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The 1993 atomic mass evaluation

(I) Atomic mass table

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Abstract This paper is the first of a series of four. In it, a table is given to replace the 1983 atomic mass table. The differences with the earlier table are briefly discussed and information is given of interest for the users of this table. Part II of this series gives values for several derived quantities (decay-, separation- and reaction energies), part III shows graphs of several of those quantities, and part IV gives a list of input data and full information on the used input data and on the procedures used in deriving the tables in the preceding parts.

1. Introduction

As in our previous work [1,2], the tables presented in this work give atomic masses and derived quantities. With very few exceptions, data on masses of nuclei refer to *"atomic"* masses or to masses of singly ionized atoms. In this last case the ionization energy is generally (much) smaller than the error on the mass, and, for the small number of very precise mass measurements, corrections for the first – and second – ionization potentials could be applied without loss of accuracy. This fact is the reason for the decision to present, in our evaluations, atomic rather than nuclear masses.

Nuclear masses can be calculated from atomic ones by using the formula

$$M_N(A,Z) = M_A(A,Z) - Z \times M_e + B_e(Z). \quad (1)$$

For the electron mass M_e, see table A; the total atomic binding energy $B_e(Z)$ of all electrons can be found in reference [3]. Unfortunately, the precision of the values $B_e(Z)$ is not clear; this quantity (values going up to 760 keV for $_{92}$U) cannot be measured easily. Very probably, its precision for $_{92}$U is rather worse than the 2 keV accuracy with which the mass of, e.g., ^{238}U is known.

The atomic masses are given in mass units and the derived quantities in energy units. The atomic mass unit is 1/12 of the mass of a ^{12}C atom in its atomic and nuclear ground states. The energy unit is the electron-volt; to be exact: using the volt as *maintained* in standard laboratories (by using a standard value for the ratio of frequency and voltage in the Josephson effect).

TABLE A
Constants used in this work or resulting from the present evaluation.

1 u	=	$M(^{12}C)/12$	=	atomic mass unit [a]	
1 u	=	1660540.2	±	1.0	$\times 10^{-33}$ kg
1 u	=	931494.32	±	0.28	keV
1 u	=	931493.86	±	0.07	keV* [b]
1 MeV*	=	1073544.38	±	0.08	nu
M_e	=	548579.903	±	0.013	nu
	=	510999.06	±	0.15	eV
M_p	=	1007276466.6	±	0.6	nu
M_α	=	4001506174.7	±	1.5	nu
n-H	=	839891.7	±	2.4	nu
	=	782353.9	±	2.3	eV*
$^{35}Cl-^{37}Cl+2u$	=	2950110	±	65	nu
$S_{2n}(^{37}Cl)$	=	18890655	±	60	eV*

[a] Due to the unfortunate acceptance of the mole as a unit rather than as a number, the dimension of the atomic mass unit is kg/mole.

[b] The *'maintained'* volt, as defined by accepting the exact value 483597.9, given in the 1990 standard [6], for the constant $(2e/h)$ in the Josephson effect.

The symbols ^{35}Cl and ^{37}Cl in the last line but one of the table stand for their masses. The first seven items are derived from the work of Cohen and Taylor [7], except those which refer to eV* energy units.

2. New features

Recently [4], the choice of the conventional Josephson constant used in the definition of the energy unit was changed by 7 ppm. We have taken care that the input precision reaction and decay energies are recalibrated to the new unit (see reference [5] and table A).

Of the other new features (for references see part IV) the most essentially new is the development by groups at Princeton, Seattle, Mainz, Tallinn, Moscow and very recently at MIT, Ohio and Stockholm of the measurement of cyclotron resonance frequency ratios of ions in a magnetic field, as done earlier by Lincoln Smith, but now using Penning traps. In this way, extremely precise measurements could be made of some fundamental masses. As a result of this development, but also of the drastic improvement of (p,γ) and (n,γ) reaction energies, the atomic masses of atoms near the line of β-stability, for mass numbers up to 40, are in an extremely satisfactory shape (see figs. 2a–2b).

Far from stability, very important developments have occurred since our last evaluation. Following the pioneering work, in the '70s, of Klapisch and Thibault [8] on direct mass measurements of radioactive species, several projects have given important results on nuclear masses for exotic species, extending thus significantly our knowledge of the

mass surface. Among these new projects, the Chalk-River on-line isotope separator and the on-line St. Petersburg prism mass spectrometer exploit further the well-established technique, in mass spectrometry, of voltage measurements, whereas in the others there is a striking evolution towards time and frequency measurements. Time-of-flight experiments are characterized by exploration in extended regions far from β-stability, even for very short-lived species (1 μs), with fair to medium accuracies (3×10^{-6} to 5×10^{-5}). In a Penning trap on-line at ISOLDE, the cyclotron frequency of a radioactive ion is directly compared to that of a stable nucleus, and leads, as above for stable species, to a drastic improvement in accuracy (better than 10^{-7}) for not too short-lived radioactive nuclei (1 or 2 seconds were needed for interaction in the trap) up till quite far from the line of β-stability.

A considerable number of new α- and β-decay energies of nuclides far from stability have also been measured and, quite interestingly, also several proton-decay energies. Unfortunately, the precision of the β-decay energies is often not as high as one should wish. Moreover, though α-particle energies are quite satisfactory, the level fed in the final nuclide is most often not known; thus here some uncertainties remain. We have used study of systematic trends in mass values and derived quantities for finding out where such uncertainties were unacceptable. And in the case of the nuclei beyond $A = 225$, we have used the Nilsson model to get estimates for the energies of the final levels; which we think has caused a definite improvement in the estimates of the most heavy masses. A similar treatment for the region $A = 146$–190 has not yet been tried in view of the required vast investment in time.

Electron capture decay-energies are often most difficult to determine for proton-rich nuclides. Therefore some new reaction energies of the type of, e.g., ^{204}Pb(α, ^{8}He)^{200}Pb have been very welcome. Near the line of β-stability, it is worth mentioning the increasing number of measurements of reaction energy differences, which can often be determined with much higher precision than absolute reaction energies.

One new feature in the present evaluation is the calculation and use of the *flow-of-information* matrix defined recently by one of us and which is of general use in the least-squares method. This method was incomplete as used until then, in the sense that it didn't allow to *see*, except in simple cases, how information could flow from the experimental data (inputs) into the adjusted masses (outputs). In reference [9] the *"influence"* of each piece of data on each of the adjusted masses, and also the total influence, or *"significance"*, of one datum are defined and it is shown that the elements of the flow-of-information matrix are the above *influences* and that the sum of all elements in a line are the *significances*. Implemented in the calculation for the evaluation of masses, this matrix happens to be very useful. Therefore, as an additional help for the reader, we add now also, in part IV, a table of the most important data (and their relative *influence*) in the determination of the mass of each primary nucleus. The table of adjusted input data in part IV (table II) has also been extended to indicate for each datum its *significance* and the nucleus to which this piece of data contributes the most (main *influence*).

In previous tables, we gave estimates of extra unknown masses with the help of the

property of regularity of the mass surface, but only as far as necessary to avoid blank spaces in tables like those in parts I and II of the present work, and the resulting missing points in the graphs of part III. On request from various sides, we now estimate rather more values, particularly for several far from stability nuclei which have been identified in recent experiments. Also, a special effort was made in a far extrapolation to get an as good as possible estimate of the masses of neutron-rich nuclei up to ^{78}Ni, in view of the large interest of projected experiments in this region, and also of theoretical astrophysical calculations [10]. For the latter, use was made of other works in progress [11] in which the concept of regularity is extended to define an *idealized* surface of masses (or *"mass geoid"*).

Finally, element symbols Ns (Nielsbohrium), Hs (Hassium) and Mt (Meitnerium) have been proposed for elements 107, 108 and 109. We will use them here, though they have not yet been officially accepted. The same is true for the element symbols Rf and Ha for elements 104 and 105. For element 106 no name has yet been proposed; we will continue use of the provisional symbol Nh used already in our previous tables.

3. Use of input data

We retained the distinction between primary and secondary masses and input data [1]. Secondary masses are, essentially, determined by one type of input data as mentioned in column 5 of the *Atomic mass table*. Thus, if new material is becoming available, such mass values can easily be updated. This is more complicated for primary data. (Originally, the difference was made in order to save computer time; this is now slightly less important.)

Penning trap measurements, just as earlier mass spectrometric ones, often give either data on essentially one nuclide (absolute mass doublets), or on the difference in mass of two nuclides with no or only slightly different mass number (relative mass doublets). All nuclear decay data and almost all nuclear reaction energy measurements are also relative measurements. Reaction energy differences are in principle represented by a combination of four masses. For completeness we mention that early mass spectrometric measurements on unstable nuclides can best be represented as linear combinations of masses of three isotopes, with non-integer coefficients [12]. The new Penning trap measurements are in most cases best represented as similar combinations of two masses.

As in our earlier work, we want to represent the input data in a graphical way (Fig. 1). This is straightforward for the absolute mass doublets and for the difference-for-two-nuclide data; but not for spectrometric triplets and for differences in reaction energies. The latter are in general more important for one of the two reaction energies than for the other one; in the graphs we therefore represent them simply by the former. (These data are primary even though the diagrams then show only one connection.)

4. Regularity of the mass surface and use of systematic trends

A striking feature in the observation of the mass surface is its regularity, at least at all

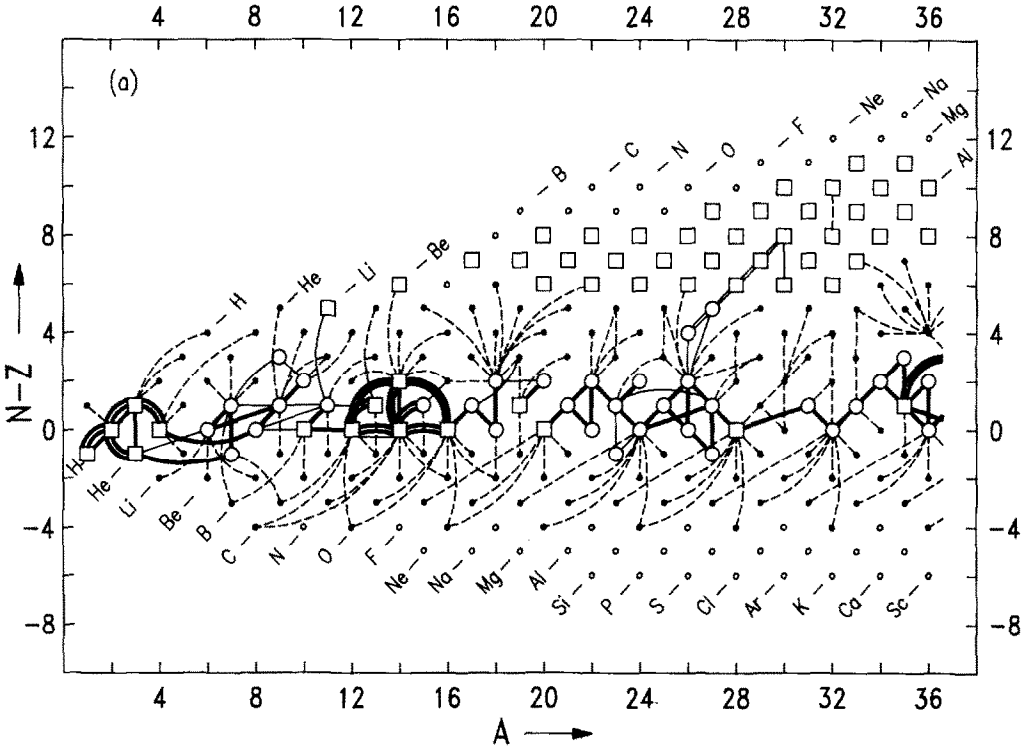


Fig. 1. (a)–(h) Diagram of connections for input data.

For *primary data* (those checked by other data, see part IV, section 3.2).

- □ absolute mass-doublet nuclide (i.e. connected to ^{12}C, ^{35}Cl or ^{37}Cl) or nuclide connected by a relative mass-doublet connection to a remote reference nuclide;
- ○ other primary nuclide;
- ⊡, ⊙ primary nuclide with relevant isomer;
- // mass-spectrometric connection;
- —— other primary reaction connection.

Primary connections are drawn with two different thicknesses. Thicker lines represent data of the highest precision in the given mass region (limits: 1 keV for $A < 36$, 2 keV for $A = 36$ to 165 and 3 keV for $A > 165$.

For *secondary data* (cases where masses are known from one type of data and are therefore not checked by a different connection):

- • secondary nuclide determined from only experimental data;
- * secondary nuclide involving only experimental data and levels from Nilsson systematics;
- o nuclide for which the mass is estimated from systematical trends;
- – – – – connection to a secondary nuclide. Note that an experimental connection may exist between two systematic nuclides when none of them is connected to the network of primaries.

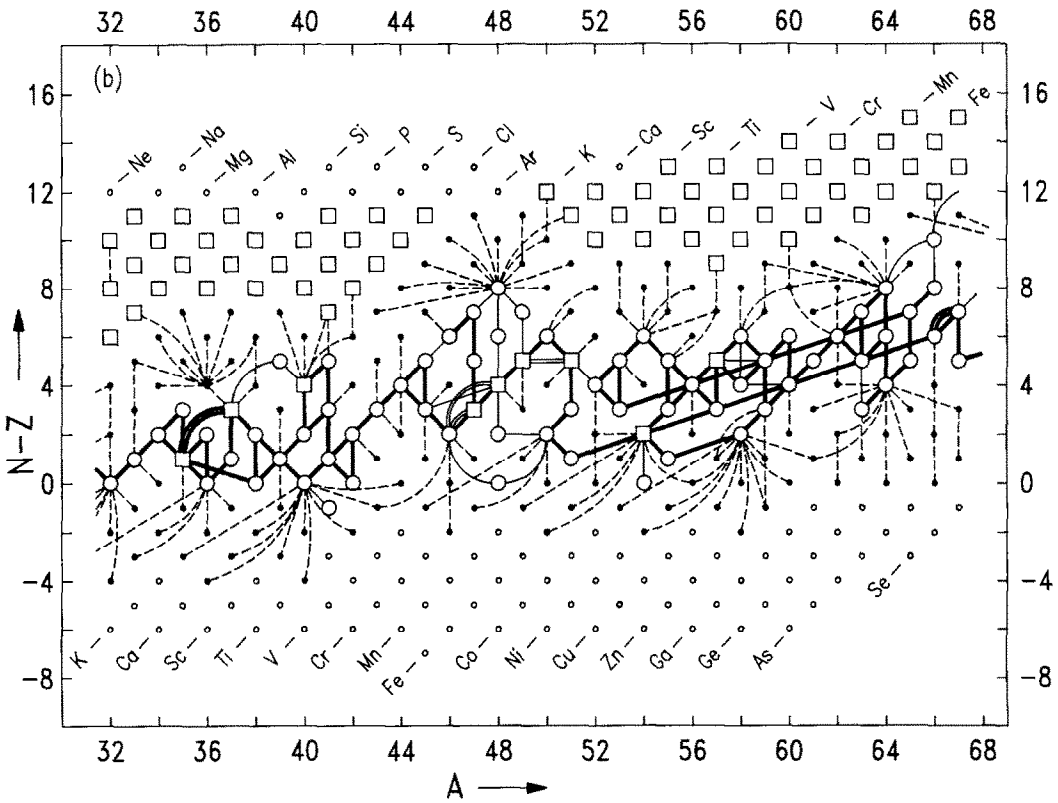


Fig. 1 — continued.

first and second order derivatives, in all places where no physical effects are known to exist. Any deviation from this regularity could then be considered as a warning that either some new physical property is being discovered or that there might be some undetected systematic contribution to the reported result of an experiment. In cases where some experimental data on the mass of a particular nuclide disagree with each other, and no particular reason for rejecting one or some of them could be found from studying the involved papers, the measure of agreement with the just mentioned regularity has been used for selecting what we think to be the most dependable result, thus following the same policy as used in our earlier work.

However, a new policy has been adopted for those locally irregular masses which are derived from one, two or (in one case) three measurements of the same physical quantity, all diverging from the mentioned regularity and which were not confirmed by a different method. These data were in previous edition of the Mass Tables replaced by *'values derived from trends in systematics'*. In order to achieve higher transparency in the evaluation of experimental masses, all experimental data for such cases, published in regular refereed journals, are used in the present compilation and evaluation (with only one exception). Consequently, the values, given here and in part II, do no more represent

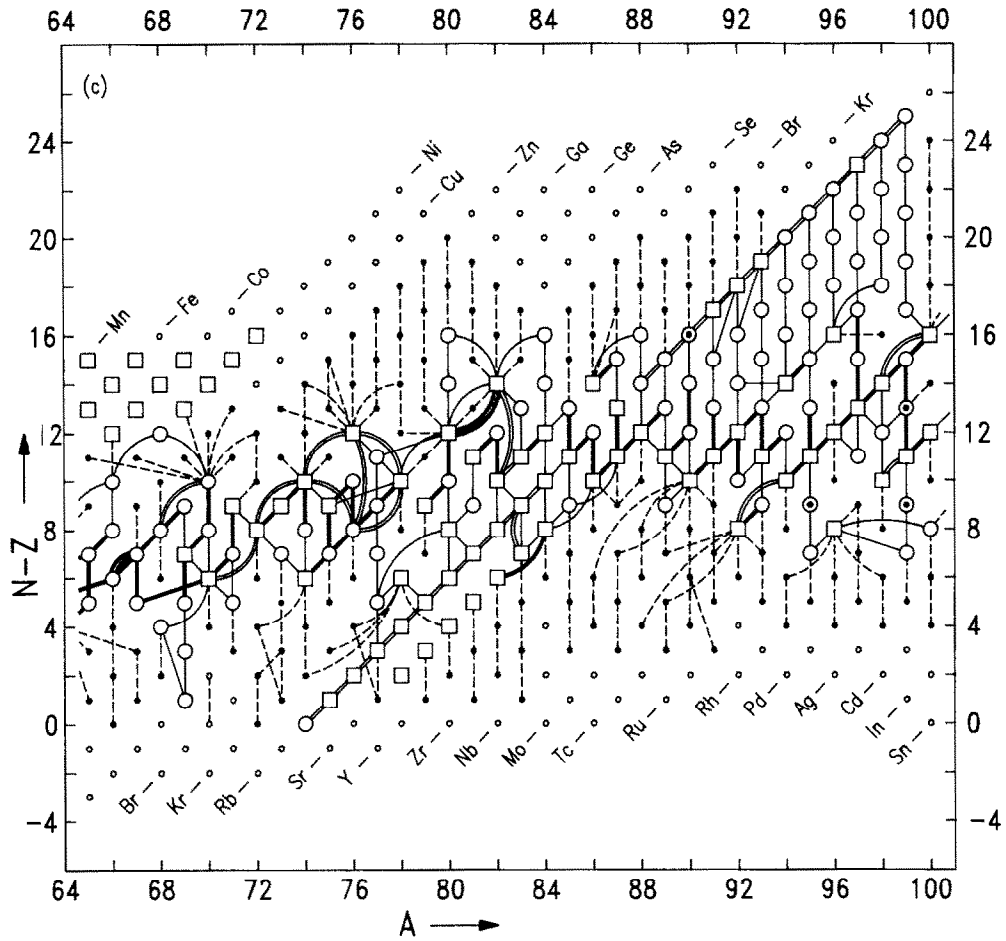


Fig. 1 — continued.

the *"best recommended values"* for the masses of these few nuclei (and for the differences in masses), but rather the values as derived from *"all experimental data"*.

Table B gives the 56 such cases involving 67 data and the values we recommend, based on the regularity of the mass surface. These cases are mentioned in part IV, in remarks added to the proper data, as being *suggested by systematical trends*. Changes in these data imply several more changes in the masses, due to connecting chains (see fig. 1). They are obtained by repeating our calculations with a data set modified according to table B. Table C lists the 99 nuclei (plus 14 isomeric states) involved and gives the experimentally determined masses (from calculation 1) together with the values we recommend (from calculation 2). To help the reader a flag is set in the atomic mass table for these nuclei. The plots in part III of the present evaluation are drawn with both sets of values and allow the reader to check our judgment. As far as the errors on the estimates are concerned, we

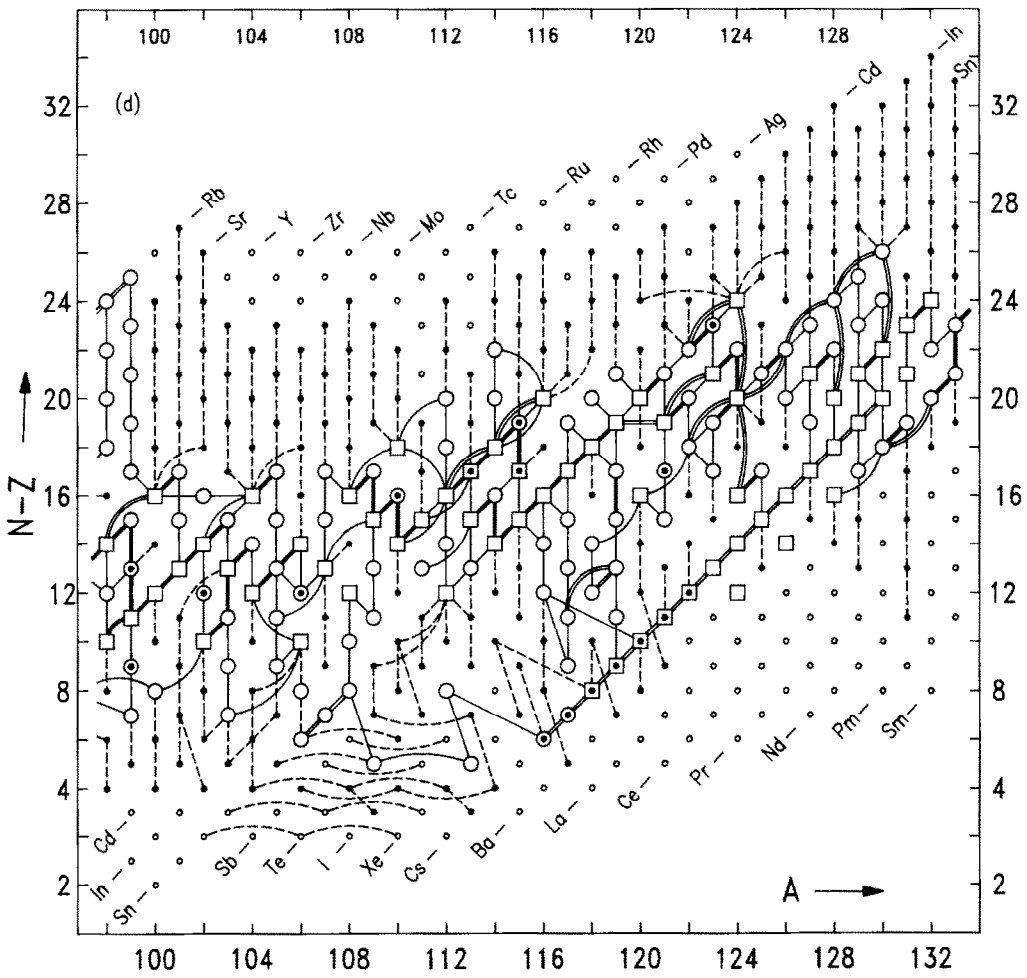


Fig. 1 — continued.

did not try everywhere to get an independent estimate for them.

Not all irregularities of the type above have been smoothened with *systematics*, but only some of the most striking ones, and those necessary to avoid, as much as possible, confusions in the plots in part III.

The lists in tables B and C as well as the other local irregularities that can be observed in the figures in part III must be considered as an incentive to remeasure the masses of the involved nuclei, preferably by different methods, in order to remove any doubt and possibly point out true irregularities due to physical properties.

To summarize, in our new procedure, two series of tables are produced: the series of **tables derived from all experimental data** for masses (main table in this part) and for nuclear-reaction and separation energies (part II); and the series of **tables of best recommended values** that results from the data used for the preceding ones combined

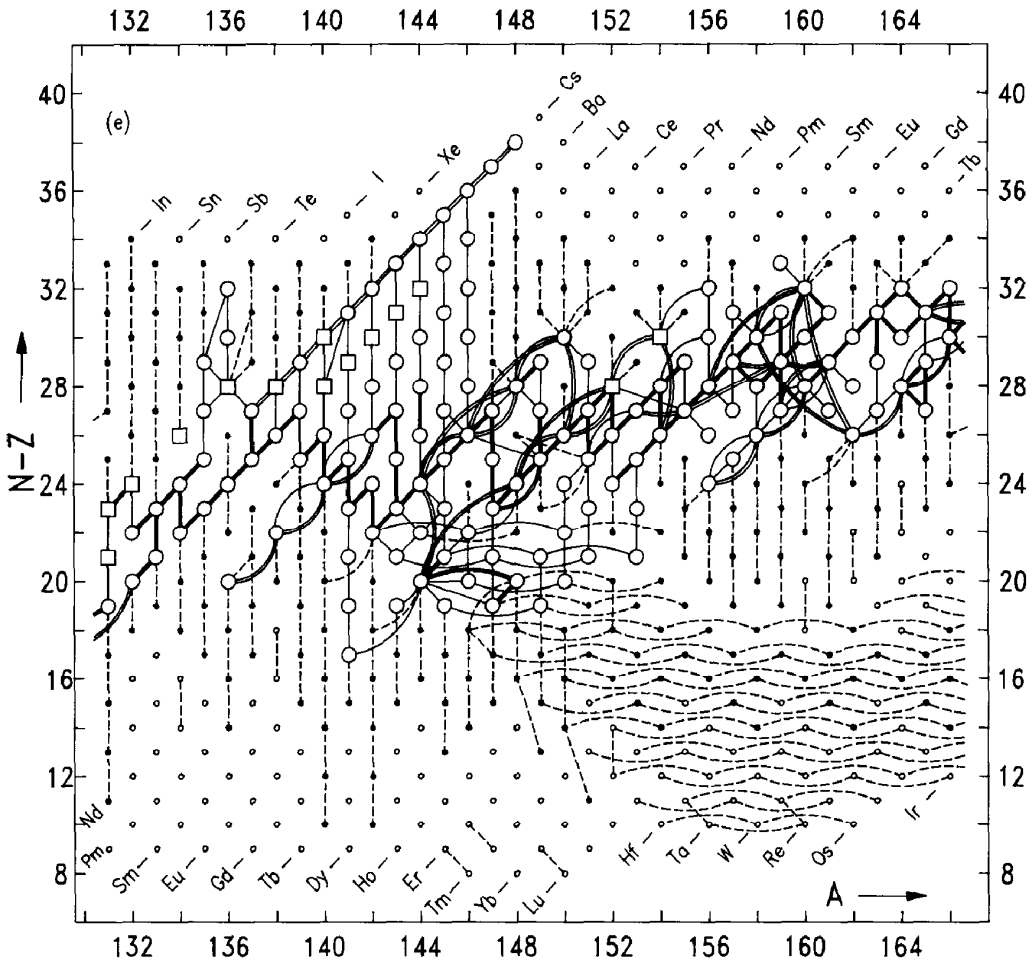


Fig. 1—continued.

with table B. The latter series is not given in full here, it is used to derive the differences with the first one in table C (for the masses) and the plots in part III (for the separation and decay energies).

5. Overview of the results

Fig. 2 shows the difference between the absolute mass values in the 1983 and 1993 evaluations. The situation for the lightest nuclides ($A < 17$) is amazingly satisfactory. The errors have been reduced by more than an order of magnitude; and the differences with the 1983 results are well within the then reported errors. The region $A = 19$–40 also shows a nice improvement: the errors have been reduced, in general, by about a factor 3, and with the exception of the $A = 20$–22 Ne isotopes and ^{23}Na the differences with

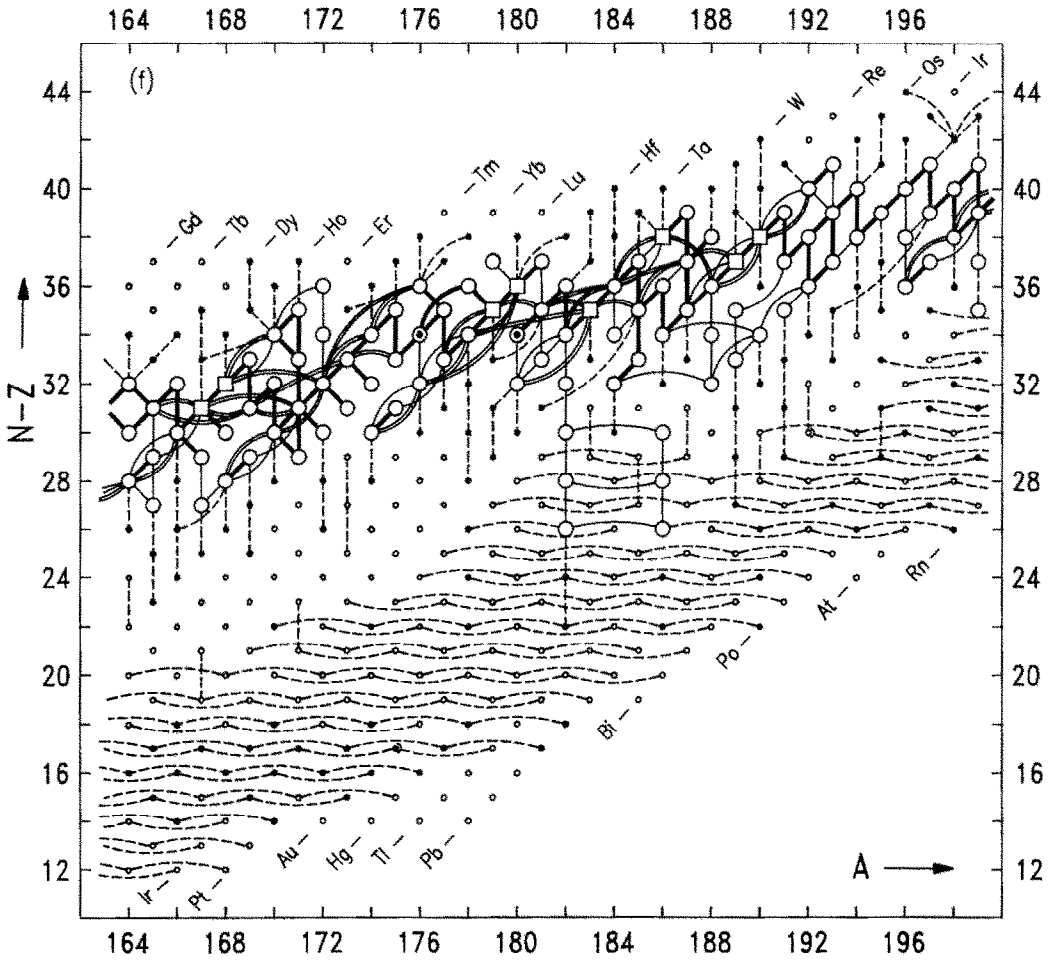


Fig. 1 — continued.

1983 agree satisfactory with the reported errors. The Ne and Na differences are caused by the fact that the 1983 values for the neutron binding energy in ^{22}Ne and the proton one in ^{24}Mg were both 2 keV lower than the values measured, with high precision, in newer experiments; the new values yield quite satisfactory agreement with the new Penning trap measurement of ^{20}Ne. In view of this situation, one must expect indeed that the *real* value of the atomic mass of the stable Si isotopes, of possible importance for the future definition of the mass unit, the kg, will certainly be to the 3σ confidence level (99.7%) within 0.6 μu of the value reported here.

The precision of the mass values along the line of β-stability for $A > 40$ did not improve drastically, as shown in fig. 2c. This observation hides the fact that many differences in those mass values, especially neutron binding energies, are much more accurate than before. As apparent in fig. 2c, a progressive difference develops nearing mass number 200.

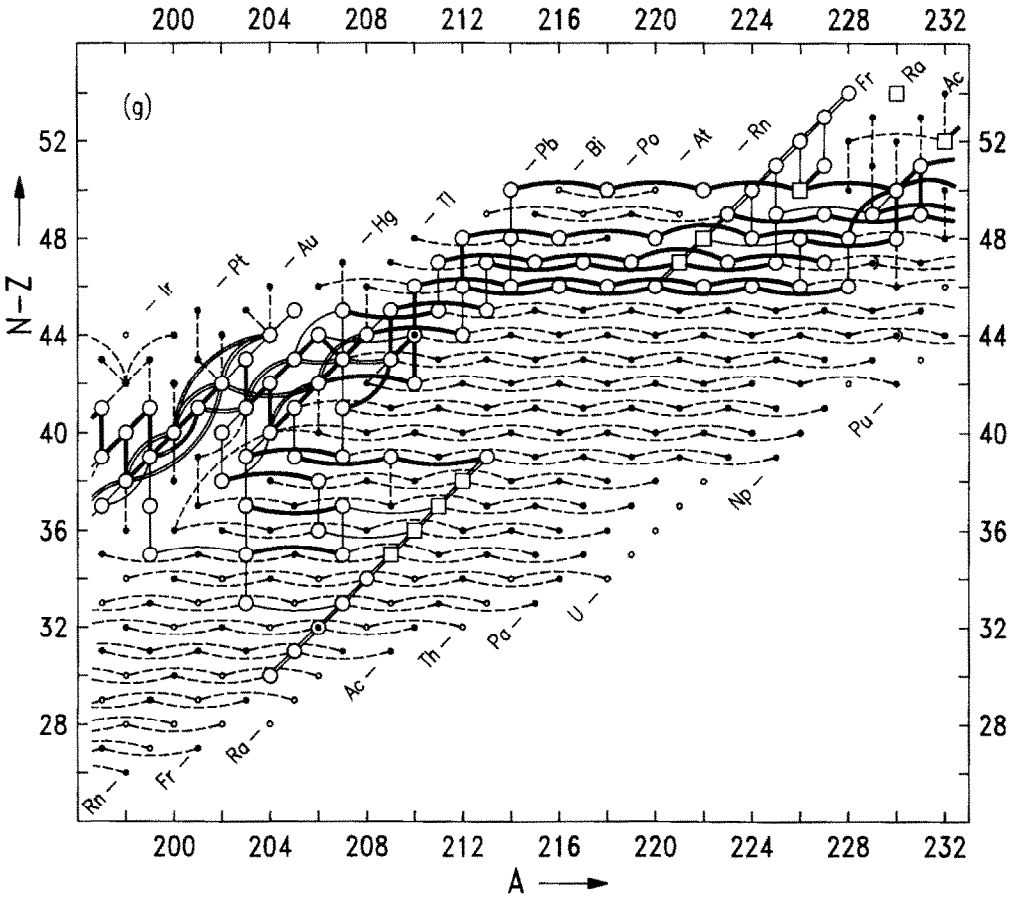
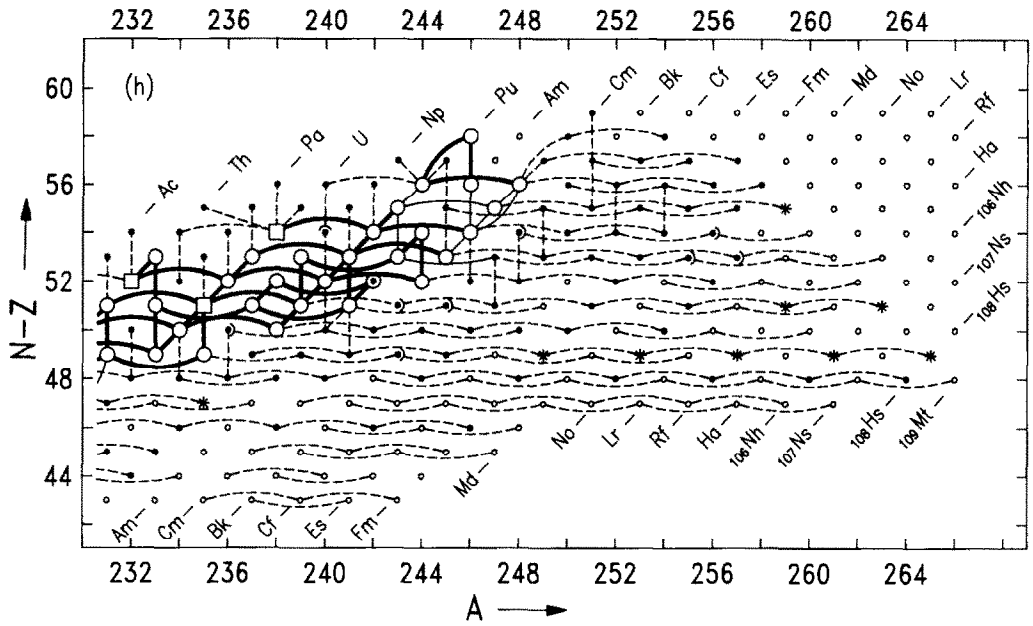


Fig. 1 — continued.

It is caused by an 18 keV shift in the mass difference between ^{228}Th and ^{230}Th discovered recently. The resulting somewhat complex differences between 1983 and 1993 mass values for $A > 200$ are discussed in part IV (see fig. 1 there). Beyond mass number $A = 230$, the mass differences along the line of β-stability are again only small. The change removes about one third of the difference with mass values for stable Hg isotopes as measured by an able and respected group of mass specrometrists. They report a precision of about 1 keV, but the difference with the present mass values, with a reported precision of about 3 keV, is some 20 keV. It goes without saying that we have good reasons to trust the present mass values better than the mass spectrometric Hg values, as discussed in part IV. And fortunately, almost all differences in mass values of importance calculated from our work can be expected to be affected only little by this uncertainty. Yet, we consider solution of this problem the single most desired improvement for the future.

Fig. 2c shows that another curious difference is present between mass numbers 130 and 138. It is caused by the fact that the Penning trap measurements on the unstable Cs



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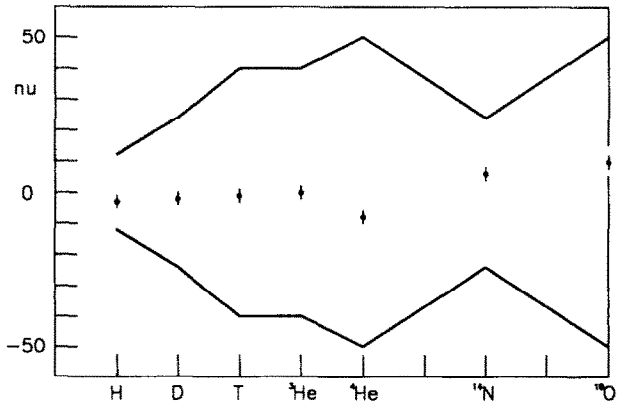
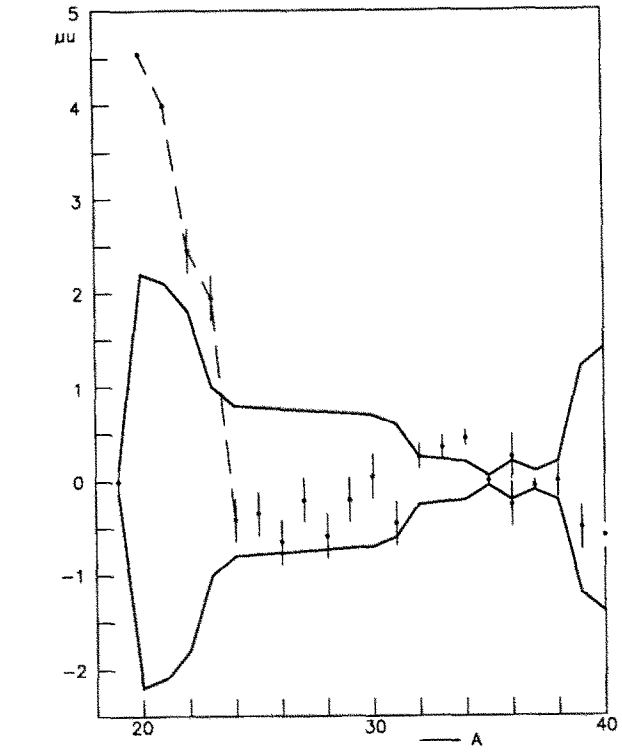


Fig. 2. Differences between the mass values obtained in the 1993 and 1983 adjustments, for nuclides along the line of β-stability. The errors found in the 1983 evaluation are given by the lines symmetric around $\delta = 0$, the error bars refer to the 1993 adjustment. (a) The fundamental nuclides with $A < 17$, differences in nu; (b) The region $A = 19$–40, differences in μu; (c) The region $A = 40$–200 (odd mass number nuclides only), differences in keV; (for the region $A > 200$ see part IV).



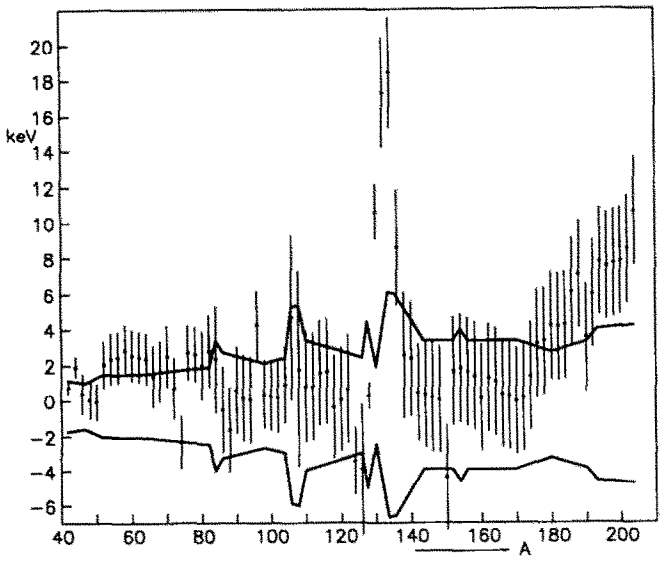


Fig. 2—continued.

isotopes showed that the earlier accepted β-decay energies of ^{130}Cs and ^{135}Cs were rather less accurate than earlier assumed. This shows the great importance of this new type of measurements.

Due to the drastic increase in the precision of the mass values of the very light nuclei (fig. 2a), the printing format of the mass table was no more adequate. Table D gives, for the most precise among them, values of mass excesses and atomic masses. Conversion of the errors from μu to keV were obtained by

$$\sigma^2_{M_{\mathrm{keV}}} = (\sigma_{M_{\mathrm{u}}} \times u)^2 + (M_{\mathrm{u}} \times \sigma_{\mathrm{u}})^2, \qquad (2)$$

where M_{u} is the mass excess in μu.

6. General information and acknowledgements

As in our previous evaluations, all the uncertainties in the present tables are one-standard deviation (1σ) errors.

The cut-off date of the data from literature used in the present tables is February 28, 1993. A few preprints and private communications received by the authors up to March 31, 1993 have also been included. Final calculation was performed on June 30, 1993.

The table of masses (part I) and the table of nuclear reaction and separation energies (part II) are being made available electronically [13] at the nuclear data centers. A total of six files can be obtained. The first file with name **mass_exp.mas93** contains the table of masses, as printed here. The next two files correspond to the table of reaction and separation energies in two parts of 6 entries each, as in part II: **rct1_exp.mas93** for S_{2n}, S_{2p}, Q_{α}, $Q_{2\beta}$, $Q_{\epsilon p}$ and $Q_{\beta n}$, and **rct2_exp.mas93** for S_n, S_{p}, $Q_{4\beta}$, $Q_{d,\alpha}$, $Q_{p,\alpha}$ and $Q_{n,\alpha}$. The three last files with names **mass_rmd.mas93**, **rct1_rmd.mas93** and **rct2_rmd.mas93** are identical to the first three ones except for the values resulting from the few experimental data, listed in table B, for which we recommend better values that we estimate from systematic trends.

Calculations are performed on the IBM 9021-820 computer of the Centre de Calcul de l'In2p3 (Lyon) to which we wish to express our gratitude, more particularly for their help in *vectorizing* our calculations (see part IV).

The help of the NNDC at Brookhaven laboratories, and more particularly of J.K. Tuli and M. Bhat, in trying to be complete in updating our files of input data and of references is highly appreciated. We are grateful to D. Polizzi for the high quality in the drawings of the connection diagrams, to M. Dziri for preparing the lay-out of the tables and to B. Wage at Elsevier for setting them up nicely. One of us (AHW) expresses his gratitude to the NIKHEF-K laboratory for the permission to use their facilities.

TABLE B

Experimental data that we recommend to replace by values following from the regular trends of the atomic masses.

Item	Reference[a])	Experimental value		Recommended value	
$^{35}Mg-C_{2.917}$	91Or01	18669	1721	17490	470
$^{53}Sc-C_{4.417}$	90Tu01	−41440	260	−40760	320
	93Se.A	−41830	280		
$^{55}Sc-C_{4.583}$	90Tu01	−30600	1100	−32530	1100
$^{57}Ti-C_{4.75}$	90Tu01	−35700	1000	−36550	1000
$^{66}As(\beta+)^{66}Ge$	79Da.A	9550	50	9800	200
$^{70}Br(\beta+)^{70}Se$	79Da.A	9970	170	10350	300
$^{71}Se(\beta+)^{71}As$	73Sc17	4428	125	4800	200
$^{79}Zn(\beta-)^{79}Ga$	86Ek01	8550	240	9090	240
$^{80}Y(\beta+)^{80}Sr$	81Li12	6952	152	9140	400
	82De36	6934	242		
$^{88}Nb(\beta+)^{88}Zr$	84Ox01	7550	100	7200	200
$^{90}Tc(\beta+)^{90}Mo$	74Ia01	8900	400	9140	300
	81Ox01	8870	300		
$^{108}Mo(\beta-)^{108}Tc$	92Gr.A	5135	60	4635	60
$^{109}Tc(\beta-)^{109}Ru$	89Gr23	6315	70	5985	70
$^{110}Sb(\beta+)^{110}Sn$	72Mi26	8750	200	8300	200
	72Si28	9085	100		
$^{111}Sb(\beta+)^{111}Sn$	72Si28	4470	50	5100	200
$^{112}Ru(\beta-)^{112}Rh$	91Jo11	4520	80	3670	80
$^{112}Rh(\beta-)^{112}Pd$	88Ay02	6200	500	6800	500
$^{113}Te(\beta+)^{113}Sb$	74Bu21	5520	300	6100	200
	74Ch17	5720	200		
$^{114}Cs(\epsilon p)^{113}I$	82Pl05	8730	150	9270	300
$^{114}Ru(\beta-)^{114}Rh$	92Jo05	6100	200	4800	200
$^{114}Rh(\beta-)^{114}Pd$	88Ay02	6500	500	7900	300
$^{116}Cs^{m}(\epsilon p)^{115}I$	78Da07	6450	300	7180	300
$^{116}Rh(\beta-)^{116}Pd$	88Ay02	8000	500	8900	500
$^{116}Xe(\beta+)^{116}I$	76Go02	4340	200	4660	200
$^{117}Ba(\epsilon p)^{116}Xe$	78Bo20	7900	300	8660	600
$^{118}Cs(\epsilon\alpha)^{114}Te$	76Jo.A	11100	500	11080	200
	77Bo28	10600	200		
$^{129}Ce(\beta+)^{129}La$	93Al03	5600	200	5050	200
$^{140}Sm(\epsilon)^{140}Pm$	87De04	3400	300	3020	200

TABLE B—continued

Item	Reference[a])	Experimental value		Recommended value	
$^{140}Gd(\beta^+)^{140}Eu$	91Fi03	4800	400	5460	400
$^{140}Tb(\beta^+)^{140}Gd$	91Fi03	11300	800	10800	800
$^{142}Gd(\beta^+)^{142}Eu$	91Fi03	4200	300	4500	300
$^{142}Tb(\beta^+)^{142}Gd$	91Fi03	10400	700	10060	700
$^{142}Dy(\beta^+)^{142}Tb$	91Fi03	7100	200	6900	200
$^{144}Gd(\beta^+)^{144}Eu$	70Ar04	4300	400	3740	200
$^{145}Dy(\beta^+)^{145}Tb$	93Al03	7300	200	7720	200
$^{149}Er(\epsilon p)^{148}Dy$	89Fi01	7080	470	6680	470
$^{150}Ho(\beta^+)^{150}Dy$	93Al03	6560	100	7240	100
$^{156}Ho(\beta^+)^{156}Dy$	76Gr20	4400	400	5060	200
$^{156}Er(\beta^+)^{156}Ho$	82Vy06	1670	70	1370	150
$^{158}Er(\beta^+)^{158}Ho$	61Bo24	1940	80	900	100
	68Ab18	1860	60		
	82Vy06	1710	40		
$^{160}Eu(\beta^-)^{160}Gd$	73Da05	3900	300	4580	200
	73Mo18	4200	200		
$^{160}Lu(\beta^+)^{160}Yb$	83Ge08	7210	240	7880	100
	93Al03	7300	100		
$^{161}Yb(\beta^+)^{161}Tm$	81Ad02	3850	250	4150	200
$^{162}Lu(\beta^+)^{162}Yb$	83Ge08	6740	270	7220	100
	93Al03	6960	100		
$^{167}W(\beta^+)^{167}Ta$	89Me02	5620	270	6240	300
$^{173}Ta(\beta^+)^{173}Hf$	73Re03	3670	200	2790	200
$^{176}Tm(\beta^-)^{176}Yb$	67Gu11	4200	200	3880	200
$^{182}Au(\beta^+)^{182}Pt$	72We.A	6850	200	7780	300
$^{182}Hg(\beta^+)^{182}Au$	72We.A	4950	200	4780	300
$^{189}Au(\beta^+)^{189}Pt$	75Un.A	3160	300	2850	200
$^{189}Hg(\beta^+)^{189}Au$	75Un.A	4200	200	3950	200
$^{191}Tl^m(\beta^+)^{191}Hg$	75Un.A	5140	200	4790	200
$^{192}Tl(\beta^+)^{192}Hg$	75Un.A	6380	200	6120	200
$^{195}Bi(\beta^+)^{195}Pb$	91Gr12	4850	550	5850	350
$^{204}Au(\beta^-)^{204}Hg$	67Wa23	4500	300	3800	200
$^{224}Fr^x - {}^{228}Fr_{.491}\ {}^{220}Fr_{.509}$	82Au01	−540	320	−970	200

[a]) References are listed in part IV.

TABLE C

Nuclides for which values derived from systematic trends are judged better than the experimental ones given in the mass table and derived from the experimental data in table B.

Nucleus	Mass excess from exp. data		Recommended Mass Excess	
^{35}Mg	17390	1600	16290#	440
^{53}Sc	−38770	180	−37970#	300
^{55}Sc	−28500	1020	−30300#	1020
^{57}Ti	−33250	930	−34050#	930
^{66}As	−52070	60	−51820#	200
^{70}Br	−51970#	270	−51590#	360
^{71}Se	−63460	130	−63090#	200
^{79}Zn	−53940	270	−53400#	270
^{80}Y	−63360	130	−61160#	400
^{88}Nb	−76080	100	−76420#	200
^{90}Tc	−71290	240	−71030#	300
^{106}Sb	−66890	170	−66350#	310
^{108}Mo	−70800	140	−71300#	140
^{109}Tc	−74540	100	−74870#	100
^{110}Sb	−76820	90	−77530#	200
^{110}I	−60890	170	−60350#	310
^{111}Sb	−81470	50	−80840#	200
^{112}Ru	−75620	510	−75870#	510
^{112}Rh	−80140	500	−79540#	500
^{113}Te	−78770	170	−78320#	200
^{114}Ru	−70890	540	−70790#	360
^{114}Rh	−76990	500	−75590#	300
^{114}Te	−81520	190	−81930#	200
^{114}Cs	−55110	160	−54560#	310
^{115}I	−75670	500	−76400#	500
^{115}Xe	−68030	230	−68440#	240
^{116}Rh	−71950	500	−71050#	500
^{116}Xe	−73230	250	−72910#	250
^{117}Ba	−58040	390	−56960#	650
^{129}Ce	−75750	210	−76300#	210
^{140}Sm	−74990	300	−75370#	200
^{140}Eu	−66590	500	−66970#	450
^{140}Gd	−61790	640	−61510#	600
^{140}Tb	−50490	1030	−50710#	1000
^{142}Gd	−67430	320	−67130#	310

TABLE C—continued

Nucleus	Mass excess from exp. data		Recommended Mass Excess	
^{142}Tb	−57030	770	−57070#	770
^{142}Dy	−49930	790	−50170#	790
^{144}Gd	−71350	400	−71910#	200
^{145}Dy	−59140	240	−58720#	240
^{149}Er	−53540	470	−53940#	470
^{149}Er^{m}	−52800	470	−53200#	470
^{150}Ho	−62760	100	−62080#	100
^{150}Er	−58650	100	−57970#	100
^{151}Yb	−42360	320	−41680#	320
^{154}Tm	−55240	110	−54560#	110
^{154}Yb	−50750	100	−50070#	100
^{156}Ho	−66130	400	−65470#	200
^{156}Er	−64460	410	−64100#	250
^{158}Er	−64400	40	−65280#	100
^{158}Tm	−57870	110	−58750#	140
^{158}Lu	−48030	120	−47350#	120
^{158}Hf	−42930	100	−42250#	100
^{160}Eu	−63840	170	−63370#	200
^{160}Lu	−50880#	230	−50280#	230
^{161}Yb	−58190	270	−57890#	220
^{161}Lu	−52890	280	−52590#	240
^{162}Lu	−52920#	230	−52630#	230
^{162}Ta	−40600	130	−39920#	130
^{162}W	−34830	100	−34150#	100
^{166}Re	−32530	140	−31850#	140
^{166}Os	−26270	100	−25590#	100
^{167}Ta	−47840#	420	−48460#	430
^{170}W	−48000	350	−47240#	470
^{170}Ir	−23940	150	−23260#	150
^{170}Pt	−17140	100	−16460#	100
^{173}Ta	−51610#	230	−52490#	220
^{173}W	−47610#	380	−48490#	370
^{174}Re	−44610#	350	−43680#	410
^{174}Os	−40700	350	−39940#	470
^{174}Au	−14730	150	−14050#	150
^{174}Hg	−7500#	140	−6820#	140
^{176}Tm	−49300	200	−49620#	200
^{178}Ir	−37180	280	−36250#	360
^{178}Pt	−32700	350	−31940#	470
^{178}Tl	−5120#	210	−4440#	210
^{178}Pb	2770#	210	3450#	210

TABLE C—continued

Nucleus	Mass excess from exp. data		Recommended Mass Excess	
^{182}Au	−29230	280	−28300#	360
^{182}Hg	−24280	350	−23520#	470
^{186}Tl	−20910	290	−19980#	360
^{186}Tl^{m}	−20810#	290	−19880#	370
^{186}Tl^{n}	−20440#	290	−19510#	370
^{186}Pb	−15380	350	−14620#	470
^{189}Au	−33330	300	−33630#	200
^{189}Hg	−29130	360	−29680#	280
^{189}Tl	−23950	410	−24510#	350
^{189}Tl^{m}	−23660	410	−24220#	350
^{190}Bi	−11630	290	−10690#	360
^{190}Bi^{m}	−11420#	290	−10490#	370
^{190}Po	−5320	350	−4560#	470
^{191}Tl	−25840	220	−26190#	220
^{191}Tl^{m}	−25540	220	−25890#	220
^{192}Hg	−32330#	720	−32070#	720
^{193}Bi	−15220	410	−15780#	350
^{193}Bi^{m}	−14910	410	−15470#	350
^{194}At	−1700#	350	−770#	420
^{194}At^{m}	−1640#	300	−710#	370
^{195}Pb	−22430	590	−23780#	410
^{195}Pb^{m}	−22230	590	−23580#	410
^{195}Bi	−17580	220	−17930#	220
^{195}Bi^{m}	−17180	220	−17530#	220
^{197}At	−5690	420	−6250#	350
^{197}At^{m}	−5640	420	−6200#	350
^{199}Po	−13930	590	−15280#	410
^{199}Po^{m}	−13620	590	−14970#	410
^{199}At	−8380	220	−8730#	220
^{201}Fr	4270	420	3710#	350
^{203}Rn	−4880	590	−6230#	410
^{203}Rn^{m}	−4510	590	−5860#	410
^{203}Fr	1330	230	980#	230
^{204}Au	−20210	300	−20910#	200
^{207}Ra	4820	590	3470#	410
^{207}Ra^{m}	5370	590	4020#	410
^{228}Fr	32400	980	33270	420

TABLE D
The most precise masses.

	Mass excess (keV)		Atomic mass (μu)	
^{1}n	8071.3231	0.0022	1008664.9236	0.0023
^{1}H	7288.96917	0.00077	1007825.03190	0.00057
^{2}H	13135.7196	0.0011	2014101.77795	0.00062
^{3}H	14949.7943	0.0017	3016049.2677	0.0014
^{3}He	14931.2033	0.0016	3016029.3094	0.0012
^{4}He	2424.9111	0.0014	4002603.2497	0.0015
^{13}C	3125.0113	0.0046	13003354.8383	0.0049
^{14}C	3019.8943	0.0040	14003241.9906	0.0042
^{14}N	2863.4190	0.0017	14003074.0074	0.0018
^{16}O	−4736.9981	0.0024	15994914.6223	0.0025
^{20}Ne	−7041.9293	0.0028	19992440.1764	0.0030
^{40}Ar	−35039.8895	0.0054	39962383.1235	0.0050

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[13] Description of the procedures for retrieving the 6 files can be obtained:
for Western Europe and Japan, from NEA-DB, internet nea@nea.fr;
for USA and Canada, from NNDC, internet nndc@bnlnd2.dne.bnl.gov;
for other countries, from IAEA, Vienna; internet online@iaeand.iaea.or.at;
audi@frcpn11.in2p3.fr.

Atomic mass table

EXPLANATION OF TABLE

N	Number of neutrons.
Z	Number of protons.
A	Mass number $A = N + Z$.
Elt.	Element symbol (for $Z > 103$ see section 2).
Orig.	Origin of values for secondary nuclides. zp nn : mass of ${}^{A}Z$ derived from mass of ${}^{A+Z+z}(Z + z)$. Special notations: IT when $z = 0, n = 0$; + when $z = +1, n = -1$; − when $z = -1, n = +1$; ++ when $z = +2, n = -2$; ϵp when $z = -2, n = +1$; $+\alpha$ when $z = +2, n = +2$; x for distant connection.
S	Flag (♦) for nuclei for which masses estimated from systematical trends are thought better than the experimental masses.
Mass excess	Mass excess $[M(\text{in u}) - A]$, in keV, and its one standard deviation error. In cases where the furthest-left significant digit in the error was larger than 3, values and errors were rounded off, but not to more than tens of keV. (Examples: $2345.67 \pm 2.78 \rightarrow 2345.7 \pm 2.8, 2345.67 \pm 4.68 \rightarrow 2346 \pm 5$, but $2346.7 \pm 468.2 \rightarrow 2350 \pm 470$). # in place of decimal point: values and errors estimated from systematic trends. * in place of decimal point: values and errors estimated with help of Nilsson model, for nuclei beyond $A = 235$ (see section 2).
Binding energy	Total binding energy $[ZM({}^{1}\text{H}) + NM({}^{1}\text{n}) - m(A, Z)]$ in keV and its one standard deviation error. # or * in place of decimal point: see above.
Beta-decay energy	Direction of decay, value and standard error in keV: for $\beta^-, Q^- = M(A, Z) - M(A, Z + 1)$; for $\beta^+, Q^+ = M(A, Z) - M(A, Z - 1)$. For a few odd-odd nuclides near maximum β-stability decaying both β^- and β^+, the Q^+ values are given as negative Q^- values for the preceding even-even isobar. * in place of value: not calculable. # or * in place of decimal point: see above.
Atomic mass	Atomic mass M and its one standard deviation error in μu. # or * in place of decimal point: see above.

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
1	0	1	n			8071.323	0.002	0.0	0.0	β^-	782.354	0.002	1 008664.9236	0.002
0	1		H			7288.969	0.001	0.0	0.0		*		1 007825.0319	0.000
1	1	2	H			13135.720	0.001	2224.573	0.002		*		2 014101.7779	0.000
2	1	3	H			14949.794	0.002	8481.821	0.004	β^-	18.591	0.001	3 016049.2677	0.001
1	2		He			14931.203	0.002	7718.058	0.002		*		3 016029.3094	0.001
3	1	4	H	−n		26000	110	5500	110	β^-	23580	110	4 027910	110
2	2		He			2424.911	0.001	28295.673	0.005		*		4 002603.2497	0.001
1	3		Li	−p		25320	210	4620	210	β^+	22900	210	4 027180	230
4	1	5	H	−nn		38490	700	1080	700	β^-	27110	700	5 041320	750
3	2		He	−n		11390	50	27410	50		*		5 012220	50
2	3		Li	−p		11680	50	26330	50	β^+	290	70	5 012540	50
5	1	6	H	−3n		41860	260	5780	260	β^-	24270	260	6 044940	280
4	2		He			17594.1	1.0	29269.1	1.0	β^-	3507.8	0.9	6 018888.1	1.1
3	3		Li			14086.3	0.5	31994.5	0.5		*		6 015122.3	0.5
2	4		Be	−		18374	5	26924	5	β^+	4288	5	6 019726	6
5	2	7	He	+		26110	30	28820	30	β^-	11203	30	7 028030	30
4	3		Li			14907.7	0.5	39244.5	0.5		*		7 016004.1	0.5
3	4		Be			15769.5	0.5	37600.3	0.5	β^+	861.815	0.018	7 016929.3	0.5
2	5		B	+3n		27870	70	24720	70	β^+	12100	70	7 029920	80
6	2	8	He			31598	7	31408	7	β^-	10653	7	8 033922	8
5	3		Li			20945.2	0.6	41278.3	0.6	β^-	16003.6	0.6	8 022485.6	0.6
4	4		Be			4941.66	0.04	56499.51	0.04		*		8 005305.09	0.04
3	5		B			22921.0	1.1	37737.8	1.1	β^+	17979.4	1.1	8 024606.7	1.2
2	6		C	4n		35094	23	24782	23	β^+	12173	23	8 037675	25
7	2	9	He	++		40820	60	30260	60	β^-	15860	60	9 043820	70
6	3		Li			24954.0	1.9	45340.9	1.9	β^-	13606.3	1.9	9 026789.2	2.1
5	4		Be			11347.7	0.4	58164.8	0.4		*		9 012182.2	0.4
4	5		B	−		12415.8	1.0	56314.3	1.0	β^+	1068.1	0.9	9 013328.9	1.0
3	6		C	−pp		28914.0	2.1	39033.8	2.1	β^+	16498.2	2.3	9 031040.4	2.3
7	3	10	Li	p − 2n		33440	50	44920	50	β^-	20840	50	10 035900	50
6	4		Be			12606.7	0.4	64977.1	0.4	β^-	555.9	0.5	10 013533.8	0.4
5	5		B			12050.8	0.3	64750.6	0.3		*		10 012937.1	0.3
4	6		C	−		15698.6	0.3	60320.5	0.3	β^+	3647.81	0.09	10 016853.2	0.4
3	7		N	−		39700#	400#	35540#	400#	β^+	24000#	400#	10 042620#	430#
8	3	11	Li			40790	40	45650	40	β^-	20610	40	11 043790	50
7	4		Be	−n		20174	6	65481	6	β^-	11506	6	11 021658	7
6	5		B			8668.0	0.4	76204.8	0.4		*		11 009305.5	0.4
5	6		C			10650.2	0.9	73440.3	0.9	β^+	1982.1	0.8	11 011433.4	1.0
4	7		N	+3n		24960	180	58350	180	β^+	14310	180	11 026800	190
8	4	12	Be	−nn		25077	15	68650	15	β^-	11708	15	12 026921	16
7	5		B	+pn		13368.9	1.4	79575.2	1.4	β^-	13368.9	1.4	12 014352.1	1.5
6	6		C			0.0	0.0	92161.754	0.014		*		12 000000.0	0.0
5	7		N			17338.1	1.0	74041.3	1.0	β^+	17338.1	1.0	12 018613.2	1.1
4	8		O	−−		32060	40	58530	40	β^+	14730	40	12 034420	50
9	4	13	Be	++		35160	50	66640	50	β^-	18600	50	13 037740	50
8	5		B	−nn		16562.3	1.1	84453.2	1.1	β^-	13437.2	1.1	13 017780.3	1.1
7	6		C			3125.011	0.005	97108.065	0.017		*		13 003354.838	0.005
6	7		N			5345.46	0.27	94105.27	0.27	β^+	2220.44	0.27	13 005738.58	0.29
5	8		O	+3n		23111	10	75558	10	β^+	17765	10	13 024810	10
10	4	14	Be	x		39880	110	69990	110	β^-	16220	110	14 042820	120
9	5		B	+		23664	21	85423	21	β^-	20644	21	14 025404	23
8	6		C			3019.894	0.004	105284.506	0.019	β^-	156.475	0.004	14 003241.991	0.004
7	7		N			2863.419	0.002	104658.627	0.017		*		14 003074.0074	0.001
6	8		O			8006.46	0.07	98733.23	0.08	β^+	5143.04	0.07	14 008595.29	0.08
5	9		F	x		33610#	400#	72350#	400#	β^+	25600#	400#	14 036080#	430#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
10	5	15	B	+3p		28967	22	88191	22	β^-	19094	22	15 031097	24
9	6		C	−n		9873.1	0.8	106502.6	0.8	β^-	9771.6	0.8	15 010599.3	0.9
8	7		N			101.508	0.011	115491.861	0.022		*		15 000108.973	0.012
7	8		O			2855.5	0.5	111955.6	0.5	β^+	2753.9	0.5	15 003065.5	0.5
6	9		F	p4n		16780	130	97250	130	β^+	13920	130	15 018010	140
5	10		Ne	x		41390#	500#	71860#	500#	β^+	24610#	520#	15 044430#	540#
11	5	16	B	x		37140#	400#	88090#	400#	β^-	23450#	400#	16 039870#	430#
10	6		C	−nn		13694	4	110753	4	β^-	8012	4	16 014701	4
9	7		N	−n		5682.0	2.3	117982.7	2.3	β^-	10419.0	2.3	16 006099.9	2.5
8	8		O			−4736.998	0.002	127619.336	0.019		*		15 994914.6223	0.0025
7	9		F	−		10680	8	111420	8	β^+	15417	8	16 011466	9
6	10		Ne	−−		23989	20	97329	20	β^+	13308	22	16 025753	21
12	5	17	B	x		43720	140	89580	140	β^-	22680	140	17 046930	150
11	6		C	2p − n		21037	17	111482	17	β^-	13166	23	17 022584	19
10	7		N	+p		7871	15	123865	15	β^-	8680	15	17 008450	16
9	8		O			−809.00	0.21	131762.66	0.21		*		16 999131.50	0.22
8	9		F			1951.70	0.25	128219.61	0.25	β^+	2760.7	0.3	17 002095.24	0.27
7	10		Ne	+3n		16490	50	112900	50	β^+	14530	50	17 017700	50
6	11		Na	x		35170#	400#	93430#	400#	β^+	18690#	400#	17 037760#	430#
13	5	18	B	x		52320#	800#	89050#	800#	β^-	27400#	800#	18 056170#	860#
12	6		C	++		24920	30	115670	30	β^-	11810	40	18 026760	30
11	7		N	+		13117	20	126690	20	β^-	13899	20	18 014082	21
10	8		O			−782.1	0.8	139807.1	0.8		*		17 999160.4	0.9
9	9		F			873.4	0.6	137369.2	0.6	β^+	1655.5	0.6	18 000937.7	0.6
8	10		Ne	−pp		5319	5	132141	5	β^+	4446	5	18 005710	5
7	11		Na	x		25320#	400#	111360#	400#	β^+	20000#	400#	18 027180#	430#
14	5	19	B	x		59360#	400#	90080#	400#	β^-	26530#	420#	19 063730#	430#
13	6		C	x		32830	110	115830	110	β^-	16970	110	19 035250	120
12	7		N	p − 2n		15860	16	132018	16	β^-	12528	17	19 017027	18
11	8		O	−n		3332.2	2.9	143764.1	2.9	β^-	4819.6	2.9	19 003577	3
10	9		F			−1487.40	0.07	147801.36	0.07		*		18 998403.20	0.07
9	10		Ne	−		1751.0	0.6	143780.6	0.6	β^+	3238.4	0.6	19 001879.7	0.6
8	11		Na	p4n		12929	12	131821	12	β^+	11178	12	19 013879	13
7	12		Mg	x		31950#	300#	112020#	300#	β^+	19020#	300#	19 034300#	320#
14	6	20	C	x		37560	200	119170	200	β^-	15790	210	20 040320	220
13	7		N	x		21770	50	134180	50	β^-	17970	50	20 023370	60
12	8		O	−nn		3796.9	1.2	151370.7	1.2	β^-	3814.3	1.2	20 004076.1	1.3
11	9		F			−17.40	0.08	154402.67	0.09	β^-	7024.53	0.08	19 999981.32	0.09
10	10		Ne			−7041.929	0.003	160644.852	0.024		*		19 992440.176	0.003
9	11		Na	−		6845	7	145976	7	β^+	13887	7	20 007348	7
8	12		Mg	4n		17571	27	134468	27	β^+	10726	28	20 018863	29
15	6	21	C	x		45960#	500#	118840#	500#	β^-	20730#	510#	21 049340#	540#
14	7		N	x		25230	90	138790	90	β^-	17170	90	21 027090	100
13	8		O	−3n		8062	12	155177	12	β^-	8109	12	21 008655	13
12	9		F	−nn		−47.6	1.8	162504.2	1.8	β^-	5684.1	1.8	20 999948.9	1.9
11	10		Ne			−5731.72	0.04	167405.97	0.05		*		20 993846.74	0.04
10	11		Na	−p		−2184.3	0.7	163076.2	0.7	β^+	3547.5	0.7	20 997655.1	0.8
9	12		Mg	+3n		10912	16	149198	16	β^+	13096	16	21 011714	18
8	13		Al	x		26120#	300#	133210#	300#	β^+	15210#	300#	21 028040#	320#
16	6	22	C	x		52580#	900#	120290#	900#	β^-	20500#	930#	22 056450#	970#
15	7		N	x		32080	200	140010	200	β^-	22800	200	22 034440	210
14	8		O	−4n		9280	60	162030	60	β^-	6490	60	22 009970	60
13	9		F	+		2794	12	167734	12	β^-	10818	12	22 002999	13
12	10		Ne			−8024.35	0.23	177769.92	0.24		*		21 991385.50	0.25
11	11		Na			−5182.2	0.4	174145.5	0.4	β^+	2842.1	0.4	21 994436.6	0.5
10	12		Mg	+nn		−396.8	1.4	168577.6	1.4	β^+	4785.5	1.4	21 999574.0	1.5
9	13		Al	x		18180#	90#	149220#	90#	β^+	18580#	90#	22 019520#	100#
8	14		Si	x		32160#	200#	134450#	200#	β^+	13980#	220#	22 034530#	220#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
16	7	23	N	x		37740#	710#	142430#	710#	β^-	23120#	720#	23 040510#	760#
15	8		O	x		14620	100	164770	100	β^-	11290	130	23 015690	110
14	9		F	p − 2n		3330	80	175270	80	β^-	8480	80	23 003570	90
13	10		Ne	−n		−5153.65	0.26	182970.54	0.27	β^-	4375.85	0.20	22 994467.33	0.28
12	11		Na			−9529.50	0.24	186564.04	0.25		*		22 989769.66	0.26
11	12		Mg			−5472.7	1.3	181724.9	1.3	β^+	4056.8	1.2	22 994124.8	1.4
10	13		Al	p4n		6767	25	168703	25	β^+	12240	25	23 007265	27
9	14		Si	x		23770#	200#	150920#	200#	β^+	17010#	200#	23 025520#	210#
17	7	24	N	x		47040#	500#	141200#	500#	β^-	28070#	590#	24 050500#	540#
16	8		O	x		18970	310	168480	310	β^-	11430	320	24 020370	330
15	9		F	x		7540	70	179130	70	β^-	13490	70	24 008100	70
14	10		Ne	−nn		−5948	10	191836	10	β^-	2470	10	23 993615	11
13	11		Na	−n		−8417.62	0.25	193523.48	0.25	β^-	5515.79	0.16	23 990963.31	0.27
12	12		Mg			−13933.40	0.24	198256.91	0.24		*		23 985041.87	0.26
11	13		Al	−		−55	4	183596	4	β^+	13878	4	23 999941	4
10	14		Si	−−		10755	19	172004	19	β^+	10810	20	24 011546	21
9	15		P	x		32000#	500#	149980#	500#	β^+	21240#	500#	24 034350#	540#
17	8	25	O	x		27140#	370#	168380#	370#	β^-	15880#	380#	25 029140#	400#
16	9		F	x		11270	80	183480	80	β^-	13330	90	25 012090	80
15	10		Ne	2p − n		−2060	40	196020	40	β^-	7300	40	24 997790	50
14	11		Na			−9357.5	1.2	202534.7	1.2	β^-	3835.3	1.2	24 989954.3	1.3
13	12		Mg			−13192.75	0.24	205587.58	0.25		*		24 985837.00	0.26
12	13		Al	−p		−8915.8	0.7	200528.2	0.7	β^+	4277.0	0.7	24 990428.5	0.8
11	14		Si	+3n		3825	10	187005	10	β^+	12741	10	25 004107	11
10	15		P	x		18870#	200#	171180#	200#	β^+	15050#	200#	25 020260#	210#
18	8	26	O	x		35160#	430#	168430#	430#	β^-	16880#	450#	26 037750#	460#
17	9		F	x		18290	120	184530	120	β^-	17860	140	26 019630	130
16	10		Ne	++		430	50	201600	50	β^-	7330	60	26 000460	60
15	11		Na			−6902	14	208151	14	β^-	9312	14	25 992590	15
14	12		Mg			−16214.51	0.25	216680.67	0.25		*		25 982593.00	0.26
13	13		Al			−12210.32	0.25	211894.12	0.25	β^+	4004.19	0.06	25 986891.67	0.27
12	14		Si	+nn		−7145	3	206046	3	β^+	5066	3	25 992330	3
11	15		P	x		10970#	200#	187150#	200#	β^+	18120#	200#	26 011780#	210#
10	16		S	x		25970#	300#	171370#	300#	β^+	15000#	360#	26 027880#	320#
18	9	27	F	x		25050	420	185830	420	β^-	17960	430	27 026890	450
17	10		Ne	x		7090	90	203010	90	β^-	12670	100	27 007620	100
16	11		Na			−5580	40	214900	40	β^-	9010	40	26 994010	40
15	12		Mg	−n		−14586.54	0.25	223124.02	0.25	β^-	2610.32	0.17	26 984340.70	0.27
14	13		Al			−17196.86	0.22	224951.98	0.22		*		26 981538.41	0.24
13	14		Si	−		−12385.03	0.25	219357.80	0.25	β^+	4811.83	0.11	26 986704.12	0.26
12	15		P	p4n		−750	40	206940	40	β^+	11630	40	26 999190	40
11	16		S	−		17510#	200#	187900#	200#	β^+	18260#	200#	27 018800#	220#
19	9	28	F	x		33230#	510#	185730#	510#	β^-	21950#	530#	28 035670#	550#
18	10		Ne	x		11280	110	206890	110	β^-	12310	140	28 012110	120
17	11		Na			−1030	80	218420	80	β^-	13990	80	27 998890	80
16	12		Mg	+		−15018.8	2.0	231627.6	2.0	β^-	1831.8	2.0	27 983876.7	2.2
15	13		Al	−n		−16850.58	0.23	232677.03	0.23	β^-	4642.24	0.14	27 981910.15	0.25
14	14		Si			−21492.83	0.20	236536.92	0.20		*		27 976926.49	0.22
13	15		P	−		−7161	4	221423	4	β^+	14332	4	27 992312	4
12	16		S	−−		4070	160	209410	160	β^+	11230	160	28 004370	170
11	17		Cl	x		26560#	500#	186140#	500#	β^+	22480#	530#	28 028510#	540#
20	9	29	F	x		40300#	580#	186730#	580#	β^-	22280#	650#	29 043260#	620#
19	10		Ne	x		18020	300	208220	300	β^-	15400	310	29 019350	320
18	11		Na			2620	90	222840	90	β^-	13280	90	29 002810	100
17	12		Mg	−3n		−10661	29	235341	29	β^-	7554	29	28 988550	30
16	13		Al	−nn		−18215.5	1.2	242113.3	1.2	β^-	3679.5	1.2	28 980444.8	1.3
15	14		Si	−n		−21895.06	0.20	245010.48	0.21		*		28 976494.68	0.22
14	15		P	−p		−16951.9	0.8	239285.0	0.8	β^+	4943.1	0.7	28 981801.3	0.8
13	16		S	+3n		−3160	50	224710	50	β^+	13790	50	28 996610	50
12	17		Cl	x		13140#	200#	207630#	200#	β^+	16300#	200#	29 014110#	210#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
20	10	30	Ne	x		22240	820	212080	820	β^-	13640	830	30 023870	880
19	11		Na			8590	90	224940	90	β^-	17480	110	30 009230	100
18	12		Mg			−8880	70	241630	70	β^-	6990	70	29 990460	70
17	13		Al	+		−15872	14	247842	14	β^-	8561	14	29 982960	15
16	14		Si	−n		−24432.92	0.21	255619.66	0.21		*		29 973770.18	0.22
15	15		P	−p		−20200.6	0.4	250605.0	0.5	β^+	4232.3	0.4	29 978313.8	0.5
14	16		S	+nn		−14063	3	243685	3	β^+	6138	3	29 984903	3
13	17		Cl	x		4440#	200#	224400#	200#	β^+	18510#	200#	30 004770#	210#
12	18		Ar	x		20080#	300#	207970#	300#	β^+	15640#	360#	30 021560#	320#
21	10	31	Ne	x		30840#	900#	211550#	900#	β^-	18180#	920#	31 033110#	970#
20	11		Na	x		12660	160	228940	160	β^-	15880	180	31 013600	180
19	12		Mg	x		−3220	80	244040	80	β^-	11740	80	30 996550	80
18	13		Al	p − 2n		−14954	20	254995	20	β^-	7995	20	30 983946	22
17	14		Si	−n		−22948.99	0.21	262207.06	0.22	β^-	1492.02	0.20	30 975363.24	0.23
16	15		P			−24441.01	0.25	262916.72	0.25		*		30 973761.49	0.27
15	16		S	+n		−19044.9	1.5	256738.2	1.5	β^+	5396.1	1.5	30 979554.5	1.6
14	17		Cl	p4n		−7060	50	243980	50	β^+	11980	50	30 992420	50
13	18		Ar	−		11300#	210#	224830#	210#	β^+	18360#	200#	31 012130#	220#
22	10	32	Ne	x		37180#	880#	213280#	880#	β^-	18870#	1000#	32 039910#	940#
21	11		Na	x		18300	480	231370	480	β^-	19100	490	32 019650	520
20	12		Mg	x		−800	100	249690	100	β^-	10270	130	31 999150	100
19	13		Al	x		−11060	90	259170	90	β^-	13020	90	31 988120	90
18	14		Si	−nn		−24080.9	2.2	271410.3	2.2	β^-	224.4	2.2	31 974148.1	2.3
17	15		P	−n		−24305.34	0.25	270852.37	0.26	β^-	1710.60	0.27	31 973907.14	0.27
16	16		S			−26015.94	0.14	271780.62	0.14		*		31 972070.73	0.15
15	17		Cl	−		−13331	7	258313	7	β^+	12685	7	31 985689	7
14	18		Ar	−−		−2180	50	246380	50	β^+	11150	50	31 997660	50
13	19		K	x		20420#	500#	223000#	500#	β^+	22600#	510#	32 021920#	540#
22	11	33	Na	x		25510	1490	232240	1490	β^-	20310	1500	33 027390	1600
21	12		Mg	x		5200	150	251760	150	β^-	13710	160	33 005590	160
20	13		Al	x		−8500	70	264690	70	β^-	11990	70	32 990870	70
19	14		Si	+n2p		−20492	16	275893	16	β^-	5845	16	32 978001	17
18	15		P	+		−26337.7	1.1	280956.0	1.1	β^-	248.5	1.1	32 971725.3	1.2
17	16		S			−26586.20	0.14	280422.20	0.14		*		32 971458.54	0.15
16	17		Cl	−p		−21003.5	0.5	274057.1	0.5	β^+	5582.7	0.5	32 977451.8	0.6
15	18		Ar	+3n		−9380	30	261650	30	β^+	11620	30	32 989930	30
14	19		K	x		6760#	200#	244730#	200#	β^+	16140#	200#	33 007260#	210#
23	11	34	Na	x		32510#	1050#	233310#	1050#	β^-	24060#	1090#	34 034900#	1130#
22	12		Mg	x		8450	260	256590	260	β^-	11310	280	34 009070	280
21	13		Al	x		−2860	90	267120	90	β^-	17090	90	33 996930	100
20	14		Si	+pp		−19957	14	283429	14	β^-	4601	15	33 978576	15
19	15		P	+pn		−24558	5	287247	5	β^-	5374	5	33 973636	5
18	16		S			−29931.81	0.13	291839.13	0.13		*		33 967866.87	0.14
17	17		Cl	−p		−24439.61	0.21	285564.58	0.21	β^+	5492.20	0.16	33 973762.99	0.22
16	18		Ar	+nn		−18378	3	278721	3	β^+	6061	3	33 980270	3
15	19		K	x		−1480#	300#	261040#	300#	β^+	16900#	300#	33 998410#	320#
14	20		Ca	x		13150#	300#	245630#	300#	β^+	14630#	420#	34 014120#	320#
24	11	35	Na	x		41150#	1550#	232740#	1550#	β^-	23760#	2230#	35 044180#	1660#
23	12		Mg	x	♦	17390	1600	255720	1600	β^-	17450	1610	35 018670	1720
22	13		Al	x		−60	140	272380	140	β^-	14300	150	34 999940	150
21	14		Si	2p − n		−14360	40	285900	40	β^-	10500	40	34 984580	40
20	15		P	+p		−24857.6	1.9	295618.6	1.9	β^-	3988.7	1.9	34 973314.2	2.0
19	16		S			−28846.33	0.12	298824.98	0.13	β^-	167.18	0.12	34 969032.18	0.13
18	17		Cl			−29013.51	0.04	298209.81	0.06		*		34 968852.71	0.04
17	18		Ar	−		−23048.2	0.8	291462.1	0.8	β^+	5965.3	0.8	34 975256.7	0.8
16	19		K	p4n		−11167	20	278799	20	β^+	11881	20	34 988012	21
15	20		Ca	x		4440#	70#	262410#	70#	β^+	15610#	70#	35 004770#	70#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
24	12	36	Mg	x		20910#	900#	260270#	900#	β^-	15000#	940#	36 022450#	970#
23	13		Al	x		5920	270	274480	270	β^-	18320	290	36 006350	290
22	14		Si	x		−12400	100	292020	100	β^-	7850	100	35 986690	110
21	15		P	+		−20251	13	299083	13	β^-	10413	13	35 978260	14
20	16		S	+p		−30663.96	0.23	308713.93	0.24	β^-	−1142.07	0.25	35 967080.88	0.25
19	17		Cl			−29521.89	0.08	306789.50	0.09	β^-	708.57	0.26	35 968306.94	0.08
18	18		Ar			−30230.46	0.26	306715.72	0.26		*		35 967546.26	0.27
17	19		K	−		−17425	8	293128	8	β^+	12805	8	35 981293	8
16	20		Ca	4n		−6440	40	281360	40	β^+	10990	40	35 993090	40
15	21		Sc	x		13900#	500#	260240#	500#	β^+	20340#	510#	36 014920#	540#
24	13	37	Al	x		9600	540	278860	540	β^-	16130	550	37 010310	580
23	14		Si	x		−6520	130	294210	130	β^-	12470	130	36 993000	130
22	15		P	p − 2n		−18990	40	305900	40	β^-	7900	40	36 979610	40
21	16		S	−n		−26896.22	0.25	313017.51	0.26	β^-	4865.30	0.25	36 971125.71	0.27
20	17		Cl			−31761.52	0.05	317100.46	0.07		*		36 965902.60	0.05
19	18		Ar			−30948.0	0.3	315504.6	0.3	β^+	813.5	0.3	36 966775.9	0.3
18	19		K	−p		−24799.26	0.27	308573.49	0.27	β^+	6148.8	0.4	36 973376.89	0.29
17	20		Ca	+3n		−13161	22	296152	22	β^+	11639	22	36 985872	24
16	21		Sc	x		2840#	300#	279370#	300#	β^+	16000#	300#	37 003050#	320#
25	13	38	Al	x		15740#	560#	280800#	560#	β^-	19490#	620#	38 016900#	600#
24	14		Si	x		−3740	270	299500	270	β^-	10720	300	37 995980	290
23	15		P	x		−14470	140	309440	140	β^-	12390	140	37 984470	150
22	16		S	+		−26861	7	321054	7	β^-	2937	7	37 971163	8
21	17		Cl	−n		−29797.98	0.11	323208.24	0.12	β^-	4916.8	0.5	37 968010.55	0.12
20	18		Ar			−34714.8	0.5	327342.7	0.5		*		37 962732.2	0.5
19	19		K			−28801.7	0.7	320647.2	0.7	β^+	5913.1	0.6	37 969080.1	0.8
18	20		Ca	+nn		−22059	5	313122	5	β^+	6743	5	37 976319	5
17	21		Sc	x		−4940#	300#	295220#	300#	β^+	17120#	300#	37 994700#	320#
16	22		Ti	x		9100#	250#	280400#	250#	β^+	14040#	390#	38 009770#	270#
25	14	39	Si	x		2140#	400#	301690#	400#	β^-	14790#	430#	39 002300#	430#
24	15		P	x		−12650	150	315700	150	β^-	10510	160	38 986420	160
23	16		S	2p − n		−23160	50	325430	50	β^-	6640	50	38 975140	50
22	17		Cl			−29799.8	1.8	331281.4	1.8	β^-	3442	5	38 968008.6	1.9
21	18		Ar	+		−33242	5	333941	5	β^-	565	5	38 964313	5
20	19		K			−33806.84	0.28	333723.71	0.28		*		38 963706.9	0.3
19	20		Ca	−		−27276.3	1.8	326410.8	1.8	β^+	6530.6	1.8	38 970717.7	1.9
18	21		Sc	2n − p		−14168	24	312520	24	β^+	13108	24	38 984790	26
17	22		Ti	−		1230#	100#	296340#	100#	β^+	15400#	100#	39 001320#	110#
26	14	40	Si	x		5400#	500#	306500#	500#	β^-	13740#	540#	40 005800#	540#
25	15		P	x		−8340	200	319450	200	β^-	14510	300	39 991050	210
24	16		S	x		−22850	230	333180	230	β^-	4710	240	39 975470	250
23	17		Cl	+		−27560	30	337110	30	β^-	7480	30	39 970420	30
22	18		Ar			−35039.889	0.005	343810.44	0.05	β^-	−1504.87	0.27	39 962383.124	0.005
21	19		K			−33535.02	0.27	341523.22	0.28	β^-	1311.09	0.12	39 963998.67	0.29
20	20		Ca			−34846.11	0.29	342051.96	0.30		*		39 962591.2	0.3
19	21		Sc	−		−20526	4	326950	4	β^+	14320	4	39 977964	4
18	22		Ti	−−		−8850	160	314490	160	β^+	11680	160	39 990500	170
17	23		V	x		10330#	500#	294530#	500#	β^+	19180#	530#	40 011090#	540#
27	14	41	Si	x		11830#	600#	308140#	600#	β^-	16670#	760#	41 012700#	640#
26	15		P	x		−4840	470	324030	470	β^-	13760	510	40 994800	500
25	16		S	x		−18600	210	337010	210	β^-	8740	220	40 980030	230
24	17		Cl	x		−27340	60	344960	60	β^-	5730	60	40 970650	70
23	18		Ar			−33067.3	0.7	349909.1	0.7	β^-	2491.6	0.7	40 964500.8	0.7
22	19		K			−35558.87	0.26	351618.40	0.27		*		40 961825.97	0.28
21	20		Ca			−35137.5	0.4	350414.7	0.4	β^+	421.38	0.28	40 962278.3	0.4
20	21		Sc			−28642.2	0.3	343137.0	0.3	β^+	6495.28	0.27	40 969251.3	0.3
19	22		Ti	x		−15710#	40#	329430#	40#	β^+	12930#	40#	40 983130#	40#
18	23		V	x		−240#	250#	313170#	250#	β^+	15470#	250#	40 999740#	270#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
27	15	42	P	x		80#	500#	327180#	500#	β^-	17330#	600#	42	000090#	540#
26	16		S	x		−17240	330	343720	330	β^-	7750	340	41	981490	350
25	17		Cl	x		−24990	110	350680	110	β^-	9430	120	41	973170	120
24	18		Ar	−nn		−34420	40	359340	40	β^-	600	40	41	963050	40
23	19		K	−n		−35021.3	0.3	359152.2	0.3	β^-	3525.4	0.3	41	962403.1	0.3
22	20		Ca			−38546.8	0.4	361895.3	0.4		*		41	958618.3	0.4
21	21		Sc			−32120.9	0.4	354687.1	0.4	β^+	6425.85	0.13	41	965516.8	0.4
20	22		Ti	−pp		−25121	5	346905	5	β^+	7000	5	41	973032	6
19	23		V	x		−8170#	200#	329170#	200#	β^+	16950#	200#	41	991230#	210#
18	24		Cr	x		5990#	300#	314230#	300#	β^+	14160#	360#	42	006430#	320#
28	15	43	P	x		3080#	500#	332250#	500#	β^-	15570#	980#	43	003310#	540#
27	16		S	x		−12480	840	347030	840	β^-	11550	850	42	986600	900
26	17		Cl	x		−24030	160	357800	160	β^-	7950	180	42	974200	170
25	18		Ar	2p3n		−31980	70	364960	70	β^-	4620	70	42	965670	80
24	19		K	+		−36593	9	368795	9	β^-	1815	9	42	960716	10
23	20		Ca			−38408.4	0.5	369828.3	0.5		*		42	958766.8	0.5
22	21		Sc	−p		−36187.6	1.9	366825.1	1.9	β^+	2220.8	1.9	42	961151.0	2.0
21	22		Ti	−n2p		−29320	7	359175	7	β^+	6867	7	42	968523	7
20	23		V	x		−18020#	230#	347100#	230#	β^+	11300#	230#	42	980650#	250#
19	24		Cr	x		−2140#	90#	330430#	90#	β^+	15890#	250#	42	997710#	90#
28	16	44	S	x		−10880#	600#	353500#	600#	β^-	9110#	640#	43	988320#	640#
27	17		Cl	x		−19990	220	361830	220	β^-	12270	220	43	978540	240
26	18		Ar	+α		−32262	20	373318	20	β^-	3550	40	43	965365	22
25	19		K	+		−35810	40	376080	40	β^-	5660	40	43	961560	40
24	20		Ca			−41469.1	0.9	380960.2	0.9		*		43	955481.1	0.9
23	21		Sc	−p		−37815.8	1.8	376524.6	1.8	β^+	3653.3	1.9	43	959403.0	1.9
22	22		Ti	−α		−37548.3	0.8	375474.7	0.8	β^+	267.5	1.9	43	959690.2	0.8
21	23		V	x		−23850#	80#	360990#	80#	β^+	13700#	80#	43	974400#	90#
20	24		Cr	x		−13540#	130#	349900#	130#	β^+	10310#	160#	43	985470#	140#
19	25		Mn	x		6400#	500#	329180#	500#	β^+	19930#	520#	44	006870#	540#
29	16	45	S	x		−4830#	800#	355520#	800#	β^-	14080#	1030#	44	994820#	860#
28	17		Cl	x		−18910	650	368820	650	β^-	10810	650	44	979700	700
27	18		Ar	+n2p		−29720	60	378850	60	β^-	6890	60	44	968090	60
26	19		K	+p		−36608	10	384953	10	β^-	4204	10	44	960700	11
25	20		Ca			−40812.5	0.9	388375.0	0.9	β^-	256.8	0.9	44	956185.9	1.0
24	21		Sc			−41069.4	1.1	387849.5	1.1		*		44	955910.2	1.2
23	22		Ti	−		−39006.9	1.2	385004.7	1.2	β^+	2062.4	0.5	44	958124.3	1.3
22	23		V	p4n		−31874	17	377089	17	β^+	7133	17	44	965782	18
21	24		Cr	x		−19410#	100#	363850#	100#	β^+	12460#	100#	44	979160#	110#
20	25		Mn	x		−5110#	300#	348770#	300#	β^+	14300#	320#	44	994510#	320#
19	26		Fe	x		13560#	400#	329310#	400#	β^+	18680#	500#	45	014560#	430#
29	17	46	Cl	x		−14790#	500#	372770#	500#	β^-	14930#	510#	45	984120#	540#
28	18		Ar	+pp		−29720	40	386920	40	β^-	5700	40	45	968090	40
27	19		K	+pn		−35419	16	391835	16	β^-	7716	16	45	961976	17
26	20		Ca			−43135.0	2.4	398768.7	2.4	β^-	−1376.3	2.4	45	953692.7	2.5
25	21		Sc	−n		−41758.7	1.1	396610.1	1.1	β^-	2366.7	0.7	45	955170.2	1.2
24	22		Ti			−44125.4	1.1	398194.4	1.1		*		45	952629.5	1.2
23	23		V	−		−37074.0	1.5	390360.7	1.5	β^+	7051.4	1.0	45	960199.5	1.6
22	24		Cr	−		−29471	20	381975	20	β^+	7603	20	45	968362	22
21	25		Mn	x		−12370#	110#	364090#	110#	β^+	17100#	110#	45	986720#	120#
20	26		Fe	x		760#	350#	350190#	350#	β^+	13130#	370#	46	000810#	380#
30	17	47	Cl	x		−11230#	800#	377280#	800#	β^-	14680#	810#	46	987950#	860#
29	18		Ar	2p − n		−25910	100	391180	100	β^-	9790	100	46	972190	110
28	19		K	+p		−35697	8	400184	8	β^-	6643	8	46	961678	9
27	20		Ca			−42339.7	2.3	406044.9	2.3	β^-	1991.9	1.2	46	954546.4	2.5
26	21		Sc			−44331.7	2.1	407254.4	2.1	β^-	600.1	1.9	46	952408.0	2.2
25	22		Ti			−44931.8	1.0	407072.2	1.0		*		46	951763.7	1.0
24	23		V	−p		−42004.0	1.1	403362.0	1.1	β^+	2927.8	1.0	46	954906.9	1.2
23	24		Cr	+3n		−34552	14	395128	14	β^+	7451	14	46	962906	15
22	25		Mn	x		−22260#	160#	382060#	160#	β^+	12290#	160#	46	976100#	170#
21	26		Fe	x		−6620#	260#	365630#	260#	β^+	15640#	310#	46	992890#	280#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
30	18	48	Ar	x		−23220#	300#	396560#	300#	β^-	8900#	300#	47	975070#	320#
29	19		K	+		−32125	24	404683	24	β^-	12090	24	47	965513	26
28	20		Ca			−44215	4	415991	4	β^-	278	5	47	952533	4
27	21		Sc			−44493	5	415487	5	β^-	3994	5	47	952235	6
26	22		Ti			−48487.1	1.0	418698.8	1.0		*		47	947947.0	1.0
25	23		V	−		−44474.7	2.6	413904.1	2.6	β^+	4012.3	2.4	47	952254.4	2.8
24	24		Cr			−42815	7	411462	7	β^+	1659	8	47	954036	8
23	25		Mn	x		−29290#	70#	397150#	70#	β^+	13530#	70#	47	968560#	80#
22	26		Fe	x		−18110#	100#	385190#	100#	β^+	11180#	130#	47	980560#	110#
21	27		Co	x		1800#	400#	364500#	400#	β^+	19910#	410#	48	001930#	430#
30	19	49	K	+		−30320	70	410950	70	β^-	10970	70	48	967450	80
29	20		Ca	−n		−41290	4	421138	4	β^-	5262	3	48	955673	4
28	21		Sc			−46552	4	425618	4	β^-	2006	4	48	950024	4
27	22		Ti			−48558.1	1.0	426841.1	1.0		*		48	947870.7	1.0
26	23		V	−		−47956.2	1.3	425456.9	1.3	β^+	601.9	0.8	48	948516.9	1.4
25	24		Cr	+n		−45325.6	2.6	422043.9	2.6	β^+	2630.7	2.6	48	951341.0	2.8
24	25		Mn	p4n		−37611	24	413547	24	β^+	7715	24	48	959623	26
23	26		Fe	x		−24580#	160#	399740#	160#	β^+	13030#	160#	48	973610#	170#
22	27		Co	x		−9880#	260#	384250#	260#	β^+	14700#	310#	48	989390#	280#
31	19	50	K	+		−25350	280	414050	280	β^-	14220	280	49	972780	300
30	20		Ca	−nn		−39572	9	427491	9	β^-	4966	17	49	957518	10
29	21		Sc	−pn		−44538	16	431674	16	β^-	6888	16	49	952187	17
28	22		Ti			−51425.9	1.0	437780.3	1.0	β^-	−2208.2	1.1	49	944792.0	1.1
27	23		V	+n		−49217.7	1.3	434789.7	1.3	β^-	1036.9	0.4	49	947162.7	1.4
26	24		Cr			−50254.6	1.3	435044.2	1.3		*		49	946049.5	1.4
25	25		Mn			−42621.6	1.4	426628.9	1.4	β^+	7632.95	0.28	49	954243.8	1.5
24	26		Fe	4n		−34470	60	417700	60	β^+	8150	60	49	962990	60
23	27		Co	x		−17500#	170#	399950#	170#	β^+	16970#	180#	49	981210#	180#
22	28		Ni	x		−3790#	260#	385450#	260#	β^+	13710#	310#	49	995930#	280#
31	20	51	Ca			−35900	90	431900	90	β^-	7310	90	50	961450	90
30	21		Sc	−p2n		−43219	20	438427	20	β^-	6508	20	50	953603	22
29	22		Ti	−n		−49726.9	1.3	444152.6	1.3	β^-	2470.7	1.5	50	946616.0	1.4
28	23		V			−52197.6	1.3	445840.9	1.3		*		50	943963.5	1.4
27	24		Cr			−51444.9	1.3	444305.9	1.3	β^+	752.73	0.24	50	944771.6	1.4
26	25		Mn			−48237.1	1.3	440315.7	1.3	β^+	3207.8	0.5	50	948215.4	1.4
25	26		Fe	+3n		−40217	15	431514	15	β^+	8020	15	50	956825	16
24	27		Co	x		−27470#	150#	417980#	150#	β^+	12750#	150#	50	970510#	160#
23	28		Ni	x		−11440#	260#	401170#	260#	β^+	16030#	300#	50	987720#	280#
32	20	52	Ca	x		−32510	470	436570	470	β^-	7950	490	51	965100	500
31	21		Sc	x		−40460	160	443740	160	β^-	9010	160	51	956570	170
30	22		Ti	−nn		−49464	7	451961	7	β^-	1973	7	51	946898	8
29	23		V	−n		−51437.5	1.3	453152.2	1.3	β^-	3975.6	1.2	51	944779.5	1.4
28	24		Cr			−55413.1	1.4	456345.4	1.4		*		51	940511.5	1.5
27	25		Mn	+pn		−50701.3	2.4	450851.2	2.4	β^+	4711.9	2.0	51	945569.9	2.5
26	26		Fe	−		−48329	10	447697	10	β^+	2372	10	51	948116	11
25	27		Co	x		−34320#	70#	432900#	70#	β^+	14010#	70#	51	963160#	70#
24	28		Ni	x		−22650#	80#	420460#	80#	β^+	11660#	110#	51	975680#	90#
23	29		Cu	x		−2630#	260#	399650#	260#	β^+	20030#	270#	51	997180#	280#
33	20	53	Ca	x		−27900#	500#	440030#	500#	β^-	10870#	530#	52	970050#	540#
32	21		Sc	x	♦	−38770	180	450120	180	β^-	8060	200	52	958380	190
31	22		Ti	+		−46820	100	457390	100	β^-	5020	100	52	949730	110
30	23		V	+p		−51845	3	461631	3	β^-	3436	3	52	944342	4
29	24		Cr			−55281.0	1.4	464284.6	1.4		*		52	940653.4	1.5
28	25		Mn			−54684.0	1.5	462905.2	1.5	β^+	597.0	0.4	52	941294.3	1.6
27	26		Fe	+n		−50941.4	2.1	458380.3	2.1	β^+	3742.6	1.8	52	945312.1	2.3
26	27		Co	p4n		−42639	18	449296	18	β^+	8302	18	52	954225	19
25	28		Ni	x		−29380#	160#	435250#	160#	β^+	13260#	160#	52	968460#	170#
24	29		Cu	x		−13460#	260#	418550#	260#	β^+	15920#	310#	52	985550#	280#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
33	21	54	Sc	x		−34000	330	453420	330	β^-	11610	370	53	963500	350
32	22		Ti	x		−45610	160	464250	160	β^-	4280	160	53	951040	170
31	23		V	+		−49887	15	467744	15	β^-	7042	15	53	946444	16
30	24		Cr			−56928.7	1.4	474003.6	1.4	β^-	−1377.1	1.0	53	938884.6	1.5
29	25		Mn	−p		−55551.6	1.7	471844.2	1.7	β^-	696.9	1.2	53	940362.9	1.9
28	26		Fe			−56248.5	1.3	471758.8	1.3		*		53	939614.7	1.4
27	27		Co			−48005.5	1.3	462733.3	1.3	β^+	8243.09	0.22	53	948464.0	1.4
26	28		Ni	4n		−39210	50	453150	50	β^+	8800	50	53	957910	50
25	29		Cu	x		−21690#	210#	434860#	210#	β^+	17510#	220#	53	976710#	230#
24	30		Zn	x		−6570#	400#	418950#	400#	β^+	15130#	450#	53	992950#	430#
34	21	55	Sc	x	♦	−28500	1020	456000	1020	β^-	13200	1040	54	969400	1100
33	22		Ti	x		−41710	180	468420	180	β^-	7440	200	54	955230	190
32	23		V	+		−49150	100	475080	100	β^-	5960	100	54	947240	110
31	24		Cr	−n		−55103.6	1.5	480249.9	1.5	β^-	2603.1	0.5	54	940843.8	1.6
30	25		Mn			−57706.7	1.4	482070.6	1.4		*		54	938049.3	1.5
29	26		Fe			−57475.1	1.3	481056.7	1.4	β^+	231.6	0.3	54	938297.9	1.4
28	27		Co			−54023.9	1.4	476823.1	1.4	β^+	3451.3	0.4	54	942003.0	1.5
27	28		Ni	+3n		−45330	11	467347	11	β^+	8694	11	54	951336	12
26	29		Cu	x		−32120#	200#	453350#	200#	β^+	13210#	200#	54	965520#	210#
25	30		Zn	x		−14920#	250#	435380#	250#	β^+	17200#	320#	54	983980#	270#
34	22	56	Ti	x		−39130	280	473910	280	β^-	7030	330	55	957990	300
33	23		V	x		−46160	170	480160	170	β^-	9130	170	55	950450	180
32	24		Cr	−nn		−55289	10	488507	10	β^-	1617	9	55	940645	10
31	25		Mn	−n		−56905.9	1.4	489341.1	1.4	β^-	3695.4	0.3	55	938909.0	1.5
30	26		Fe			−60601.3	1.4	492254.2	1.4		*		55	934941.8	1.5
29	27		Co	−		−56035.3	2.4	486905.9	2.4	β^+	4566.0	2.0	55	939843.6	2.6
28	28		Ni	−pp		−53900	11	483988	11	β^+	2136	11	55	942136	12
27	29		Cu	x		−38600#	140#	467910#	140#	β^+	15300#	140#	55	958560#	150#
26	30		Zn	x		−25730#	260#	454250#	260#	β^+	12870#	300#	55	972380#	280#
25	31		Ga	x		−4740#	260#	432480#	260#	β^+	20990#	370#	55	994910#	280#
35	22	57	Ti	x	♦	−33250	930	476110	930	β^-	11020	950	56	964300	1000
34	23		V	x		−44280	210	486350	210	β^-	8120	230	56	952470	220
33	24		Cr	+		−52390	90	493680	90	β^-	5090	90	56	943750	90
32	25		Mn	−nn		−57485	3	497992	3	β^-	2691	3	56	938287	4
31	26		Fe			−60176.0	1.4	499900.3	1.4		*		56	935398.3	1.5
30	27		Co			−59340.0	1.4	498281.8	1.4	β^+	836.1	0.4	56	936295.9	1.5
29	28		Ni	+n		−56075.7	2.9	494235.2	2.9	β^+	3264.2	2.6	56	939800	3
28	29		Cu	2n − p		−47306	16	484683	16	β^+	8770	16	56	949215	17
27	30		Zn	x		−32690#	140#	469280#	140#	β^+	14620#	140#	56	964910#	150#
26	31		Ga	x		−16410#	260#	452230#	260#	β^+	16270#	300#	56	982380#	280#
35	23	58	V	x		−40320	180	490460	180	β^-	11580	240	57	956720	200
34	24		Cr	x		−51890	160	501250	160	β^-	4010	160	57	944290	170
33	25		Mn	IT		−55900	30	504480	30	β^-	6250	30	57	939990	30
32	26		Fe			−62149.2	1.4	509944.7	1.4	β^-	−2307.4	1.1	57	933280.1	1.5
31	27		Co			−59841.7	1.7	506854.9	1.7	β^-	381.5	1.2	57	935757.2	1.9
30	28		Ni			−60223.3	1.4	506454.1	1.4		*		57	935347.7	1.6
29	29		Cu	−		−51660.2	2.5	497108.7	2.5	β^+	8563.0	2.1	57	944540.5	2.7
28	30		Zn	−−		−42290	50	486960	50	β^+	9370	50	57	954600	50
27	31		Ga	x		−23990#	210#	467870#	210#	β^+	18310#	220#	57	974250#	230#
26	32		Ge	x		−8370#	320#	451480#	320#	β^+	15610#	380#	57	991010#	340#
36	23	59	V	x		−37910	330	496130	330	β^-	9860	370	58	959300	350
35	24		Cr	x		−47770	170	505200	170	β^-	7700	170	58	948710	180
34	25		Mn	+		−55473	29	512123	29	β^-	5185	29	58	940450	30
33	26		Fe	−n		−60658.8	1.4	516525.6	1.4	β^-	1565.1	0.6	58	934880.1	1.5
32	27		Co			−62223.9	1.4	517308.4	1.4		*		58	933199.9	1.5
31	28		Ni			−61151.4	1.4	515453.5	1.4	β^+	1072.5	0.6	58	934351.3	1.5
30	29		Cu	−p		−56351.8	1.7	509871.6	1.7	β^+	4799.6	0.9	58	939503.8	1.8
29	30		Zn	−		−47260	40	500000	40	β^+	9090	40	58	949270	40
28	31		Ga	x		−34120#	170#	486080#	170#	β^+	13140#	170#	58	963370#	180#
27	32		Ge	x		−17000#	280#	468170#	280#	β^+	17120#	330#	58	981750#	300#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
37	23	60	V	x		−33070	560	499350	560	β^-	13760	620	59 964500	600
36	24		Cr	x		−46830	260	512330	260	β^-	5950	320	59 949730	280
35	25		Mn	IT		−52770	190	517500	190	β^-	8630	190	59 943340	200
34	26		Fe	−nn		−61407	4	525345	4	β^-	237	3	59 934077	4
33	27		Co			−61644.5	1.4	524800.3	1.4	β^-	2823.9	0.5	59 933821.9	1.5
32	28		Ni			−64468.4	1.4	526841.9	1.4		*		59 930790.3	1.5
31	29		Cu	−		−58341.5	2.5	519932.6	2.5	β^+	6126.9	2.1	59 937367.8	2.7
30	30		Zn	−pp		−54183	11	514992	11	β^+	4158	11	59 941832	11
29	31		Ga	x		−40000#	110#	500030#	110#	β^+	14190#	110#	59 957060#	120#
28	32		Ge	x		−27770#	230#	487010#	230#	β^+	12230#	260#	59 970190#	250#
27	33		As	x		−6400#	600#	464860#	600#	β^+	21370#	640#	59 993130#	640#
37	24	61	Cr	x		−42760	280	516340	280	β^-	8810	340	60 954090	300
36	25		Mn	x		−51570	190	524360	190	β^-	7350	190	60 944640	200
35	26		Fe	+n2p		−58918	20	530927	20	β^-	3978	20	60 936749	22
34	27		Co	p2n		−62895.4	1.6	534122.5	1.6	β^-	1321.7	0.9	60 932479.0	1.7
33	28		Ni			−64217.1	1.4	534661.9	1.4		*		60 931060.1	1.5
32	29		Cu	p2n		−61980.0	1.8	531642.4	1.8	β^+	2237.1	1.2	60 933461.7	2.0
31	30		Zn	+3n		−56343	16	525223	16	β^+	5637	16	60 939513	18
30	31		Ga	x		−47350#	200#	515450#	200#	β^+	9000#	200#	60 949170#	210#
29	32		Ge	x		−33730#	300#	501050#	300#	β^+	13620#	360#	60 963790#	320#
28	33		As	x		−18050#	600#	484590#	600#	β^+	15680#	670#	60 980620#	640#
38	24	62	Cr	x		−41170	370	522820	370	β^-	7290	450	61 955800	400
37	25		Mn	x		−48470	260	529330	260	β^-	10430	260	61 947970	280
36	26		Fe	+pp		−58898	15	538979	15	β^-	2530	25	61 936770	16
35	27		Co	+		−61428	20	540727	20	β^-	5315	20	61 934054	22
34	28		Ni			−66743.0	1.4	545259.1	1.4		*		61 928348.4	1.5
33	29		Cu	−		−62795	4	540529	4	β^+	3948	4	61 932587	4
32	30		Zn	+nn		−61168	10	538119	10	β^+	1627	11	61 934334	11
31	31		Ga	−		−51997	28	528166	28	β^+	9171	26	61 944179	30
30	32		Ge	x		−42240#	140#	517630#	140#	β^+	9750#	140#	61 954650#	150#
29	33		As	x		−24960#	300#	499570#	300#	β^+	17280#	330#	61 973200#	320#
38	25	63	Mn	x		−46750	280	535690	280	β^-	8760	310	62 949810	300
37	26		Fe	x		−55510	140	543670	140	β^-	6320	150	62 940400	150
36	27		Co	+p		−61837	20	549207	20	β^-	3672	20	62 933615	22
35	28		Ni			−65509.5	1.4	552097.0	1.4	β^-	66.945	0.004	62 929672.6	1.5
34	29		Cu			−65576.5	1.4	551381.6	1.4		*		62 929600.7	1.5
33	30		Zn			−62209.7	2.1	547232.4	2.1	β^+	3366.8	1.6	62 933215.1	2.3
32	31		Ga	−		−56690	100	540930	100	β^+	5520	100	62 939140	110
31	32		Ge	x		−46910#	200#	530370#	200#	β^+	9780#	220#	62 949640#	210#
30	33		As	x		−33820#	500#	516500#	500#	β^+	13090#	540#	62 963690#	540#
39	25	64	Mn	x		−43100	330	540110	330	β^-	11800	400	63 953730	350
38	26		Fe	x		−54900	220	551120	220	β^-	4890	220	63 941060	240
37	27		Co	+		−59790	20	555231	20	β^-	7307	20	63 935813	22
36	28		Ni			−67096.2	1.5	561755.0	1.5	β^-	−1675.10	0.20	63 927969.2	1.6
35	29		Cu			−65421.1	1.4	559297.5	1.4	β^-	578.8	0.9	63 929767.5	1.6
34	30		Zn			−66000.0	1.7	559094.0	1.7		*		63 929146.1	1.8
33	31		Ga	−		−58835	4	551147	4	β^+	7165	4	63 936838	4
32	32		Ge	−		−54430	250	545950	250	β^+	4410	250	63 941570	270
31	33		As	x		−39650#	500#	530400#	500#	β^+	14770#	560#	63 957430#	540#
40	25	65	Mn	x		−40890	560	545970	560	β^-	10400	620	64 956100	600
39	26		Fe	x		−51290	280	555580	280	β^-	7880	280	64 944940	300
38	27		Co	3p2n		−59164	13	562677	13	β^-	5958	13	64 936484	14
37	28		Ni	−n		−65122.9	1.5	567853.0	1.5	β^-	2136.7	1.0	64 930087.7	1.6
36	29		Cu			−67259.6	1.7	569207.3	1.7		*		64 927793.8	1.9
35	30		Zn			−65908.2	1.7	567073.6	1.7	β^+	1351.4	0.4	64 929244.6	1.8
34	31		Ga	−p		−62653.3	1.8	563036.4	1.8	β^+	3254.9	0.9	64 932738.9	2.0
33	32		Ge	ep		−56410	100	556010	100	β^+	6240	100	64 939440	110
32	33		As	−p		−47060#	390#	545880#	390#	β^+	9360#	400#	64 949480#	420#
31	34		Se	x		−32920#	600#	530960#	600#	β^+	14140#	710#	64 964660#	640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
40	26	66	Fe	x		−50320	330	562690	330	β^-	5730	430	65	945980	350
39	27		Co	x		−56050	270	567640	270	β^-	9980	270	65	939830	290
38	28		Ni			−66029	16	576830	16	β^-	225	16	65	929115	17
37	29		Cu			−66254.2	1.7	576273.3	1.7	β^-	2642.4	1.3	65	928873.2	1.9
36	30		Zn			−68896.6	1.5	578133.3	1.5		*		65	926036.4	1.7
35	31		Ga	−		−63722	3	572176	3	β^+	5175.0	3.0	65	931592	4
34	32		Ge	−		−61620	30	569290	30	β^+	2100	30	65	933850	30
33	33		As	−	♦	−52070	60	558960	60	β^+	9550	50	65	944100	60
32	34		Se	x		−41720#	300#	547830#	300#	β^+	10350#	300#	65	955210#	320#
41	26	67	Fe	x		−46570	470	567010	470	β^-	8750	540	66	950000	500
40	27		Co	x		−55320	280	574980	280	β^-	8420	280	66	940610	300
39	28		Ni	+n2p		−63743	19	582615	19	β^-	3558	21	66	931569	20
38	29		Cu	+		−67300	8	585391	8	β^-	577	8	66	927750	9
37	30		Zn			−67877.4	1.6	585185.5	1.6		*		66	927130.5	1.7
36	31		Ga			−66877.0	1.8	583402.7	1.8	β^+	1000.5	1.3	66	928204.6	1.9
35	32		Ge	−n2p		−62654	5	578398	5	β^+	4223	5	66	932738	5
34	33		As	−		−56640	100	571610	100	β^+	6010	100	66	939190	110
33	34		Se	x		−46490#	200#	560670#	200#	β^+	10150#	220#	66	950090#	210#
42	26	68	Fe	x		−44240#	700#	572750#	700#	β^-	7590#	770#	67	952510#	750#
41	27		Co	x		−51830	330	579550	330	β^-	11660	330	67	944360	350
40	28		Ni			−63486	17	590430	17	β^-	2060	50	67	931845	18
39	29		Cu	+		−65540	50	591700	50	β^-	4460	50	67	929640	50
38	30		Zn			−70004.3	1.6	595383.7	1.6		*		67	924847.3	1.7
37	31		Ga	−		−67083.2	2.0	591680.2	2.0	β^+	2921.1	1.2	67	927983.2	2.2
36	32		Ge			−66977	6	590792	6	β^+	106	6	67	928097	7
35	33		As	−		−58880	100	581910	100	β^+	8100	100	67	936790	110
34	34		Se	x		−54150#	300#	576400#	300#	β^+	4730#	310#	67	941870#	320#
33	35		Br	−p		−38890#	540#	560360#	540#	β^+	15260#	610#	67	958250#	580#
42	27	69	Co	x		−51050	370	586840	370	β^-	9330	400	68	945200	400
41	28		Ni	2p − n		−60380	140	595390	140	β^-	5360	140	68	935180	150
40	29		Cu	+p		−65740	8	599973	8	β^-	2675	8	68	929425	9
39	30		Zn			−68415.2	1.7	601865.9	1.7	β^-	905.9	2.9	68	926553.2	1.8
38	31		Ga			−69321	3	601989	3		*		68	925581	3
37	32		Ge			−67094	3	598980	3	β^+	2227.3	0.5	68	927972	3
36	33		As			−63080	30	594180	30	β^+	4010	30	68	932280	30
35	34		Se			−56300	30	586620	30	β^+	6780	40	68	939560	40
34	35		Br	−p		−46680#	420#	576220#	420#	β^+	9620#	420#	68	949890#	450#
43	27	70	Co	x		−46750#	700#	590620#	700#	β^-	12730#	770#	69	949810#	750#
42	28		Ni	x		−59490	330	602570	330	β^-	3480	330	69	936140	350
41	29		Cu	+		−62961	15	605265	15	β^-	6599	14	69	932409	16
40	30		Zn			−69560	3	611082	3	β^-	−654.7	1.6	69	925325	4
39	31		Ga			−68905	3	609645	3	β^-	1656	3	69	926027	3
38	32		Ge			−70560.7	1.7	610518.0	1.7		*		69	924250.0	1.9
37	33		As	−		−64340	50	603520	50	β^+	6220	50	69	930930	50
36	34		Se	−		−61940#	210#	600330#	210#	β^+	2400#	200#	69	933500#	220#
35	35		Br	−	♦	−51970#	270#	589580#	270#	β^+	9970	170	69	944210#	290#
34	36		Kr	x		−40980#	400#	577800#	400#	β^+	10990#	480#	69	956010#	430#
44	27	71	Co	x		−44960#	800#	596900#	800#	β^-	10930#	880#	70	951730#	860#
43	28		Ni	x		−55890	370	607050	370	β^-	6870	370	70	940000	400
42	29		Cu	p − 2n		−62760	40	613140	40	β^-	4560	40	70	932620	40
41	30		Zn	−n		−67322	11	616915	11	β^-	2813	11	70	927727	11
40	31		Ga			−70134.6	1.9	618945.6	1.9		*		70	924707.3	2.0
39	32		Ge			−69905.2	1.7	617933.9	1.7	β^+	229.4	0.7	70	924953.6	1.9
38	33		As			−67893	4	615139	4	β^+	2013	4	70	927114	5
37	34		Se	−	♦	−63460	130	609930	130	β^+	4430	130	70	931870	130
36	35		Br	−−		−56590#	300#	602270#	300#	β^+	6870#	330#	70	939250#	320#
35	36		Kr	x		−46100#	300#	591000#	300#	β^+	10490#	420#	70	950510#	320#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
44	28	72	Ni	x		−54680	470	613910	470	β^-	5230#	510#	71	941300	500
43	29		Cu	x		−59900#	200#	618350#	200#	β^-	8220#	200#	71	935690#	210#
42	30		Zn	+		−68126	6	625791	6	β^-	458	6	71	926863	7
41	31		Ga	−n		−68584.3	2.1	625466.6	2.1	β^-	4001.1	2.3	71	926371.7	2.3
40	32		Ge			−72585.4	1.5	628685.4	1.5		*		71	922076.3	1.6
39	33		As	−		−68229	4	623547	4	β^+	4356	4	71	926753	5
38	34		Se	+nn		−67894	12	622430	12	β^+	335	13	71	927112	13
37	35		Br	+n		−59180	260	612930	260	β^+	8710	260	71	936470	270
36	36		Kr	−		−54140	270	607110	270	β^+	5040	80	71	941880	290
35	37		Rb	x		−38120#	500#	590310#	500#	β^+	16020#	570#	71	959080#	540#
45	28	73	Ni	x		−50330#	600#	617630#	600#	β^-	8830#	670#	72	945970#	640#
44	29		Cu	x		−59160#	300#	625680#	300#	β^-	6250#	300#	72	936490#	320#
43	30		Zn	+n2p		−65410	40	631150	40	β^-	4290	40	72	929780	40
42	31		Ga	+p		−69704	6	634657	6	β^-	1593	6	72	925170	7
41	32		Ge			−71297.0	1.5	635468.3	1.5		*		72	923459.5	1.6
40	33		As			−70956	4	634345	4	β^+	341	4	72	923825	4
39	34		Se	−		−68216	11	630823	11	β^+	2740	10	72	926767	12
38	35		Br	−		−63560	130	625380	130	β^+	4660	130	72	931770	140
37	36		Kr	εp		−56890	140	617930	140	β^+	6670	190	72	938930	150
36	37		Rb	−p		−46260#	480#	606520#	480#	β^+	10620#	500#	72	950340#	520#
46	28	74	Ni	x		−48730#	700#	624100#	700#	β^-	7100#	810#	73	947690#	750#
45	29		Cu	x		−55820#	400#	630410#	400#	β^-	9890#	400#	73	940070#	430#
44	30		Zn	+pp		−65710	50	639520	50	β^-	2340	90	73	929460	50
43	31		Ga	+		−68050	70	641080	70	β^-	5370	70	73	926940	80
42	32		Ge			−73421.9	1.5	645664.5	1.5	β^-	−2562.4	1.7	73	921178.4	1.6
41	33		As			−70859.5	2.2	642319.7	2.2	β^-	1353.0	1.8	73	923929.2	2.4
40	34		Se			−72212.5	1.5	642890.3	1.5		*		73	922476.7	1.6
39	35		Br	−		−65306	15	635201	15	β^+	6907	15	73	929891	16
38	36		Kr	4n		−62170	60	631280	60	β^+	3140	60	73	933260	60
37	37		Rb			−51720	430	620050	430	β^+	10440	440	73	944470	460
47	28	75	Ni	x		−44160#	800#	627610#	800#	β^-	10410#	950#	74	952590#	860#
46	29		Cu	x		−54580#	500#	637240#	500#	β^-	7890#	510#	74	941410#	540#
45	30		Zn	+		−62470	70	644350	70	β^-	6000	70	74	932940	80
44	31		Ga	+p		−68464	7	649560	7	β^-	3392	7	74	926501	7
43	32		Ge	−n		−71855.8	1.5	652169.7	1.5	β^-	1176.6	1.0	74	922859.6	1.6
42	33		As			−73032.3	1.6	652563.9	1.7		*		74	921596.6	1.8
41	34		Se			−72168.7	1.5	650917.9	1.5	β^+	863.6	0.8	74	922523.7	1.6
40	35		Br	−		−69139	14	647106	14	β^+	3030	14	74	925777	15
39	36		Kr	+3n		−64240	15	641425	15	β^+	4899	21	74	931035	17
38	37		Rb			−57220	8	633622	8	β^+	7020	17	74	938572	8
37	38		Sr	x		−46650#	300#	622270#	300#	β^+	10570#	300#	74	949920#	320#
48	28	76	Ni	x		−42180#	900#	633690#	900#	β^-	8560#	1080#	75	954720#	970#
47	29		Cu	x		−50740#	600#	641470#	600#	β^-	11300#	610#	75	945530#	640#
46	30		Zn	+		−62040	120	651990	120	β^-	4160	80	75	933390	130
45	31		Ga	+		−66200	90	655370	90	β^-	7010	90	75	928930	100
44	32		Ge			−73212.7	1.5	661598.0	1.5	β^-	−923.3	0.9	75	921402.9	1.6
43	33		As			−72289.4	1.7	659892.3	1.7	β^-	2962.0	0.8	75	922394.1	1.8
42	34		Se			−75251.4	1.5	662071.9	1.5		*		75	919214.3	1.6
41	35		Br	−		−70289	9	656327	9	β^+	4963	9	75	924542	10
40	36		Kr	+nn		−68977	11	654233	11	β^+	1311	14	75	925950	11
39	37		Rb			−60477	8	644950	8	β^+	8500	13	75	935076	8
38	38		Sr	x		−54390#	300#	638080#	300#	β^+	6090#	300#	75	941610#	320#
49	28	77	Ni	x		−37200#	1000#	636790#	1000#	β^-	11900#	1220#	76	960060#	1070#
48	29		Cu	x		−49110#	700#	647910#	700#	β^-	9500#	710#	76	947280#	750#
47	30		Zn	+		−58600	130	656630	130	β^-	7270	120	76	937090	140
46	31		Ga	+		−65870	60	663110	60	β^-	5340	60	76	929280	60
45	32		Ge	−n		−71214.0	1.8	667670.5	1.8	β^-	2702.0	2.1	76	923548.6	2.0
44	33		As			−73916.0	2.2	669590.2	2.2	β^-	682.9	1.8	76	920647.9	2.3
43	34		Se			−74598.9	1.5	669490.8	1.5		*		76	919914.8	1.6
42	35		Br			−73234	3	667343	3	β^+	1365.1	2.8	76	921380	3
41	36		Kr			−70170	9	663497	9	β^+	3064	9	76	924669	9
40	37		Rb			−64826	8	657370	8	β^+	5344	11	76	930407	8
39	38		Sr	εp		−57970	150	649740	150	β^+	6850	150	76	937760	160
38	39		Y	x		−46930#	300#	637910#	300#	β^+	11050#	330#	76	949620#	320#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
50	28	78	Ni	x		−34750#	1100#	642400#	1100#	β^-	10120#	1360#	77	962700#	1180#
49	29		Cu	x		−44860#	800#	651740#	800#	β^-	12360#	820#	77	951840#	860#
48	30		Zn	+		−57220	160	663310	160	β^-	6440	140	77	938570	170
47	31		Ga	+		−63660	80	668970	80	β^-	8200	80	77	931660	90
46	32		Ge	−nn		−71862	4	676390	4	β^-	954	10	77	922853	4
45	33		As	+pn		−72816	10	676562	10	β^-	4210	10	77	921829	11
44	34		Se			−77025.5	1.5	679988.7	1.5	β^-	−3574	4	77	917309.7	1.6
43	35		Br	−		−73452	4	675633	4	β^-	706	8	77	921146	4
42	36		Kr			−74158	7	675557	7		*		77	920388	7
41	37		Rb			−66934	8	667550	8	β^+	7224	10	77	928144	8
40	38		Sr	x		−63172	8	663005	8	β^+	3762	10	77	932182	8
39	39		Y	x		−52630#	400#	651680#	400#	β^+	10540#	400#	77	943500#	430#
50	29	79	Cu	x		−42710#	900#	657660#	900#	β^-	11230#	940#	78	954150#	970#
49	30		Zn	+	♦	−53940	270	668100	270	β^-	8550	240	78	942100	290
48	31		Ga	+		−62490	120	675870	120	β^-	7000	80	78	932920	130
47	32		Ge	+		−69490	90	682090	90	β^-	4150	90	78	925400	100
46	33		As	+p		−73636	6	685453	6	β^-	2281	6	78	920949	6
45	34		Se	−n		−75917.1	1.6	686951.6	1.6	β^-	150.7	1.8	78	918499.6	1.8
44	35		Br			−76067.8	1.9	686319.9	1.9		*		78	918337.9	2.0
43	36		Kr	−		−74442	4	683912	4	β^+	1626	3	78	920083	4
42	37		Rb			−70793	7	679480	7	β^+	3649	8	78	924001	7
41	38		Sr	x		−65475	9	673380	9	β^+	5318	11	78	929710	9
40	39		Y	−		−58350	450	665480	450	β^+	7120	450	78	937350	480
50	30	80	Zn	+		−51780	170	674010	170	β^-	7290	120	79	944410	180
49	31		Ga	+		−59070	120	680520	120	β^-	10380	120	79	936590	130
48	32		Ge			−69448	23	690118	23	β^-	2670	18	79	925445	25
47	33		As			−72118	21	692006	21	β^-	5641	21	79	922578	23
46	34		Se			−77759.2	1.9	696865.0	1.9	β^-	−1870.6	0.3	79	916522.1	2.0
45	35		Br			−75888.6	1.9	694212.1	1.9	β^-	2004	4	79	918530.2	2.0
44	36		Kr			−77893	4	695434	4		*		79	916379	4
43	37		Rb			−72170	7	688929	7	β^+	5723	8	79	922522	8
42	38		Sr	x		−70302	8	686278	8	β^+	1868	10	79	924528	8
41	39		Y	−	♦	−63360	130	678550	130	β^+	6950	130	79	931990	140
40	40		Zr	x		−55340#	300#	669750#	300#	β^+	8020#	330#	79	940590#	320#
51	30	81	Zn	x		−46130#	400#	676430#	400#	β^-	11860#	440#	80	950480#	430#
50	31		Ga	+		−57980	190	687510	190	β^-	8320	150	80	937750	210
49	32		Ge	+		−66300	120	695040	120	β^-	6230	120	80	928820	130
48	33		As	+p		−72532	6	700492	6	β^-	3856	5	80	922133	6
47	34		Se	−n		−76388.9	2.0	703566.0	2.0	β^-	1585.2	2.6	80	917993.2	2.1
46	35		Br			−77974.0	2.8	704368.8	2.8		*		80	916291	3
45	36		Kr			−77693.3	2.9	703305.7	2.9	β^+	280.7	0.5	80	916593	3
44	37		Rb			−75455	6	700285	6	β^+	2238	6	80	918995	7
43	38		Sr	x		−71524	8	695571	8	β^+	3932	10	80	923216	8
42	39		Y	−		−66010	60	689280	60	β^+	5510	60	80	929130	70
41	40		Zr	−		−58850	300	681340	300	β^+	7160	290	80	936820	320
52	30	82	Zn	x		−42070#	400#	680440#	400#	β^-	10880#	500#	81	954840#	430#
51	31		Ga	x		−52950#	300#	690540#	300#	β^-	12590#	340#	81	943160#	320#
50	32		Ge	+		−65540	150	702350	150	β^-	4700	140	81	929640	170
49	33		As	+		−70240	70	706270	70	β^-	7350	70	81	924600	70
48	34		Se			−77593.2	2.1	712841.6	2.1	β^-	−97.6	2.4	81	916700.3	2.2
47	35		Br			−77495.6	2.8	711961.7	2.8	β^-	3092.6	1.5	81	916805	3
46	36		Kr			−80588.2	2.6	714272.0	2.6		*		81	913485.0	2.8
45	37		Rb			−76187	7	709088	7	β^+	4401	7	81	918210	7
44	38		Sr			−76007	6	708126	6	β^+	180	9	81	918404	6
43	39		Y	−		−68190	100	699530	100	β^+	7820	100	81	926790	110
42	40		Zr	−		−64190	510	694740	510	β^+	4000	500	81	931090	550
41	41		Nb	x		−52970#	300#	682750#	300#	β^+	11220#	590#	81	943130#	320#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
52	31	83	Ga	x		−49490#	500#	695160#	500#	β^-	11510#	590#	82	946870#	540#
51	32		Ge	x		−61000#	300#	705890#	300#	β^-	8880#	370#	82	934510#	320#
50	33		As	+		−69880	220	713980	220	β^-	5460	220	82	924980	240
49	34		Se	−n		−75340	4	718660	4	β^-	3668	5	82	919119	4
48	35		Br			−79008	4	721546	4	β^-	972	4	82	915181	5
47	36		Kr			−79981	3	721736	3		*		82	914137	4
46	37		Rb			−79071	6	720044	6	β^+	910	7	82	915114	6
45	38		Sr			−76795	9	716986	9	β^+	2276	6	82	917557	9
44	39		Y	−		−72330	40	711740	40	β^+	4470	40	82	922350	40
43	40		Zr	−		−66460	90	705090	90	β^+	5870	90	82	928650	100
42	41		Nb	−		−58960	310	696800	310	β^+	7500	300	82	936700	340
53	31	84	Ga	x		−44400#	600#	698130#	600#	β^-	14000#	720#	83	952340#	640#
52	32		Ge	x		−58400#	400#	711350#	400#	β^-	7690#	500#	83	937310#	430#
51	33		As	x		−66080#	300#	718250#	300#	β^-	9870#	300#	83	929060#	320#
50	34		Se			−75949	15	727341	15	β^-	1826	27	83	918465	16
49	35		Br			−77775	25	728384	25	β^-	4654	25	83	916505	27
48	36		Kr			−82430	3	732256	3	β^-	−2681.3	2.3	83	911508	3
47	37		Rb			−79748	3	728792	3	β^-	894	3	83	914387	3
46	38		Sr			−80643	3	728904	3		*		83	913426	4
45	39		Y	−		−74230	170	721710	170	β^+	6410	170	83	920310	180
44	40		Zr	x		−71490#	300#	718190#	300#	β^+	2740#	340#	83	923250#	320#
43	41		Nb	x		−61880#	400#	707790#	400#	β^+	9610#	500#	83	933570#	430#
42	42		Mo	x		−55810#	500#	700940#	500#	β^+	6070#	640#	83	940090#	540#
53	32	85	Ge	x		−53380#	500#	714410#	500#	β^-	10140#	640#	84	942690#	540#
52	33		As	x		−63520#	400#	723760#	400#	β^-	8910#	400#	84	931810#	430#
51	34		Se	+		−72426	30	731888	30	β^-	6182	23	84	922250	30
50	35		Br	+		−78608	19	737288	19	β^-	2870	19	84	915611	21
49	36		Kr			−81478	3	739376	3	β^-	687.0	1.9	84	912530	3
48	37		Rb			−82164.8	2.5	739280.2	2.5		*		84	911792.4	2.7
47	38		Sr			−81100	4	737433	4	β^+	1064.8	2.7	84	912936	4
46	39		Y	−		−77845	25	733396	25	β^+	3255	25	84	916430	27
45	40		Zr	−		−73150	100	727920	100	β^+	4690	100	84	921470	110
44	41		Nb	−		−67150	220	721140	220	β^+	6000	200	84	927910	240
43	42		Mo	x		−59070#	400#	712270#	400#	β^+	8090#	460#	84	936590#	430#
54	32	86	Ge	x		−50050#	600#	719150#	600#	β^-	9350#	780#	85	946270#	640#
53	33		As	x		−59400#	500#	727720#	500#	β^-	11140#	500#	85	936230#	540#
52	34		Se	+		−70537	16	738070	16	β^-	5099	11	85	924276	17
51	35		Br	+		−75636	12	742387	12	β^-	7626	11	85	918802	13
50	36		Kr			−83262	5	749231	5	β^-	−517	5	85	910615	5
49	37		Rb			−82744.7	2.5	747931.4	2.5	β^-	1774.7	1.4	85	911169.9	2.6
48	38		Sr			−84519.4	2.3	748923.7	2.3		*		85	909264.7	2.5
47	39		Y	−		−79279	14	742901	14	β^+	5240	14	85	914890	15
46	40		Zr	4n		−77810	30	740650	30	β^+	1470	30	85	916470	30
45	41		Nb	−		−69830	90	731890	90	β^+	7980	80	85	925040	90
44	42		Mo	x		−65020#	300#	726290#	300#	β^+	4810#	310#	85	930200#	320#
43	43		Tc	x		−53130#	300#	713630#	300#	β^+	11890#	420#	85	942960#	320#
54	33	87	As	x		−56280#	600#	732670#	600#	β^-	10300#	600#	86	939580#	640#
53	34		Se	+		−66580	40	742180	40	β^-	7280	40	86	928530	40
52	35		Br	+		−73853	18	748676	18	β^-	6853	18	86	920715	20
51	36		Kr			−80706	5	754746	5	β^-	3887	5	86	913359	5
50	37		Rb			−84592.9	2.6	757850.9	2.6	β^-	283.3	1.5	86	909185.8	2.8
49	38		Sr			−84876.2	2.3	757351.8	2.3		*		86	908881.6	2.5
48	39		Y	−		−83014.6	2.7	754707.9	2.7	β^+	1861.6	1.4	86	910880.2	2.9
47	40		Zr	+3n		−79349	8	750260	8	β^+	3665	8	86	914815	9
46	41		Nb	−		−74180	60	744310	60	β^+	5170	60	86	920360	70
45	42		Mo	−		−67690	220	737040	220	β^+	6490	210	86	927330	240
44	43		Tc	x		−59120#	300#	727690#	300#	β^+	8570#	370#	86	936530#	320#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
55	33	88	As	x		−51640#	700#	736100#	700#	β^-	12230#	700#	87	944560#	750#
54	34		Se	+		−63870	50	747550	50	β^-	6850	30	87	931430	50
53	35		Br	+		−70730	40	753620	40	β^-	8960	40	87	924070	40
52	36		Kr			−79688	14	761799	14	β^-	2914	14	87	914452	15
51	37		Rb			−82602	4	763931	4	β^-	5316	3	87	911323	4
50	38		Sr			−87917.5	2.3	768464.5	2.3		*		87	905616.7	2.5
49	39		Y	−		−84294.9	2.7	764059.5	2.7	β^+	3622.6	1.5	87	909505.7	2.9
48	40		Zr	+nn		−83625	10	762607	10	β^+	670	10	87	910225	11
47	41		Nb	−	♦	−76080	100	754280	100	β^+	7550	100	87	918330	110
46	42		Mo	4n		−72701	20	750119	20	β^+	3370	100	87	921952	22
45	43		Tc	x		−62570#	300#	739200#	300#	β^+	10130#	300#	87	932830#	320#
55	34	89	Se	x		−59600#	400#	751350#	400#	β^-	8970#	410#	88	936020#	430#
54	35		Br	+		−68560	60	759530	60	β^-	8155	30	88	926400	60
53	36		Kr	+		−76720	50	766900	50	β^-	4990	50	88	917640	60
52	37		Rb			−81703	7	771104	7	β^-	4501	6	88	912288	7
51	38		Sr			−86204.9	2.3	774823.2	2.3	β^-	1496.6	2.3	88	907455.2	2.5
50	39		Y			−87701.5	2.4	775537.5	2.4		*		88	905848.5	2.6
49	40		Zr			−84869	3	771923	3	β^+	2832.3	2.5	88	908889	4
48	41		Nb	p2n		−80580	40	766850	40	β^+	4290	40	88	913490	40
47	42		Mo	+3n		−75004	15	760493	15	β^+	5580	40	88	919480	17
46	43		Tc	−		−67490	210	752200	210	β^+	7510	210	88	927540	230
45	44		Ru	x		−59510#	600#	743440#	600#	β^+	7980#	630#	88	936110#	640#
56	34	90	Se	x		−56430#	600#	756250#	600#	β^-	8180#	600#	89	939420#	640#
55	35		Br	+		−64610	80	763650	80	β^-	10350	70	89	930640	80
54	36		Kr	+		−74959	19	773214	19	β^-	4392	17	89	919528	21
53	37		Rb			−79351	8	776823	8	β^-	6590	8	89	914813	9
52	38		Sr			−85941.1	2.8	782630.8	2.8	β^-	546.2	1.4	89	907738.4	3.0
51	39		Y			−86487.3	2.4	782394.6	2.4	β^-	2282.0	1.7	89	907152.1	2.6
50	40		Zr			−88769.3	2.2	783894.2	2.2		*		89	904702.2	2.4
49	41		Nb	−		−82658	5	777001	5	β^+	6111	4	89	911263	5
48	42		Mo	−		−80169	6	773730	6	β^+	2489	4	89	913935	7
47	43		Tc	−	♦	−71290	240	764070	240	β^+	8880	240	89	923470	260
46	44		Ru	x		−65410#	500#	757410#	500#	β^+	5880#	560#	89	929780#	540#
57	34	91	Se	x		−50890#	700#	758780#	700#	β^-	10660#	700#	90	945370#	750#
56	35		Br	+		−61550	70	768660	70	β^-	9800	40	90	933920	80
55	36		Kr	+		−71350	60	777680	60	β^-	6440	60	90	923400	60
54	37		Rb			−77788	8	783331	8	β^-	5861	5	90	916491	8
53	38		Sr			−83649	7	788410	7	β^-	2699	7	90	910199	8
52	39		Y			−86348.5	2.9	790327.1	2.9	β^-	1544.0	2.0	90	907301	3
51	40		Zr			−87892.6	2.2	791088.8	2.2		*		90	905643.4	2.3
50	41		Nb	−		−86639	3	789053	3	β^+	1253.4	2.4	90	906989	3
49	42		Mo	+n		−82205	12	783837	12	β^+	4434	13	90	911749	13
48	43		Tc	−		−75990	200	776830	200	β^+	6220	200	90	918430	220
47	44		Ru	εp		−68580	500	768650	500	β^+	7410	540	90	926380	540
57	35	92	Br	+		−56620	50	771800	50	β^-	12200	50	91	939210	50
56	36		Kr	+		−68827	14	783224	14	β^-	5987	10	91	926111	15
55	37		Rb			−74814	10	788429	10	β^-	8105	8	91	919683	11
54	38		Sr			−82920	11	795752	11	β^-	1911	12	91	910982	12
53	39		Y			−84831	10	796881	10	β^-	3625	10	91	908931	11
52	40		Zr			−88456.0	2.2	799723.6	2.2	β^-	−2005.7	1.8	91	905038.6	2.3
51	41		Nb			−86450.3	2.7	796935.5	2.7	β^-	356	4	91	907191.7	2.9
50	42		Mo			−86806	4	796509	4		*		91	906810	4
49	43		Tc	−		−78936	26	787857	26	β^+	7870	26	91	915259	28
48	44		Ru	x		−74410#	300#	782550#	300#	β^+	4530#	300#	91	920120#	320#
47	45		Rh	x		−63360#	400#	770720#	400#	β^+	11050#	500#	91	931980#	430#
58	35	93	Br	x		−53000#	300#	776250#	300#	β^-	11100#	320#	92	943100#	320#
57	36		Kr	+		−64100	100	786570	100	β^-	8600	100	92	931180	110
56	37		Rb			−72702	12	794388	12	β^-	7460	9	92	921951	13
55	38		Sr			−80162	14	801066	14	β^-	4083	14	92	913943	15
54	39		Y			−84245	11	804366	11	β^-	2874	11	92	909559	12
53	40		Zr			−87118.8	2.2	806457.7	2.2	β^-	91.1	1.6	92	906474.1	2.3
52	41		Nb			−87209.9	2.3	805766.5	2.3		*		92	906376.2	2.4
51	42		Mo			−86805	4	804579	4	β^+	405	4	92	906811	4
50	43		Tc	−p		−83604	4	800596	4	β^+	3200.9	1.0	92	910248	4
49	44		Ru	−		−77270	90	793480	90	β^+	6340	80	92	917050	90
48	45		Rh	x		−69170#	400#	784600#	400#	β^+	8090#	410#	92	925740#	430#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
58	36	94	Kr	+		−61220#	300#	791760#	300#	β^-	7310#	300#	93	934280#	320#
57	37		Rb			−68530	14	798288	14	β^-	10307	13	93	926430	15
56	38		Sr			−78837	7	807812	7	β^-	3511	5	93	915365	8
55	39		Y			−82348	5	810541	5	β^-	4919	5	93	911595	6
54	40		Zr			−87267.6	2.4	814677.8	2.4	β^-	−901.5	2.2	93	906314.4	2.6
53	41		Nb			−86366.1	2.3	812994.0	2.3	β^-	2045.1	1.9	93	907282.2	2.4
52	42		Mo			−88411.2	1.8	814256.7	1.8		*		93	905086.7	2.0
51	43		Tc	−		−84155	4	809219	4	β^+	4256	4	93	909655	5
50	44		Ru	+nn		−82563	13	806843	13	β^+	1593	14	93	911365	14
49	45		Rh	IT		−72930#	450#	796430#	450#	β^+	9630#	450#	93	921700#	480#
48	46		Pd	x		−66350#	500#	789070#	500#	β^+	6580#	670#	93	928770#	540#
59	36	95	Kr	x		−56140#	400#	794750#	400#	β^-	9720#	400#	94	939730#	430#
58	37		Rb			−65863	16	803691	16	β^-	9296	18	94	929293	17
57	38		Sr			−75159	13	812205	13	β^-	6080	9	94	919314	14
56	39		Y			−81239	10	817503	10	β^-	4420	10	94	912786	11
55	40		Zr			−85658.9	2.4	821140.4	2.4	β^-	1124.5	1.9	94	908041.4	2.5
54	41		Nb			−86783.3	1.9	821482.5	1.9	β^-	925.6	0.5	94	906834.2	2.0
53	42		Mo			−87708.9	1.8	821625.8	1.8		*		94	905840.6	2.0
52	43		Tc			−86018	5	819152	5	β^+	1691	5	94	907656	6
51	44		Ru			−83445	12	815797	12	β^+	2572	13	94	910418	13
50	45		Rh	−		−78340	150	809900	150	β^+	5110	150	94	915900	160
49	46		Pd	x		−70150#	400#	800940#	400#	β^+	8180#	430#	94	924690#	430#
60	36	96	Kr	x		−53260#	600#	799950#	600#	β^-	7960#	600#	95	942820#	640#
59	37		Rb			−61227	19	807127	19	β^-	11756	21	95	934270	21
58	38		Sr			−72983	15	818101	15	β^-	5371	8	95	921649	16
57	39		Y			−78355	13	822690	13	β^-	7087	12	95	915883	14
56	40		Zr			−85442	3	828994	3	β^-	164	4	95	908275	3
55	41		Nb	+		−85605	4	828376	4	β^-	3187	3	95	908099	4
54	42		Mo			−88791.9	1.8	830780.0	1.8	β^-	−2973	5	95	904678.0	2.0
53	43		Tc	−		−85819	5	827024	5	β^-	248	10	95	907870	6
52	44		Ru			−86067	8	826490	8		*		95	907604	9
51	45		Rh	−		−79620	13	819261	13	β^+	6446	10	95	914524	14
50	46		Pd	−		−76170	150	815030	150	β^+	3450	150	95	918230	160
49	47		Ag	x		−64570#	500#	802650#	500#	β^+	11600#	530#	95	930680#	540#
60	37	97	Rb			−58375	23	812346	23	β^-	10420	24	96	937332	25
59	38		Sr			−68795	18	821984	18	β^-	7467	15	96	926145	19
58	39		Y			−76262	11	828669	11	β^-	6688	10	96	918129	12
57	40		Zr			−82950	3	834574	3	β^-	2658.1	1.9	96	910950	3
56	41		Nb			−85607.8	2.6	836449.7	2.6	β^-	1933.9	1.9	96	908096.2	2.8
55	42		Mo			−87541.7	1.8	837601.2	1.8		*		96	906020.1	2.0
54	43		Tc			−87221	5	836499	5	β^+	320	4	96	906364	5
53	44		Ru	−n		−86107	8	834602	8	β^+	1115	10	96	907560	9
52	45		Rh	−		−82580	40	830300	40	β^+	3520	40	96	911340	40
51	46		Pd	−		−77790	300	824720	300	β^+	4790	300	96	916480	320
50	47		Ag	x		−70790#	400#	816940#	400#	β^+	7000#	500#	96	924000#	430#
61	37	98	Rb			−54270	30	816310	30	β^-	12344	23	97	941740	30
60	38		Sr			−66610	24	827870	24	β^-	5826	10	97	928491	26
59	39		Y			−72436	23	832914	23	β^-	8830	14	97	922237	25
58	40		Zr			−81266	19	840962	19	β^-	2261	20	97	912757	21
57	41		Nb	−pn		−83527	6	842440	6	β^-	4586	6	97	910330	6
56	42		Mo			−88112.9	1.8	846243.7	1.8	β^-	−1684	3	97	905406.9	2.0
55	43		Tc			−86429	4	843777	4	β^-	1796	7	97	907215	4
54	44		Ru			−88225	6	844791	6		*		97	905287	7
53	45		Rh	−		−83167	12	838951	12	β^+	5057	10	97	910716	13
52	46		Pd	−pp		−81295	22	836296	22	β^+	1873	25	97	912727	23
51	47		Ag	−		−72870	150	827090	150	β^+	8420	150	97	921770	160
50	48		Cd	−		−67460#	210#	820890#	210#	β^+	5420#	140#	97	927580#	220#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
62	37	99	Rb			−50930	110	821040	110	β^-	11250	100	98	945330	120
61	38		Sr			−62170	120	831500	120	β^-	8030	120	98	933250	130
60	39		Y			−70204	24	838753	24	β^-	7567	14	98	924633	26
59	40		Zr			−77771	20	845538	20	β^-	4558	15	98	916510	21
58	41		Nb			−82328	13	849313	13	β^-	3639	13	98	911617	14
57	42		Mo			−85966.9	1.8	852169.1	1.8	β^-	1357.2	1.0	98	907710.7	2.0
56	43		Tc			−87324.2	1.9	852743.9	1.9	β^-	293.5	1.4	98	906253.6	2.1
55	44		Ru			−87617.7	2.0	852255.1	2.0		*		98	905938.5	2.2
54	45		Rh	−		−85515	10	849370	10	β^+	2103	10	98	908196	11
53	46		Pd			−82149	17	845222	17	β^+	3365	20	98	911809	19
52	47		Ag	−		−76720	150	839010	150	β^+	5430	150	98	917640	160
51	48		Cd	x		−69850#	210#	831360#	210#	β^+	6870#	260#	98	925010#	220#
50	49		In	x		−60910#	500#	821640#	500#	β^+	8940#	540#	98	934610#	540#
63	37	100	Rb	x		−46700#	300#	824880#	300#	β^-	13520#	320#	99	949870#	320#
62	38		Sr	+		−60220	130	837620	130	β^-	7070	100	99	935350	140
61	39		Y	+		−67300	80	843920	80	β^-	9310	70	99	927760	80
60	40		Zr	+		−76610	40	852440	40	β^-	3335	25	99	917760	40
59	41		Nb	+		−79940	26	854996	26	β^-	6245	25	99	914181	28
58	42		Mo			−86185	6	860459	6	β^-	−168	6	99	907476	6
57	43		Tc	−n		−86017.2	2.2	859508.3	2.2	β^-	3202.3	1.7	99	907656.7	2.3
56	44		Ru			−89219.5	2.0	861928.2	2.0		*		99	904218.9	2.2
55	45		Rh	−		−85590	20	857516	20	β^+	3630	20	99	908116	22
54	46		Pd			−85227	11	856371	11	β^+	363	23	99	908505	12
53	47		Ag	−		−78150	80	848510	80	β^+	7070	80	99	916100	90
52	48		Cd	−		−74260	110	843840	110	β^+	3890	70	99	920280	120
51	49		In	x		−63730#	400#	832530#	400#	β^+	10530#	420#	99	931580#	430#
50	50		Sn	−		−56460#	450#	824480#	450#	β^+	7270#	200#	99	939390#	480#
64	37	101	Rb	+		−43600	170	829850	170	β^-	11810	110	100	953200	180
63	38		Sr	+		−55410	120	840880	120	β^-	9500	80	100	940520	130
62	39		Y	+		−64910	100	849610	100	β^-	8550	90	100	930310	100
61	40		Zr	+		−73460	30	857370	30	β^-	5485	25	100	921140	30
60	41		Nb	+		−78943	19	862070	19	β^-	4569	18	100	915251	20
59	42		Mo			−83512	6	865857	6	β^-	2824	24	100	910346	6
58	43		Tc			−86337	24	867899	24	β^-	1614	24	100	907314	26
57	44		Ru			−87950.3	2.0	868730.3	2.0		*		100	905581.5	2.2
56	45		Rh	+nn		−87409	17	867406	17	β^+	542	17	100	906163	19
55	46		Pd	−		−85429	18	864644	18	β^+	1980	4	100	908289	19
54	47		Ag	−		−81220	100	859660	100	β^+	4200	100	100	912800	110
53	48		Cd	−		−75750	150	853400	150	β^+	5480	110	100	918680	160
52	49		In	x		−68410#	300#	845280#	300#	β^+	7340#	330#	100	926560#	320#
51	50		Sn	x		−59560#	500#	835650#	500#	β^+	8850#	590#	100	936060#	540#
64	38	102	Sr	+		−53080	110	846620	110	β^-	8810	70	101	943020	120
63	39		Y	+		−61890	90	854660	90	β^-	9850	70	101	933550	90
62	40		Zr	+		−71740	50	863720	50	β^-	4605	30	101	922980	50
61	41		Nb	+		−76350	40	867550	40	β^-	7210	40	101	918040	40
60	42		Mo	−nn		−83558	21	873974	21	β^-	1010	23	101	910296	22
59	43		Tc			−84568	9	874202	9	β^-	4530	9	101	909212	10
58	44		Ru			−89098.5	2.0	877949.9	2.0	β^-	−2323	5	101	904348.8	2.2
57	45		Rh			−86776	5	874845	5	β^-	1150	5	101	906842	5
56	46		Pd			−87926	3	875213	3		*		101	905607	3
55	47		Ag	−		−82000	50	868510	50	β^+	5920	50	101	911970	60
54	48		Cd	−		−79420	60	865140	60	β^+	2587	8	101	914740	60
53	49		In	εp		−70520	330	855460	330	β^+	8900	330	101	924300	350
52	50		Sn	x		−64750#	400#	848910#	400#	β^+	5770#	520#	101	930490#	430#
64	39	103	Y	x		−58590#	300#	859430#	300#	β^-	9780#	320#	102	937100#	320#
63	40		Zr	+		−68370	110	868430	110	β^-	6950	80	102	926600	120
62	41		Nb	+		−75320	70	874590	70	β^-	5530	30	102	919140	70
61	42		Mo	+		−80850	60	879340	60	β^-	3750	60	102	913200	70
60	43		Tc	+p		−84600	10	882305	10	β^-	2660	10	102	909178	11
59	44		Ru			−87259.6	2.1	884182.3	2.1	β^-	763.3	2.1	102	906322.9	2.2
58	45		Rh			−88022.9	2.8	884163.2	2.8		*		102	905504	3
57	46		Pd			−87479.8	2.9	882837.8	2.9	β^+	543.1	0.8	102	906087	3
56	47		Ag			−84792	17	879367	17	β^+	2688	17	102	908972	18
55	48		Cd			−80650	15	874443	15	β^+	4142	10	102	913419	17
54	49		In	−		−74600	25	867611	25	β^+	6050	20	102	919914	27
53	50		Sn	x		−66950#	300#	859180#	300#	β^+	7650#	300#	102	928130#	320#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
65	39	104	Y	x		−54910#	400#	863820#	400#	β^-	11430#	570#	103	941050# 430#
64	40		Zr	x		−66340#	400#	874460#	400#	β^-	5890#	420#	103	928780# 430#
63	41		Nb	+		−72230	110	879570	110	β^-	8100	90	103	922460 120
62	42		Mo	+		−80330	60	886890	60	β^-	2160	40	103	913760 70
61	43		Tc	+		−82490	50	888270	50	β^-	5600	50	103	911440 50
60	44		Ru			−88092	4	893086	4	β^-	−1141	4	103	905430 4
59	45		Rh	−n		−86950.6	2.8	891162.3	2.8	β^-	2441	5	103	906655 3
58	46		Pd			−89392	5	892821	5		*		103	904034 5
57	47		Ag	−		−85113	6	887760	6	β^+	4279	4	103	908627 7
56	48		Cd	+nn		−83976	10	885841	10	β^+	1137	11	103	909848 10
55	49		In	−		−76070	140	877150	140	β^+	7910	140	103	918340 150
54	50		Sn	−		−71550	150	871850	150	β^+	4520	60	103	923190 160
53	51		Sb	x		−59030#	600#	858550#	600#	β^+	12520#	620#	103	936630# 640#
65	40	105	Zr	x		−62360#	400#	878560#	400#	β^-	8490#	410#	104	933050# 430#
64	41		Nb	+		−70860	100	886270	100	β^-	6490	70	104	923930 110
63	42		Mo	+		−77340	70	891970	70	β^-	4950	40	104	916970 80
62	43		Tc	+		−82290	60	896140	60	β^-	3640	60	104	911660 60
61	44		Ru			−85931	4	898996	4	β^-	1917	4	104	907750 4
60	45		Rh			−87848	5	900131	5	β^-	566.7	2.5	104	905692 5
59	46		Pd			−88414	5	899915	5		*		104	905083 5
58	47		Ag			−87069	11	897787	11	β^+	1346	11	104	906528 12
57	48		Cd			−84330	11	894266	11	β^+	2739	4	104	909468 12
56	49		In	−		−79481	17	888635	17	β^+	4849	13	104	914674 19
55	50		Sn	+α		−73230	80	881600	80	β^+	6250	80	104	921380 90
54	51		Sb	x		−63910#	500#	871500#	500#	β^+	9320#	510#	104	931390# 540#
66	40	106	Zr	x		−60180#	500#	884450#	500#	β^-	6800#	590#	105	935390# 540#
65	41		Nb	x		−66980#	300#	890470#	300#	β^-	9270#	300#	105	928090# 320#
64	42		Mo	+		−76257	22	898958	22	β^-	3520	17	105	918135 23
63	43		Tc	+		−79777	14	901696	14	β^-	6547	11	105	914356 15
62	44		Ru	+		−86324	8	907461	8	β^-	39.40	0.21	105	907327 8
61	45		Rh	+		−86363	8	906718	8	β^-	3541	6	105	907285 8
60	46		Pd			−89905	5	909476	5	β^-	−2965.3	2.8	105	903484 5
59	47		Ag			−86939	5	905729	5	β^-	195	8	105	906667 6
58	48		Cd			−87134	6	905141	6		*		105	906458 6
57	49		In			−80612	13	897837	13	β^+	6521	11	105	913459 14
56	50		Sn			−77430	50	893870	50	β^+	3180	50	105	916880 50
55	51		Sb	+α	♦	−66890	170	882550	170	β^+	10540	180	105	928190 190
54	52		Te	−α		−58000#	400#	872880#	400#	β^+	8890#	440#	105	937740# 430#
66	41	107	Nb	x		−65040#	400#	896590#	400#	β^-	7900#	430#	106	930180# 430#
65	42		Mo	+		−72940	160	903710	160	β^-	6160	60	106	921700 170
64	43		Tc	+		−79100	150	909090	150	β^-	4820	80	106	915080 160
63	44		Ru	+		−83920	120	913130	120	β^-	2940	120	106	909910 130
62	45		Rh			−86861	12	915287	12	β^-	1511	13	106	906751 13
61	46		Pd			−88372	6	916015	6	β^-	33.0	3.0	106	905129 7
60	47		Ag			−88405	6	915266	6		*		106	905093 6
59	48		Cd	−		−86988	7	913067	7	β^+	1417	4	106	906614 7
58	49		In	−		−83562	13	908858	13	β^+	3426	11	106	910292 14
57	50		Sn			−78560	80	903080	80	β^+	5000	90	106	915660 90
56	51		Sb	x		−70650#	300#	894390#	300#	β^+	7910#	310#	106	924150# 320#
55	52		Te	−α		−60520#	300#	883470#	300#	β^+	10140#	430#	106	935030# 320#
67	41	108	Nb	x		−60990#	500#	900620#	500#	β^-	9810#	520#	107	934520# 540#
66	42		Mo	+	♦	−70800	140	909640	140	β^-	5140	60	107	923990 150
65	43		Tc	+		−75940	130	914000	130	β^-	7720	50	107	918480 140
64	44		Ru	+		−83660	120	920930	120	β^-	1360	60	107	910190 130
63	45		Rh	+		−85020	110	921510	110	β^-	4510	100	107	908730 110
62	46		Pd			−89521	4	925236	4	β^-	−1918	6	107	903895 4
61	47		Ag	−n		−87603	6	922536	6	β^-	1649	8	107	905954 6
60	48		Cd			−89253	6	923403	6		*		107	904183 6
59	49		In			−84105	12	917473	12	β^+	5148	11	107	909709 13
58	50		Sn			−82013	27	914598	27	β^+	2092	25	107	911955 29
57	51		Sb	x		−72510#	210#	904310#	210#	β^+	9510#	210#	107	922160# 220#
56	52		Te	−α		−65690	150	896710	150	β^+	6820#	260#	107	929480 160
55	53		I	−α		−52570#	600#	882810#	600#	β^+	13120#	620#	107	943570# 640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
67	42	109	Mo	x		−67360#	300#	914270#	300#	β^-	7180#	310#	927690#	320#
66	43		Tc	+	♦	−74540	100	920670	100	β^-	6320	70	919980	100
65	44		Ru	+		−80850	70	926200	70	β^-	4160	60	913200	70
64	45		Rh	+p		−85012	12	929580	12	β^-	2591	12	908736	13
63	46		Pd			−87603	4	931389	4	β^-	1115.9	2.0	905954	4
62	47		Ag			−88719	3	931723	3		*		904756	3
61	48		Cd			−88506	4	930727	4	β^+	213.8	2.7	904985	4
60	49		In			−86485	6	927924	6	β^+	2020	6	907154	6
59	50		Sn	+3n		−82635	10	923291	10	β^+	3850	11	911288	11
58	51		Sb	−		−76255	19	916129	19	β^+	6380	16	918137	20
57	52		Te			−67580	70	906670	70	β^+	8670	70	927450	70
56	53		I	−p		−57580	150	895890	150	β^+	10010	170	938190	160
68	42	110	Mo	x		−65670#	400#	920660#	400#	β^-	5690#	570#	929500#	430#
67	43		Tc	x		−71360#	400#	925570#	400#	β^-	8780#	460#	923390#	430#
66	44		Ru	+		−80140	230	933560	230	β^-	2810	50	913970	250
65	45		Rh	IT		−82950	220	935590	220	β^-	5400	220	910950	240
64	46		Pd			−88350	11	940207	11	β^-	−893	11	905153	12
63	47		Ag			−87457	3	938532	3	β^-	2892.1	1.5	906111	3
62	48		Cd			−90349.3	3.0	940641.9	3.0		*		903006	3
61	49		In	IT		−86471	12	935982	12	β^+	3878	12	907169	13
60	50		Sn	+nn		−85834	16	934562	16	β^+	638	19	907854	17
59	51		Sb	−	♦	−76820	90	924760	90	β^+	9020	90	917530	100
58	52		Te	−α		−72280	50	919440	50	β^+	4540	110	922400	60
57	53		I	+α	♦	−60890	170	907270	170	β^+	11390	180	934640	180
56	54		Xe	−α		−51690#	400#	897290#	400#	β^+	9200#	440#	944510#	430#
68	43	111	Tc	x		−69820#	400#	932090#	400#	β^-	6980#	500#	925050#	430#
67	44		Ru	x		−76790#	300#	938290#	300#	β^-	5500#	360#	917560#	320#
66	45		Rh	x		−82290#	210#	943000#	210#	β^-	3740#	210#	911660#	220#
65	46		Pd	+		−86030	40	945960	40	β^-	2190	40	907640	40
64	47		Ag	+		−88217	3	947363	3	β^-	1036.8	1.4	905295	4
63	48		Cd			−89253.8	3.0	947617.7	3.0		*		904182	3
62	49		In			−88388	5	945969	5	β^+	866	5	905112	6
61	50		Sn	+n		−85943	7	942742	7	β^+	2445	8	907736	8
60	51		Sb	−	♦	−81470	50	937490	50	β^+	4470	50	912540	50
59	52		Te	εp		−73470	70	928710	70	β^+	8000	90	921120	80
58	53		I	−α		−64950#	300#	919400#	300#	β^+	8520#	310#	930270#	320#
57	54		Xe	−α		−54380#	310#	908050#	310#	β^+	10570#	430#	941620#	330#
69	43	112	Tc	x		−65910#	500#	936260#	500#	β^-	9700#	710#	929240#	540#
68	44		Ru	+	♦	−75620	510	945180	510	β^-	4520	80	918820	540
67	45		Rh	+	♦	−80140	500	948920	500	β^-	6200	500	913970	540
66	46		Pd			−86337	18	954337	18	β^-	288	17	907314	19
65	47		Ag			−86625	17	953842	17	β^-	3956	17	907005	18
64	48		Cd			−90580.6	2.8	957015.8	2.8	β^-	−2586	5	902757.7	3.0
63	49		In			−87994	5	953647	5	β^-	663	5	905534	6
62	50		Sn			−88658	4	953528	4		*		904822	5
61	51		Sb	−		−81603	23	945691	23	β^+	7055	23	912396	25
60	52		Te			−77260	160	940560	160	β^+	4340	160	917060	170
59	53		I	−α		−67100#	210#	929620#	210#	β^+	10160#	270#	927970#	230#
58	54		Xe	−α		−59940	150	921680	150	β^+	7150#	260#	935650	170
57	55		Cs	−p		−46290#	370#	907250#	370#	β^+	13650#	400#	950300#	390#
70	43	113	Tc	x		−63970#	600#	942380#	600#	β^-	8190#	780#	931330#	640#
69	44		Ru	x		−72150#	500#	949790#	500#	β^-	6630#	640#	922540#	540#
68	45		Rh	x		−78790#	400#	955640#	400#	β^-	4910#	400#	915420#	430#
67	46		Pd	+		−83690	40	959760	40	β^-	3340	40	910150	40
66	47		Ag	+		−87033	17	962322	17	β^-	2016	17	906566	18
65	48		Cd			−89049.5	2.8	963556.0	2.8	β^-	316	3	904401.4	3.0
64	49		In			−89365	3	963090	3		*		904062	4
63	50		Sn			−88329	4	961271	4	β^+	1035.9	2.8	905174	4
62	51		Sb	−p		−84424	24	956583	24	β^+	3905	24	909367	26
61	52		Te	−	♦	−78770	170	950140	170	β^+	5660	170	915440	180
60	53		I	−α		−71120	50	941720	50	β^+	7640	180	923650	60
59	54		Xe			−62060	80	931870	80	β^+	9060	100	933370	90
58	55		Cs	−p		−51680	150	920710	150	β^+	10380	170	944520	170

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
70	44	114	Ru	+	♦	−70890	540	956600	540	β^-	6100	200	113	923890	580
69	45		Rh	+	♦	−76990	500	961920	500	β^-	6500	500	113	917340	540
68	46		Pd			−83494	25	967636	25	β^-	1451	25	113	910366	26
67	47		Ag			−84944	26	968305	26	β^-	5076	26	113	908808	28
66	48		Cd			−90020.9	2.8	972598.8	2.8	β^-	−1453	3	113	903358.6	3.0
65	49		In			−88568	3	970364	3	β^-	1988.7	0.7	113	904918	3
64	50		Sn			−90557	3	971570	3		*		113	902783	3
63	51		Sb	−		−84680	200	964910	200	β^+	5880	200	113	909100	220
62	52		Te	$-\epsilon\alpha$	♦	−81520	190	960970	190	β^+	3150	270	113	912480	200
61	53		I	x		−72800#	300#	951460#	300#	β^+	8730#	350#	113	921850#	320#
60	54		Xe	$-\alpha$		−66940#	210#	944820#	210#	β^+	5860#	360#	113	928140#	220#
59	55		Cs	ϵp	♦	−55110	160	932210	160	β^+	11830#	260#	113	940840	170
71	44	115	Ru	x		−66780#	700#	960560#	700#	β^-	7620#	860#	114	928310#	750#
70	45		Rh	+		−74400	500	967400	500	β^-	6000	500	114	920130	540
69	46		Pd	+		−80400	60	972620	60	β^-	4580	50	114	913680	70
68	47		Ag	+		−84990	30	976420	30	β^-	3100	30	114	908760	40
67	48		Cd			−88090.5	2.8	978739.6	2.8	β^-	1446	4	114	905431	3
66	49		In			−89536	4	979403	4	β^-	495	4	114	903879	4
65	50		Sn			−90031.4	3.0	979115.9	3.0		*		114	903347	3
64	51		Sb	−		−87001	20	975304	20	β^+	3030	20	114	906600	22
63	52		Te	IT		−82360	110	969880	110	β^+	4640	110	114	911580	120
62	53		I	2p − n	♦	−75670	500	962410	500	β^+	6690	510	114	918760	530
61	54		Xe	ϵp	♦	−68030	230	953990	230	β^+	7640	550	114	926960	240
60	55		Cs	$-\alpha$		−59680#	430#	944850#	430#	β^+	8360#	480#	114	935940#	460#
59	56		Ba	x		−48710#	800#	933100#	800#	β^+	10970#	910#	114	947710#	860#
72	44	116	Ru	x		−65160#	800#	967010#	800#	β^-	6800#	950#	115	930050#	860#
71	45		Rh	+	♦	−71950	500	973020	500	β^-	8000	500	115	922760	540
70	46		Pd	+		−79950	50	980240	50	β^-	2607	30	115	914170	60
69	47		Ag	+		−82560	40	982060	40	β^-	6160	40	115	911370	50
68	48		Cd			−88719	3	987440	3	β^-	−470	4	115	904756	3
67	49		In	−n		−88249	4	986187	4	β^-	3274	4	115	905261	5
66	50		Sn			−91523.5	3.0	988679.3	3.0		*		115	901745	3
65	51		Sb			−86816	6	983189	6	β^+	4707	5	115	906799	6
64	52		Te			−85320	90	980910	90	β^+	1500	90	115	908410	100
63	53		I	−		−77570	140	972380	140	β^+	7750	110	115	916720	150
62	54		Xe	−	♦	−73230	250	967260	250	β^+	4340	200	115	921380	260
61	55		Cs			−62430	260	955680	260	β^+	10800	360	115	932970	280
60	56		Ba	x		−54330#	700#	946790#	700#	β^+	8110#	750#	115	941680#	750#
72	45	117	Rh	x		−69540#	700#	978680#	700#	β^-	7000#	760#	116	925350#	750#
71	46		Pd	x		−76530#	300#	984890#	300#	β^-	5710#	300#	116	917840#	320#
70	47		Ag	+		−82240	40	989820	40	β^-	4180	40	116	911710	50
69	48		Cd	−n		−86425	3	993217	3	β^-	2516	6	116	907219	4
68	49		In			−88941	5	994951	5	β^-	1455	4	116	904517	6
67	50		Sn			−90396.7	2.9	995623.8	2.9		*		116	902955	3
66	51		Sb			−88640	9	993085	9	β^+	1757	9	116	904841	10
65	52		Te			−85105	19	988768	19	β^+	3535	17	116	908636	20
64	53		I			−80450	70	983330	70	β^+	4650	70	116	913630	70
63	54		Xe			−74010	180	976100	180	β^+	6450	180	116	920550	190
62	55		Cs	IT		−66480	100	967800	100	β^+	7520	200	116	928630	100
61	56		Ba	ϵp	♦	−58040	390	958580	390	β^+	8440	400	116	937690	420
73	45	118	Rh	x		−65740#	800#	982950#	800#	β^-	9810#	830#	117	929430#	860#
72	46		Pd	+		−75540	220	991970	220	β^-	4100	200	117	918900	240
71	47		Ag	+		−79640	100	995290	100	β^-	7060	100	117	914500	110
70	48		Cd	−nn		−86709	20	1001572	20	β^-	520	22	117	906915	22
69	49		In			−87228	8	1001309	8	β^-	4423	8	117	906356	9
68	50		Sn			−91651.7	2.9	1004950.1	2.9		*		117	901608	3
67	51		Sb	−		−87995	4	1000511	4	β^+	3656.6	3.0	117	905533	4
66	52		Te			−87717	16	999451	16	β^+	278	16	117	905832	17
65	53		I			−80670	80	991620	80	β^+	7040	80	117	913390	80
64	54		Xe	+		−77730	1000	987900	1000	β^+	2940	1000	117	916560	1070
63	55		Cs	IT		−68428	22	977815	22	β^+	9300	1000	117	926539	24
62	56		Ba	x		−62000#	500#	970610#	500#	β^+	6430#	500#	117	933440#	540#
61	57		La	x		−49840#	800#	957670#	800#	β^+	12160#	950#	117	946490#	860#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
74	45	119	Rh	x		−63940#	900#	989220#	900#	β^-	8090#	950#	118	931360#	970#
73	46		Pd	x		−72020#	300#	996520#	300#	β^-	6530#	310#	118	922680#	320#
72	47		Ag	+		−78550	70	1002270	70	β^-	5350	40	118	915670	80
71	48		Cd	+		−83900	60	1006840	60	β^-	3800	60	118	909920	60
70	49		In			−87702	8	1009854	8	β^-	2364	7	118	905848	8
69	50		Sn			−90065.6	2.8	1011435.3	2.8		*		118	903311	3
68	51		Sb			−89472	8	1010059	8	β^+	594	8	118	903948	9
67	52		Te			−87179	8	1006984	8	β^+	2293.0	2.0	118	906410	9
66	53		I			−83670	60	1002690	60	β^+	3510	60	118	910180	70
65	54		Xe			−78660	120	996900	120	β^+	5000	110	118	915550	130
64	55		Cs			−72336	24	989794	24	β^+	6330	120	118	922344	26
63	56		Ba	εp		−64240	1020	980910	1020	β^+	8100	1020	118	931040	1100
62	57		La	x		−54820#	800#	970710#	800#	β^+	9420#	1300#	118	941150#	860#
74	46	120	Pd	x		−70770#	400#	1003340#	400#	β^-	5010#	410#	119	924030#	430#
73	47		Ag	+		−75770	100	1007560	100	β^-	8200	100	119	918650	110
72	48		Cd	+α		−83973	19	1014979	19	β^-	1760	40	119	909851	20
71	49		In	+		−85730	40	1015950	40	β^-	5370	40	119	907960	40
70	50		Sn			−91101.5	2.5	1020542.5	2.5	β^-	−2681	7	119	902198.5	2.7
69	51		Sb	−		−88421	8	1017080	8	β^-	978	13	119	905076	8
68	52		Te			−89399	10	1017275	10		*		119	904026	11
67	53		I	−		−83784	18	1010878	18	β^+	5615	15	119	910054	20
66	54		Xe	−		−81820	40	1008140	40	β^+	1960	40	119	912160	50
65	55		Cs			−73902	21	999431	21	β^+	7920	50	119	920663	23
64	56		Ba	−		−68900	300	993650	300	β^+	5000	300	119	926030	320
63	57		La	x		−57690#	800#	981650#	800#	β^+	11220#	860#	119	938070#	860#
75	46	121	Pd	x		−66900#	500#	1007540#	500#	β^-	7650#	540#	120	928180#	540#
74	47		Ag	+		−74550	190	1014410	190	β^-	6400	120	120	919970	210
73	48		Cd	+		−80950	150	1020020	150	β^-	4890	150	120	913100	160
72	49		In	+p		−85837	27	1024132	27	β^-	3364	27	120	907850	29
71	50		Sn			−89200.9	2.5	1026713.3	2.5	β^-	388.1	1.9	120	904238.8	2.7
70	51		Sb			−89589.0	2.4	1026319.0	2.4		*		120	903822.2	2.6
69	52		Te			−88553	25	1024500	25	β^+	1036	25	120	904935	27
68	53		I			−86282	11	1021447	11	β^+	2271	26	120	907373	12
67	54		Xe	+		−82550	24	1016933	24	β^+	3732	26	120	911379	26
66	55		Cs	IT		−77150	13	1010750	13	β^+	5400	20	120	917177	14
65	56		Ba	εp		−70330	300	1003150	300	β^+	6810	300	120	924490	330
64	57		La	x		−62400#	700#	994440#	700#	β^+	7930#	760#	120	933010#	750#
63	58		Ce	x		−52470#	900#	983730#	900#	β^+	9930#	1140#	120	943670#	970#
75	47	122	Ag	x		−71430#	210#	1019360#	210#	β^-	9150#	290#	121	923320#	220#
74	48		Cd	x		−80570#	210#	1027720#	210#	β^-	3000#	210#	121	913500#	220#
73	49		In	+		−83580	50	1029940	50	β^-	6370	50	121	910280	50
72	50		Sn			−89944.0	2.7	1035527.7	2.7	β^-	−1619.7	2.8	121	903441.1	2.9
71	51		Sb			−88324.3	2.4	1033125.6	2.4	β^-	1978.6	2.2	121	905180.0	2.6
70	52		Te			−90302.9	2.7	1034321.9	2.7		*		121	903055.8	2.9
69	53		I	−		−86069	6	1029306	6	β^+	4234	5	121	907601	6
68	54		Xe	+		−85170	90	1027630	90	β^+	890	90	121	908560	90
67	55		Cs			−78120	15	1019792	15	β^+	7050	90	121	916135	16
66	56		Ba	x		−74280#	300#	1015170#	300#	β^+	3840#	300#	121	920260#	320#
65	57		La	x		−64540#	600#	1004650#	600#	β^+	9730#	670#	121	930710#	640#
64	58		Ce	x		−57740#	900#	997070#	900#	β^+	6800#	1080#	121	938010#	970#
76	47	123	Ag	x		−69960#	300#	1025960#	300#	β^-	7360#	300#	122	924900#	320#
75	48		Cd	+		−77310	40	1032530	40	β^-	6120	30	122	917000	40
74	49		In	+		−83428	23	1037865	23	β^-	4391	23	122	910437	25
73	50		Sn			−87818.6	2.7	1041473.7	2.7	β^-	1403.6	2.8	122	905722.8	2.9
72	51		Sb			−89222.2	2.0	1042094.9	2.0		*		122	904216.0	2.2
71	52		Te			−89170.9	1.9	1041261.3	1.9	β^+	51.3	1.9	122	904271.1	2.0
70	53		I			−87929	4	1039237	4	β^+	1242	4	122	905605	4
69	54		Xe	−		−85253	16	1035778	16	β^+	2676	15	122	908477	17
68	55		Cs			−81053	12	1030796	12	β^+	4200	19	122	912987	12
67	56		Ba	x		−75590#	300#	1024550#	300#	β^+	5460#	300#	122	918850#	320#
66	57		La	x		−68710#	500#	1016890#	500#	β^+	6880#	590#	122	926240#	540#
65	58		Ce	x		−60070#	800#	1007470#	800#	β^+	8640#	950#	122	935510#	860#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
77	47	124	Ag	x		−66570#	400#	1030650#	400#	β^-	10140#	410#	123 928530#	430#
76	48		Cd	+		−76710	60	1040000	60	β^-	4170	40	123 917650	70
75	49		In	+		−80880	50	1043380	50	β^-	7360	50	123 913180	50
74	50		Sn			−88236.2	1.4	1049962.6	1.4	β^-	−617.9	2.0	123 905274.5	1.5
73	51		Sb			−87618.4	2.0	1048562.4	2.0	β^-	2905.4	1.5	123 905937.8	2.2
72	52		Te			−90523.7	1.5	1050685.4	1.5	β^-	−3159.6	1.9	123 902818.8	1.6
71	53		I	−		−87364.1	2.4	1046743.5	2.4	β^-	293.7	2.9	123 906210.7	2.6
70	54		Xe			−87657.8	2.0	1046254.8	2.0		*		123 905895.4	2.1
69	55		Cs			−81741	11	1039555	11	β^+	5917	12	123 912248	12
68	56		Ba	x		−79094	14	1036127	14	β^+	2646	18	123 915089	15
67	57		La	x		−70300#	400#	1026550#	400#	β^+	8790#	400#	123 924530#	430#
66	58		Ce	x		−64720#	700#	1020190#	700#	β^+	5580#	810#	123 930520#	750#
65	59		Pr	x		−53020#	900#	1007710#	900#	β^+	11700#	1140#	123 943080#	970#
77	48	125	Cd	+		−73320	50	1044680	50	β^-	7160	40	124 921290	50
76	49		In	+		−80480	25	1051060	25	β^-	5418	25	124 913601	27
75	50		Sn	−n		−85897.9	1.5	1055695.6	1.5	β^-	2363.8	3.0	124 907784.8	1.6
74	51		Sb	+		−88261.7	2.8	1057277.0	2.8	β^-	766.7	2.1	124 905247	3
73	52		Te			−89028.4	1.9	1057261.3	1.9		*		124 904424.1	2.0
72	53		I	−		−88842.3	1.9	1056292.9	1.9	β^+	186.1	0.3	124 904623.9	2.1
71	54		Xe			−87189.8	2.0	1053858.1	2.0	β^+	1652.5	2.6	124 906397.9	2.1
70	55		Cs			−84098	9	1049984	9	β^+	3092	9	124 909717	10
69	56		Ba	−		−79540	250	1044640	250	β^+	4560	250	124 914610	270
68	57		La	x		−73900#	300#	1038220#	300#	β^+	5640#	390#	124 920670#	320#
67	58		Ce	x		−66570#	600#	1030100#	600#	β^+	7330#	670#	124 928540#	640#
66	59		Pr	x		−57810#	800#	1020570#	800#	β^+	8760#	1000#	124 937940#	860#
78	48	126	Cd	+		−72330	50	1051760	50	β^-	5490	40	125 922350	60
77	49		In	+		−77810	40	1056460	40	β^-	8210	40	125 916460	40
76	50		Sn	−nn		−86020	11	1063889	11	β^-	378	30	125 907654	11
75	51		Sb	−		−86400	30	1063480	30	β^-	3670	30	125 907250	30
74	52		Te			−90070.9	1.9	1066375.2	1.9	β^-	−2155	4	125 903304.9	2.0
73	53		I			−87916	4	1063438	4	β^-	1258	5	125 905619	4
72	54		Xe	−		−89174	6	1063913	6		*		125 904268	7
71	55		Cs			−84348	11	1058305	11	β^+	4826	13	125 909449	12
70	56		Ba	x		−82675	14	1055850	14	β^+	1673	18	125 911244	15
69	57		La	x		−75110#	300#	1047500#	300#	β^+	7570#	300#	125 919370#	320#
68	58		Ce	x		−70700#	500#	1042310#	500#	β^+	4410#	590#	125 924100#	540#
67	59		Pr	x		−60260#	700#	1031090#	700#	β^+	10440#	860#	125 935310#	750#
79	48	127	Cd	+		−68530	70	1056030	70	β^-	8470	60	126 926430	80
78	49		In	+		−76990	40	1063720	40	β^-	6510	30	126 917340	40
77	50		Sn	+		−83508	25	1069448	25	β^-	3201	24	126 910350	27
76	51		Sb	+		−86709	6	1071867	6	β^-	1581	5	126 906914	6
75	52		Te			−88290	3	1072666	3	β^-	698	4	126 905217	4
74	53		I			−88988	4	1072581	4		*		126 904468	4
73	54		Xe			−88325	4	1071136	4	β^+	662.3	2.0	126 905179	4
72	55		Cs			−86245	8	1068273	8	β^+	2081	8	126 907413	9
71	56		Ba	−		−82790	100	1064040	100	β^+	3450	100	126 911120	110
70	57		La	x		−78100#	220#	1058560#	220#	β^+	4700#	250#	126 916160#	240#
69	58		Ce	x		−71960#	400#	1051640#	400#	β^+	6140#	460#	126 922750#	430#
68	59		Pr	x		−64430#	600#	1043330#	600#	β^+	7530#	720#	126 930830#	640#
67	60		Nd	x		−55420#	900#	1033540#	900#	β^+	9010#	1080#	126 940500#	970#
80	48	128	Cd	+		−67290	290	1062870	290	β^-	7070	290	127 927760	320
79	49		In	+		−74360	50	1069150	50	β^-	8980	40	127 920170	50
78	50		Sn	+		−83336	27	1077348	27	β^-	1274	15	127 910535	29
77	51		Sb	IT		−84610	25	1077839	25	β^-	4384	25	127 909167	27
76	52		Te			−88993.5	1.8	1081440.5	1.8	β^-	−1251	4	127 904461.5	1.9
75	53		I			−87742	4	1079407	4	β^-	2118	4	127 905805	4
74	54		Xe			−89860.7	1.4	1080742.9	1.4		*		127 903530.5	1.5
73	55		Cs			−85931	5	1076030	5	β^+	3930	5	127 907750	6
72	56		Ba			−85409	11	1074727	11	β^+	521	12	127 908309	12
71	57		La	−		−78760	400	1067290	400	β^+	6650	400	127 915450	430
70	58		Ce	x		−75570#	300#	1063330#	300#	β^+	3190#	500#	127 918870#	320#
69	59		Pr	x		−66320#	500#	1053290#	500#	β^+	9250#	590#	127 928800#	540#
68	60		Nd	x		−60180#	800#	1046370#	800#	β^+	6140#	950#	127 935390#	860#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
80	49	129	In	+		−72970	130	1075840	130	β^-	7660	30	128	921660	140
79	50		Sn	+		−80630	120	1082710	120	β^-	4000	120	128	913440	130
78	51		Sb	+		−84626	21	1085927	21	β^-	2380	21	128	909150	23
77	52		Te			−87005.4	3.0	1087523.7	3.0	β^-	1497.9	2.8	128	906596	3
76	53		I			−88503	3	1088239	3	β^-	194	3	128	904988	4
75	54		Xe			−88697.0	0.8	1087650.5	0.9		*		128	904779.9	0.9
74	55		Cs			−87501	5	1085673	5	β^+	1195	5	128	906063	5
73	56		Ba			−85068	11	1082457	11	β^+	2433	11	128	908675	12
72	57		La	−		−81350	50	1077950	50	β^+	3720	50	128	912670	50
71	58		Ce	−	♦	−75750	210	1071570	210	β^+	5600	200	128	918680	220
70	59		Pr	x		−69990#	400#	1065030#	400#	β^+	5760#	450#	128	924860#	430#
69	60		Nd	x		−62170#	800#	1056430#	800#	β^+	7830#	900#	128	933260#	860#
81	49	130	In	+		−69990	50	1080930	50	β^-	10250	40	129	924860	50
80	50		Sn	+		−80242	28	1090397	28	β^-	2150	13	129	913860	30
79	51		Sb	+		−82393	25	1091765	25	β^-	4960	25	129	911548	27
78	52		Te			−87352.8	1.9	1095942.4	2.0	β^-	−420	3	129	906222.9	2.1
77	53		I			−86932	3	1094740	3	β^-	2949	3	129	906674	4
76	54		Xe			−89880.9	1.1	1096905.8	1.1	β^-	−2983	8	129	903508.9	1.1
75	55		Cs			−86898	8	1093141	8	β^-	373	11	129	906711	9
74	56		Ba			−87271	7	1092731	7		*		129	906311	7
73	57		La	x		−81670#	210#	1086350#	210#	β^+	5600#	210#	129	912320#	220#
72	58		Ce	x		−79470#	210#	1083360#	210#	β^+	2210#	290#	129	914690#	220#
71	59		Pr	x		−71370#	300#	1074480#	300#	β^+	8100#	360#	129	923380#	320#
70	60		Nd	x		−66340#	700#	1068670#	700#	β^+	5030#	760#	129	928780#	750#
69	61		Pm	x		−55470#	800#	1057020#	800#	β^+	10870#	1060#	129	940450#	860#
82	49	131	In	+		−68200	80	1087210	80	β^-	9180	30	130	926790	90
81	50		Sn	+		−77380	70	1095610	70	β^-	4638	20	130	916930	80
80	51		Sb	+		−82020	70	1099460	70	β^-	3190	70	130	911950	80
79	52		Te	−n		−85211.1	2.0	1101872.1	2.0	β^-	2232.8	2.7	130	908522.1	2.2
78	53		I	+		−87443.9	1.8	1103322.5	1.8	β^-	970.8	0.6	130	906125.1	1.9
77	54		Xe			−88414.8	1.6	1103511.0	1.7		*		130	905082.8	1.8
76	55		Cs			−88063	5	1102377	5	β^+	352	5	130	905460	6
75	56		Ba			−86693	7	1100224	7	β^+	1370	7	130	906931	7
74	57		La	−		−83730	100	1096480	100	β^+	2960	100	130	910110	110
73	58		Ce	−		−79710	410	1091680	410	β^+	4020	400	130	914420	440
72	59		Pr	−		−74460	440	1085650	440	β^+	5250	150	130	920060	470
71	60		Nd	−		−67900	460	1078310	460	β^+	6560	150	130	927100	500
70	61		Pm	x		−59800#	800#	1069420#	800#	β^+	8100#	930#	130	935800#	860#
83	49	132	In	+		−63020	400	1090100	400	β^-	13600	400	131	932340	430
82	50		Sn	+		−76620	26	1102917	26	β^-	3300	50	131	917745	28
81	51		Sb	IT		−79920	60	1105440	60	β^-	5290	50	131	914200	60
80	52		Te	+		−85209	11	1109942	11	β^-	493	4	131	908524	12
79	53		I	+		−85702	11	1109652	11	β^-	3577	11	131	907995	11
78	54		Xe			−89279.4	1.4	1112446.9	1.4	β^-	−2120	3	131	904154.6	1.5
77	55		Cs			−87160	3	1109545	3	β^-	1279.5	2.2	131	906430	4
76	56		Ba			−88439	3	1110042	3		*		131	905056	3
75	57		La	−		−83730	40	1104550	40	β^+	4710	40	131	910110	50
74	58		Ce	x		−82450#	200#	1102490#	200#	β^+	1290#	200#	131	911490#	210#
73	59		Pr	x		−75340#	210#	1094600#	210#	β^+	7110#	280#	131	919120#	220#
72	60		Nd	x		−71610#	500#	1090090#	500#	β^+	3730#	540#	131	923120#	540#
71	61		Pm	x		−61710#	700#	1079400#	700#	β^+	9900#	860#	131	933750#	750#
83	50	133	Sn	+		−71130	100	1105490	100	β^-	7830	70	132	923640	110
82	51		Sb	+		−78960	80	1112540	80	β^-	4003	13	132	915240	80
81	52		Te	+		−82960	80	1115760	80	β^-	2920	70	132	910940	80
80	53		I	+		−85877	26	1117899	26	β^-	1771	26	132	907807	28
79	54		Xe	+		−87648	4	1118887	4	β^-	427.4	2.4	132	905906	4
78	55		Cs			−88075	3	1118532	3		*		132	905447	3
77	56		Ba			−87558	3	1117232	3	β^+	517.4	1.0	132	906003	3
76	57		La	−		−85330	200	1114220	200	β^+	2230	200	132	908400	210
75	58		Ce	x		−82390#	200#	1110500#	200#	β^+	2940#	280#	132	911550#	210#
74	59		Pr	x		−78060#	210#	1105390#	210#	β^+	4330#	280#	132	916200#	220#
73	60		Nd	x		−72460#	400#	1099010#	400#	β^+	5600#	450#	132	922210#	430#
72	61		Pm	x		−65470#	600#	1091230#	600#	β^+	7000#	720#	132	929720#	640#
71	62		Sm	x		−57070#	800#	1082050#	800#	β^+	8390#	1000#	132	938730#	860#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
84	50	134	Sn	x		−67230#	300#	1109670#	300#	β^-	6750#	340#	133 927830#	320#
83	51		Sb	+		−73980	160	1115630	160	β^-	8420	110	133 920580	170
82	52		Te	+		−82390	110	1123270	110	β^-	1560	90	133 911550	120
81	53		I	+		−83950	60	1124050	60	β^-	4170	60	133 909870	60
80	54		Xe			−88124.4	0.8	1127434.6	0.9	β^-	−1229	3	133 905394.5	0.9
79	55		Cs			−86896	3	1125423	3	β^-	2058.7	0.4	133 906714	3
78	56		Ba			−88954	3	1126700	3		*		133 904504	3
77	57		La	−		−85241	26	1122204	26	β^+	3713	26	133 908490	28
76	58		Ce	−		−84740	200	1120920	200	β^+	500	200	133 909030	220
75	59		Pr	x		−78530#	200#	1113930#	200#	β^+	6210#	280#	133 915690#	210#
74	60		Nd	−		−75760#	250#	1110380#	250#	β^+	2770	150	133 918660#	270#
73	61		Pm	x		−66880#	500#	1100720#	500#	β^+	8880#	560#	133 928200#	540#
72	62		Sm	x		−61460#	700#	1094510#	700#	β^+	5420#	860#	133 934020#	750#
84	51	135	Sb	+		−69710	110	1119430	110	β^-	8120	50	134 925170	110
83	52		Te	+		−77830	90	1126770	90	β^-	5960	90	134 916450	100
82	53		I			−83787	23	1131951	23	β^-	2648	24	134 910051	25
81	54		Xe			−86435	10	1133817	10	β^-	1151	10	134 907208	11
80	55		Cs			−87586	3	1134185	3	β^-	268.6	1.1	134 905972	3
79	56		Ba			−87855	3	1133672	3		*		134 905684	3
78	57		La	−		−86655	10	1131689	10	β^+	1200	10	134 906972	11
77	58		Ce	−		−84629	11	1128881	11	β^+	2026	5	134 909147	12
76	59		Pr	−		−80910	150	1124380	150	β^+	3720	150	134 913140	160
75	60		Nd	x		−76160#	210#	1118850#	210#	β^+	4750#	250#	134 918240#	220#
74	61		Pm	x		−70140#	400#	1112050#	400#	β^+	6020#	450#	134 924700#	430#
73	62		Sm	x		−63020#	600#	1104140#	600#	β^+	7130#	720#	134 932350#	640#
72	63		Eu	x		−54290#	800#	1094630#	800#	β^+	8730#	1000#	134 941720#	860#
85	51	136	Sb	x		−65080#	300#	1122880#	300#	β^-	9340#	300#	135 930130#	320#
84	52		Te			−74420	50	1131440	50	β^-	5070	60	135 920100	50
83	53		I			−79500	50	1135730	50	β^-	6930	50	135 914660	50
82	54		Xe			−86424	7	1141877	7	β^-	−81	8	135 907220	8
81	55		Cs	+		−86343	4	1141014	4	β^-	2548.2	1.9	135 907307	4
80	56		Ba			−88891	3	1142779	3	β^-	−2870	70	135 904571	3
79	57		La	−		−86020	70	1139130	70	β^-	470	80	135 907650	80
78	58		Ce			−86490	50	1138820	50		*		135 907140	50
77	59		Pr	−		−81370	50	1132910	50	β^+	5126	18	135 912650	50
76	60		Nd	−		−79160	60	1129920	60	β^+	2211	25	135 915020	60
75	61		Pm	−		−71310	210	1121280	210	β^+	7850	200	135 923450	220
74	62		Sm	x		−66790#	500#	1115980#	500#	β^+	4520#	540#	135 928300#	540#
73	63		Eu	x		−56360#	700#	1104770#	700#	β^+	10430#	860#	135 939500#	750#
85	52	137	Te	+		−69560	120	1134650	120	β^-	6940	120	136 925330	130
84	53		I	p − 2n		−76501	28	1140807	28	β^-	5877	27	136 917873	30
83	54		Xe	−n		−82378	7	1145902	7	β^-	4172	7	136 911563	8
82	55		Cs			−86550	3	1149292	3	β^-	1175.63	0.17	136 907085	3
81	56		Ba			−87726	3	1149685	3		*		136 905822	3
80	57		La	+		−87130	50	1148300	50	β^+	600	50	136 906470	50
79	58		Ce	−n		−85900	50	1146300	50	β^+	1222.1	1.6	136 907780	50
78	59		Pr	−		−83200	50	1142810	50	β^+	2702	10	136 910680	50
77	60		Nd	−		−79510	70	1138340	70	β^+	3690	50	136 914640	80
76	61		Pm	IT		−73930#	170#	1131980#	170#	β^+	5580#	150#	136 920630#	180#
75	62		Sm	x		−67880#	400#	1125140#	400#	β^+	6050#	430#	136 927130#	430#
74	63		Eu	x		−60350#	600#	1116830#	600#	β^+	7530#	720#	136 935210#	640#
73	64		Gd	x		−51560#	700#	1107260#	700#	β^+	8790#	920#	136 944650#	750#
86	52	138	Te	x		−65930#	210#	1139090#	210#	β^-	6370#	220#	137 929220#	220#
85	53		I	+		−72300	80	1144680	80	β^-	7820	70	137 922380	90
84	54		Xe	+		−80120	40	1151710	40	β^-	2770	40	137 913990	40
83	55		Cs			−82893	10	1153706	10	β^-	5373	9	137 911011	10
82	56		Ba			−88266	3	1158297	3	β^-	−1737	4	137 905242	3
81	57		La	+n		−86529	4	1155777	4	β^-	1044	11	137 907108	4
80	58		Ce			−87573	11	1156039	11		*		137 905986	11
79	59		Pr	−		−83136	15	1150820	15	β^+	4437	10	137 910750	16
78	60		Nd	−		−82040#	200#	1148940#	200#	β^+	1100#	200#	137 911930#	220#
77	61		Pm	−		−75140#	450#	1141260#	450#	β^+	6900	400	137 919340#	480#
76	62		Sm	x		−71220#	300#	1136560#	300#	β^+	3910#	540#	137 923540#	320#
75	63		Eu	x		−61990#	500#	1126550#	500#	β^+	9230#	590#	137 933450#	540#
74	64		Gd	x		−55920#	600#	1119690#	600#	β^+	6070#	780#	137 939970#	640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
86	53	139	I	+		−68840	30	1149290	30	β^-	6806	23	138 926090	30
85	54		Xe	+		−75649	21	1155315	21	β^-	5057	21	138 918788	23
84	55		Cs			−80706	4	1159590	4	β^-	4213	3	138 913359	5
83	56		Ba			−84918	3	1163020	3	β^-	2317.1	2.7	138 908836	3
82	57		La			−87235	3	1164555	3		*		138 906349	4
81	58		Ce	−		−86957	8	1163495	8	β^+	278	7	138 906647	8
80	59		Pr	−		−84828	8	1160583	8	β^+	2129.0	3.0	138 908933	9
79	60		Nd	−		−82040	40	1157010	40	β^+	2790	40	138 911920	40
78	61		Pm	−		−77520	50	1151710	50	β^+	4520	40	138 916780	50
77	62		Sm	−		−72060	120	1145470	120	β^+	5460	110	138 922640	130
76	63		Eu	x		−65380#	400#	1138010#	400#	β^+	6680#	420#	138 929810#	430#
75	64		Gd	x		−57680#	500#	1129520#	500#	β^+	7700#	640#	138 938080#	540#
74	65		Tb	x		−48410#	700#	1119470#	700#	β^+	9270#	860#	138 948030#	750#
87	53	140	I	x		−64240#	210#	1152760#	210#	β^-	8760#	220#	139 931040#	230#
86	54		Xe	+		−73000	60	1160740	60	β^-	4060	60	139 921630	70
85	55		Cs			−77059	11	1164015	11	β^-	6219	12	139 917274	12
84	56		Ba			−83278	9	1169451	9	β^-	1047	8	139 910598	9
83	57		La			−84325	3	1169716	3	β^-	3761.9	1.9	139 909473	4
82	58		Ce			−88087	3	1172696	3		*		139 905435	3
81	59		Pr	−		−84699	7	1168525	7	β^+	3388	6	139 909072	7
80	60		Nd	+nn		−84477	19	1167521	19	β^+	222	20	139 909310	21
79	61		Pm	−		−78390	40	1160650	40	β^+	6090	40	139 915850	40
78	62		Sm	−	♦	−74990	300	1156470	300	β^+	3400	300	139 919500	330
77	63		Eu	−	♦	−66590	500	1147290	500	β^+	8400	400	139 928510	540
76	64		Gd	−	♦	−61790	640	1141700	640	β^+	4800	400	139 933670	690
75	65		Tb	−	♦	−50490	1030	1129620	1030	β^+	11300	800	139 945800	1100
88	53	141	I	x		−60480#	300#	1157070#	300#	β^-	7840#	310#	140 935070#	320#
87	54		Xe	+		−68320	90	1164130	90	β^-	6150	90	140 926650	100
86	55		Cs			−74471	12	1169498	12	β^-	5255	12	140 920052	13
85	56		Ba			−79726	10	1173971	10	β^-	3216	10	140 914410	11
84	57		La			−82942	5	1176405	5	β^-	2502	4	140 910958	5
83	58		Ce			−85444	3	1178124	3	β^-	580.7	1.1	140 908272	3
82	59		Pr			−86025	3	1177923	3		*		140 907648	3
81	60		Nd			−84202	4	1175317	4	β^+	1822.9	2.8	140 909605	4
80	61		Pm			−80487	24	1170820	24	β^+	3715	24	140 913594	26
79	62		Sm			−75944	12	1165495	12	β^+	4543	23	140 918471	13
78	63		Eu	−		−70390	100	1159160	100	β^+	5550	100	140 924430	110
77	64		Gd	x		−63150#	300#	1151130#	300#	β^+	7250#	320#	140 932210#	320#
76	65		Tb	x		−54810#	600#	1142010#	600#	β^+	8340#	670#	140 941160#	640#
75	66		Dy	x		−45470#	700#	1131890#	700#	β^+	9340#	920#	140 951190#	750#
88	54	142	Xe	+		−65480	100	1169360	100	β^-	5040	100	141 929710	110
87	55		Cs			−70518	13	1173617	13	β^-	7306	12	141 924295	14
86	56		Ba			−77825	7	1180141	7	β^-	2212	5	141 916452	8
85	57		La			−80037	6	1181570	6	β^-	4505	5	141 914077	7
84	58		Ce			−84542	3	1185293	4	β^-	−745.2	2.4	141 909241	4
83	59		Pr			−83797	3	1183766	3	β^-	2162.3	1.5	141 910041	3
82	60		Nd			−85958.9	2.9	1185145.6	2.9		*		141 907719	3
81	61		Pm	−		−81090	40	1179490	40	β^+	4870	40	141 912950	50
80	62		Sm	+nn		−78987	15	1176609	15	β^+	2100	50	141 915204	17
79	63		Eu	−		−71630	100	1168470	100	β^+	7360	90	141 923110	100
78	64		Gd	−	♦	−67430	320	1163480	320	β^+	4200	300	141 927610	340
77	65		Tb	−	♦	−57030	770	1152300	770	β^+	10400	700	141 938780	820
76	66		Dy	−	♦	−49930	790	1144420	790	β^+	7100	200	141 946400	850
89	54	143	Xe	x		−60400#	220#	1172350#	220#	β^-	7310#	220#	142 935160#	240#
88	55		Cs			−67705	19	1178875	19	β^-	6243	18	142 927315	20
87	56		Ba			−73948	13	1184335	13	β^-	4243	17	142 920614	14
86	57		La			−78191	15	1187796	15	β^-	3425	15	142 916058	16
85	58		Ce			−81616	3	1190438	3	β^-	1461.6	1.8	142 912382	4
84	59		Pr			−83077	3	1191118	3	β^-	934.0	1.4	142 910813	3
83	60		Nd			−84011.2	2.9	1191269.2	2.9		*		142 909810	3
82	61		Pm			−82970	4	1189445	4	β^+	1041.4	2.4	142 910928	4
81	62		Sm			−79527	4	1185220	4	β^+	3443	4	142 914624	4
80	63		Eu	−		−74360	40	1179270	40	β^+	5170	40	142 920170	40
79	64		Gd	IT		−68350	200	1172480	200	β^+	6010	200	142 926620	220
78	65		Tb	x		−60960#	400#	1164300#	400#	β^+	7390#	450#	142 934560#	430#
77	66		Dy	x		−52190#	500#	1154760#	500#	β^+	8770#	640#	142 943970#	540#
76	67		Ho	x		−42160#	700#	1143940#	700#	β^+	10030#	860#	142 954740#	750#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
90	54	144	Xe	x		−57250#	320#	1177270#	320#	β^-	6070#	320#	143	938540#	340#
89	55		Cs			−63316	25	1182557	25	β^-	8465	24	143	932028	26
88	56		Ba			−71780	14	1190239	14	β^-	3120	60	143	922941	15
87	57		La			−74900	60	1192580	60	β^-	5540	60	143	919590	60
86	58		Ce			−80441	4	1197335	4	β^-	318.7	0.8	143	913643	4
85	59		Pr			−80759	4	1196871	4	β^-	2997.5	2.4	143	913301	4
84	60		Nd			−83756.9	2.9	1199086.2	2.9	β^-	−2331.8	2.2	143	910083	3
83	61		Pm			−81425	4	1195972	4	β^-	550.2	2.6	143	912586	4
82	62		Sm			−81975	3	1195740	3		*		143	911996	4
81	63		Eu	−		−75647	21	1188629	21	β^+	6329	21	143	918790	23
80	64		Gd	−	♦	−71350	400	1183550	400	β^+	4300	400	143	923410	430
79	65		Tb	x		−62990#	300#	1174410#	300#	β^+	8360#	500#	143	932380#	320#
78	66		Dy	x		−56760#	400#	1167390#	400#	β^+	6230#	500#	143	939070#	430#
77	67		Ho	x		−45000#	600#	1154850#	600#	β^+	11760#	720#	143	951690#	640#
90	55	145	Cs			−60160	40	1187480	40	β^-	7890	40	144	935410	40
89	56		Ba			−68050	50	1194580	50	β^-	4930	60	144	926940	60
88	57		La			−72980	70	1198730	70	β^-	4120	60	144	921650	70
87	58		Ce			−77100	40	1202060	40	β^-	2540	40	144	917230	40
86	59		Pr			−79636	8	1203819	8	β^-	1805	7	144	914508	8
85	60		Nd			−81441.0	2.9	1204841.7	2.9		*		144	912569	3
84	61		Pm			−81278	4	1203896	4	β^+	163.2	2.2	144	912745	4
83	62		Sm			−80661	3	1202497	3	β^+	616.7	2.4	144	913407	4
82	63		Eu			−78001	4	1199055	4	β^+	2660.2	2.8	144	916263	5
81	64		Gd	−		−72950	40	1193220	40	β^+	5050	40	144	921690	40
80	65		Tb	−		−66440	130	1185930	130	β^+	6510	120	144	928680	130
79	66		Dy	−	♦	−59140	240	1177840	240	β^+	7300	200	144	936510	250
78	67		Ho	x		−49610#	600#	1167540#	600#	β^+	9530#	640#	144	946740#	640#
77	68		Er	x		−39260#	700#	1156400#	700#	β^+	10350#	920#	144	957850#	750#
91	55	146	Cs			−55660	70	1191050	70	β^-	9380	40	145	940240	70
90	56		Ba			−65040	70	1199640	70	β^-	4120	40	145	930180	70
89	57		La			−69160	70	1202980	70	β^-	6550	50	145	925760	70
88	58		Ce			−75700	60	1208740	60	β^-	1040	40	145	918730	70
87	59		Pr			−76740	60	1208990	60	β^-	4200	60	145	917620	60
86	60		Nd			−80935.0	2.9	1212406.9	2.9	β^-	−1472	4	145	913113	3
85	61		Pm	+		−79463	5	1210153	5	β^-	1542.0	3.0	145	914693	5
84	62		Sm			−81005	4	1210912	4		*		145	913038	4
83	63		Eu			−77127	7	1206252	7	β^+	3878	6	145	917201	8
82	64		Gd	+nn		−76097	5	1204440	5	β^+	1030	8	145	918306	6
81	65		Tb	−		−68020	110	1195580	110	β^+	8080	110	145	926980	110
80	66		Dy	−		−62860	150	1189640	150	β^+	5160	100	145	932510	160
79	67		Ho	x		−52180#	500#	1178180#	500#	β^+	10680#	520#	145	943980#	540#
78	68		Er	x		−44760#	600#	1169970#	600#	β^+	7420#	780#	145	951950#	640#
77	69		Tm	−p		−30850#	700#	1155280#	700#	β^+	13910#	920#	145	966890#	750#
92	55	147	Cs			−52230	100	1195690	100	β^-	9250	140	146	943930	110
91	56		Ba	+		−61490	90	1204160	90	β^-	5750	50	146	933990	100
90	57		La	+		−67240	80	1209130	80	β^-	4950	60	146	927820	80
89	58		Ce	+		−72180	50	1213290	50	β^-	3290	40	146	922510	60
88	59		Pr	+		−75470	40	1215800	40	β^-	2690	40	146	918980	40
87	60		Nd			−78155.7	2.9	1217699.0	2.9	β^-	896.1	0.9	146	916096	3
86	61		Pm			−79051.8	3.0	1217812.7	3.0	β^-	224.1	0.3	146	915134	3
85	62		Sm			−79275.9	3.0	1217254.5	3.0		*		146	914894	3
84	63		Eu			−77554	4	1214751	4	β^+	1721.5	2.3	146	916742	4
83	64		Gd			−75367	4	1211781	4	β^+	2187.8	2.8	146	919090	4
82	65		Tb	IT		−70755	12	1206387	12	β^+	4611	12	146	924041	13
81	66		Dy	IT		−64380	50	1199230	50	β^+	6370	50	146	930880	60
80	67		Ho	x		−56230#	400#	1190300#	400#	β^+	8150#	400#	146	939630#	430#
79	68		Er	x		−47130#	500#	1180420#	500#	β^+	9100#	640#	146	949400#	540#
78	69		Tm	−p		−36410#	600#	1168910#	600#	β^+	10730#	780#	146	960910#	640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
93	55	148	Cs			−47520	360	1199050	360	β^-	10520	380	147	948980	380
92	56		Ba	+		−58050	140	1208790	140	β^-	5110	60	147	937680	150
91	57		La	+		−63160	130	1213120	130	β^-	7260	50	147	932190	140
90	58		Ce	+		−70430	120	1219600	120	β^-	2060	210	147	924400	130
89	59		Pr	IT		−72490	220	1220880	220	β^-	4930	220	147	922180	240
88	60		Nd			−77417	3	1225032	3	β^-	−539	6	147	916889	4
87	61		Pm	+p		−76878	7	1223710	7	β^-	2468	6	147	917468	7
86	62		Sm			−79346.2	3.0	1225396.0	3.0	β^-	−3107	17	147	914818	3
85	63		Eu	−		−76239	18	1221506	18	β^-	40	17	147	918154	19
84	64		Gd			−76279	3	1220764	3		*		147	918111	4
83	65		Tb	−		−70590	30	1214290	30	β^+	5690	30	147	924220	30
82	66		Dy	−		−67910	30	1210830	30	β^+	2678	10	147	927100	30
81	67		Ho	IT		−58510#	270#	1200650#	270#	β^+	9400#	270#	147	937190#	290#
80	68		Er	x		−51750#	400#	1193110#	400#	β^+	6750#	480#	147	944440#	430#
79	69		Tm	x		−39760#	700#	1180330#	700#	β^+	12000#	810#	147	957320#	750#
78	70		Yb	x		−30500#	800#	1170290#	800#	β^+	9260#	1060#	147	967260#	860#
94	55	149	Cs	x		−44210#	300#	1203810#	300#	β^-	9750#	500#	148	952540#	320#
93	56		Ba	x		−53960#	400#	1212780#	400#	β^-	7330#	500#	148	942070#	430#
92	57		La	x		−61290#	300#	1219330#	300#	β^-	5510#	310#	148	934200#	320#
91	58		Ce	+		−66800	80	1224050	80	β^-	4190	70	148	928290	80
90	59		Pr	+p		−70988	11	1227456	11	β^-	3397	10	148	923791	11
89	60		Nd			−74385	3	1230071	3	β^-	1691	3	148	920145	4
88	61		Pm			−76075	4	1230979	4	β^-	1071	4	148	918330	5
87	62		Sm			−77146.5	3.0	1231267.7	3.0		*		148	917180	3
86	63		Eu	+nn		−76454	5	1229793	5	β^+	692	5	148	917923	6
85	64		Gd			−75135	5	1227691	5	β^+	1319	6	148	919339	5
84	65		Tb			−71499	5	1223273	5	β^+	3636	5	148	923243	5
83	66		Dy	−		−67687	11	1218678	11	β^+	3812	10	148	927335	12
82	67		Ho	−		−61673	22	1211882	22	β^+	6014	19	148	933791	23
81	68		Er	ϵp	♦	−53540	470	1202970	470	β^+	8130	470	148	942520	510
80	69		Tm	x		−44370#	600#	1193010#	600#	β^+	9170#	760#	148	952370#	640#
79	70		Yb	x		−33680#	700#	1181550#	700#	β^+	10680#	920#	148	963840#	750#
94	56	150	Ba	x		−50710#	500#	1217600#	500#	β^-	6450#	640#	149	945560#	540#
93	57		La	x		−57160#	400#	1223260#	400#	β^-	7840#	420#	149	938640#	430#
92	58		Ce	+		−64990	120	1230320	120	β^-	3010	90	149	930230	130
91	59		Pr	+		−68000	80	1232540	80	β^-	5690	80	149	927000	90
90	60		Nd			−73693	4	1237451	4	β^-	−86	20	149	920887	4
89	61		Pm	+		−73607	20	1236582	20	β^-	3454	20	149	920980	22
88	62		Sm			−77060.8	2.9	1239253.3	3.0	β^-	−2261	6	149	917272	3
87	63		Eu			−74800	7	1236210	7	β^-	971	4	149	919699	8
86	64		Gd			−75771	7	1236399	7		*		149	918656	7
85	65		Tb			−71115	8	1230960	8	β^+	4656	9	149	923655	9
84	66		Dy	$-\alpha$		−69321	5	1228384	5	β^+	1794	9	149	925581	6
83	67		Ho	−	♦	−62760	100	1221040	100	β^+	6560	100	149	932620	110
82	68		Er	−	♦	−58650	100	1216150	100	β^+	4108	15	149	937030	110
81	69		Tm	x		−47140#	500#	1203860#	500#	β^+	11510#	510#	149	949390#	540#
80	70		Yb	x		−39010#	600#	1194950#	600#	β^+	8130#	780#	149	958120#	640#
79	71		Lu	−p		−25120#	700#	1180280#	700#	β^+	13890#	920#	149	973030#	750#
94	57	151	La	x		−54640#	500#	1228820#	500#	β^-	6820#	590#	150	941340#	540#
93	58		Ce	x		−61460#	300#	1234850#	300#	β^-	5330#	310#	150	934020#	320#
92	59		Pr	+		−66790	80	1239400	80	β^-	4170	70	150	928300	80
91	60		Nd	−n		−70956	4	1242785	4	β^-	2442	4	150	923825	4
90	61		Pm			−73399	6	1244445	6	β^-	1187	5	150	921203	6
89	62		Sm			−74585.9	2.9	1244849.8	3.0	β^-	76.8	0.5	150	919929	3
88	63		Eu			−74662.7	3.0	1244144.2	3.0		*		150	919846	3
87	64		Gd			−74198	4	1242898	4	β^+	464.2	2.8	150	920345	4
86	65		Tb			−71633	5	1239550	5	β^+	2565	4	150	923099	5
85	66		Dy	$-\alpha$		−68762	4	1235897	4	β^+	2871	5	150	926181	5
84	67		Ho	$-\alpha$		−63635	12	1229987	12	β^+	5128	12	150	931685	13
83	68		Er	x		−58410#	300#	1223980#	300#	β^+	5220#	300#	150	937290#	320#
82	69		Tm	−		−50880#	360#	1215670#	360#	β^+	7530#	200#	150	945370#	390#
81	70		Yb	ϵp	♦	−42360	320	1206370	320	β^+	8520#	480#	150	954520	340
80	71		Lu	IT		−30680#	610#	1193910#	610#	β^+	11680#	690#	150	967060#	660#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
94	58	152	Ce	x		−59050#	400#	1240510#	400#	β^-	4420#	500#	151	936610# 430#
93	59		Pr	x		−63460#	300#	1244150#	300#	β^-	6700#	300#	151	931870# 320#
92	60		Nd	−nn		−70160	30	1250060	30	β^-	1110	80	151	924680 30
91	61		Pm	+		−71270	70	1250390	70	β^-	3500	70	151	923490 80
90	62		Sm			−74772.2	3.0	1253107.3	3.0	β^-	−1874.1	0.7	151	919729 3
89	63		Eu			−72898.1	3.0	1250450.9	3.0	β^-	1818.2	1.1	151	921741 3
88	64		Gd			−74716	3	1251487	3		*		151	919789 3
87	65		Tb	−		−70730	40	1246710	40	β^+	3990	40	151	924070 40
86	66		Dy	−α		−70128	6	1245333	6	β^+	600	40	151	924715 6
85	67		Ho	−α		−63650	30	1238080	30	β^+	6470	30	151	931660 30
84	68		Er	−α		−60550	30	1234190	30	β^+	3105	10	151	935000 30
83	69		Tm	x		−51880#	300#	1224740#	300#	β^+	8670#	300#	151	944300# 320#
82	70		Yb	−		−46420#	360#	1218500#	360#	β^+	5460	200	151	950170# 380#
81	71		Lu	x		−34070#	700#	1205370#	700#	β^+	12350#	780#	151	963420# 750#
95	58	153	Ce	x		−55000#	500#	1244530#	500#	β^-	6550#	590#	152	940960# 540#
94	59		Pr	x		−61540#	300#	1250300#	300#	β^-	5520#	360#	152	933930# 320#
93	60		Nd	x		−67070#	210#	1255040#	210#	β^-	3600#	210#	152	928000# 220#
92	61		Pm	+p		−70668	16	1257857	16	β^-	1900	16	152	924135 17
91	62		Sm	−n		−72568.6	3.0	1258975.1	3.0	β^-	808.4	0.8	152	922094 3
90	63		Eu			−73377.0	3.0	1259001.2	3.0		*		152	921227 3
89	64		Gd			−72892	3	1257734	3	β^+	484.8	1.1	152	921747 3
88	65		Tb			−71322	5	1255381	5	β^+	1570	4	152	923433 5
87	66		Dy			−69151	5	1252428	5	β^+	2170.6	1.9	152	925763 5
86	67		Ho	−α		−65023	7	1247517	7	β^+	4129	7	152	930195 8
85	68		Er	−α		−60459	11	1242171	11	β^+	4564	11	152	935094 12
84	69		Tm	−α		−54000	22	1234930	22	β^+	6459	19	152	942029 23
83	70		Yb	x		−47310#	300#	1227460#	300#	β^+	6690#	300#	152	949210# 320#
82	71		Lu	x		−38480#	600#	1217850#	600#	β^+	8830#	670#	152	958690# 640#
95	59	154	Pr	x		−57700#	400#	1254520#	400#	β^-	7920#	500#	153	938060# 430#
94	60		Nd	x		−65610#	300#	1261660#	300#	β^-	2800#	320#	153	929560# 320#
93	61		Pm	+		−68410	110	1263670	110	β^-	4050	110	153	926560 120
92	62		Sm			−72465	3	1266943	3	β^-	−717.1	1.1	153	922206 3
91	63		Eu			−71747.7	3.0	1265443.2	3.0	β^-	1968.5	1.1	153	922976 3
90	64		Gd			−73716.2	3.0	1266629	3	β^-	−3560	50	153	920862 3
89	65		Tb	−		−70150	50	1262280	50	β^-	250	50	153	924690 50
88	66		Dy	−α		−70400	9	1261748	9		*		153	924423 9
87	67		Ho	−α		−64648	9	1255214	9	β^+	5751	11	153	930597 10
86	68		Er	−α		−62617	6	1252400	6	β^+	2032	10	153	932778 7
85	69		Tm	−α	♦	−55240	110	1244240	110	β^+	7370	110	153	940690 120
84	70		Yb	−α	♦	−50750	100	1238970	100	β^+	4490	50	153	945510 110
83	71		Lu	x		−39960#	500#	1227400#	500#	β^+	10790#	510#	153	957100# 540#
82	72		Hf	x		−33300#	700#	1219960#	700#	β^+	6660#	860#	153	964250# 750#
96	59	155	Pr	x		−55340#	500#	1260240#	500#	β^-	6670#	640#	154	940590# 540#
95	60		Nd	x		−62010#	400#	1266120#	400#	β^-	5020#	450#	154	933430# 430#
94	61		Pm	x		−67030#	210#	1270360#	210#	β^-	3170#	210#	154	928040# 220#
93	62		Sm	−n		−70201	3	1272750	3	β^-	1627.0	1.2	154	924636 3
92	63		Eu			−71827.8	3.0	1273595	3	β^-	252.2	1.1	154	922890 3
91	64		Gd			−72080	3	1273064	3		*		154	922619 3
90	65		Tb	+		−71259	12	1271461	12	β^+	821	12	154	923500 13
89	66		Dy	+n		−69164	12	1268584	12	β^+	2094.5	1.9	154	925749 13
88	67		Ho	−		−66062	23	1264700	23	β^+	3102	20	154	929079 25
87	68		Er	−α		−62220	50	1260070	50	β^+	3840	60	154	933210 50
86	69		Tm	−α		−56640	14	1253713	14	β^+	5580	50	154	939194 15
85	70		Yb	−α		−50650#	300#	1246940#	300#	β^+	5990#	300#	154	945620# 320#
84	71		Lu	−α		−42690#	360#	1238200#	360#	β^+	7970#	210#	154	954170# 390#
83	72		Hf	x		−34690#	600#	1229410#	600#	β^+	8000#	700#	154	962760# 640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
96	60	156	Nd	x		−60110#	500#	1272290#	500#	β^-	4110#	500#	155 935470#	540#
95	61		Pm	+		−64220	40	1275620	40	β^-	5160	40	155 931060	40
94	62		Sm			−69372	10	1279992	10	β^-	722	8	155 925526	10
93	63		Eu			−70094	6	1279932	6	β^-	2451	5	155 924751	6
92	64		Gd			−72545	3	1281601	3	β^-	−2444	4	155 922120	3
91	65		Tb			−70101	5	1278374	5	β^-	434	7	155 924744	5
90	66		Dy			−70534	7	1278025	7		*		155 924278	7
89	67		Ho	−	♦	−66130	400	1272840	400	β^+	4400	400	155 929000	430
88	68		Er	−	♦	−64460	410	1270390	410	β^+	1670	70	155 930790	440
87	69		Tm	−α		−56890	60	1262030	60	β^+	7580	410	155 938930	60
86	70		Yb	−α		−53310	30	1257670	30	β^+	3570	50	155 942770	40
85	71		Lu	−α		−43870#	300#	1247450#	300#	β^+	9450#	300#	155 952910#	320#
84	72		Hf	−α		−37960#	360#	1240760#	360#	β^+	5910	200	155 959250#	380#
83	73		Ta	−p		−26370#	600#	1228390#	600#	β^+	11590#	700#	155 971690#	640#
97	60	157	Nd	x		−56060#	600#	1276310#	600#	β^-	6170#	670#	156 939820#	640#
96	61		Pm	x		−62220#	300#	1281700#	300#	β^-	4550#	360#	156 933200#	320#
95	62		Sm	+		−66770	200	1285460	200	β^-	2700	200	156 928320	210
94	63		Eu			−69471	6	1287381	6	β^-	1363	6	156 925420	7
93	64		Gd			−70834	3	1287961	3		*		156 923957	3
92	65		Tb			−70774	3	1287118	3	β^+	60.05	0.30	156 924021	3
91	66		Dy			−69432	7	1284995	7	β^+	1341	6	156 925461	7
90	67		Ho	−		−66890	50	1281670	50	β^+	2540	50	156 928190	50
89	68		Er	−		−63420	90	1277420	90	β^+	3470	80	156 931910	100
88	69		Tm	−		−58940	140	1272160	140	β^+	4480	100	156 936720	150
87	70		Yb	−α		−53410	50	1265840	50	β^+	5530	150	156 942660	60
86	71		Lu	IT		−46479	22	1258130	22	β^+	6930	50	156 950102	24
85	72		Hf	−α		−39000#	300#	1249870#	300#	β^+	7480#	300#	156 958130#	320#
84	73		Ta	−α		−29670#	600#	1239760#	600#	β^+	9330#	670#	156 968150#	640#
97	61	158	Pm	x		−58970#	400#	1286520#	400#	β^-	6300#	450#	157 936690#	430#
96	62		Sm	x		−65270#	210#	1292030#	210#	β^-	1950#	220#	157 929930#	220#
95	63		Eu	+		−67210	80	1293200	80	β^-	3490	80	157 927840	80
94	64		Gd			−70700	3	1295898	3	β^-	−1220.0	0.9	157 924101	3
93	65		Tb			−69480	3	1293896	3	β^-	936.8	2.4	157 925410	3
92	66		Dy			−70417	4	1294050	4		*		157 924405	4
91	67		Ho	−		−66180	26	1289031	26	β^+	4237	26	157 928953	28
90	68		Er	−	♦	−64400	40	1286470	40	β^+	1780	30	157 930870	40
89	69		Tm	−	♦	−57870	110	1279150	110	β^+	6530	100	157 937880	120
88	70		Yb	−α		−56021	10	1276525	10	β^+	1850	110	157 939859	11
87	71		Lu	−α	♦	−48030	120	1267750	120	β^+	7990	120	157 948440	130
86	72		Hf	−α	♦	−42930	100	1261860	100	β^+	5100	70	157 953920	110
85	73		Ta	−α		−31330#	510#	1249490#	510#	β^+	11600#	520#	157 966370#	540#
84	74		W	−α		−24280#	700#	1241650#	700#	β^+	7050#	860#	157 973940#	750#
98	61	159	Pm	x		−56540#	490#	1292160#	490#	β^-	5680#	580#	158 939300#	530#
97	62		Sm	x		−62220#	300#	1297060#	300#	β^-	3830#	300#	158 933200#	320#
96	63		Eu			−66057	8	1300109	8	β^-	2514	7	158 929085	9
95	64		Gd			−68572	3	1301841	3	β^-	970.6	0.7	158 926385	3
94	65		Tb			−69542	3	1302030	3		*		158 925343	3
93	66		Dy			−69177	3	1300882	3	β^+	365.6	1.2	158 925736	3
92	67		Ho	−		−67339	4	1298262	4	β^+	1837.6	2.7	158 927708	4
91	68		Er	−		−64571	5	1294711	5	β^+	2768.5	2.0	158 930681	5
90	69		Tm	−		−60720	100	1290080	100	β^+	3850	100	158 934810	110
89	70		Yb	−		−55670	220	1284250	220	β^+	5050	200	158 940240	240
88	71		Lu	−α		−49680	50	1277480	50	β^+	5990	230	158 946660	60
87	72		Hf	−α		−43000#	300#	1270020#	300#	β^+	6680#	310#	158 953830#	320#
86	73		Ta	−α		−34520#	370#	1260750#	370#	β^+	8490#	220#	158 962940#	390#
85	74		W	−α		−25820#	600#	1251270#	600#	β^+	8700#	700#	158 972280#	640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
98	62	160	Sm	x		−60290#	400#	1303190#	400#	β^-	3560#	430#	159	935280#	430#
97	63		Eu	+	♦	−63840	170	1305970	170	β^-	4110	170	159	931460	180
96	64		Gd			−67952	3	1309293	3	β^-	−105.6	1.0	159	927051	3
95	65		Tb			−67846	3	1308405	3	β^-	1835.4	1.3	159	927164	3
94	66		Dy			−69682	3	1309458	3		*		159	925194	3
93	67		Ho	−		−66390	11	1305384	11	β^+	3292	11	159	928727	12
92	68		Er	+nn		−66060	50	1304270	50	β^+	330	50	159	929080	50
91	69		Tm	−		−60170	110	1297600	110	β^+	5890	100	159	935400	120
90	70		Yb	−−		−58160#	210#	1294810#	210#	β^+	2010#	220#	159	937560#	220#
89	71		Lu	−	♦	−50880#	230#	1286740#	230#	β^+	7290	90	159	945380#	240#
88	72		Hf	−α		−45980	30	1281070	30	β^+	4890#	230#	159	950630	40
87	73		Ta	−α		−35900#	310#	1270200#	310#	β^+	10090#	310#	159	961470#	330#
86	74		W	−α		−29460#	360#	1262980#	360#	β^+	6430	210	159	968370#	380#
85	75		Re	−α		−17250#	600#	1249980#	600#	β^+	12220#	700#	159	981490#	640#
99	62	161	Sm	x		−56800#	500#	1307780#	500#	β^-	4970#	590#	160	939020#	540#
98	63		Eu	x		−61780#	300#	1311970#	300#	β^-	3740#	300#	160	933680#	320#
97	64		Gd	−n		−65516	3	1314928	3	β^-	1955.6	1.4	160	929666	3
96	65		Tb			−67471	3	1316101	3	β^-	593.1	1.4	160	927566	3
95	66		Dy			−68065	3	1315912	3		*		160	926930	3
94	67		Ho			−67206	4	1314271	4	β^+	858.8	2.7	160	927852	4
93	68		Er	+n		−65203	10	1311486	10	β^+	2003	9	160	930002	10
92	69		Tm	−		−62040	90	1307540	90	β^+	3160	90	160	933400	100
91	70		Yb	−	♦	−58190	270	1302910	270	β^+	3850	250	160	937530	290
90	71		Lu	−	♦	−52890	280	1296830	280	β^+	5300	100	160	943220	300
89	72		Hf	−α		−46270	70	1289420	70	β^+	6620	290	160	950330	80
88	73		Ta	−α		−38770	50	1281150	50	β^+	7490	90	160	958370	60
87	74		W	−α		−30660#	310#	1272250#	310#	β^+	8120#	310#	160	967090#	330#
86	75		Re	−α		−20810#	600#	1261620#	600#	β^+	9850#	670#	160	977660#	640#
99	63	162	Eu	x		−58650#	400#	1316910#	400#	β^-	5640#	400#	161	937040#	430#
98	64		Gd	−nn		−64290	5	1321774	5	β^-	1390	40	161	930981	5
97	65		Tb	+		−65680	40	1322390	40	β^-	2510	40	161	929480	40
96	66		Dy			−68190	3	1324109	3	β^-	−2140	4	161	926795	3
95	67		Ho			−66050	4	1321187	4	β^-	295	4	161	929092	5
94	68		Er			−66346	4	1320700	4		*		161	928775	4
93	69		Tm	−		−61540	40	1315110	40	β^+	4810	40	161	933940	40
92	70		Yb	x		−59850#	210#	1312640#	210#	β^+	1690#	210#	161	935750#	220#
91	71		Lu	−	♦	−52920#	230#	1304920#	230#	β^+	6930	90	161	943190#	240#
90	72		Hf	−α		−49179	11	1300404	11	β^+	3740#	230#	161	947204	12
89	73		Ta	−α	♦	−40600	130	1291040	130	β^+	8580	130	161	956420	140
88	74		W	−α	♦	−34830	100	1284490	100	β^+	5770	90	161	962610	110
87	75		Re	−α		−22630#	510#	1271510#	510#	β^+	12200#	520#	161	975710#	550#
86	76		Os	−α		−15070#	700#	1263170#	700#	β^+	7560#	870#	161	983820#	750#
100	63	163	Eu	x		−56530#	500#	1322870#	500#	β^-	4960#	590#	162	939310#	540#
99	64		Gd	x		−61490#	300#	1327040#	300#	β^-	3120#	300#	162	933990#	320#
98	65		Tb	+p		−64605	5	1329377	5	β^-	1785	4	162	930644	5
97	66		Dy			−66390	3	1330380	3		*		162	928728	3
96	67		Ho			−66387	3	1329595	3	β^+	2.576	0.016	162	928730	3
95	68		Er			−65177	5	1327603	5	β^+	1210	5	162	930029	6
94	69		Tm	−		−62738	6	1324381	6	β^+	2439.0	3.0	162	932648	7
93	70		Yb	−		−59370	100	1320230	100	β^+	3370	100	162	936270	110
92	71		Lu	−		−54770	220	1314850	220	β^+	4600	200	162	941200	240
91	72		Hf	+α		−49320#	320#	1308610#	320#	β^+	5450#	390#	162	947060#	340#
90	73		Ta	−α		−42510	70	1301020	70	β^+	6810#	330#	162	954360	80
89	74		W	−α		−35060#	310#	1292790#	310#	β^+	7450#	320#	162	962360#	330#
88	75		Re	−α		−26030#	370#	1282970#	370#	β^+	9030#	230#	162	972060#	400#
87	76		Os	−α		−16720#	600#	1272890#	600#	β^+	9300#	710#	162	982050#	640#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
100	64	164	Gd	x		−59750#	400#	1333370#	400#	β^-	2340#	410#	163	935860#	430#
99	65		Tb	+		−62090	100	1334930	100	β^-	3890	100	163	933350	110
98	66		Dy			−65977	3	1338038	3	β^-	−986.7	2.2	163	929171	3
97	67		Ho			−64990	3	1336269	3	β^-	962.5	2.3	163	930231	3
96	68		Er			−65952	3	1336449	3		*		163	929197	4
95	69		Tm	−		−61990	20	1331705	20	β^+	3962	20	163	933451	22
94	70		Yb	x		−60990#	100#	1329930#	100#	β^+	1000#	100#	163	934520#	110#
93	71		Lu	−		−54740#	140#	1322890#	140#	β^+	6250	90	163	941230#	150#
92	72		Hf	+α		−51770#	200#	1319140#	200#	β^+	2970#	240#	163	944420#	210#
91	73		Ta	x		−43250#	400#	1309830#	400#	β^+	8520#	450#	163	953570#	430#
90	74		W	−α		−38280	30	1304080	30	β^+	4970#	400#	163	958900	40
89	75		Re	−α		−27550#	310#	1292570#	310#	β^+	10730#	310#	163	970430#	330#
88	76		Os	−α		−20560#	360#	1284800#	360#	β^+	6990	210	163	977930#	380#
101	64	165	Gd	x		−56470#	500#	1338170#	500#	β^-	4190#	590#	164	939380#	540#
100	65		Tb	x		−60660#	300#	1341570#	300#	β^-	2960#	300#	164	934880#	320#
99	66		Dy	−n		−63621	3	1343754	3	β^-	1286.2	1.9	164	931700	3
98	67		Ho			−64907	3	1344258	3		*		164	930319	3
97	68		Er			−64531	3	1343099	3	β^+	376.3	2.1	164	930723	4
96	69		Tm			−62939	4	1340724	4	β^+	1592.5	1.5	164	932433	4
95	70		Yb	−		−60177	20	1337180	20	β^+	2762	20	164	935398	22
94	71		Lu	−		−56260	80	1332480	80	β^+	3920	80	164	939610	90
93	72		Hf	+α		−51660#	370#	1327100#	370#	β^+	4600#	380#	164	944540#	400#
92	73		Ta	+α		−45810#	220#	1320470#	220#	β^+	5850#	440#	164	950820#	240#
91	74		W	−α		−38810	90	1312680	90	β^+	7010#	240#	164	958340	90
90	75		Re	−α		−30690	70	1303780	70	β^+	8120	110	164	967050	80
89	76		Os	−α		−21910#	310#	1294220#	310#	β^+	8780#	320#	164	976480#	330#
101	65	166	Tb	x		−57710#	400#	1346690#	400#	β^-	4890#	400#	165	938050#	430#
100	66		Dy	−n		−62593	3	1350798	3	β^-	486.3	1.9	165	932803	3
99	67		Ho			−63080	3	1350502	3	β^-	1854.5	0.9	165	932281	3
98	68		Er			−64934.1	3.0	1351573.7	3.0		*		165	930290	3
97	69		Tm	−		−61894	11	1347751	11	β^+	3040	11	165	933554	12
96	70		Yb	+nn		−61590	8	1346665	8	β^+	304	14	165	933880	9
95	71		Lu	−		−56110	160	1340400	160	β^+	5480	160	165	939760	170
94	72		Hf	x		−53790#	300#	1337300#	300#	β^+	2320#	340#	165	942250#	320#
93	73		Ta	x		−46140#	300#	1328870#	300#	β^+	7660#	420#	165	950470#	320#
92	74		W	−α		−41898	12	1323843	12	β^+	4240#	300#	165	955021	13
91	75		Re	−α	♦	−32530	140	1313700	140	β^+	9360	140	165	965070	150
90	76		Os	−α	♦	−26270	100	1306650	100	β^+	6260	100	165	971800	110
89	77		Ir	−α		−13500#	510#	1293100#	510#	β^+	12770#	520#	165	985510#	550#
102	65	167	Tb	x		−55840#	500#	1352900#	500#	β^-	4100#	510#	166	940050#	540#
101	66		Dy	+		−59940	60	1356220	60	β^-	2350	60	166	935650	60
100	67		Ho	p2n		−62292	6	1357785	6	β^-	1007	5	166	933127	6
99	68		Er			−63298.9	2.9	1358009.8	3.0		*		166	932046	3
98	69		Tm			−62551	3	1356479	3	β^+	748.3	1.5	166	932849	3
97	70		Yb			−60596	5	1353743	5	β^+	1954	4	166	934947	5
96	71		Lu	−		−57470	100	1349830	100	β^+	3130	100	166	938310	110
95	72		Hf	x		−53470#	210#	1345050#	210#	β^+	4000#	230#	166	942600#	220#
94	73		Ta	+	♦	−47840#	420#	1338640#	420#	β^+	5620#	460#	166	948640#	450#
93	74		W	+α		−42220#	320#	1332240#	320#	β^+	5620	270	166	954670#	340#
92	75		Re	IT		−34840#	130#	1324080#	130#	β^+	7380#	340#	166	962600#	140#
91	76		Os	−α		−26660#	310#	1315110#	310#	β^+	8190#	340#	166	971380#	330#
90	77		Ir	−α		−17060#	370#	1304730#	370#	β^+	9600#	240#	166	981690#	400#
102	66	168	Dy	x		−58470#	300#	1362820#	300#	β^-	1610#	300#	167	937230#	320#
101	67		Ho	+		−60084	29	1363649	29	β^-	2914	29	167	935500	30
100	68		Er			−62998.7	3.0	1365780.9	3.0	β^-	−1679.0	1.9	167	932368	3
99	69		Tm			−61320	3	1363320	3	β^-	257	4	167	934171	4
98	70		Yb			−61577	4	1362794	4		*		167	933895	5
97	71		Lu	−		−57100	80	1357540	80	β^+	4470	80	167	938700	90
96	72		Hf	x		−55300#	100#	1354960#	100#	β^+	1800#	130#	167	940630#	110#
95	73		Ta	+α		−48630#	370#	1347500#	370#	β^+	6670#	380#	167	947790#	400#
94	74		W	+α		−44840#	200#	1342930#	200#	β^+	3790#	420#	167	951860#	210#
93	75		Re	−α		−35760#	400#	1333070#	400#	β^+	9080#	450#	167	961610#	430#
92	76		Os	−α		−30040	30	1326560	30	β^+	5720#	400#	167	967750	40
91	77		Ir	−α		−18710#	310#	1314450#	310#	β^+	11330#	320#	167	979910#	340#
90	78		Pt	−α		−11150#	360#	1306100#	360#	β^+	7570	220	167	988040#	380#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
103	66	169	Dy	+		−55610	300	1368020	300	β^-	3200	300	168	940300	320
102	67		Ho	+p		−58806	20	1370442	20	β^-	2124	20	168	936869	22
101	68		Er			−60930.5	3.0	1371784.0	3.0	β^-	351.2	1.1	168	934588	3
100	69		Tm			−61281.7	2.9	1371352.9	2.9		*		168	934211	3
99	70		Yb			−60373	4	1369661	4	β^+	909	4	168	935187	5
98	71		Lu	−		−58080	5	1366586	5	β^+	2293.0	3.0	168	937649	6
97	72		Hf	−		−54810	80	1362530	80	β^+	3270	80	168	941160	90
96	73		Ta	x		−50380#	210#	1357320#	210#	β^+	4440#	220#	168	945920#	220#
95	74		W	+α		−44940#	320#	1351100#	320#	β^+	5440#	380#	168	951760#	340#
94	75		Re	x		−38350#	210#	1343730#	210#	β^+	6590#	380#	168	958830#	220#
93	76		Os	−α		−30670	100	1335260	100	β^+	7680#	230#	168	967080	110
92	77		Ir	−α		−21990	90	1325800	90	β^+	8680	130	168	976390	100
91	78		Pt	−α		−12650#	310#	1315680#	310#	β^+	9340#	330#	168	986420#	340#
103	67	170	Ho	+		−56250	50	1375960	50	β^-	3870	50	169	939620	50
102	68		Er			−60118	3	1379043	3	β^-	−314.4	1.8	169	935461	3
101	69		Tm			−59803.6	3.0	1377946.1	3.0	β^-	968.0	0.8	169	935798	3
100	70		Yb			−60771.7	2.9	1378131.8	2.9		*		169	934759	3
99	71		Lu	−		−57313	19	1373890	19	β^+	3459	19	169	938472	20
98	72		Hf	x		−56220#	200#	1372010#	200#	β^+	1100#	200#	169	939650#	210#
97	73		Ta	x		−50220#	200#	1365230#	200#	β^+	6000#	280#	169	946090#	210#
96	74		W	+α	♦	−48000	350	1362230	350	β^+	2220#	400#	169	948470	370
95	75		Re	+α		−38970#	400#	1352420#	400#	β^+	9030#	530#	169	958160#	430#
94	76		Os	−α		−33932	13	1346598	13	β^+	5040#	400#	169	963572	14
93	77		Ir	−α	♦	−23940	150	1335820	150	β^+	10000	150	169	974300	160
92	78		Pt	−α	♦	−17140	100	1328240	100	β^+	6790	110	169	981600	110
104	67	171	Ho	+		−54530	600	1382310	600	β^-	3200	600	170	941460	640
103	68		Er			−57728	3	1384724	3	β^-	1490.5	1.3	170	938026	3
102	69		Tm			−59218.7	3.0	1385432.5	3.0	β^-	96.4	1.0	170	936426	3
101	70		Yb			−59315.1	2.8	1384746.6	2.8		*		170	936323	3
100	71		Lu			−57836	3	1382485	3	β^+	1478.8	1.9	170	937910	3
99	72		Hf	x		−55430#	200#	1379300#	200#	β^+	2400#	200#	170	940490#	210#
98	73		Ta	x		−51740#	210#	1374820#	210#	β^+	3700#	280#	170	944460#	220#
97	74		W	x		−47160#	280#	1369460#	280#	β^+	4570#	350#	170	949370#	300#
96	75		Re	−		−41490#	340#	1363010#	340#	β^+	5670	200	170	955460#	370#
95	76		Os	+α		−34430#	310#	1355170#	310#	β^+	7060#	460#	170	963040#	330#
94	77		Ir	−α		−26260#	130#	1346210#	130#	β^+	8170#	340#	170	971810#	140#
93	78		Pt	−α		−17620#	310#	1336800#	310#	β^+	8630#	340#	170	981080#	340#
104	68	172	Er			−56493	5	1391560	5	β^-	891	5	171	939352	5
103	69		Tm			−57383	6	1391668	6	β^-	1880	6	171	938396	7
102	70		Yb			−59263.5	2.8	1392766.3	2.8		*		171	936378	3
101	71		Lu			−56744	3	1389465	3	β^+	2519.3	2.4	171	939082	4
100	72		Hf	−		−56390	50	1388330	50	β^+	350	50	171	939460	50
99	73		Ta	−		−51470	190	1382630	190	β^+	4920	180	171	944740	200
98	74		W	−		−48970#	270#	1379350#	270#	β^+	2500#	200#	171	947420#	290#
97	75		Re	+α		−41650#	310#	1371240#	310#	β^+	7330#	410#	171	955290#	330#
96	76		Os	+α		−37190#	200#	1366000#	200#	β^+	4460#	370#	171	960080#	210#
95	77		Ir	−α		−27350#	400#	1355370#	400#	β^+	9840#	450#	171	970640#	430#
94	78		Pt	−α		−21150	30	1348390	30	β^+	6200#	400#	171	977300	40
93	79		Au	−α		−9190#	370#	1335650#	370#	β^+	11960#	370#	171	990140#	400#
105	68	173	Er	x		−53660#	200#	1396800#	200#	β^-	2600#	200#	172	942390#	210#
104	69		Tm	p2n		−56262	5	1398618	5	β^-	1298	5	172	939601	6
103	70		Yb			−57559.8	2.8	1399133.9	2.8		*		172	938207	3
102	71		Lu			−56889.0	2.8	1397680.7	2.8	β^+	670.8	1.7	172	938927	3
101	72		Hf	x		−55280#	100#	1395290#	100#	β^+	1610#	100#	172	940650#	110#
100	73		Ta	−	♦	−51610#	230#	1390840#	230#	β^+	3670	200	172	944590#	240#
99	74		W	−	♦	−47610#	380#	1386060#	380#	β^+	4000	300	172	948880#	400#
98	75		Re	+α		−43720#	450#	1381380#	450#	β^+	3890#	590#	172	953060#	480#
97	76		Os	+α		−37450#	310#	1374330#	310#	β^+	6270#	550#	172	959790#	330#
96	77		Ir	−α		−30080#	230#	1366180#	230#	β^+	7370#	390#	172	967710#	250#
95	78		Pt	−α		−21890	110	1357200	110	β^+	8190#	250#	172	976500	120
94	79		Au	−α		−12670	100	1347200	100	β^+	9220	150	172	986400	110

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
106	68	174	Er	x		−52120#	300#	1403330#	300#	β^-	1760#	300#	173	944050#	320#
105	69		Tm	+		−53870	40	1404300	40	β^-	3080	40	173	942160	50
104	70		Yb			−56953.1	2.8	1406598.5	2.8	β^-	−1374.3	1.6	173	938858	3
103	71		Lu			−55578.7	2.8	1404441.8	2.8	β^-	272.2	2.3	173	940334	3
102	72		Hf			−55851	3	1403932	3		*		173	940042	4
101	73		Ta	−		−52010	80	1399300	80	β^+	3840	80	173	944170	90
100	74		W	x		−50150#	300#	1396670#	300#	β^+	1850#	310#	173	946160#	320#
99	75		Re	+α	♦	−44610#	350#	1390340#	350#	β^+	5550#	460#	173	952120#	370#
98	76		Os	+α	♦	−40700	350	1385650	350	β^+	3900#	280#	173	956310	370
97	77		Ir	+α		−30920#	400#	1375090#	400#	β^+	9780#	530#	173	966800#	430#
96	78		Pt	−α		−25324	14	1368710	14	β^+	5600#	400#	173	972814	15
95	79		Au	−α	♦	−14730	150	1357330	150	β^+	10600	150	173	984190	160
94	80		Hg	−α	♦	−7500#	140#	1349320#	140#	β^+	7230#	150#	173	991950#	150#
106	69	175	Tm	+		−52320	50	1410820	50	β^-	2390	50	174	943830	50
105	70		Yb			−54704.1	2.8	1412420.8	2.8	β^-	470.0	1.3	174	941273	3
104	71		Lu			−55174.1	2.6	1412108.5	2.6		*		174	940768.2	2.8
103	72		Hf			−54488	3	1410640	3	β^+	685.8	2.2	174	941504	4
102	73		Ta	x		−52490#	100#	1407860#	100#	β^+	2000#	100#	174	943650#	110#
101	74		W	x		−49580#	200#	1404170#	200#	β^+	2910#	220#	174	946770#	210#
100	75		Re	+α		−45280#	450#	1399080#	450#	β^+	4310#	490#	174	951390#	480#
99	76		Os	+α		−40020#	300#	1393050#	300#	β^+	5250#	540#	174	957030#	330#
98	77		Ir	−α		−33450#	350#	1385690#	350#	β^+	6580#	460#	174	964090#	380#
97	78		Pt	+α		−25830#	310#	1377280#	310#	β^+	7620#	470#	174	972280#	330#
96	79		Au	−α		−17050#	130#	1367730#	130#	β^+	8770#	340#	174	981690#	140#
95	80		Hg	−α		−8160#	320#	1358050#	320#	β^+	8900#	350#	174	991240#	340#
107	69	176	Tm	+	♦	−49300	200	1415870	200	β^-	4200	200	175	947080	210
106	70		Yb			−53496.9	2.9	1419285.0	2.9	β^-	−106.2	1.7	175	942569	3
105	71		Lu			−53390.8	2.6	1418396.5	2.6	β^-	1191.7	1.3	175	942682.7	2.8
104	72		Hf			−54582.4	2.9	1418805.8	2.9		*		175	941403	3
103	73		Ta	−		−51470	100	1414910	100	β^+	3110	100	175	944740	110
102	74		W	x		−50680#	200#	1413340#	200#	β^+	790#	220#	175	945590#	210#
101	75		Re	x		−45110#	200#	1406990#	200#	β^+	5570#	280#	175	951570#	210#
100	76		Os	+α		−41950#	200#	1403040#	200#	β^+	3170#	280#	175	954970#	210#
99	77		Ir	+α		−33990#	310#	1394300#	310#	β^+	7960#	360#	175	963510#	330#
98	78		Pt	x		−28880#	200#	1388410#	200#	β^+	5110#	360#	175	969000#	210#
97	79		Au	−α		−18380#	400#	1377130#	400#	β^+	10500#	450#	175	980270#	430#
96	80		Hg	−α		−11800	30	1369760	30	β^+	6580#	400#	175	987330	40
95	81		Tl	−α		640#	480#	1356540#	480#	β^+	12440#	480#	176	000690#	510#
108	69	177	Tm	x		−47800#	300#	1422450#	300#	β^-	3190#	300#	176	948680#	320#
107	70		Yb	−n		−50992	3	1424852	3	β^-	1399.2	2.0	176	945257	3
106	71		Lu			−52391.7	2.6	1425468.7	2.6	β^-	498.2	0.8	176	943755.2	2.8
105	72		Hf			−52889.9	2.5	1425184.6	2.6		*		176	943220.4	2.7
104	73		Ta	−		−51724	4	1423236	4	β^+	1166.0	3.0	176	944472	4
103	74		W	x		−49720#	300#	1420450#	300#	β^+	2000#	300#	176	946620#	320#
102	75		Re	x		−46320#	200#	1416270#	200#	β^+	3400#	360#	176	950270#	210#
101	76		Os	+α		−41850#	280#	1411020#	280#	β^+	4470#	340#	176	955070#	300#
100	77		Ir	+α		−36170#	450#	1404550#	450#	β^+	5680#	530#	176	961170#	480#
99	78		Pt	+α		−29390#	310#	1396990#	310#	β^+	6780#	550#	176	968450#	330#
98	79		Au	−α		−21230#	230#	1388050#	230#	β^+	8160#	390#	176	977210#	250#
97	80		Hg	−α		−12720	120	1378760	120	β^+	8500#	260#	176	986340	130
96	81		Tl	−α		−2900#	230#	1368160#	230#	β^+	9820#	260#	176	996880#	240#
108	70	178	Yb	−nn		−49701	10	1431632	10	β^-	645	10	177	946644	11
107	71		Lu			−50346	3	1431494	3	β^-	2099.1	2.1	177	945952	3
106	72		Hf			−52444.9	2.5	1432810.9	2.6		*		177	943698.1	2.7
105	73		Ta	IT		−50530	100	1430120	100	β^+	1910	100	177	945750	110
104	74		W	−		−50440	100	1429240	100	β^+	91.3	2.0	177	945850	110
103	75		Re	−		−45780	210	1423800	210	β^+	4660	180	177	950850	220
102	76		Os	+α		−43450	200	1420680	200	β^+	2330	290	177	953360	220
101	77		Ir	+α	♦	−37180	280	1413630	280	β^+	6270	200	177	960090	310
100	78		Pt	+α	♦	−32700	350	1408370	350	β^+	4480	200	177	964890	370
99	79		Au	+α		−22380#	400#	1397270#	400#	β^+	10320#	530#	177	975980#	430#
98	80		Hg	−α		−16321	15	1390428	15	β^+	6060#	400#	177	982479	16
97	81		Tl	−α	♦	−5120#	210#	1378450#	210#	β^+	11200#	210#	177	994500#	230#
96	82		Pb	−α	♦	2770#	210#	1369780#	210#	β^+	7890#	260#	178	002970#	220#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
109	70	179	Yb	x		−46710#	300#	1436720#	300#	β^-	2350#	300#	178 949850#	320#
108	71		Lu			−49067	6	1438287	6	β^-	1405	5	178 947324	6
107	72		Hf			−50472.6	2.5	1438909.9	2.6		*		178 945815.4	2.7
106	73		Ta	+nn		−50362	6	1438017	6	β^+	110	5	178 945934	6
105	74		W	+n		−49303	16	1436175	16	β^+	1060	16	178 947072	17
104	75		Re	−		−46590	50	1432680	50	β^+	2710	50	178 949980	60
103	76		Os	+α		−42910#	240#	1428220#	240#	β^+	3680#	240#	178 953930#	260#
102	77		Ir	+α		−38050#	400#	1422580#	400#	β^+	4860#	470#	178 959150#	430#
101	78		Pt	+α		−32320#	300#	1416060#	300#	β^+	5730#	500#	178 965310#	320#
100	79		Au	−α		−24940#	350#	1407900#	350#	β^+	7380#	460#	178 973230#	380#
99	80		Hg	+α		−16970#	310#	1399150#	310#	β^+	7970#	470#	178 981780#	330#
98	81		Tl	−α		−7770#	170#	1389170#	170#	β^+	9200#	360#	178 991660#	190#
97	82		Pb	−α		2040#	330#	1378580#	330#	β^+	9810#	380#	179 002190#	360#
109	71	180	Lu	+		−46690	70	1443980	70	β^-	3100	70	179 949880	80
108	72		Hf			−49789.5	2.6	1446298.2	2.6	β^-	−854.0	2.9	179 946548.8	2.7
107	73		Ta			−48936	3	1444662	3	β^-	708	4	179 947466	3
106	74		W			−49643	5	1444587	5		*		179 946706	5
105	75		Re	−		−45840	30	1440000	30	β^+	3800	30	179 950790	40
104	76		Os	+α		−44380#	180#	1437760#	180#	β^+	1470#	180#	179 952360#	190#
103	77		Ir	x		−37960#	300#	1430560#	300#	β^+	6420#	350#	179 959250#	320#
102	78		Pt	+α		−34270#	200#	1426080#	200#	β^+	3690#	360#	179 963210#	210#
101	79		Au	+α		−25710#	300#	1416750#	300#	β^+	8550#	360#	179 972400#	320#
100	80		Hg	−α		−20190#	200#	1410440#	200#	β^+	5520#	360#	179 978320#	210#
99	81		Tl	−α		−9140#	450#	1398600#	450#	β^+	11060#	490#	179 990190#	480#
98	82		Pb	−α		−1920#	60#	1390610#	60#	β^+	7210#	450#	179 997940#	70#
110	71	181	Lu	x		−44930#	300#	1450290#	300#	β^-	2490#	300#	180 951770#	320#
109	72		Hf			−47413.8	2.6	1451993.8	2.6	β^-	1027.4	2.7	180 949099.1	2.8
108	73		Ta			−48441.2	2.9	1452238.8	2.9		*		180 947996	3
107	74		W			−48253	5	1451269	5	β^+	188	5	180 948198	6
106	75		Re	4n		−46515	14	1448748	14	β^+	1739	15	180 950064	15
105	76		Os	IT		−43590#	220#	1445040#	220#	β^+	2930#	220#	180 953210#	240#
104	77		Ir	+α		−39520#	240#	1440180#	240#	β^+	4070	80	180 957580#	260#
103	78		Pt	+α		−34290#	280#	1434180#	280#	β^+	5220#	360#	180 963190#	300#
102	79		Au	+α		−27990#	450#	1427100#	450#	β^+	6300#	530#	180 969950#	480#
101	80		Hg	+α		−20670#	310#	1419000#	310#	β^+	7320#	550#	180 977810#	330#
100	81		Tl	−α		−12200#	380#	1409740#	380#	β^+	8470#	490#	180 986900#	410#
99	82		Pb	−α		−2930	130	1399680	130	β^+	9280#	400#	180 996860	140
110	72	182	Hf	−nn		−46060	7	1458711	7	β^-	373	7	181 950553	7
109	73		Ta			−46432.8	2.9	1458301.8	2.9	β^-	1813.6	1.8	181 950152	3
108	74		W			−48246.4	2.9	1459333.0	2.9		*		181 948205	3
107	75		Re	IT		−45450	100	1455750	100	β^+	2800	100	181 951210	110
106	76		Os			−44538	25	1454060	25	β^+	910	100	181 952186	27
105	77		Ir			−38930	140	1447670	140	β^+	5610	140	181 958210	150
104	78		Pt			−36080	200	1444040	200	β^+	2850	140	181 961270	220
103	79		Au	−	♦	−29230	280	1436400	280	β^+	6850	200	181 968620	310
102	80		Hg	−	♦	−24280	350	1430670	350	β^+	4950	200	181 973940	370
101	81		Tl	x		−13400#	400#	1419010#	400#	β^+	10880#	530#	181 985610#	430#
100	82		Pb	−α		−6820	17	1411648	17	β^+	6580#	400#	181 992679	18
111	72	183	Hf	+		−43290	30	1464010	30	β^-	2010	30	182 953530	30
110	73		Ta	−n		−45295.7	2.9	1465236.0	2.9	β^-	1070.1	1.8	182 951373	3
109	74		W			−46365.8	2.8	1465523.8	2.8		*		182 950224.2	3.0
108	75		Re	−		−45810	8	1464185	8	β^+	556	8	182 950821	9
107	76		Os	x		−43680#	100#	1461270#	100#	β^+	2130#	100#	182 953110#	110#
106	77		Ir	−		−40230#	140#	1457040#	140#	β^+	3450	100	182 956810#	150#
105	78		Pt	IT		−35650#	230#	1451680#	230#	β^+	4580#	270#	182 961730#	250#
104	79		Au	IT		−30160#	400#	1445410#	400#	β^+	5490#	460#	182 967620#	430#
103	80		Hg	+α		−23850#	300#	1438320#	300#	β^+	6310#	500#	182 974390#	320#
102	81		Tl	x		−16210#	400#	1429890#	400#	β^+	7650#	500#	182 982600#	430#
101	82		Pb	x		−7520#	310#	1420420#	310#	β^+	8690#	510#	182 991930#	330#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
112	72	184	Hf	+		−41500	40	1470290	40	β^-	1340	30	183 955450	40
111	73		Ta	+		−42840	26	1470852	26	β^-	2866	26	183 954009	28
110	74		W			−45706.2	2.8	1472935.5	2.8	β^-	−1483	4	183 950932.3	3.0
109	75		Re			−44224	5	1470670	5	β^-	31	4	183 952524	6
108	76		Os			−44254.8	3.0	1469919.3	3.0		*		183 952491	3
107	77		Ir	−		−39690	270	1464570	270	β^+	4560	270	183 957390	290
106	78		Pt	+α		−37360#	180#	1461460#	180#	β^+	2330#	320#	183 959890#	190#
105	79		Au	−α		−30230#	300#	1453550#	300#	β^+	7130#	350#	183 967540#	320#
104	80		Hg	+α		−26180#	200#	1448710#	200#	β^+	4050#	360#	183 971900#	210#
103	81		Tl	x		−16990#	300#	1438740#	300#	β^+	9190#	360#	183 981760#	320#
102	82		Pb	−α		−10990#	200#	1431960#	200#	β^+	6000#	360#	183 988200#	210#
112	73	185	Ta	+		−41397	14	1477480	14	β^-	1992	14	184 955559	15
111	74		W			−43388.6	2.8	1478689.2	2.8	β^-	433.0	0.9	184 953420.4	3.0
110	75		Re			−43821.7	2.8	1478339.9	2.8		*		184 952955	3
109	76		Os			−42808.9	2.8	1476544.8	2.9	β^+	1012.8	0.4	184 954043	3
108	77		Ir	x		−40440#	200#	1473390#	200#	β^+	2370#	200#	184 956590#	210#
107	78		Pt	−α		−36620#	230#	1468790#	230#	β^+	3820#	300#	184 960690#	250#
106	79		Au	−		−31910#	230#	1463300#	230#	β^+	4710	40	184 965740#	250#
105	80		Hg	+α		−26090#	280#	1456700#	280#	β^+	5820#	360#	184 971990#	300#
104	81		Tl	x		−19470#	400#	1449290#	400#	β^+	6620#	490#	184 979100#	430#
103	82		Pb	x		−11570#	310#	1440610#	310#	β^+	7900#	510#	184 987580#	330#
102	83		Bi	−α		−1780#	430#	1430040#	430#	β^+	9790#	530#	184 998090#	460#
113	73	186	Ta	+		−38610	60	1482760	60	β^-	3900	60	185 958550	60
112	74		W			−42511.6	2.9	1485883.5	2.9	β^-	−581.6	1.7	185 954362	3
111	75		Re			−41930.0	2.8	1484519.6	2.9	β^-	1069.5	0.9	185 954986	3
110	76		Os			−42999.5	2.9	1484806.7	2.9		*		185 953838	3
109	77		Ir	−		−39169	20	1480193	20	β^+	3831	20	185 957951	22
108	78		Pt			−37790	30	1478030	30	β^+	1380	40	185 959430	30
107	79		Au			−31750	140	1471210	140	β^+	6040	140	185 965920	150
106	80		Hg			−28450	200	1467130	200	β^+	3300	140	185 969460	220
105	81		Tl	−α	♦	−20910	290	1458810	290	β^+	7540	210	185 977550	310
104	82		Pb	−α	♦	−15380	350	1452500	350	β^+	5530	210	185 983480	370
103	83		Bi	−α		−3280#	450#	1439610#	450#	β^+	12100#	570#	185 996480#	480#
114	73	187	Ta	x		−36880#	300#	1489100#	300#	β^-	3030#	300#	186 960410#	320#
113	74		W			−39907.0	2.9	1491350.2	2.9	β^-	1311.2	1.3	186 957158	3
112	75		Re			−41218.2	2.8	1491879.0	2.8	β^-	2.663	0.019	186 955750.5	3.0
111	76		Os			−41220.8	2.8	1491099.4	2.8		*		186 955747.6	3.0
110	77		Ir	−		−39718	7	1488815	7	β^+	1502	6	186 957361	7
109	78		Pt	+		−36610#	160#	1484920#	160#	β^+	3110#	160#	186 960700#	170#
108	79		Au	−α		−33010#	150#	1480540#	150#	β^+	3600	40	186 964560#	160#
107	80		Hg	IT		−28150#	240#	1474890#	240#	β^+	4870#	280#	186 969790#	260#
106	81		Tl	x		−22200#	400#	1468160#	400#	β^+	5950#	470#	186 976170#	430#
105	82		Pb	x		−15030#	300#	1460220#	300#	β^+	7160#	500#	186 983860#	320#
104	83		Bi	IT		−6090#	400#	1450500#	400#	β^+	8940#	500#	186 993460#	430#
114	74	188	W	+		−38669	4	1498184	4	β^-	349.0	3.0	187 958487	4
113	75		Re	−n		−39018.4	2.8	1497750.6	2.8	β^-	2120.4	0.4	187 958112	3
112	76		Os			−41138.8	2.8	1499088.6	2.8		*		187 955835.7	3.0
111	77		Ir			−38329	7	1495497	7	β^+	2809	7	187 958852	8
110	78		Pt			−37823	6	1494208	6	β^+	507	7	187 959395	6
109	79		Au	−		−32520#	100#	1488130#	100#	β^+	5300#	100#	187 965090#	110#
108	80		Hg	+α		−30230#	180#	1485050#	180#	β^+	2300#	200#	187 967550#	190#
107	81		Tl	x		−22430#	220#	1476470#	220#	β^+	7800#	290#	187 975920#	240#
106	82		Pb	x		−17640#	200#	1470900#	200#	β^+	4790#	300#	187 981060#	210#
105	83		Bi	−α		−7290#	300#	1459760#	300#	β^+	10350#	360#	187 992170#	320#
115	74	189	W	+		−35480	200	1503060	200	β^-	2500	200	188 961910	210
114	75		Re	+p		−37979	9	1504782	9	β^-	1009	8	188 959228	9
113	76		Os			−38988.1	2.8	1505009.3	2.8		*		188 958145	3
112	77		Ir			−38456	13	1503695	13	β^+	532	13	188 958716	14
111	78		Pt			−36485	11	1500942	11	β^+	1971	14	188 960832	12
110	79		Au	−	♦	−33330	300	1497000	300	β^+	3160	300	188 964220	320
109	80		Hg	−	♦	−29130	360	1492020	360	β^+	4200	200	188 968730	390
108	81		Tl	+α	♦	−23950	410	1486060	410	β^+	5180	200	188 974290	440
107	82		Pb	x		−17810#	270#	1479140#	270#	β^+	6140#	490#	188 980880#	290#
106	83		Bi	−α		−9770#	400#	1470320#	400#	β^+	8040#	480#	188 989510#	430#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
116	74	190	W	+		−34290	160	1509940	160	β^-	1270	70	189	963190	170
115	75		Re	+		−35560	150	1510430	150	β^-	3150	150	189	961830	160
114	76		Os			−38708.4	2.8	1512800.9	2.8	β^-	−2000	200	189	958445	3
113	77		Ir	−		−36710	200	1510020	200	β^-	620	200	189	960590	210
112	78		Pt			−37325	6	1509853	6		*		189	959930	7
111	79		Au	−		−32883	16	1504629	16	β^+	4442	15	189	964698	17
110	80		Hg	+α		−31410#	150#	1502370#	150#	β^+	1470#	150#	189	966280#	160#
109	81		Tl	−		−24410#	430#	1494590#	430#	β^+	7000	400	189	973800#	460#
108	82		Pb	−α		−20330	200	1489720	200	β^+	4080#	470#	189	978180	220
107	83		Bi	−α	♦	−11630	290	1480240	290	β^+	8700	210	189	987520	310
106	84		Po	−α	♦	−5320	350	1473150	350	β^+	6310	210	189	994290	370
116	75	191	Re	+p		−34351	11	1517297	11	β^-	2045	10	190	963123	11
115	76		Os			−36395.7	2.8	1518559.5	2.8	β^-	313.7	1.1	190	960928	3
114	77		Ir			−36709.5	2.9	1518090.9	2.9		*		190	960591	3
113	78		Pt			−35691	5	1516290	5	β^+	1019	4	190	961684	5
112	79		Au	−		−33860	50	1513680	50	β^+	1830	50	190	963650	50
111	80		Hg	−		−30680	90	1509720	90	β^+	3180	70	190	967060	90
110	81		Tl	+α	♦	−25840	220	1504090	220	β^+	4840	200	190	972260	230
109	82		Pb	x		−20310#	210#	1497780#	210#	β^+	5530#	310#	190	978200#	230#
108	83		Bi	−α		−12990#	400#	1489680#	400#	β^+	7320#	450#	190	986050#	430#
107	84		Po	−α		−5140#	300#	1481040#	300#	β^+	7850#	500#	190	994480#	320#
117	75	192	Re	x		−31710#	200#	1522730#	200#	β^-	4170#	200#	191	965960#	210#
116	76		Os			−35882	4	1526118	4	β^-	−1046.2	2.3	191	961479	4
115	77		Ir			−34836.2	2.9	1524289.0	2.9	β^-	1459.7	1.9	191	962602	3
114	78		Pt			−36296	3	1524966	3		*		191	961035	4
113	79		Au	−		−32780	16	1520668	16	β^+	3516	16	191	964810	17
112	80		Hg	+	♦	−32330#	720#	1519430#	720#	β^+	450#	720#	191	965290#	780#
111	81		Tl	IT		−25950#	690#	1512270#	690#	β^+	6380	200	191	972140#	750#
110	82		Pb	x		−22580#	180#	1508120#	180#	β^+	3370#	720#	191	975760#	190#
109	83		Bi	−α		−13630#	220#	1498390#	220#	β^+	8950#	290#	191	985370#	240#
108	84		Po	−α		−7900#	200#	1491870#	200#	β^+	5730#	300#	191	991520#	210#
118	75	193	Re	x		−30300#	200#	1529390#	200#	β^-	3100#	200#	192	967470#	210#
117	76		Os			−33396	4	1531703	4	β^-	1140.6	2.4	192	964148	4
116	77		Ir			−34536.8	2.9	1532060.9	2.9		*		192	962923	3
115	78		Pt			−34480.1	2.9	1531221.9	2.9	β^+	56.64	0.30	192	962984	3
114	79		Au	4n		−33412	9	1529371	9	β^+	1069	9	192	964131	10
113	80		Hg	−		−31071	19	1526248	19	β^+	2340	17	192	966644	21
112	81		Tl	+α		−27430#	170#	1521830#	170#	β^+	3640#	170#	192	970550#	180#
111	82		Pb	x		−22280#	190#	1515890#	190#	β^+	5150#	250#	192	976080#	200#
110	83		Bi	−α	♦	−15220	410	1508050	410	β^+	7060#	450#	192	983660	440
109	84		Po	−α		−8290#	280#	1500340#	280#	β^+	6930#	500#	192	991100#	300#
118	76	194	Os	+		−32436	4	1538813	4	β^-	96.6	2.0	193	965179	4
117	77		Ir			−32532.3	2.9	1538127.7	2.9	β^-	2246.9	1.6	193	965075	3
116	78		Pt			−34779.2	2.9	1539592.2	3.0		*		193	962663	3
115	79		Au	−		−32287	12	1536318	12	β^+	2492	11	193	965338	12
114	80		Hg	−		−32247	23	1535496	23	β^+	40	20	193	965381	25
113	81		Tl	+α		−26970#	170#	1529430#	170#	β^+	5280#	170#	193	971050#	180#
112	82		Pb	x		−24250#	150#	1525930#	150#	β^+	2720#	230#	193	973970#	160#
111	83		Bi	−α		−16070#	430#	1516970#	430#	β^+	8180	400	193	982750#	460#
110	84		Po	−α		−10910	200	1511030	200	β^+	5150#	470#	193	988280	220
109	85		At	−α	♦	−1700#	350#	1501040#	350#	β^+	9210#	290#	193	998170#	380#
119	76	195	Os	+		−29690	500	1544140	500	β^-	2000	500	194	968120	540
118	77		Ir	−n		−31692.8	2.9	1545359.6	2.9	β^-	1120.1	1.6	194	965976	3
117	78		Pt			−32812.9	2.9	1545697.3	3.0		*		194	964774	3
116	79		Au	−		−32586	3	1544688	3	β^+	226.8	1.0	194	965017	3
115	80		Hg	−		−31080	50	1542400	50	β^+	1510	50	194	966640	50
114	81		Tl	+α		−28270#	100#	1538810#	100#	β^+	2800#	110#	194	969650#	110#
113	82		Pb	+	♦	−22430	590	1532190	590	β^+	5840#	600#	194	975920	640
112	83		Bi	−α	♦	−17580	220	1526550	220	β^+	4850	550	194	981130	230
111	84		Po	−α		−11140#	220#	1519330#	220#	β^+	6450#	310#	194	988050#	240#
110	85		At	−α		−3170#	450#	1510570#	450#	β^+	7970#	500#	194	996600#	480#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
120	76	196	Os	+pp		−28300	40	1550820	40	β^-	1160	60	195 969620	40
119	77		Ir	+		−29450	40	1551190	40	β^-	3210	40	195 968380	40
118	78		Pt			−32663.5	2.9	1553619.2	3.0	β^-	−1505.8	2.9	195 964934	3
117	79		Au			−31158	4	1551331	4	β^-	686	3	195 966551	4
116	80		Hg			−31844	4	1551235	4		*		195 965814	4
115	81		Tl	+α		−27470#	130#	1546080#	130#	β^+	4380#	130#	195 970510#	140#
114	82		Pb	x		−25420#	140#	1543250#	140#	β^+	2050#	190#	195 972710#	150#
113	83		Bi	+α		−18060	690	1535110	690	β^+	7360#	710#	195 980610	740
112	84		Po	−α		−13500#	180#	1529760#	180#	β^+	4570#	720#	195 985510#	190#
111	85		At	−α		−4000#	230#	1519480#	230#	β^+	9500#	290#	195 995700#	250#
120	77	197	Ir	+p		−28284	20	1558093	20	β^-	2155	20	196 969636	22
119	78		Pt			−30438.6	3.0	1559465.6	3.0	β^-	718.9	0.6	196 967323	3
118	79		Au			−31157.5	3.0	1559402.2	3.0		*		196 966551	3
117	80		Hg			−30558	4	1558020	4	β^+	600	3	196 967195	5
116	81		Tl	+α		−28375	28	1555055	28	β^+	2183	28	196 969540	30
115	82		Pb	x		−24800#	100#	1550690#	100#	β^+	3580#	110#	196 973380#	110#
114	83		Bi	+α		−19620	160	1544740	160	β^+	5180#	190#	196 978940	170
113	84		Po	−α		−13450#	190#	1537780#	190#	β^+	6180#	250#	196 985570#	210#
112	85		At	−α	♦	−5690	420	1529240	420	β^+	7750#	460#	196 993890	450
121	77	198	Ir	x		−25820#	200#	1563700#	200#	β^-	4100#	200#	197 972280#	210#
120	78		Pt	−n		−29924	4	1567022	4	β^-	−325	3	197 967875	5
119	79		Au			−29598.4	3.0	1565914.4	3.0	β^-	1372.4	0.5	197 968225	3
118	80		Hg			−30970.8	3.0	1566504.4	3.0		*		197 966752	3
117	81		Tl	−		−27510	80	1562260	80	β^+	3460	80	197 970470	90
116	82		Pb	x		−26100#	90#	1560070#	90#	β^+	1410#	120#	197 971980#	100#
115	83		Bi	+α		−19540	140	1552730	140	β^+	6560#	170#	197 979020	150
114	84		Po	−α		−15510#	150#	1547920#	150#	β^+	4030#	200#	197 983350#	160#
113	85		At	−α		−6750#	430#	1538370#	430#	β^+	8760	400	197 992760#	460#
112	86		Rn	−α		−1140	200	1531980	200	β^+	5600#	470#	197 998770	220
121	78	199	Pt	−n		−27409	4	1572578	4	β^-	1702	3	198 970576	5
120	79		Au			−29110.9	3.0	1573498.3	3.0	β^-	452.6	0.7	198 968748	3
119	80		Hg			−29563.5	3.0	1573168.5	3.0		*		198 968262	3
118	81		Tl			−28120	100	1570940	100	β^+	1440	100	198 969810	110
117	82		Pb			−25240	70	1567280	70	β^+	2880	90	198 972910	70
116	83		Bi	+α		−20890	90	1562150	90	β^+	4340	100	198 977570	100
115	84		Po	−α	♦	−13930	590	1554410	590	β^+	6960	600	198 985040	640
114	85		At	−α	♦	−8380	220	1548070	220	β^+	5560	550	198 991010	240
113	86		Rn	−α		−1580#	230#	1540490#	230#	β^+	6800#	320#	198 998310#	240#
122	78	200	Pt	−nn		−26619	20	1579860	20	β^-	660	60	199 971423	22
121	79		Au	+		−27280	50	1579730	50	β^-	2240	50	199 970720	60
120	80		Hg			−29520.4	3.0	1581196.7	3.0		*		199 968309	3
119	81		Tl	−		−27064	6	1577958	6	β^+	2456	6	199 970945	7
118	82		Pb	4n		−26254	13	1576366	13	β^+	810	14	199 971815	14
117	83		Bi	+α		−20360	90	1569690	90	β^+	5890	90	199 978140	90
116	84		Po	−α		−17010#	140#	1565560#	140#	β^+	3350#	170#	199 981740#	150#
115	85		At	+α		−9040	690	1556810	690	β^+	7970#	710#	199 990290	740
114	86		Rn	−α		−4030#	180#	1551010#	180#	β^+	5010#	720#	199 995670#	190#
123	78	201	Pt	+		−23740	50	1585060	50	β^-	2660	50	200 974510	60
122	79		Au	+p		−26404	15	1586934	15	β^-	1275	15	200 971654	16
121	80		Hg			−27679.3	3.0	1587426.9	3.0		*		200 970285	3
120	81		Tl	+nn		−27197	15	1586162	15	β^+	483	15	200 970803	16
119	82		Pb	+α		−25290	30	1583480	30	β^+	1900	30	200 972850	30
118	83		Bi	+α		−21450	27	1578850	27	β^+	3840	40	200 976973	29
117	84		Po	−α		−16570#	100#	1573190#	100#	β^+	4880#	110#	200 982210#	110#
116	85		At	+α		−10720	160	1566560	160	β^+	5850#	190#	200 988490	170
115	86		Rn	−α		−4160#	200#	1559210#	200#	β^+	6560#	250#	200 995540#	210#
114	87		Fr	−α	♦	4270	420	1550000	420	β^+	8430#	460#	201 004590	450

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
123	79	202	Au	+		−24420	170	1593020	170	β^-	2950	170	201 973790	180
122	80		Hg			−27362.3	3.0	1595181.2	3.0		*		201 970625	3
121	81		Tl			−25998	15	1593034	15	β^+	1364	15	201 972090	16
120	82		Pb			−25948	10	1592202	10	β^+	50	15	201 972143	11
119	83		Bi	+α		−20790	50	1586260	50	β^+	5160	50	201 977680	50
118	84		Po	−α		−17980#	90#	1582660#	90#	β^+	2820#	110#	201 980700#	100#
117	85		At	+α		−10760	140	1574670	140	β^+	7210#	170#	201 988450	150
116	86		Rn	−α		−6310#	150#	1569440#	150#	β^+	4450#	200#	201 993220#	160#
115	87		Fr	−α		3070#	430#	1559280#	430#	β^+	9380	400	202 003290#	460#
124	79	203	Au	+p		−23145	15	1599817	15	β^-	2139	15	202 975153	16
123	80		Hg			−25284	3	1601174	3	β^-	491.9	1.2	202 972857	3
122	81		Tl			−25775.7	3.0	1600883.6	3.0		*		202 972329	3
121	82		Pb			−24801	7	1599126	7	β^+	975	6	202 973375	8
120	83		Bi			−21548	20	1595091	20	β^+	3253	21	202 976868	22
119	84		Po			−17310	60	1590080	60	β^+	4230	60	202 981410	70
118	85		At			−12260	90	1584230	90	β^+	5060	100	202 986840	100
117	86		Rn	−α	♦	−4880	590	1576070	590	β^+	7380	600	202 994760	640
116	87		Fr	−α	♦	1330	230	1569090	230	β^+	6200	550	203 001420	250
125	79	204	Au	+	♦	−20210	300	1604950	300	β^-	4500	300	203 978310	320
124	80		Hg			−24707	3	1608669	3	β^-	−347.3	1.5	203 973475	3
123	81		Tl			−24360.2	3.0	1607539.5	3.0	β^-	763.70	0.18	203 973848	3
122	82		Pb			−25123.9	3.0	1607520.8	3.0		*		203 973028	3
121	83		Bi	+α		−20686	22	1602301	22	β^+	4438	22	203 977792	23
120	84		Po	−α		−18344	13	1599176	13	β^+	2342	25	203 980307	14
119	85		At	+α		−11870	70	1591920	70	β^+	6480	70	203 987260	80
118	86		Rn	−α		−8040#	140#	1587310#	140#	β^+	3820#	160#	203 991370#	150#
117	87		Fr	IT		550	690	1577930	690	β^+	8600#	710#	204 000590	740
116	88		Ra	−α		6050#	270#	1571660#	270#	β^+	5490#	740#	204 006490#	290#
125	80	205	Hg			−22304	5	1614337	5	β^-	1531	4	204 976056	5
124	81		Tl			−23835.3	3.0	1615085.8	3.0		*		204 974412	3
123	82		Pb			−23784.1	3.0	1614252.3	3.0	β^+	51.2	0.5	204 974467	3
122	83		Bi			−21076	8	1610762	8	β^+	2708	7	204 977374	8
121	84		Po	+α		−17545	29	1606448	29	β^+	3531	28	204 981170	30
120	85		At	+α		−13005	27	1601126	27	β^+	4540	40	204 986038	29
119	86		Rn	−α		−7760#	110#	1595100#	110#	β^+	5240#	120#	204 991670#	120#
118	87		Fr			−1240	150	1587800	150	β^+	6520#	190#	204 998670	160
117	88		Ra	−α		5770#	210#	1580000#	210#	β^+	7010#	250#	205 006200#	220#
126	80	206	Hg	+α		−20959	21	1621064	21	β^-	1308	20	205 977499	22
125	81		Tl			−22267.6	3.0	1621590	3	β^-	1533.2	0.7	205 976095	3
124	82		Pb			−23800.8	2.9	1622340.4	3.0		*		205 974449	3
123	83		Bi	−		−20043	8	1617801	8	β^+	3758	8	205 978483	9
122	84		Po			−18197	10	1615172	10	β^+	1846	12	205 980465	11
121	85		At			−12480	50	1608670	50	β^+	5720	50	205 986600	50
120	86		Rn	−α		−9170#	90#	1604580#	90#	β^+	3310#	110#	205 990160#	100#
119	87		Fr	IT		−1410	140	1596040	140	β^+	7750#	170#	205 998480	150
118	88		Ra	−α		3530#	150#	1590320#	150#	β^+	4940#	200#	206 003790#	160#
127	80	207	Hg	+		−16270	150	1624450	150	β^-	4770	150	206 982530	160
126	81		Tl			−21044	6	1628438	6	β^-	1423	5	206 977408	6
125	82		Pb			−22467.3	2.9	1629078.2	3.0		*		206 975880	3
124	83		Bi			−20068	4	1625897	4	β^+	2398.8	2.1	206 978456	4
123	84		Po			−17160	7	1622206	7	β^+	2909	6	206 981578	8
122	85		At			−13250	20	1617514	20	β^+	3910	21	206 985775	21
121	86		Rn			−8640	60	1612120	60	β^+	4610	60	206 990730	70
120	87		Fr			−2930	80	1605630	80	β^+	5710	100	206 996860	80
119	88		Ra	−α	♦	4820	590	1597100	590	β^+	7750	600	207 005180	640
127	81	208	Tl	+α		−16762.8	3.0	1632227.4	3.0	β^-	5000.9	1.7	207 982004	3
126	82		Pb			−21763.8	2.9	1636446.0	3.0		*		207 976636	3
125	83		Bi	+n		−18884	4	1632784	4	β^+	2879.7	2.0	207 979727	4
124	84		Po	−α		−17484	3	1630601	3	β^+	1400.6	2.4	207 981231	3
123	85		At	+α		−12510	22	1624845	22	β^+	4973	22	207 986570	23
122	86		Rn	−α		−9659	14	1621212	14	β^+	2851	25	207 989631	14
121	87		Fr			−2670	50	1613440	50	β^+	6990	50	207 997130	50
120	88		Ra	−α		1660#	140#	1608330#	140#	β^+	4330#	150#	208 001780#	150#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
128	81	209	Tl	+α		−13648	10	1637184	10	β⁻	3980	10	208	985348	10
127	82		Pb			−17628	3	1640382	3	β⁻	644.1	1.1	208	981075	3
126	83		Bi			−18273	3	1640244	3		*		208	980384	3
125	84		Po	−α		−16380	3	1637569	3	β⁺	1892.6	1.6	208	982415	3
124	85		At			−12893	8	1633300	8	β⁺	3486	7	208	986158	8
123	86		Rn	−		−8964	29	1628589	29	β⁺	3929	28	208	990380	30
122	87		Fr			−3803	27	1622645	27	β⁺	5160	40	208	995917	29
121	88		Ra	−α		1810#	130#	1616250#	130#	β⁺	5610#	130#	209	001940#	130#
120	89		Ac	−α		8920	160	1608360	160	β⁺	7110#	200#	209	009570	170
129	81	210	Tl	+α		−9258	12	1640866	12	β⁻	5484	12	209	990061	13
128	82		Pb			−14742	3	1645567	3	β⁻	63.5	0.5	209	984174	3
127	83		Bi			−14806	3	1644848	3	β⁻	1162.7	0.8	209	984105	3
126	84		Po			−15968.5	2.9	1645228.6	3.0		*		209	982857	3
125	85		At	−α		−11987	8	1640465	8	β⁺	3981	8	209	987131	9
124	86		Rn	−α		−9613	10	1637309	10	β⁺	2374	12	209	989679	11
123	87		Fr			−3351	20	1630264	20	β⁺	6262	23	209	996402	22
122	88		Ra	−α		420#	90#	1625720#	90#	β⁺	3770#	100#	210	000450#	100#
121	89		Ac	−α		8620	150	1616730	150	β⁺	8210#	180#	210	009250	160
129	82	211	Pb			−10496.4	2.9	1649392.5	2.9	β⁻	1373	6	210	988732	3
128	83		Bi			−11869	6	1649983	6	β⁻	579	6	210	987258	6
127	84		Po	−α		−12447.9	3.0	1649779.3	3.0		*		210	986637	3
126	85		At	−α		−11661	4	1648210	4	β⁺	786.7	2.5	210	987481	4
125	86		Rn	−α		−8770	7	1644536	7	β⁺	2891	7	210	990585	8
124	87		Fr			−4165	20	1639149	20	β⁺	4605	20	210	995529	21
123	88		Ra	−α		830	70	1633370	70	β⁺	5000	60	211	000890	70
122	89		Ac	−α		7120	90	1626300	90	β⁺	6290	110	211	007640	100
130	82	212	Pb			−7557.1	2.8	1654524.6	2.8	β⁻	573.7	2.0	211	991887.1	3.0
129	83		Bi			−8130.8	3.0	1654315.9	3.0	β⁻	2254.0	1.7	211	991271	3
128	84		Po			−10384.7	2.9	1655787.5	3.0	β⁻	−1754.5	2.9	211	988852	3
127	85		At	−α		−8630	4	1653251	4	β⁻	43	4	211	990735	4
126	86		Rn	−α		−8674	4	1652512	4		*		211	990689	4
125	87		Fr			−3556	21	1646612	21	β⁺	5117	22	211	996182	23
124	88		Ra	−α		−202	14	1642475	14	β⁺	3354	25	211	999783	15
123	89		Ac	−α		7270	70	1634220	70	β⁺	7480	70	212	007810	80
122	90		Th	−α		12030#	140#	1628680#	140#	β⁺	4760#	160#	212	012920#	150#
131	82	213	Pb	+		−3170#	100#	1658210#	100#	β⁻	2070#	100#	212	996600#	110#
130	83		Bi			−5241	8	1659497	8	β⁻	1426	7	212	994374	8
129	84		Po			−6667	4	1660141	4		*		212	992843	4
128	85		At	−α		−6594	6	1659285	6	β⁺	73	5	212	992922	6
127	86		Rn	−α		−5712	7	1657621	7	β⁺	882	8	212	993868	8
126	87		Fr			−3563	8	1654691	8	β⁺	2148	10	212	996174	9
125	88		Ra	−α		320	30	1650025	30	β⁺	3883	29	213	000340	30
124	89		Ac	−α		6130	60	1643440	60	β⁺	5810	60	213	006580	60
123	90		Th	−α		12070#	130#	1636710#	130#	β⁺	5950#	150#	213	012960#	140#
132	82	214	Pb			−189.0	2.6	1663299.1	2.6	β⁻	1023	11	213	999797.1	2.8
131	83		Bi			−1212	11	1663540	11	β⁻	3272	11	213	998699	12
130	84		Po			−4484	3	1666029	3	β⁻	−1090	4	213	995186	3
129	85		At	−α		−3394	5	1664157	5	β⁻	942	10	213	996357	5
128	86		Rn	−α		−4335	10	1664316	10		*		213	995346	10
127	87		Fr	−α		−975	9	1660173	9	β⁺	3361	13	213	998954	10
126	88		Ra	−α		85	11	1658331	11	β⁺	1059	14	214	000091	12
125	89		Ac	−α		6420	50	1651210	50	β⁺	6340	50	214	006900	60
124	90		Th	−α		10670#	90#	1646190#	90#	β⁺	4240#	110#	214	011450#	100#
132	83	215	Bi	+α		1710	100	1668690	100	β⁻	2250	100	215	001830	100
131	84		Po			−545.1	2.8	1670161.8	2.8	β⁻	721	7	214	999415	3
130	85		At	−α		−1266	7	1670100	7		*		214	998641	8
129	86		Rn	−α		−1184	8	1669236	8	β⁺	82	10	214	998729	9
128	87		Fr	−α		304	8	1666966	8	β⁺	1488	10	215	000326	8
127	88		Ra	−α		2519	8	1663968	8	β⁺	2215	10	215	002704	9
126	89		Ac	−α		6010	50	1659700	50	β⁺	3490	50	215	006450	60
125	90		Th	−α		10920	70	1654000	70	β⁺	4910	80	215	011730	70
124	91		Pa	−α		17710	110	1646430	110	β⁺	6790	120	215	019010	110

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
133	83	216	Bi	+		5770#	100#	1672700#	100#	β^-	4000#	100#	216 006200#	110#
132	84		Po			1774.3	2.8	1675913.7	2.8	β^-	−469	4	216 001904.8	3.0
131	85		At			2243	4	1674662	4	β^-	2003	8	216 002408	5
130	86		Rn	−α		240	8	1675883	8		*		216 000258	8
129	87		Fr	−α		2970	13	1672371	13	β^+	2730	14	216 003188	14
128	88		Ra	−α		3277	9	1671282	9	β^+	307	15	216 003518	10
127	89		Ac	−α		8112	23	1665664	23	β^+	4835	25	216 008709	25
126	90		Th	−α		10294	16	1662700	16	β^+	2182	28	216 011051	17
125	91		Pa	−α		17710	90	1654500	90	β^+	7420	90	216 019020	90
133	84	217	Po	−α		5910#	100#	1679850#	100#	β^-	1530#	100#	217 006350#	110#
132	85		At			4386	8	1680591	8	β^-	740	8	217 004709	8
131	86		Rn	−α		3647	5	1680548	5		*		217 003915	5
130	87		Fr	−α		4301	7	1679112	7	β^+	654	8	217 004617	8
129	88		Ra	−α		5874	10	1676756	10	β^+	1573	11	217 006306	10
128	89		Ac	−α		8693	13	1673155	13	β^+	2819	16	217 009332	14
127	90		Th	−α		12170	30	1668900	30	β^+	3480	30	217 013060	30
126	91		Pa	−α		17040	80	1663250	80	β^+	4870	80	217 018290	80
134	84	218	Po			8350.6	2.6	1685480.1	2.6	β^-	264	12	218 008964.8	2.8
133	85		At	−α		8087	12	1684962	12	β^-	2883	12	218 008681	13
132	86		Rn			5204	4	1687062	4	β^-	−1842	5	218 005586	4
131	87		Fr	−α		7046	5	1684438	5	β^-	410	12	218 007564	6
130	88		Ra	−α		6636	11	1684066	12		*		218 007124	12
129	89		Ac	−α		10830	50	1679090	50	β^+	4190	50	218 011620	50
128	90		Th	−α		12358	14	1676778	14	β^+	1530	50	218 013267	15
127	91		Pa	−α		18640	70	1669710	70	β^+	6290	70	218 020010	80
126	92		U	−α		21880#	100#	1665690#	100#	β^+	3230#	120#	218 023490#	100#
134	85	219	At	+α		10520	80	1690600	80	β^-	1700	80	219 011300	90
133	86		Rn			8825.9	2.8	1691511.4	2.8	β^-	218	7	219 009475	3
132	87		Fr	−α		8608	7	1690947	7		*		219 009241	8
131	88		Ra	−α		9371	12	1689401	12	β^+	764	13	219 010061	12
130	89		Ac	−α		11560	50	1686430	50	β^+	2180	50	219 012410	50
129	90		Th	−α		14460	50	1682750	50	β^+	2900	70	219 015520	50
128	91		Pa	−α		18520	70	1677910	70	β^+	4060	90	219 019880	80
127	92		U	−α		23250#	210#	1672400#	210#	β^+	4730#	220#	219 024960#	230#
135	85	220	At	−α		14250#	100#	1694940#	100#	β^-	3650#	100#	220 015300#	110#
134	86		Rn			10603.9	2.8	1697804.7	2.8	β^-	−865	4	220 011383.8	3.0
133	87		Fr			11469	5	1696157	5	β^-	1209	11	220 012313	5
132	88		Ra	−α		10260	10	1696584	10		*		220 011014	11
131	89		Ac	−α		13740	50	1692320	50	β^+	3480	50	220 014750	60
130	90		Th	−α		14655	22	1690624	22	β^+	910	60	220 015733	24
129	91		Pa	−α		20370	60	1684130	60	β^+	5710	60	220 021860	60
128	92		U	−α		23020#	300#	1680700#	300#	β^+	2650#	310#	220 024710#	320#
135	86	221	Rn	−α		14490#	100#	1701990#	100#	β^-	1220#	100#	221 015550#	110#
134	87		Fr			13269	8	1702428	8	β^-	312	9	221 014245	8
133	88		Ra	−α		12957	7	1701958	7		*		221 013910	8
132	89		Ac	−α		14510	50	1699620	50	β^+	1550	50	221 015580	50
131	90		Th	−α		16926	10	1696424	10	β^+	2420	50	221 018171	11
130	91		Pa	−α		20370	50	1692200	50	β^+	3440	50	221 021860	60
129	92		U	−α		24540#	200#	1687240#	200#	β^+	4180#	210#	221 026350#	220#
136	86	222	Rn			16365.9	2.5	1708185.4	2.6	β^-	25	21	222 017569.5	2.7
135	87		Fr			16341	21	1707428	21	β^-	2032	21	222 017543	22
134	88		Ra			14309	5	1708678	5		*		222 015361	5
133	89		Ac	−α		16599	21	1705605	21	β^+	2290	21	222 017820	23
132	90		Th	−α		17190	13	1704232	13	β^+	591	24	222 018454	14
131	91		Pa	−α		22050#	100#	1698590#	100#	β^+	4860#	100#	222 023670#	110#
130	92		U	−α		24280#	100#	1695570#	100#	β^+	2230#	140#	222 026070#	110#
136	87	223	Fr			18379.2	2.7	1713461.0	2.7	β^-	1149.1	0.9	223 019730.9	2.9
135	88		Ra			17230.1	2.8	1713827.8	2.8		*		223 018497	3
134	89		Ac	−α		17816	7	1712460	7	β^+	586	7	223 019126	8
133	90		Th	−α		19363	12	1710130	12	β^+	1547	14	223 020787	13
132	91		Pa	−α		22320	70	1706390	70	β^+	2960	70	223 023960	80
131	92		U	−α		25820	70	1702100	70	β^+	3500	100	223 027720	80

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
137	87	224	Fr			21640	50	1718270	50	β^-	2820	50	224 023230	50
136	88		Ra			18817.7	2.8	1720311.5	2.8	β^-	−1403	4	224 020201.6	3.0
135	89		Ac			20221	5	1718126	5	β^-	232	13	224 021708	5
134	90		Th	−α		19989	12	1717576	12		*		224 021459	13
133	91		Pa	−α		23860	50	1712920	50	β^+	3870	50	224 025620	60
132	92		U	−α		25700	25	1710300	25	β^+	1840	60	224 027590	27
138	87	225	Fr			23851	10	1724131	10	β^-	1866	10	225 025606	11
137	88		Ra			21986	3	1725215	3	β^-	357	7	225 023603	3
136	89		Ac			21629	8	1724789	8		*		225 023220	8
135	90		Th	−α		22304	7	1723332	7	β^+	675	10	225 023944	8
134	91		Pa	−α		24330	70	1720530	70	β^+	2020	70	225 026110	80
133	92		U	−α		27370	50	1716700	50	β^+	3050	90	225 029380	50
132	93		Np	−α		31580	70	1711710	70	β^+	4210	90	225 033900	80
139	87	226	Fr			27300	80	1728760	80	β^-	3630	80	226 029300	90
138	88		Ra			23661.4	2.5	1731610.5	2.6	β^-	−640	3	226 025401.5	2.7
137	89		Ac			24302	4	1730188	4	β^-	1116	5	226 026089	4
136	90		Th			23185	5	1730522	5		*		226 024891	5
135	91		Pa	−α		26011	23	1726914	23	β^+	2825	24	226 027924	25
134	92		U	−α		27321	20	1724821	20	β^+	1310	30	226 029330	21
133	93		Np	−α		32670#	110#	1718690#	110#	β^+	5350#	110#	226 035080#	120#
140	87	227	Fr			29660	90	1734470	90	β^-	2490	90	227 031840	100
139	88		Ra			27171.4	2.5	1736171.8	2.6	β^-	1325.1	2.4	227 029169.7	2.7
138	89		Ac			25846.3	2.7	1736714.5	2.7	β^-	44.8	0.8	227 027747.2	2.9
137	90		Th			25801.5	2.8	1735977.0	2.8		*		227 027699.0	3.0
136	91		Pa	−α		26821	8	1734175	8	β^+	1019	8	227 028793	8
135	92		U	−α		28999	19	1731215	19	β^+	2178	20	227 031132	20
134	93		Np	−α		32560	70	1726870	70	β^+	3570	70	227 034960	80
141	87	228	Fr		♦	32400	980	1739800	980	β^-	3460	980	228 034780	1060
140	88		Ra	+α		28935.2	2.5	1742479.3	2.5	β^-	45.9	0.9	228 031063.2	2.7
139	89		Ac	−		28889.3	2.7	1741742.8	2.7	β^-	2127	3	228 031014.0	2.9
138	90		Th			26762.7	2.8	1743087.1	2.8		*		228 028731.0	3.0
137	91		Pa			28874	5	1740193	5	β^+	2111	5	228 030998	6
136	92		U	−α		29217	16	1739068	16	β^+	343	16	228 031366	17
135	93		Np	x		33700#	200#	1733800#	200#	β^+	4480#	200#	228 036180#	210#
141	88	229	Ra	+		32430	60	1747050	60	β^-	1760	40	229 034820	70
140	89		Ac	+		30670	50	1748030	50	β^-	1100	50	229 032930	50
139	90		Th			29579	3	1748342	3		*		229 031754	3
138	91		Pa	−α		29895	9	1747244	9	β^+	316	9	229 032093	10
137	92		U	−α		31204	8	1745152	8	β^+	1309	11	229 033499	9
136	93		Np	−α		33760	90	1741810	90	β^+	2560	90	229 036250	90
142	88	230	Ra	−4n		34540	30	1753010	30	β^-	990	110	230 037080	40
141	89		Ac	+		33560	100	1753220	100	β^-	2700	100	230 036020	110
140	90		Th			30856.3	2.0	1755136.1	2.1	β^-	−1309.8	2.8	230 033125.7	2.2
139	91		Pa			32166	3	1753044	3	β^-	563	5	230 034532	4
138	92		U	−α		31603	5	1752825	5		*		230 033927	5
137	93		Np	−α		35210	60	1748430	60	β^+	3610	60	230 037800	60
136	94		Pu	−α		36921	25	1745942	25	β^+	1710	60	230 039636	27
142	89	231	Ac	+		35910	100	1758940	100	β^-	2100	100	231 038550	110
141	90		Th			33809.6	2.1	1760254.1	2.1	β^-	389.5	1.7	231 036296.1	2.2
140	91		Pa			33420.1	2.6	1759861.3	2.6		*		231 035878.0	2.8
139	92		U	−α		33780	50	1758720	50	β^+	360	50	231 036260	50
138	93		Np	−α		35610	50	1756100	50	β^+	1840	70	231 038230	50
137	94		Pu	−α		38420#	100#	1752510#	100#	β^+	2810#	110#	231 041250#	110#
143	89	232	Ac	+		39140	100	1763770	100	β^-	3700	100	232 042020	110
142	90		Th			35442.9	2.1	1766692.2	2.1	β^-	−495	8	232 038049.5	2.2
141	91		Pa	+		35938	8	1765414	8	β^-	1337	7	232 038581	9
140	92		U	−α		34601.2	2.8	1765969.2	2.8		*		232 037145.9	3.0
139	93		Np	−α		37300#	100#	1762490#	100#	β^+	2700#	100#	232 040040#	110#
138	94		Pu	−α		38358	19	1760648	19	β^+	1060#	100#	232 041179	20

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
143	90	233	Th			38727.9	2.1	1771478.6	2.1	β^-	1245.2	1.4	233 041576.1	2.2
142	91		Pa			37482.6	2.3	1771941.5	2.3	β^-	570.5	2.2	233 040239.3	2.5
141	92		U			36912.1	3.0	1771729.6	3.0		*		233 039627	3
140	93		Np	$-\alpha$		38150#	160#	1769710#	160#	β^+	1230#	160#	233 040950#	170#
139	94		Pu	$-\alpha$		40050	50	1767030	50	β^+	1900#	170#	233 042990	50
138	95		Am	$-\alpha$		43290#	220#	1763010#	220#	β^+	3240#	220#	233 046470#	230#
144	90	234	Th	$+\alpha$		40610	4	1777668	4	β^-	273	3	234 043596	4
143	91		Pa	IT		40337	5	1777159	5	β^-	2197	5	234 043303	5
142	92		U			38139.7	2.0	1778573.3	2.0		*		234 040944.7	2.2
141	93		Np	$-$		39950	9	1775981	9	β^+	1810	8	234 042888	9
140	94		Pu	$-\alpha$		40338	7	1774810	7	β^+	388	11	234 043305	8
139	95		Am	$-\alpha$		44510#	210#	1769860#	210#	β^+	4170#	210#	234 047790#	220#
145	90	235	Th	+n2p		44250	50	1782100	50	β^-	1930	70	235 047510	50
144	91		Pa	+		42320	50	1783240	50	β^-	1410	50	235 045440	50
143	92		U			40913.2	2.0	1783871.2	2.0		*		235 043922.2	2.1
142	93		Np			41036.9	2.2	1782965.1	2.2	β^+	123.7	0.9	235 044055.0	2.3
141	94		Pu	$-\alpha$		42200*	70*	1781020*	70*	β^+	1170*	70*	235 045310*	80*
140	95		Am	$-\alpha$		44740#	210#	1777700#	210#	β^+	2540#	220#	235 048030#	220#
139	96		Cm	$-\alpha$		48050#	220#	1773610#	220#	β^+	3310#	310#	235 051580#	240#
145	91	236	Pa	+		45340	200	1788300	200	β^-	2900	200	236 048670	210
144	92		U			42439.8	2.0	1790415.9	2.0	β^-	−940	50	236 045561.0	2.1
143	93		Np	IT		43380	50	1788690	50	β^-	490	50	236 046570	50
142	94		Pu	$-\alpha$		42893.2	2.8	1788397.8	2.8		*		236 046047.7	3.0
141	95		Am	$-$		46170#	100#	1784340#	100#	β^+	3280#	100#	236 049570#	110#
140	96		Cm	$-\alpha$		47880#	200#	1781840#	200#	β^+	1710#	220#	236 051410#	220#
146	91	237	Pa	+		47640	100	1794070	100	β^-	2250	100	237 051140	110
145	92		U			45385.2	2.0	1795541.8	2.1	β^-	518.6	0.6	237 048723.0	2.2
144	93		Np			44866.7	2.0	1795278.0	2.0		*		237 048166.3	2.1
143	94		Pu	$+\alpha$		45087.0	2.4	1794275.3	2.4	β^+	220.3	1.3	237 048402.9	2.6
142	95		Am	$-\alpha$		46820#	190#	1791760#	190#	β^+	1730#	190#	237 050260#	200#
141	96		Cm	$-\alpha$		49270#	210#	1788530#	210#	β^+	2450#	280#	237 052890#	220#
140	97		Bk	$-\alpha$		53210#	300#	1783800#	300#	β^+	3940#	360#	237 057130#	320#
147	91	238	Pa	+		50760	60	1799020	60	β^-	3460	60	238 054500	60
146	92		U			47304.5	2.0	1801693.8	2.1	β^-	−145.3	1.4	238 050783.5	2.2
145	93		Np			47449.9	2.0	1800766.1	2.0	β^-	1292.0	0.7	238 050939.6	2.2
144	94		Pu			46157.8	2.0	1801275.8	2.0		*		238 049552.5	2.2
143	95		Am	$-\alpha$		48420	50	1798240	50	β^+	2260	50	238 051980	50
142	96		Cm	$-\alpha$		49380	40	1796480	40	β^+	970	60	238 053020	40
141	97		Bk	$-\alpha$		54340#	290#	1790750#	290#	β^+	4950#	290#	238 058330#	310#
147	92	239	U	$-$n		50569.6	2.0	1806500.1	2.1	β^-	1265.2	1.6	239 054288.7	2.2
146	93		Np			49304.4	2.2	1806982.9	2.2	β^-	721.8	0.9	239 052930.5	2.3
145	94		Pu			48582.6	2.0	1806922.3	2.0		*		239 052155.6	2.2
144	95		Am	$-\alpha$		49385.5	2.8	1805337.1	2.8	β^+	802.9	2.0	239 053018	3
143	96		Cm	$-$		51090#	100#	1802860#	100#	β^+	1700#	100#	239 054840#	110#
142	97		Bk	$-\alpha$		54360#	290#	1798790#	290#	β^+	3280#	300#	239 058360#	310#
141	98		Cf	$-\alpha$		58280#	230#	1794090#	230#	β^+	3920#	370#	239 062570#	250#
148	92	240	U	$+\alpha$		52708	5	1812433	5	β^-	388	16	240 056585	6
147	93		Np	+		52320	15	1812039	15	β^-	2200	15	240 056168	16
146	94		Pu			50120.5	2.0	1813455.8	2.0		*		240 053806.5	2.1
145	95		Am	+n		51499	14	1811294	14	β^+	1379	14	240 055287	15
144	96		Cm	$-\alpha$		51715.3	2.8	1810296.3	2.8	β^+	216	14	240 055519	3
143	97		Bk	$-$		55660#	150#	1805570#	150#	β^+	3940#	150#	240 059750#	160#
142	98		Cf	$-\alpha$		58030#	200#	1802420#	200#	β^+	2370#	250#	240 062290#	220#
148	93	241	Np	+		54260	70	1818170	70	β^-	1300	70	241 058250	80
147	94		Pu			52950.2	2.0	1818697.4	2.0	β^-	20.81	0.20	241 056844.4	2.1
146	95		Am			52929.4	2.0	1817935.9	2.0		*		241 056822.0	2.1
145	96		Cm	$-$		53696.9	2.3	1816386.0	2.3	β^+	767.5	1.2	241 057646.0	2.5
144	97		Bk	$-$		56100#	200#	1813200#	200#	β^+	2400#	200#	241 060220#	220#
143	98		Cf	$-\alpha$		59350#	260#	1809160#	260#	β^+	3260#	320#	241 063720#	270#
142	99		Es	$-\alpha$		63900#	330#	1803830#	330#	β^+	4550#	420#	241 068600#	360#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
149	93	242	Np	+		57410	200	1823090	200	β^-	2700	200	242 061630	210
148	94		Pu			54712.1	2.0	1825006.8	2.0	β^-	−751.0	0.7	242 058735.9	2.1
147	95		Am			55463.1	2.0	1823473.4	2.0	β^-	664.8	0.7	242 059542.1	2.1
146	96		Cm	−α		54798.3	2.0	1823355.9	2.0		*		242 058828.4	2.2
145	97		Bk	−		57800#	200#	1819570#	200#	β^+	3000#	200#	242 062050#	220#
144	98		Cf	−α		59330	40	1817260	40	β^+	1530#	200#	242 063690	40
143	99		Es	−α		64940#	330#	1810860#	330#	β^+	5620#	330#	242 069720#	350#
150	93	243	Np	+p		59919	11	1828654	11	β^-	2170	11	243 064325	12
149	94		Pu			57749	3	1830041	3	β^-	581.5	2.8	243 061996	4
148	95		Am			57167.4	2.2	1829840.5	2.2		*		243 061371.8	2.4
147	96		Cm	−α		57176.3	2.2	1829049.2	2.3	β^+	8.9	1.4	243 061381.3	2.4
146	97		Bk	−α		58685	5	1826758	5	β^+	1508	5	243 063001	5
145	98		Cf	−α		60900#	120#	1823760#	120#	β^+	2220#	120#	243 065380#	130#
144	99		Es	−α		64860#	290#	1819020#	290#	β^+	3960#	310#	243 069630#	310#
143	100		Fm	−α		69400#	240#	1813700#	240#	β^+	4540#	370#	243 074500#	250#
150	94	244	Pu			59799	5	1836063	5	β^-	−76	5	244 064197	5
149	95		Am			59875.0	2.2	1835204.2	2.2	β^-	1428.1	0.9	244 064278.5	2.3
148	96		Cm			58447.0	2.0	1835849.9	2.0		*		244 062745.4	2.1
147	97		Bk	−α		60700	50	1832810	50	β^+	2260	50	244 065170	60
146	98		Cf	−α		61469	3	1831263	3	β^+	770	50	244 065990	4
145	99		Es	−α		66030#	180#	1825920#	180#	β^+	4560#	180#	244 070880#	200#
144	100		Fm	−α		69050#	280#	1822120#	280#	β^+	3030#	340#	244 074130#	310#
151	94	245	Pu	−n		63097	14	1840836	14	β^-	1205	15	245 067738	15
150	95		Am	+α		61893	3	1841258	3	β^-	894.0	1.8	245 066444	4
149	96		Cm			60998.6	2.7	1841369.6	2.8		*		245 065484.7	2.9
148	97		Bk	−α		61808.8	2.5	1839777.0	2.5	β^+	810.2	2.4	245 066354.5	2.7
147	98		Cf	−α		63377	3	1837426	3	β^+	1568.6	2.8	245 068038	3
146	99		Es	−α		66430#	200#	1833590#	200#	β^+	3050#	200#	245 071320#	220#
145	100		Fm	−α		70210#	280#	1829030#	280#	β^+	3780#	340#	245 075380#	300#
152	94	246	Pu			65389	15	1846616	15	β^-	401	14	246 070197	16
151	95		Am	IT		64988	18	1846234	18	β^-	2376	18	246 069767	20
150	96		Cm			62611.8	2.2	1847827.7	2.3		*		246 067216.6	2.4
149	97		Bk	−		63960	60	1845700	60	β^+	1350	60	246 068670	60
148	98		Cf	−α		64084.8	2.2	1844790.0	2.3	β^+	120	60	246 068797.9	2.4
147	99		Es	−α		67970#	220#	1840130#	220#	β^+	3880#	220#	246 072960#	240#
146	100		Fm	−α		70120	40	1837190	40	β^+	2160#	230#	246 075280	40
152	95	247	Am	+		67230#	100#	1852070#	100#	β^-	1700#	100#	247 072170#	110#
151	96		Cm			65527	4	1852984	4	β^-	45	7	247 070346	5
150	97		Bk	−α		65482	6	1852247	6		*		247 070298	6
149	98		Cf	−		66128	8	1850818	8	β^+	646	6	247 070991	9
148	99		Es	−α		68600#	30#	1847560#	30#	β^+	2480#	30#	247 073650#	30#
147	100		Fm	−α		71520#	130#	1843860#	130#	β^+	2910#	140#	247 076780#	140#
146	101		Md	−α		76100#	350#	1838500#	350#	β^+	4590#	380#	247 081700#	380#
153	95	248	Am	+		70490#	200#	1856880#	200#	β^-	3100#	200#	248 075670#	220#
152	96		Cm			67385	5	1859197	5	β^-	−717	21	248 072341	5
151	97		Bk	+		68103	21	1857697	21	β^-	870	20	248 073111	22
150	98		Cf	−α		67233	5	1857785	5		*		248 072177	6
149	99		Es	−α		70290	60	1853940	60	β^+	3060	60	248 075460	60
148	100		Fm	−α		71896	12	1851556	12	β^+	1600	60	248 077184	13
147	101		Md	−α		77150#	240#	1845520#	240#	β^+	5250#	240#	248 082820#	260#
153	96	249	Cm	−n		70743	5	1863910	5	β^-	900	5	249 075946	5
152	97		Bk	+		69843	3	1864028	3	β^-	124.9	1.4	249 074980	3
151	98		Cf	−α		69718.5	2.8	1863370.3	2.9		*		249 074846	3
150	99		Es	−α		71170#	30#	1861140#	30#	β^+	1450#	30#	249 076400#	30#
149	100		Fm	−α		73610*	100*	1857910*	100*	β^+	2440#	110#	249 079020*	110*
148	101		Md	−α		77320#	280#	1853430#	280#	β^+	3710#	300#	249 083000#	300#
154	96	250	Cm	−nn		72982	11	1869743	11	β^-	37	12	250 078350	12
153	97		Bk	+α		72945	4	1868998	4	β^-	1780	3	250 078309	4
152	98		Cf	−α		71165.1	2.2	1869995.0	2.3		*		250 076398.9	2.4
151	99		Es	−		73270#	100#	1867110#	100#	β^+	2100#	100#	250 078650#	110#
150	100		Fm	−α		74067	12	1865529	12	β^+	800#	100#	250 079514	13
149	101		Md	−α		78700#	300#	1860110#	300#	β^+	4630#	300#	250 084490#	320#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
155	96	251	Cm	+		76640	23	1874156	23	β^-	1420	20	251 082277	24
154	97		Bk	+		75220	11	1874793	11	β^-	1093	10	251 080752	12
153	98		Cf	−α		74127	5	1875104	5		*		251 079579	5
152	99		Es	−α		74504	6	1873945	6	β^+	376	7	251 079983	7
151	100		Fm	−α		75978	8	1871689	8	β^+	1474	7	251 081566	9
150	101		Md	−α		79050#	200#	1867830#	200#	β^+	3070#	200#	251 084860#	220#
149	102		No	−α		82830#	140#	1863280#	140#	β^+	3780#	250#	251 088920#	150#
155	97	252	Bk	+		78530#	200#	1879560#	200#	β^-	2500#	200#	252 084300#	220#
154	98		Cf	−α		76027	5	1881275	5	β^-	−1260	50	252 081619	5
153	99		Es	−		77290	50	1879230	50	β^-	480	50	252 082970	50
152	100		Fm	−α		76810	6	1878928	6		*		252 082459	6
151	101		Md	x		80700#	200#	1874260#	200#	β^+	3890#	200#	252 086630#	210#
150	102		No	−α		82871	13	1871302	13	β^+	2180#	200#	252 088966	14
156	97	253	Bk	x		80800#	310#	1885360#	310#	β^-	1510#	310#	253 086740#	330#
155	98		Cf	−α		79293	7	1886081	7	β^-	285	7	253 085124	8
154	99		Es	−α		79007	3	1885584	3		*		253 084818	3
153	100		Fm	−α		79340	5	1884469	5	β^+	333	4	253 085175	5
152	101		Md	x		81300#	210#	1881730#	210#	β^+	1960#	210#	253 087280#	220#
151	102		No	−α		84480*	230*	1877770*	230*	β^+	3180#	300#	253 090690*	240*
150	103		Lr	−α		88730#	290#	1872730#	290#	β^+	4250#	370#	253 095260#	310#
156	98	254	Cf	−α		81334	12	1892112	12	β^-	−654	13	254 087315	13
155	99		Es	−α		81988	5	1890675	5	β^-	1090	4	254 088017	5
154	100		Fm	−α		80897	3	1890983	3		*		254 086847	3
153	101		Md	−α		83580#	140#	1887520#	140#	β^+	2680#	140#	254 089730#	150#
152	102		No	−α		84717	18	1885599	18	β^+	1140#	140#	254 090948	19
151	103		Lr	−α		89870#	340#	1879660#	340#	β^+	5150#	340#	254 096480#	360#
157	98	255	Cf	+		84780#	200#	1896740#	200#	β^-	700#	200#	255 091020#	220#
156	99		Es	−α		84081	11	1896653	11	β^-	288	10	255 090265	12
155	100		Fm	−α		83793	5	1896159	5		*		255 089955	5
154	101		Md	−α		84835	7	1894334	7	β^+	1042	8	255 091075	8
153	102		No	−α		86847	12	1891540	12	β^+	2012	12	255 093234	13
152	103		Lr	−α		90090#	230#	1887520#	230#	β^+	3240#	230#	255 096720#	240#
151	104		Rf	−α		94550#	170#	1882270#	170#	β^+	4460#	290#	255 101500#	190#
157	99	256	Es	+		87150#	100#	1901660#	100#	β^-	1670#	100#	256 093560#	110#
156	100		Fm	−α		85479	7	1902544	7		*		256 091766	8
155	101		Md	−α		87610	50	1899630	50	β^+	2130	50	256 094050	60
154	102		No	−α		87817	8	1898642	8	β^+	210	50	256 094275	9
153	103		Lr	−α		92010#	220#	1893670#	220#	β^+	4190#	220#	256 098770#	240#
152	104		Rf	−α		94248	27	1890646	27	β^+	2240#	220#	256 101179	29
158	99	257	Es	x		89400#	500#	1907480#	500#	β^-	810#	500#	257 095970#	540#
157	100		Fm	−α		88581	7	1907513	7		*		257 095096	8
156	101		Md	−α		88990	3	1906322	3	β^+	409	8	257 095535	4
155	102		No	−α		90220	30	1904310	30	β^+	1230	30	257 096850	30
154	103		Lr	−α		92730#	210#	1901020#	210#	β^+	2520#	210#	257 099550#	230#
153	104		Rf	−α		96150*	270*	1896820*	270*	β^+	3420#	340#	257 103220*	290*
152	105		Ha	−α		100460#	300#	1891720#	300#	β^+	4310#	400#	257 107850#	320#
158	100	258	Fm	−α		90460#	200#	1913710#	200#	β^-	−1230#	200#	258 097110#	220#
157	101		Md	−α		91684	5	1911700	5	β^-	160#	200#	258 098427	5
156	102		No	−α		91520#	200#	1911080#	200#		*		258 098250#	220#
155	103		Lr	−α		94910#	140#	1906910#	140#	β^+	3380#	250#	258 101890#	150#
154	104		Rf	−α		96390#	150#	1904640#	150#	β^+	1490#	210#	258 103480#	160#
153	105		Ha	−α		101840#	340#	1898410#	340#	β^+	5450#	380#	258 109330#	370#
159	100	259	Fm	x		93700#	400#	1918540#	400#	β^-	80#	570#	259 100590#	430#
158	101		Md	−α		93620#	400#	1917840#	400#		*		259 100500#	430#
157	102		No	−α		94120*	100*	1916550*	100*	β^+	510#	410#	259 101050*	110*
156	103		Lr	−α		95930#	70#	1913960#	70#	β^+	1810#	120#	259 102990#	80#
155	104		Rf	−α		98380*	70*	1910730*	70*	β^+	2450#	100#	259 105620*	80*
154	105		Ha	x		102200#	300#	1906120#	300#	β^+	3820#	310#	259 109720#	320#
153	106		Nh	−α		106850#	200#	1900700#	200#	β^+	4640#	360#	259 114700#	220#

N	Z	A	Elt.	Orig.	S	Mass excess (keV)		Binding energy (keV)		Beta-decay energy (keV)			Atomic mass (μu)	
159	101	260	Md	x		96600#	600#	1922930#	600#	β^-	990#	630#	260 103700#	640#
158	102		No	$-\alpha$		95600#	200#	1923140#	200#		*		260 102640#	220#
157	103		Lr	$-\alpha$		98340#	120#	1919620#	120#	β^+	2740#	230#	260 105570#	120#
156	104		Rf	$-\alpha$		99240#	200#	1917940#	200#	β^+	900#	230#	260 106540#	220#
155	105		Ha	$-\alpha$		103800#	230#	1912600#	230#	β^+	4560#	310#	260 111440#	250#
154	106		Nh	$-\alpha$		106600	40	1909020	40	β^+	2800#	240#	260 114440	40
160	101	261	Md	x		98400#	700#	1929200#	700#		*		261 105640#	750#
159	102		No	x		98500#	600#	1928320#	600#	β^+	90#	920#	261 105740#	640#
158	103		Lr	$-\alpha$		99620#	400#	1926420#	400#	β^+	1120#	720#	261 106940#	430#
157	104		Rf	$-\alpha$		101450#	110#	1923800#	110#	β^+	1840#	410#	261 108910#	110#
156	105		Ha	$-\alpha$		104430#	260#	1920040#	260#	β^+	2980#	280#	261 112110#	280#
155	106		Nh	$-\alpha$		108380*	280*	1915300*	280*	β^+	3960#	380#	261 116360*	300*
154	107		Ns	$-\alpha$		113450#	300#	1909460#	300#	β^+	5070#	410#	261 121790#	320#
160	102	262	No	x		100200#	700#	1934690#	700#		*		262 107570#	750#
159	103		Lr	x		102300#	600#	1931810#	600#	β^+	2100#	920#	262 109820#	640#
158	104		Rf	x		102550#	250#	1930770#	250#	β^+	250#	650#	262 110090#	270#
157	105		Ha	$-\alpha$		106540#	250#	1926010#	250#	β^+	3990#	350#	262 114370#	260#
156	106		Nh	x		108600#	250#	1923150#	250#	β^+	2070#	350#	262 116590#	270#
155	107		Ns	$-\alpha$		114680#	380#	1916290#	380#	β^+	6080#	450#	262 123120#	400#
161	102	263	No	x		103200#	400#	1939760#	400#		*		263 110790#	430#
160	103		Lr	x		103770#	600#	1938410#	600#	β^+	570#	720#	263 111400#	640#
159	104		Rf	x		105000#	500#	1936400#	500#	β^+	1230#	780#	263 112720#	540#
158	105		Ha	$-\alpha$		107390#	170#	1933220#	170#	β^+	2400#	530#	263 115290#	180#
157	106		Nh	$-\alpha$		110500*	130*	1929330*	130*	β^+	3100#	210#	263 118620*	140*
156	107		Ns	x		114860#	500#	1924180#	500#	β^+	4370#	520#	263 123310#	540#
161	103	264	Lr	x		106500#	700#	1943750#	700#	β^-	200#	920#	264 114330#	750#
160	104		Rf	x		106300#	600#	1943160#	600#		*		264 114120#	640#
159	105		Ha	x		109630#	500#	1939060#	500#	β^+	3330#	780#	264 117690#	540#
158	106		Nh	x		111100#	350#	1936800#	350#	β^+	1470#	620#	264 119270#	380#
157	107		Ns	x		116350#	500#	1930770#	500#	β^+	5250#	620#	264 124910#	540#
156	108		Hs	$-\alpha$		119820	300	1926510	300	β^+	3470#	590#	264 128630	320
162	103	265	Lr	x		108200#	900#	1950120#	900#		*		265 116160#	970#
161	104		Rf	x		108800#	800#	1948740#	800#	β^+	600#	1210#	265 116800#	860#
160	105		Ha	x		110700#	700#	1946060#	700#	β^+	1900#	1060#	265 118840#	750#
159	106		Nh	x		113110#	600#	1942860#	600#	β^+	2410#	920#	265 121430#	640#
158	107		Ns	x		116820#	500#	1938370#	500#	β^+	3710#	780#	265 125410#	540#
157	108		Hs	$-\alpha$		121630*	300*	1932770*	300*	β^+	4810#	590#	265 130580*	320*
162	104	266	Rf	x		110400#	900#	1955210#	900#		*		266 118520#	970#
161	105		Ha	x		112990#	800#	1951840#	800#	β^+	2590#	1210#	266 121300#	860#
160	106		Nh	x		114030#	700#	1950010#	700#	β^+	1040#	1060#	266 122420#	750#
159	107		Ns	x		118720#	600#	1944540#	600#	β^+	4690#	920#	266 127450#	640#
158	108		Hs	x		121700#	500#	1940780#	500#	β^+	2980#	780#	266 130650#	540#
157	109		Mt	$-\alpha$		128390#	350#	1933310#	350#	β^+	6690#	610#	266 137830#	380#