

Beta-Disintegration Energy Charts

by

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## Beta-Disintegration Energy Charts

prepared by

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The following charts show beta-disintegration energies  $M(A,Z) - M(A,Z+1)$ , where  $M$  is the nuclidic mass (or mass excess), for mass numbers  $A=40$  to  $160$ . They are plotted essentially in the manner of Way and Wood<sup>1</sup>, the only difference being that the mass number  $A$  is taken as abscissa rather than the neutron number  $N$ . This arrangement makes it possible to draw lines of constant proton number  $Z$  as well as those of constant neutron number  $N$ , facilitating extrapolations along both lines when attempting to predict disintegration energies which have not yet been measured. Analogous diagrams have been employed earlier by Glass, Thompson, and Seaborg<sup>2</sup> and by Zeldes<sup>3</sup> for different reasons.

### Meaning of Symbols

- ⊙ Well-established experimental value
- (⊙) Experimental value requiring assumption about decay scheme
- ⊥ Uncertainty; not shown when  $< 0.1$  MeV
- ⊙<sup>+</sup> Experimental value representing an upper or lower limit only
- Value predicted from this graph

The values were taken from the 1962 mass table<sup>4</sup> with some changes or additions as noted below. We have added some new data where these seem significant in determining the trend of the lines and also some values where upper or lower limits can be determined. We have substituted for a few mass-table values new values or limits according to our interpretation of the decay scheme. All these additions and changes are listed in the accompanying table.

| (Z, A) - (Z+1, A)                     | Adopted Value | 1961 Mass Table | Comment                                       |
|---------------------------------------|---------------|-----------------|---|
| V <sup>53</sup> - Cr <sup>53</sup>    | 3.54 5        | 2.53 5          | See A = 53, comment B                         |
| Zn <sup>72</sup> - Ga <sup>72</sup>   | > 1.6         | 1.6 2           | 1.6 <sub>β</sub> probably does not go to g.s. |
| Se <sup>75</sup> - Br <sup>75</sup>   | ≤ -2.7        | -2.722 20       | 1.7 <sub>β</sub> may not go to g.s.           |
| Ge <sup>78</sup> - As <sup>78</sup>   | > 0.9         | 0.9 1           | 0.9 <sub>β</sub> may not go to g.s.           |
| As <sup>81</sup> - Se <sup>81</sup>   | ≥ 3.8         | --              | lower limit only                              |
| Rb <sup>83</sup> - Sr <sup>83</sup>   | < -2.17       | --              | upper limit only                              |
| Y <sup>88</sup> - Zr <sup>88</sup>    | < -0.4        | --              | upper limit only                              |
| Mo <sup>92</sup> - Tc <sup>92</sup>   | -7.9 2        | -6.4 6          | new reference, 62Va4                          |
| Nb <sup>99</sup> - Mo <sup>99</sup>   | ≥ 3.2         | --              | lower limit only                              |
| Rh <sup>101</sup> - Pd <sup>101</sup> | -1.76 5       | --              | absolute masses unknown                       |
| Tc <sup>103</sup> - Ru <sup>103</sup> | ≥ 2.5 1       | --              | lower limit only                              |
| Ru <sup>104</sup> - Rh <sup>104</sup> | -1.56 3       | -0.61 41        | discrepancy not understood                    |
| Ag <sup>105</sup> - Cd <sup>105</sup> | ≤ -2.7        | --              | upper limit only                              |
| Ru <sup>107</sup> - Rh <sup>107</sup> | 3.2 3         | --              | new reference, 62Pi2                          |
| Cd <sup>107</sup> - In <sup>107</sup> | ≈ -3.2        | --              | βγ coincidences observed                      |
| Ru <sup>108</sup> - Rh <sup>108</sup> | 1.32          | --              | new reference, 62Pi2                          |
| Rh <sup>108</sup> - Pd <sup>108</sup> | 4.50          | --              | new reference, 62Pi2                          |
| Te <sup>121</sup> - I <sup>121</sup>  | -2.36 5       | --              | absolute masses unknown                       |

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| $(Z, A) - (Z+1, A)$                   | Adopted Value  | 1961 Mass Table | Comment                                |
|---------------------------------------|----------------|-----------------|--|
| I <sup>123</sup> - Xe <sup>123</sup>  | -2.8 2         | --              | absolute masses unknown                |
| Xe <sup>125</sup> - Cs <sup>125</sup> | -3.07 2        | --              | absolute masses unknown                |
| Sb <sup>126</sup> - Te <sup>126</sup> | 3.7            | --              | $\beta\gamma$ coincidences observed    |
| Te <sup>128</sup> - I <sup>128</sup>  | -1.267 12      | --              | new reference, 61La16                  |
| Cs <sup>129</sup> - Ba <sup>129</sup> | -2.45 2        | --              | absolute masses unknown                |
| Ba <sup>131</sup> - La <sup>131</sup> | -2.96 4        | --              | absolute masses unknown                |
| Ba <sup>133</sup> - La <sup>133</sup> | $\leq -2.2$    | -2.2 2          | no $\beta\gamma$ coincidences observed |
| Ce <sup>137</sup> - Pr <sup>137</sup> | $\leq -2.7$    | --              | upper limit only                       |
| Pr <sup>140</sup> - Nd <sup>140</sup> | $< -0.5$       | --              | upper limit only                       |
| Ba <sup>141</sup> - La <sup>141</sup> | $\geq 2.8$     | 2.9 3           | no decay scheme                        |
| Nd <sup>141</sup> - Pm <sup>141</sup> | $\leq -3.6$    | -3.62 20        | no decay scheme                        |
| La <sup>142</sup> - Ce <sup>142</sup> | $\approx 4.5$  | --              | partial decay scheme                   |
| Pm <sup>142</sup> - Sm <sup>142</sup> | $\leq -2.05$   | --              | upper limit only                       |
| Nd <sup>144</sup> - Pm <sup>144</sup> | $< -1.79$      | --              | upper limit only                       |
| Pm <sup>144</sup> - Sm <sup>144</sup> | $> 0.1$        | --              | lower limit only                       |
| Eu <sup>145</sup> - Gd <sup>145</sup> | -5.2 3         | --              | absolute masses unknown                |
| Sm <sup>146</sup> - Eu <sup>146</sup> | -3.886 15      | --              | new reference, 60Fu2                   |
| Nd <sup>150</sup> - Pm <sup>150</sup> | $\approx 0$    | -0.35 44        | new reference, 60Go24                  |
| Pm <sup>150</sup> - Sm <sup>150</sup> | 3.50 8         | 3.8 4           | new reference, 60Go24                  |
| Tb <sup>155</sup> - Dy <sup>155</sup> | $\leq -1.87$   | --              | upper limit only                       |
| Sm <sup>156</sup> - Eu <sup>156</sup> | $\geq 0.90 5$  | 0.90 5          | no level scheme                        |
| Eu <sup>158</sup> - Gd <sup>158</sup> | 3.6 2          | --              | new reference, 60Mo16                  |
| Gd <sup>158</sup> - Tb <sup>158</sup> | $\leq -1.18$   | -0.87 29        | new reference, 62Na1                   |
| Tb <sup>158</sup> - Dy <sup>158</sup> | 0.944 10       | 0.99 36         | new reference, 62Na1                   |
| Dy <sup>160</sup> - Ho <sup>160</sup> | $\approx -3.3$ | --              | partial decay scheme                   |

<sup>1</sup>K. Way, M. Wood - Phys. Rev. 94, 119 (1954).

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<sup>2</sup>R. A. Glass, S. G. Thompson, G. T. Seaborg - J. Inorg. & Nuclear Chem. 1, 3 (1959).

<sup>3</sup>N. Zeldes - Nuclear Phys. 7, 27 (1958).

<sup>4</sup>L. A. König, J. H. E. Mattauch, A. H. Wapstra - to be published in Nuclear Physics. This is a revision of the 1961 mass table, for which see:

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