					
70	Yb	163	2.82		He	2	4		Er	68	91		2.78	2.71	19.1	40.3	20.9	21.2			E	215	30
					C	0	8	16	Sm	62	85		24.64	22.22	40.0	42.7	23.3	23.6					
					Si	14	30		Gd	64	87		14.83	13.74	42.4	42.7	23.3	23.6					
					Si	14	29		Ba	56	77		52.63	42.95	42.8	43.2	23.8	24.2					
					Ne	10	20		Ce	58	79		42.70	36.53	44.7	44.9	22.7	22.7					
					Ne	10	19		Ce	58	78		42.70	36.53	44.7	44.9	22.7	22.7					
					Mg	12	24		Ba	56	76		52.03	42.11	44.8	45.3	25.8	26.2					
					Mg	12	24		Ba	56	76		52.03	42.11	44.8	45.3	25.8	26.2					
					S	16	36		Ce	58	81		41.54	35.42	45.5	45.9	26.5	26.8					
					S	16	34		Ce	58	79		41.54	35.42	45.5	45.9	26.5	26.8					
					Nb	10	22		Nd	60	81		32.87	28.43	46.4	46.8	27.4	27.7					
70	Yb	164	3.66	0	He	2	4		Er	68	92		2.65	2.58	20.4	42.3	22.7	21.9			E	215	13
					C	0	8	16	Ba	56	78		52.41	42.83	43.2	43.8	24.1	23.3					
					Mg	12	26		Ce	58	80		42.80	36.01	44.5	44.3	24.6	24.1					
					Ne	10	20		Sm	62	85		53.09	40.94	45.0	44.3	24.6	24.1					
					Ne	10	19		Sm	62	84		53.09	40.94	45.0	44.3	24.6	24.1					
					Si	14	30		Ba	56	78		50.73	41.72	44.0	42.4	25.2	25.0					
					Si	14	29		Ba	56	77		51.48	41.49	46.6	47.1	25.2	25.0					
					Mg	12	24		Ce	58	82		41.03	35.03	46.6	45.9	26.2	25.5					
					Mg	12	25		Ce	58	80		41.98	35.11	47.4	47.8	26.0	26.4					
					S	16	36		Ce	58	82		41.10	34.88	47.5	47.9	26.1	26.5					
					S	16	34		Ce	58	80		41.10	34.88	47.5	47.9	26.1	26.5					
70	Yb	165	2.77		He	2	4		Er	68	93		2.61	2.54	21.4	44.1	22.3	22.7			E	216	16
					Si	14	30		Ba	56	79		52.13	42.65	43.7	44.1	22.3	22.7					
					Mg	12	26		Ce	58	81		43.01	36.23	43.9	44.3	22.5	22.9					
					Ne	10	20		Sm	62	86		53.09	40.94	45.0	44.3	22.5	22.9					
					Ne	10	19		Sm	62	85		53.09	40.94	45.0	44.3	22.5	22.9					
					Si	14	30		Ba	56	79		50.73	41.72	44.0	42.4	25.2	25.0					
					Si	14	29		Ba	56	78		51.48	41.49	46.6	47.1	25.2	25.0					
					Mg	12	24		Ce	58	82		41.03	35.03	46.6	45.9	26.2	25.5					
					Mg	12	25		Ce	58	80		41.98	35.11	47.4	47.8	26.0	26.4					
					S	16	36		Ce	58	82		41.10	34.88	47.5	47.9	26.1	26.5					
					S	16	34		Ce	58	80		41.10	34.88	47.5	47.9	26.1	26.5					
70	Yb	166	5.31		He	2	4		Er	68	94		2.33	2.27	25.1	43.5	19.2	18.4			E	215	6
					Si	14	30		Ba	56	80		51.75	42.40	44.4	43.5	19.2	18.4					
					Si	14	29		Ba	56	79		51.75	42.40	44.4	43.5	19.2	18.4					
					Ne	10	20		Sm	62	86		53.09	40.94	45.0	44.3	22.5	22.9					
					Ne	10	19		Sm	62	85		53.09	40.94	45.0	44.3	22.5	22.9					
					Si	14	30		Ba	56	80		50.73	41.72	44.0	42.4	25.2	25.0					
					Si	14	29		Ba	56	79		51.48	41.49	46.6	47.1	25.2	25.0					
					Mg	12	24		Ce	58	82		41.03	35.03	46.6	45.9	26.2	25.5					
					Mg	12	25		Ce	58	80		41.98	35.11	47.4	47.8	26.0	26.4					
					S	16	36		Ce	58	82		41.10	34.88	47.5	47.9	26.1	26.5					
					S	16	34		Ce	58	80		41.10	34.88	47.5	47.9	26.1	26.5					

Parent		Emitted		Daughter		T <sub>1/2</sub>		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )											
Z	EI	A	log(I <sub>0</sub> /I <sub>t</sub> )	C	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nT		
70	Yb	167	3.03		He	2	4		Er	68	95		2.15	2.10	28.8	45.1	15.9	16.3			E	213	9
					Si	14	30		Ba	56	81		51.57	42.31	44.6	46.5	17.3	17.8					
					Si	14	31		Ba	56	80		51.26	41.75	46.1	46.5	17.3	17.8					
					Si	14	32		Ba	56	79												



Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		log-CA		nT	
Z	El	A	log(Tt)	C	El	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	T'(s)	log-TA	log-TA	CA	nq	nT
71	Lu	157	0.65	0	He	2	4	0	5.13	4.99	1.9	23.4	21.5	21.5	M	214	110
					He	2	4	0	10.28	9.76	23.4	37.0	34.5	37.0			
					C	6	12	0	19.57	18.07	26.4	37.1	34.8	37.4			
					He	4	8	0	28.09	25.22	32.3	37.3	34.8	37.6			
					He	4	8	0	103.82	64.51	35.0	37.0	33.5	33.5			
					He	4	8	0	101.59	65.22	35.5	37.0	33.7	33.7			
					He	4	8	0	98.58	64.31	35.8	37.0	33.9	33.9			
					He	4	8	0	105.06	64.91	36.2	37.0	34.3	34.3			
					He	2	4	0	4.96	4.84	2.8	28.2	20.5	21.4	E	214	127
					He	2	4	0	20.62	19.05	23.3	37.0	34.5	37.0			
					He	2	4	0	39.09	26.32	29.1	37.0	34.5	37.0			
					He	2	4	0	21.84	19.90	15.4	37.0	34.5	37.0			
					He	2	4	0	20.90	19.20	36.4	37.0	34.5	37.0			
					He	2	4	0	105.32	63.99	36.0	37.0	34.5	37.0			
					He	2	4	0	102.60	64.29	37.0	37.0	34.5	37.0			
					He	2	4	0	104.12	63.52	37.6	37.0	34.5	37.0			
					He	2	4	0	97.26	63.61	38.0	37.0	34.5	37.0			
					He	2	4	0	99.71	63.34	38.1	37.0	34.5	37.0			
					He	2	4	0	4.28	4.18	6.8	24.7	17.0	17.0	E	215	123
					He	2	4	0	20.12	17.11	27.0	24.7	17.0	17.0			
					He	2	4	0	22.98	20.97	31.7	24.9	17.0	17.0			
					He	2	4	0	8.54	8.11	32.5	24.9	17.0	17.0			
					He	2	4	0	22.59	20.47	34.6	24.9	17.0	17.0			
					He	2	4	0	17.57	16.15	34.9	24.9	17.0	17.0			
					He	2	4	0	102.39	63.03	39.3	24.9	17.0	17.0			
					He	2	4	0	95.39	45.33	39.3	24.9	17.0	17.0			
					He	2	4	0	3.85	3.76	9.5	26.7	17.3	17.3	E	215	97
					He	2	4	0	30.22	27.22	26.7	26.7	17.3	17.3			
					He	2	4	0	18.98	17.57	28.0	26.7	17.3	17.3			
					He	2	4	0	23.49	21.30	31.8	26.7	17.3	17.3			
					He	2	4	0	8.54	8.11	32.5	26.7	17.3	17.3			
					He	2	4	0	22.59	20.47	34.6	26.7	17.3	17.3			
					He	2	4	0	17.57	16.15	34.9	26.7	17.3	17.3			
					He	2	4	0	102.39	63.03	39.3	26.7	17.3	17.3			
					He	2	4	0	95.39	45.33	39.3	26.7	17.3	17.3			
					He	2	4	0	3.61	3.53	11.8	30.2	17.3	18.4	E	216	113
					He	2	4	0	29.19	26.31	29.1	30.2	17.3	18.4			
					He	2	4	0	18.44	17.08	29.7	30.2	17.3	18.4			
					He	2	4	0	22.74	20.64	33.9	30.2	17.3	18.4			
					He	2	4	0	20.75	18.96	38.7	30.2	17.3	18.4			

Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		log-CA		nT	
Z	El	A	log(Tt)	C	El	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	T'(s)	log-TA	log-TA	CA	nq	nT
71	Lu	163	2.39	0	He	2	4	0	3.40	3.32	13.2	33.2	22.0	22.0	E	216	75
					He	2	4	0	27.59	24.85	33.2	40.5	27.4	28.7			
					He	2	4	0	16.89	15.65	35.2	40.5	27.4	28.7			
					He	2	4	0	21.44	19.46	38.1	40.5	27.4	28.7			
					He	2	4	0	35.27	30.95	39.6	40.5	27.4	28.7			
					He	2	4	0	55.26	45.09	40.0	42.0	28.8	28.8			
					He	2	4	0	44.04	37.55	42.0	42.0	28.8	28.8			
					He	2	4	0	53.42	44.25	42.0	42.0	28.8	28.8			
					He	2	4	0	86.05	59.66	42.3	42.3	29.0	29.0			
					He	2	4	0	3.35	3.26	14.4	37.7	22.2	23.3	E	217	85
					He	2	4	0	26.31	23.75	36.6	39.0	23.6	24.5			
					He	2	4	0	16.18	15.00	38.0	39.0	23.6	24.5			
					He	2	4	0	55.01	44.95	40.4	42.2	26.0	27.7			
					He	2	4	0	53.88	44.35	41.9	43.6	27.4	29.2			
					He	2	4	0	20.34	18.48	41.9	43.0	27.5	28.5			
					He	2	4	0	43.64	37.53	42.5	44.1	28.1	29.7			
					He	2	4	0	52.80	43.82	43.1	44.8	28.7	30.4			
					He	2	4	0	3.21	3.13	15.2	40.9	25.7	25.7	E	216	51
					He	2	4	0	54.73	44.78	40.9	40.9	25.7	25.7			
					He	2	4	0	24.81	22.40	41.1	41.1	25.9	25.9			
					He	2	4	0	44.68	37.64	42.4	42.4	27.2	27.2			
					He	2	4	0	53.58	47.74	42.9	42.9	27.9	27.9			
					He	2	4	0	39.11	33.66	43.2	43.2	28.0	28.0			
					He	2	4	0	14.94	13.85	43.4	43.4	28.1	28.1			
					He	2	4	0	34.61	30.00	43.6	43.6	28.3	28.3			
					He	2	4	0	3.01	2.94	18.0	43.3	23.5	23.5	E	216	45
					He	2	4	0	54.35	44.53	41.5	43.3	23.5	23.5			
					He	2	4	0	44.79	37.78	42.0	43.3	23.5	23.5			
					He	2	4	0	53.50	43.95	44.0	43.6	25.9	25.9			
					He	2	4	0	57.79	46.30	44.2	46.1	25.9	25.9			
					He	2	4	0	48.05	40.23	44.2	46.1	25.9	25.9			
					He	2	4	0	48.30	40.16	44.6	46.3	26.2	27.8			
					He	2	4	0	57.16	46.14	44.8	46.3	26.5	28.2			
					He	2	4	0	2.84	2.77	19.3	46.6	26.7	28.2			
					He	2	4	0	44.77	37.86	42.0	46.6	26.7	28.2			
					He	2	4	0	57.84	46.41	44.0	46.6	26.7	28.2			
					He	2	4	0	47.81	40.08	44.6	46.6	26.7	28.2			
					He	2	4	0	53.28	43.07	45.1	46.6	26.7	28.2			
					He	2	4	0	48.32	39.93	45.3	46.6	26.7	28.2			
					He	2	4	0	80.74	57.05	45.8	46.6	26.7	28.2			
					He	2	4	0	51.26	42.67	46.1	46.6	26.7	28.2			
					He	2	4	0	2.46	2.40	25.8	46.1	16.5	18.3	E	215	24
					He	2	4	0	53.85	44.24	42.3	46.1	16.5	18.3			
					He	2	4	0	52.97	43.20	44.9	46.1	16.5	18.3			
					He	2	4	0	52.02	43.04	45.2	46.1	16.5	18.3			



Parent			Emitted			Daughter			T <sub>1/2</sub>												
Z	El	A	log(Tt)	C	El	Ze	Ae	Ce	El	Zd	Nd	Cd	Q	EK	log(T)	log(T')	log(T)	log(T')	CA	nQ	nT
			Tt(s)										(MeV)	(s)	(s)	(s)	TA	TA			
71	Lu	169	5.09		He	2	4		Im	69	96		2.43	2.38	24.9	42.7	17.8	17.8	E	215	14
					Si	14	30		La	57	82		53.59	44.08	45.4	45.2	20.2	20.2			
					P	15	33		Ba	56	80		57.17	46.00	45.4	45.2	20.3	20.3			
					Si	14	32		Ba	56	80		53.13	43.07	45.2	45.2	20.3	20.3			
					Al	13	29		La	57	80		48.22	39.95	45.4	45.4	20.4	20.4			
					S	16	36		Ce	58	82		60.68	47.75	47.2	47.2	22.3	22.3			
					Ne	10	20		Cs	55	78		79.57	56.50	47.6	47.6	22.6	22.6			
					Ar	18	38		Pr	59	82		82.56	57.85	47.6	47.6	22.6	22.6			
					S	16	34		Cs	55	80		59.52	47.54	48.2	48.2	23.2	23.2			
71	Lu	170	5.24		He	2	4		Im	69	97		2.13	2.08	31.8	46.6	13.0	14.9	E	214	13
					Si	14	32		La	57	81		53.28	43.25	44.8	46.6	13.0	15.0			
					Si	14	31		La	57	82		52.86	43.22	44.9	46.7	13.2	15.0			
					P	15	33		Ba	56	82		56.74	45.73	45.9	47.8	14.1	16.0			
					Si	14	30		La	57	83		51.43	42.35	47.2	49.0	15.4	17.2			
					Ca	20	48		Ba	56	80		56.13	44.91	47.9	49.8	16.1	18.1			
					P	15	34		La	57	82		50.24	44.49	48.0	50.0	16.2	18.2			
					S	16	32		Cs	55	82		50.52	44.49	48.0	50.1	16.2	18.2			
					S	16	34		Cs	55	81		58.96	47.17	49.2	51.2	17.4	19.3			
71	Lu	171	5.85		He	2	4		Im	69	98		2.29	2.24	27.3	44.3	17.0	17.0	E	214	7
					Si	14	32		La	57	82		53.48	43.47	44.3	44.3	17.0	17.0			
					P	15	33		Ba	56	82		56.78	45.82	45.7	45.7	18.4	18.4			
					S	16	36		Cs	55	80		60.50	47.76	47.4	47.4	20.1	20.1			
					P	15	35		Ba	56	80		56.01	44.55	48.8	48.8	21.5	21.5			
					Ca	20	48		La	57	83		78.66	56.32	49.0	49.0	21.7	21.7			
					Ca	20	48		Sb	51	72		78.66	56.32	49.0	49.0	21.7	21.7			
					S	16	34		Cs	55	82		58.60	46.99	49.7	49.7	22.4	22.4			
71	Lu	172	5.76		He	2	4		Im	69	99		2.15	2.10	31.8	49.8	15.9	18.0	E	213	5
					S	16	36		Cs	55	81		60.28	47.66	47.7	49.8	16.0	18.0			
					P	15	34		Ba	56	82		56.09	45.00	47.8	49.9	16.3	18.2			
					Si	14	32		La	57	83		51.66	42.05	48.1	49.9	17.1	19.0			
					P	15	35		Ba	56	81		55.93	44.55	48.8	50.8	17.1	19.0			
					Ca	20	48		Sb	51	73		75.09	54.14	49.9	52.3	18.1	20.6			
71	Lu	173	7.64		He	2	4		Im	69	100		1.97	1.92	33.5	47.5	14.0	14.0	E	212	3
					S	16	36		Cs	55	82		60.34	47.78	47.5	47.5	14.4	14.4			
					P	15	35		Ba	56	82		56.33	44.93	47.9	47.9	14.4	14.4			
					Ca	20	48		Sb	51	74		75.59	54.61	48.8	48.8	15.3	15.3			
71	Lu	174	8.02		He	2	4		Im	69	101		1.80	1.76	40.1	52.2	9.7	12.1	E	212	1
					Ca	20	48		Sb	51	75		75.04	54.34	49.8	52.2	9.7	12.1			
71	Lu	175	UNMA		He	2	4		Im	69	102		1.62	1.58	42.3	48.3	6.0	6.0	E	209	1
					Ca	20	48		Sb	51	76		75.75	54.97	48.3	48.3	6.0	6.0			
71	Lu	176	18.06		He	2	4		Im	69	103		1.56	1.53	47.6	51.2	1.2	3.7	E	209	1
					Ca	20	48		Sb	51	77		75.42	54.85	48.8	51.2	1.2	3.7			
71	Lu	177	5.76		He	2	4		Im	69	104		1.45	1.41	47.9	46.8	-1.1	-1.1	E	209	1
					Ca	20	48		Sb	51	78		76.45	55.72	46.8	46.8	-1.1	-1.1			

Parent			Emitted			Daughter			T <sub>1/2</sub>												
Z	El	A	log(Tt)	C	El	Ze	Ae	Ce	El	Zd	Nd	Cd	Q	EK	log(T)	log(T')	log(T)	log(T')	CA	nQ	nT
			Tt(s)										(MeV)	(s)	(s)	(s)	TA	TA			
71	Lu	178	3.23		He	2	4		Im	69	105		1.10	1.07	68.0	49.5	-20.9	-18.5	E	209	2
					Ca	20	49		Sb	51	79		76.24	55.68	47.0	51.2	-19.3	-16.8			
					Ca	20	49		Sb	51	78		75.59	54.78	48.7	48.7					
71	Lu	179	4.22		He	2	4		Im	69	106		0.74	0.73	87.3	45.3	-42.0	-42.0	E	206	4
					Ca	20	48		Tm	69	106		77.11	56.43	45.3	45.3	-38.0	-38.0			
					K	19	47		Te	52	80		71.78	52.94	49.3	49.3	-37.4	-37.4			
					Sc	21	59		Sn	50	90		75.07	56.37	49.9	49.9					
					Ca	20	50		Sb	51	78		75.07	54.10	50.0	50.0					
71	Lu	180	2.53		He	2	4		Im	69	107	0	0.49	0.47	131.4	47.4	-86.5	-84.5	E	207	6
					Ca	20	49		Sb	51	80		77.26	56.65	44.9	49.0	-84.9	-82.5			
					Ca	20	48		Sb	51	81		76.62	55.76	46.5	49.0	-82.6	-80.2			
					K	19	47		Te	52	81		72.00	53.20	48.8	51.7	-82.2	-79.8			
					Ca	20	47		Te	52	82		74.69	55.19	49.2	52.0	-82.0	-79.4			
					Sc	21	50		Sn	50	90		78.04	56.36	49.4	52.0	-81.9	-79.5			
					Ca	20	50		Sb	51	79		75.24	54.34	49.5	52.0					
72	Hf	154	0.30	0	He	2	4		Yb	70	80	10	1.37	1.33	0.3	27.0	28.0	26.7	E	206	81
					Ni	28	60		Ru	44	50		114.22	69.72	28.3	27.6	28.6	27.3			
					Ni	28	58		Ru	44	52		113.48	70.74	28.9	27.6	28.6	27.3			
					Fe	26	56		Pd	46	52		109.08	69.42	29.2	27.9	28.9	27.6			
					Fe	26	54		Pd	46	54		108.64	70.54	29.4	28.1	29.1	27.8			
					Cr	24	52		Cd	48	54	0	102.29	67.75	31.2	29.9	30.9	29.6			
					Ni	28	59		Ru	44	51		111.78	68.96	31.3	30.0	31.0	29.7			
					Fe	26	55		Ru	44	53		101.41	68.49	31.9	30.5	31.6	30.3			
					Fe	26	55		Pd	46	53		106.85	68.69	32.0	30.7	31.7	30.4			
72	Hf	155	-0.05	0	He	2	4		Yb	70	81	10	2.84	2.77	-0.0	29.8	29.1	29.8	E	209	



Parent		Emitted				Daughter				T <sub>1/2</sub>													
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zr	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T)	log(T')	log(T)	log(T')	CA	nQ	nT		
			Tt(s)										(MeV)	(MeV)	T(s)	T(s)	T(s)	T(s)	TA	TA	CA	nQ	nT
72	Hf	159	0.75	0	He	2	4		Yb	70	85	0	5.22	5.09	0.7	22.3	21.3	21.3			M	213	118
					C	6	12		Dy	66	81	0	21.48	19.86	22.2	22.7	22.7	22.7					
					Be	4	8		Er	68	83	0	10.47	9.34	23.5	23.9	23.9	23.9					
					O	8	16		Rd	84	99	0	10.47	9.34	23.5	23.9	23.9	23.9					
					Ni	28	56		Ru	44	57	0	109.77	66.96	33.8	34.5	33.0	33.0					
					Ni	28	57		Pd	46	57	0	104.97	68.00	34.0	34.7	33.2	33.9					
					Ni	28	61		Ru	44	54	0	109.35	67.40	34.2	34.9	33.4	34.1					
					Fe	26	57		Pd	46	56	0	104.99	67.35	34.2	34.9	33.4	34.1					
					Ni	28	60		Ru	44	55	0	109.00	67.87	34.5	35.2	33.7	34.4					
72	Hf	160	1.08		He	2	4		Yb	70	86	0	4.90	4.77	2.7	20.4	18.7	17.7			M	214	102
					C	6	12		Dy	66	82	0	21.48	20.56	27.4	26.8	26.8	26.8					
					O	8	16		Er	68	80	0	31.25	29.56	27.4	27.2	27.2	27.2					
					Be	4	8		Ru	44	54	0	9.65	9.10	27.6	27.2	27.2	27.2					
					Fe	26	56		Pd	46	58	0	108.91	66.71	34.8	33.4	32.1	30.7					
					Cr	24	52		Cd	48	60	0	103.94	67.56	35.3	34.0	32.6	31.3					
					Fe	26	58		Pd	46	56	0	107.88	66.34	36.1	34.2	32.7	31.4					
					Ni	28	60		Ru	44	56	0	103.99	66.30	35.7	34.3	32.0	32.7					
					Fe	26	57		Pd	46	58	0	107.63	67.27	36.2	34.9	33.5	32.1					
72	Hf	161	1.23	0	He	2	4		Yb	70	87	0	4.71	4.60	4.1	22.4	18.0	18.2			E	215	118
					C	6	12		Dy	66	81	0	21.41	19.81	22.1	22.4	22.4	22.4					
					O	8	16		Er	68	83	0	31.21	28.11	26.0	26.2	26.2	26.2					
					Be	4	8		Ru	44	54	0	9.25	8.79	29.5	29.7	29.7	29.7					
					Fe	26	56		Pd	46	58	0	18.37	16.89	33.3	33.5	33.5	33.5					
					Cr	24	52		Cd	48	60	0	26.76	24.27	35.6	35.8	35.8	35.8					
					Fe	26	58		Pd	46	56	0	107.88	66.34	36.1	36.8	32.0	32.7					
					Cr	24	53		Cd	48	60	0	98.06	65.78	36.3	37.0	32.7	32.7					
					Fe	26	57		Pd	46	58	0	103.09	66.60	36.6	37.3	32.4	33.1					
72	Hf	162	1.58		He	2	4		Yb	70	88	0	4.42	4.31	5.9	24.4	19.0	18.5			E	215	95
					C	6	12		Dy	66	84	0	31.66	28.53	24.9	25.2	25.2	25.2					
					O	8	16		Er	68	86	0	20.15	18.65	25.7	25.2	25.2	25.2					
					Be	4	8		Ru	44	54	0	8.50	8.08	33.8	33.4	33.4	33.4					
					Fe	26	56		Pd	46	58	0	57.18	47.30	37.4	36.5	31.5	30.6					
					Ni	28	62		Ru	44	56	0	106.78	65.92	37.5	36.1	31.6	30.2					
					Fe	26	58		Pd	46	58	0	102.37	65.72	37.8	37.1	31.9	30.2					
					Ne	10	20		Sm	62	70	0	59.83	47.01	38.0	37.1	31.9	30.2					
					Si	14	28		Ce	58	77	0	56.76	47.01	38.0	38.4	30.1	30.5					
					Si	14	30		Ce	58	79	0	57.61	47.01	38.0	38.4	30.1	30.5					
72	Hf	163	1.64	0	He	2	4		Yb	70	89	0	4.12	4.01	7.9	26.9	18.7	19.0			E	216	107
					C	6	12		Dy	66	84	0	30.85	27.82	26.6	26.9	26.9	26.9					
					O	8	16		Er	68	86	0	19.51	18.08	27.5	27.8	27.8	27.8					
					Be	4	8		Ru	44	54	0	27.52	24.65	36.4	36.7	36.7	36.7					
					Fe	26	56		Pd	46	58	0	8.03	7.63	36.9	37.1	37.1	37.1					
					Ne	10	20		Sm	62	70	0	37.19	32.62	37.7	38.1	38.1	38.1					
					Si	14	28		Ce	58	76	0	57.61	47.01	38.0	38.4	30.1	30.5					
					Si	14	30		Ce	58	77	0	56.76	47.01	38.0	38.4	30.1	30.5					
72	Hf	164	2.06	0	He	2	4		Yb	70	90	0	3.84	3.75	9.8	29.9	20.6	20.0			E	216	75
					C	6	12		Dy	66	86	0	29.22	26.37	30.4	29.9	29.9	29.9					
					O	8	16		Er	68	88	0	18.34	17.00	31.3	30.9	30.9	30.9					
					Ne	10	20		Sm	62	70	0	37.23	32.69	36.7	36.2	36.2	36.2					
					Mg	12	24		Ce	58	76	0	17.23	15.89	38.5	37.6	28.2	26.3					
					Si	14	28		Nd	60	78	0	56.20	46.61	39.0	38.1	29.1	28.3					
					Si	14	30		Ce	58	79	0	55.75	46.29	39.1	38.7	29.2	27.9					
					Cr	24	54		Cd	48	62	0	95.49	64.05	40.0	38.8	30.2	28.9					

Parent		Emitted				Daughter				T <sub>1/2</sub>													
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zr	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T)	log(T')	log(T)	log(T')	CA	nQ	nT		
			Tt(s)										(MeV)	(MeV)	T(s)	T(s)	T(s)	T(s)	TA	TA	CA	nQ	nT
72	Hf	165	1.88	0	He	2	4		Yb	70	91	0	3.73	3.64	10.8	33.2	22.1	22.4			E	216	92
					C	6	12		Dy	66	87	0	28.22	25.48	32.9	34.5	23.4	23.7					
					Si	14	30		Ce	58	77	0	17.50	16.22	34.2	38.5	27.2	27.7					
					Mg	12	24		Ce	58	78	0	57.44	47.00	38.1	39.0	27.8	28.2					
					Ne	10	20		Nd	60	81	0	46.50	39.73	38.6	39.1	27.9	28.3					
					Ne	10	20		Sm	62	83	0	36.06	31.69	39.4	39.7	28.6	28.9					
					Si	14	28		Ce	58	79	0	59.81	46.29	39.5	40.1	28.6	29.3					
					Si	14	28		Ce	58	79	0	55.75	46.29	39.1	40.1	28.9	29.3					
72	Hf	166	2.61	0	He	2	4		Yb	70	92	0	3.53	3.45	12.4	40.1	28.9	29.3			E	215	59
					C	6	12		Dy	66	88	0	26.71	24.14	37.0	36.4	24.6	24.0					
					O	8	16		Er	68	90	0	16.60	15.40	37.6	37.1	25.2	24.8					



Parent Z EI A	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	Emitted				Daughter				Q (MeV)	EK (MeV)	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	log-- TA	log-- TA	CA	nq	nT
		Z	EI	A	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	EI	Zd	Nd	Cd									
72 Hf 171	4.64	0	He 2 4	Yb 70 97	2.73	2.67	41.6	42.2	20.1	20.5	E 215	20						
			Si 14 31	Ce 58 82	55.60	45.21	42.4		20.8	21.2								
			Si 14 32	Ce 58 81	55.61	45.21	42.4		20.6	21.2								
			Si 14 33	Ce 58 83	54.44	44.89	43.3	43.7	21.6	22.1								
			S 16 36	Ba 56 79	63.10	49.81	45.0	45.5	23.4	23.9								
			S 16 34	Ba 56 81	62.23	49.86	45.4	45.9	23.8	24.2								
			S 16 35	Ba 56 80	62.31	49.56	45.9	46.4	24.3	24.8								
			Ti 22 50	Sn 50 71	85.19	60.28	46.2	46.8	24.6	25.2								
			Ti 22 51	Sn 50 70	85.39	59.52	46.2	46.9	24.6	25.2								
72 Hf 172	7.77		He 2 4	Yb 70 98	2.76	2.70	20.6	41.1	21.4	20.5	E 215	10						
			Si 14 32	Ce 58 82	55.78	45.40	42.0	43.8	24.2	23.2								
			S 16 36	Ba 56 80	63.18	49.96	44.8	43.8	24.2	23.2								
			S 16 34	Ba 56 82	61.82	49.60	46.1	45.1	25.5	24.5								
			Ti 22 50	Sn 50 72	84.98	60.28	46.4	45.2	25.8	24.6								
			Si 14 33	Ce 58 82	53.37	43.19	47.6	48.1	24.8	25.2								
			Ca 20 48	Te 52 72	94.36	59.31	47.0	48.3	24.6	25.2								
			Ca 20 47	Te 52 71	94.36	59.31	47.0	48.3	24.6	25.2								
			Ti 22 51	Sn 50 73	81.96	56.85	47.3	46.5	26.0	25.0								
			Si 14 31	Ce 58 84	52.20	42.89	48.6	49.0	25.2	26.2								
72 Hf 173	4.93	0	He 2 4	Yb 70 99	2.66	2.60	22.9	45.3	21.9	22.4	E 215	11						
			Si 14 32	Ce 58 81	63.11	49.98	44.8	45.3	22.2	22.6								
			S 16 35	Ba 56 83	54.24	44.20	45.0	45.5	22.2	22.6								
			Si 14 33	Ce 58 82	61.83	49.32	46.6	47.1	23.8	24.2								
			Ca 20 47	Te 52 76	83.51	59.19	48.4	48.1	23.1	23.8								
			Ca 20 46	Te 52 75	83.51	59.19	48.4	48.1	23.1	23.8								
72 Hf 175	6.78		He 2 4	Yb 70 101	2.40	2.35	27.0	48.2	20.5	21.1	E 213	5						
			S 16 36	Ba 56 83	61.11	48.54	48.5	49.0	21.5	22.0								
			Ti 22 51	Sn 50 74	83.48	59.15	49.0	49.7	22.0	22.7								
			Ca 20 47	Te 52 76	76.85	56.21	49.2	49.8	22.2	22.6								
			Ca 20 46	Te 52 75	76.85	56.21	49.2	49.8	22.2	22.6								
72 Hf 176	UNKN		He 2 4	Yb 70 102	2.26	2.21	28.2	50.4	22.8	23.4	E 242	3						
			Ti 22 50	Sn 50 76	82.87	59.32	49.6	48.4	21.4	20.1								
			Ti 22 52	Sn 50 74	83.12	58.56	49.9	48.7	21.7	20.4								
72 Hf 177	UNKN		He 2 4	Yb 70 103	2.24	2.19	30.2	47.3	16.6	17.2	E 213	4						
			Ca 20 48	Te 52 77	76.33	57.09	46.9	49.5	16.7	19.2								
			Ca 20 47	Te 52 76	76.33	57.09	46.9	49.5	16.7	19.2								
			Ti 22 51	Sn 50 76	82.85	58.98	49.9	50.5	19.7	20.4								
72 Hf 178	UNKN		He 2 4	Yb 70 104	2.08	2.03	31.6	44.0	13.6	12.4	E 209	2						
			Ti 22 52	Sn 50 76	79.12	57.78	45.2	44.0	13.6	12.4								

Parent Z EI A	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	Emitted				Daughter				Q (MeV)	EK (MeV)	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	log-- TA	log-- TA	CA	nq	nT
		Z	EI	A	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	EI	Zd	Nd	Cd									
72 Hf 179	UNKN		He 2 4	Yb 70 105	1.80	1.76	40.1	46.0	5.3	5.9	E 211	3						
			Ca 20 49	Te 52 78	78.11	56.79	42.2	45.0	7.1	6.7								
			Ca 20 47	Te 52 80	77.08	56.84	48.3	48.9	8.2	8.8								
72 Hf 180	UNMA		He 2 4	Yb 70 106	1.28	1.26	54.3	42.8	-10.3	-11.5	E 208	4						
			Ca 20 48	Te 52 80	79.64	58.40	44.0	48.2	-4.9	-6.1								
			Ti 22 52	Sn 50 78	77.13	55.70	49.4	48.4	-4.6	-5.9								
			Ca 20 49	Te 52 79	82.98	59.01	49.7	48.4	-4.5	-5.7								
72 Hf 181	6.56		He 2 4	Yb 70 107	1.15	1.13	64.0	44.2	-20.3	-19.7	E 208	4						
			Ca 20 48	Te 52 81	79.79	58.63	43.6	45.9	-18.7	-18.7								
			Ca 20 49	Te 52 80	79.09	57.68	45.3	45.9	-16.3	-15.7								
			Ca 20 50	Te 52 82	77.34	57.25	47.6	48.2	-15.1	-14.5								
72 Hf 182	14.45		He 2 4	Yb 70 108	1.22	1.19	57.3	41.0	-15.2	-16.4	E 207	7						
			Ca 20 48	Te 52 86	80.26	59.32	42.2	45.0	-11.1	-12.3								
			Ca 20 50	Te 52 81	78.22	57.16	46.7	45.0	-0.6	-1.6								
			Ti 22 52	Sn 50 80	83.59	59.71	48.3	47.1	-8.3	-9.5								
			Ar 19 47	Xe 54 82	70.09	52.37	49.0	47.9	-8.3	-9.5								
			K 19 47	I 53 82	73.45	54.48	49.1	47.9	-8.2	-9.4								
			Sc 21 47	Sb 51 82	79.53	58.12	49.6	48.4	-7.7	-9.0								
73 Ta 157	-2.28	0	He 2 4	Lu 71 82	6.38	6.21	-2.3	21.1	19.5	20.4	E 215	133						
			Ni 28 57	Rh 45 82	117.97	72.29	27.5	27.5	29.8	29.8								
			Co 27 57	Pd 46 82	114.97	72.29	27.5	27.5	30.0	30.0								
			Fe 26 56	Ag 47 82	112.24	72.29	27.5	27.5	30.0	30.0								
			Mn 25 53	Ag 47 81	112.24	72.29	27.5	27.5	30.0	30.0								
			Ni 28 58	Rh 45 84	109.08	72.26	28.7	28.7	31.1	31.1								
			Fe 26 54	Rh 45 82	116.16	73.25	28.8	28.8	31.1	31.1								
			Co 27 59	Pd 46 82	111.45	73.12	29.0	29.0	31.2	31.2								
			Cr 24 53	Pd 46 82	113.94	71.12	29.4	29.4	31.7	31.7								
			Cr 24 52	Pd 46 81	105.42	70.51	29.9	29.9	32.2	32.2								
73 Ta 159	-0.24	0	He 2 4	Lu 71 84	0	5.74	5.60	0.1	20.4	20.4	E 214	114						
			Be 4 12	Tm 69 82	0	11.46	10.88	0.2	20.7	20.7								
			C 6 12	Ho 67 80	0	20.98	19.80	20.7	20.7	20.4								
			O 8 16	Tb 65 78	0	30.61	27.53	29.0	29.0	29.9								
			Fe 26 56	Ag 47 82	110.78	71.77	29.8	29.8	30.0	30.0								
			Ni 28 60	Rh 45 84	115.39	71.85	29.9	29.9	30.0	30.0								
			Co 27 57	Pd 46 82	112.64	72.26	30.4	30.4	30.5	30.5								
			Co 27 53	Pd 46 82	112.63	70.96	30.5	30.5	30.7	30.7								
			Mn 25 53	Cd 48 56	107.82	71.48	30.8	30.8	31.0	31.0								
73 Ta 160	0.48	0	He 2 4															







Parent		Emitted		Daughter		Q		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )							
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z <sub>e</sub>	Ae	Ce	EI	Z <sub>d</sub>	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nQ	nT	
			Tt(s)						(MeV)				(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	TA	TA	TA	
73	Ta	173	4.11	0	He	2	4			Lu	71	98	3.17	3.09	17.1	40.6	23.6	23.6	23.6	23.6	28
					P	15	33			Ce	58	82	61.94	40.12	40.6	40.7	40.7	23.6	23.6	23.6	
					Sc	14	34			Pr	59	82	51.62	46.96	40.7	40.7	40.7	23.6	23.6	23.6	
					S	16	34			La	57	80	64.90	51.71	43.2	43.4	43.4	26.3	26.3	26.3	
					Si	14	30			Pr	59	84	55.02	45.48	44.3	44.3	44.3	27.3	27.3	27.3	
					Ti	22	50			Sb	51	72	84.16	62.68	44.5	44.5	44.5	27.4	27.4	27.4	
					Sc	21	49			Te	52	72	84.59	60.63	45.3	45.3	45.3	28.2	28.2	28.2	
					Cl	17	37			Ba	56	80	68.18	53.60	45.4	45.4	45.4	28.3	28.3	28.3	
73	Ta	174	3.57	0	He	2	4			Lu	71	99	3.06	2.99	19.5	45.2	23.6	25.7	25.7	25.7	32
					P	16	36			La	57	81	65.34	48.63	43.2	43.2	43.2	25.7	25.7	25.7	
					Sc	21	49			Ce	58	82	56.03	45.72	43.7	43.7	43.7	26.1	26.1	26.1	
					Si	14	32			Pr	59	83	59.93	48.57	44.3	44.3	44.3	26.7	26.7	26.7	
					P	15	33			La	57	82	64.23	51.31	44.6	44.6	44.6	27.1	27.1	27.1	
					P	15	35			Co	58	81	80.71	58.57	46.1	46.1	46.1	26.2	26.2	26.2	
					Ti	22	50			Sb	51	73	67.55	53.27	46.3	46.3	46.3	26.4	26.4	26.4	
					Cl	17	37			Pr	59	84	54.67	44.67	46.4	46.4	46.4	26.6	26.6	26.6	
					P	15	33			Ce	58	84	58.39	47.38	47.3	47.3	47.3	27.4	27.4	27.4	
73	Ta	175	4.58	0	He	2	4			Lu	71	100	2.92	2.85	19.9	42.9	23.0	23.0	23.0	23.0	14
					P	16	36			La	57	82	60.54	48.93	44.4	44.4	44.4	24.5	24.5	24.5	
					Sc	21	49			Te	52	74	84.13	60.58	45.8	45.8	45.8	25.9	25.9	25.9	
					Ti	22	50			Sb	51	74	87.19	62.28	45.8	45.8	45.8	25.9	25.9	25.9	
					Ca	20	48			La	57	83	80.71	58.57	46.1	46.1	46.1	26.2	26.2	26.2	
					Cl	17	37			Ba	56	82	67.55	53.27	46.3	46.3	46.3	26.4	26.4	26.4	
					P	15	33			Ce	58	84	58.39	47.38	47.3	47.3	47.3	27.4	27.4	27.4	
73	Ta	176	4.46		He	2	4			Lu	71	101	2.84	2.77	22.6	48.9	23.7	26.2	26.2	26.2	20
					Ca	20	48			La	57	83	80.47	58.53	46.4	46.4	46.4	23.7	23.7	23.7	
					S	16	36			Te	52	76	83.61	60.61	46.1	46.1	46.1	24.5	24.5	24.5	
					Sc	21	49			Sb	51	76	86.40	61.99	46.9	46.9	46.9	25.8	25.8	25.8	
					Ti	22	50			Sb	51	75	86.35	61.82	47.1	47.1	47.1	24.5	24.5	24.5	
					P	15	35			Ce	58	83	86.50	61.44	47.2	47.2	47.2	27.2	27.2	27.2	
					Sc	21	50			Te	52	74	83.12	59.51	47.8	47.8	47.8	25.0	25.0	25.0	
					Ca	20	47			I	53	76	79.37	58.17	47.9	47.9	47.9	25.3	25.3	25.3	
73	Ta	177	5.31		He	2	4			Lu	71	102	2.73	2.67	22.4	45.3	22.9	22.9	22.9	22.9	11
					Ca	20	48			I	53	76	80.99	59.02	45.3	45.3	45.3	22.9	22.9	22.9	
					Sc	21	49			Te	52	77	83.81	60.17	47.3	47.3	47.3	23.6	23.6	23.6	
					Ti	22	50			Sb	51	76	86.40	61.99	46.9	46.9	46.9	24.5	24.5	24.5	
					Ca	20	46			Sb	51	74	78.86	58.36	48.2	48.2	48.2	26.0	26.0	26.0	
					V	23	53			Sn	50	74	85.99	60.73	48.4	48.4	48.4	26.8	26.8	26.8	
					S	16	36			La	57	84	88.35	61.99	49.2	49.2	49.2	26.8	26.8	26.8	
					Cl	17	39			Ba	56	82	61.33	49.33	49.2	49.2	49.2	27.1	27.1	27.1	
73	Ta	178	3.95		He	2	4			Lu	71	103	2.61	2.55	26.3	49.6	27.2	27.2	27.2	27.2	10
					Ca	20	48			I	53	77	80.57	58.85	45.9	45.9	45.9	23.1	23.1	23.1	
					Sc	21	49			Te	52	77	83.02	60.17	47.3	47.3	47.3	24.0	24.0	24.0	
					Ca	20	47			I	53	78	79.26	58.33	47.9	47.9	47.9	24.4	24.4	24.4	
					Ti	22	51			Sb	51	76	85.89	61.28	48.0	48.0	48.0	24.4	24.4	24.4	
					Sc	21	50			Sb	51	77	85.49	61.47	48.4	48.4	48.4	24.4	24.4	24.4	
					Ca	20	49			I	53	76	78.51	58.07	48.1	48.1	48.1	24.0	24.0	24.0	

Parent		Emitted		Daughter		Q		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )							
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z <sub>e</sub>	Ae	Ce	EI	Z <sub>d</sub>	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nQ	nT	
			Tt(s)						(MeV)				(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	TA	TA	TA	
73	Ta	179	7.76		He	2	4			Lu	71	104	2.38	2.33	27.6	44.5	16.9	16.9	16.9	16.9	6
					Ca	20	48			Ce	58	82	81.34	59.50	44.5	44.5	44.5	18.7	18.7	18.7	
					Sc	21	49			Te	52	78	83.54	60.67	46.3	46.3	46.3	20.2	20.2	20.2	
					Ti	22	50			Sb	51	78	85.69	61.75	47.9	47.9	47.9	20.7	20.7	20.7	
					Ca	20	46			Sb	51	80	78.68	58.46	48.3	48.3	48.3	20.8	20.8	20.8	
					Ti	22	52			Ar	18	42	85.80	60.88	48.5	48.5	48.5	20.8	20.8	20.8	
					Ar	18	42						70.61	54.05	49.4	49.4	49.4	21.8	21.8	21.8	
73	Ta	180	UNKN		He	2	4			Lu	71	105	2.03	1.98	37.6	47.5	7.4	7.4	7.4	7.4	10
					Sc	21	49			Te	52	79	82.82	59.28	47.5	47.5	47.5	9.9	9.9	9.9	
					Ca	20	49			I	53	80	79.31	58.60	47.5	47.5	47.5	12.4	12.4	12.4	
					Ca	20	47			I	53	80	79.31	58.60	47.5	47.5	47.5	9.9	9.9	9.9	
					Sc	21	50			Sb	51	78	82.95	59.91	47.6	47.6	47.6	10.0	10.0	10.0	
					Ca	20	46			Sb	51	78	85.42	61.22	48.6	48.6	48.6	11.0	11.0	11.0	
					Ca	20	46			I	53	81	78.17	58.19	49.1	49.1	49.1	11.5	11.5	11.5	
					Ti	22	50			Sb	51	79	84.85	61.28	49.2	49.2	49.2	11.6	11.6	11.6	
73	Ta	181	UNKN		He	2	4			Lu	71	106	1.52	1.49	47.6	43.6	-3.9	-3.9	-3.9	-3.9	9
					Ca	20	48			Te	52	80	81.26	60.02	43.4	43.4	43.4	-1.2	-1.2	-1.2	



Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		log(T)		log(T')									
Z	EI	A	log(Tt)	C	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T)	T(s)	log(T')	T'(s)	log(T)	T(s)	log(T')	T'(s)	CA	nT	
74	W	162	0.14	0	He	2	4		Hf	72	86	0	5.67	5.53	0.3	17.9	18.0	17.6					M	214	117
					Er	66	82	0	Er	66	82	0	23.82	22.06	18.3			22.8	22.4						
					Ba	4	8	0	Yb	70	84	0	10.98	10.44	23.1			23.7	23.2						
					Fe	26	56	0	Cd	48	58	0	113.54	30.10	24.0			29.1	27.7						
					Ni	28	60	0	Pd	46	56	0	118.17	74.40	29.6			29.3	28.0						
					Cr	24	52	0	Sn	50	60	0	107.04	72.68	30.4			30.1	28.8						
					Mi	28	62	0	Pd	46	54	0	117.75	72.69	30.5			30.2	28.8						
					Fe	26	54	0	Cd	48	54	0	111.31	74.21	31.9			30.5	30.2						
74	W	163	0.40	0	Hg	2	4		Hf	72	87	0	5.51	5.38	0.7	19.6	18.7	18.9					M	216	130
					Er	68	83	0	Er	68	83	0	23.35	21.63	19.4			22.6	21.9						
					O	8	16	0	Yb	66	81	0	34.16	30.80	22.4			24.7	23.8	24.0					
					Be	4	8	0	Yb	70	85	0	10.65	10.13	24.5			24.7	23.8	24.0					
					Fe	26	56	0	Cd	48	56	0	112.44	73.81	30.6			30.5	29.5	29.8					
					Cr	24	52	0	Sn	50	62	0	105.71	72.19	31.8			30.6	29.5	28.2					
					Ni	28	62	0	Pd	46	56	0	116.29	72.32	32.1			30.7	29.8	28.3					
					Si	14	28	0	Nd	60	76	0	122.50	72.72	33.0			31.9	30.9	28.3					
					Ni	28	60	0	Pd	46	58	0	115.51	73.25	32.8			31.9	30.3	29.0					
74	W	164	0.81	0	Hf	72	88	0	Hf	72	88	0	5.27	5.15	2.4	21.4	19.5	19.0					M	214	125
					Er	66	82	0	Er	66	82	0	34.36	31.01	21.9			21.6	19.7	19.2					
					O	6	12	0	Dy	68	84	0	22.26	20.63	22.1			21.6	19.7	19.2					
					Be	4	8	0	Yb	70	86	0	10.08	9.59	27.2			26.8	24.8	24.4					
					Fe	26	56	0	Cd	48	60	0	111.50	73.43	31.7			30.4	29.3	28.0					
					Cr	24	52	0	Sn	50	62	0	105.71	72.19	31.8			30.6	29.5	28.2					
					Ni	28	62	0	Pd	46	56	0	116.29	72.32	32.1			30.7	29.8	28.3					
					Si	14	28	0	Nd	60	76	0	122.50	72.72	33.0			31.9	30.9	28.3					
					Ni	28	60	0	Pd	46	58	0	115.51	73.25	32.8			31.9	30.3	29.0					
74	W	165	0.71	0	He	2	4		Hf	72	89	0	5.04	4.91	2.5	23.6	20.8	21.1					M	216	135
					O	6	12	0	Dy	66	83	0	33.61	30.35	23.3			23.6	20.8	21.1					
					C	6	12	0	Er	68	85	0	21.65	20.08	23.6			23.9	21.1	21.3					
					Be	4	8	0	Yb	70	87	0	9.66	9.19	29.3			29.5	26.8	27.0					
					Ne	10	20	0	Gd	64	81	0	40.98	36.01	32.0			32.4	29.5	29.8					
					Cr	24	53	0	Sn	50	62	0	104.52	71.22	33.0			33.7	30.5	31.2					
					Cr	24	52	0	Sn	40	63	0	61.07	71.47	33.8			32.5	29.0	28.1					
					Se	34	74	0	Nd	60	74	0	104.42	72.72	33.0			34.0	30.7	29.4					
					Si	14	28	0	Nd	60	77	0	61.87	51.37	33.3			33.8	30.8	31.2					
74	W	166	1.20	0	He	2	4		Hf	72	90	0	4.85	4.74	4.4	25.8	21.8	21.3					E	216	116
					O	6	12	0	Er	68	86	0	20.72	19.23	26.2			25.8	21.8	21.3					
					C	6	12	0	Dy	66	84	0	32.16	29.06	26.3			25.8	21.9	21.4					
					Ne	10	20	0	Gd	64	82	0	41.25	36.28	31.4			30.8	27.0	26.3					
					Be	4	8	0	Yb	70	88	0	9.18	8.74	31.9			31.5	27.5	27.1					
					Si	14	28	0	Nd	60	78	0	61.07	71.47	33.8			32.5	29.0	28.1					
					Cr	24	52	0	Sn	40	64	0	51.02	43.64	33.8			33.1	29.4	28.6					
					Mg	12	24	0	Sm	62	80	0	109.51	71.25	34.6			33.2	30.1	28.8					
					Cr	24	52	0	Sn	50	65	0	103.08	70.98	35.0			35.7	29.1	29.8					
74	W	167	1.30	0	He	2	4		Hf	72	91	0	4.59	4.48	5.9	28.6	22.4	22.7					E	216	129
					O	6	12	0	Dy	66	85	0	31.27	28.27	28.3			28.6	22.4	22.7					
					C	6	12	0	Er	68	87	0	19.99	18.55	28.4			28.6	22.4	22.7					
					Ne	10	20	0	Gd	64	83	0	40.18	35.37	33.5			33.9	27.9	28.0					
					Mg	12	24	0	Sm	62	82	0	21.09	40.72	34.2			34.9	26.3	26.7					
					Si	14	28	0	Nd	60	79	0	61.16	50.91	34.3			34.7	28.4	28.8					
					Cr	24	53	0	Sn	50	64	0	103.47	70.63	34.7			35.4	28.8	29.5					
					Cr	24	52	0	Sn	50	65	0	103.08	70.98	35.0			35.7	29.1	29.8					



Parent		Emitted		Daughter				EK		log(T')		log--		CA		nT				
Z	EI	A	log(Tt) C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	T'(s)	T'(s)	TA	TA	CA	nQ	nT
74	W	174	3.24	0	Hf	72	98	0	Hf	72	98	3.55	3.47	13.5	37.7	25.1	24.2	E	215	43
					Si	14	32		Nd	60	82	59.89	48.87	38.6	39.0	26.5	25.5			
					Si	16	34		Ce	58	82	67.87	54.61	40.0	39.8	27.1	26.3			
					Si	14	30		Nd	60	84	58.04	48.03	40.7	39.8	27.3	26.3			
					S	16	36		Ce	58	80	68.09	54.00	40.8	41.3	28.2	27.7			
					I	6	12		Er	68	94	16.20	15.08	41.8	40.6	28.4	27.1			
					Ti	22	50		Te	52	72	91.80	65.52	41.9	40.6	28.4	27.1			
					Cr	24	54		Sn	50	74	67.96	58.01	43.3	44.3	28.2	28.7			
					Cr	24	54		Sn	50	74	62.21	50.42	42.3	41.0	29.0	28.0			
74	W	175	3.31	0	He	2	4	0	Hf	72	99	3.42	3.35	15.4	41.3	25.3	25.9	E	216	51
					Si	14	32		Ce	58	81	68.05	54.05	40.8	41.3	25.3	25.9			
					Si	14	32		Nd	60	83	58.50	47.80	41.2	41.6	26.0	26.2			
					S	16	35		Ce	58	82	67.34	53.88	41.4	41.9	26.0	26.5			
					Si	14	31		Nd	60	84	57.12	47.00	43.1	43.6	27.7	28.1			
					Ti	22	50		Te	52	72	94.76	69.10	43.3	44.3	28.2	28.7			
					Cr	24	54		Sn	50	74	64.76	54.24	44.0	44.6	28.5	29.1			
					Cr	24	54		Sn	50	74	56.28	46.64	44.0	44.4	28.5	29.0			
74	W	176	3.95	0	He	2	4	0	Hf	72	100	3.28	3.21	16.1	39.6	24.5	23.5	E	215	31
					Si	14	32		Ce	58	82	68.07	54.15	40.6	39.6	24.5	23.5			
					Ti	22	50		Te	52	74	90.81	65.01	43.2	42.0	27.1	25.9			
					Ca	20	48		Te	52	74	37.16	46.76	43.7	42.6	27.6	27.2			
					Ca	20	48		Te	52	74	83.18	60.62	44.8	45.3	28.5	27.2			
					Ca	20	46		Xe	54	76	82.34	60.82	45.5	44.4	29.4	28.2			
					Ca	20	46		Xe	54	76	15.27	14.23	45.8	45.3	29.7	28.2			
					Cr	24	56		Sn	50	76	95.71	65.26	46.1	44.7	29.9	28.6			
74	W	177	3.91	0	He	2	4	0	Hf	72	101	3.13	3.06	18.7	44.1	24.9	25.4	E	216	32
					Si	16	36		Ce	58	83	66.88	52.88	43.6	44.1	24.9	25.4			
					Ti	22	50		Te	52	74	92.33	68.11	44.7	45.3	26.3	25.1			
					Ca	20	48		Xe	54	75	81.98	60.79	45.9	44.7	26.3	25.1			
					Ca	20	47		Xe	54	75	83.18	60.62	44.8	45.4	26.1	26.7			
					Ca	20	47		Xe	54	76	82.49	60.59	45.6	46.2	26.9	27.5			
					Cr	24	55		Sn	50	75	95.32	65.70	46.3	46.9	27.5	28.2			
					Cr	24	56		Xe	54	77	81.83	60.57	46.3	46.9	27.6	28.2			
					S	16	37		Xe	54	78	65.25	51.61	46.3	46.9	27.6	28.1			
74	W	178	6.28		He	2	4		Hf	72	102	2.97	2.91	19.6	42.7	24.3	23.1	E	215	16
					Ti	22	50		Te	52	76	83.25	61.09	43.9	42.7	24.3	23.1			
					Ca	20	48		Te	52	76	89.97	64.70	44.3	43.1	24.7	23.5			
					Ca	20	46		Xe	54	78	81.98	60.79	45.9	44.7	26.3	25.1			
					Ti	22	52		Te	52	74	89.08	63.06	46.5	45.2	27.0	25.7			
					S	16	36		Ce	58	84	64.76	51.66	46.6	45.4	27.0	26.0			
					Cr	24	54		Sn	50	74	94.72	65.98	46.8	45.4	27.2	25.9			
					Cr	24	56		Sn	50	76	72.86	56.49	47.3	46.2	27.7	26.6			
					Cr	24	56		Sn	50	76	94.79	64.37	47.3	46.0	27.7	26.4			
74	W	179	3.36		He	2	4		Hf	72	103	2.75	2.69	23.8	44.9	20.5	22.2	E	216	19
					Ti	22	51		Te	52	77	83.33	60.99	44.3	44.9	20.5	22.2			
					Ca	20	48		Te	52	76	89.41	63.94	45.5	46.1	21.7	21.2			
					Ca	20	47		Te	52	77	89.13	64.23	45.6	46.2	21.8	22.5			
					Ca	20	47		Xe	54	78	82.33	60.71	45.6	46.2	21.9	22.5			
					Ca	20	46		Xe	54	79	81.50	60.59	46.6	47.2	22.9	23.5			
					Ca	20	49		Xe	54	76	81.86	59.46	47.3	48.1	23.7	24.1			
					Ti	22	52		Te	52	78	88.48	64.67	48.1	48.3	24.1	24.4			
					Cr	24	55		Sn	50	74	94.03	65.14	48.1	48.8	24.3	25.0			
74	W	181	7.02		He	2	4		Hf	72	105	2.21	2.16	33.1	44.2	12.5	11.1	E	215	10
					Ca	20	48		Xe	54	79	83.62	61.45	45.6	46.2	12.5	11.1			
					Ca	20	47		Xe	54	80	82.21	60.86	46.2	46.8	13.1	13.1			
					Ca	20	49		Te	52	78	88.82	63.79	46.2	46.9	13.1	13.8			
					Ti	22	51		Te	52	78	81.39	60.70	46.6	47.2	13.5	14.1			
					Ca	20	46		Xe	54	81	88.37	63.96	46.6	47.2	13.5	14.2			
					Ti	22	50		Te	52	79	88.21	62.87	47.9	48.3	14.6	15.2			
					Cr	24	54		Sn	50	76	93.30	65.31	48.8	47.5	22.9	21.6			
74	W	182	UNKN		He	2	4		Hf	72	106	1.77	1.73	40.7	41.4	1.9	0.7	E	213	10
					Ca	20	48		Xe	54	80	84.09	61.91	42.6	41.4	1.9	0.7			
					Ca	20	47		Xe	54	80	88.39	64.11	46.4	45.1	5.7	4.4			
					Ca	20	49		Xe	54	82	81.32	60.77	46.5	45.3	5.9	4.7			
					Ti	22	52		Te	52	78	88.56	63.26	46.9	45.6	6.2	4.9			
					Cr	24	54		Sn	50	76	84.21	61.54	48.2	46.9	7.2	6.2			
					Ca	20	47		Xe	54	81	80.70	58.08	49.0	47.7	8.3	7.0			
					Ca	20	50		Xe	54	78	80.61	58.47	49.6	48.3	8.9	7.6			
74	W	183	UNKN		He	2	4		Hf	72	107	1.68	1.64	46.3	42.7	-4.2	-3.6	E	213	10
					Ca	20	48		Xe	54	81	84.35	62.23	42.0	42.7	-1.6	-0.9			
					Ca	20	49		Xe	54	80	83.05	60.81	44.7	45.3	-1.3	-0.7			
					Ca	20	47		Xe	54	82	82.40	61.24	45.0	45.6	0.1	0.3			
					Ti	22	51		Te	52	80	88.57	63.89	46.4	47.9	0.9	1.0			
					Ti	22	50		Te	52	79	88.35	63.21	47.2	47.9	0.9	1.6			
					Cr	24	55		Sn	50	76	84.15	61.62</							







Parent		Emitted		Daughter		Parent		Emitted		Daughter							
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zd	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	T <sub>1/2</sub>	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nt
75	Re	175	2.44	0	He	2	4										
					Si	14	33										
					S	16	34										
					Cl	17	37										
					Ar	18	42										
					K	19	45										
					Ca	20	46										
					Sc	21	50										
					Ti	22	52										
					V	23	53										
					Cr	24	54										
					Mn	25	55										
					Fe	26	56										
					Co	27	59										
					Ni	28	60										
					Cu	29	63										
					Zn	30	65										
					Ga	31	69										
					Ge	32	72										
					As	33	75										
					Se	34	78										
					Br	35	80										
					Kr	36	84										
					Rb	37	85										
					Sr	38	88										
					Y	39	89										
					Zr	40	91										
					Nb	41	93										
					Mo	42	96										
					Tc	43	98										
					Ru	44	101										
					Rh	45	103										
					Pd	46	106										
					Ag	47	108										
					Cd	48	112										
					In	49	115										
					Sn	50	119										
					Sb	51	123										
					Te	52	128										
					I	53	131										
					Xe	54	136										
					Ba	56	137										
					La	57	139										
					Ce	58	142										
					Pr	59	144										
					Nd	60	147										
					Pm	61	147										
					Sm	62	150										
					Eu	63	151										
					Gd	64	157										
					Tb	65	159										
					Dy	66	163										
					Ho	67	165										
					Er	68	167										
					Tm	69	169										
					Yb	70	173										
					Lu	71	175										
					Hf	72	178										
					Ta	73	182										
					W	74	186										
					Re	75	187										
					Os	76	190										
					Ir	77	192										
					Pt	78	196										
					Au	79	197										
					Hg	80	200										
					Tl	81	204										
					Pb	82	208										
					Bi	83	214										
					Po	84	214										
					At	85	218										
					Rn	86	222										
					Fr	87	223										
					Ra	88	226										
					Ac	89	227										
					Th	90	232										
					Pa	91	231										
					U	92	238										
					Np	93	237										
					Pu	94	244										
					Am	95	243										
					Cm	96	250										
					Bk	97	247										
					Cf	98	251										
					Es	99	252										
					Fm	100	257										



Parent		Emitted				Daughter				T									
Z	EI A	log(T <sub>1/2</sub> )	C	EI	Z <sub>e</sub>	Ae	Ce	EI	Z <sub>d</sub>	Nd	Cd	Q	EK	log(T)	log(T')	log--	CA	nQ	NT
		Tt(s)										(MeV)	(MeV)	Tt(s)	Tt(s)	TA	TA		
75	Re 187	18.20			Hg	2	4	Ta	73	110		1.65	1.61	46.0	43.9	-2.1			
					Tl	22	52	I	53	82		92.05	66.46	43.9	44.5	-1.6			E 213 14
					Sc	21	51	Xe	54	82		86.43	64.31	44.5	44.5	-1.4			
					Ca	20	48	Cs	55	82		84.91	62.21	44.6	44.6	-0.1			
					Ca	20	48	Cs	55	84		83.71	62.22	45.9	45.9	-0.1			
					V	23	53	Te	52	82		93.03	66.67	47.4	47.4	1.3			
					Ca	20	49	Cs	55	83		82.97	61.23	47.6	47.6	1.6			
					Cr	24	56	Sb	51	80		96.09	67.31	47.8	47.8	1.7			
					Ti	22	54		53	80		90.12	64.09	47.9	47.9	1.6			
75	Re 188	4.79			Hg	2	4	Ta	73	111		1.39	1.36	61.7	47.6	-16.9	-14.2		
					Tl	22	53	I	53	82		91.62	65.79	44.8	49.1	-15.3	-12.7		
					Sc	21	52	Xe	54	82		87.45	63.26	46.4	49.1	-14.7	-12.1		
					Ca	20	50	Cs	55	83		83.45	61.25	47.0	49.7	-14.7	-12.1		
					Cr	24	58	Sb	51	80		93.27	66.48	47.2	50.0	-14.6	-11.8		
					Ti	22	54		53	83		89.95	65.07	47.3	50.0	-14.5	-11.7		
					V	23	52		53	81		90.37	64.42	47.3	50.0	-14.5	-11.7		
					Ca	20	51	Cs	55	82		83.98	60.93	47.3	50.0	-14.4	-11.7		
					Ca	20	49	Cs	55	84		82.98	61.93	47.5	50.0	-14.3	-11.7		
75	Re 189	4.94			Hg	2	4	Ta	73	112		0.99	0.97	75.0	45.6	-29.3	-29.3		
					Tl	23	55	I	53	82		91.26	65.18	45.6	45.6	-28.1	-28.1		
					Cr	24	57	Sb	51	82		93.57	66.34	46.9	46.9	-27.9	-27.9		
					Cr	24	56	Sb	51	81		96.24	66.86	47.7	48.1	-26.8	-26.8		
					V	23	56	0	52	82		92.98	65.58	48.1	49.0	-26.0	-26.0		
					Ti	22	54	0	53	83		89.40	63.99	48.1	51.5	-69.3	-66.5		
76	Os 166	-0.52	0		He	2	4	W	74	88	0	6.14	5.99	-0.5	18.3	19.3	18.8		
					C	0	0	Yb	68	82	0	37.15	33.54	19.1	18.2	22.3	21.9		
					Be	4	8	Hf	72	86	0	11.72	11.75	21.7	21.4	22.3	21.9		
					Fe	26	56	Sn	50	60		120.79	80.04	26.6	25.2	27.1	25.7		
					Ni	28	60	Cd	48	58		125.96	80.43	26.7	25.3	27.2	25.8		
					Fe	26	54	Sn	50	62		119.26	80.47	28.1	26.7	28.6	27.2		
					Ni	28	62	Cd	48	56		125.08	78.36	28.1	26.7	28.7	27.2		
					Ne	10	20	Oy	66	80	0	44.27	38.93	28.9	28.2	29.4	28.7		
76	Os 167	-0.19	0		He	2	4	W	74	89	0	5.99	5.84	-0.2	20.0	20.0	20.2		
					C	0	0	Yb	68	83	0	34.50	31.00	20.2	20.5	20.4	20.7		
					Be	4	8	Hf	72	87	0	11.41	10.86	23.0	23.2	23.2	23.4		
					Fe	26	56	Sn	50	61		119.80	79.63	27.6	28.3	27.8	28.5		
					Ne	10	20	Oy	66	81		44.88	39.50	27.6	28.0	27.8	28.1		
					Fe	26	55	Sn	50	62		119.39	80.07	27.9	28.6	28.1	28.8		
					Ni	28	60	Cd	48	59		124.72	79.91	28.1	28.8	28.1	28.8		
					Ni	28	61	Cd	48	58		124.61	79.09	28.4	29.1	28.6	29.3		
76	Os 168	0.30			He	2	4	W	74	90		5.82	5.69	0.7	21.1	20.8	20.4		
					C	0	0	Yb	68	86		23.27	21.61	21.5	22.0	21.8	21.3		
					Be	4	8	Hf	72	88		11.01	10.48	24.7	24.3	24.0	23.6		

Parent		Emitted				Daughter				T									
Z	EI A	log(T <sub>1/2</sub> )	C	EI	Z <sub>e</sub>	Ae	Ce	EI	Z <sub>d</sub>	Nd	Cd	Q	EK	log(T)	log(T')	log--	CA	nQ	NT
		Tt(s)										(MeV)	(MeV)	Tt(s)	Tt(s)	TA	TA		
76	Os 169	0.48	0		He	2	4	W	74	91	0	5.71	5.58	0.5	23.1	22.4	22.6		
					C	0	0	Yb	68	87	0	22.74	21.13	22.8	24.2	23.4	23.7		
					Be	4	8	Hf	72	89	0	10.66	10.15	26.2	26.4	25.8	25.9		
					Mg	12	24	Cd	64	81	0	56.00	48.05	28.6	28.9	28.1	28.5		
					Fe	26	56	Sn	50	62		44.06	38.84	29.0	29.3	28.5	28.8		
					Fe	26	54	Sn	50	63		118.95	58.93	29.5	30.2	29.0	29.8		
					Si	14	28	Sm	62	73		116.57	58.61	30.4	29.0	28.5	27.1		
					Fe	26	57	Sn	50	62		117.95	58.17	29.9	30.6	29.4	30.1		
76	Os 170	0.60			He	2	4	W	74	92		5.54	5.41	2.0	24.1	22.6	22.1		
					C	0	0	Yb	68	88		22.09	20.53	24.5	24.1	24.2	24.2		
					Be	4	8	Hf	72	90		33.43	30.28	26.1	25.6	24.2	24.2		
					Mg	12	24	Cd	64	82		56.10	48.18	28.3	27.5	25.9	25.5		
					Fe	26	56	Sn	50	63		44.06	38.84	29.0	28.7	27.6	26.3		
					Si	14	28	Sm	62	74		116.57	58.61	30.4	29.0	28.5	27.1		
					Fe	26	56	Sn	50	62		117.95	58.17	29.9	30.6	29.4	29.9		
76	Os 171	0.91	0		He	2	4	W	74	93	0	5.38	5.25	2.7	26.7	23.8	24.1		
					C	0	0	Yb	68	89	0	21.36	19.86	26.5	26.7	26.3	26.6		
					Be	4	8	Hf	72	91	0	66.45	55.57	29.6	30.0	29.9	27.3		
					Mg	12	24	Cd	64	82	0	57.89	49.42	30.0	30.2	27.3	27.5		
					Fe	26	56	Sn	50	63		44.06	38.84	29.0	28.7	27.6	26.3		
					Si	14	29	Sm	62	75		116.57	58.61	30.4	29.0	28.5	27.1		
					Fe	26	56	Sn	50	62		117.95	58.17	29.9	30.6	29.4	29.9		
76	Os 172	1.28	0		He	2	4	W	74	94	0	5.22	5.10	3.8	32.5	29.1	29.1		
					C	0	0	Yb	68	90	0	20.80	19.35	28.1	27.6	24.3	23.8		
					Be	4	8	Hf	72	92	0	66.21	55.43	29.8	29.0	26.0	25.2		
					Si	14	30	Sm	62	76		116.57	58.61	30.4	29.8	26.6	26.0		
					Mg	12	26	Cd	64	82	0	55.05	46.73	31.5	30.7	27.7	26.9		
					Be	4	8	Hf	72	92	0	9.59	9.14	31.5	31.1	27.1	27.3		
					Fe	26	58	Sn	50	64		115.45	76.52	32.9	31.5	29.1	27.7		
					Fe	26	56	Sn	50	66		114.87	77.47	33.2	31.8	29.4	28.0		
76	Os 173	1.20	0		He	2	4	W	74	95	0	5.05	4.94	4.9	32.5	29.1	29.1		
					C	0													



Parent		Emitted				Daughter				T								
Z	EI A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	Q	EK (MeV)	log(T <sub>1/2</sub> )	log--	CA	nQ	nT
		Tt(s)										(MeV)	Tt(s)	TA	TA			
0	8	16	34	Er	68	90	0	29.99	27.23	33.9	33.3	28.5	28.0					
S	16	34	80	Nd	60	80	0	74.46	59.91	34.1	33.1	28.7	27.0					
Fe	26	58	66	Sm	50	66	0	113.72	75.82	34.9	33.5	29.6	26.2					
Be	4	8	8	Hf	72	94	0	8.90	8.49	35.5	35.1	30.1	29.7					
Si	14	28	28	Sm	62	84	0	62.53	52.47	35.6	34.7	30.2	29.4					
Mg	12	26	26	Cd	64	84	0	52.54	44.69	35.9	35.1	30.5	29.7					
76 Os 175	1.92	0	4	W	74	97	0	4.74	4.64	6.4	6.4			E	217	128		
C	6	12	12	Yb	70	93	0	19.30	17.98	32.5	32.9	26.3	26.5					
Si	14	30	31	Sm	62	83	0	65.02	53.88	32.7	33.2	26.3	26.8					
Si	14	31	31	Sm	62	82	0	64.85	53.37	33.6	34.1	27.2	27.7					
Si	14	34	34	Nd	60	81	0	74.07	59.68	34.5	35.0	28.2	28.7					
Si	14	29	29	Sm	62	84	0	62.82	52.41	35.7	36.2	29.3	29.8					
0	8	16	16	Er	68	91	0	29.24	26.57	35.8	36.0	29.4	28.9					
0	16	32	32	Nd	60	80	0	73.28	58.61	36.4	36.9	30.0	30.5					
Fe	26	58	58	Sm	50	67	0	112.48	75.20	36.8	37.2	30.1	30.8					
76 Os 176	2.33	0	4	W	74	98	0	4.51	4.41	7.5	7.5			E	217	107		
C	6	12	12	Yb	70	94	0	18.96	17.67	33.8	33.3	26.3	25.8					
S	16	34	34	Nd	60	82	0	73.86	59.59	34.8	33.8	27.3	26.3					
Si	14	30	30	Sm	62	84	0	63.39	52.59	35.3	34.5	27.8	26.9					
Si	14	32	32	Sm	62	82	0	64.02	52.38	35.6	34.7	28.1	27.2					
0	16	32	32	Er	68	92	0	28.77	26.15	36.9	36.4	29.4	28.9					
0	16	36	36	Nd	60	84	0	113.71	78.96	37.3	36.0	29.6	28.6					
Fe	26	58	58	Sm	50	60	0	113.71	78.96	37.3	36.0	29.6	28.6					
Ti	22	50	50	Xe	54	72	0	98.56	70.58	37.9	36.6	30.4	29.1					
76 Os 177	2.22	0	4	W	74	99	0	4.35	4.26	9.1	9.1			E	217	115		
C	6	12	12	Yb	70	95	0	18.25	17.01	36.3	36.5	27.2	27.5					
S	16	35	35	Nd	60	82	0	72.87	58.46	36.8	37.3	27.7	28.2					
Si	14	36	36	Nd	60	81	0	72.95	58.11	37.3	37.8	28.2	28.7					
Si	14	32	32	Sm	62	83	0	62.81	51.45	37.6	38.1	28.5	29.0					
Si	14	30	30	Sm	62	85	0	62.78	51.36	38.1	38.5	29.0	29.1					
Si	14	31	31	Sm	62	84	0	62.01	51.15	38.4	38.8	29.3	29.8					
Ti	22	50	50	Xe	54	73	0	97.82	70.19	38.9	39.5	29.8	30.5					
76 Os 178	2.48	0	4	W	74	100	0	4.18	4.08	9.8	9.8			E	217	78		
S	16	36	36	Nd	60	82	0	73.07	58.29	36.9	35.9	27.1	26.1					
Ti	22	50	50	Yb	70	96	0	18.04	16.83	37.0	36.5	27.2	26.7					
Cr	24	54	54	Te	52	72	0	101.91	70.38	38.8	37.4	29.0	27.7					
Si	14	32	32	Sm	62	84	0	61.52	50.46	39.9	38.9	30.0	28.9					
Fe	26	58	58	Sm	50	70	0	109.70	73.96	40.0	38.6	30.2	28.8					
0	8	16	16	Er	68	94	0	27.53	25.06	40.3	39.7	30.5	29.9					
S	16	34	34	Nd	60	84	0	70.14	56.74	40.7	39.7	30.9	29.9					
76 Os 179	2.58	0	4	W	74	101	0	4.15	4.06	10.7	10.7			E	217	91		
C	6	12	12	Yb	70	97	0	17.29	16.11	38.7	38.9	27.9	28.2					
S	16	32	32	Nd	60	84	0	71.29	57.59	39.0	38.0	28.9	29.0					
Ti	22	50	50	Xe	54	75	0	97.11	69.99	39.7	40.3	29.0	29.0					
Cr	24	54	54	Te	52	74	0	102.95	71.89	41.1	41.5	30.1	30.8					
Cr	24	54	54	Te	52	73	0	96.58	69.06	40.8	41.5	30.1	30.8					
Fe	26	58	58	Sm	50	70	0	102.95	71.89	41.1	41.5	30.4	31.1					
0	8	16	16	Er	68	94	0	108.75	72.91	41.1	42.3	30.8	31.5					
S	16	34	34	Nd	60	84	0	70.14	56.74	40.7	39.7	30.5	29.9					
76 Os 180	3.11	0	4	W	74	102	0	3.90	3.82	11.9	11.9			E	217	60		
C	6	12	12	Yb	70	98	0	17.26	16.02	39.6	38.5	27.9	26.6					
Cr	24	54	54	Te	52	74	0	102.65	71.85	41.4	40.0	30.1	29.1					
Cr	24	54	54	Te	52	74	0	102.65	71.85	41.4	40.0	30.3	29.1					
Ca	20	48	48	Ba	56	76	0	70.07	56.06	41.8	40.8	29.9	28.9					
Ca	20	48	48	Ba	56	76	0	88.32	64.77	42.2	41.0	30.4	29.2					
Ar	18	40	40	Ce	58	82	0	87.76	65.33	42.3	41.1	30.4	29.2					
Fe	26	60	60	Sn	50	70	0	108.16	72.11	42.5	41.4	30.6	29.5					
76 Os 181	3.81	0	4	W	74	103	0	3.78	3.69	14.0	14.0			E	217	61		
Ti	22	50	50	Xe	54	77	0	96.35	69.71	41.3	41.2	26.5	27.2					
Ti	22	51	51	Xe	54	76	0	96.06	69.01	41.3	42.0	27.3	27.6					
C	6	12	12	Yb	70	99	0	16.84	15.73	41.6	41.8	27.5	27.8					
Ca	20	48	48	Ba	56	77	0	88.26	64.85	42.2	42.8	28.1	28.8					
Ca	20	48	48	Ba	56	78	0	87.78	64.99	42.6	43.2	28.5	29.1					
Ca	20	46	46	Ba	56	79	0	87.48	65.25	42.6	43.3	28.6	29.2					
Cr	24	54	54	Te	52	75	0	101.69	71.35	42.7	43.4	28.7	29.2					
Cr	24	54	54	Te	52	74	0	101.64	70.76	43.1	43.8	29.0	29.7					
76 Os 182	4.90	0	4	W	74	104	0	3.42	3.35	16.2	16.2			E	217	38		
Ti	22	50	50	Xe	54	78	0	96.12	69.71	40.8	39.5	24.6	24.1					
Ca	20	48	48	Ba	56	78	0	88.59	65.22	41.5	40.3	25.3	24.0					
Ca	20	46	46	Ba	56	80	0	87.45	65.34	42.6	41.3	26.4	25.2					
Cr	24	54	54	Te	52	76	0	101.32	71.26	43.1	41.7	26.9	25.6					
Cr	24	54	54	Te	52	76	0	94.74	67.67	43.6	42.3	27.4	26.1					
Fe	26	58	58	Sn	50	70	0	106.75	71.56	44.4	42.9	28.2	26.7					
Cr	24	56	56	Te	52	77	0	100.48	70.76	44.4	43.1	28.2	27.7					
Cr	24	56	56	Te	52	74	0	100.76	69.76	44.6	43.2	28.4	27.1					
76 Os 183	4.67	0	4	W	74	105	0	3.37	3.30	18.2	18.2			E	217	45		
Ca	20	48	48	Ba	56	79	0	88.58	65.35	41.4	42.0	23.2	23.8					
Ti	22	50	50	Xe	54	79	0											



Parent		Emit		Daughter		T <sub>1/2</sub>		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )	
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	Ae	Ce	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )
			Tt(s)						(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	Tt(s)	Tt(s)
76	Os	186	22.80		He 2 4	W 74 108			2.82	2.76	22.8	38.3	16.7	15.5	M 216 21
					Ca 20 48	Ba 56 82			89.48	66.39	39.5	40.9	19.4	18.1	
					Ti 22 50	Xe 54 82			94.85	69.35	42.2	42.0	20.5	19.2	
					Sc 21 47	Te 52 80			94.56	68.14	43.3	43.0	21.6	20.3	
					Si 14 28	Xe 54 82			93.21	67.27	43.2	43.0	22.9	21.6	
					Al 13 27	Ba 56 82			86.02	63.36	45.7	44.4	23.1	21.7	
					Cr 20 40	Te 52 80			99.63	69.64	45.9	44.6	23.2	21.8	
					Cr 24 54	Te 52 80			99.14	70.36	46.0	44.6	23.2	21.8	
76	Os	187	UNKN		He 2 4	W 74 109			2.72	2.66	27.2	42.3	14.5	15.1	E 216 25
					Ca 20 49	Ba 56 82			88.34	65.19	41.6	42.3	14.5	15.1	
					Ca 20 48	Te 52 80			87.92	65.35	41.9	42.6	14.6	15.4	
					Ti 22 50	Xe 54 82			94.73	68.44	42.9	43.2	15.8	15.4	
					Sc 21 47	Te 52 80			94.73	68.44	42.9	43.2	15.8	15.4	
					Ti 22 50	Xe 54 82			93.73	67.16	44.9	45.6	17.8	18.4	
					Si 14 28	Ba 56 82			89.87	65.84	45.0	45.7	17.8	18.5	
					Sc 21 47	Te 52 80			92.58	67.83	45.7	46.4	18.5	19.2	
					Cr 20 40	Xe 54 82			86.08	63.06	45.8	46.5	18.7	19.3	
					Cr 24 54	Te 52 80			86.08	63.06	45.8	46.5	18.7	19.3	
76	Os	188	UNKN		He 2 4	W 74 110			2.14	2.09	34.4	41.5	8.4	7.1	E 214 16
					Ca 20 48	Ba 56 82			94.75	68.54	42.8	41.5	8.4	7.1	
					Ca 20 48	Te 52 80			86.76	63.21	44.4	43.4	10.3	9.0	
					Ti 22 50	Xe 54 82			92.61	67.33	45.8	46.5	3.8	4.2	
					Sc 21 47	Te 52 80			99.29	69.87	46.0	46.7	4.1	4.8	
					Cr 20 40	Ba 56 82			85.59	63.40	46.0	46.7	4.1	4.7	
					Cr 24 54	Te 52 80			85.59	63.40	46.0	46.7	4.1	4.7	
					Ca 20 50	Xe 54 82			92.94	66.39	46.3	47.0	4.4	5.1	
					Ca 20 50	Ba 56 82			85.50	62.88	46.6	47.2	4.7	5.3	
					Ca 20 48	Ba 56 82			84.99	63.41	46.6	47.3	4.7	5.3	
					Cr 24 55	Te 52 82			98.52	69.85	46.9	47.6	5.0	5.7	
76	Os	190	UNKN		He 2 4	W 74 112			1.37	1.35	56.1	44.5	-10.2	-11.6	E 213 10
					Ca 20 48	Ba 56 82			93.14	66.65	45.8	44.5	-9.7	-11.1	
					Ca 20 48	Te 52 82			98.98	69.81	46.3	44.9	-8.4	-9.8	
					Cr 24 58	Te 52 82			98.55	68.47	47.7	46.3	-8.4	-9.8	
					Ca 20 50	Ba 56 84			84.15	62.00	48.8	47.6	-7.2	-8.5	
					Fe 26 62	Sn 50 78			103.49	69.72	49.0	47.5	-7.1	-8.6	
					Ti 22 52	Xe 54 84			90.88	66.01	49.0	47.6	-7.1	-8.4	
					Ca 20 48	Ba 56 86			83.41	62.34	49.3	48.0	-6.8	-8.0	
					V 23 55	Te 52 82			94.25	66.96	49.3	47.9	-6.8	-8.2	
76	Os	191	6.12		He 2 4	W 74 113			1.08	1.06	76.9	47.7	-29.9	-29.2	E 213 7
					Ca 24 57	Te 52 82			98.70	69.24	47.0	47.7	-29.9	-29.2	
					Cr 24 58	Te 52 81			98.64	68.68	47.4	48.1	-29.5	-28.7	
					Ti 22 54	Xe 54 83			91.41	65.57	48.7	49.3	-28.2	-27.5	
					Fe 26 62	Sn 50 79			103.12	69.65	49.4	50.2	-27.5	-26.7	
					Ti 22 53	Xe 54 84			90.56	65.43	49.8	50.4	-27.1	-26.4	
					Fe 26 61	Sn 50 80			102.71	69.90	49.8	50.6	-27.1	-26.3	
					Cr 24 56	Te 52 83			96.74	68.38	49.9	50.6	-26.9	-26.2	

Parent		Emit		Daughter		T <sub>1/2</sub>		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )	
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	Ae	Ce	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )
			Tt(s)						(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	Tt(s)	Tt(s)
76	Os	192	UNMA		He 2 4	W 74 114			0.36	0.35	161.6	46.0	-114.2	-115.6	E 208 2
					Cr 24 52	Te 52 82			98.57	68.79	47.4	47.7	-112.4	-113.9	
					Fe 26 62	Sn 50 80			103.19	69.87	49.2	49.2	50.3	49.6	209 1
76	Os	193	5.03		He 2 4	W 74 115			-0.34	0.0	STAB	50.3	-99.0	-98.2	207 1
					Fe 26 62	Sn 50 81			102.86	69.82	49.6	47.6	-99.0	-100.5	M 216 140
76	Os	194	8.28		He 2 4	W 74 116			-0.60	0.0	STAB	49.1	20.0	20.0	
					Cr 24 56	Te 52 82			103.06	70.13	49.1	19.6	22.2	21.2	
					C 6 12	Lu 71 90			6.28	6.13	-0.4	22.9	22.2	21.2	
					O 8 16	Tm 69 86			34.79	32.15	9.6	22.1	22.8	21.8	
					Re 4 8	Ta 73 88			10.40	11.28	22.1	25.7	26.1	26.7	
					Re 10 20	Ho 67 82			46.76	41.22	25.7	26.4	26.8	26.8	
					Ni 28 60	In 49 60			128.83	83.09	26.4	26.6	27.0	27.0	
					Co 27 57	Sn 50 62			125.86	83.41	26.6	26.6	27.0	27.0	
					Co 27 59	Sn 50 60			122.92	81.96	26.9	26.9	27.3	27.3	
					Fe 26 56	Sb 51 62			122.88	82.17	26.9	26.9	27.3	27.3	
77	Ir	170	0.04	0	C 6 12	Lu 71 91			6.16	6.02	0.0	21.8	20.9	21.8	M 218 151
					He 2 4	Tm 69 85			36.05	35.65	22.1	23.3	22.1	21.2	
					Re 4 8	Ta 73 89			11.65	11.10	22.8	23.6	22.8	23.5	
					Mg 12 24	Tb 65 81			58.47	50.22	26.3	27.8	26.2	27.8	
					Si 14 28	Eu 63 79			69.76	58.27	26.7	28.5	26.7	28.4	
					Ne 10 20	Ho 67 83			45.95	40.54	27.0	28.4	27.0	28.3	
					Co 27 59	Sn 50 62			125.18	82.47	27.5	30.4	27.4	30.4	
					Ni 28 60	In 49 61			121.56	82.94	27.8	30.8	27.7	30.8	
77	Ir	171	0.23	0	C 6 12	Lu 71 92			6.07	5.92	0.2	21.9	21.7	21.7	M 216 150
					He 2 4	Tm 69 86			33.49	31.84	21.9	23.9	21.7	21.7	
					Re 4 8	Ta 73 89			11.39	10.86	23.9	23.9	23.5	23.5	
					Bg 12 24	Tb 65 82			58.53	50.32	26.1	26.1	25.8	25.8	
					Si 14 28	Eu 63 80			69.51	58.13	27.0	27.0	26.7	26.7	
					Fe 26 56	Sn 50 62			124.52	81.56	28.3	28.3	28.1	28.1	
					Co 27 59	Sn 50 60			124.62	81.54	28.6	28.6	28.4	28.4	
					Ni 28 62	In 49 60			120.89	80.88	28.6	28.6	28.5	28.5	
77	Ir	172	0.23	0	C 6 12	Lu 71 93			5.96	5.83	0.2	24.5	23.4	24.3	M 219 155
					He 2 4	Tm 69 87			22.83	21.24	23.6	24.5	23.4	24.3	
					Re 4 8	Ta 73 91			11.07	10.55	25.2	26.0	25.0	25.8	
					O 8 16	Tm 69 87			34.28	31.09	25.6	26.7	25.3	26.5	
					Si 14 28	Eu 63 81			69.71	58.36	26.6	28.3	26.3	28.1	
					Mg 12 24	Tb 65 83			57.17	49.20	28.2	29.7	27		



Parent		Emitted		Daughter				T <sub>1/2</sub>		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )				
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	Q	Ek	log(T)	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nT
			Tt(s)						(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	TA	TA	
77	Ir	174	0.60	0	He	2	4		5.60	5.48	2.1	27.8	24.7	25.7		E 218 156
					C	14	29		21.34	20.11	26.8	30.1	26.1	27.9		
					Si	14	30		68.83	57.36	28.3	27.1	26.5	27.5		
					Be	4	8		69.02	57.12	28.6	30.4	26.5	28.3		
					Be	4	8		10.31	9.83	28.7	29.6	26.6	27.5		
					Te	73	93	0	32.38	29.40	29.6	30.7	27.5	28.6		
					Tm	69	89	0	67.55	56.68	29.6	31.4	27.5	29.2		
					Si	14	28		72.91	59.92	30.3	32.2	28.2	30.1		
					P	15	31		61.64	52.08	30.8	32.5	28.7	30.4		
					Al	13	27									
77	Ir	175	0.65	0	He	2	4		5.51	5.39	2.7	27.5	24.9	24.9		E 217 149
					C	14	29		21.34	19.88	27.5	28.4	25.8	25.8		
					Si	14	30		69.03	57.20	28.4	30.0	27.3	27.3		
					Sm	62	82		73.01	60.08	30.0	30.0	27.3	27.3		
					Be	4	8		10.03	9.57	30.1	30.1	27.5	27.5		
					Te	73	93	0	31.91	28.99	30.6	30.6	27.9	27.9		
					Tm	69	90	0	66.93	55.14	32.3	33.4	28.1	30.0		
					Si	14	31		31.18	28.34	32.3	33.4	28.2	29.3		
					D	8	16		16.98	16.98	32.3	34.3	28.7	30.7		
					S	16	34		71.84	62.17	32.3	34.3	28.7	30.7		
					P	15	33									
77	Ir	176	0.90	0	He	2	4		5.24	5.12	4.1	32.5	30.2	30.2		E 217 152
					C	14	30		20.67	19.26	29.5	30.5	25.4	26.3		
					Si	14	30		67.53	56.02	30.7	32.5	26.6	28.4		
					P	15	32		72.26	59.12	31.6	33.6	27.5	29.5		
					Be	4	8		9.65	9.21	32.1	33.0	28.0	28.9		
					Si	14	31		66.93	55.14	32.3	34.1	28.1	30.0		
					D	8	16		31.18	28.34	32.3	33.4	28.2	29.3		
					S	16	34		71.84	62.17	32.3	34.3	28.7	30.7		
					P	15	33									
77	Ir	177	1.32	0	He	2	4		5.13	5.02	4.6	30.3	25.8	25.8		E 217 141
					C	14	30		20.38	19.00	30.3	30.3	25.8	25.8		
					P	15	33		72.31	58.83	32.0	32.0	27.4	27.4		
					Si	14	30		62.13	52.33	32.3	32.3	27.7	27.7		
					Eu	63	84		65.99	54.80	33.1	33.1	28.5	28.5		
					Tm	69	92	0	30.75	27.97	33.3	33.3	28.7	28.7		
					Be	4	8		9.65	9.21	32.1	33.0	28.0	28.9		
					Tl	81	81		24.34	23.92	33.9	33.9	29.3	29.3		
					Cl	17	37		60.24	53.47	35.3	35.3	30.7	30.7		
					Cl	17	37									
77	Ir	178	1.08	0	He	2	4		4.89	4.78	6.2	33.0	25.8	26.8		E 217 145
					C	14	30		19.83	18.49	32.1	33.0	25.8	26.8		
					P	15	33		70.71	57.60	34.5	36.4	28.2	30.2		
					S	16	35		75.52	60.97	34.9	36.9	28.6	30.7		
					Sm	61	82		75.07	60.73	35.0	37.1	28.8	30.8		
					D	8	16		30.01	27.31	35.1	36.2	28.8	30.0		
					Be	4	8		9.65	9.21	32.1	33.0	28.0	28.9		
					Tl	81	81		24.34	23.92	33.9	33.9	29.3	29.3		
					Cl	17	37		60.24	53.47	35.3	35.3	30.7	30.7		
					Cl	17	37									
77	Ir	179	2.38	0	He	2	4		4.79	4.69	6.5	33.3	26.7	26.7		E 217 126
					C	14	30		19.45	18.15	33.3	33.3	26.7	26.7		
					S	16	36		75.61	60.41	35.1	35.1	28.6	28.6		
					Cl	17	37		79.70	63.23	35.9	35.9	29.3	29.3		
					D	8	16		29.46	26.82	36.4	36.4	29.9	29.9		
					P	15	33		69.31	56.72	36.7	36.7	30.7	30.7		
					Tl	81	81		24.34	23.92	33.9	33.9	29.3	29.3		
					Cl	17	37		107.76	75.25	37.5	37.5	31.0	31.0		
					V	23	51		104.04	74.40	37.7	37.7	31.1	31.1		
					V	23	51									

Parent		Emitted		Daughter				T <sub>1/2</sub>		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )				
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	Q	Ek	log(T)	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nT
			Tt(s)						(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	TA	TA	
77	Ir	180	1.95	0	He	2	4		4.80	4.70	7.1	35.2	27.1	28.1		E 217 136
					C	12	24		19.16	17.88	34.2	35.2	27.1	28.1		
					Si	14	30		74.14	59.31	37.4	39.5	30.4	32.5		
					Tl	22	50		100.33	72.46	37.9	40.6	30.9	33.6		
					Be	4	8		28.78	26.22	38.2	39.4	31.2	32.3		
					Cr	24	54		108.29	80.20	38.2	39.3	31.4	32.3		
					Cl	17	37		171.82	131.83	38.7	40.0	31.7	34.8		
					V	23	52		103.35	73.89	38.8	40.0	31.8	34.5		
					V	23	52									
77	Ir	181	2.48	0	He	2	4		4.35	4.25	9.4	36.0	26.6	26.6		E 217 104
					C	12	24		18.62	17.39	36.0	36.0	26.6	26.6		
					Tl	22	50		100.04	72.41	38.2	38.2	28.8	28.8		
					Cr	24	54		106.45	74.69	39.1	39.1	29.7	29.7		
					Sb	51	72		102.62	73.70	39.4	39.4	30.0	30.0		
					Sm	61	82		29.22	29.98	39.9	39.9	30.2	30.2		
					D	8	16		72.48	59.07	40.1	40.1	30.3	30.3		
					Fe	26	58		111.91	76.05	40.1	40.1	30.7	30.7		
					Fe	26	58									
77	Ir	182	2.95	0	He	2	4		4.21	4.12	11.4	38.6	26.2	27.2		E 217 105
					C	12	24		18.18	16.98	37.6	38.6	26.2	27.2		
					Tl	22	50		99.44	72.12	39.0	41.7	27.6	30.3		
					Cr	24	54		102.17	72.99	40.3	43.7	28.9	31.7		
					Si	14	30		105.52	74.21	40.3	43.2	29.0	31.8		
					Tl	22	51		98.26	71.01	40.4	43.2	29.1	31.9		
					V	23	51		101.77	75.97	41.3	41.3	28.3	28.3		
					V	23	51		101.97	73.04	41.0	43.6	29.6	32.4		
					Sc	21	48		94.31	69.44	41.0	43.6	29.6	32.3		
					Sc	21	48									
77	Ir	183	3.52													







Parent		Emitted		Daughter		Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log-- TA	log-- TA	CA	n0	nT	
Z	EI	A	log(Tt) Tt(s)	EI	Ze										Ae
Mg	12	24		Dy	66	82	60.69	52.22	24.4	23.6	25.3	24.6			
Si	14	28		Sm	64	80	12.21	60.46	24.9	24.1	25.9	25.0			
Ni	28	60		Sn	50	62	131.90	85.89	25.8	24.3	26.7	25.2			
Ni	28	62		Sn	50	60	131.35	84.01	26.8	25.3	27.7	26.2			
Ne	10	20		Er	68	84	46.45	41.05	27.5	26.9	28.5	27.8			
He	2	4	0.01	Os	76	93	6.35	6.21	0.0				M 218 153		
C	6	12		Hf	72	99	24.38	25.09	20.7	21.0	20.7	21.0			
Be	4	8		W	74	92	16.26	12.90	22.8	22.1	22.8	23.1			
O	8	16		Yb	70	87	16.26	12.90	22.8	22.1	22.8	23.1			
Si	14	28		Cd	64	81	72.34	60.63	24.6	25.1	24.6	25.1			
Mg	12	24		Dy	66	83	59.72	51.44	25.8	26.2	25.8	26.2			
Si	14	29		Gd	64	80	71.73	59.71	26.1	26.5	26.1	26.5			
Ni	28	60		Sn	50	63	130.70	85.37	27.1	27.8	27.1	27.8			
Ni	28	61		Sn	50	62	130.70	84.66	27.1	27.9	27.1	27.9			
He	2	4	-0.15	Os	76	94	6.18	6.04	0.1				M 217 146		
Be	4	8		W	74	92	11.63	11.10	23.7	21.5	22.0	21.6			
O	8	16		Yb	70	88	35.83	32.18	24.4	23.8	24.4	23.9			
Si	14	28		Gd	64	82	72.27	60.64	24.6	23.8	24.7	23.8			
Si	14	30		Gd	64	80	71.05	58.80	27.6	26.7	27.6	26.7			
Ni	28	62		Sn	50	62	130.07	83.73	28.0	26.5	28.1	26.6			
Ni	28	60		Sn	50	64	129.70	84.98	28.2	26.6	28.3	26.7			
Mg	12	26		Dy	66	82	56.87	50.07	28.5	27.7	28.6	27.8			
He	2	4	0	Os	76	95	6.18	6.04	0.5				M 218 155		
C	6	12		Hf	72	91	0	23.13	23.82	24.3	23.2	23.5	22.7		
Be	4	8		W	74	93	11.47	10.94	24.3	24.5	23.8	24.0			
Si	14	29		Gd	64	82	72.03	60.10	25.4	25.9	24.9	25.3			
O	8	16		Yb	70	89	34.71	31.53	25.8	26.1	25.3	25.6			
Si	14	28		Gd	64	83	71.04	59.67	26.3	26.7	26.4	26.2			
Si	14	30		Gd	64	81	71.42	59.18	26.9	27.3	26.4	26.8			
Ni	28	62		Sn	50	63	129.11	83.37	29.0	29.8	28.5	29.3			
Ni	28	61		Sn	50	64	128.82	83.91	29.2	30.0	28.7	29.5			
He	2	4	0.80	Os	76	96	5.90	5.76	1.2				M 217 143		
C	6	12		Hf	72	92	22.85	21.29	24.5	24.0	23.3	22.8			
Be	4	8		W	74	94	11.03	10.53	26.2	25.8	25.0	24.7			
Si	14	30		Gd	64	83	70.47	58.52	28.1	28.5	26.0	26.5			
Be	4	8		Yb	70	91	10.61	10.13	28.2	28.4	26.1	26.3			
O	8	16		Yb	70	89	0	33.08	30.09	29.2	29.5	27.1	27.4		
Si	14	28		Gd	64	84	68.83	57.88	29.4	28.6	28.3	27.4			
Ni	28	62		Sn	50	64	128.36	83.14	29.8	28.3	28.6	27.1			
Ni	28	60		Sn	50	62	129.98	84.53	30.2	29.2	29.0	28.0			
S	16	34		Sm	62	82	79.05	64.68	30.4	29.5	29.3	28.3			
He	2	4	0.85	Os	76	97	5.65	5.52	2.1				M 218 152		
C	6	12		Hf	72	93	22.18	20.68	26.2	26.5	24.2	24.5			
Si	14	30		Gd	64	83	70.47	58.52	28.1	28.5	26.0	26.5			
Be	4	8		Yb	70	91	10.61	10.13	28.2	28.4	26.1	26.3			
O	8	16		Yb	70	89	0	33.08	30.09	29.2	29.5	27.1	27.4		
Si	14	31		Gd	64	82	69.58	57.39	30.0	30.5	28.0	28.5			
Si	14	29		Gd	64	84	68.70	57.45	30.2	30.6	28.4	28.4			
S	16	32		Sm	62	82	77.79	62.17	31.0	31.3	28.7	29.2			
He	2	4	1.32	Os	76	98	5.57	5.45	2.5				M 217 140		
C	6	12		Hf	72	94	21.84	20.37	27.1	26.7	24.7	24.2			
Be	4	8		W	74	96	10.35	9.88	29.4	29.0	26.9	26.5			

Parent		Emitted		Daughter		Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log-- TA	log-- TA	CA	n0	nT
Z	EI	A	log(Tt) Tt(s)	EI	Ze									
S	16	34		Sm	62	82	79.96	64.68	30.0	29.0	27.5	26.5		
O	8	16		Yb	70	92	32.54	29.61	30.4	29.8	27.9	27.3		
Ni	28	62		Gd	64	84	68.76	57.17	30.6	29.7	28.1	27.2		
Si	14	32		Cd	60	82	126.32	82.32	32.2	30.6	29.7	28.1		
Ni	28	64		Sn	50	64	125.70	80.51	33.3	31.8	30.2	29.3		
He	2	4	1.52	Os	76	99	5.29	5.18	4.1				M 217 142	
C	6	12		Hf	72	95	21.12	19.70	29.2	29.4	25.1	25.3		
Be	4	8		W	74	97	9.95	9.50	31.5	31.7	27.4	27.6		
O	8	16		Yb	70	93	31.76	28.92	32.1	32.4	28.0	28.3		
S	16	34		Sm	62	83	78.24	63.38	32.4	32.9	28.3	28.8		
Si	14	35		Sm	62	82	78.47	63.13	32.6	33.1	28.5	29.0		
Si	14	33		Sm	62	84	74.95	61.32	34.8	33.3	30.6	29.1		
Ni	28	62		Sn	50	67	124.97	81.57	33.0	33.4	28.9	29.3		
Ni	28	60		Sn	50	66	124.27	80.09	34.9	33.9	30.6	29.6		
S	16	36		Sm	62	81	77.84	62.18	34.0	34.6	29.9	30.5		
He	2	4	1.70	Os	76	100	5.25	5.14	4.2				M 217 127	
C	6	12		Hf	72	96	20.86	19.47	29.9	29.5	25.7	25.2		
Be	4	8		W	74	98	9.68	9.25	32.9	32.5	28.7	28.2		
O	8	16		Yb	70	94	31.38	28.59	33.0	32.4	28.8	28.3		
S	16	36		Sm	62	82	78.29	62.63	33.2	32.2	29.0	28.0		
Ni	28	62		Sn	50	68	124.95	81.32	34.8	33.3	30.6	29.1		
Ni	28	60		Sn	50	66	124.27	80.09	34.9	33.9	30.6	29.6		
Ar	18	38		Sm	60	82	86.32	68.10	35.0	33.9	30.7	29.7		
He	2	4	1.71	Os	76	101	5.13	5.01	4.9				M 217 139	
C	6	12		Hf	72	97	20.35	19.00	31.5	31.7	26.5	26.8		
Be	4	8		W	74	99	9.39	8.97	34.5	34.7	29.6	29.8		
O	8	16		Yb	70	95	30.53	27.83	35.0	35.3	30.1	30.4		
S	16	36		Sm	62	83	78.74	63.38	35.2	35.7	30.3	30.8		
Tl	24	53		Xe	54	74	110.77	78.33	36.0	36.8	31.3	31.9		
Cr	24	54		Xe	54	73	110.87	77.80	36.2	36.9	31.3	32.0		
Ni	28	64		Sn	50	67	123.11	79.58	36.3	37.1	31.4	32.1		
He	2	4	2.19	Os	76	102	4.94	4.84	5.9				M 217 117	
C	6	12		Hf	72	98	19.95	18.63	32.7	32.2	26.8	26.3		
O	8	16		Yb	70	96	30.15	27.50	35.9	35.4	30.0	29.5		
Tl	22	50		Ba	56	76	103.70	75.21	35.9	34.6	30.1	28.7		
Pr	24	48		Xc	54	74	110.61	78.69	36.3	35.1	30.6	29.2		
Ni	28	68		Sm	60	80	122.57	79.67	36.9	35.3	30.8	29.4		
Fe	26	58		Te	52	72	116.50	79.37	37.2	35.7	31.3	29.8		
S	16	36		Sm	62	84	75.48	60.55	37.5	36.4	31.6			



Parent		Emitted		Daughter		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	EI	Zd	Nd	Cd	Q	(MeV)	T <sub>1/2</sub> (s)	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nQ	nT
78	Pt	184	3.02	0	He	2	4	Os	76	104	0	4.60	4.50	8.0	35.2	27.6	27.1	M	217	97
					He	2	4	Hf	72	100	0	19.06	17.82	35.6	35.3	28.5	27.2			
					Ti	22	54	Ba	56	78	103.07	75.06	36.6	36.4	29.7	28.3				
					Cr	24	54	Xe	54	76	109.48	77.35	37.8	36.4	30.9	29.4				
					Ni	28	64	Sn	50	70	120.87	78.83	38.9	37.4	30.9	29.8				
					0	8	16	Yb	70	98	28.39	26.46	38.9	39.3	31.9	30.8				
					Ca	20	56	Te	52	74	131.88	77.37	39.1	37.7	31.1	29.7				
					Ca	20	48	Ce	56	78	93.39	69.02	39.1	38.5	31.7	30.5				
78	Pt	185	3.64	0	He	2	4	Os	76	105	0	4.49	4.40	9.9	37.2	27.0	27.3	E	217	93
					He	2	4	Hf	72	101	0	18.68	17.47	37.0	37.6	27.0	27.7			
					Ti	22	50	Ba	56	79	102.69	74.94	37.0	37.6	28.2	28.9				
					Cr	24	54	Xe	54	77	108.75	77.00	38.2	39.4	28.7	29.4				
					Ca	20	46	Ce	58	81	93.50	70.43	38.1	39.3	28.4	29.1				
					Ti	22	49	Ce	58	80	93.91	69.40	39.4	40.0	29.4	30.1				
					Ca	20	48	Ce	58	79	93.52	69.25	39.4	40.1	29.5	30.1				
78	Pt	186	3.86		He	2	4	Os	76	106	4.32	4.23	9.7	35.8	27.4	26.1	M	217	67	
					Ti	22	50	Ba	56	80	102.48	74.94	37.1	37.5	28.9	27.7				
					Ca	20	46	Ce	58	80	93.94	69.70	38.6	37.4	29.0	27.8				
					Cr	24	54	Xe	54	78	108.37	76.91	39.1	37.7	29.3	28.0				
					C	6	12	Hf	72	102	18.50	16.87	39.2	39.3	30.9	29.6				
					Ti	22	52	Sn	50	75	119.70	76.18	40.0	39.5	31.3	29.7				
					Ni	28	66	Sn	50	76	113.29	77.97	41.1	39.7	31.4	30.0				
78	Pt	187	3.93	0	He	2	4	Os	76	107	0	4.26	4.16	12.0	37.9	25.2	25.9	E	217	77
					Ti	22	50	Ba	56	81	102.33	74.97	37.2	37.9	25.2	25.9				
					Ca	20	48	Ce	58	81	94.36	70.14	37.8	38.5	25.9	26.5				
					Ti	22	52	Ba	56	80	101.81	74.04	38.3	39.0	26.3	27.0				
					Ca	20	47	Ce	58	82	93.60	70.08	38.6	39.3	26.3	27.0				
					Sc	21	49	La	71	82	107.22	76.43	40.4	39.0	26.7	27.3				
					Ti	22	54	Xe	54	82	100.70	75.60	40.3	40.0	28.4	29.0				
					Cr	24	54	Xe	54	78	107.57	75.93	40.4	41.1	28.4	29.1				
					Ti	22	52	Ba	56	79	100.51	72.56	40.6	41.3	28.6	29.3				
78	Pt	188	5.95		He	2	4	Os	76	108	4.00	3.91	12.5	36.3	25.1	23.8	M	217	53	
					Ca	20	48	Ce	58	82	94.47	70.35	37.5	36.3	25.1	23.8				
					Ti	22	50	Ba	56	82	101.87	74.78	37.7	36.4	25.3	23.9				
					Ti	22	52	Ba	56	80	100.54	72.73	40.4	39.1	27.9	26.6				
					Cr	24	54	Xe	54	80	107.22	76.43	40.4	39.0	26.7	27.3				
					Sc	21	49	La	71	82	95.35	70.20	41.5	40.1	29.0	27.7				
					Ti	22	50	Ba	56	83	109.92	73.49	40.7	41.4	26.4	26.0				
					Cr	24	54	Xe	54	80	106.73	76.67	41.3	42.1	26.0	26.7				
					Fe	26	60	Te	52	76	112.57	76.64	42.4	40.9	29.3	28.5				
78	Pt	189	4.60		He	2	4	Os	76	109	3.89	3.80	15.3	39.1	23.1	23.8	E	217	56	
					Ti	22	51	Ba	56	82	101.50	74.11	38.5	39.1	24.1	24.7				
					Ca	20	48	Ce	58	83	93.16	69.50	39.4	40.1	24.7	25.4				
					Ti	22	52	Ba	56	81	100.70	72.99	40.0	40.3	24.9	25.6				
					Ca	20	49	Ce	58	82	92.88	68.80	40.2	40.3	24.9	25.6				
					Ti	22	50	Ba	56	83	109.92	73.49	40.7	41.4	26.4	26.0				
					Cr	24	54	Xe	54	80	106.73	76.67	41.3	42.1	26.0	26.7				
					Cr	24	52	Xe	54	78	106.46	74.91	42.0	42.8	26.7	27.4				

Parent		Emitted		Daughter		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	EI	Zd	Nd	Cd	Q	(MeV)	T <sub>1/2</sub> (s)	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nQ	nT
78	Pt	190	19.34		He	2	4	Os	76	110	3.20	3.18	19.3	39.0	21.0	19.6	M	216	37	
					Ti	22	52	Ba	56	82	100.40	72.92	41.9	40.5	22.7	21.2				
					Ca	20	48	Ce	58	84	91.42	68.32	42.1	41.1	23.1	21.7				
					Cr	24	56	Xe	54	80	106.08	74.81	42.5	42.4	24.5	23.0				
					Fe	26	60	Ni	28	66	111.42	76.23	43.9	42.6	24.8	23.2				
					Ni	28	66	Sn	50	74	116.93	76.31	44.2	43.0	25.0	23.2				
					Ti	22	50	Ba	56	84	97.38	71.76	44.3	43.0	25.0	23.2				
					Cr	24	54	Xe	54	80	106.73	76.67	41.3	42.1	26.0	26.7				
					Fe	26	60	Te	52	76	112.57	76.64	42.4	40.9	29.3	28.5				
78	Pt	191	5.38		He	2	4	Os	76	111	3.09	3.03	24.2	42.8	17.9	18.6	E	217	43	
					Ti	22	53	Ba	56	82	99.40	71.81	42.3	43.0	18.2	19.4				
					Cr	24	56	Xe	54	81	106.09	74.99	42.3	43.1	18.2	19.4				
					Ti	22	55	Xe	54	82	105.83	75.35	42.4	43.5	18.7	19.4				
					Ca	20	48	Ce	58	85	98.68	71.82	42.9	44.7	19.9	20.5				
					Cr	24	57	0	Xe	54	80	90.12	67.47	44.0	44.9	20.0	20.7			
					Ca	20	49	Ce	58	84	105.10	73.74	44.1	44.9	20.0	20.7				
					Fe	26	60	Te	52	79	110.90	76.00	44.5	45.1	20.3	20.9				
78	Pt	192	UNKN		He	2	4	Os	76	112	2.41	2.36	31.2	41.8	12.0	10.6	E	216	22	
					Fe	26	60	Te	52	80	110.31	75.84	45.2	43.7	14.0	12.9				
					Ti	22	54	0	Ba	56	82	97.39	70.00	45.5	44.1	14.3	12.9			
					Ni	28	66	Sn	50	76	115.74	75.95	45.7	44.1	14.5	12.9				
					Cr	24	58	0	Xe	54	80	103.66	72.49	46.3	44.8	15.1	13.6			
					Fe	26	62	0	Ba	56	84	96.45	70.33	46.3	45.0	15.1	13.7			



Parent		Emitted				Daughter				I'					
Z	El A	log(T <sub>1/2</sub> )	C	El Ze Ae Ce	El Zd Nd Cd	Q (MeV)	EK (MeV)	log(I)	log(T')	log(T')	log--	log--	CA	nq	nT
		Tt(s)				(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	TA	TA	TA	TA	
78	Pt 196	UNKN		He 2 4 Fe 26 62 Ni 28 66	Os 76 116 Ta 52 82 Sn 50 78 Sn 50 80	0.80 108.63 114.12 113.55	0.78 74.27 74.53 75.31	94.2 47.6 46.2 48.5	46.3 46.4 46.9	46.3 46.4 46.9	-46.4	-47.9	E 208	3	
78	Pt 197	4.82		He 2 4 Ni 28 68 Ni 28 67 Ni 28 66 Ni 28 69	Os 76 117 Sn 50 79 Sn 50 80 Sn 50 81 Sn 50 78	0.54 113.67 113.49 112.95 113.32	0.52 74.43 74.89 75.11 73.63	142.0 48.6 48.7 49.3 49.4	49.4 49.5 50.1 50.2	49.4 49.5 50.1 50.2	-93.4	-92.5	E 210	4	
78	Pt 198	UNKN		He 2 4 Ni 28 68 Ni 28 66	Os 76 118 Sn 50 80 Sn 50 82	0.09 113.74 112.71	0.08 74.68 75.14	399.3 48.3 49.5	46.7 47.9	46.7 47.9	-351.0	-352.6	E 205	2	
78	Pt 199	3.27		He 2 4 Ni 28 68 Ni 28 67 Ni 28 69	Os 76 119 Sn 50 81 Sn 50 82 Sn 50 80	0.15 112.42 112.92 113.22	0.0 74.66 74.90 73.96	STAB 48.7 49.3 49.4	49.5 50.1	49.5 50.1	-99.0	-98.2	206	3	
78	Pt 200	4.65		He 2 4 Ni 28 68	Os 76 120 Sn 50 82	0.75 113.47	0.0 74.89	STAB 48.5	46.9	46.9	-99.0	-100.6	202	1	
79	Au 177	0.11		Hg 2 4 Be 4 8 O 8 16 Si 14 30 P 15 31 S 16 32 S 16 34 S 16 33	Ir 77 96 Ta 73 92 Re 75 94 Lu 71 90 Tb 65 82 Tm 63 82 Yb 63 81 Eu 63 82	6.29 24.38 12.01 35.75 73.89 71.04 82.51 82.81	6.15 21.6 22.9 24.9 25.1 25.3 27.2 27.7	0.1 21.6 22.9 24.9 25.1 25.3 27.2 27.7	21.6 21.6 22.9 24.9 25.1 25.3 27.2 27.7	21.5	21.5	M 217	155		
79	Au 178	0.42		He 2 4 Be 4 8 O 8 16 S 16 34 P 15 31 S 16 33	Ir 77 97 Ta 73 94 Re 75 96 Lu 71 92 Eu 63 82 Tm 63 82 Yb 63 81 Eu 63 82	6.06 23.73 11.57 34.82 82.94 77.92 83.00 82.00	5.92 23.2 11.05 31.69 67.17 63.89 63.14 66.80	0.4 24.0 25.4 27.4 27.8 28.2 29.9 30.4	24.1 25.5 26.3 26.5 27.2 28.3 29.0 30.4	24.1 25.5 26.3 26.5 27.2 28.3 29.0 30.4	22.8	23.1	M 219	164	
79	Au 179	0.88		He 2 4 Be 4 8 O 8 16 S 16 34 P 15 31 S 16 33	Ir 77 98 Ta 73 94 Re 75 96 Lu 71 92 Eu 63 82 Tm 63 82 Yb 63 81 Eu 63 82	5.99 23.38 11.41 34.49 82.94 77.92 83.00 86.00	5.85 21.81 10.90 31.40 67.17 63.89 63.14 69.18	0.9 24.0 25.4 27.4 27.8 28.2 29.9 30.4	24.0 25.4 27.4 27.8 28.2 29.9 30.4	24.0 25.4 27.4 27.8 28.2 29.9 30.4	23.1	23.1	M 217	158	
79	Au 180	0.91		He 2 4 Be 4 8 O 8 16 S 16 34 P 15 31	Ir 77 99 Ta 73 95 Re 75 97 Lu 71 93 Eu 63 83 Cd 64 83	5.79 22.81 10.94 33.63 81.25 76.04	5.67 21.29 10.45 30.64 65.90 62.10	2.2 25.5 27.5 29.2 30.1 30.4	26.4 28.3 30.3 32.2 32.3	26.4 28.3 30.3 32.2 32.3	23.3	24.2	E 219	164	

Parent		Emitted				Daughter				I'					
Z	El A	log(T <sub>1/2</sub> )	C	El Ze Ae Ce	El Zd Nd Cd	Q (MeV)	EK (MeV)	log(I)	log(T')	log(T')	log--	log--	CA	nq	nT
		Tt(s)				(MeV)	(MeV)	Tt(s)	Tt(s)	Tt(s)	TA	TA	TA	TA	
79	Au 181	1.06		S 16 35 Si 14 30 Cl 17 36	Eu 63 82 Tb 65 85 Sm 62 82	81.04 69.73 85.70	65.29 58.11 68.56	30.9 30.9 31.2	33.0 33.8 33.4	33.0 33.8 33.4	28.7	30.6	M 217	159	
79	Au 181	1.06		He 2 4 Be 4 8 O 8 16 Cl 17 37 S 16 33 P 15 31 Ar 18 38 S 16 34	Ir 77 100 Ta 73 96 Re 75 98 Lu 71 94 Sm 62 82 Eu 63 82 Gd 64 84 Pm 61 82 Eu 63 84	5.74 22.45 10.79 83.59 80.43 74.79 89.85 79.66	5.62 20.96 10.31 30.34 64.74 61.15 70.99 64.69	3.3 26.4 28.1 29.9 31.2 32.2 32.3	26.4 28.1 29.9 31.2 32.2 32.3	26.4 28.1 29.9 31.2 32.2 32.3	23.1	23.1	M 217	159	
79	Au 182	1.34		He 2 4 C 6 12 Be 4 8 O 8 16 S 16 34 Cl 17 37 Cr 24 53 Fe 26 58 Cr 24 54	Ir 77 101 Ta 73 97 Re 75 99 Lu 71 95 Sm 62 83 Cs 55 74 I 53 71 Eu 63 84	5.54 22.00 10.34 72.53 84.09 114.49 121.19 114.53	5.41 20.55 9.88 29.97 67.03 81.15 82.57 80.55	3.7 29.3 30.3 31.8 33.8 34.2 34.4	3.7 29.3 30.3 31.8 33.8 34.2 34.4	28.6	28.9	E 219	164		
79	Au 183	1.64		He 2 4 Be 4 8 O 8 16 V 23 51 Ti 22 50 Cr 24 54 Fe 26 58 Mn 25 55	Ir 77 102 Ta 73 98 Re 75 100 Lu 71 96 Ba 56 76 Cs 55 74 I 53 72 Xe 54 74	5.46 21.41 10.17 132.95 106.82 80.55 113.12 117.44	5.35 20.01 9.72 29.77 77.62 80.55 80.55	4.2 29.3 31.2 32.5 34.4 34.6 34.7	4.2 29.3 31.2 32.5 34.4 34.6 34.7	37.3	30.7	M 217	154		
79	Au 184	1.72		He 2 4 Be 4 8 O 8 16 Ti 22 50 Cr 24 54 Fe 26 58 Mn 25 55	Ir 77 103 Ta 73 99 Re 75 101 Lu 71 97 Cs 55 77 Ba 56 77 Cs 55 76 Ba 56 76	5.29 21.23 10.00 131.61 116.66 80.55 113.12 115.74	5.17 19.85 9.56 28.86 77.62 80.55 80.55	5.4 29.8 32.0 33.6 35.7 36.5 36.8	5.4 29.8 32.0 33.6 35.7 36.5 36.8	34.7	30.5	M 219	156		
79	Au 185	2.41		He 2 4 C 6 12 Ti 22 50 O 8 16 K 19 39 V 23 51 Cr 24 54 Fe 26 58 Mn 25 55	Ir 77 104 Ta 73 100 La 57 78 K 19 39 Ba 56 76 Cs 55 76 I 53 74 Xe 54 76	5.18 20.64 106.25 109.39 80.55 113.16 119.29 115.74	5.07 19.30 77.53 79.13 77.62 80.55 81.33	5.4 31.6 35.0 35.7 36.8 36.7	5.4 31.6 35.0 35.7 36.8 36.7	36.7	31.3	M 217	134		
79	Au 186	2.81		He 2 4 C 6 12 Ti 22 50 Be 4 8	Ir 77 105 Ta 73 101 La 57 79 Lu 71 99	5.15 20.27 105.89 30.49	5.03 18.96 77.42 27.87	6.4 32.7 35.4 36.3	6.4 32.7 35.4 36.3	6.4 32.7 35.4 36.3	26.3	27.3	E 218	141	



Parent		Emitted		Daughter		Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log(T) TA	log(T') TA	CA	nQ	nT
Z	EI A	EI	Zc	Ae	Ce									
79 Au 187	2.68 0	Cr 24 54	112.51	79.85	36.6	39.5	30.2	33.1	E 217 111	28.0	28.2	30.7	33.4	
		Ba 56 78	108.43	78.41	36.6	39.5	30.2	33.1						
		V 23 51	108.49	78.74	36.8	39.6	30.4	33.2						
		Ce 58 79	100.88	74.31	37.1	39.8	30.7	33.4						
79 Au 188	2.72 0	Ir 77 106 0	4.79	4.68	7.6	35.7	28.0	28.0	E 218 106	28.2	28.2	30.8	30.8	
		La 57 80	105.45	77.25	35.9	35.9	28.2	28.2						
		Ce 58 81	101.00	74.67	36.6	39.4	26.3	29.0						
		Ta 73 103	18.95	17.74	37.1	38.1	26.8	27.8						
		Pr 59 81	96.39	71.78	37.6	40.2	27.3	29.9						
		La 57 80	104.33	76.03	37.7	40.4	27.3	30.1						
		Ce 58 82	100.05	74.51	37.7	40.4	27.4	30.1						
		Ba 56 80	107.82	78.00	37.8	40.7	27.5	30.3						
		Ce 58 82	107.82	78.00	37.8	40.7	27.5	30.3						
		Cr 24 54	111.31	79.34	38.0	40.9	27.6	30.6						
79 Au 189	3.23 0	Ir 77 108 0	4.08	4.00	12.5	36.4	23.9	23.9	E 217 77	23.9	23.9	24.2	24.2	
		La 57 82	104.86	77.12	36.4	36.4	24.2	24.2						
		Ce 58 82	100.84	74.70	36.7	37.7	24.2	24.2						
		Pr 59 82	99.73	73.49	38.6	41.8	24.8	24.8						
		Ce 58 82	106.82	77.58	39.0	41.8	22.4	25.2						
		Cs 55 81	110.40	79.02	39.0	41.9	22.4	25.3						
		Ce 58 83	99.10	73.55	39.2	41.9	22.6	25.3						
		La 57 83	102.86	75.79	39.2	42.0	22.9	25.4						
		Pr 59 83	102.79	74.51	40.1	42.1	22.9	25.4						
		Ba 56 81	106.69	76.93	39.5	42.3	22.9	25.7						
79 Au 190	3.41	Ir 77 109	3.85	3.77	16.6	40.5	21.1	23.9	E 217 79	23.9	21.1	23.9	23.9	
		La 57 82	104.07	76.13	37.7	40.5	21.1	23.9						
		Ce 58 82	109.61	78.62	40.0	40.0	21.4	21.4						
		Ba 56 82	109.61	78.62	40.0	40.0	21.4	21.4						
		Cs 55 80	106.24	76.76	40.0	40.0	21.4	21.4						
		Pr 59 84	93.41	69.54	41.6	41.6	22.8	22.8						
		Ce 58 84	93.41	69.54	41.6	41.6	22.8	22.8						
		La 57 80	111.72	76.39	42.1	42.1	23.5	23.5						
		Pr 59 80	111.72	76.39	42.1	42.1	23.5	23.5						
		La 57 81	114.98	78.86	42.2	42.2	23.7	23.7						
79 Au 191	4.06	Ir 77 110 0	3.43	3.35	18.5	39.8	21.4	21.2	E 217 57	21.2	21.4	21.4	21.4	
		La 57 82	102.82	74.83	39.8	39.8	21.4	21.4						
		Ce 58 82	109.61	78.62	40.0	40.0	21.4	21.4						
		Ba 56 82	109.61	78.62	40.0	40.0	21.4	21.4						
		Cs 55 80	106.24	76.76	40.0	40.0	21.4	21.4						
		Pr 59 84	93.41	69.54	41.6	41.6	22.8	22.8						
		Ce 58 84	93.41	69.54	41.6	41.6	22.8	22.8						
		La 57 80	111.72	76.39	42.1	42.1	23.5	23.5						
		Pr 59 80	111.72	76.39	42.1	42.1	23.5	23.5						
		La 57 81	114.98	78.86	42.2	42.2	23.7	23.7						
79 Au 192	4.25	Ir 77 111	3.13	3.06	25.1	44.2	16.1	19.1	E 217 55	19.1	16.1	19.1	19.1	
		La 57 82	108.87	77.68	41.2	44.2	16.1	19.1						
		Ce 58 82	105.37	75.73	41.5	44.4	16.3	19.3						
		Ba 56 82	105.37	75.73	41.5	44.4	16.3	19.3						
		Cs 55 81	108.86	77.11	41.5	44.5	16.4	19.4						

Parent		Emitted		Daughter		Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log(T) TA	log(T') TA	CA	nQ	nT
Z	EI A	EI	Zc	Ae	Ce									
79 Au 193	4.80 0	Ti 22 53	101.27	73.32	42.3	45.2	17.2	20.1	E 217 39	20.1	17.2	20.1	20.1	
		La 57 82	101.00	73.66	42.4	45.3	17.3	20.1						
		Xe 54 81	111.20	78.19	42.7	45.8	17.6	20.7						
		Mn 25 58	114.32	78.60	43.0	46.2	17.9	21.1						
79 Au 194	5.15	Ir 77 112	2.54	2.49	30.0	42.1	12.1	12.1	E 217 36	12.1	12.1	12.1	12.1	
		Cs 55 82	108.36	76.92	42.1	42.1	12.1	12.1						
		Xe 54 82	113.83	78.48	43.7	43.7	13.7	13.9						
		Ra 56 82	109.94	74.32	43.8	43.8	13.8	13.8						
		Sb 51 76	119.24	78.47	44.4	44.4	14.3	14.3						
		Xe 54 80	110.11	76.45	44.8	44.8	14.8	14.8						
		Fe 26 58	112.47	78.67	45.1	45.1	15.0	15.0						
		Ni 28 64	118.24	79.03	45.4	45.4	15.4	15.4						
		He 2 4	2.02	1.98	46.0	46.0	-1.6	1.7						
		Cr 24 56	106.17	75.19	44.6	47.7	-1.5	1.7						
79 Au 195	7.20	Ir 77 113	1.70	1.67	48.8	45.1	-3.7	-3.7	E 216 13	-3.7	-3.7	-3.7	-3.7	
		Cs 55 83	112.63	77.97	45.1	45.7	-3.1	-3.1						
		Xe 54 82	109.32	76.24	45.7	45.7	-3.0	-3.0						
		Sb 51 78	118.07	78.11	45.8	45.8	-2.8	-2.8						
		Cs 55 82	106.02	74.49	46.1	46.3	-2.5	-2.5						
		Fe 26 62	112.21	76.54	46.3	46.3	-2.5	-2.5						
		Co 27 63	114.46	77.48	47.0	47.0	-1.8	-1.8						
		Ni 28 68	117.60	76.59	47.0	47.0	-1.8	-1.8						
		Sb 51 76	116.53	76.28	47.7	47.7	-1.1	-1.1						
		He 2 4	1.27	1.24	74.6	50.1	-27.7	-24.5						
79 Au 196	5.73	Ir 77 115	1.27	1.24	74.6	50.1	-27.7	-24.5	E 214 16	-24.5	-27.7	-24.5	-24.5	
		La 57 82	111.54	76.44	47.1	47.1	-36.5	-36.5						
		Fe 26 61	111.70	76.37	47.0	50.2	-27.6	-24.3						
		Ni 28 66	117.22	77.75	47.0	50.3	-27.4	-24.0						
		Sb 51 79	117.21	77.14	47.2	50.6	-26.9	-23.8						
		Cs 55 82	108.17	75.05	47.7	50.8	-26.9	-23.8						
		Xe 54 82	116.92	76.35	47.9	51.3	-26.5	-23.3						
		Mn 25 60	113.86	76.11	48.1	51.3	-26.5	-23.3						
		Co 27 64	113.86	76.11	48.1	51.3	-26.5	-23.3						
		Te 52 81	113.86	76.11	48.1	51.3	-26.5	-23.3						
79 Au 197	UNNA	Ir 77 116	0.95	0.93	83.6	47.1	-36.5	-36.5	E 212 6	-36.5	-36.5	-36.5	-36.5	
		La 57 82	111.54	76.44	47.1	47.1	-36.5	-36.5						
		Sb 51 80	116.88	77.72	47.3	47.3	-35.9	-35.9						
		Ni 28 68	116.95	76.58	47.7	47.7	-34.7	-34.7						
		Co 27 63	113.08	76.92	48.9	48.9	-34.7	-34.7						
		Te 52 82	113.21	75.86	49.2	49.2	-33.8	-33.8						
		Fe 26 65	113.21	75.86	49.2	49.2	-33.8	-33.8						
		Sb 51 82	114.97	77.02	49.8	49.8	-33.8	-33.8						
		He 2 4	0.51	0.50	155.0	51.7	-106.7	-103.3						
		79 Au 198	5.37	Ir 77 117	0.51	0.50	155.0	51.7						
La 57 82	116.16			76.45	48.6	51.9	-106.4	-103.1						
Sb 51 80	116.16			76.45	48.6	51.9	-106.4	-103.1						
Ni 28 67	116.24			76.32	48.7	52.1	-106.3	-102.9						
Co 27 64	116.24			76.32	48.7	52.1	-106.3	-102.9						
Te 52 82	116.24			76.32	48.7	52.1	-106.3	-102.9						
Fe 26 64	116.24			76.32	48.7	52.1	-106.3	-102.9						
Sb 51 79	116.24			76.32	48.7	52.1	-106.3	-102.9						
Ni 28 68	116.24			76.32	48.7	52.1	-106.3	-102.9						
Co 27 64	116.24			76.32	48.7	52.1	-106.3	-102.9						



Parent Z E I A	Emitted				Daughter				Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log(T) T(s)	log(T') T'(s)	I <sub>T</sub>		
	EI	Z	A	log(T) T(s)	EI	Z	A	log(T) T(s)								CA	nq
79 Au 199	He	2	4	5.43	Ir	77	118	0.16	0.15	285.9	48.3	-237.6	-237.6	E	208	2	
	Ni	28	68		Sb	51	80	116.38	77.61	48.5	48.5	-237.4	-237.4				
	Ni	28	66		Sb	51	82	115.95	77.49	48.5	48.5						
79 Au 200	He	2	4	3.46	Ir	77	119	-0.29	0.0	STAB				208	2		
	Ni	28	68		Sb	51	81	115.89	76.79	48.9	52.7	-99.0	-95.6				
	Ni	28	67		Sb	51	82	115.46	76.78	49.4	52.7	-99.0	-95.6				
79 Au 201	He	2	4	3.20	Ir	77	120	-0.55	0.0	STAB				204	1		
	Ni	28	68		Sb	51	82	116.11	76.83	48.4	48.4	-99.0	-99.0				
	He	2	4		Pt	78	95	0	6.73	6.58	-0.8	18.9	19.5	19.7			
80 Hg 177	He	2	4	-0.77	W	74	91	0	26.08	24.31	18.7	20.2	20.6	21.9			
	Be	4	8		Os	76	93	0	13.00	12.41	20.0	20.2	20.6	21.9			
	Be	4	8		Hf	72	89	0	38.58	34.82	23.3	22.7	23.1	23.5			
	Si	14	29		Dy	66	82	0	76.44	64.35	22.4	22.8	23.0	23.6			
	Si	14	30		Dy	66	81	0	76.06	63.17	24.0	24.4	24.7	25.2			
	S	16	32		Gd	64	81	0	86.03	70.47	25.1	25.6	25.9	26.4			
	S	16	34		Gd	64	80	0	85.55	69.21	26.6	26.3	26.6	27.0			
	Si	14	29		Er	68	85	0	61.66	53.30	25.9	26.3	26.6	27.0			
	He	2	4	-0.33	Pt	78	96	0	6.58	6.43	-0.2	19.3	20.0	19.6			
	Be	4	8		W	74	92	0	25.58	23.85	19.8	20.8	21.4	21.1			
	Be	4	8		Os	76	94	0	12.67	12.10	21.2	20.8	21.4	21.1			
	O	8	16		Hf	72	90	0	37.59	34.57	22.8	22.9	24.1	23.2			
Si	14	30		Dy	66	82	0	77.21	62.61	24.9	24.3	25.2	24.3				
Si	14	32		Dy	66	80	0	74.49	62.78	24.9	24.3	25.2	24.3				
S	16	34		Dy	66	81	0	85.79	70.37	25.3	24.3	25.5	24.6				
Si	14	29		Gd	64	80	0	85.55	69.21	26.6	25.6	26.1	26.6				
Si	14	29		Gd	64	83	0	73.46	61.49	27.0	26.1	27.2	26.3				
80 Hg 178	He	2	4	0.04	Pt	78	97	0	6.43	6.28	0.0	20.7	20.4	20.7			
	Be	4	8		W	74	93	0	25.26	23.57	20.5	21.9	21.5	21.7			
	Be	4	8		Os	76	95	0	12.52	11.76	21.7	21.9	21.5	21.8			
	O	8	16		Hf	72	91	0	37.21	32.61	24.9	25.4	25.9	26.4			
	Si	14	30		Dy	66	82	0	85.58	69.80	25.9	26.4	25.9	26.4			
	Si	14	32		Dy	66	80	0	85.58	69.80	25.9	26.4	25.9	26.4			
	S	16	34		Dy	66	84	0	74.11	62.10	25.9	26.4	25.9	26.4			
	S	16	36		Gd	64	81	0	85.77	69.48	26.1	26.6	26.1	26.6			
	Si	14	28		Oy	66	85	0	73.28	61.82	26.5	27.0	26.5	26.9			
	He	2	4	0.46	Pt	78	98	0	6.25	6.12	0.5	21.4	21.4	21.0			
	Be	4	8		W	74	94	0	24.65	23.01	21.9	23.0	21.5	21.7			
	Be	4	8		Os	76	96	0	12.06	11.52	23.5	23.1	23.5	23.0			
O	8	16		Hf	72	92	0	36.77	33.97	26.0	25.0	25.5	25.0				
Si	14	30		Dy	66	84	0	73.50	61.25	27.3	26.4	26.8	25.9				
Si	14	32		Dy	66	82	0	85.79	70.37	25.3	26.4	25.5	25.9				
S	16	34		Xe	54	70	0	128.00	88.18	29.0	27.5	28.5	27.1				
Si	14	28		Oy	66	86	0	71.36	60.26	29.2	28.3	28.7	27.9				
Si	14	28		Te	52	66	0	134.13	87.93	29.3	27.7	28.8	27.3				
80 Hg 180	He	2	4	0.56	Pt	78	99	0	6.28	6.15	1.3	23.0	21.5	21.7			
	Be	4	8		W	74	95	0	24.26	22.95	25.8	23.0	21.5	21.7			
	Be	4	8		Os	76	97	0	11.84	12.38	28.2	24.5	24.8	25.1			
	O	8	16		Hf	72	93	0	36.48	33.68	27.4	27.9	26.1	26.6			
	Si	14	30		Dy	66	84	0	84.68	68.77	27.4	29.1	27.2	27.7			
	Si	14	32		Dy	66	82	0	84.68	67.91	28.5	29.1	27.2	27.7			
	S	16	34		Gd	64	82	0	84.19	67.91	28.5	29.0	27.2	27.7			
	Si	14	30		Oy	66	85	0	72.57	60.55	28.5	29.0	27.2	27.7			
	Si	14	30		Sm	62	81	0	93.48	73.85	29.7	30.3	28.4	29.0			
	He	2	4	0.94	Pt	78	101	0	6.04	5.90	2.8	25.2	22.2	22.4			
	Be	4	8		W	74	97	0	23.35	21.82	25.0	25.2	24.1	24.3			
	Be	4	8		Os	76	99	0	11.24	10.75	27.0	27.2	24.1	24.3			
O	8	16		Hf	72	95	0	32.22	21.52	28.8	29.1	26.0	26.3				
Si	14	30		Dy	66	84	0	82.69	64.92	31.5	32.0	28.7	29.2				
Si	14	32		Dy	66	82	0	82.69	64.92	31.5	32.4	28.9	29.6				
S	16	34		Xe	54	72	0	125.45	86.38	31.9	31.9	29.1	27.6				
Si	14	30		Gd	64	82	0	81.24	66.78	30.2	29.0	27.9	26.9				
Si	14	30		Dy	66	86	0	71.04	59.33	30.8	29.6	28.7	27.1				
Fe	26	56		Xe	54	72	0	126.25	87.40	30.9	29.4	28.8	27.3				
80 Hg 183	He	2	4	0.94	Pt	78	101	0	6.04	5.90	2.8	25.2	22.2	22.4			
	Be	4	8		W	74	97	0	23.35	21.82	25.0	25.2	24.1	24.3			
	Be	4	8		Os	76	99	0	11.24	10.75	27.0	27.2	24.1	24.3			
	O	8	16		Hf	72	95	0	32.22	21.52	28.8	29.1	26.0	26.3			
	Si	14	30		Dy	66	84	0	82.69	64.92	31.5	32.0	28.7	29.2			
	Si	14	32		Dy	66	82	0	82.69	64.92	31.5	32.4	28.9	29.6			
	S	16	34		Xe	54	72	0	125.45	86.38	31.9	31.9	29.1	27.6			
	Si	14	30		Gd	64	82	0	81.24	66.78	30.2	29.0	27.9	26.9			
	Si	14	30		Dy	66	86	0	71.04	59.33	30.8	29.6	28.7	27.1			
	Fe	26	56		Xe	54	72	0	126.25	87.40	30.9	29.4	28.8	27.3			
	80 Hg 184	He	2	4	1.49	Pt	78	102	0	5.66	5.54	3.4	26.2	23.3	22.9		
		Be	4	8		W	74	98	0	22.71	21.23	26.7	26.2	23.3	22.9		
Be		4	8		Os	76	100	0	10.83	10.36	28.8	28.4	25.5	25.1			
O		8	16		Hf	72	96	0	30.83	29.53	30.1	29.6	26.8	26.2			
Si		14	29		Dy	66	82	0	125.09	80.76	30.1	31.0	29.1	27.6			
Si		14	30		Dy	66	80	0	125.09	80.76	30.1	31.0	29.1	27.6			
S		16	34		Dy	66	84	0	117.97	84.37	32.7	31.3	29.4	27.9			
Si		14	30		Te	52	70	0	117.97	83.35	32.7	31.3	29.4	27.9			
Si		14	30		Te	52	70	0	110.79	86.72	32.9	31.3	29.5	29.9			
Te		52	72		Ce	58	76	0	110.04	80.13	33.0	31.7	29.6	28.3			
80 Hg 185		He	2	4	1.70	Pt	78	103	0	5.78	5.66	3.3	27.3	23.8	24.0		
		Be	4	8		W	74	99	0	22.54	21.08	27.1	27.3	23.5	23.7		
	Be	4	8		Os	76	101	0	10.35	10.35	28.8	29.1	25.5	25.0			
	O	8	16		Hf	72	97	0	33.82	30.82	30.0	31.2	27.6	27.9			
	Si	14	29		Dy	66	82	0	117.9								



Parent		Emitted				Daughter				Q		EK		log(T')		log(T)		T'		
Z	EI A	EI	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	(MeV)	log(T')	log(T)	TA	TA	log--	log--	CA	nQ nT	
												T'(s)	T'(s)	TA	TA					
80 Hg 188	2.29	Ti 22 49			Ce 58 80				107.96	79.67	35.1	35.8	27.5	28.2						
		Fe 26 58			Xe 54 75				122.68	84.63	35.2	35.9	27.6	28.3						
		C 6 12			W 74 106				0	4.70	4.60	8.5	32.7	24.6	24.2					E 217 113
		Ti 22 50			Ba 56 80				20.48	19.17	34.2	32.7	25.6	24.2						
		Cr 24 54			Ce 58 80				108.80	79.86	34.1	33.8	26.6	25.2						
		Cr 24 54			Ba 56 78				115.70	82.47	35.2	33.8	27.5	26.3						
		Ca 20 46			Nd 60 82				98.90	74.70	36.1	34.6	27.6	26.1						
		Fe 26 58			Xe 54 76				121.83	84.25	36.1	34.6	28.0	27.4						
		O 8 16			Hf 72 100				30.93	28.29	36.5	35.9	28.0	26.9						
		Cr 24 52			Ba 56 80				114.12	92.56	36.8	35.5	28.3	27.0						
Ti 22 48			Ce 58 82				106.38	79.22	36.8	35.5	28.3	27.0								
80 Hg 189	2.66	Hg 2 4			Pt 78 107				4.58	4.49	10.7	34.6	23.2	23.9						E 218 120
		C 6 12			Ce 58 81				108.80	80.02	34.3	34.6	23.5	23.8						
		Ti 22 50			W 74 103				20.13	18.85	34.3	34.5	23.5	23.8						
		Cr 24 54			Ba 56 80				114.54	81.99	36.5	35.1	23.8	22.6						
		Cr 24 54			Ce 58 79				98.87	73.90	36.5	35.3	23.9	22.6						
		Ti 22 51			Ce 58 80				107.70	78.64	35.8	36.5	25.1	25.8						
		Ti 22 49			Ce 58 82				107.05	79.29	36.1	36.8	25.4	26.0						
		Cr 24 53			Ba 56 80				114.59	82.46	36.3	37.0	25.6	26.3						
		Ca 20 47			Nd 60 82				98.70	74.16	36.7	37.4	26.1	24.7						
		Ca 20 48			Nd 60 81				98.83	73.73	36.7	37.4	26.0	26.7						
80 Hg 190	3.08	Hg 2 4			Pt 78 108				4.13	4.04	12.7	33.3	21.9	20.6						
		Ti 22 50			Ce 58 82				108.21	79.74	34.6	33.3	21.9	20.6						
		C 6 12			W 74 104				20.13	18.85	34.3	35.1	23.8	22.6						
		Cr 24 54			Ba 56 80				114.54	81.99	36.5	35.3	23.9	22.6						
		Cr 24 54			Ce 58 81				98.87	73.90	36.5	35.3	23.9	22.6						
		Ti 22 51			Ce 58 80				107.70	78.64	35.8	36.5	25.1	25.8						
		Ti 22 49			Ce 58 82				107.05	79.29	36.1	36.8	25.4	26.0						
		Cr 24 53			Ba 56 80				114.59	82.46	36.3	37.0	25.6	26.3						
		Ca 20 47			Nd 60 82				98.70	74.16	36.7	37.4	26.1	24.7						
		Ca 20 48			Nd 60 81				98.83	73.73	36.7	37.4	26.0	26.7						
80 Hg 191	3.48	Hg 2 4			Pt 78 109				3.86	3.78	16.8	36.8	19.3	20.0						
		Ti 22 51			Ce 58 82				107.28	78.63	36.1	36.8	19.3	20.0						
		Cr 24 54			Ba 56 81				114.13	81.86	36.9	37.6	20.1	20.8						
		Ti 22 52			Ce 58 80				105.55	76.97	38.8	37.4	19.6	18.2						
		Cr 24 56			Ba 56 82				112.20	79.47	40.1	38.6	20.9	19.4						
		Fe 26 60			Xe 54 78				118.70	81.60	40.4	38.9	21.2	19.7						
		Ti 22 50			Ce 58 84				103.97	76.89	40.5	39.1	21.3	19.8						
		Fe 26 58			Nd 54 80				116.56	75.92	40.7	39.4	21.5	20.2						
		Ca 20 48			Nd 62 82				124.09	82.73	41.1	39.5	21.9	20.3						
		Ni 28 64			W 74 105				18.77	17.59	39.0	39.2	22.2	22.4						
80 Hg 192	4.25	Hg 2 4			Pt 78 110				3.41	3.34	19.2	36.6	18.9	17.4						
		Cr 24 54			Pa 56 82				113.21	81.37	38.1	36.6	18.9	17.4						
		Ti 22 52			Ce 58 82				105.55	76.97	38.8	37.4	19.6	18.2						
		Cr 24 56			Ba 56 80				112.20	79.47	40.1	38.6	20.9	19.4						
		Fe 26 60			Xe 54 78				118.70	81.60	40.4	38.9	21.2	19.7						
		Ti 22 50			Ce 58 84				103.97	76.89	40.5	39.1	21.3	19.8						
		Fe 26 58			Nd 54 80				116.56	75.92	40.7	39.4	21.5	20.2						
		Ca 20 48			Nd 62 82				124.09	82.73	41.1	39.5	21.9	20.3						
		Ni 28 64			W 74 105				18.77	17.59	39.0	39.2	22.2	22.4						
		Hg 2 4			Pt 78 111				2.92	2.86	28.0	40.3	11.6	12.3						
80 Hg 193	4.10	Hg 2 4			Pt 78 111				2.92	2.86	28.0	40.3	11.6	12.3						
		Cr 24 55			Ba 56 82				112.23	79.42	39.6	41.1	12.4	13.1						
		Cr 24 56			Ba 56 81				111.88	78.42	40.4	41.1	12.4	13.1						
		Ti 22 52			Ce 58 83				103.76	75.80	41.3	42.0	13.3	14.0						
		Fe 26 60			Xe 54 79				117.92	81.26	41.3	42.1	13.3	14.1						
		Fe 26 58			Xe 54 81				117.51	82.20	41.4	42.2	13.4	14.2						

Parent		Emitted				Daughter				Q		EK		log(T')		log(T)		T'		
Z	EI A	EI	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	(MeV)	log(T')	log(T)	TA	TA	log--	log--	CA	nQ nT	
												T'(s)	T'(s)	TA	TA					
80 Hg 194	10.06	Fe 26 59			Xe 54 80				117.64	81.67	41.5	42.3	13.5	14.3						
		Cr 24 54			Ba 56 83				110.71	79.73	41.5	42.2	13.5	14.2						
		Ti 22 53			Ce 58 82				103.77	75.27	41.6	42.3	13.6	14.3						
		Hg 2 4			Pt 78 112				2.67	2.62	28.5	39.6	12.5	11.1						E 217 33
		Fe 26 60			Ba 56 82				117.29	79.19	41.1	40.6	13.6	12.1						
		Cr 24 56			Xe 54 80				116.34	81.56	42.9	41.4	14.4	12.9						
		Ni 28 66			Te 52 76				122.78	81.01	43.1	41.5	14.6	12.9						
		Ni 28 64			Te 52 78				122.21	81.89	43.5	41.9	14.9	13.3						
		Ti 22 52			Ce 58 84				101.77	74.49	44.2	42.9	15.7	14.3						
		Fe 26 62			Xe 54 78				115.95	78.89	44.6	43.1	16.1	14.6						
80 Hg 195	4.53	Mn 25 57			Cs 55 82				111.81	78.96	45.2	43.7	16.7	15.2						
		He 2 4			Pt 78 113				2.21	2.17	41.2	43.4	1.4	2.9						
		Fe 26 60			Xe 54 81				116.65	80.89	42.6	43.4	1.4	2.9						
		Cr 24 57			Ba 56 82				109.90	77.77	43.4	44.3	2.4	3.1						
		Fe 26 59			Xe 54 82				116.02	80.92	43.6	44.3	2.4	3.1						
		Ni 28 66			Te 52 77				121.97	79.69	44.1	44.9	2.9	3.8						
		Ni 28 61			Xe 54 80				115.97	79.69	44.2	45.0	3.0	3.8						
		Cr 24 56			Ba 56 83				109.15	77.80	44.2	44.9	3.0	3.7						
		Ni 28 65			Te 52 78															



Parent		Emitted		Daughter		T <sub>1/2</sub>		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )		CA		nT		
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	A	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log <sub>10</sub> (T <sub>1/2</sub> )	log <sub>10</sub> (T <sub>1/2</sub> )	CA	nT	
			log(T <sub>1/2</sub> )					(MeV)	(MeV)	T <sub>1/2</sub> (s)	T <sub>1/2</sub> (s)	TA	TA			
80	Hg	200	UNKN		Pt	78	118	0.72	0.70	106.1	46.3	-58.2	-59.8	E	210 2	
					Te	52	82	118.91	79.67	47.9	46.4	-58.1	-59.8			
					Te	52	80	119.17	78.65	48.0						
80	Hg	201	UNKN		Pt	78	119	0.33	0.33	204.7	26.3	22.5	23.5	E	210 3	
					Te	52	81	118.78	78.66	48.5	49.3	-156.3	-155.4			
					Te	52	82	118.46	78.98	48.7	49.6	-156.0	-155.2			
					Te	52	80	117.99	77.49	50.0	50.8	-154.6	-153.9			
80	Hg	202	UNMA		Pt	78	120	0.13	0.13	317.5	47.1	-268.7	-270.4	E	204 1	
					Te	52	82	118.52	78.62	48.7						
81	Tl	186	1.42	0	Au	79	103	0	5.88	5.76	25.8	26.3	22.5	23.5	E	219 173
					Rn	75	103	0	21.07	20.8	26.6	26.6	22.4	22.4		
					Ir	77	102	0	10.95	10.48	29.1	29.1	24.9	24.9		
					Be	4	6	0	11.33	10.84	27.4	28.2	24.6	25.2		
					O	8	16	0	35.05	32.03	28.4	29.6	25.5	26.7		
					Cr	24	52	0	120.66	86.93	31.6	34.5	28.8	31.8		
					Cr	24	53	0	120.83	86.40	31.7	34.6	28.8	31.8		
					Fe	26	58	0	128.06	88.13	31.7	34.9	28.9	32.0		
					Mn	25	55	0	124.41	87.62	31.8	34.8	28.9	32.0		
					V	23	51	0	116.84	84.80	31.8	34.7	28.9	31.8		
81	Tl	187	1.65	0	Au	79	104	0	5.57	5.46	44.2	26.6	22.4	22.4	E	219 164
					Rn	75	104	0	23.11	21.65	26.6	26.6	22.4	22.4		
					Ir	77	102	0	10.95	10.48	29.1	29.1	24.9	24.9		
					Be	4	6	0	11.33	10.84	27.4	28.2	24.6	25.2		
					O	8	16	0	34.15	31.23	30.3	30.3	26.1	26.1		
					V	23	51	0	116.57	84.78	32.0	32.0	27.8	27.8		
					Mn	25	55	0	112.09	82.28	32.6	35.4	26.8	29.6		
					Fe	26	58	0	124.03	87.55	32.1	32.1	27.9	27.9		
					Ti	22	50	0	127.56	87.99	32.2	32.2	28.0	28.0		
					Cr	24	52	0	112.50	82.42	32.2	32.2	28.0	28.0		
					Cr	24	53	0	120.37	85.61	32.3	32.3	28.1	28.1		
81	Tl	188	1.86	0	Au	79	105	0	5.35	5.23	5.9	28.6	21.8	22.7	E	220 166
					Rn	75	105	0	22.71	21.26	27.6	28.6	21.8	22.7		
					Ir	77	103	0	10.54	10.09	31.1	32.0	25.3	26.1		
					Be	4	6	0	11.87	11.87	32.8	32.8	25.6	25.6		
					O	8	16	0	32.83	30.05	33.2	33.2	26.0	26.0		
					V	23	51	0	115.37	84.24	33.3	33.3	26.1	26.1		
					Cr	24	54	0	10.12	9.69	33.3	33.3	26.1	26.1		
					Cr	24	54	0	119.20	85.15	33.6	33.6	26.4	26.4		
					Mn	25	55	0	122.88	86.00	34.1	34.1	26.9	26.9		
					Fe	26	58	0	125.83	87.22	34.2	34.2	27.0	27.0		
81	Tl	189	2.14	0	Au	79	106	0	5.02	4.92	7.2	30.1	23.0	23.0	E	218 145
					Rn	75	106	0	21.83	20.44	30.1	30.1	23.0	23.0		
					Ir	77	104	0	10.54	10.09	31.1	32.0	25.3	26.1		
					Be	4	6	0	11.87	11.87	32.8	32.8	25.6	25.6		
					O	8	16	0	33.74	30.87	31.2	32.3	26.0	26.0		
					V	23	50	0	112.09	82.28	32.6	35.4	26.8	29.6		
					Cr	24	54	0	119.73	85.34	33.0	36.0	27.2	30.2		
					Cr	24	54	0	115.64	84.27	33.1	35.9	27.2	30.1		
					Cr	24	53	0	119.49	85.80	33.1	36.1	27.2	30.2		
					Fe	26	58	0	126.54	87.50	33.4	36.5	27.5	30.7		
81	Tl	190	2.19	0	Au	79	107	0	4.45	4.36	11.9	33.3	20.5	21.5	E	218 146
					Rn	75	107	0	21.09	19.76	32.4	33.3	20.5	21.5		
					Ir	77	105	0	10.54	10.09	31.1	32.0	25.3	26.1		
					Be	4	6	0	11.87	11.87	32.8	32.8	25.6	25.6		
					O	8	16	0	32.83	30.05	33.2	33.2	26.0	26.0		
					V	23	51	0	114.47	83.75	34.3	37.2	22.4	24.2		
					Cr	24	54	0	118.27	84.66	34.7	37.6	22.8	25.9		
					Cr	24	52	0	118.31	83.03	34.8	37.7	23.0	25.9		
					Ti	22	49	0	109.88	81.55	35.0	37.8	23.2	26.0		

Parent		Emitted		Daughter		T <sub>1/2</sub>		log <sub>10</sub> (T <sub>1/2</sub> )		log <sub>10</sub> (T <sub>1/2</sub> )		CA		nT		
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	A	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log <sub>10</sub> (T <sub>1/2</sub> )	log <sub>10</sub> (T <sub>1/2</sub> )	CA	nT	
			log(T <sub>1/2</sub> )					(MeV)	(MeV)	T <sub>1/2</sub> (s)	T <sub>1/2</sub> (s)	TA	TA			
81	Tl	192	2.80	0	Sc	21	49	81	106.07	78.71	35.1	37.8	23.2	25.9		
					Cr	24	53	81	117.71	84.88	35.2	38.1	23.3	26.3		
					He	2	4	81	4.05	4.05	14.9	38.4	20.5	23.5	E	219 114
					Cr	24	54	81	117.49	84.45	35.2	38.4	20.5	23.5		
					Ti	22	50	81	103.56	82.86	35.2	38.5	21.0	23.9		
					V	23	50	81	109.25	80.80	35.9	38.8	21.0	23.9		
					C	6	12	81	19.88	18.64	36.2	37.3	21.3	22.3		
					Cr	24	53	81	116.55	84.38	36.4	39.4	21.5	24.5		
					V	23	53	81	112.85	81.70	36.9	39.8	21.9	24.9		
					Sc	21	49	81	104.60	77.90	36.9	39.6	22.0	24.7		
81	Tl	193	3.13		Au	79	110	0	3.91	3.83	15.1	36.4	21.2	21.2	E	217 80
					La	57	82	81	112.48	81.59	37.9	37.2	23.1	22.1		
					Pr	59	82	81	108.03	78.92	38.2	38.2	23.1	23.1		
					Fe	26	58	81	122.36	85.59	38.5	38.5	23.4	23.4		
					Mn	25	57	81	118.94	83.61	38.5	38.5	23.4	23.4		
					Mn	25	55	81	118.52	84.75	38.6	38.6	23.5	23.5		
					Ti	22	50	81	107.04	79.31	39.0	39.0	23.8	23.8		
					C	6	12	81	19.10	17.91	39.0	39.0	23.9	23.9		
81	Tl	194	3.30	0	Au	79	111	0	3.38	3.31	22.9	41.6	15.6	18.6	E	217 75
					La	57	82	81	115.25	82.58	38.9	41.6	16.4	19.4		
					Pr	59	82	81	118.09	84.00	39.3	42.5	16.4	19.4		
					Cs	55	81	81	121.42	85.12	39.4	42.5	16.6	19.7		
					Mn	25	57	81	118.13	83.42	39.5	42.6	16.6	19.7		
					Cr	24	56	81	114.73	81.61	39.6	42.6	16.6	19.7		
					V	23	54	81	110.89	80.02	39.7	42.6	16.7	19.7		
					Cr	24										







Parent Z E I A	log(T <sub>1/2</sub> ) Tt(s)	Emitted				Daughter				Q (MeV)	EK (MeV)	log(T <sub>1/2</sub> ) Tt(s)	log(T <sub>1/2</sub> ) TA	log-- log--	CA	nQ	nT
		E I	Ae	Ce	Ze	E I	Zd	Nd	Cd								
82 Pb 193	2.38	0	He 2 4	Cr 26 54	Hg 80 109	0	4.93	4.82	9.8	33.1	22.9	23.2	E 219	128			
			Cr 26 54	Ni 28 61	Ce 58 81	Os 76 106	121.65	87.62	32.9	33.7	23.0	23.6					
			Ti 22 51	Nd 60 82	Ce 58 82	Os 76 106	113.44	83.46	33.4	34.1	23.5	24.2					
			Cr 24 53	Nd 60 83	Ce 58 82	Os 76 106	121.12	87.86	33.4	34.1	23.5	24.2					
			Fe 26 58	Nd 60 83	Ce 58 82	Os 76 106	113.19	83.86	33.4	34.1	23.5	24.2					
			Cr 24 55	Nd 60 82	Ce 58 80	Os 76 106	127.77	89.38	34.4	35.2	24.6	25.3					
			Fe 26 59	Nd 60 82	Ce 58 80	Os 76 106	120.43	86.11	34.8	35.6	24.9	25.7					
							127.38	88.44	35.2	36.0	25.3	26.1					
82 Pb 194	2.82	0	He 2 4	Cr 26 54	Hg 80 110	0	4.63	4.54	10.1	32.5	23.8	23.3	E 218	90			
			Cr 26 54	Ni 28 61	Ce 58 82	Os 76 106	120.78	87.16	33.9	34.0	23.8	23.9					
			Fe 26 58	Nd 60 82	Ce 58 82	Os 76 106	126.82	88.91	35.5	35.3	25.6	25.1					
			C 6 12	Os 76 106	Ce 58 82	Os 76 106	20.36	19.10	35.8	35.3	25.6	25.1					
			Ti 22 50	Nd 60 84	Ce 58 82	Os 76 106	110.94	82.35	36.3	35.0	26.2	24.8					
			Ni 28 64	Xe 54 76	Ce 58 82	Os 76 106	132.74	88.95	36.6	34.9	26.4	24.8					
			Ti 22 52	Nd 60 82	Ce 58 84	Os 76 106	111.18	81.38	36.6	35.2	26.5	25.1					
			Fe 26 60	Nd 60 82	Ce 58 84	Os 76 106	116.02	84.06	40.2	38.7	26.3	24.8					
			Cr 24 54	Nd 60 82	Ce 58 84	Os 76 106	129.42	88.98	40.3	38.7	26.3	24.8					
			Fe 26 59	Nd 60 81	Ce 58 80	Os 76 106	122.95	85.94	40.3	39.3	26.9	25.3					
82 Pb 196	3.35	0	He 2 4	Cr 26 58	Hg 80 112	0	4.12	4.04	13.9	36.2	23.8	22.3	E 217	60			
			Cr 26 58	Ni 28 62	Ce 58 82	Os 76 106	124.98	87.99	37.7	36.6	24.2	22.7					
			Fe 26 60	Nd 60 82	Ce 58 82	Os 76 106	117.93	84.24	38.1	36.6	24.2	22.7					
			Fe 26 60	Nd 60 82	Ce 58 80	Os 76 106	124.87	86.64	38.4	36.8	24.4	22.9					
			Ni 28 64	Xe 54 78	Ce 58 80	Os 76 106	130.94	88.18	38.7	37.1	24.7	23.1					
			Ti 22 50	Nd 60 84	Ce 58 80	Os 76 106	130.46	86.53	39.8	38.1	25.8	24.2					
			Cr 24 54	Nd 60 82	Ce 58 84	Os 76 106	116.02	84.06	40.2	38.7	26.3	24.8					
			Fe 26 59	Nd 60 81	Ce 58 80	Os 76 106	122.95	85.94	40.3	39.3	26.9	25.3					
			Fe 26 61	Nd 60 81	Ce 58 80	Os 76 106	123.01	84.92	41.1	41.9	22.4	23.2					
82 Pb 198	3.94	0	He 2 4	Cr 26 60	Hg 80 114	0	3.90	3.83	18.7	39.8	20.3	21.1	E 217	57			
			Cr 26 60	Ni 28 62	Ce 58 82	Os 76 106	124.32	86.46	39.0	39.8	20.3	21.1					
			Fe 26 59	Nd 60 82	Ce 58 82	Os 76 106	124.12	86.94	39.0	39.8	20.3	21.1					
			Ni 28 64	Xe 54 80	Ce 58 82	Os 76 106	129.20	87.37	40.9	39.3	23.1	21.5					
			Fe 26 62	Nd 60 82	Ce 58 80	Os 76 106	129.59	86.13	41.3	39.6	23.5	21.8					
			Cr 24 56	Nd 60 82	Ce 58 80	Os 76 106	121.68	83.59	43.1	41.7	25.3	23.7					
			Ni 28 62	Ce 58 82	Ce 58 82	Os 76 106	113.76	81.57	43.9	42.4	22.1	20.6					
			Cr 24 57	Nd 60 82	Ce 58 82	Os 76 106	115.92	82.41	40.0	41.8	22.4	21.2					
			Fe 26 61	Nd 60 81	Ce 58 80	Os 76 106	123.01	84.92	41.1	41.9	22.4	23.2					
82 Pb 198	3.94	0	He 2 4	Cr 26 60	Hg 80 114	0	3.69	3.62	17.8	38.4	22.1	20.6	E 217	32			
			Cr 26 60	Ni 28 62	Ce 58 82	Os 76 106	123.56	86.12	39.9	38.4	22.1	20.6					
			Fe 26 59	Nd 60 82	Ce 58 82	Os 76 106	124.32	86.46	39.0	39.8	20.3	21.1					
			Ni 28 64	Xe 54 80	Ce 58 82	Os 76 106	129.20	87.37	40.9	39.3	23.1	21.5					
			Fe 26 62	Nd 60 82	Ce 58 80	Os 76 106	129.59	86.13	41.3	39.6	23.5	21.8					
			Cr 24 56	Nd 60 82	Ce 58 80	Os 76 106	121.68	83.59	43.1	41.7	25.3	23.7					
			Ni 28 62	Ce 58 82	Ce 58 82	Os 76 106	113.76	81.57	43.9	42.4	22.1	20.6					
			Cr 24 57	Nd 60 82	Ce 58 82	Os 76 106	115.92	82.41	40.0	41.8	22.4	21.2					
			Fe 26 61	Nd 60 81	Ce 58 80	Os 76 106	123.01	84.92	41.1	41.9	22.4	23.2					
82 Pb 199	3.73	0	He 2 4	Cr 26 64	Hg 80 115	0	3.38	3.31	24.9	42.6	17.0	17.8	E 216	30			
			Cr 26 64	Ni 28 64	Ce 58 81	Os 76 106	128.34	87.06	41.9	42.6	17.0	17.8					
			Fe 26 61	Nd 60 82	Ce 58 81	Os 76 106	128.42	85.83	42.1	43.0	17.3	18.1					
			Cr 24 56	Nd 60 82	Ce 58 81	Os 76 106	121.92	84.55	42.3	43.1	17.4	18.2					
			Fe 26 60	Nd 60 82	Ce 58 81	Os 76 106	121.06	84.56	43.3	44.1	18.4	19.2					
			Cr 24 57	Nd 60 82	Ce 58 81	Os 76 106	127.76	84.75	43.3	44.2	18.4	19.3					
			Fe 26 62	Nd 60 82	Ce 58 81	Os 76 106	121.36	83.55	43.4	44.2	18.5	19.3					
			Ni 28 63	Xe 54 82	Ce 58 82	Os 76 106	126.67	86.57	43.9	44.8	19.1	19.9					

Parent Z E I A	log(T <sub>1/2</sub> ) Tt(s)	Emitted				Daughter				Q (MeV)	EK (MeV)	log(T <sub>1/2</sub> ) Tt(s)	log(T <sub>1/2</sub> ) TA	log-- log--	CA	nQ	nT
		E I	Ae	Ce	Ze	E I	Zd	Nd	Cd								
82 Pb 200	4.89	0	He 2 6	Ni 28 66	Hg 80 116	0	3.16	3.09	23.6	41.1	19.1	17.5	E 216	11			
			Ni 28 66	Xe 54 80	Ce 58 82	Os 76 106	127.26	86.54	43.2	41.5	19.5	17.9					
			Fe 26 62	Nd 60 82	Ce 58 82	Os 76 106	120.90	83.42	43.9	42.3	20.3	18.7					
			Ni 28 68	Xe 54 78	Ce 58 82	Os 76 106	126.50	83.49	45.2	43.5	21.6	20.9					
			Co 27 63	Cs 55 82	Ce 58 82	Os 76 106	125.36	84.62	46.2	44.5	22.6	21.3					
			Fe 26 67	Cs 55 82	Ce 58 82	Os 76 106	125.14	83.22	47.0	45.3	22.9	21.7					
			Fe 26 60	Nd 60 82	Ce 58 82	Os 76 106	116.43	82.90	47.0	45.5	23.4	21.8					
82 Pb 201	4.53	0	He 2 4	Cr 26 66	Hg 80 117	0	2.84	2.78	32.9	44.4	10.6	11.5	E 216	11			
			Ni 28 66	Xe 54 81	Ce 58 82	Os 76 106	127.24	85.46	43.5	44.4	10.6	11.5					
			Ni 28 65	Xe 54 82	Ce 58 82	Os 76 106	126.25	85.43	44.7	45.6	11.8	12.6					
			Ni 28 68	Xe 54 80	Ce 58 82	Os 76 106	126.57	84.38	44.7	45.6	11.8	12.7					
			Fe 26 62	Nd 60 82	Ce 58 82	Os 76 106	125.85	83.27	46.0	46.9	13.1	14.0					
			Ni 28 64	Xe 54 83	Ce 58 82	Os 76 106	118.52	81.96	47.3	48.1	14.4	15.2					
			Fe 26 64	Xe 54 83	Ce 58 82	Os 76 106	124.19	84.64	47.5	48.4	14.6	15.4					
			Fe 26 63	Nd 60 82	Ce 58 82	Os 76 106	118.17	81.13	48.1	49.0	15.2	16.0					
			Co 27 64	Cs 55 82	Ce 58 82	Os 76 106	121.05	82.51	48.3	49.1	15.4	16.2					
82 Pb 202	12.98	0	He 2 4	Cr 26 66	Hg 80 118	0	2.60	2.55	31.7	42.8	12.8	11.1	E 215	3			
			Ni 28 66	Xe 54 82	Ce 58 82	Os 76 106	126.50	85.17	44.4	44.5	14.5	12.8					
			Ni 28 68	Xe 54 80	Ce 58 82	Os 76 106	125.65										



Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		T							
Z	EI	A	log(Tt) C Tt(s)	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	Tt(s)	(MeV)	Tt'(s)	log-- TA	log-- TA	CA	nQ	nT	
83	Bi	191	1.11	0	He	2	4	Tl	81	106	0	6.76	1.5	31.5	22.0	22.0				M 220 173	
					Be	6	12	Ir	77	102	0	25.08	13.70	23.1	21.6	21.6					
					Ba	8	16	Re	75	100	0	37.05	26.5	25.1	25.0	25.0					
					V	23	51	Nd	60	80	123.74	90.70	28.2	26.7	26.7	27.1					
					Cr	24	52	Pr	59	80	127.32	92.66	28.6	28.6	27.1	27.1					
					Mn	25	55	Ce	58	78	131.27	93.47	28.8	28.8	27.3	27.3					
					Ti	22	50	Pm	61	80	118.97	87.82	29.0	29.0	27.5	27.5					
					Ti	22	48	Pm	61	82	118.52	88.73	29.1	29.1	27.6	27.6					
83	Bi	192	1.62	0	He	2	4	Tl	81	107	0	6.44	2.3	26.2	22.9	23.9				M 220 178	
					C	6	12	Ir	77	103	0	11.75	17.21	27.3	26.2	25.1	25.1				
					Be	8	16	Au	79	101	0	36.32	33.29	28.0	29.1	25.6	26.8				
					Ti	22	50	Pm	61	81	118.90	87.93	29.0	31.8	26.6	26.8					
					V	23	51	Nd	60	81	122.81	90.19	29.2	32.2	26.9	29.8					
					Cr	24	52	Pr	59	81	126.52	92.25	29.5	32.5	27.2	30.2					
					Cr	24	53	Pr	59	80	126.53	91.60	29.7	32.7	27.4	30.4					
					Ti	22	49	Pm	61	82	117.93	87.83	29.9	32.8	27.6	30.5					
83	Bi	193	1.87	0	He	2	4	Tl	81	108	0	6.31	2.1	26.7	24.6	24.6					M 219 164
					C	6	12	Ir	77	104	0	18.70	26.37	29.0	29.0	26.9	26.9				
					Be	8	16	Au	79	102	0	11.25	10.78	29.5	29.5	27.4	27.4				
					V	23	51	Nd	60	82	122.50	90.13	29.5	29.5	27.4	27.4					
					Cr	24	52	Pr	59	82	125.78	91.89	30.3	30.3	28.2	28.2					
					Cr	24	54	Pr	59	80	126.11	90.83	30.3	30.3	28.2	28.2					
					Mn	25	55	Ce	58	80	129.62	92.68	30.5	30.5	28.4	28.4					
83	Bi	194	2.02	0	He	2	4	Tl	81	109	0	6.01	5.89	4.7	30.1	24.4	25.4				M 220 162
					C	6	12	Ir	77	105	0	22.89	21.47	29.1	34.2	25.7	25.7				
					Cr	24	54	Pr	59	81	125.37	90.47	31.1	34.2	26.4	29.4					
					Cr	24	53	Pr	59	82	125.05	90.89	31.3	34.3	26.6	29.6					
					V	23	52	Nd	60	82	121.14	88.67	31.3	34.3	26.6	29.6					
					Fe	26	58	La	57	80	116.59	86.54	31.7	34.5	26.9	29.8					
					Mn	25	55	Ce	58	81	128.42	92.01	31.9	35.0	27.2	30.3					
					Ti	22	51	Pm	61	82	116.44	85.83	32.1	35.1	27.4	30.3					
					Ti	22	51	Pm	61	84	114.73	85.31	34.0	34.0	29.1	29.1					
					Co	27	61	Ba	56	78	133.89	92.01	34.2	34.2	29.3	29.3					
83	Bi	195	2.23	0	He	2	4	Tl	81	110	0	5.83	5.72	4.9	30.7	25.7	25.7				M 218 137
					Cr	24	54	Pr	59	82	124.98	90.37	31.5	31.5	26.5	26.5					
					Fe	26	58	Ce	58	82	127.82	91.77	32.5	32.5	27.6	27.6					
					La	57	80	Nd	60	82	131.30	92.25	33.0	33.0	28.0	28.0					
					V	23	53	Nd	60	82	119.83	87.26	33.2	33.2	28.2	28.2					
					Mn	25	57	Ce	58	80	127.08	89.94	34.0	34.0	29.1	29.1					
					Ti	22	50	Pm	61	84	114.73	85.31	34.0	34.0	29.1	29.1					
					Co	27	61	Ba	56	78	133.89	92.01	34.2	34.2	29.3	29.3					
83	Bi	198	2.85	0	He	2	4	Tl	81	113	0	5.10	4.99	9.8	39.9	26.9	30.1				E 219 90
					Fe	26	59	La	57	82	128.37	90.09	36.6	40.1	27.1	30.3					
					Fe	26	60	La	57	81	128.37	89.47	36.8	40.1	27.1	30.3					
					Mn	25	58	Ce	58	82	134.44	90.99	37.4	40.9	27.7	31.1					
					Ni	28	64	Ce	58	82	124.35	87.92	37.4	40.6	27.7	30.9					
					Co	27	61	Ba	56	81	131.06	90.68	37.5	40.8	27.7	31.1					
					Co	27	62	Ba	56	80	130.76	89.82	38.1	41.5	28.4	31.7					
					Ni	28	62	Cs	55	81	133.54	91.72	38.2	41.5	28.4	31.6					
					Co	27	60	Ba	56	82	130.35	90.85	38.2	41.5	28.5	31.8					

Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		T							
Z	EI	A	log(Tt) C Tt(s)	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	Tt(s)	(MeV)	Tt'(s)	log-- TA	log-- TA	CA	nQ	nT	
83	Bi	199	3.21	0	He	2	4	Tl	81	114	0	4.93	4.80	37.6	28.7	28.7					E 218 63
					Ni	28	64	Cs	55	82	127.73	89.20	37.6	37.6	28.7	28.7					
					Co	27	61	Ba	56	82	130.23	90.31	38.5	38.5	29.2	29.2					
					Co	27	62	Ba	56	80	133.18	89.01	39.4	39.4	30.5	30.5					
					Ni	28	66	Cs	55	78	133.18	89.01	39.4	39.5	30.6	30.6					
					Ni	28	62	Cs	55	82	129.81	88.71	39.5	39.5	30.6	30.6					
					Mn	25	59	Ce	58	82	132.37	91.13	39.6	39.6	30.8	30.8					
					Co	27	62	Cs	55	81	122.63	86.27	39.9	39.9	31.1	31.1					
					Co	27	61	Ba	56	81	128.22	88.27	41.5	41.5	32.6	32.6					
83	Bi	200	3.34	0	He	2	4	Tl	81	115	0	4.68	4.59	13.1	42.4	25.8	29.3				E 218 54
					Cs	55	81	Cs	55	81	133.05	90.47	39.0	42.4	26.8	29.3					
					La	57	82	Nd	60	82	129.29	89.21	39.8	43.2	26.7	30.1					
					Ni	28	65	Cs	55	80	132.38	89.36	40.1	43.6	27.0	30.4					
					Co	27	63	Ba	56	81	129.16	88.48	40.2	43.6	27.1	30.5					
					Fe	26	61	La	57	82	125.75	87.39	40.4	43.7	27.2	30.5					
					Ni	28	63	Cs	55	82	131.66	90.19	40.7	44.1	27.5	30.9					
					Fe	26	60	La	57	83	125.32	87.73	40.7	44.0	27.5	30.9					
83	Bi	201	3.81	0	He	2	4	Tl	81	116	0	4.50	4.42	11.7	40.0	28.3	28.3				E 217 33
					Ni	28	64	Cs	55	82	132.17	90.09	40.0	40.0	28.3	28.3					
					Co	27	63	Ba	56	82	132.21	88.80	40.4	40.4	28.7	28.7					
					Co	27	62	Ba	56	80	128.62	88.31	40.8	40.8	29.1	29.1					
					Fe	26	62														



Parent		Emitted		Daughter		Q (MeV)	FK (MeV)	log(T) T(s)	log(T') T'(s)	log(T) T(s)	log(T') T'(s)	log <sub>10</sub> TA	CA	nQ	nT	
Z	EI	A	log(T) T(s)	C	EI											Zd
83	Bi	205	6.12		He	2	3.69	3.62	18.6							
					Ni	28	128.96	66.18	44.8	44.8	26.2	26.2		E	217	4
					Ni	28	125.66	65.20	49.3	49.3	30.7	30.7				
					Ni	28	125.76	64.52	49.7	49.7	31.1	31.1				
					Ni	28	123.74	63.42	49.9	49.9	31.3	31.3				
83	Bi	206	5.73		He	2	3.53	3.46	26.4							
					Ni	28	126.97	84.44	47.9	51.4	21.5	25.1		E	215	2
					Ni	28	126.33	84.63	48.6	52.1	22.2	25.8				
84	Po	193	0.01	0	He	2	7.10	6.96	0.0					M	220	179
					Pb	82	107	24.39	22.2	22.4	22.2	22.4				
					Pt	78	103	26.01	22.2	22.4	22.2	22.4				
					Hg	80	107	12.36	23.4	23.6	23.4	23.6				
					Os	76	102	13.26	22.5	22.7	22.5	22.7				
					Nd	60	81	95.89	27.3	27.3	27.3	27.3				
					Cr	24	54	131.26	27.3	27.3	27.3	27.3				
					Cr	24	52	95.31	26.6	26.6	26.6	26.6				
					Ti	22	50	131.39	27.0	27.0	27.0	27.0				
					Sm	62	81	122.58	27.0	27.0	27.0	27.0				
					Ti	22	49	122.16	27.3	28.0	27.3	28.0				
					Fe	26	57	138.31	27.7	28.5	27.7	28.5				
84	Po	194	-0.22	0	He	2	6.99	6.85	-0.2					M	219	164
					Hg	80	104	12.67	28.2	28.2	28.2	28.2				
					Pb	82	108	23.61	28.2	28.2	28.2	28.2				
					Bi	83	122	90.85	27.1	27.1	27.1	27.1				
					Bi	83	122	90.85	27.1	27.1	27.1	27.1				
					Os	76	102	37.28	27.2	26.6	27.4	26.8				
					Nd	60	82	130.36	27.5	26.0	27.7	26.2				
					Cr	24	54	94.10	27.9	26.4	28.1	26.6				
					Fe	26	58	137.64	28.5	26.9	28.7	27.2				
					Fe	26	56	137.17	28.7	27.2	28.9	27.4				
84	Po	195	0.65	0	He	2	6.74	6.61	0.6					M	220	170
					Pb	82	109	23.86	29.2	29.2	29.2	29.2				
					Hg	80	107	12.06	29.2	29.2	29.2	29.2				
					Nd	60	82	130.07	29.2	29.2	29.2	29.2				
					Cr	24	54	129.42	29.2	29.2	29.2	29.2				
					Cr	24	53	93.98	28.2	29.0	27.6	28.3				
					O	8	16	136.26	29.9	28.3	29.1	27.6				
					Os	76	104	35.62	32.71	30.5	29.9	28.8				
					Fe	26	56	135.22	30.8	29.2	30.0	28.5				
					Ba	56	78	142.25	30.9	29.3	30.2	28.6				
					Sm	62	84	118.95	31.2	29.8	30.4	29.0				
84	Po	196	0.74	0	He	2	6.65	6.52	0.8					M	218	147
					Pb	82	110	23.96	31.2	29.8	30.4	29.0				
					Hg	80	108	11.79	31.2	27.4	27.0	26.7				
					Nd	60	82	129.42	31.76	28.8	27.3	26.1				
					Cr	24	54	129.97	33.98	28.2	29.0	27.6				
					O	8	16	136.58	33.58	28.5	28.8	27.9				
					Sm	62	83	120.92	33.2	30.5	29.9	28.9				
					Fe	26	56	142.25	30.9	29.2	30.0	28.5				
					Ni	28	62	134.83	31.7	32.1	29.5	30.3				
					Ti	22	50	141.21	31.7	32.5	29.9	30.7				
84	Po	197	1.75	0	He	2	6.41	6.28	1.8					M	220	153
					Pt	78	107	23.20	31.9	29.2	29.5	27.4				
					Hg	80	109	11.25	30.3	30.5	28.5	28.7				
					Nd	60	82	135.71	32.4	31.2	28.6	29.4				
					Cr	24	54	127.53	32.4	31.0	28.2	29.0				
					Nd	60	83	127.53	32.4	31.8	29.3	30.1				
					Cr	24	55	127.65	32.4	31.1	28.9	29.2				
					Fe	26	57	134.86	31.3	32.1	29.5	30.3				
					Fe	26	56	134.83	31.7	32.1	29.5	30.3				
					Ni	28	62	141.21	31.7	32.5	29.9	30.7				

Parent		Emitted		Daughter		Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log <sub>10</sub> TA	CA	nQ	nT			
Z	EI	A	log(T) T(s)	C	EI									Zd	Ed	Cd
84	Po	198	2.02	0	He	2	6.31	6.19	2.2					M	218	122
					Pb	82	112	134.74	31.7	29.9	29.3	27.7				
					Ce	58	82	23.35	31.7	31.6	30.5	29.0				
					Pt	78	108	10.86	32.2	31.6	30.9	29.0				
					Hg	80	110	140.57	33.1	31.4	30.9	29.0				
					Ba	56	78	140.57	33.1	31.6	31.1	29.4				
					Ce	58	80	140.15	33.2	31.6	31.1	29.4				
					Ba	56	80	133.48	33.5	31.9	31.3	29.7				
					Nd	60	82	125.75	33.7	32.2	31.5	30.0				
					Sm	62	84	125.19	33.9	32.4	31.7	30.2				
84	Po	199	2.49	0	He	2	6.07	5.95	3.4					M	219	118
					Pb	82	113	133.48	33.4	33.9	29.7	30.5				
					Ce	58	82	133.11	33.4	33.6	30.4	30.5				
					Ce	58	81	92.98	34.0	34.9	30.6	31.5				
					Ni	28	64	139.70	34.0	34.9	30.6	31.5				
					Pt	78	109	21.56	34.1	34.3	30.6	30.9				
					Ba	56	81	139.21	34.4	35.1	30.9	31.7				
					Ce	58	83	132.33	34.6	35.2	31.0	31.8				
					Ba	56	80	139.15	34.6	35.5	31.1	32.1				
					Hg	80	111	103.33	34.9	35.2	31.5	31.7				
84	Po	200	2.84	0	He	2	5.99	5.87	3.7					M	218	82
					Pb	82	114	132.46	34.5	32.9	30.9	29.3				
					Ce	58	82	132.46	34.5	33.2	31.2	29.5				
					Ba	56	80	138.97	34.8	34.8	32.0	30.9				
					Ba	56	82	137.98	35.7	34.1	32.1	30.4				
					Pt	78	110	20.79	35.7	34.1	32.1	30.4				
					Ba	56	78	137.96	36.5	36.0	32.9	32.4				
					Ba	56	78	137.96	36.6	36.9	32.9	31.2				
					Hg	80	112	10.02	36.6	36.2	33.0	32.5				
					La	57	84	124.65	37.8	36.2	34.1	32.6				



Parent		Emitted				Daughter				log(T <sub>1/2</sub> )								
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zr	Ae	Ce	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	NT	
						Zd		Nd	Cd	(MeV)	(s)	(s)	(s)	TA	TA			
84	Po	204	4.10	0	He	2	4	Pb	82	118	0	5.49	5.38	6.3	36.9	32.3	30.6	M 218 21
					Ni	28	66	Ba	56	82	0	135.94	91.96	38.6	40.0	35.4	33.7	
					Ni	28	68	Ba	56	80	0	134.03	89.35	41.7	40.0	35.4	33.7	
					Ni	28	64	Ba	56	84	0	133.12	89.40	42.8	41.1	36.5	34.6	
					Ni	28	64	Ba	56	81	0	132.03	89.51	43.5	42.7	36.0	34.6	
					Fe	26	62	Cr	58	84	0	125.08	87.06	44.6	43.0	38.3	36.7	
					Co	27	65	La	57	82	0	128.04	87.24	45.5	43.8	39.2	37.5	
					Be	4	8	Hg	80	116	0	8.55	8.21	46.0	45.6	39.7	39.3	
84	Po	205	3.81		He	2	4	Pb	82	119	0	5.31	5.21	6.9	41.6	33.7	34.6	M 217 13
					Ni	28	67	Ba	56	82	0	134.46	90.51	40.7	41.6	33.7	34.6	
					Ni	28	66	Ba	56	83	0	133.40	90.45	42.0	42.9	32.1	32.0	
					Ni	28	68	Ba	56	81	0	133.66	87.46	46.9	45.8	38.0	38.8	
					Ni	28	69	Ba	56	80	0	132.57	87.41	47.4	46.2	38.4	39.3	
					Ni	28	64	Ba	56	85	0	130.66	89.37	45.4	46.2	38.4	39.3	
					Fe	26	62	Ce	58	85	0	129.31	88.94	47.4	48.2	40.4	41.3	
					Co	27	65	La	57	83	0	122.95	85.77	47.6	48.4	40.6	41.5	
					Co	27	62	La	57	83	0	125.93	86.00	48.5	49.3	41.5	42.4	
84	Po	206	5.88		He	2	4	Pb	82	120	0	5.33	5.22	7.1	40.3	34.9	33.1	M 218 5
					Ni	28	68	Ba	56	82	0	133.72	89.71	42.0	44.4	37.9	36.2	
					Ni	28	66	Ba	56	83	0	132.63	89.65	43.3	44.5	39.1	37.4	
					Ni	28	67	Ba	56	81	0	130.46	88.03	46.3	44.5	39.1	37.4	
					Ni	28	69	Ba	56	81	0	129.99	86.45	47.4	45.7	40.3	38.5	
					Ca	20	48	Gd	64	94	0	96.71	74.18	49.6	48.3	42.5	41.1	
84	Po	207	4.31		He	2	4	Pb	82	121	0	5.22	5.12	8.4	45.8	36.5	37.4	M 217 4
					Ni	28	69	Ba	56	82	0	131.57	87.71	44.9	45.8	36.5	37.4	
					Ni	28	68	Ba	56	83	0	131.24	88.13	45.2	46.1	36.8	36.6	
					Ni	28	67	Ba	56	84	0	129.81	87.83	47.5	46.1	36.8	36.6	
					Ni	28	66	Ba	56	85	0	128.63	87.82	48.5	49.4	40.1	41.0	
84	Po	208	7.97		He	2	4	Pb	82	122	0	5.21	5.11	8.0	46.2	39.9	38.2	M 217 1
					Ni	28	68	Ba	56	84	0	129.28	87.02	47.9	46.2	39.9	38.2	
84	Po	213	-5.37		He	2	4	Pb	82	127	0	6.54	6.38	-5.4	23.3	28.4	28.6	M 222 2
					Be	4	8	Hg	80	125	0	10.69	10.29	32.4	32.6	37.8	38.0	
84	Po	214	-3.78		He	2	4	Pb	82	128	0	7.83	7.69	-3.8	27.9	32.0	31.6	M 221 3
					Be	4	8	Hg	80	126	0	11.33	11.10	28.3	27.9	47.0	46.5	
					C	6	12	Pt	78	124	10	18.74	17.69	43.2	42.7	47.0	46.5	
					C	6	14	Pt	78	122	10	19.11	17.86	46.5	45.9	50.2	49.7	
84	Po	215	-2.74		He	2	4	Pb	82	129	0	7.33	7.39	-2.7	32.1	34.5	34.8	M 222 9
					Be	4	8	Hg	80	127	0	10.79	10.39	31.9	32.1	34.5	34.8	
					He	2	5	Pb	82	128	10	20.82	19.08	34.7	38.0	40.5	40.7	
					C	6	12	Pt	78	123	10	20.19	18.87	42.1	42.4	44.9	45.1	
					C	6	13	Pt	78	124	10	19.57	18.39	42.3	42.6	45.1	45.3	
					Be	4	9	Hg	80	126	0	9.08	8.70	45.7	45.9	48.4	48.6	
					Be	4	10	Hg	80	125	0	9.16	8.74	48.5	48.8	51.3	51.5	
					Ca	20	49	Gd	64	102	10	96.20	74.27	49.8	50.5	52.5	53.2	
85	At	196	-0.52	0	He	2	4	Bi	83	109	0	7.20	7.06	-0.5	22.4	23.0	23.9	M 220 185
					Be	4	8	Au	81	107	0	3.57	3.01	22.4	23.4	23.0	23.9	
					C	6	12	Au	81	103	0	18.78	18.56	53.4	53.6	58.0	57.1	
					C	6	16	Ir	77	103	0	31.56	31.56	53.4	53.6	58.0	57.1	

Parent		Emitted				Daughter				log(T <sub>1/2</sub> )								
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zr	Ae	Ce	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	NT	
						Zd		Nd	Cd	(MeV)	(s)	(s)	(s)	TA	TA			
85	At	197	-0.40	0	He	2	4	Bi	83	110	0	7.10	6.95	-0.4	22.4	22.8	22.8	M 220 177
					Be	4	8	Tl	81	108	0	13.32	12.78	22.4	23.7	24.1	24.1	
					Cr	24	54	Au	79	106	0	25.71	24.14	23.7	26.3	26.7	26.7	
					Cr	24	54	Pm	61	82	0	133.76	97.09	26.3	26.6	27.0	27.0	
					Mn	25	54	Nd	60	82	0	137.53	99.13	26.6	26.6	27.0	27.0	
					V	23	52	Sm	62	82	0	129.44	95.10	26.5	29.5	27.0	30.0	
					He	2	4	Bi	83	110	0	7.10	6.95	-0.4	22.4	22.8	22.8	
					Be	4	8	Tl	81	108	0	13.32	12.78	22.4	23.7	24.1	24.1	
					C	6	12	Au	79	106	0	25.71	24.14	23.7	26.3	26.7	26.7	
					Cr	24	54	Pm	61	82	0	133.76	97.09	26.3	26.6	27.0	27.0	
					Mn	25	54	Nd	60	82	0	137.53	99.13	26.6	26.6	27.0	27.0	
					Fe	26	58	Pf	59	80	0	140.86	99.39	27.4	27.4	27.8	27.8	
					Fe	26	56	Pf	59	82	0	140.49	100.55	27.4	27.4	27.8	27.8	
					Ni	28	62	La	57	78	0	147.28	100.93	28.1	28.1	28.5	28.5	
85	At	198	0.69	0	He	2	4	Bi	83	111	0	6.89	6.76	0.7	25.1	23.6	24.4	M 220 174
					Be	4	8	Tl	81	109	0	12.82	12.30	0.7	25.1	23.6	24.4	
					C	6	12	Au	79	107	0	24.64	23.15	26.4	27.4	25.7	26.7	
					Cr	24	54	Pm	61	82	0	135.91	97.43	28.5	31.7	27.6	31.0	
					Mn	25	56	Nd	60	82	0	135.91	97.43	28.5	31.7	27.6	31.0	
					Fe	26	57	Ir	77	105	0	36.95	33.96	28.9	30.1	28.2	29.4	
					Fe	26	57	Pf	59	82	0	139.26	99.17	28.9	32.2	28.3	31.5	
					Cr	24	54	Pm	61	83	0	131.41	95.57	29.0	32.2	28.4	31.5	
					Co	27	61	Ce	58	80	0	141.70	98.27	30.6	32.8	28.9	32.1	
85	At	199	0.85	0	He	2	4	Bi	83	112	0	6.78	6.65	0.8	25.4	24.6	24.6	M 220 157
					Be	4	8	Tl	81	111	0	12.06	12.03	0.8	25.4	24.6	24.6	
					C	6	12	Au	79	108	0	23.56	22.15	29.2	30.2	26.9	28.9	
					Cr	24	54	Pm	61	82	0	133.76						



Parent		Emitted										Daughter		T <sub>1/2</sub>												
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	Q	EK	log(T <sub>1/2</sub> )	T <sub>1/2</sub>	log--	CA	nQ	nT						
			T <sub>1/2</sub> (s)										(MeV)	(MeV)	T <sub>1/2</sub> (s)	(s)	TA	TA								
85 At	203	2.65			C 6 12	Au 79 111	22.11	20.79	33.4	34.4	30.7	31.0														
					Ni 20 63	La 57 82	141.96	97.69	34.1	37.6	30.7	34.2														
					Co 27 62	Pf 59 82	136.12	96.14	34.1	37.6	30.7	34.2														
					Ni 28 65	La 57 80	141.46	95.91	35.1	38.7	31.6	35.1														
					Co 27 63	Ce 58 81	138.02	94.98	35.3	38.7	31.9	35.3														
					He 2 4	Bi 83 116	6.20	6.08	32.1	32.1	28.9	28.9														
					Be 4 8	Tl 81 114	11.04	10.60	32.1	34.0	30.9	30.9														
					Ni 28 64	Au 79 114	142.03	97.25	34.0	35.0	31.9	31.9														
					Co 27 63	Ce 58 82	121.27	90.29	35.0	38.0	32.6	35.0														
					Ni 28 66	La 57 80	140.85	95.04	35.0	38.0	32.6	35.0														
Ni 28 65	La 57 81	139.34	94.73	37.8	37.8	34.6	34.6																			
Fe 26 62	Pf 59 82	132.61	92.11	37.8	37.9	34.6	34.6																			
Fe 26 60	Pr 59 84	132.17	93.11	37.9	37.9	34.6	34.6																			
85 At	204	2.74			He 2 4	Bi 83 117	6.06	5.95	4.1	34.9	29.9	30.8														
					Be 4 8	Tl 81 115	10.66	10.24	34.0	34.9	29.9	30.8														
					Ni 28 65	La 57 82	140.64	95.64	36.1	39.5	32.0	36.1														
					Ni 28 64	La 57 83	139.51	95.74	37.2	40.7	33.2	37.2														
					C 6 12	Au 79 113	20.44	19.24	38.7	40.7	33.2	38.7														
					Ni 28 64	La 57 84	137.05	94.26	40.3	40.3	36.1	40.3														
					Co 27 65	Ce 58 82	134.20	91.65	40.3	40.5	36.2	40.5														
					Ni 28 68	La 57 80	137.56	91.93	40.5	40.5	36.3	40.5														
					Ni 28 67	La 57 81	137.22	92.37	40.7	40.7	36.5	40.7														
					Co 27 63	Ce 58 84	133.33	92.36	41.1	41.1	36.9	41.1														
85 At	205	3.19			He 2 4	Bi 83 118	5.88	5.77	5.3	38.0	31.8	32.7														
					Be 4 8	Tl 81 117	10.08	9.69	37.1	38.0	31.8	32.7														
					Ni 28 67	La 57 82	138.48	93.44	38.8	42.4	33.5	38.8														
					Ni 28 66	La 57 83	137.86	93.69	39.5	43.0	34.2	39.5														
					Ni 28 68	La 57 81	137.51	92.12	40.4	44.0	35.1	40.4														
					C 6 12	Au 79 115	19.78	18.63	41.0	42.1	35.8	41.0														
					Ni 28 65	La 57 84	135.62	92.83	42.3	45.9	37.1	42.3														
					Co 27 65	Ce 58 83	132.11	90.42	43.1	46.6	37.8	43.1														
					Co 27 64	Ce 58 84	131.83	90.88	43.3	46.8	38.0	43.3														
					He 2 4	Bi 83 120	5.87	5.76	4.8	38.5	33.5	35.5														
85 At	206	3.81			Be 4 8	Tl 81 118	9.84	9.46	38.5	38.5	33.7	33.7														
					Ni 28 68	La 57 82	137.43	92.28	40.3	40.3	35.5	40.3														
					Ni 28 66	La 57 84	135.74	92.46	42.8	42.8	38.0	42.8														
					C 6 12	Au 79 116	19.30	18.18	42.8	42.8	38.0	42.8														
					Ni 28 67	La 57 83	134.78	91.76	43.8	43.8	39.0	43.8														
					Co 27 65	Ce 58 84	130.41	89.46	45.4	45.4	40.6	45.4														
					Ni 28 69	La 57 85	138.79	96.34	48.2	48.2	42.5	48.2														
					Ca 20 48	Tb 65 95	99.50	76.53	47.5	46.9	39.4	47.5														
					Co 27 65	Ce 58 85	128.21	88.15	48.5	52.0	42.4	48.5														
					He 2 4	Bi 83 122	5.76	5.65	5.7	35.7	35.7	35.7														
85 At	209	4.29			Be 4 8	Tl 81 120	9.36	9.00	41.4	41.4	35.7	35.7														
					Ni 28 68	La 57 84	133.58	90.12	45.4	45.4	39.8	45.4														
					Ni 28 66	La 57 86	131.45	89.94	48.1	48.1	41.1	48.1														
					Co 27 67	Ce 58 86	125.93	86.34	48.2	48.2	42.4	48.2														
					Ni 28 67	La 57 85	130.86	88.91	49.2	49.2	43.5	49.2														
					He 2 4	Bi 83 123	5.63	5.52	7.7	35.7	35.7	35.7														
					Be 4 8	Tl 81 121	9.07	8.72	43.3	44.2	36.6	43.3														
					Ni 28 68	La 57 85	131.51	88.93	48.3	48.3	42.5	48.3														
					Ni 28 69	La 57 84	131.47	88.27	48.6	48.6	42.5	48.6														
					C 6 12	Au 79 119	17.61	16.61	49.6	50.7	41.8	49.6														
85 At	211	4.41			Be 4 8	Bi 83 124	5.98	5.87	4.8	42.6	37.8	37.8														
					He 2 4	Bi 81 122	9.17	8.82	42.6	42.6	37.8	37.8														
					He 2 4	Bi 83 123	5.63	5.52	7.7	35.7	35.7	35.7														
					Be 4 8	Tl 81 121	9.07	8.72	43.3	44.2	36.6	43.3														
					Ni 28 68	La 57 85	131.51	88.93	48.3	48.3	42.5	48.3														
					Ni 28 69	La 57 84	131.47	88.27	48.6	48.6	42.5	48.6														
					C 6 12	Au 79 119	17.61	16.61	49.6	50.7	41.8	49.6														
					He 2 4	Bi 83 124	5.98	5.87	4.8	42.6	37.8	37.8														
					Be 4 8	Tl 81 122	9.17	8.82	42.6	42.6	37.8	37.8														
					He 2 4	Bi 83 123	5.63	5.52	7.7	35.7	35.7	35.7														
85 At	212	-0.50			Be 4 8	Bi 83 125	7.83	7.68	-0.5	33.0	33.5	34.5														
					Be 4 8	Tl 81 123	10.79	10.38	33.0	33.0	33.5	33.5														
					C 6 12	Au 79 121	18.68	17.62	45.0	46.0	45.5	46.0														
					He 2 4	Bi 83 124	5.98	5.87	4.8	42.6	37.8	37.8														
					Be 4 8	Tl 81 122	9.17	8.82	42.6	42.6	37.8	37.8														
					He 2 4	Bi 83 123	5.63	5.52	7.7	35.7	35.7	35.7														
					Be 4 8	Tl 81 121	9.07	8.72	43.3	44.2	36.6	43.3														
					Ni 28 68	La 57 85	131.51	88.93	48.3	48.3	42.5	48.3														
					Ni 28 69	La 57 84	131.47	88.27	48.6	48.6	42.5	48.6														
					C 6 12	Au 79 119	17.61	16.61	49.6	50.7	41.8	49.6														
85 At	214	-5.69																								



Parent		Emitted				Daughter				T						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zd	Ae	Ce	Q	EK	log(T)	log(T')	log--	CA	nq	nT
			Tt(s)						(MeV)	T(s)	T'(s)	TA	TA	TA		
	B	5	11		Hg	80	125		15.87	15.06	36.6	37.6	40.1	41.1		
	He	2	5		Bi	83	128		2.71	2.65	37.1	38.0	40.6	41.5		
85 At	217	-1.48			Bi	83	130		7.30	7.07	-1.5	22.5	24.0	24.0	M	221 19
	He	2	4		Tl	81	128	10	13.60	12.41	22.5	27.5	29.0	29.0		
	Be	4	12		Pb	82	128	10	23.84	22.52	27.5	28.8	30.2	30.2		
	Be	4	14		Tl	81	126	10	12.82	12.32	28.8	29.1	30.6	30.6		
	B	5	11		Au	79	124		24.51	22.93	29.1	29.1	34.8	34.8		
	N	7	15		Hg	80	126		16.67	15.83	33.3	33.3	38.0	38.0		
	C	6	13		Pt	78	124	10	27.51	25.61	36.5	36.5	38.0	38.0		
	Be	4	9		Au	79	125		21.47	20.18	36.7	36.7	38.2	38.2		
	He	2	4		Tl	81	127		9.80	9.40	41.9	41.9	43.4	43.4	M	222 28
85 At	218	0.30			Bi	83	131		6.88	6.76	0.3	26.0	24.8	25.7		
	He	2	4		Po	84	129		15.81	13.96	25.2	28.0	26.6	27.6		
	Be	4	10		Au	79	125		25.29	23.67	26.9	28.6	27.3	28.3		
	C	6	12		Au	79	126	10	24.43	22.97	27.6	30.1	28.7	29.8		
	C	6	12		Tl	81	127	10	23.25	21.97	29.1	32.1	30.9	31.8		
	Be	4	10		Tl	81	125	10	12.26	11.70	31.3	32.1	32.0	32.0		
	N	7	15		Pt	78	125	10	28.73	26.76	33.0	34.2	32.0	32.0		
	Be	4	9		Hg	80	127		15.69	14.90	37.2	38.2	37.8	38.7		
	Be	4	9		Tl	81	128		10.40	9.97	38.2	39.1	37.8	38.7		
86 Rn	199	-0.30	0		Po	84	111	0	7.14	6.99	0.0	21.7	21.5	21.7	E	221 180
	He	2	4		Pb	82	109	0	13.79	13.23	23.1	22.9	22.6	22.9		
	Be	4	10		Hg	80	107	0	26.56	24.96	22.6	26.4	25.6	26.4		
	C	6	12		Nd	60	81		144.75	102.57	25.6	26.5	26.2	26.5		
	Fe	26	58		Nd	60	82		144.53	103.13	25.8	26.5	26.2	26.5		
	O	8	16		Pt	78	105	0	38.87	35.74	26.2	27.1	26.8	27.1		
	Cr	24	54		Sm	62	83		135.98	99.08	26.3	27.1	26.8	27.1		
	Ni	28	62		Ce	58	79		151.04	103.99	27.1	27.9	27.1	27.9		
	Cr	24	55		Sm	62	82		135.47	98.03	27.1	27.9	27.1	27.9		
86 Rn	200	0.01	0		Po	84	112	0	7.05	6.90	0.0	21.7	21.5	21.7	M	221 164
	He	2	4		Pb	82	110	0	13.61	13.06	23.1	23.0	23.4	23.0		
	Be	4	12		Hg	80	108	0	26.20	24.63	22.4	24.6	23.6	24.6		
	Fe	26	58		Nd	60	82		144.11	102.32	26.2	25.8	25.7	25.9		
	Ni	28	62		Ce	58	80		150.32	103.72	27.5	27.1	27.1	27.1		
	O	8	16		Pt	78	106	0	38.07	35.02	27.7	27.2	26.6	27.0		
	Ni	28	64		Ce	58	78		149.60	101.73	28.7	27.2	28.7	27.2		
	Cr	24	54		Sm	62	84		133.92	97.66	29.2	27.6	28.5	27.6		
	Ni	28	60		Ce	58	82		148.56	103.99	29.2	27.6	28.5	27.6		
86 Rn	201	0.85	0		Po	84	113	0	6.87	6.73	0.8	23.8	22.8	23.0	M	221 166
	He	2	4		Pb	82	111	0	13.19	12.66	23.6	25.4	24.3	24.6		
	Be	4	12		Hg	80	109	0	25.48	23.96	25.2	29.0	27.3	28.1		
	C	6	12		Nd	60	82		142.50	100.67	28.1	29.0	27.3	28.1		
	Fe	26	58		Ce	58	81		149.60	103.45	28.1	29.0	27.3	28.1		
	Ni	28	62		Fe	26	58		142.04	101.06	28.1	29.0	27.3	28.1		
	Ni	28	63		Ce	58	80		148.97	102.68	29.3	29.9	28.2	29.1		
	Ni	28	64		Ce	58	79		149.23	102.68	29.3	30.2	28.5	29.4		
	O	8	16		Pt	78	107	0	37.23	34.26	29.4	29.7	28.5	28.8		
86 Rn	202	0.99	0		Po	84	114	0	6.76	6.63	1.1	24.0	23.3	22.9	M	221 141
	He	2	4		Pb	82	112	0	12.99	12.47	24.4	25.9	25.3	24.8		
	Be	4	12		Hg	80	110	0	24.99	23.51	26.4	27.6	26.2	27.1		
	C	6	12		Ce	58	82		148.52	102.94	29.3	28.1	28.2	29.1		
	Ni	28	62		Ce	58	80		148.36	101.36	29.8	28.3	28.9	27.3		
	Ni	28	64		Nd	60	82		141.06	99.16	29.9	28.3	28.9	27.3		

Parent		Emitted				Daughter				T						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zd	Ae	Ce	Q	EK	log(T)	log(T')	log--	CA	nq	nT
			Tt(s)						(MeV)	T(s)	T'(s)	TA	TA	TA		
86 Rn	203	1.65	0		Pt	78	108		36.28	33.40	31.4	30.8	30.3	29.7		
	Fe	26	58		Nd	60	84		139.60	99.52	31.4	29.8	30.3	28.7		
	Ni	28	63		Ce	58	81		146.17	100.59	32.4	30.7	31.3	29.6		
86 Rn	204	1.86	0		Po	84	115	0	6.63	6.49	1.8	26.1	24.0	28.2	M	220 144
	He	2	4		Pb	82	113	0	12.61	12.11	25.9	30.1	28.2	28.2		
	Be	4	12		Hg	80	111		24.32	22.98	28.1	30.1	28.2	28.2		
	C	6	12		Ce	58	82		147.39	101.64	30.7	31.5	28.9	29.7		
	Fe	26	60		Nd	60	83		139.20	98.06	32.1	33.0	30.3	31.1		
	Ni	28	65		Ce	58	80		146.48	99.58	32.2	33.0	30.3	31.2		
	Ni	28	62		Ce	58	83		145.97	101.39	32.3	33.1	30.3	31.3		
	Fe	26	61		Nd	60	82		138.66	96.99	32.0	33.9	31.2	32.0		
86 Rn	204	1.86	0		Po	84	116	0	6.54	6.42	2.0	28.2	25.1	25.3	M	220 110
	He	2	4		Pb	82	114	0	12.44	11.95	26.5	26.1	24.5	24.1		
	Be	4	12		Hg	80	112	0	23.37	22.02	26.6	30.9	27.8	28.0		
	C	6	12		Ce	58	82		147.13	100.92	31.0	29.3	29.0	29.9		
	Ni	28	64		Ce	58	80		145.43	99.32	33.1	31.7	31.4	29.7		
	Fe	26	60		Nd	60	84		145.55	98.45	33.4	33.4	31.0	31.6		
	Ni	28	64		Ce	58	83		145.22	98.47	33.6	34.5	30.7	31.6		
	Ni	28	68		Ce	58	80		144.76	99.57	33.8	34.7	31.0	31.8		
	Ni	28	67		Ce	58	80		143.54	96.62	36.0	36.9	33.1	34.0		
	Fe	26	60		Ce	58	84		142.27	98.55	36.9	37.7	33.0	34.9		
	Fe	26	62		Nd	60	85		135.07	95.54	37.3	38.1	34.4	35.2		
86 Rn	205	2.23	0		Po	84	117	0	6.38	6.26	2.9	28.2	25.1	25.3	M	220 112
	He	2	4		Pb	82	115	0	12.00	11.51	26.4	28.0	26.8	28.3		
	Be	4	12		Hg	80	114	0	23.06	21.71	26.4	31.0	28.6	28.6		
	C	6	12		Ce	58	82		145.43	99.32	33.1	34.0	30.3	31.2		
	Ni	28	66		Ce	58	80		142.46	98.20	33.8	34.9	31.1	29.4		
	Ni	28	64		Ce	58	84		142.46	98.20	36.7	34.9	33.9	32.2		
	Ni	28	68		Ce	58	80		141.88	95.04	38.2	36.5	35.5	33.8		



Parent		Emitted		Daughter				Q		EK		log(T')		log(T)		log(T')		log(T)					
Z	EI	A	log(Tt)	C	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(s)	(MeV)	(s)	(MeV)	(s)	(MeV)	(s)			
86 Rn 209	3.23	Ni 28 67		Ce 58 83					139.51	84.57	10.9	39.2	37.5	35.6									
		Ni 28 68		Pb 82 124					137.24	82.32	12.0	45.0	43.7	39.0									
		Ca 20 48		Pe 78 114					131.37	78.96	43.4	42.0	40.1	38.7									
				Oy 66 94					104.22	80.17	43.4	42.0	40.1	38.7									
		He 2 4		Po 84 121					6.16	6.05	4.0	31.3	27.1	27.3									
		Be 4 8		Pb 82 119					11.39	10.95	31.1	31.3	27.1	27.3									
		C 6 12		Hg 80 117					21.59	20.36	35.8	36.1	31.8	32.1									
		Ni 28 68		Ce 58 83					139.96	94.42	40.4	41.2	36.4	37.2									
		Ni 28 69		Ce 58 84					139.51	94.52	41.0	41.9	37.0	37.9									
		Ni 28 69		Ce 58 85					138.67	94.28	41.7	42.6	37.7	38.6									
Ni 28 65		Ce 58 85					136.60	94.31	44.3	45.2	40.3	41.2											
Ca 20 48		Oy 66 95					103.31	79.58	44.7	45.4	40.7	41.4											
He 2 4		Po 84 122					6.16	6.04	4.0	30.6	27.1	26.7											
Be 4 8		Pb 82 120					11.39	10.96	31.0	30.6	27.1	26.7											
C 6 12		Hg 80 118					21.36	20.14	36.6	36.1	32.6	32.1											
Ni 28 68		Ce 58 84					138.40	93.59	42.3	40.6	38.4	36.6											
Ni 28 68		Ce 58 85					138.22	92.28	42.5	46.4	41.0	40.9											
Ni 28 67		Ce 58 86					135.40	92.41	46.2	47.1	40.7	41.6											
Ca 20 48		Oy 66 97					101.83	77.66	46.7	47.4	41.2	41.9											
Ca 20 48		Hg 80 118					19.07	17.90	47.3	47.6	41.8	42.1											
C 6 13		Ce 58 85					134.35	92.33	47.5	48.4	42.0	42.9											
Ni 28 66		Ce 58 87					6.38	6.26	3.2	30.0	27.2	26.8											
He 2 4		Po 84 124					11.51	11.07	30.4	30.0	27.2	26.8											
Be 4 8		Pb 82 122					20.79	19.61	38.4	37.7	32.9	33.2											
C 6 12		Hg 80 119					15.24	14.06	38.5	44.7	43.3	43.2											
Ni 28 68		Ce 58 86					136.22	91.28	42.5	46.4	41.0	40.9											
Ni 28 67		Ce 58 87					135.40	92.41	46.2	47.1	40.7	41.6											
Ni 28 67		Ce 58 88					135.40	92.41	46.2	47.1	40.7	41.6											
Ca 20 48		Oy 66 97					101.83	77.66	46.7	47.4	41.2	41.9											
Ca 20 48		Hg 80 118					19.07	17.90	47.3	47.6	41.8	42.1											
C 6 13		Ce 58 88					133.11	91.67	49.1	47.4	45.9	44.2											
Ni 28 69		Ce 58 85					133.39	89.98	49.4	47.7	46.3	44.5											
He 2 4		Po 84 125					8.24	8.09	-1.7	23.6	25.1	25.3											
Be 4 8		Pb 82 123					13.13	12.63	23.4	23.6	25.1	25.3											
C 6 12		Hg 80 121					21.36	20.14	34.4	44.2	46.2	46.0											
Ni 28 68		Ce 58 87					20.83	19.46	42.6	42.9	46.3	44.6											
Ni 28 67		Ce 58 88					101.51	78.53	49.1	45.7	43.9	42.5											
Ca 20 48		Oy 66 98					101.51	78.53	49.1	45.7	43.9	42.5											
Ca 20 48		Hg 80 119					19.28	18.00	48.8	48.2	45.6	45.0											
C 6 13		Ce 58 86					135.18	91.39	46.6	47.6	48.4	49.3											
Ni 28 69		Ce 58 87					134.86	91.81	47.0	47.8	48.7	49.5											
Ni 28 68		Ce 58 88					101.54	78.18	47.3	48.0	49.0	49.5											
Ca 20 49		Dy 66 98					6.84	6.68	-5.6	13.0	18.4	18.6											
He 2 4		Po 84 127					16.34	15.73	22.8	28.3	33.7	33.9											
Be 4 8		Pb 82 125					24.40	23.12	28.1	29.2	33.7	33.9											
C 6 12		Hg 80 123					23.05	21.66	33.0	33.2	38.6	38.9											
Ni 28 68		Ce 58 89																					

Parent		Emitted		Daughter				Q		EK		log(T')		log(T)		log(T')		log(T)				
Z	EI	A	log(Tt)	C	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(s)	(MeV)	(s)	(MeV)	(s)	(MeV)	(s)		
86 Rn 216	-4.35	C 6 14		Hg 80 121					23.48	21.95	33.5	33.8	39.2	39.4								
		Be 4 8		Pb 82 124					11.27	10.80	34.6	34.8	40.2	40.5								
		N 7 15		Au 79 121					26.03	24.21	42.4	42.7	48.1	48.4								
		He 2 4		Po 84 128					30.97	28.67	43.6	43.9	49.3	49.6								
		Be 4 8		Pb 82 126					8.20	8.05	-4.3	10.4	15.2	14.8								
		C 6 12		Hg 80 124					24.95	23.56	25.7	25.2	30.0	29.6								
		C 6 14		Hg 80 122					24.58	22.99	30.2	29.7	34.5	34.0								
		Be 4 8		Pb 82 125					11.36	10.89	34.1	33.7	38.4	38.0								
		C 6 13		Hg 80 123					22.40	21.05	35.0	34.4	39.3	38.8								
		Be 4 8		Pb 82 124					11.43	10.90	36.6	36.2	40.9	40.5								
N 7 15		Au 79 122					25.51	24.63	39.8	39.3	44.1	43.6										
He 2 4		Po 84 129					7.88	7.73	-3.3	12.9	16.0	16.2										
Be 4 8		Pb 82 127					16.33	15.73	22.7	22.9	25.5	25.7										
Be 4 8		Pb 82 126					14.06	13.48	22.3	22.5	26.4	26.6										
C 6 12		Hg 80 125					25.95	24.51	23.1	23.4	26.4	26.6										
C 6 14		Hg 80 123					25.91	24.24	26.5	26.7	29.7	30.0										
C 6 13		Hg 80 124					25.22	23.71	26.7	26.9	29.9	30.2										
Be 4 8		Pb 82 125					13.50	12.88	26.8	27.0	30.0	30.3										
Be 4 8		Pb 82 127					11.28	10.69	31.0	30.6	32.5	32.0										
N 7 15		Au 79 123					26.54	25.97	32.7	32.1	37.1	36.4										
He 2 4		Po 84 130					7.27	7.13	-1.4	16.2	18.0	17.7										
Be 4 8		Pb 82 128					15.01	14.46	16.6	16.2	18.0	17.7										
Be 4 8		Pb 82 126					26.17	24.73	22.5	22.1	24.0	23.5										
C 6 12		Hg 80 126					14.36	13.70	23.3	23.4	24.8	24.4										
C 6 14		Hg 80 124					26.89	25.17	23.9	23.4	25.3	24.8										
C 6 13		Hg 80 125																				







Parent		Emitted		Daughter		Q (MeV)	EK (MeV)	log(T) T(s)	log(T')	log(T)	log(T')	log-- TA	log-- TA	CA	nq	nT	
Z	EI	A	log(Tt) Tt(s)	EI	Zd												Nd
87	Fr	212	3.08	He 2 4	At 85 123	6.52	6.40	4.5	23.7	24.6	E	221	54				
				Be 6 13	Bi 83 120	12.19	11.3	28.1	32.1	32.1							
				C 6 14	Tl 81 118	21.45	20.03	40.0	41.1	35.5	36.6						
				N 7 15	Hg 80 117	26.85	24.95	41.5	42.7	37.0	38.1						
				O 8 16	Au 79 117	32.29	29.85	41.7	43.0	37.2	38.5						
				NI 28 68	Pt 59 85	140.63	95.52	42.7	46.4	43.2	41.9						
				Ca 20 48	Ho 67 97	105.54	81.65	43.7	46.6	39.2	42.0						
				Ni 28 67	Pt 59 86	139.77	95.60	43.7	47.4	39.2	42.9						
87	Fr	213	1.55	He 2 4	At 85 124	6.90	6.77	1.5	26.5	25.0	M	221	36				
				Be 6 13	Tl 81 120	15.61	15.30	30.6	30.6	29.0	29.0						
				N 7 15	Hg 80 118	21.70	20.38	40.1	40.1	38.5	38.5						
				O 8 16	Au 79 118	27.30	25.38	40.1	41.6	40.0	40.0						
				C 6 14	Tl 81 118	32.33	29.90	41.6	41.6	40.0	40.0						
				C 6 13	Tl 81 119	21.48	20.07	41.6	43.4	41.9	41.9						
				Ca 20 48	Ho 67 98	20.38	19.13	43.4	43.6	42.0	42.0						
				Ni 28 68	Pt 59 86	105.55	81.76	43.6	44.1	42.5	42.5						
87	Fr	214	-2.27	He 2 4	At 85 125	8.59	8.43	-2.3	21.3	22.8	M	221	61				
				Be 6 13	Bi 83 121	18.11	13.66	26.7	27.7	29.0	30.0						
				C 6 14	Tl 81 120	25.02	23.62	26.7	35.2	36.4	37.4						
				N 7 15	Hg 80 119	23.10	21.70	34.1	35.2	38.4	39.4						
				O 8 16	Au 79 119	23.08	21.57	36.1	37.8	38.9	40.1						
				Ca 20 48	Ho 67 99	28.49	26.49	36.6	40.1	41.1	42.3						
				Ni 28 68	Pt 59 87	33.36	30.87	38.8	43.2	44.5	45.5						
				Be 6 13	Bi 83 122	15.16	14.38	42.2	43.2	44.5	47.4						
				C 6 14	Tl 81 121	106.32	82.47	42.3	45.1	44.5	47.4						
87	Fr	217	-4.66	He 2 4	At 85 128	8.47	8.31	-4.7	10.0	14.7	M	221	76				
				Be 6 13	Bi 83 126	17.63	16.98	19.1	12.6	15.0	15.7						
				C 6 14	Tl 81 124	26.14	26.58	19.1	17.5	19.7	20.6						
				N 7 15	Hg 80 123	27.06	25.31	24.6	24.6	24.5	25.5						
				O 8 16	Pb 82 124	19.43	18.45	25.9	25.9	30.6	30.6						
				Ca 20 48	Hg 80 119	25.54	24.01	27.0	27.0	31.6	31.6						
				Ni 28 68	Au 79 119	31.56	29.38	28.6	28.6	33.2	33.2						
				Be 6 13	Bi 83 125	11.84	11.35	32.7	32.7	37.3	37.3						
				C 6 14	Tl 81 123	35.44	32.83	33.6	33.6	36.2	36.2						
87	Fr	218	-3.12	He 2 4	At 85 129	8.01	7.87	-3.1	12.6	15.0	M	222	92				
				Be 6 13	Bi 83 127	16.91	16.29	11.9	12.6	15.0	15.7						
				C 6 14	Tl 81 125	29.31	27.70	16.6	17.5	19.7	20.7						
				N 7 15	Hg 80 124	28.39	26.56	21.4	22.4	24.5	25.5						
				O 8 16	Pb 82 125	27.76	26.10	21.4	22.4	24.5	25.5						
				Ca 20 48	Hg 80 122	20.84	19.79	21.7	22.6	24.8	25.7						
				Ni 28 68	Au 79 122	13.97	13.39	23.4	24.3	26.6	27.4						
				Be 6 13	Bi 83 126	32.23	30.01	27.0	28.1	30.1	31.2						
				C 6 14	Tl 81 124	13.32	12.71	28.5	29.3	31.6	32.5						
87	Fr	219	-1.67	He 2 4	At 85 130	7.45	7.32	-1.7	15.7	17.4	M	221	85				
				Be 6 13	Bi 83 128	15.54	14.97	15.7	15.7	17.4	17.4						
				C 6 14	Tl 81 126	29.66	28.03	15.8	15.8	17.5	17.5						
				N 7 15	Hg 80 125	29.44	27.55	19.0	19.0	20.7	20.7						
				O 8 16	Pb 82 126	21.71	20.62	19.3	19.3	20.9	20.9						
				Ca 20 48	Hg 80 124	27.76	26.11	21.4	21.4	23.0	23.0						
				Ni 28 68	Au 79 126	14.28	13.63	24.5	24.5	26.2	26.2						
				Be 6 13	Bi 83 127	33.22	30.95	24.7	24.7	26.4	26.4						
				C 6 14	Tl 81 125	16.50	15.85	31.3	31.3	33.1	33.1						
87	Fr	220	1.43	He 2 4	At 85 131	6.80	6.68	1.6	17.2	18.6	M	221	94				
				Be 6 13	Bi 83 129	30.71	27.64	17.7	18.3	19.7	19.7						
				C 6 14	Tl 81 127	14.66	14.12	18.5	19.3	16.8	17.6						
				N 7 15	Hg 80 127	28.23	26.69	18.7	19.7	17.1	18.1						
				O 8 16	Pb 82 127	20.42	19.40	22.8	23.7	21.1	22.1						
				Ca 20 48	Hg 80 125	33.66	31.37	23.7	24.8	22.1	23.2						
				Ni 28 68	Au 79 127	19.85	18.77	26.4	27.3	24.7	25.7						
				Be 6 13	Bi 83 127	13.66	13.04	27.0	27.8	25.3	26.2						
87	Fr	221	2.46	He 2 4	At 85 132	6.46	6.34	2.5	15.0	16.5	M	221	88				
				Be 6 13	Bi 83 130	31.26	29.34	12.5	12.5	13.5	13.5						
				C 6 14	Tl 81 128	26.92	25.46	21.6	21.6	19.7	19.7						
				N 7 15	Hg 80 128	13.57	13.08	22.3	22.3	20.1	20.1						
				O 8 16	Pb 82 128	34.12	31.81	22.7	22.7	20.1	20.1						
				Ca 20 48	Hg 80 126	26.91	25.33	23.3	23.3	20.7	20.7						
				Ni 28 68	Au 79 128	19.34	18.38	26.0	26.0	23.5	23.5						
				Be 6 13	Bi 83 131	37.46	34.75	28.9	28.9	26.3	26.3						
				C 6 14	Tl 81 129	25.66	23.92	29.6	29.6	27.1	27.1						
87	Fr	222	2.94	He 2 4	At 85 133	5.85	5.74	5.4	18.4	19.9	E	221	94				
				Be 6 13	Bi 83 132	30.12	28.22	17.4	18.4	11.9	12.9						
				C 6 14	Tl 81 129	26.90	25.32	23.2	24.3	17.8	18.8						
				N 7 15	Hg 80 129	27.53	25.67	24.6	25.7	19.2	20.2						
				O 8 16	Pb 82 129	25.62	24.24	24.7	25.7	19.3	20.3						
				Ca 20 48	Hg 80 127	12.64	12.18	25.9	26.8	20.5	21.3						
				Ni 28 68	Au 79 127	32.53	30.33	26.0	27.2	20.6	21.8						
				Be 6 13	Bi 83 132	31.65	29.37	29.5	30.7	24.1	25.3						
				C 6 14	Tl 81 127	18.18	17.28	29.8	30.7	24.3	25.3						
87	Fr	223	3.12	He 2 4	At 85 134	5.44	5.34	7.4	19.7	12.3	M	221	84				
				Be 6 13	Bi 83 133	29.02	27.20	19.7	19.7	18.7	19.7						
				C 6 14	Tl 81 130	32.51	30.32	26.0	26.0	16.7	17.7						
				N 7 15	Hg 80 130	24.90	23.56	26.6	26.6	19.2	19.2						
				O 8 16	Pb 82 130	38.63	35.51	28.8	28.8	21.5	21.5						
</																	



Parent		Emitted				Daughter				T <sub>1/2</sub>														
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Z	A	log(T <sub>1/2</sub> )	C	EI	Z	A	log(T <sub>1/2</sub> )	C	nQ	nT								
		T <sub>1/2</sub> (s)				Q (MeV)				log(T <sub>1/2</sub> ) (s)														
88	Ra	207	0.11	0	He	2	4			Rn	86	117	0	7.27	7.13	0.1	22.9	22.5	22.2	22.8	M	221	167	
					Be	4	12			Pb	82	113	0	27.25	25.67	22.7	22.9	22.7	22.9	22.9				
					Ni	28	64			Po	84	115	0	13.81	13.28	22.8	23.0	22.7	22.9	22.9				
					Ni	28	66			Nd	60	83		154.59	106.79	28.4	29.3	28.3	29.1	28.6				
					Ni	28	65			Hg	80	111		38.76	35.76	28.4	28.7	28.3	28.6					
					Ni	28	66			Nd	60	82		154.56	106.01	28.6	29.4	28.4	29.3					
					Ni	28	67			Nd	60	81		152.75	104.26	29.5	30.3	29.4	30.2					
					Ni	28	68			Nd	60	80		152.72	104.24	30.3	31.5	30.4	31.2					
					Ni	28	69			Pb	82	112	0	24.59	23.05	31.3	31.5	31.1	31.4					
88	Ra	208	0.15	0	He	2	4			Rn	86	118	0	7.27	7.14	0.1	22.5	22.9	22.4					
					Be	4	12			Pb	82	114	0	27.08	25.52	23.0	22.6	22.9	22.5					
					Be	4	16			Po	84	116	0	13.73	13.20	23.0	22.6	22.9	22.5					
					Ni	28	66			Hg	80	112	0	38.37	35.42	29.2	28.6	29.0	28.4					
					Ni	28	66			Nd	60	82		153.62	104.87	29.7	27.9	29.5	27.8					
					Ni	28	67			Nd	60	84		152.49	103.27	30.6	29.0	30.6	29.3					
					Ni	28	68			Nd	60	83		152.47	103.25	32.5	33.6	31.9	32.1					
					Ni	28	69			Nd	60	84		150.57	103.81	33.0	35.9	32.4	32.2					
					Ni	28	62			Nd	60	86		149.31	104.30	33.4	32.3	33.8	32.2					
					Ni	28	62			Nd	60	86		149.31	104.30	33.3	32.7	34.2	32.6					
88	Ra	209	0.66	0	He	2	4			Rn	86	119	0	7.14	7.01	0.7	24.3	23.4	23.6					
					Be	4	12			Pb	82	115	0	26.61	25.08	24.1	24.3	23.4	23.6					
					Be	4	16			Po	84	117	0	13.44	12.92	24.1	24.3	23.4	23.6					
					Ni	28	66			Hg	80	113	0	37.68	34.79	30.5	30.8	29.9	30.2					
					Ni	28	66			Nd	60	83		151.83	103.88	31.7	32.6	31.7	32.0					
					Ni	28	67			Nd	60	82		151.79	102.99	33.5	33.6	31.9	32.0					
					Ni	28	68			Nd	60	82		148.83	101.20	34.5	35.8	35.0	33.2					
					Ni	28	69			Nd	60	83		148.29	100.50	36.3	37.3	35.0	35.9					
					Ni	28	67			Nd	60	83		148.15	100.89	36.5	34.7	35.9	34.1					
					Tl	22	50			Oy	66	94		121.51	92.58	37.4	35.9	36.8	35.3					
88	Ra	211	1.08		He	2	4			Rn	86	121		7.04	6.91	1.1	25.1	23.8	24.0					
					Be	4	12			Po	84	119		13.21	12.71	24.9	25.1	24.2	24.4					
					Be	4	16			Pb	82	117		26.07	24.59	25.3	25.5	24.2	24.4					
					C	6	13			Hg	80	115		36.61	33.83	32.7	33.0	31.6	31.9					
					Ni	28	66			Nd	60	84		150.18	102.99	33.5	33.6	32.3	32.6					
					Ni	28	66			Nd	60	86		145.02	99.86	37.8	36.0	36.7	34.9					
					Ni	28	67			Nd	60	85		148.50	101.21	36.1	37.0	35.0	35.9					
					Ni	28	68			Nd	60	83		148.29	100.50	36.3	37.3	35.2	36.2					
					Ni	28	65			Nd	60	86		146.86	101.62	37.6	38.6	36.5	37.5					
88	Ra	212	1.15	0	He	2	4			Rn	86	122		7.03	6.90	1.1	24.5	23.8	23.4					
					Be	4	12			Po	84	120		13.20	12.70	24.9	24.5	24.2	24.4					
					Be	4	16			Pb	82	118		26.05	24.58	25.3	24.8	24.1	23.6					
					C	6	13			Hg	80	116		36.37	33.62	33.2	32.6	32.0	31.6					
					Ni	28	66			Nd	60	86		145.02	99.86	37.8	36.0	36.7	34.9					
					Ni	28	67			Nd	60	85		148.50	101.21	36.1	37.0	35.0	35.9					
					Ni	28	68			Nd	60	83		148.29	100.50	36.3	37.3	35.2	36.2					
					Ni	28	65			Nd	60	86		146.86	101.62	37.6	38.6	36.5	37.5					
88	Ra	214	0.40		He	2	4			Rn	86	124		7.27	7.14	0.4	23.9	23.9	23.5					
					Be	4	12			Po	84	122		13.34	12.84	24.3	24.7	24.8	24.3					
					Be	4	16			Pb	82	120		26.03	24.57	25.2	24.7	24.8	24.3					
					C	6	13			Hg	80	118		35.79	33.11	34.3	33.7	33.9	33.3					
					C	6	14			Nd	60	82		23.32	21.80	36.5	36.0	36.1	35.6					
					Ni	28	66			Nd	60	85		145.23	98.87	40.0	41.0	37.4	38.3					
					Ni	28	67			Nd	60	86		144.99	99.38	40.2	41.1	37.5	38.5					
					Ni	28	68			Tl	81	117		27.73	25.78	40.2	40.5	37.6	37.9					
88	Ra	214	0.40		He	2	4			Rn	86	124		7.27	7.14	0.4	23.9	23.9	23.5					
					Be	4	12			Po	84	122		13.34	12.84	24.3	24.7	24.8	24.3					
					Be	4	16			Pb	82	120		26.03	24.57	25.2	24.7	24.8	24.3					
					C	6	13			Hg	80	118		35.79	33.11	34.3	33.7	33.9	33.3					
					C	6	14			Nd	60	82		23.32	21.80	36.5	36.0	36.1	35.6					
					Ni	28	66			Nd	60	85		145.23	98.87	40.0	41.0	37.4	38.3					
					Ni	28	67			Nd	60	86		144.99	99.38	40.2	41.1	37.5	38.5					
					Ni	28	68			Tl	81	117		27.73	25.78	40.2	40.5	37.6	37.9					
88	Ra	215	-2.79		He	2	4			Rn	86	125		8.86	8.70	-2.8	19.4	22.0	22.2					
					Be	4	12			Po	84	123		14.74	14.19	19.2	19.4	22.0	22.2					
					Be	4	16			Pb	82	121		27.32	25.80	22.1	22.3	24.8	25.1					
					C	6	13			Hg	80	119		25.34	23.81	28.7	29.0	31.5	31.8					



Parent Z	E <sub>1</sub> A log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	C	E <sub>2</sub>	Z <sub>e</sub>	A <sub>e</sub>	Ce	Daughter		Q <sub>α</sub> (MeV)	E <sub>K</sub> (MeV)	log(T) T(s)	log(T') T'(s)	log(T'' T''(s)	log(T''') T'''(s)	CA	nT
							El	Zd Nd Cd								
88 Ra 220	-1.64	He	2	4	Rn	86	130	7.59	7.45	-1.6	11.8	13.8	13.4	M	221	99
		C	6	12	Pb	82	126	32.02	30.28	12.2	15.6	17.6	17.2			
		Be	4	8	Po	84	128	15.70	15.13	16.0	16.1	18.2	17.7			
		C	6	14	Pb	82	124	31.04	29.06	16.6	17.8	19.9	19.4			
		C	6	13	Pb	82	125	29.60	27.85	18.3	23.6	25.8	25.2			
		N	7	15	Tl	81	124	33.99	31.68	24.2	23.0	27.1	26.7			
		B	5	11	Bi	83	126	39.76	36.82	22.7	22.0	25.1	24.7			
		O	8	16	Pb	82	130	37.16	34.76	24.4	24.3	27.4	27.0			
		Be	4	10	Po	84	126	13.62	13.00	28.1	27.7	29.7	29.3			
88 Ra 221	1.45	He	2	4	Rn	86	131	6.88	6.75	1.9	14.1	11.9	12.2	M	221	114
		C	6	14	Pb	82	125	32.39	30.34	13.8	14.5	12.3	12.5			
		C	6	13	Pb	82	126	31.58	29.73	14.2	15.4	12.9	13.2			
		C	6	12	Pb	82	127	30.58	28.92	14.8	15.1	17.3	17.5			
		Be	4	8	Po	84	129	14.67	14.14	19.2	19.4	19.9	19.3			
		N	7	15	Tl	81	125	35.01	32.73	21.8	22.0	20.4	20.7			
		O	8	16	Pb	82	129	36.81	34.53	21.8	21.9	20.4	20.7			
		C	6	15	Pb	82	125	27.87	25.05	27.0	27.3	25.3	25.8			
		B	5	11	Bi	83	124	32.87	30.12	27.4	27.2	25.2	25.6			
		O	8	18	Hg	80	124	19.08	18.14	27.8	28.1	25.9	26.2			
88 Ra 222	1.59	He	2	4	Rn	86	132	6.68	6.56	1.6	12.1	11.0	10.5	M	221	103
		C	6	14	Pb	82	126	33.05	30.97	12.6	17.4	16.3	15.8			
		C	6	13	Pb	82	127	29.05	27.48	17.9	19.4	18.3	17.8			
		C	6	12	Pb	82	128	28.81	27.13	19.9	20.9	14.4	14.7			
		C	6	15	Pb	82	126	27.13	27.17	21.8	22.0	15.5	15.8			
		N	7	15	Tl	81	126	33.81	31.53	24.1	24.4	17.9	18.2			
		Be	4	8	Po	84	130	13.85	13.15	22.0	21.9	20.4	20.7			
		O	8	16	Pb	82	126	26.90	25.09	27.4	28.3	25.8	25.2			
		O	8	17	Hg	80	126	39.80	36.57	27.8	27.2	26.2	25.6			
88 Ra 223	5.99	He	2	4	Rn	86	133	5.98	5.87	6.3	15.0	8.5	8.8	M	221	109
		C	6	14	Pb	82	127	31.85	29.85	14.8	15.9	13.4	13.7			
		C	6	13	Pb	82	128	28.86	27.18	19.7	19.9	14.4	14.7			
		C	6	12	Pb	82	129	27.73	26.23	20.7	20.9	15.5	15.8			
		C	6	15	Pb	82	126	29.13	27.17	21.8	22.0	12.5	12.8			
		N	7	15	Tl	81	127	34.91	32.53	24.1	24.4	17.9	18.2			
		Be	4	8	Po	84	125	33.81	31.53	24.1	24.4	17.9	18.2			
		O	8	18	Hg	80	125	40.33	37.07	26.0	26.9	20.4	20.7			
		O	8	17	Hg	80	126	39.01	36.04	28.1	28.4	21.8	22.1			
88 Ra 224	5.53	He	2	4	Rn	86	134	5.79	5.69	5.5	16.9	11.8	11.4	M	221	95
		C	6	14	Pb	82	128	30.54	28.63	17.4	16.9	13.4	13.7			
		C	6	13	Pb	82	129	26.37	24.96	23.8	23.3	18.3	17.8			
		C	6	15	Pb	82	126	26.17	24.65	26.0	25.5	20.5	20.0			
		O	8	18	Hg	80	126	40.55	37.30	26.1	25.5	20.6	20.0			
		N	7	15	Tl	81	128	32.56	30.29	28.5	28.0	22.0	21.4			
		C	6	16	Pb	82	126	26.88	24.96	28.1	28.2	23.2	22.6			
		Be	4	8	Po	84	132	12.10	11.67	29.1	28.7	23.6	23.2			
88 Ra 225	6.11	He	2	4	Rn	86	135	5.15	5.06	9.4	19.9	10.3	10.5	E	221	102
		C	6	14	Pb	82	129	29.46	27.63	19.6	19.9	16.0	16.2			
		C	6	13	Pb	82	130	26.43	24.91	25.3	25.6	12.5	12.8			
		C	6	12	Pb	82	131	25.24	23.89	26.7	26.9	17.3	17.5			
		C	6	15	Pb	82	128	26.87	25.07	27.3	27.6	17.9	18.2			
		O	8	16	Pb	82	127	49.62	46.28	28.3	28.1	19.7	20.0			
		O	8	17	Hg	80	127	39.04	35.92	29.2	29.5	19.8	20.1			
		N	7	15	Tl	81	129	31.15	29.07	30.3	30.6	21.0	21.2			

Parent Z	E <sub>1</sub> A log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	C	E <sub>2</sub>	Z <sub>e</sub>	A <sub>e</sub>	Ce	Daughter		Q <sub>α</sub> (MeV)	E <sub>K</sub> (MeV)	log(T) T(s)	log(T') T'(s)	log(T'' T''(s)	log(T''') T'''(s)	CA	nT	
							El	Zd Nd Cd									
88 Ra 226	10.73	He	2	4	Rn	86	136	4.87	4.78	10.7	21.9	11.7	11.2	M	221	81	
		C	6	14	Pb	82	130	28.21	26.47	22.4	26.9	16.8	16.2				
		O	8	20	Hg	80	126	40.83	37.22	27.6	29.2	19.7	19.2				
		C	6	18	Hg	80	128	38.67	35.59	29.9	30.4	20.1	19.3				
		N	7	14	Pb	82	132	52.82	47.24	30.4	32.0	21.8	21.3				
		C	6	13	Pb	82	131	21.79	22.42	32.5	32.0	21.8	21.3				
		N	7	15	Tl	81	130	30.08	28.08	32.9	32.4	22.2	21.6				
		O	8	18	Hg	80	127	49.62	46.28	28.3	28.1	19.7	20.0				
		O	8	17	Hg	80	128	39.04	35.92	29.2	29.5	19.8	20.1				
		N	7	15	Tl	81	129	31.15	29.07	30.3	30.6	21.0	21.2				
89 Ac 209	-1.00	He	2	4	Fr	87	118	7.73	7.59	-1.0	20.4	21.4	21.4	M	221	176	
		Be	4	8	At	85	116	14.70	14.14	20.4	20.7	21.7	21.7				
		C	6	12	Bi	83	114	28.54	26.90	20.7	20.7	16.8	16.8				
		O	8	16	Tl	81	112	41.07	37.82	25.0	25.0	16.8	16.8				
		Ni	28	66	Pm	61	82	37.81	36.64	27.2	27.2	29.2	29.2				
		Ni	28	65	Pm	61	83	37.81	36.64	27.2	27.2	29.2	29.2				
		Co	27	63	Sm	62	84	151.75	109.10	28.3	28.3	29.3	29.3				
		Ni	28	65	Sm	61	83	155.42	107.08	30.6	30.6	31.6	31.6				
89 Ac 210	-0.46	He	2	4	Fr	87	119	7.60	7.46	1.1	22.1	20.1	21.0	E	221	174	
		Be	4	8	At	85	117	14.44	13.89	21.3	22.4	20.3	20.3				
		C	6	12	Bi	83	115	28.16	26.55	21.4	22.4	16.8	16.2				
		O	8	16	Tl	81	113	40.42	37.34	26.2	27.4	19.9	19.9				
		N	7	15	Pb	82	113	35.66	33.00	29.9	30.9	20.8	20.8				
		Ni	28	64	Pm	61	85	152.06	107.00	29.9	30.9	28.8	28.8				
		Ni	28	66	Pm	61	85	155.14	107.86	30.7	31.8	29.6	29.6				
		C	6	13	Bi	83	114	25.13	23.58	30.7	31.8	29.6	29.6				
		N	7	14	Pb	82	114	0	31.18	29.10	30.8	31.9	29.7	30.8			
89 Ac 211	-0.60	He	2	4	Fr	87	120	7.62	7.48	-0.6	21.2	21.8	21.8	M	221	161	
		Be	4	8	At	85	118	14.44	13.89	21.2	21.2	21.8	21.8				
		C	6	12	Bi	83	116	28.01	2								



Parent		Emitted		Daughter				Q		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )				
Z	EI	A	log(T <sub>1/2</sub> )	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(s)	(s)	(s)	TA	TA	CA	nQ	nT
89 Ac 214																				
He	2	4	0.91	Fr	87	123		Fr	87	123		7.35	7.22	1.5	23.8	21.5	22.3			M 221 143
Be	4	8		At	85	121		At	85	121		13.93	13.41	22.9	23.8	21.5	22.3			
C	6	12		Bi	83	119		Bi	83	119		27.18	25.66	23.5	24.5	22.0	23.0			
N	7	15		Pb	82	117		Pb	82	117		36.53	35.14	19.3	19.9	18.0	19.3			
O	8	16		Bi	83	118		Bi	83	118		24.73	23.23	31.6	32.7	30.2	31.2			
N	7	14		Pb	82	118	0	Pb	82	118	0	29.78	27.83	34.0	35.2	32.6	33.7			
C	6	14		Bi	83	117		Bi	83	117		23.76	22.21	36.4	37.5	34.9	36.1			
O	8	17		Tl	81	116		Tl	81	116		35.60	32.77	37.7	39.0	36.3	37.6			
89 Ac 215																				
He	2	4	-0.77	Fr	87	124		Fr	87	124		7.74	7.60	-0.8	21.5	22.2	22.2			M 221 126
Be	4	8		At	85	122		At	85	122		14.32	13.79	19.9	20.8	19.0	20.0			
C	6	12		Bi	83	120		Bi	83	120		27.56	26.02	22.5	23.3	21.5	22.5			
N	7	15		Pb	82	118		Pb	82	118		32.16	30.90	20.8	21.8	20.2	21.2			
O	8	16		Bi	83	119	0	Bi	83	119	0	39.87	36.92	26.8	28.3	26.1	27.2			
N	7	15		Pb	82	119		Pb	82	119		33.26	30.95	27.2	28.3	26.3	27.3			
C	6	13		Bi	83	118		Bi	83	118		24.44	22.85	34.3	34.3	32.0	33.0			
C	6	14		Bi	83	119		Bi	83	119		23.65	22.22	34.8	34.8	32.5	33.5			
N	7	14		Pb	82	119		Pb	82	119		28.41	26.56	37.6	37.6	35.4	36.4			
Ca	20	48		Tm	69	98		Tm	69	98		112.74	87.57	38.3	38.3	39.1	39.1			
89 Ac 216																				
He	2	4	-3.52	Fr	87	125		Fr	87	125		9.24	9.07	-3.5	17.8	20.4	21.2			M 221 118
Be	4	8		At	85	123		At	85	123		15.68	15.10	17.0	17.8	15.0	15.0			
C	6	13		Bi	83	120		Bi	83	120		28.50	27.00	19.7	20.7	18.0	19.0			
N	7	15		Tl	81	119		Tl	81	119		31.57	30.07	20.2	20.7	18.0	19.0			
O	8	16		Pb	82	119		Pb	82	119		39.87	36.92	26.8	28.3	25.8	26.8			
N	7	15		Pb	82	119		Pb	82	119		33.26	30.95	27.2	28.3	26.3	27.3			
C	6	13		Bi	83	123		Bi	83	123		28.46	26.77	21.8	21.8	21.8	21.8			
C	6	14		Bi	83	124		Bi	83	124		42.06	38.99	22.5	22.5	22.5	22.5			
N	7	14		Pb	82	120		Pb	82	120		25.85	24.18	30.1	31.2	28.0	29.0			
O	8	17		Tl	81	118		Tl	81	118		31.15	29.13	30.5	31.6	28.0	29.0			
89 Ac 219																				
He	2	4	-5.15	Fr	87	128		Fr	87	128		8.83	8.66	-5.1	9.8	15.0	15.0			M 221 152
Be	4	8		At	85	126		At	85	126		18.27	17.60	13.6	14.6	12.8	13.6			
C	6	13		Bi	83	127		Bi	83	127		32.45	30.80	17.0	18.0	16.0	17.0			
N	7	15		Pb	82	127		Pb	82	127		36.68	34.87	17.0	18.0	16.0	17.0			
N	7	14		Bi	83	123		Bi	83	123		31.59	29.56	16.4	17.4	15.3	16.3			
C	6	14		Pb	82	123		Pb	82	123		30.76	28.80	18.1	19.2	17.0	18.0			
O	8	16		Tl	81	123		Tl	81	123		37.42	34.87	18.5	19.6	17.0	18.1			
O	8	17		Po	84	125		Po	84	125		42.84	39.72	21.1	22.3	20.0	21.0			
N	7	14		Pb	82	124		Pb	82	124		21.45	20.38	21.8	22.7	22.0	23.3			
89 Ac 220																				
He	2	4	-1.59	Fr	87	129		Fr	87	129		8.35	8.19	-1.0	11.0	12.8	13.6			M 222 155
Be	4	8		At	85	127		At	85	127		16.78	16.04	11.1	11.7	11.7	12.8			
C	6	13		Bi	83	127		Bi	83	127		32.45	30.80	17.0	18.0	16.0	17.0			
N	7	15		Pb	82	127		Pb	82	127		36.68	34.87	17.0	18.0	16.0	17.0			
N	7	14		Bi	83	123		Bi	83	123		31.59	29.56	16.4	17.4	15.3	16.3			
C	6	14		Pb	82	123		Pb	82	123		30.76	28.80	18.1	19.2	17.0	18.0			
O	8	16		Tl	81	123		Tl	81	123		37.42	34.87	18.5	19.6	17.0	18.1			
O	8	17		Po	84	125		Po	84	125		42.84	39.72	21.1	22.3	20.0	21.0			
N	7	14		Pb	82	124		Pb	82	124		21.45	20.38	21.8	22.7	22.0	23.3			
89 Ac 221																				
He	2	4	-1.28	Fr	87	130		Fr	87	130		7.78	7.64	-1.1	11.7	12.8	12.8			M 221 152
Be	4	8		At	85	128		At	85	128		16.78	16.04	11.1	11.7	11.7	12.8			
C	6	14		Bi	83	128		Bi	83	128		32.45	30.80	17.0	18.0	16.0	17.0			
N	7	15		Pb	82	128		Pb	82	128		36.68	34.87	17.0	18.0	16.0	17.0			
N	7	14		Bi	83	124		Bi	83	124		31.59	29.56	16.4	17.4	15.3	16.3			
C	6	15		Pb	82	124		Pb	82	124		30.76	28.80	18.1	19.2	17.0	18.0			
O	8	16		Tl	81	124		Tl	81	124		37.42	34.87	18.5	19.6	17.0	18.1			
O	8	17		Po	84	126		Po	84	126		42.84	39.72	21.1	22.3	20.0	21.0			
N	7	14		Pb	82	125		Pb	82	125		21.45	20.38	21.8	22.7	22.0	23.3			

Parent		Emitted		Daughter				Q		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )				
Z	EI	A	log(T <sub>1/2</sub> )	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(s)	(s)	(s)	TA	TA	CA	nQ	nT
89 Ac 222																				
He	2	4	0.65	Fr	87	131		Fr	87	131		7.14	7.01	0.6	15.1	13.5	14.4			M 221 153
C	6	12		Bi	83	127		Bi	83	127		31.42	29.72	14.1	15.6	13.9	14.9			
C	6	14		Bi	83	125		Bi	83	125		32.48	30.43	14.6	16.2	14.1	15.1			
N	7	15		Pb	82	125		Pb	82	125		38.98	36.30	15.8	17.9	16.0	17.0			
Be	4	8		At	85	129		At	85	129		15.06	14.52	18.9	19.5	18.0	18.8			
O	8	16		Tl	81	125		Tl	81	125		43.62	40.47	19.6	20.8	18.9	20.1			
N	7	14		Pb	82	126		Pb	82	126		35.51	33.27	20.7	21.8	20.1	21.2			
B	5	11		Po	84	127		Po	84	127		20.39	19.38	24.7	25.7	24.1	25.0			
89 Ac 223																				
He	2	4	2.12	Fr	87	132		Fr	87	132		6.78	6.66	2.5	13.4	10.9	10.9			M 221 139
C	6	14		Bi	83	128		Bi	83	128		33.08	31.00	13.4	14.7	12.2	13.2			
N	7	15		Pb	82	128		Pb	82	128		39.69	36.63	17.7	19.3	17.0	18.0			
C	6	13		Bi	83	127		Bi	83	127		29.51	27.79	19.3	19.3	16.9	17.8			
O	8	16		Tl	81	127		Tl	81	127		43.60	40.47	19.6	19.6	17				



Parent		Emitted		Daughter		Q		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )								
Z	EI	A	log(Tt)	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	EK	(MeV)	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nT	
89	Th	228	4.34	He	2	4		Ff	87	137		4.84	4.75	12.6	27.2	13.6	14.7					E 221 118
				C	14			Bi	83	131		27.09	25.43	26.2	27.2	13.6	14.7					
				O	8	20		Tl	81	127		41.87	38.20	26.6	28.1	14.1	15.5					
				Ne	10	24		Au	79	125		55.96	49.56	28.2	29.8	15.2	16.6					
				N	7	12		Pb	82	120		42.02	20.00	28.9	30.3	16.3	17.8					
				F	9	23		Hg	80	125	0	47.85	43.02	29.6	31.1	17.0	18.5					
				Ne	10	23		Hg	79	126	10	53.51	48.11	30.1	31.7	17.5	19.1					
90	Th	212	-1.52	0	He	2	4	Ra	88	120	0	7.95	7.80	-1.2	19.3	20.9	20.5					E 221 166
				Be	4	12		Rn	86	118	0	15.13	14.56	19.7	19.3	20.9	20.5					
				C	6	12		Po	84	116	0	29.04	27.40	20.4	19.9	21.6	21.1					
				O	8	16		Pb	82	114	0	42.19	39.00	28.0	23.4	25.2	24.6					
				Ni	28	66		Sm	62	84		128.02	109.21	29.4	27.6	30.6	28.6					
				Ni	28	65		Sm	62	85		127.46	108.94	31.7	29.8	32.9	31.7					
				Ni	28	68		Er	68	94		129.77	109.17	31.9	30.5	33.2	31.7					
				Cr	24	54		Dy	66	92		139.35	103.86	32.1	30.6	33.3	31.8					
90	Th	213	-0.82	0	He	2	4	Ra	88	121	0	7.85	7.70	-0.8	20.6	21.2	21.4					M 221 172
				Be	4	8		Rn	86	119	0	14.90	14.34	20.4	20.6	21.2	21.4					
				C	6	12		Po	84	117	0	28.65	27.04	21.2	21.4	22.0	22.3					
				O	8	16		Pb	82	115	0	41.62	38.49	25.0	25.3	25.8	26.1					
				N	7	12		Bi	83	116	0	41.53	38.40	25.7	28.5	26.0	25.4					
				Sm	62	86		Sm	62	86		156.02	107.90	32.8	31.0	33.6	31.8					
				Ni	28	65		Er	68	96		128.03	98.11	33.9	32.4	34.8	33.3					
				Ti	22	50		Er	68	96		128.03	98.11	33.9	32.4	34.8	33.3					
				Ni	28	64		Sm	62	88		154.81	108.51	33.9	32.1	34.8	33.0					
				Ni	28	68		Sm	62	84		155.12	105.83	34.2	32.4	35.1	33.3					
90	Th	215	0.08	0	He	2	4	Ra	88	123	0	7.66	7.52	0.4	21.5	20.9	21.1					M 221 160
				Be	4	8		Rn	86	121		14.62	14.08	21.3	21.5	20.9	21.1					
				C	6	12		Po	84	119		28.24	26.66	22.0	22.2	21.6	21.9					
				N	7	12		Pb	82	118		41.53	38.40	25.7	28.5	26.0	25.4					
				Sm	62	86		Sm	62	86		156.02	107.90	32.8	31.0	33.6	31.8					
				N	7	15		Bi	83	117	0	31.20	29.02	33.3	31.6	33.0	33.3					
				O	8	17		Pb	82	116	0	37.82	34.83	33.9	34.2	33.5	33.8					
				Mi	28	66		Sm	62	87		154.06	106.77	35.1	36.0	34.7	35.7					
				Er	68	97		Er	68	97		126.85	97.35	35.3	36.0	34.7	35.7					
90	Th	216	-1.55	0	He	2	4	Ra	88	124	0	8.06	7.92	-1.5	19.5	21.5	21.1					M 221 143
				Be	4	8		Rn	86	122	0	15.01	14.45	19.9	19.5	21.5	21.1					
				C	6	12		Po	84	120	0	28.53	27.04	21.1	20.6	22.6	22.1					
				N	7	15		Bi	83	118	0	31.62	28.16	32.4	34.6	33.7	33.1					
				M	6	14		Po	84	118	0	25.24	23.60	35.0	32.5	34.6	34.1					
				C	6	13		Po	84	119	0	24.49	23.02	33.4	32.8	34.9	34.4					
				Ti	22	50		Er	68	98		126.63	97.32	35.4	33.9	36.9	35.5					
				Ni	28	66		Sm	62	88		153.36	106.50	35.8	34.0	37.3	35.5					

Parent		Emitted		Daughter		Q		EK		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )								
Z	EI	A	log(Tt)	EI	Zd	Ae	Ce	EI	Zd	Nd	Cd	Q	(MeV)	EK	(MeV)	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	CA	nq	nT	
90	Th	217	-3.60	0	He	2	4	Ra	88	125		9.43	9.25	3.6	16.4	19.8	20.0					M 221 163
				Be	4	8		Rn	86	123		16.79	15.62	18.7	16.9	22.3	22.5					
				C	6	12		Po	84	121		29.72	28.08	18.7	23.9	27.2	27.5					
				O	8	16		Pb	82	119	0	42.20	39.09	23.6	25.8	29.1	29.4					
				C	6	13		Po	84	120	0	27.39	25.75	25.5	25.8	29.1	29.4					
				N	7	15		Bi	83	119		32.87	30.60	29.2	29.5	32.8	33.1					
				C	6	14		Po	84	119		26.49	24.78	29.5	29.8	33.1	33.4					
				O	8	17		Pb	82	118	0	39.24	36.16	30.7	31.0	34.3	34.6					
				N	7	14		Bi	83	120		30.69	28.89	32.3	32.6	35.9	36.2					
90	Th	219	-6.00	0	He	2	4	Ra	88	127		9.26	9.34	6.0	10.6	16.5	16.6					M 222 169
				Be	4	8		Rn	86	126		18.26	17.32	18.2	15.1	16.5	16.6					
				C	6	12		Po	84	124		31.62	29.89	18.2	15.1	16.5	16.6					
				O	8	16		Pb	82	121		44.00	40.78	20.3	20.6	26.3	26.6					
				C	6	13		Po	84	122		29.53	27.78	20.5	20.7	26.5	26.7					
				C	6	14		Po	84	121		28.99	27.14	23.1	23.4	29.1	29.4					
				N	7	15		Bi	83	121		35.09	32.69	24.2	24.5	30.2	30.5					
				O	8	17		Pb	82	120		41.22	38.02	26.5	26.9	32.5	32.9					
				N	7	14		Bi	83	122		32.67	30.58	28.0	28.3	34.0	34.3					
90	Th	220	-5.01	0	He	2	4	Ra	88	128		8.95	8.79	5.0	9.8	15.2	14.8					M 221 158
				Be	4	8		Rn	86	128		18.30	17.72	13.6	10.6	16.5	16.6					
				C	6	12		Po	84	124		32.74	30.38	13.6	13.3	18.6	18.3					
				O	8	16		Pb	82	122		44.51	41.28	19.4	18.8	24.4	23.8					
				C	6	14		Po	84	122		29.63	27.93	21.2	20.7	26.2	25.7					
				C	6	13		Po	84	123		28.69	26.99	22.3	21.8	27.3	26.8					
				N	7	15		Bi	83	122		35.63	33.20	23.1	22.5	28.1	27.5					
				O	8	1																



Parent		Emitted				Daughter				T										
Z	EI A	log(T <sub>1/2</sub> )	C	EI	Z <sub>e</sub>	Ae	Ce	EI	Z <sub>d</sub>	Nd	Cd	Q	EK	log(T)	log(T')	log(T'')	log(T''')	CA	nQ	nT
		f(s)										(MeV)	(MeV)	f(s)	f(s)	f(s)	f(s)			
90	Th	224	0.01	He	2	4		Ra	88	132		7.30	7.17	0.0	14.1	14.5	14.1	M	221	156
				C	6	14		Pb	82	126		32.94	30.88	14.6	15.3	15.9	15.3			
				C	6	12		Pb	82	126		46.49	43.17	15.9	16.3	16.7	16.0			
				M	4	12		Po	84	128		30.37	28.17	16.0	16.3	16.7	16.0			
				Be	4	12		Ra	88	130		14.81	14.28	16.3	16.9	17.0	16.3			
				C	6	13		Pb	84	127		29.31	27.61	20.1	20.2	20.7	20.2			
				C	8	18		Pb	82	124		44.57	40.99	21.1	20.5	21.1	20.5			
				O	8	17		Pb	82	125		43.26	39.98	22.4	21.8	22.4	21.8			
90	Th	225	2.68	He	2	4		Ra	88	133		6.92	6.80	3.1	13.9	14.1	13.9	M	221	159
				C	6	14		Po	84	127		31.72	29.75	16.9	17.1	17.3	16.6			
				O	8	16		Pb	82	126		44.56	41.88	18.9	19.7	19.3	18.6			
				O	8	19		Pb	82	126		49.27	46.59	22.2	22.6	22.4	21.7			
				C	6	15		Pb	82	126		44.84	41.87	19.5	19.8	19.4	18.7			
				M	4	12		Po	84	129		28.96	27.41	19.9	20.1	19.8	19.0			
				C	7	15		Bi	83	128		34.95	32.63	24.1	23.5	23.5	23.0			
				C	6	13		Bi	83	128		41.03	38.14	25.1	25.4	25.4	24.9			
				O	8	17		Pb	82	127		41.63	38.50	25.3	24.7	24.7	24.1			
				O	8	20		Pb	82	124		43.19	39.37	25.5	24.8	24.8	24.1			
				O	8	19		Pb	82	125		42.32	38.77	26.2	25.5	25.5	24.8			
90	Th	226	3.27	He	2	4		Ra	88	134		6.45	6.34	3.4	15.6	15.9	15.4	M	221	142
				C	6	14		Pb	82	126		45.73	42.09	18.9	18.3	18.3	17.6			
				C	6	18		Pb	82	126		48.25	45.57	21.9	21.9	21.9	21.2			
				C	6	15		Pb	82	126		42.27	39.59	22.2	21.6	21.6	21.0			
				C	6	12		Pb	82	126		47.20	44.54	23.0	22.8	22.8	22.2			
				O	8	20		Pb	82	126		44.58	40.54	23.6	23.3	23.3	22.6			
				C	6	14		Pb	82	126		44.48	40.57	23.0	22.8	22.8	22.2			
				C	6	10		Pb	82	126		44.58	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.58	40.54	23.0	22.8	22.8	22.2			
				C	6	13		Pb	82	126		41.03	38.14	25.1	25.4	25.4	24.9			
				O	8	19		Pb	82	127		41.03	38.14	25.1	25.4	25.4	24.9			
				O	8	16		Pb	82	127		41.03	38.14	25.1	25.4	25.4	24.9			
				F	9	21		Y	81	126		47.84	43.44	25.1	24.4	24.4	23.7			
90	Th	228	7.78	He	2	4		Ra	88	136		5.52	5.42	7.9	14.5	14.5	13.9	M	221	126
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2			
				C	6	14		Pb	82	126		44.25	40.54	23.0	22.8	22.8	22.2</			



Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		T		T'				
Z	EI A	log(Tt)	C	EI	Ze	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	T'(s)	log--	log--	CA	nQ	nT
91	Pa 222	-2.24		He	2	4	AC	89	129			8.69	8.54	-1.9						
				C	6	12	At	85	125			33.93	32.10	11.4	12.4	13.3	14.3	M	222	192
				Be	4	8	Fr	87	127			17.98	17.33	11.8	12.6	13.8	14.5			
				C	6	13	At	85	124			31.72	29.86	16.8	17.8	18.7	19.7			
				O	8	16	Bi	83	123			46.72	43.36	16.8	18.0	18.7	19.9			
				N	7	15	Po	84	123			39.01	36.37	17.6	18.7	19.6	20.7			
				C	6	12	At	85	124			31.59	34.20	20.0	22.0	23.8	24.9			
				B	5	11	Po	86	125			22.05	20.96	22.0	22.9	23.9	24.8			
91	Pa 223	-2.19		He	2	4	AC	89	130			8.34	8.20	-1.8						
				C	6	12	At	85	126			33.98	32.15	11.3	11.3	13.1	13.1	M	221	185
				Be	4	8	Fr	87	128			17.08	16.47	14.1	14.1	16.0	16.0			
				O	8	16	Bi	83	124			47.12	43.74	16.1	16.1	17.9	17.9			
				C	6	13	Po	84	124			39.70	37.03	16.4	16.4	18.2	18.2			
				C	6	13	At	85	125			31.19	29.37	17.8	17.8	19.6	19.6			
				N	7	14	Po	84	126			22.32	21.22	21.2	21.2	23.0	23.0			
				B	5	11	Po	84	125			35.84	33.59	22.2	22.2	24.1	24.1			
91	Pa 224	-0.02		He	2	4	AC	89	131			7.63	7.49	-0.0						
				C	6	12	At	85	127			32.42	30.68	14.0	14.9	14.0	15.0	M	221	181
				C	6	13	At	85	126			32.33	30.45	15.5	16.5	15.5	16.5			
				O	8	16	Bi	83	125			47.41	44.02	15.9	16.8	15.9	16.8			
				N	7	15	Po	84	125			32.75	30.73	15.0	16.9	15.0	16.9			
				C	6	14	At	85	125			15.08	14.54	20.1	20.1	19.7	19.7			
				Be	4	8	Fr	87	129			15.88	15.31	17.6	18.4	17.6	18.4			
				O	8	16	Po	84	126			36.89	34.59	20.1	21.2	20.1	21.2			
				O	8	17	Bi	83	124			44.67	41.28	21.1	22.3	21.1	22.4			
91	Pa 225	0.26		He	2	4	AC	89	132			7.39	7.25	0.4						
				N	7	15	Po	84	126			40.19	37.51	15.4	15.4	15.0	15.0	M	221	178
				O	8	16	At	85	126			32.36	30.91	15.7	15.7	15.2	15.2			
				C	6	12	Bi	83	127			38.37	35.82	18.5	19.6	16.1	17.2			
				O	8	16	At	85	128			30.91	29.26	16.8	16.8	16.4	16.4			
				Be	4	8	Fr	87	130			15.08	14.54	20.1	20.1	19.7	19.7			
				C	6	13	At	85	127			29.82	28.10	20.5	20.5	20.1	20.1			
				O	8	18	Bi	83	125			45.69	42.05	20.2	21.5	17.8	19.0			
				C	6	13	At	85	128			29.49	27.80	21.2	22.2	18.7	19.8			
				O	8	17	Po	84	126			36.31	33.74	23.7	24.9	21.3	22.4			
91	Pa 226	2.03		He	2	4	AC	89	133			6.99	6.86	2.4						
				C	6	14	At	85	127			31.64	29.68	18.0	19.0	15.5	16.6	M	221	175
				N	7	15	Po	84	127			38.37	35.82	18.5	19.6	16.1	17.2			
				O	8	16	Bi	83	128			29.42	27.86	19.8	20.8	17.4	18.3			
				C	6	12	At	85	129			45.11	41.71	20.2	21.4	17.7	18.2			
				O	8	18	Bi	83	126			45.69	42.05	20.2	21.5	17.8	19.0			
				C	6	13	At	85	128			29.49	27.80	21.2	22.2	18.7	19.8			
				O	8	17	Po	84	126			36.31	33.74	23.7	24.9	21.3	22.4			
91	Pa 227	3.36		He	2	4	AC	89	134			6.58	6.47	3.7						
				C	6	14	At	85	128			30.41	28.53	20.5	20.5	16.8	16.8	M	221	163
				O	8	16	Bi	83	128			37.12	34.67	20.8	20.8	17.1	17.1			
				N	7	15	Po	84	128			43.43	40.37	21.9	21.9	18.2	18.2			
				O	8	16	Bi	83	128			28.09	26.61	22.7	22.7	19.0	19.0			
				C	6	12	At	85	130			58.70	53.01	23.5	23.5	19.8	19.8			
				Ne	10	22	Tl	81	124			50.08	45.89	24.5	24.5	20.8	20.8			
				F	9	19	Pb	82	126			42.45	39.27	24.9	24.9	21.2	21.2			
				O	8	17	Bi	83	127											
91	Pa 227	3.36		He	2	4	AC	89	134			6.58	6.47	3.7						
				C	6	14	At	85	128			30.41	28.53	20.5	20.5	16.8	16.8	M	221	163
				O	8	16	Bi	83	128			37.12	34.67	20.8	20.8	17.1	17.1			
				N	7	15	Po	84	128			43.43	40.37	21.9	21.9	18.2	18.2			
				O	8	16	Bi	83	128			28.09	26.61	22.7	22.7	19.0	19.0			
				C	6	12	At	85	130			58.70	53.01	23.5	23.5	19.8	19.8			
				Ne	10	22	Tl	81	124			50.08	45.89	24.5	24.5	20.8	20.8			
				F	9	19	Pb	82	126			42.45	39.27	24.9	24.9	21.2	21.2			
				O	8	17	Bi	83	127											



Parent				Emitted				Daughter				T										
Z	EI	A	log(Tt)	Z	EI	Ae	Ce	Zd	EI	Ae	Cd	Q	EK	log(T)	log(T')	log(T)	log(T')	log(T)	log(T')	CA	nQ	nT
			Tt(s)									(MeV)	(MeV)	T(s)	T'(s)	T(s)	T'(s)	TA	TA	CA	nQ	nT
92	U	227	1.82	0	He	2	4	Th	90	133		7.20	7.08	1.8	18.9	16.8	17.1			M	221	184
				C	0	8	16	Po	84	127		46.06	42.82	18.6	21.0	17.2	17.5					
				C	6	14		Rn	86	127		31.57	29.63	19.0	19.3	17.2	17.5					
				C	8	12		Po	84	125		40.06	38.24	20.4	20.7	18.5	18.9					
				C	6	18		Po	84	125		46.04	42.59	20.7	21.0	19.0	19.2					
				C	8	13		Rn	86	128		30.09	28.36	20.8	21.1	19.0	19.3					
				N	7	15		At	85	127		37.41	34.94	21.3	21.6	19.5	19.8					
				Ne	10	22		Pb	82	123		60.69	54.81	21.8	22.2	20.0	20.4					
92	U	228	2.74		He	2	4	Th	90	134		6.80	6.68	2.9	20.2	17.9	17.2			M	221	174
				O	8	16		Po	84	126		45.97	42.34	20.9	20.2	17.9	17.2					
				Ne	10	24		Pb	82	124		31.53	29.62	19.2	19.5	17.3	17.6					
				Ne	10	23		Pb	82	124		30.54	28.66	19.2	19.5	17.3	17.6					
				O	8	16		Po	84	128		44.34	41.23	21.4	20.8	18.5	17.9					
				C	6	12		Rn	86	130		28.98	27.45	21.6	21.2	18.7	18.2					
				C	10	24		Pb	82	122		60.59	53.94	23.9	23.1	21.0	20.2					
				Ne	10	20		Pb	82	126		58.03	52.94	24.1	23.4	21.2	20.5					
				Be	4	8		Ra	88	132		14.02	13.53	24.6	24.2	21.7	21.3					
92	U	229	3.54		He	2	4	Th	90	135		6.47	6.36	4.3	20.6	15.8	16.2			M	221	171
				Ne	10	24		Pb	82	123		61.92	55.44	20.8	20.6	18.5	18.2					
				Ne	10	23		Pb	82	124		60.14	54.10	23.3	23.7	18.9	19.3					
				O	8	18		Po	84	127		44.42	40.93	23.4	23.8	19.1	19.4					
				C	6	14		Rn	86	129		29.35	27.56	23.8	24.1	19.5	19.8					
				C	10	21		Pb	82	126		58.69	53.31	23.9	24.3	19.6	19.9					
				O	8	16		Po	84	129		42.59	39.62	24.5	24.8	20.0	19.3					
				C	6	12		Rn	86	131		27.55	26.10	24.9	25.1	20.1	20.4					
92	U	230	6.26		He	2	4	Th	90	136		5.99	5.89	6.4	19.8	14.1	13.3			M	221	159
				Ne	10	22		Pb	82	126		62.21	55.74	20.7	21.0	10.8	11.2					
				Ne	10	24		Pb	82	124		61.36	54.95	22.0	21.3	15.6	14.8					
				Ne	10	23		Pb	82	125		59.23	53.31	24.6	23.9	18.2	17.4					
				Mg	12	28		Hg	80	122		73.99	64.98	25.2	24.3	18.7	17.8					
				Mg	12	26		Hg	80	124		72.53	64.33	26.0	25.1	19.5	18.7					
				C	6	14		Rn	86	130		28.35	26.62	26.2	25.7	19.8	19.3					
				O	8	18		Po	84	128		42.77	39.43	26.5	25.8	20.0	19.4					
				O	8	20		Po	84	126		43.78	39.97	26.7	26.0	20.2	19.6					
92	U	231	5.56		He	2	4	Th	90	137		5.55	5.45	9.8	19.6	10.9	10.1			M	221	157
				Ne	10	24		Pb	82	125		62.21	55.74	20.7	21.0	10.8	11.2					
				Ne	10	23		Pb	82	126		60.71	54.66	22.2	21.6	12.4	12.8					
				Ne	10	22		Pb	82	127		59.44	53.78	23.4	23.8	13.6	14.0					
				Mg	12	28		Hg	80	123		74.09	65.11	24.9	25.4	15.1	15.5					
				Mg	12	25		Hg	80	125		59.75	53.28	25.2	26.2	15.4	15.8					
				C	6	14		Rn	86	124		73.08	64.54	25.8	26.2	15.9	16.4					
				Mg	12	26		Hg	80	125		72.31	64.17	26.2	26.7	16.4	16.8					
				Ne	10	25		Hg	80	123		65.42	58.34	26.4	26.8	16.6	17.0					
92	U	232	9.36		He	2	4	Th	90	138		5.41	5.32	9.5	19.6	10.9	10.1			M	221	142
				Ne	10	24		Pb	82	126		62.31	55.86	20.4	19.6	10.9	10.1					
				Mg	12	25		Hg	80	124		74.32	65.35	24.5	23.6	15.0	14.1					
				Ne	10	25		Pb	82	125		59.22	52.84	26.0	25.2	16.5	15.7					
				Ne	10	22		Pb	82	128		57.36	51.92	26.7	25.9	17.1	16.4					
				Mg	12	26		Hg	80	126		71.77	63.73	26.9	26.0	17.4	16.5					
				Na	11	23		Tl	81	125		64.98	57.29	27.9	26.7	17.5	16.6					
				Ne	10	25		Pb	82	124		71.98	63.99	27.9	26.7	17.5	16.6					
				Mg	12	27		Hg	80	125		71.48	63.10	28.0	27.2	18.9	17.6					
92	U	233	12.70		He	2	4	Th	90	139		4.91	4.82	12.8	23.5	10.3	10.7			M	221	140
				Ne	10	24		Pb	82	126		60.95	54.52	23.1	23.0	10.5	10.9					
				Ne	10	23		Pb	82	127		59.47	52.87	26.2	25.3	13.1	12.3					
				Mg	12	28		Hg	80	125		74.24	65.32	24.5	23.7	13.7	14.1					
				Mg	12	27		Hg	80	126		72.47	64.07	26.5	26.9	14.4	14.8					
				Ne	10	26		Tl	81	125		58.95	52.37	27.1	27.5	15.1	15.5					
				Na	11	26		Tl	81	126		64.87	57.63	27.8	28.3	15.1	15.5					
				Mg	12	29		Hg	80	124		72.36	63.35	27.9	28.4	15.2	15.6					
				Ne	10	23		Pb	82	128		56.82	51.21	28.4	28.8	15.6	16.0					
92	U	234	12.88		He	2	4	Th	90	140		4.85	4.78	13.0	23.7	11.5	10.6			M	221	129
				Ne	10	24		Pb	82	126		61.93	55.26	23.7	23.0	12.7	11.9					
				Ne	10	25		Pb	82	127		59.47	52.87	26.2	25.3	13.1	12.3					
				Ne	10	25		Pb	82	127		57.94	51.75	28.0	27.2	15.0	14.2					
				Si	14	32		Pt	78	124	10	85.46	73.77	28.4	27.3	15.4	14.3					
				Na	11	27		Tl	81	126		64.84	57.36	28.5	27.6	15.5	14.6					
				Mg	12	30		Hg	80	124		71.96	62.73	29.1	28.2	16.1	15.1					
				Mg	12	29		Hg	80	125		71.18	62.36	29.7	28.8	16.7	15.7					
92	U	235	16.33		He																	



Parent		Emitted				Daughter				T <sub>1/2</sub>									
Z	EI	A	log(I <sub>β</sub> )	C	EI	Ze	Ae	Ce	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )					
			l(s)						(MeV)	(MeV)	l(s)	l(s)	l(s)	l(s)					
93	Np	232	2.95	0	He	2	4	Pa	91	137	6.00	5.90	8.0	23.7	14.0	15.7	E	221	173
					Bi	83	125	Pb	82	125	62.12	55.70	22.1	24.0	14.2	15.9			
					Pb	82	125	Tl	81	123	69.11	61.67	22.3	24.0	14.2	15.9			
					Tl	81	123	Pb	82	123	76.67	67.41	22.7	24.6	14.7	16.6			
					Mg	12	26	Tl	81	124	75.77	67.28	22.8	25.3	15.4	17.3			
					Mg	12	27	Bi	83	124	75.71	66.90	23.5	24.6	14.7	16.6			
					He	10	22	Bi	83	125	60.12	54.40	23.7	25.2	15.2	17.2			
					Bi	83	125	Pb	82	125	67.47	60.46	24.0	25.7	15.9	17.8			
					Pb	82	126	Au	79	122	67.47	60.46	24.0	25.7	15.9	17.8			
93	Np	233	3.34	0	He	2	4	Pa	91	138	5.70	5.60	8.3	21.8	13.5	13.5	M	221	165
					Bi	83	126	Bi	83	126	62.23	55.82	21.8	22.2	13.8	13.8			
					Pb	82	126	Pb	82	126	69.13	61.71	22.2	23.4	14.0	14.0			
					Tl	81	124	Tl	81	124	76.86	67.63	22.4	23.4	15.0	15.0			
					Mg	12	26	Tl	81	126	75.26	66.86	23.4	24.4	15.0	15.0			
					Mg	12	27	Bi	83	126	64.38	59.88	25.6	26.6	17.1	17.1			
					Bi	83	126	Pb	82	126	67.48	59.64	26.0	26.6	17.7	17.7			
					Si	14	32	Au	79	122	68.49	76.34	26.1	26.1	17.7	17.8			
93	Np	234	5.58		He	2	4	Pa	91	139	5.36	5.27	11.7	23.6	10.0	11.9	E	221	160
					Bi	83	125	Tl	81	125	77.25	68.00	21.7	23.6	11.8	13.5			
					Pb	82	126	Pb	82	126	68.63	61.00	23.5	25.2	11.8	13.5			
					Tl	81	126	Tl	81	126	75.58	66.86	23.5	25.3	11.8	13.6			
					Bi	83	127	Bi	83	127	68.01	64.29	24.0	25.8	12.2	14.1			
					Pb	82	127	Pb	82	127	66.95	59.75	25.3	27.0	13.6	15.3			
					Bi	83	127	Pb	82	127	66.95	59.75	25.3	27.0	13.6	15.3			
					Bi	83	126	Bi	83	126	60.39	53.94	25.4	28.1	13.7	15.4			
					Si	14	32	Au	79	123	68.40	76.31	26.1	27.3	14.4	16.6			
93	Np	235	7.53		He	2	4	Pa	91	140	5.19	5.10	12.7	21.8	9.2	9.2	M	221	147
					Tl	81	126	Tl	81	126	77.10	67.92	21.8	21.8	9.2	9.2			
					Pb	82	126	Pb	82	126	68.46	60.59	24.3	24.3	11.6	11.6			
					Au	79	124	Au	79	124	78.27	66.55	26.6	26.6	12.2	14.2			
					Si	14	32	Au	79	125	87.67	75.72	26.9	29.1	12.9	15.1			
					Al	13	29	Hg	80	122	80.22	70.32	27.1	27.1	14.4	14.4			
					Ne	10	24	Bi	83	128	58.86	52.85	27.1	27.1	14.4	14.4			
					Al	13	31	Hg	80	125	80.77	70.16	27.3	28.4	13.0	14.8			
					Al	13	30	Hg	80	124	80.84	70.18	27.3	27.3	14.7	14.7			
					Mg	12	30	Tl	81	124	73.98	64.54	27.6	27.6	14.9	14.9			
93	Np	236	12.56		He	2	4	Pa	91	141	5.02	4.94	14.0	26.4	10.5	12.4	E	221	141
					Tl	81	127	Tl	81	127	75.17	66.25	24.5	26.4	10.5	12.4			
					Pb	82	127	Pb	82	127	78.37	69.39	24.8	26.4	10.5	12.4			
					Mg	12	26	Tl	81	126	75.17	66.25	24.5	26.4	10.5	12.4			
					Mg	12	27	Pb	82	127	78.37	69.39	24.8	26.4	10.5	12.4			
					Si	14	32	Au	79	125	87.67	75.72	26.9	29.1	12.9	15.1			
					Ne	10	24	Pb	82	127	66.66	59.03	27.0	28.8	13.0	14.8			
					Al	13	31	Hg	80	125	80.77	70.16	27.3	28.4	13.0	14.8			
					Al	13	30	Hg	80	124	80.84	70.18	27.3	27.3	14.7	14.7			
					Si	14	34	Au	79	123	87.60	74.98	28.0	30.3	13.6	15.6			
94	Pu	232	3.16		He	2	4	U	92	136	6.72	6.60	4.0	19.9	16.8	15.9	M	221	182
					Mg	12	26	Pb	82	124	78.37	69.39	24.8	19.9	16.8	15.9			
					Mg	12	27	Pb	82	125	78.37	69.39	24.8	19.9	16.8	15.9			
					Si	14	32	Hg	80	122	78.50	69.04	21.8	20.9	17.8	16.8			
					Ne	10	24	Pb	82	123	91.96	79.27	23.4	22.3	19.3	18.3			
					Mg	12	27	Pb	82	123	76.73	67.80	23.6	22.3	19.3	18.3			
					Ne	10	24	Po	84	124	61.79	55.40	24.0	23.2	20.0	19.2			
					Si	14	30	Hg	80	122	90.15	78.49	24.7	23.7	20.7	19.7			
					Mg	12	24	Pb	82	126	74.05	66.39	25.3	24.5	21.3	20.5			

Parent		Emitted				Daughter				T <sub>1/2</sub>									
Z	EI	A	log(I <sub>β</sub> )	C	EI	Ze	Ae	Ce	Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )					
			l(s)						(MeV)	(MeV)	l(s)	l(s)	l(s)	l(s)					
94	Pu	233	3.10		He	2	4	U	92	137	6.41	6.30	6.0	20.7	14.2	14.7	M	221	179
					Mg	12	26	Pb	82	125	78.41	69.33	20.2	21.7	15.2	15.7			
					Mg	12	27	Pb	82	124	78.41	69.33	20.2	21.7	15.2	15.7			
					Ne	10	24	Po	84	123	62.36	55.94	23.1	23.5	17.0	17.4			
					Si	14	32	Hg	80	121	91.79	79.18	23.5	24.0	17.5	18.0			
					Ne	10	23	Po	84	125	61.55	55.72	24.2	24.6	18.2	18.6			
					Si	14	30	Bi	83	126	89.44	78.01	25.4	24.4	19.5	18.5			
					Mg	12	25	Pb	82	126	74.98	66.94	24.7	25.1	18.6	18.1			
94	Pu	234	4.50		He	2	4	U	92	138	6.31	6.20	5.9	19.8	14.8	13.9	M	221	168
					Mg	12	26	Pb	82	126	78.32	69.62	20.7	19.8	14.8	13.9			
					Mg	12	27	Pb	82	125	79.16	69.69	20.7	19.8	14.8	13.9			
					Ne	10	24	Po	84	126	62.26	55.87	23.1	22.3	17.2	16.4			
					Si	14	32	Hg	80	122	91.78	79.23	23.4	22.3	17.5	16.4			
					Si	14	30	Bi	83	126	89.44	78.01	25.4	24.4	19.5	18.5			
					Al	13	29	Tl	81	124	82.39	72.18	25.8	24.8	19.9	19.0			
94	Pu	235	3.18		He	2	4	U	92	139	5.96	5.85	7.7	20.4	12.2	12.7	M	221	166
					Mg	12	26	Pb	82	125	79.65	70.16	19.9	19.9	12.2	12.7			
					Mg	12	27	Pb	82	126	78.52	69.50	20.9	21.3	13.2	13.6			
					Si	14													



Parent		Emitted				Daughter				Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	T <sub>1/2</sub>	T <sub>1/2</sub>	T <sub>1/2</sub>	CA	nq	nT			
Z	El	A	log(Tt)	C	El	Ze	Ae	Ce	El	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	log(T <sub>1/2</sub> )	T(s)	log(T <sub>1/2</sub> )	TA	nq	nT	
94	Pu	239	11.88		He	2	4		U	92	143		5.24	5.16	12.0		25.7	13.1	13.7	M	221	133
					Si	14	34		Hg	80	125		90.76	77.85	25.2		25.7	13.1	13.7			
					Si	14	32		Hg	80	127		88.92	77.69	22.7		25.2	13.1	13.7			
					Si	14	32		Pb	82	127		75.32	65.87	26.8		27.9	14.6	15.3			
					Mg	12	28		Pb	82	129		74.09	65.41	27.4		27.9	14.6	15.3			
					Mg	12	29		Pb	82	128		74.06	65.08	28.1		28.6	16.1	16.6			
					Al	13	31		Tl	81	127		80.45	70.02	29.3		29.9	17.3	17.8			
					Al	13	32	0	Tl	81	126		80.81	69.99	29.3		29.9	17.3	17.8			
94	Pu	240	11.31		He	2	4		U	92	144		5.26	5.17	11.4		23.7	13.3	12.2	M	221	118
					Si	14	34		Hg	80	126	10	90.75	78.07	24.8		23.7	13.3	12.2			
					Si	14	32		Pb	82	126		88.91	77.94	22.7		27.8	14.4	15.1			
					Si	14	32		Pb	82	128		73.97	64.73	26.8		27.8	14.4	15.1			
					Si	14	32		Pb	82	127		94.53	80.74	28.9		27.8	14.4	15.1			
					Si	14	32		Pb	82	129		72.71	64.23	29.9		28.5	18.0	17.1			
					Si	14	33		Hg	80	127		86.96	75.00	29.9		28.5	18.0	17.1			
					S	16	36	0	Pt	78	126	10	99.75	84.79	30.4		29.2	19.0	17.8			
					Si	14	36	0	Hg	80	124		87.60	74.46	30.5		29.4	19.1	18.0			
94	Pu	241	8.65		He	2	4		U	92	145		5.14	5.05	13.3		27.8	13.9	14.5	M	221	110
					Si	14	34		Hg	80	126		87.76	75.71	26.7		29.2	15.3	15.9			
					Si	14	32		Hg	80	128	10	88.42	75.61	28.7		29.3	15.3	15.9			
					Si	14	35	0	Hg	80	125		88.02	74.88	29.8		30.4	16.5	17.0			
					Si	14	36	0	Hg	80	129		86.55	75.06	29.8		30.4	16.5	17.0			
					Si	14	32		Hg	80	129		100.56	84.70	30.1		30.7	16.8	17.4			
					S	16	38		Pt	78	125	10	93.05	79.54	30.8		31.4	17.5	18.1			
					P	15	35		Au	79	127	10	93.05	79.54	30.8		31.4	17.5	18.1			
					Mg	12	30		Pb	82	129		72.54	63.51	31.0		31.4	17.6	18.1			
95	Am	233	2.56	0	He	2	4		Np	93	136		7.01	6.88	3.6		20.8	17.2	17.2	E	221	197
					Mg	12	26		Bi	83	126		79.46	70.38	21.0		21.0	15.6	15.6			
					Al	13	29		Tl	81	124		94.46	81.48	21.8		20.8	18.2	18.2			
					Al	13	29		Pb	82	122		86.52	75.75	22.0		22.0	18.4	18.4			
					Ne	10	22		At	85	126		62.87	56.93	22.1		22.1	18.5	18.5			
					Si	14	30		Tl	81	122		93.39	81.36	22.2		22.2	18.6	18.6			
					Mg	12	28		Bi	83	122		79.27	69.75	22.2		22.2	18.6	18.6			
					Mg	12	27		Bi	83	123		77.80	68.79	23.6		23.6	20.0	20.0			
					Na	11	25		Po	84	124		70.02	62.51	23.8		23.8	20.2	20.2			
95	Am	234	2.19	0	He	2	4		Np	93	137		6.70	6.58	5.7		22.5	15.0	16.8	E	221	194
					Mg	12	26		Bi	83	125		79.46	70.65	20.7		22.5	15.0	16.8			
					Si	14	32		Tl	81	124		94.42	81.51	21.7		23.7	16.2	18.1			
					Mg	12	27		Bi	83	124		79.00	69.89	21.9		23.7	16.2	18.1			
					Mg	12	28		Bi	83	123		79.41	69.90	21.9		23.8	16.2	18.1			
					Al	13	29		Pb	82	123		86.35	75.65	22.1		24.1	16.5	18.5			
					Al	13	29		Pb	82	123		86.35	75.65	22.1		24.1	16.5	18.5			
					Si	14	30		Tl	81	123		93.14	81.20	22.4		24.5	16.7	18.8			
					Si	14	31		Tl	81	122		93.07	80.74	23.0		25.1	17.3	19.4			
					Al	13	28		Pb	82	124		85.00	74.83	23.4		25.3	17.7	19.6			
95	Am	235	2.95	0	He	2	4		Np	93	138		6.60	6.48	5.4		21.0	15.6	15.6	E	221	184
					Mg	12	26		Bi	83	126		79.14	70.24	21.4		21.0	15.6	15.6			
					Si	14	32		Tl	81	124		94.50	81.64	21.5		21.5	16.1	16.1			
					Al	13	29		Pb	82	124		86.66	75.97	21.6		21.6	16.3	16.3			
					Al	13	29		Pb	82	124		86.66	75.97	21.6		21.6	16.3	16.3			
					Si	14	30		Tl	81	124		92.92	81.06	22.6		22.6	17.2	17.2			
					Mg	12	27		Bi	83	125		78.12	69.14	23.0		23.0	17.6	17.6			
					Na	11	25		Po	84	126		69.98	62.53	23.7		24.3	18.3	18.3			
					Si	14	31		Tl	81	123		91.96	79.83	24.3		24.3	18.3	18.3			

Parent		Emitted				Daughter				Q	EK	log(T <sub>1/2</sub> )	log(T <sub>1/2</sub> )	T <sub>1/2</sub>	T <sub>1/2</sub>	T <sub>1/2</sub>	CA	nq	nT			
Z	El	A	log(Tt)	C	El	Ze	Ae	Ce	El	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	log(T <sub>1/2</sub> )	T(s)	log(T <sub>1/2</sub> )	TA	nq	nT	
95	Am	236	2.95	0	He	2	4		Np	93	139	0	6.30	6.19	7.6		22.9	13.4	15.3	E	221	181
					Si	14	32		Tl	81	123		94.45	81.64	21.5		23.6	13.9	16.0			
					Al	13	29		Pb	82	125		86.69	76.04	21.5		23.5	13.9	15.9			
					Mg	12	27		Bi	83	126		78.87	69.84	21.9		24.8	14.3	16.1			
					Si	14	30		Tl	81	125		92.71	80.93	22.7		24.8	15.1	17.2			
					Si	14	31		Pb	82	124		82.90	70.61	23.1		25.2	15.5	17.6			
					Al	13	28		Pb	82	126		84.62	74.58	23.7		25.6	16.1	18.0			
95	Am	237	3.64	0	He	2	4		Np	93	140	0	6.21	6.10	7.2		20.9	13.7	13.7	M	221	169
					Mg	12	28		Bi	83	126		79.93	70.49	20.9		20.9	14.0	14.0			
					Al	13	29		Tl	81	124		94.56	81.79	21.2		21.2	14.2	14.2			
					Al	13	29		Pb	82	126		86.62	76.02	21.5		21.5	14.2	14.2			
					Al	13	30		Tl	81	126		92.11	80.45	23.4		23.4	16.1	16.1			
					Al	13	31		Pb	82	124		85.53	74.34	24.							



Parent Z EI A	log(T <sub>1/2</sub> ) t <sub>1/2</sub> (s)	Emitted				Daughter Z EI ZD	Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log <sup>-1</sup> TA	CA	nQ	nT	
		He	Li	Be	Ce										
95 Am 242	4.76	He 2 4	Si 14 34	0	Mp 93 145	5.59	5.49	11.8	27.1	13.1	15.3	M	221	132	
		Si 14 35	0	Ti 81 127	92.10	79.16	24.8	29.0	15.0	17.3					
		P 15 36	0	Ti 81 126	91.05	77.88	26.7	29.0	15.0	17.3					
		Si 14 33		Hg 80 126	97.32	82.84	27.2	29.6	15.5	18.1					
		P 15 35		Ti 81 128	89.69	77.46	27.7	29.9	15.9	18.2					
		Si 14 34		Hg 80 127	96.57	92.69	27.7	30.0	15.9	18.2					
		P 15 36	0	Al 80 125	96.87	92.06	28.3	30.3	16.5	18.0					
		Si 14 33	0	Hg 80 126	96.87	92.06	28.3	30.3	16.5	18.0					
		Si 14 32		Ti 81 129	88.81	77.06	28.4	30.5	16.6	18.8					
		He 2 4		Mp 93 146	5.44	5.35	11.4	26.7	15.2	15.2			M	221	119
		Si 14 34		Ti 81 128	90.69	78.00	26.7	27.2	15.8	15.8					
		Si 14 36	0	Ti 81 126	90.98	77.50	27.2	27.2	16.3	16.3					
P 15 37	0	Hg 80 126	97.24	82.43	27.7	27.7	16.3	16.3							
S 16 38		Au 89 126	103.30	87.31	27.9	27.9	16.2	16.2							
S 16 38		Au 89 126	103.30	87.31	27.9	27.9	16.2	16.2							
S 16 40		Ag 79 124	102.84	85.91	29.7	29.7	18.2	18.2							
Si 14 32		Ti 81 130	107.77	76.21	29.7	29.7	18.3	18.3							
Ca 20 44		Re 75 120	127.43	102.26	30.2	30.2	18.8	18.8							
He 2 4		Mp 93 147	5.24	5.16	13.9	31.2	15.0	17.3			E	221	113		
Si 14 34		Ti 81 129	89.00	76.60	28.9	31.2	15.0	17.3							
Si 14 36	0	Ti 81 127	89.41	76.22	29.3	31.7	15.4	17.8							
S 16 39	0	Au 79 126	102.34	85.98	29.8	32.4	15.9	18.5							
S 16 39	0	Au 79 126	102.34	85.98	29.8	32.4	15.9	18.5							
S 16 39	0	Au 79 127	102.92	82.03	29.9	32.5	16.0	18.6							
Ca 20 48		Re 75 121	127.30	102.26	30.2	33.3	16.3	19.4							
K 19 47		Os 76 121	121.58	98.16	30.2	33.3	16.3	19.3							
P 15 36		Hg 80 128	94.99	80.98	30.2	32.6	16.3	18.7							
He 2 4		Mp 94 137	7.21	7.08	3.1	20.6	17.0	17.6			E	221	198		
Si 14 32		Pu 82 123	96.24	83.96	20.1	20.6	14.7	15.2							
Si 14 34		Pb 82 124	96.91	93.71	20.2	20.7	17.1	17.7							
Si 14 36	0	Pb 82 122	96.92	93.42	20.8	21.9	17.7	17.9							
Mg 12 28		Pb 84 124	80.38	70.84	21.9	21.0	18.7	17.8							
Si 14 31		Pb 82 123	94.61	82.18	22.5	21.5	19.3	18.3							
Mg 12 27		Po 84 123	80.21	70.65	22.3	22.3	19.2	19.2							
Mg 12 28		Po 84 124	83.72	82.16	22.7	23.2	19.6	20.2							
Al 13 29		Pb 82 120	94.55	81.27	23.7	24.2	20.6	21.1							
He 2 4		Mp 94 138	7.10	6.98	3.2	18.8	16.7	15.6			E	221	188		
Si 14 32		Pu 82 122	97.08	83.92	19.9	18.8	16.7	15.6							
Si 14 34		Pb 82 125	96.01	93.29	20.5	20.5	16.0	15.9							
Si 14 36	0	Pb 82 124	96.91	93.71	20.2	20.6	14.7	15.2							
Mg 12 28		Pb 84 124	80.38	70.84	21.9	21.0	18.7	17.8							
Si 14 31		Pb 82 123	94.61	82.18	22.5	21.5	19.3	18.3							
Mg 12 27		Po 84 123	80.21	70.65	22.3	22.3	20.2	19.3							
Mg 12 28		Po 84 124	86.16	75.58	23.8	22.9	20.6	19.6							
Al 13 29		Hg 80 120	108.06	91.58	24.1	22.9	20.9	19.7							
He 2 4		Mp 94 139	6.71	6.59	5.2	20.4	14.7	15.2			E	221	184		
Si 14 32		Pu 82 125	96.02	83.96	20.1	20.6	14.7	15.2							
Si 14 34		Pb 82 124	96.91	93.71	20.2	20.6	14.7	15.2							
Si 14 36	0	Pb 82 122	96.92	93.42	20.8	21.3	15.6	16.1							
Mg 12 28		Pb 84 124	80.56	71.04	21.6	22.1	16.4	16.9							
Mg 12 27		Po 84 123	79.71	70.63	22.2	22.6	17.9	17.5							
Mg 12 28		Po 84 124	94.85	81.64	23.0	23.6	17.9	18.4							
Al 13 29		Bi 83 125	86.26	75.70	23.6	24.1	18.4	18.9							
Si 14 29		Pb 82 126	92.82	81.46	24.7	24.2	18.5	19.0							

Parent Z EI A	log(T <sub>1/2</sub> ) t <sub>1/2</sub> (s)	Emitted				Daughter Z EI ZD	Q (MeV)	EK (MeV)	log(T) T(s)	log(T') T'(s)	log <sup>-1</sup> TA	CA	nQ	nT	
		He	Li	Be	Ce										
96 Cm 238	3.92	He 2 4	Si 14 32	0	Pu 94 140	6.63	6.52	4.9	18.4	14.5	13.5	M	221	174	
		Si 14 34		Pb 82 124	97.28	84.20	19.4	19.6	15.7	14.7					
		Mg 12 28		Po 84 126	95.59	83.55	20.6	20.8	16.8	15.9					
		Si 14 31		Bi 83 125	94.82	82.47	22.0	21.0	17.1	16.1					
		Si 14 33		Pb 82 125	85.89	75.42	24.0	23.0	19.1	18.1					
		Si 14 34		Pb 82 122	94.38	80.90	24.0	22.9	19.1	18.0					
		Si 14 34		Po 84 124	94.76	82.16	24.4	23.3	19.7	18.4					
		P 15 35		Ti 81 122	107.42	91.17	24.6	23.5	19.7	18.5					
		He 2 4		Mp 94 141	6.51	6.40	7.0	19.4	13.8	12.4			E	221	175
		Si 14 32		Pb 82 125	97.65	84.57	18.9	19.4	11.7	14.2					
		Si 14 34		Pb 82 126	95.81	83.38	20.7	21.2	13.7	14.2					
		Si 14 36	0	Pb 82 124	95.47	82.29	22.0	22.0	15.0	15.5					
Si 14 33		Pb 82 123	94.74	81.26	23.4	24.0	16.4	16.9							
Si 14 30		Pb 82 127	73.16	81.47	23.5	24.1	16.5	17.0							
Mg 12 28		Po 84 124	94.76	82.16	24.4	24.5	17.9	17.6							
P 15 35		Ti 81 123	100.40	85.70	25.0	25.5	17.9	18.5							
He 2 4		Mp 94 142	6.40	6.29	6.5	17.8	12.3	11.3			E	221	163		
Si 14 32		Pu 82 126	97.55	84.55	18.9	17.8	16.0	14.9							
Si 14 34		Pb 82 124	95.37	81.86	22.5	21.4	16.0	15.3							
P 15 35		Ti 81 124	94.75	81.72	22.9	21.8	16.3	15.3							
P 15 36		Ti 81 125	100.49	85.83	24.7	23.6	18.2	17.1							
S 16 36		Hg 80 124	100.91	86.76	24.1	24.6	15.2	16.0							
S 16 36		Hg 80 124	100.91	86.76	24.1	24.6	15.2	16.0							
Si 14 31		Ti 81 126	99.30	85.29	22.7	22.3	17.1	17.7							
Al 13 31		Bi 83 126	91.40	70.64	26.2	26.7	17.6	18.1							
He 2 4		Mp 94 143	6.19	6.08	8.6	25.0	19.5	18.5			E	221	159		
Si 14 33		Pu 82 127	96.04	82.89	21.1	21.6	12.5	13.0							
Si 14 35		Pb 82 128	95.41	82.74	21.4	22.0	12.8	13.4							
Si 14 32		Pb 82 127	93.63	81.25	23.6	22.6	13.9	14.0							
P 15 35		Ti 81 126	100.79	86.21	24.1	23.0	16.9	17.5							
S 16 36		Hg 80 125	103.43	89.33	24.9	24.2	18.1	17.9							
S 16 36		Hg 80 124	106.38	89.67	26.3	25.1	19.0	17.8							
Si 14 35	0	Os 76 118	131.46	105.38	27.7	26.4	20.3	19.1							
Ca 20 48		Os 76 118	131.46	105.38	27.7	26.2	20.4	18.9							
He 2 4		Mp 94 144	6.22	6.11	7.3	19.8	13.6	12.5			E	221	146		
Si 14 34		Pu 82 126	96.43	82.88	20.9	19.8	16.3	15.3							
Si 14 36	0	Pb 82 128	93.63	81.25	24.1	22.6	15.3	16.0							
P 15 35		Ti 81 126	100.79	86.21	24.1	23.0	16.9	17.5							
S 16 36		Hg 80 125	106.35	89.72	26.2	26.8	17.1	17.8							



Parent		Emitted		Daughter		Q		EK		log(T)		log(T)		log(T)		log(T)		
Z	EI	A	log(T) <sub>1/2</sub>	C	EI	Zd	Nd	Cd	(MeV)	(MeV)	(s)	(s)	(s)	(s)	(s)	CA	nQ	nT
96	Cm	244	8.75		He	2	4		5.90	5.81	8.9		24.0	16.2	15.2			
					Si	14	34	0	93.06	80.09	25.1		25.0	17.3	16.1			
					Pb	82	128		92.98	79.26	26.1		25.0	17.3	16.1			
					S	16	38	0	106.28	89.73	26.2		26.5	18.8	17.6			
					P	15	37	0	98.60	83.65	27.7		26.5	18.8	17.6			
					S	16	40		105.68	88.36	27.8		26.2	16.9	17.9			
					Ca	20	48		90.16	78.20	28.2		27.1	19.3	18.2			
					Os	76	130		90.16	78.20	28.2		27.1	19.3	18.2			
					Sp	15	35		97.05	83.13	28.9		27.7	20.0	18.9			
96	Cm	245	11.43		He	2	4		5.62	5.53	11.5		27.9	15.9	16.5			
					Si	14	34		91.35	78.67	27.4		28.1	16.0	16.6			
					Pb	82	129		105.83	88.55	27.4		28.3	16.1	16.9			
					Os	76	121	10	131.22	105.52	27.6		28.8	16.8	17.4			
					Ca	20	48		104.97	98.26	28.2		29.4	17.2	18.0			
					Si	14	36	0	171.50	104.47	28.2		29.4	17.2	18.0			
					Ar	18	44		131.44	108.99	28.9		27.5	17.6	18.2			
					Ca	20	34		90.08	77.60	29.1		28.0	17.8	16.7			
					Os	76	121	10	129.91	104.04	29.4		27.9	18.1	16.6			
					Ca	20	49		103.70	87.68	29.4		28.2	18.1	16.9			
					S	16	38		7.40	7.28	3.5		22.1	16.3	18.5			
96	Cm	246	11.17		He	2	4		5.48	5.39	11.3		25.7	15.7	18.4			
					Si	14	34		106.10	88.85	27.0		25.6	15.9	18.4			
					Pb	82	126		131.46	105.81	27.2		26.3	16.1	17.3			
					Os	76	122	10	118.96	96.71	27.9		26.3	16.1	17.3			
					Ar	18	46		171.20	89.84	28.2		25.5	17.6	18.9			
					Pt	78	122	10	138.41	108.99	28.9		27.5	17.6	18.2			
					Ar	18	44		104.32	89.00	21.8		22.0	18.4	18.4			
					Pb	82	125		88.78	77.96	21.8		23.9	18.3	20.3			
					Al	13	29		103.86	89.02	22.1		24.5	18.6	20.9			
					Mg	12	28		81.18	71.63	22.2		24.1	18.7	20.3			
					S	16	36		110.84	94.07	22.4		24.8	18.8	21.3			
97	Bk	239	2.56	0	He	2	4		7.21	7.08	3.6		19.6	16.0	16.0			
					Si	14	32		98.43	85.25	19.6		20.9	16.3	18.6			
					P	15	31		106.98	94.61	20.9		20.9	17.3	19.3			
					Sp	15	35		96.83	84.32	21.0		23.2	16.5	18.7			
					P	15	35		104.32	89.00	21.8		21.8	18.2	18.2			
					Si	14	31		96.11	83.65	22.0		22.0	18.4	18.4			
					Al	13	29		88.46	77.73	22.1		22.1	18.5	18.5			
					Mg	12	28		80.96	71.48	22.4		22.4	18.8	18.8			
					S	16	36		110.72	94.04	22.5		22.5	18.9	18.9			
97	Bk	239	2.56	0	He	2	4		7.18	7.06	4.5		19.6	16.0	16.0			
					Si	14	32		98.27	85.13	19.8		21.5	14.8	17.0			
					P	15	31		106.98	94.61	20.9		20.9	16.3	18.6			
					Sp	15	35		96.83	84.32	21.0		23.2	16.5	18.7			
					P	15	35		104.32	89.00	21.8		21.8	18.2	18.2			
					Si	14	31		96.11	83.65	22.0		22.0	18.4	18.4			
					Al	13	29		88.46	77.73	22.1		22.1	18.5	18.5			
					Mg	12	28		80.96	71.48	22.4		22.4	18.8	18.8			
					S	16	36		110.72	94.04	22.5		22.5	18.9	18.9			
97	Bk	240	2.48	0	He	2	4		7.18	7.06	4.5		19.6	16.0	16.0			
					Si	14	32		98.27	85.13	19.8		21.5	14.8	17.0			
					P	15	31		106.98	94.61	20.9		20.9	16.3	18.6			
					Sp	15	35		96.83	84.32	21.0		23.2	16.5	18.7			
					P	15	35		104.32	89.00	21.8		21.8	18.2	18.2			
					Si	14	31		96.11	83.65	22.0		22.0	18.4	18.4			
					Al	13	29		88.46	77.73	22.1		22.1	18.5	18.5			
					Mg	12	28		80.96	71.48	22.4		22.4	18.8	18.8			
					S	16	36		110.72	94.04	22.5		22.5	18.9	18.9			

Parent		Emitted		Daughter		Q		EK		log(T)		log(T)		log(T)		log(T)		
Z	EI	A	log(T) <sub>1/2</sub>	C	EI	Zd	Nd	Cd	(MeV)	(MeV)	(s)	(s)	(s)	(s)	(s)	CA	nQ	nT
97	Bk	241	2.95	0	He	2	4		7.05	6.93	4.2		19.3	15.1	15.1			
					Si	14	32		98.46	85.39	19.3		20.9	16.7	16.7			
					P	15	33		104.21	89.94	20.9		21.0	16.7	16.0			
					S	16	36		104.85	89.62	21.0		22.7	18.4	18.4			
					P	15	34		110.61	94.09	22.3		22.7	18.4	18.4			
					Si	14	34		103.13	88.59	22.3		23.3	19.0	19.0			
					Al	13	30		96.54	82.48	23.4		23.4	19.2	19.2			
					Sp	15	33		93.86	81.79	24.7		24.7	20.4	20.4			
97	Bk	242	2.62	0	He	2	4		6.86	6.74	5.9		22.9	14.6	16.9			
					Si	14	32		105.12	89.91	20.5		23.8	15.2	17.9			
					P	15	34		104.03	89.41	21.5		23.3	15.1	18.4			
					Si	14	32		96.59	83.82	21.6		24.6	16.2	18.7			
					S	16	36		96.59	83.39	22.1		24.9	16.7	19.0			
					Si	14	34		101.68	87.81	24.0		26.2	18.0	20.3			
					P	15	34		102.40	87.17	24.3		26.7	18.4	20.8			
97	Bk	243	4.21		He	2	4		6.87	6.76	5.0		20.0	15.1	15.1			
					Si	14	34		105.39	90.21	22.0		22.0	17.0	17.0			
					Pb	82	126		96.82	83.28	22.0		22.3	17.3	17.3			
					Si	14	34		110.39	85.07	24.0		24.3	19.0	19.0			
					Al	13	28		109.39	92.28	24.3		24.3	19.3	19.3			
					S	16	38		102.05	86.93	24.7		24.7	19.7	19.7			
					Sp	15	33		94.07	81.29	25.2		25.2	20.2	20.2			
					P	15	34		100.88	86.76	25.3		25.3	20.3	20.3			
97	Bk	244	4.19		He	2	4		6.77	6.66	6.4		25.0	16.2	18.6	</		



Parent		Emitted		Daughter		Parent		Emitted		Daughter						
Z	EI	A	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	C	EI	Zr	Ae	Ce	Q <sub>EK</sub> (MeV)	log(T) T <sub>1/2</sub> (s)	EK	log(T) T <sub>1/2</sub> (s)	log(T' <sub>1/2</sub> ) T' <sub>1/2</sub> (s)	CA	nq	nT
97	Bk	247	10.65		He	2	4		5.89	5.79	11.0		14.0	14.0	M	221 133
					Ca	20	48		109.05	91.39	25.0		14.5	14.5		
					K	19	47		134.63	108.47	25.5		15.6	15.6		
					Ar	18	46		127.81	103.49	26.6		16.0	16.0		
					Au	79	122		121.62	98.97	27.0		16.2	16.2		
					Au	80	124		120.90	99.36	27.0		16.2	16.2		
					Cl	17	41		133.95	94.36	27.2		16.2	16.2		
					Ca	20	50		133.95	94.36	27.2		16.2	16.2		
					Ca	20	49		132.71	100.38	26.2		17.2	17.2		
97	Bk	249	7.44		He	2	4		5.53	5.44	12.4		12.5	12.5	M	221 114
					Ar	18	46		122.72	100.05	24.9		12.6	12.6		
					Ca	20	48		134.80	108.81	25.0		12.6	12.6		
					K	19	47		128.78	104.47	25.1		13.4	13.4		
					Ar	18	44		121.57	100.09	25.8		13.6	13.6		
					Ca	20	49		134.35	107.37	26.0		14.3	14.3		
					Ca	20	49		127.26	102.25	27.5		15.1	15.1		
					K	19	43		113.94	94.27	27.5		15.1	15.1		
					Cl	17	43		127.92	102.25	27.5		15.1	15.1		
98	Cf	239	1.59	0	He	2	4		7.80	7.66	1.6		18.0	18.0	E	221 201
					Si	14	30		99.06	86.63	19.6		18.4	18.4		
					Si	14	32		99.49	86.17	20.0		18.4	18.4		
					Si	14	31		98.68	85.88	20.5		18.9	18.9		
					S	16	36		113.71	96.59	20.7		19.1	19.1		
					P	15	34		111.96	96.04	22.0		20.4	20.4		
					S	16	35		112.22	95.78	22.1		20.5	20.5		
					Si	14	33		104.74	70.08	22.6		20.8	20.8		
					Mg	12	28		110.72	92.59	22.6		21.0	21.0		
					Si	14	30		96.06	84.10	23.1		21.0	21.0		
98	Cf	241	2.36	0	He	2	4		7.60	7.47	3.4		16.2	16.8	M	221 190
					Si	14	32		99.64	86.41	19.6		17.2	17.8		
					S	16	36		113.63	96.65	20.6		17.7	18.2		
					Si	14	31		98.10	85.48	21.0		19.0	19.6		
					S	16	34		111.58	95.84	22.2		20.5	20.5		
					P	15	32		111.82	95.58	22.3		20.9	20.9		
					S	16	35		104.70	80.11	22.5		21.2	21.2		
					Si	14	33		97.73	83.72	23.1		21.0	21.0		
					Si	14	30		96.06	84.10	23.1		19.7	20.2		
98	Cf	242	2.35		He	2	4		7.52	7.39	2.4		17.3	16.3	M	221 183
					Si	14	32		99.39	86.24	19.8		17.3	16.3		
					S	16	36		113.80	96.87	20.2		17.8	16.6		
					Si	14	34		111.03	95.43	22.8		20.3	19.2		
					P	15	33		103.95	89.77	22.9		20.9	19.4		
					Si	14	32		104.35	89.26	23.3		20.9	19.7		
					S	16	37		110.32	91.65	23.6		21.2	20.0		
					Si	14	30		96.68	83.10	24.1		21.7	20.6		

Parent		Emitted		Daughter		Parent		Emitted		Daughter						
Z	EI	A	log(T <sub>1/2</sub> ) T <sub>1/2</sub> (s)	C	EI	Zr	Ae	Ce	Q <sub>EK</sub> (MeV)	log(T) T <sub>1/2</sub> (s)	EK	log(T) T <sub>1/2</sub> (s)	log(T' <sub>1/2</sub> ) T' <sub>1/2</sub> (s)	CA	nq	nT
98	Cf	243	2.79	0	He	2	4		7.40	7.27	3.8		16.0	16.6	M	221 181
					Si	14	32		114.05	97.15	19.8		16.3	16.8		
					S	16	35		97.45	84.61	22.1		18.7	19.3		
					Si	14	33		111.53	95.46	22.5		19.5	19.5		
					P	15	35		97.46	84.22	22.7		18.9	19.5		
					Si	14	32		104.74	89.66	22.7		19.3	19.9		
					S	16	37		111.61	94.62	23.1		19.6	20.1		
					Si	14	34		97.16	83.57	23.4		19.6	20.1		
					Si	14	30		103.75	89.23	23.5		19.7	20.3		
98	Cf	244	3.06		He	2	4		7.33	7.21	3.2		16.7	15.5	M	221 171
					P	15	35		113.89	97.09	19.9		16.7	15.5		
					Si	14	34		104.68	89.67	22.7		19.5	18.3		
					S	16	38		112.13	94.67	22.7		21.5	19.5		
					Si	14	34		97.30	83.74	23.1		19.9	18.2		
					Ca	20	48		138.35	111.13	23.8		20.7	19.8		
					Si	14	32		95.93	83.35	23.9		20.8	19.7		
					S	16	37		110.93	94.02	24.0		20.8	19.6		
					Ar	18	42		123.25	102.03	26.0		22.8	21.5		
98	Cf	245	3.42		He	2	4		7.26	7.14	3.9		17.9	18.6	M	221 171
					Si	14	32		112.71	95.23	21.9		17.9	16.6		
					S	16	37		112.04	95.12	22.3		18.4	19.0		
					Ca	20	48		111.68	95.27	22.4		18.5	19.1		
					Ar	18	42		138.04	110.99	24.1		20.1	21.0		
					Si	14	34		103.13	88.40	24.5		20.6	21.1		
					Si	14	34		95.69	82.41	25.1		21.1	21.7		
					Ca	20	50		110.19	92.67	25.2		21.2	22.1		
					S	16	39		136.33	106.62	26.1		21.2	22.1		
98	Cf	246	5.11		He	2	4		6.86	6.75	5.2		16.5	15.3	M	221 155
					Ca	20	48		112.72	95.31	21.7		16.5	15.3		
					Ca	20	46		138.23	111.26	23.0		18.5	17.0		
					S	16	36		109.50	93.48	25.0		19.8	18.6		
					Ar	18	40		110.42	92.46	25.4		20.1	18.9		
					Ar	18	42		123.22	102.18	25.7		20.5	19.2		
					Ar	18	42		123.22	102.18	25.7		20.5	19.2		
					As	33	61		163.72	101.59	25.8		20.5	19.2		
					Ca	20	50		132.33	106.62	26.1		21.3	19.6		
					Ca	20	50		136.33	106.62	26.1		21.3	19.6		
98	Cf	247	4.05	0	He	2	4		6.55	6.44	6.9		17.1	17.9	E	221 150
					Ca	20	48		137.80	111.02	24.1		17.1	17.9		
					S	16	38		110.65	93.63	24.2		17.3	17.9		
					S	16	39		110.92	93.41	24.2		17.3	17.9		
					Ca	20	49		111.15	93.15	24.3		17.4	18.0		
					Ca	20	49		137.37	110.12	24.8		17.9	18.7		
					Ar	18	43		122.88	101.59	25.0		18.1	19.4		
					Ar	18	43		122.85	101.46	25.4		18.1	19.4		</



Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		T		T'			
Z	EI	A	log(Tt)	C	EI	Zd	Md	Cd	Q	(MeV)	T(s)	log(T)	T'(s)	log(T')	TA	CA	nq	nT	
			Tt(s)						(MeV)		T(s)	log(T)	T'(s)	log(T')	TA	CA	nq	nT	
98	Cf	249	10.04	He	2	4			6.29	6.19	11.4	24.7	12.5	13.3				M	221 137
				Ca	20	48			137.68	111.14	23.9	25.0	12.8	13.6					
				Pr	78	123			137.63	110.55	24.2	25.3	13.3	14.0					
				Ar	18	44			124.29	102.33	24.6	25.8	13.3	14.0					
				Hg	80	125			124.73	101.69	24.6	25.8	13.7	14.4					
				Ar	18	44			124.15	101.72	25.1	25.8	13.7	14.4					
				Ca	20	50			136.72	109.26	25.6	26.3	14.2	15.0					
				S	16	40			109.87	92.22	25.7	26.3	14.3	15.0					
				K	19	47			129.78	105.29	26.2	26.9	14.8	15.5					
99	Es	243	1.32	0					8.03	7.89	1.3	20.0	18.7	18.7				M	221 196
				He	2	4			100.47	87.24	20.0	20.0	18.7	18.7					
				Si	14	32			115.46	98.36	20.0	20.9	19.6	19.6					
				S	16	36			107.03	92.50	20.9	21.5	20.2	20.2					
				P	15	33			107.15	91.72	21.5	22.3	20.9	20.9					
				Po	84	124			112.93	97.13	22.3	22.5	21.2	21.2					
				S	16	34			120.29	101.97	22.5	22.6	21.3	21.3					
				Cl	17	37			181.53	133.57	24.6	25.0	20.1	20.1					
				Ca	20	48			181.53	133.57	24.6	25.0	20.1	20.1					
				P	15	34			105.67	90.88	23.0	23.0	21.6	21.6					
99	Es	244	1.57	0					7.94	7.80	2.4	22.3	17.6	20.0				E	221 195
				He	2	4			115.52	98.47	19.9	23.6	18.9	21.3					
				Si	14	32			106.49	91.65	21.8	24.2	19.5	21.8					
				P	15	34			106.49	91.65	21.8	24.2	19.5	21.8					
				Po	84	126			113.09	96.87	22.4	24.8	20.0	22.5					
				S	16	35			120.20	101.97	22.7	23.1	20.1	22.5					
				Cl	17	37			181.53	133.57	24.6	25.0	20.1	20.1					
				Ca	20	48			181.53	133.57	24.6	25.0	20.1	20.1					
				P	15	34			98.20	84.92	23.2	23.9	21.3	21.3					
99	Es	245	1.88	0					7.86	7.73	2.7	20.0	17.3	17.3				M	221 190
				He	2	4			115.33	98.38	20.0	21.1	18.5	18.5					
				P	15	35			107.30	91.97	21.1	22.1	19.4	19.4					
				Ca	20	48			141.76	113.99	22.1	22.7	20.1	20.1					
				Cl	17	37			119.91	101.80	22.7	23.1	20.4	20.4					
				S	16	38			113.32	95.74	23.1	23.9	20.4	20.4					
				Cl	17	39			120.20	101.97	22.7	23.1	20.4	20.4					
				Cl	17	39			97.97	80.82	21.9	23.9	21.3	21.3					
				P	15	38			126.58	104.86	23.9	23.9	21.3	21.3					
				Ar	18	42			126.72	105.08	23.7	26.5	20.0	22.8					
99	Es	246	2.67	0					7.81	7.68	3.7	25.0	18.2	21.4				M	221 190
				He	2	4			141.75	114.09	21.9	25.0	18.2	21.4					
				Ca	20	48			113.41	96.81	22.1	24.6	18.4	20.9					
				S	16	36			113.69	96.12	22.5	25.1	18.8	21.4					
				S	16	38			113.11	96.10	22.9	25.4	19.2	21.7					
				Cl	17	39			120.20	101.97	22.7	23.1	20.4	20.4					
				Cl	17	39			119.76	99.86	24.0	24.0	20.5	20.3					
				P	15	38			126.60	104.04	24.3	24.3	20.6	20.6					
				Ar	18	42			139.45	111.78	24.7	24.7	21.1	21.1					
99	Es	247	2.48						7.44	7.32	3.6	21.6	17.9	17.9				M	221 178
				He	2	4			141.88	114.31	21.6	22.4	18.7	18.7					
				Ca	20	48			113.69	96.20	22.4	22.8	19.2	20.2					
				S	16	38			120.13	101.16	22.8	23.4	20.5	20.2					
				Ar	18	42			126.92	105.25	23.4	24.0	20.5	20.3					
				K	19	47			119.76	99.86	24.0	24.0	20.5	20.3					
				Cl	17	41			133.05	108.33	23.8	26.9	18.1	21.2					
				Ar	18	44			133.05	108.33	24.3	27.3	18.6	21.6					
				Ca	20	49			126.61	103.22	24.5	24.5	18.7	18.7					
99	Es	249	3.79						6.87	6.76	5.8	21.5	15.6	15.6				M	221 160
				He	2	4			141.74	114.42	21.5	23.0	17.2	17.2					
				Ca	20	48			120.28	100.48	23.0	23.2	17.2	17.2					
				K	19	47			134.18	108.95	23.1	23.2	17.4	17.6					
				Ar	18	44			127.52	104.73	23.2	24.1	18.3	18.3					
				Ca	20	46			139.72	112.23	24.1	24.1	18.4	18.4					
				Ar	18	46			126.61	103.22	24.5	24.5	18.7	18.7					
99	Es	250	4.49	0					6.84	6.73	7.2	24.3	14.0	17.2				E	221 153
				He	2	4			141.86	114.62	21.2	24.3	14.0	17.2					
				Ar	18	44			127.67	105.32	22.4	25.3	15.2	18.1					
				Ca	20	47			134.26	108.92	22.9	25.9	15.7	18.7					
				Ar	18	46			127.36	103.92	23.4	26.4	16.3	19.3					
				K	19	46			133.41	108.66	23.6	26.6	16.4	19.5					
				Ca	20	50			140.17	112.80	23.3	26.9	16.5	19.7					
				Ar	18	45			126.84	104.01	23.8	26.8	16.7	19.6					
				Ca	20	49			119.41	98.95	24.5	24.5	17.0	17.0					
99	Es	251	5.07						6.60	6.49	7.5	21.0	13.5	13.5				M	221 141
				He	2	4			141.88	114.74	21.0	21.0	13.5	13.5					
				Ca	20	48			127.82	105.91	22.3	23.3	14.8	14.8					
				K	19	47			128.07	104.60	22.4	23.4	14.9	14.9					
				Ar	18	46			140.49	112.50	23.1	23.1	15.6	15.6					
				Ca	20	50			140.17	112.80	23.3	23.3	15.8	15.8					
				Ar	18	45			126.50	103.62	24.1	24.1	16.6	16.6					
				Cl	17	43			119.41	98.95	24.5	24.5	17.0	17.0					



Parent		Emitted		Daughter				Q		EK		log(I)		log(I')		log--						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Zd	Ae	Ce	El	Zd	Nd	Cd	Q	(MeV)	T <sub>1/2</sub> (s)	I	TA	log--	CA	nQ	nT	
			T <sub>1/2</sub> (s)											(MeV)	T <sub>1/2</sub> (s)	I	TA	log--	CA	nQ	nT	
100	Fm	244	-2.52	0	He	2	4		Cf	98	142	0	8.60	8.45	10.5	18.6	20.3	19.1				221 200
					Si	14	32		Po	84	124	0	117.20	99.95	19.8	18.6	19.9	18.5				
					Ca	20	48		Rn	86	126		101.80	88.45	20.0	18.9	20.3	19.1				
					Ca	20	48		Hg	80	116		145.11	116.56	20.6	19.1	21.2	21.0				
					Ca	20	46		Po	84	126		114.95	98.93	21.6	20.5	22.2	21.6				
					Ar	18	40		Hg	80	118		143.16	116.17	22.5	21.0	23.0	21.5				
					Ar	18	40		Pb	82	122		129.21	108.03	22.5	21.2	23.0	21.7				
					P	15	33		At	85	126		107.05	92.57	22.5	21.4	23.0	21.9				
					Be	4	8		Cm	96	140	0	16.23	15.70	22.7	22.3	23.3	22.8				
100	Fm	245	0.62	0	He	2	4		Cf	98	143	0	8.51	8.37	0.6	20.3	19.1	19.7				221 199
					Ca	20	48		Po	84	125		117.15	99.94	19.7	20.3	21.5	20.3				
					Ca	20	46		Hg	80	117		144.88	116.50	20.7	21.5	21.3	21.9				
					Si	14	32		Po	84	126		114.92	98.51	21.9	22.5	20.3	21.9				
					Ca	20	47		Rn	86	127		99.90	86.85	22.2	22.8	21.6	22.4				
					Ar	18	40		Hg	80	118		143.42	115.91	22.2	22.8	21.6	22.4				
					Ar	18	40		Pb	82	123		128.93	107.88	22.7	23.4	22.1	22.7				
					Ca	20	46		Hg	80	119		142.81	116.00	22.7	23.5	22.1	22.8				
					P	15	33		At	85	126		106.74	91.56	23.1	22.4	23.4	22.2				
					Ca	20	47		Hg	80	119		142.04	114.51	23.1	22.2	23.6	22.1				
100	Fm	246	0.12		He	2	4		Cf	98	144		8.38	8.24	0.1	20.7	17.9	18.6				221 190
					Ca	20	48		Po	84	126		116.77	99.68	20.0	18.6	19.9	18.5				
					Ca	20	46		Hg	80	118		145.32	116.97	20.1	20.1	20.9	20.6				
					Ar	18	42		Pb	82	122		129.68	107.54	22.3	20.9	22.1	21.0				
					Ca	20	46		Hg	80	120		128.98	108.01	22.5	21.2	22.4	21.0				
					Ca	20	46		Hg	80	120		142.80	116.10	22.6	21.1	22.4	21.0				
					P	15	33		Po	84	124		114.48	96.80	23.5	22.2	23.3	22.1				
					Ar	18	40		At	85	126		106.74	91.56	23.1	22.4	23.4	22.2				
					Ca	20	47		Hg	80	119		142.04	114.51	23.1	22.2	23.6	22.1				
100	Fm	247	1.54	0	He	2	4		Cf	98	145	0	8.21	8.07	2.1	20.7	17.9	18.6				221 191
					Ca	20	48		Hg	80	119		145.33	117.09	19.9	20.7	19.8	18.5				
					Ca	20	47		Hg	80	118		143.41	115.28	21.9	22.7	19.9	20.6				
					Ar	18	42		Pb	82	122		129.75	107.69	22.0	22.7	20.0	20.7				
					Ar	18	40		Pb	82	123		129.05	108.16	22.3	22.9	20.2	20.9				
					Ca	20	46		Po	84	125		114.56	97.95	22.4	23.0	20.3	20.9				
					Ca	20	46		Po	84	125		142.73	117.05	22.9	23.7	20.9	21.6				
					S	16	38		Hg	80	125		114.73	97.13	23.0	23.6	20.9	21.5				
100	Fm	248	1.57		He	2	4		Cf	98	146		8.00	7.87	1.7	18.0	17.8	16.3				221 184
					Ca	20	48		Hg	80	120		145.63	117.44	19.4	20.3	17.0	17.7				
					Ar	18	42		Pb	82	124		130.11	108.08	21.5	20.1	19.8	18.5				
					Ca	20	46		Hg	80	122		128.70	107.94	22.6	21.2	20.9	19.6				
					Ca	20	46		Hg	80	122		142.39	115.98	22.7	21.3	21.1	19.6				
					S	16	38		Po	84	126		114.72	97.15	22.9	21.7	21.3	20.0				
					Ar	18	43		Pb	82	123		129.25	106.66	22.6	23.3	20.0	20.7				
					Ar	18	43		Pb	82	123		146.28	114.34	23.0	21.5	21.3	19.8				
					Ca	20	46		Hg	80	123		141.91	115.71	23.1	23.9	20.9	20.1				
					Ar	18	41		Pb	82	126		128.34	107.21	23.1	22.0	21.9	20.4				
100	Fm	249	2.19	0	He	2	4		Cf	98	147		7.70	7.57	2.6	20.3	17.0	17.7				221 180
					Ca	20	48		Hg	80	121		145.40	117.37	19.5	20.3	17.0	17.7				
					Ca	20	49		Hg	80	120		144.32	115.92	21.0	21.8	18.4	19.2				
					Ar	18	42		Pb	82	125		130.40	108.40	21.0	21.7	18.4	19.1				
					Ca	20	47		Hg	80	122		143.21	116.18	21.9	22.6	19.3	20.1				
					Ca	20	47		Hg	80	122		129.25	106.66	22.6	23.3	20.0	20.7				
					Ca	20	47		Pb	82	123		146.28	114.34	23.0	21.5	21.3	19.8				
					Ar	18	43		Pb	82	123		141.91	115.71	23.1	23.9	20.9	20.1				
					Ca	20	46		Hg	80	123		128.34	107.21	23.1	22.0	21.9	20.4				
100	Fm	250	3.25		He	2	4		Cf	98	148		7.55	7.43	3.2	17.6	15.9	14.3				221 170
					Ar	18	48		Hg	80	122		145.65	117.68	19.1	19.7	17.8	16.4				
					Ar	18	44		Pb	82	126		130.25	108.37	21.0	20.3	18.5	17.1				
					Ca	20	50		Pb	82	124		130.13	107.23	21.7	20.8	19.2	17.6				
					Ca	20	50		Hg	80	120		143.16	112.53	22.4	20.9	19.2	17.6				
					Ca	20	46		Hg	80	124		141.92	115.80	23.0	21.5	19.6	16.9				
					Ca	20	43		Pb	82	125		128.52	106.41	23.4	22.0	20.1	18.8				
					Ca	20	47		Hg	80	123		141.70	115.06	23.5	22.0	20.3	18.8				
100	Fm	251	4.28	0	He	2	4		Cf	98	149	0	7.43	7.31	6.1	19.9	13.0	13.8				221 164
					Ca	20	48		Hg	80	123		145.51	117.68	19.1	19.9	13.0	13.8				
					Ca	20	49		Hg	80	122		144.56	116.42	20.3	21.2	14.2	15.1				
					Ar	18	44		Pb	82	126		130.04	107.92	20.8	21.6	14.9	15.2				
					Ca	20	47		Hg	80	123		143.40	115.52	21.8	20.3	16.7	15.1				



Parent		Emitted				Daughter				T						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	Q	EK	log(T)	log(T')	log--	CA	nT	
			T <sub>1/2</sub> (s)						(MeV)	(MeV)	T <sub>1/2</sub> (s)	T <sub>1/2</sub> (s)	TA	TA	IA	
100	Fm	256	3.97		He	2	4		7.03	6.92	5.1	16.6	13.0	11.5	M 221 130	
					Ca	20	50	Hg	80	126	146.02	117.50	18.1	18.7	15.1	13.6
					Ca	20	48	Hg	80	128	143.93	116.94	20.2	18.7	15.9	14.4
					K	19	49	Tl	81	126	137.32	111.04	21.0	19.5	15.9	14.3
					Ca	20	51	Hg	80	125	143.73	115.10	21.0	19.5	15.9	14.3
					Ca	20	49	Hg	80	127	143.04	115.66	21.5	19.9	16.4	14.8
					Ar	18	46	Pb	82	128	129.95	106.60	21.6	20.2	16.2	15.1
					Sc	21	51	Pu	79	156	148.97	122.62	23.6	21.2	17.9	16.1
					Ti	22	52	Pl	78	156	153.91	122.62	23.6	21.2	17.9	16.2
100	Fm	257	6.87		He	2	4		6.86	6.76	6.9	19.6	11.9	12.7	M 221 132	
					Ca	20	51	Hg	80	126	145.49	116.62	18.8	19.6	11.9	13.8
					Ca	20	50	Hg	80	127	144.43	116.33	19.9	20.7	13.0	14.0
					Ca	20	49	Hg	80	128	144.10	116.63	20.1	20.8	13.2	14.0
					Ca	20	48	Hg	80	129	142.32	115.74	22.0	22.7	15.1	15.9
					Ti	22	54	0	Pl	78	152	154.76	122.24	22.2	19.3	16.3
					K	19	49	Tl	81	124	146.64	117.21	21.0	24.3	19.4	22.6
					Ti	22	50	Hg	80	128	136.38	120.15	22.3	23.0	15.4	16.4
					Ar	18	46	Au	79	149	158.11	126.23	21.2	25.0	19.9	23.3
					Ar	18	42	Bi	83	123	131.55	109.27	21.9	24.8	20.2	23.1
101	Md	248	0.85	0	He	2	4		8.70	8.55	1.7	18.1	17.0	20.2	M 221 206	
					Ca	20	48	Tl	81	119	148.37	119.65	18.6	21.8	17.0	20.2
					Sc	21	49	Hg	80	119	153.21	122.94	20.3	23.6	18.6	21.9
					Ca	20	47	Tl	81	120	146.63	118.84	20.4	23.6	18.8	21.9
					Ca	20	46	Tl	81	121	146.22	119.10	20.7	23.8	19.0	22.1
					Ca	20	45	Pb	82	122	139.00	113.88	21.4	21.4	20.9	20.0
					Ca	20	44	Pb	82	123	137.01	113.01	21.5	21.5	20.2	20.2
					Ar	18	42	Bi	83	124	131.76	109.93	21.5	24.9	17.7	21.0
					Ar	18	42	Bi	83	125	152.67	122.13	20.8	24.9	17.7	21.0
					Ti	22	50	Au	79	120	157.80	126.12	21.8	21.8	20.4	20.4
					Ca	20	49	Tl	81	119	145.63	116.97	21.8	21.8	20.5	20.5
101	Md	250	1.72	0	He	2	4		8.25	8.11	3.1	18.1	16.7	16.7	M 221 199	
					Ca	20	48	Tl	81	121	148.82	120.25	17.8	21.0	14.7	17.9
					Ca	20	47	Tl	81	120	147.10	118.27	20.0	23.2	16.9	20.1
					Ca	20	46	Tl	81	122	146.73	119.84	20.0	23.2	16.9	20.1
					Ca	20	45	Hg	80	123	146.85	113.62	20.3	23.7	17.3	20.5
					Sc	21	50	Pb	82	124	139.44	114.44	20.2	20.2	18.2	18.2
					Sc	21	46	Hg	80	120	152.67	122.13	20.8	24.9	17.7	21.0
					Ar	18	42	Bi	83	125	131.91	109.75	21.2	24.1	18.1	21.0
					Ar	18	42	Bi	83	122	139.15	113.55	21.3	24.4	18.2	21.3
101	Md	251	2.38	0	He	2	4		8.05	7.92	2.4	17.4	15.1	15.1	E 221 190	
					Ca	20	48	Tl	81	122	149.02	120.52	17.4	17.4	15.1	15.1
					Sc	21	49	Hg	80	122	152.94	123.09	20.1	20.1	17.7	17.7
					Ca	20	46	Pb	82	122	146.85	113.62	20.3	20.2	18.2	18.2
					Ca	20	45	Pb	82	123	146.95	113.62	20.3	20.2	18.2	18.2
					K	19	47	Pb	82	124	139.44	114.44	20.2	20.2	18.2	18.2
					Ca	20	49	Tl	81	121	146.31	117.75	20.7	20.7	18.4	18.4
					Ca	20	47	Tl	81	123	145.73	118.44	21.0	21.0	18.6	18.6
					Ar	18	42	Bi	83	126	131.72	109.68	21.3	21.3	18.9	18.9

Parent		Emitted				Daughter				T						
Z	EI	A	log(T <sub>1/2</sub> )	C	EI	Ze	Ae	Ce	Q	EK	log(T)	log(T')	log--	CA	nT	
			T <sub>1/2</sub> (s)						(MeV)	(MeV)	T <sub>1/2</sub> (s)	T <sub>1/2</sub> (s)	TA	TA	IA	
101	Md	252	2.14	0	He	2	4		7.95	7.72	3.7	20.4	13.6	16.7	E 221 185	
					Ca	20	48	Tl	81	123	149.12	120.72	19.2	22.3	15.6	16.7
					Ca	20	49	Tl	81	122	147.61	118.91	19.6	22.9	16.0	19.2
					K	19	47	Pb	82	123	140.03	113.91	20.2	23.3	16.5	19.6
					K	19	45	Pb	82	124	139.63	114.69	20.2	23.3	16.6	19.6
					Ca	20	46	Tl	81	125	152.67	122.13	20.8	24.9	17.7	21.0
					Ca	20	45	Tl	81	124	152.37	121.26	20.3	24.9	17.7	21.0
					Sc	21	49	Hg	80	123	152.39	122.76	20.8	23.9	16.9	20.2
101	Md	254	3.23	0	He	2	4		7.80	7.67	4.0	19.2	11.9	15.2	E 221 177	
					Ca	20	48	Tl	81	125	149.98	121.64	15.9	20.8	13.6	16.8
					Ca	20	49	Pb	82	125	148.63	119.95	17.6	21.1	14.0	17.1
					K	19	47	Pb	82	126	141.66	115.45	18.0	22.0	14.9	18.0
					Ca	20	46	Pb	82	125	140.68	115.20	18.9	22.4	15.2	18.4
					Ca	20	50	Tl	81	123	147.83	118.71	19.2	22.0	16.8	19.9
					Sc	21	50	Hg	80	124	152.74	122.68	20.2	23.4	16.2	19.4
					Sc	21	49	Hg	80	125	152.36	122.97	20.3	23.6	16.3	19.6
101	Md	255	3.21		He	2	4		7.91	7.79	3.2	15.6	12.4	13.4	E 221 163	
					Ca	20	48	Tl	81	126	150.11	121.85	15.6	15.6	13.4	13.4
					K	19	47	Pb	82	126	142.31	116.08	17.1	17.1	13.9	13.9
					Ca	20	49	Tl	81	125	148.41	119.89	17.0	17.7	14.5	14.5
					Ca	20	50	Hg	80	124	148.76	119.39	18.0	18.0	14.8	14.8
					Sc	21	49	K	19	47	140.82	115.00	18.2	21.3	14.2	17.8
					Sc	21	49	Pb	82	125	140.79	113.84	19.1	22.3	15.1	18.3
					Ar	19	48	Bi	83	126	132.64	108.88	20.4	20.4	17.2	17.2
					Sc	21	50	Hg	80	125	139.44	113.19	20.7	20.7	17.4	17.4
101	Md	256	3.67		He	2	4		7.83	7.71	4.0	19.1	11.9	15.2	E 221 168	
					Ca	20	49	Tl	81	126	149.86	121.18	15.9	19.1	13.6	16.8
					Ca	20	50	Pb	82	126	149.37	120.20	16.6	19.9	13.6	16.8
					Ca	20	48	Pb	82	125	148.52	120.67	17.3	20.5	12.3	15.9
					K	19	47	Pb	82	127	140.82	115.00	18.2	21.3	14.2	17.8
					K	19	49	Pb	82	125	140.79	113.84	19.1	22.3	15.1	18.3
					Sc	21	51	Hg	80	126	153.22	122.81	19.2	22.5	15.0	18.5
					Sc	21	51	Pb	82	128	139.48	113.97	20.1	20.1	15.9	15.9



Parent		Emitted		Daughter		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		log(T <sub>1/2</sub> )		
Z	EI	A	log(T <sub>1/2</sub> )	EI	Zd	Ae	Ce	Q	EK	log(T)	log(T)	
			Tt(s)					(MeV)	(MeV)	T(s)	T(s)	
102	No 251	-0.10	0	He 2	4	4	0	8.82	8.67	0.0	17.4	
				Ca 20	46	46	Fm 100	147	0	0.0	16.6	
				Ca 20	47	47	Pb 82	121	151.81	122.78	16.6	17.4
				Ca 20	48	48	Pb 82	122	151.75	122.78	16.6	17.4
				Ca 20	49	49	Pb 82	123	152.37	123.37	18.2	19.0
				Ca 20	50	50	Pb 82	124	150.03	120.74	18.6	19.7
				Ca 20	51	51	Pb 82	125	161.89	129.64	19.4	20.2
				Ca 20	52	52	Hg 80	120	162.04	129.11	19.4	20.3
				Ca 20	53	53	Hg 80	121	161.81	128.29	19.8	20.7
				Ca 20	54	54	Tl 81	121	155.34	125.01	19.8	20.6
				Ca 20	55	55	Tl 81	122	8.55	8.41	0.5	15.5
				Ca 20	56	56	Pb 82	126	156.80	123.66	18.0	18.5
				Ca 20	57	57	Pb 82	127	148.99	121.20	19.4	17.9
				Ca 20	58	58	Hg 80	122	161.65	129.58	19.6	18.0
				Ca 20	59	59	Hg 80	123	161.85	128.45	19.6	18.0
				Ca 20	60	60	Tl 81	122	155.19	125.02	19.8	18.3
				Ca 20	61	61	Pb 82	121	148.96	119.99	19.9	18.3
				Ca 20	62	62	Pb 82	120	148.38	118.94	20.7	19.2
				Ca 20	63	63	Pb 82	119	8.41	8.27	2.0	15.5
				Ca 20	64	64	Pb 82	124	152.31	123.88	15.1	13.6
				Ca 20	65	65	Pb 82	125	150.48	122.53	17.1	16.5
				Ca 20	66	66	Pb 82	126	150.75	123.16	17.7	18.5
				Ca 20	67	67	Pb 82	127	150.75	123.16	17.7	18.5
				Ca 20	68	68	Pb 82	128	149.94	122.68	18.0	18.8
				Ca 20	69	69	Pb 82	129	149.54	121.87	18.6	17.0
				Ca 20	70	70	Pb 82	130	149.43	120.01	19.2	17.6
				Ca 20	71	71	Tl 81	124	155.12	125.20	19.6	18.1
				Ca 20	72	72	Hg 80	122	161.56	128.48	19.6	18.0
				Ca 20	73	73	Hg 80	123	160.86	129.20	20.1	18.5
				Ca 20	74	74	Pb 82	125	8.45	8.31	2.8	14.8
				Ca 20	75	75	Pb 82	126	153.56	124.66	14.1	14.8
				Ca 20	76	76	Pb 82	127	151.97	122.77	16.0	16.8
				Ca 20	77	77	Pb 82	128	150.98	123.16	16.8	17.5
				Ca 20	78	78	Pb 82	129	150.23	120.78	18.1	18.9
				Ca 20	79	79	Tl 81	125	155.70	125.78	18.8	19.7
				Ca 20	80	80	Hg 80	123	161.63	128.67	19.4	20.2
				Ca 20	81	81	Tl 81	124	155.25	124.81	19.5	20.3
				Ca 20	82	82	Hg 80	124	161.31	129.05	19.6	20.4
				Ca 20	83	83	Pb 82	122	8.55	8.42	0.5	13.1
				Ca 20	84	84	Pb 82	123	153.78	124.95	13.7	12.1
				Ca 20	85	85	Pb 82	124	151.56	122.55	16.3	14.7
				Ca 20	86	86	Pb 82	125	151.18	121.65	16.9	15.3
				Ca 20	87	87	Hg 80	124	161.98	129.07	18.8	17.2
				Ca 20	88	88	Tl 81	126	155.40	125.65	19.0	17.4
				Ca 20	89	89	Hg 80	126	141.78	115.75	19.8	18.3
				Ca 20	90	90	Tl 81	126	154.86	124.01	19.9	18.5
				Ca 20	91	91	Tl 81	125	154.61	124.41	20.1	18.5
				Ca 20	92	92	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	93	93	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	94	94	Pb 82	128	150.39	122.41	17.1	15.6
				Ca 20	95	95	Pb 82	129	150.35	121.79	17.4	15.8
				Ca 20	96	96	Pb 82	130	149.84	120.22	18.3	16.7
				Ca 20	97	97	Hg 80	126	161.85	129.23	18.6	17.0
				Ca 20	98	98	Tl 81	126	155.90	129.82	18.6	19.2
				Ca 20	99	99	Tl 81	127	155.70	129.42	18.7	19.2
				Ca 20	100	100	Hg 80	124	161.77	128.41	19.1	18.9
				Ca 20	101	101	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	102	102	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	103	103	Pb 82	128	150.39	122.41	17.1	15.6
				Ca 20	104	104	Pb 82	129	150.35	121.79	17.4	15.8
				Ca 20	105	105	Pb 82	130	149.84	120.22	18.3	16.7
				Ca 20	106	106	Hg 80	126	161.85	129.23	18.6	17.0
				Ca 20	107	107	Tl 81	126	155.90	129.82	18.6	19.2
				Ca 20	108	108	Tl 81	127	155.70	129.42	18.7	19.2
				Ca 20	109	109	Hg 80	124	161.77	128.41	19.1	18.9
				Ca 20	110	110	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	111	111	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	112	112	Pb 82	128	150.39	122.41	17.1	15.6
				Ca 20	113	113	Pb 82	129	150.35	121.79	17.4	15.8
				Ca 20	114	114	Pb 82	130	149.84	120.22	18.3	16.7
				Ca 20	115	115	Hg 80	126	161.85	129.23	18.6	17.0
				Ca 20	116	116	Tl 81	126	155.90	129.82	18.6	19.2
				Ca 20	117	117	Tl 81	127	155.70	129.42	18.7	19.2
				Ca 20	118	118	Hg 80	124	161.77	128.41	19.1	18.9
				Ca 20	119	119	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	120	120	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	121	121	Pb 82	128	150.39	122.41	17.1	15.6
				Ca 20	122	122	Pb 82	129	150.35	121.79	17.4	15.8
				Ca 20	123	123	Pb 82	130	149.84	120.22	18.3	16.7
				Ca 20	124	124	Hg 80	126	161.85	129.23	18.6	17.0
				Ca 20	125	125	Tl 81	126	155.90	129.82	18.6	19.2
				Ca 20	126	126	Tl 81	127	155.70	129.42	18.7	19.2
				Ca 20	127	127	Hg 80	124	161.77	128.41	19.1	18.9
				Ca 20	128	128	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	129	129	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	130	130	Pb 82	128	150.39	122.41	17.1	15.6
				Ca 20	131	131	Pb 82	129	150.35	121.79	17.4	15.8
				Ca 20	132	132	Pb 82	130	149.84	120.22	18.3	16.7
				Ca 20	133	133	Hg 80	126	161.85	129.23	18.6	17.0
				Ca 20	134	134	Tl 81	126	155.90	129.82	18.6	19.2
				Ca 20	135	135	Tl 81	127	155.70	129.42	18.7	19.2
				Ca 20	136	136	Hg 80	124	161.77	128.41	19.1	18.9
				Ca 20	137	137	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	138	138	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	139	139	Pb 82	128	150.39	122.41	17.1	15.6
				Ca 20	140	140	Pb 82	129	150.35	121.79	17.4	15.8
				Ca 20	141	141	Pb 82	130	149.84	120.22	18.3	16.7
				Ca 20	142	142	Hg 80	126	161.85	129.23	18.6	17.0
				Ca 20	143	143	Tl 81	126	155.90	129.82	18.6	19.2
				Ca 20	144	144	Tl 81	127	155.70	129.42	18.7	19.2
				Ca 20	145	145	Hg 80	124	161.77	128.41	19.1	18.9
				Ca 20	146	146	Pb 82	126	8.10	7.97	1.8	13.2
				Ca 20	147	147	Pb 82	127	152.76	123.16	14.8	13.2
				Ca 20	148	148	Pb 82	128	150.39	122.41		



Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		log--		CA		nQ		nT	
Z	EI	A	log(Tc)	C	EI	Zb	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	T'(s)	TA	TA	CA	nQ	nT
103	256	1.49	0	He	2	4			Md	101	151	0	8.78	8.64	1.9		12.9	16.1			M 221 200
				Ca	20	48			Pb	83	125		154.85	125.82	14.8	18.0	18.7	15.2			
				Sc	21	49			Pb	82	125		160.77	130.00	15.4	18.7	14.4	16.9			
				Ca	20	49			Pb	83	124		160.09	128.82	16.3	19.7	14.4	17.8			
				Ca	20	50			Bi	83	124		153.11	123.80	16.8	20.1	15.0	18.2			
				Ti	22	50			Ti	81	125		165.44	133.13	17.2	20.6	15.3	18.7			
				Cr	20	51			Ti	81	123		165.57	131.94	17.3	20.8	15.4	18.9			
				Ti	22	51			Bi	83	126		152.36	124.39	17.4	20.6	15.5	18.7			
				He	2	4			Md	101	153	0	8.84	8.70	1.0		13.9	17.3			M 222 190
				Ca	20	49			Pb	82	126		161.06	129.85	14.9	18.3	13.9	17.3			
				Ca	20	48			Bi	83	126		154.32	125.01	15.2	18.5	14.2	17.5			
				Ca	20	48			Bi	83	127		153.78	125.17	15.6	18.9	14.7	17.9			
				Sc	21	51			Pb	82	125		160.45	128.73	15.7	19.1	14.7	18.2			
				Ti	22	52			Ti	81	125		166.49	132.94	16.0	19.5	15.0	18.5			
				Ca	20	50			Bi	83	125		153.21	123.52	16.6	19.9	15.6	18.9			
				Ti	22	50			Bi	83	125		169.52	132.90	16.9	20.4	15.9	19.4			
				Sc	21	49			Pb	82	127		158.34	128.76	17.1	20.4	16.1	19.5			
103	259	0.73		He	2	4			Md	101	154		8.58	8.45	0.7		14.4	14.4			M 221 181
				Ca	20	51			Pb	82	126		160.84	129.17	15.1	15.1	14.4	14.4			
				Ca	20	48			Bi	83	126		153.70	124.03	15.9	15.9	15.1	15.1			
				Ti	22	52			Ti	81	126		166.36	132.96	16.0	16.0	15.2	15.2			
				Ca	20	48			Bi	83	128		151.94	123.78	17.6	17.6	16.8	16.8			
				Ti	22	54			Ti	81	124		165.13	130.70	17.6	17.6	16.9	16.9			
				Ti	22	53			Bi	83	125		164.96	131.20	17.6	17.6	16.9	16.9			
				Ca	20	50			Bi	83	125		152.32	124.44	18.4	18.4	17.7	17.7			
				Ca	20	49			Bi	83	126		151.26	122.76	18.3	18.3	17.0	17.0			
				He	2	4			No	102	149	0	9.11	8.96	0.1		16.2	15.2			E 221 209
				Ti	22	50			Pb	82	123		159.91	127.93	16.1	16.1	13.6	13.6			
				Ti	22	51			Pb	82	122		169.17	135.24	15.4	15.4	14.2	14.2			
				Ca	20	48			Pb	84	123		155.69	126.39	16.3	17.0	16.1	16.9			
				Ti	22	52			Pb	82	121		168.58	134.21	16.7	17.5	16.1	17.4			
				Sc	21	51			Bi	83	123		160.91	129.99	17.8	18.6	17.6	18.4			
				Ca	20	47			Pb	84	124		154.84	125.73	17.9	18.6	17.7	18.4			
				Ca	20	46			Bi	83	124		152.81	124.05	18.3	19.1	18.2	19.0			
				He	2	4			No	102	150		9.00	8.86	-0.4		13.6	15.6			E 221 202
				Ca	20	48			Pb	82	124		169.51	136.41	15.2	15.2	14.5	14.6			
				Ti	22	52			Pb	82	122		155.99	126.74	15.8	14.2	16.2	14.6			
				Ti	22	51			Pb	82	122		168.88	134.57	16.2	14.5	16.6	14.9			
				Sc	21	51			Pb	82	123		167.80	134.37	17.2	15.6	17.6	15.9			
				Ca	20	49			Bi	83	124		160.91	130.11	17.6	16.0	18.0	16.4			
				Cr	24	50			Hg	84	126		173.19	132.93	18.3	16.9	18.7	17.1			
				Cr	24	54			Hg	80	122		178.58	140.91	18.3	17.1	19.2	17.5			

Parent		Emitted		Daughter		Q		EK		log(T)		log(T')		log--		CA		nQ		nT	
Z	EI	A	log(Tc)	C	EI	Zb	Ae	Ce	EI	Zd	Nd	Cd	(MeV)	(MeV)	T(s)	T'(s)	TA	TA	CA	nQ	nT
104	257	0.65	0	He	2	4			No	102	151	0	9.14	8.99	0.6		14.1	15.0			E 221 204
				Ti	22	48			Pb	84	125		169.79	136.76	14.8	15.6	14.1	15.0			
				Ca	20	48			Pb	82	125		156.50	127.67	15.1	12.9	14.4	15.2			
				Ti	22	52			Pb	82	124		169.15	130.92	15.7	16.6	14.6	15.0			
				Sc	21	49			Bi	83	125		161.34	130.58	17.0	17.0	16.3	17.2			
				Ca	20	49			Pb	84	124		154.67	125.18	17.2	18.0	16.6	17.4			
				Ti	22	53			Pb	82	122		167.85	133.24	17.3	18.1	16.6	17.5			
				Ca	20	47			Pb	84	126		154.21	126.01	17.4	18.2	16.8	17.6			
104	258	-1.89	0	He	2	4			No	102	152		9.20	9.06	-1.0		15.8	14.3			E 221 195
				Ca	20	48			Pb	84	126		156.54	127.42	14.9	13.3	15.8	14.3			
				Ti	22	50			Pb	82	126		169.25	136.69	14.9	13.3	15.9	14.3			
				Ti	22	51			Pb	82	125		168.55	132.21	15.0	14.4	16.1	15.4			
				Ca	20	49			Pb	84	124		158.57	128.14	15.9	16.7	15.4	16.3			
				Ca	20	48			Pb	84	127		154.97	126.25	16.4	17.2	16.0	16.8			
				Sc	21	50			Bi	83	126		161.12	130.02	17.1	17.9	16.6	17.4			
				Cr	24	56			Hg	80	124		167.36	135.05	17.1	17.9	16.6	17.4			
				Ti	22	54			Pb	82	123		167.52	132.59	17.5	18.3	16.5	17.5			
104	259	0.48	0	He	2	4			No	102	153	0	9.01	8.87	0.5		13.7	14.6			E 222 194
				Ti	22	52			Pb	82	125		170.24	136.06	14.2	15.0	13.7	14.6			
				Ti	22	51			Pb	82	126		169.80	136.39	14.9	12.4	14.2	14.7			
				Ti	22	53			Pb	82	125		168.32	134.91	16.2	14.7	16.2	14.5			
				Ca	20	50			Pb	84	126		158.57	128.84	17.0	18.5	16.8	15.2			
				Ca	20	48			Pb	84	128		153.63	125.27	17.8	16.3	17.6	16.1			
				Sc	21	51			Bi	83	126		160.52	129.03	17.8	16.1	17.6	15.9			
				Cr	24	57			Hg	80	124		179.03	140.47	17.9	16.1	17.7	15.9			
				Cr	24	58			Hg	80	123		166.38	133.75	18.1	16.5	17.9	16.3			
104	261	1.81	0	He	2	4			No	102	155		8.60	8.46	1.9		12.5	13.4			M 222 186



Z	E1	A	log(Tt)	Parent				Emitted				Daughter				Q (MeV)	EK (MeV)	log(T) T(s)	log(Tt) T(s)	log--TA	log--CA	nQ	nT
				C	El	Ze	Ae	Ce	El	Zd	Nd	Cd	El	Zd	Nd								
105	261	0.26	0	He 2	Ti 22	52	4	Bi 103	124	0	9.07	8.93	0.4	14.5	14.1	14.1	14.1	14.1	14.1	M	221	199	
				V 23	53			Pb 82	126		171.91	137.66	14.5	15.0	14.6	14.6	14.6	14.6	14.6				
				Cr 24	56			Tl 81	124		177.78	141.68	15.0	15.7	15.4	15.4	15.4	15.4	15.4				
				V 23	55			Pb 82	124		183.30	143.97	15.9	15.9	15.5	15.5	15.5	15.5	15.5				
				Cr 24	54			Pb 82	125		177.12	139.80	16.4	16.4	16.0	16.0	16.0	16.0	16.0				
				Sc 24	54			Bi 81	126		182.14	144.46	16.8	16.8	16.4	16.4	16.4	16.4	16.4				
				Ti 22	53			Bi 81	125		189.88	135.39	16.8	16.8	16.5	16.5	16.5	16.5	16.5				
105	262	1.60	0	He 2	V 23	54	4	Pb 82	126	0	8.80	8.66	2.1	18.7	12.9	12.9	12.9	12.9	12.9	M	222	198	
				V 23	55			Pb 82	125		177.63	141.02	15.0	19.0	13.2	13.2	13.2	13.2	13.2				
				Cr 24	56			Tl 81	125		177.60	140.31	15.3	19.1	13.2	13.2	13.2	13.2	13.2				
				Ti 22	53			Bi 81	126		183.54	144.31	15.4	18.9	13.3	13.3	13.3	13.3	13.3				
				Ti 22	52			Bi 83	127		171.08	136.47	16.2	19.7	14.1	14.1	14.1	14.1	14.1				
				Cr 24	54		0	Bi 83	125		170.25	136.46	16.3	20.0	14.2	14.2	14.2	14.2	14.2				
				Cr 24	58		0	Tl 81	123		182.39	142.01	16.7	20.4	14.6	14.6	14.6	14.6	14.6				
106	263	-0.04	0	He 2	Cr 24	56	4	Pb 82	125	0	9.40	9.25	-0.0	14.0	13.2	13.2	13.2	13.2	13.2	M	222	204	
				Cr 24	55			Pb 82	126		187.89	147.88	13.2	14.9	14.1	14.1	14.1	14.1	14.1				
				Cr 24	57		0	Pb 82	124		187.00	147.89	14.1	15.5	14.6	14.6	14.6	14.6	14.6				
				Cr 24	58		0	Pb 82	123		186.62	146.17	14.5	16.3	15.4	15.4	15.4	15.4	15.4				
				Ti 22	53			Pb 84	126		185.96	144.95	15.3	16.5	15.7	15.7	15.7	15.7	15.7				
				Ce 26	60			Hg 80	123		172.93	138.08	15.6	17.3	16.2	16.2	16.2	16.2	16.2				
				Cr 24	24			Hg 82	121		196.82	151.92	16.2	17.3	16.2	16.2	16.2	16.2	16.2				
				Fe 26	24			Hg 80	121		198.59	146.37	16.4	17.5	16.5	16.5	16.5	16.5	16.5				

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Received by Publishing Department  
on June 6, 1985.

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E7-85-431

Периоды полураспада и кинетические энергии тяжелых кластеров, спонтанно испускаемых из ядер

Оцениваются парциальные периоды полураспада, относительные к альфа-распаду выходы, кинетические энергии и величины  $Q$  для большинства возможных спонтанно испускаемых тяжелых кластеров из 766 нуклидов с  $Z = 47-106$  и общим периодом полураспада больше, чем  $1 \mu\text{s}$ . Используются аналитическая суперсимметрическая модель деления ядра, полумпирическая формула для периодов  $\alpha$ -полураспада, которые не измеряются, и таблицы новых масс Вапстра-Ауди. Даже так называемые "стабильные" нуклиды с  $Z > 40$  являются метастабильными по отношению к новым способам распадов. В краткой форме сделан обзор экспериментальных данных.

Работа выполнена в Лаборатории ядерных реакций ОИЯИ.

Сообщение Объединенного института ядерных исследований. Дубна 1985

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E7-85-431

Half-Lives and Kinetic Energies for the Spontaneously Emitted Heavy Ions from Nuclei

The partial half-lives, branching ratios relative to the alpha decay, kinetic energies and  $Q$ -values for the most probable spontaneously emitted heavy ions from 766 nuclides with  $Z = 47-106$  and total half-lives longer than  $1 \mu\text{s}$  are estimated by using the analytical superasymmetric fission model, a semi-empirical formula for  $\alpha$ -decay life-time, which are not measured, and the Wapstra-Audi new mass tables. Even the so-called "stable" nuclides with  $Z > 40$  are meta-stable relative to the new decay modes. The experimental evidences are briefly reviewed.

The investigation has been performed at the Laboratory of Nuclear Reactions, JINR.

Communication of the Joint Institute for Nuclear Research. Dubna 1985