

**Parent Nuclides from the *Table of Isotopes***

| Parent           | E(keV) | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)     |
|------------------|--------|------|----------------|--------------------------|------------|
| <sup>3</sup> H   | 0      | β-   | 1/2+           | 12.33 y 6                | 18.591 10  |
| <sup>6</sup> He  | 0      | β-   | 0+: T=1        | 806.7 ms 15              | 3507.8 9   |
| <sup>7</sup> Be  | 0      | EC   | 3/2-: T=1/2    | 53.29 d 7                | 861.815 18 |
| <sup>8</sup> He  | 0      | β-   | 0+: T=2        | 119.0 ms 15              | 10653 7    |
| <sup>8</sup> Li  | 0      | β-   | 2+             | 838 ms 6                 | 16003.6 6  |
| <sup>8</sup> B   | 0      | β+   | 2+             | 770 ms 3                 | 17979.4 11 |
| <sup>9</sup> Li  | 0      | β-   | 3/2-: T=3/2    | 178.3 ms 4               | 13606.3 19 |
| <sup>9</sup> C   | 0      | β+   | (3/2-): T=3/2  | 126.5 ms 9               | 16498.2 23 |
| <sup>10</sup> Be | 0      | β-   | 0+: T=1        | 1.51×10 <sup>6</sup> y 6 | 555.9 5    |
| <sup>10</sup> C  | 0      | β+   | 0+: T=1        | 19.255 s 53              | 3647.81 9  |
| <sup>11</sup> Li | 0      | β-n  | 3/2-           | 8.5 ms 2                 |            |
|                  | 0      | β-   | 3/2-: T=5/2    | 8.5 ms 2                 | 20610 40   |
| <sup>11</sup> Be | 0      | β-   | 1/2+: T=3/2    | 13.81 s 8                | 11506 6    |
| <sup>11</sup> C  | 0      | EC   | 3/2-: T=1/2    | 20.39 m 2                | 1982.1 8   |
| <sup>12</sup> Be | 0      | β-   | 0+: T=2        | 23.6 ms 9                | 11708 15   |
| <sup>12</sup> B  | 0      | β-   | 1+: T=1        | 20.20 ms 2               | 13368.9 14 |
| <sup>12</sup> N  | 0      | EC   | 1+: T=1        | 11.000 ms 16             | 17338.1 10 |
| <sup>13</sup> B  | 0      | β-   | 3/2-: T=3/2    | 17.36 ms 16              | 13437.2 11 |
| <sup>13</sup> N  | 0      | β+   | 1/2-: T=1/2    | 9.965 m 4                | 2220.4 3   |
| <sup>13</sup> O  | 0      | ECp  | (3/2-)         | 8.58 ms 5                |            |
|                  | 0      | β+   | (3/2-): T=3/2  | 8.58 ms 5                | 17765 10   |
| <sup>14</sup> Be | 0      | β-   | 0+             | 4.35 ms 17               | 16220 110  |
| <sup>14</sup> B  | 0      | β-   | 2-: T=2        | 13.8 ms 10               | 20644 21   |
| <sup>14</sup> C  | 0      | β-   | 0+: T=1        | 5730 y 40                | 156.475 4  |
| <sup>14</sup> O  | 0      | β+   | 0+: T=1        | 70.606 s 18              | 5143.04 8  |
| <sup>15</sup> C  | 0      | β-   | 1/2+: T=3/2    | 2.449 s 5                | 9771.6 8   |
| <sup>15</sup> O  | 0      | β+   | 1/2-: T=1/2    | 122.24 s 16              | 2753.9 5   |
| <sup>15</sup> F  | 0      | p    | (1/2+)         | 1.0 MeV 2                | (15)       |
| <sup>16</sup> C  | 0      | β-   | 0+: T=2        | 0.747 s 8                | 8012 4     |
| <sup>16</sup> N  | 0      | β-   | 2-: T=1        | 7.13 s 2                 | 10419.0 23 |
| <sup>16</sup> F  | 0      | p    | 0-             | 40 keV 20                | (5)        |
| <sup>16</sup> Ne | 0      | 2p   | 0+             | 122 keV 37               |            |
| <sup>17</sup> C  | 0      | β-   |                | 193 ms 13                | 13166 23   |
| <sup>17</sup> N  | 0      | β-   | 1/2-: T=3/2    | 4.173 s 4                | 8680 15    |
| <sup>17</sup> F  | 0      | β+   | 5/2+: T=1/2    | 64.49 s 16               | 2760.7 3   |
| <sup>17</sup> Ne | 0      | EC   | 1/2-: T=3/2    | 109.2 ms 6               | 14530 50   |
| <sup>18</sup> N  | 0      | β-   | 1-: T=2        | 624 ms 12                | 13899 20   |
| <sup>18</sup> F  | 0      | β+   | 1+: T=0        | 109.77 m 5               | 1655.5 6   |
| <sup>18</sup> Ne | 0      | β+   | 0+: T=1        | 1672 ms 8                | 4446 5     |
| <sup>19</sup> N  | 0      | β-   |                | 0.27 s 6                 | 12528 17   |
| <sup>19</sup> O  | 0      | β-   | 5/2+: T=3/2    | 26.91 s 8                | 4820 3     |
| <sup>19</sup> Ne | 0      | β+   | 1/2+: T=1/2    | 17.34 s 9                | 3238.4 6   |
| <sup>20</sup> N  | 0      | β-   |                | 100 ms +30-20            | 17970 50   |
| <sup>20</sup> O  | 0      | β-   | 0+: T=2        | 13.51 s 5                | 3814.3 12  |
| <sup>20</sup> F  | 0      | β-   | 2+: T=1        | 11.00 s 2                | 7024.53 8  |
| <sup>20</sup> Na | 0      | EC   | 2+: T=1        | 447.9 ms 23              | 13887 7    |
| <sup>20</sup> Mg | 0      | β+   | 0+             | 95 ms +80-50             | 10730 30   |
| <sup>21</sup> N  | 0      | β-   |                | 85 ms 16                 | 17170 90   |
| <sup>21</sup> O  | 0      | β-   | (1/2,3/2,5/2)+ | 3.42 s 10                | 8109 12    |
| <sup>21</sup> F  | 0      | β-   | 5/2+           | 4.158 s 20               | 5684.1 18  |
| <sup>21</sup> Na | 0      | β+   | 3/2+           | 22.49 s 4                | 3547.5 7   |
| <sup>21</sup> Mg | 0      | ECp  | (3/2,5/2)+     | 122 ms 3                 | 8000 50    |
|                  | 0      | β+   | (3/2,5/2)+     | 122 ms 3                 | 13096 16   |
| <sup>22</sup> N  | 0      | β-   |                | 24 ms 7                  | 22800 200  |
| <sup>22</sup> O  | 0      | β-   | 0+             | 2.25 s 15                | 6490 60    |

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| Parent           | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>        | Q(keV)     |
|------------------|------------|------|----------------|-------------------------|------------|
| <sup>22</sup> F  | 0          | β-   | 4+,(3+)        | 4.23 s 4                | 10818 12   |
| <sup>22</sup> Na | 0          | β+   | 3+             | 2.6019 y 4              | 2842.1 4   |
| <sup>22</sup> Mg | 0          | β+   | 0+             | 3.857 s 9               | 4785.5 14  |
| <sup>22</sup> Al | 0          | EC   |                | 70 ms +70-35            | (186)      |
| <sup>22</sup> Si | 0          | ECp  | 0+             | 6 ms 3                  |            |
|                  | 0          | EC   | 0+             | 6 ms 3                  | (13980)    |
| <sup>23</sup> O  | 0          | β-   |                | 82 ms 37                | 11290 130  |
| <sup>23</sup> F  | 0          | β-   | (3/2,5/2)+     | 2.23 s 14               | 8480 80    |
| <sup>23</sup> Ne | 0          | β-   | 5/2+           | 37.24 s 12              | 4375.85 20 |
| <sup>23</sup> Mg | 0          | EC   | 3/2+           | 11.317 s 11             | 4056.8 12  |
| <sup>23</sup> Al | 0          | ECp  |                | 0.47 s 3                | 8590 30    |
|                  | 0          | EC   |                | 0.47 s 3                | 12240 25   |
| <sup>24</sup> O  | 0          | β-n  | 0+             | 61 ms 26                | 11400 30   |
|                  | 0          | β-   | 0+             | 61 ms 26                | 11400 30   |
| <sup>24</sup> F  | 0          | β-   | (1,2,3)+       | 0.34 s 8                | 13490 70   |
| <sup>24</sup> Ne | 0          | β-   | 0+             | 3.38 m 2                | 2470 10    |
| <sup>24</sup> Na | 0          | β-   | 4+             | 14.9590 h 12            | 5515.79 16 |
|                  | 472.207 9  | β-   | 1+             | 20.20 ms 7              | 5515.79 16 |
| <sup>24</sup> Al | 0          | EC   | 4+             | 2.053 s 4               | 13878 4    |
|                  | 425.8 1    | EC   | 1+             | 131.3 ms 25             | 13878 4    |
| <sup>24</sup> Si | 0          | ECp  | 0+             | 102 ms 35               | 9240 30    |
|                  | 0          | EC   | 0+             | 102 ms 35               | 10810 20   |
| <sup>25</sup> Ne | 0          | β-   | (1/2,3/2)+     | 602 ms 8                | 7300 40    |
| <sup>25</sup> Na | 0          | β-   | 5/2+           | 59.1 s 6                | 3835.3 12  |
| <sup>25</sup> Al | 0          | EC   | 5/2+           | 7.183 s 12              | 4277.0 7   |
| <sup>25</sup> Si | 0          | EC   | 5/2+           | 220 ms 3                | 12741 10   |
| <sup>26</sup> Ne | 0          | β-   | 0+             | 197 ms 1                | 7330 60    |
| <sup>26</sup> Na | 0          | β-   | 3+             | 1.072 s 9               | 9312 14    |
| <sup>26</sup> Al | 0          | EC   | 5+             | 7.4×10 <sup>5</sup> y 3 | 4004.19 7  |
|                  | 228.305 13 | EC   | 0+             | 6.3452 s 19             | 4004.19 7  |
| <sup>26</sup> Si | 0          | EC   | 0+             | 2.234 s 13              | 5066 3     |
| <sup>26</sup> P  | 0          | ECα  | (3+)           | 20 ms +35-1             | (15000)    |
|                  | 0          | ECp  | (3+)           | 20 ms +35-1             | (9640)     |
|                  | 0          | EC   | (3+)           | 20 ms +35-1             | (18120)    |
| <sup>27</sup> Ne | 0          | β-   |                | 32 ms 2                 | 12670 100  |
| <sup>27</sup> Na | 0          | β-n  | 5/2+           | 301 ms 6                | 9010 40    |
|                  | 0          | β-   | 5/2+           | 301 ms 6                | 9010 40    |
| <sup>27</sup> Mg | 0          | β-   | 1/2+           | 9.458 m 12              | 2610.32 17 |
| <sup>27</sup> Si | 0          | EC   | 5/2+           | 4.16 s 2                | 4811.83 10 |
| <sup>27</sup> P  | 0          | EC   | 1/2+           | 260 ms                  | 11630 40   |
| <sup>27</sup> S  | 0          | EC   |                | 21 ms 4                 | (18260)    |
| <sup>28</sup> Ne | 0          | β-   | 0+             | 17 ms 4                 | 12310 140  |
| <sup>28</sup> Na | 0          | β-   | 1+             | 30.5 ms 4               | 13990 80   |
| <sup>28</sup> Mg | 0          | β-   | 0+             | 20.91 h 3               | 1831.8 20  |
| <sup>28</sup> Al | 0          | β-   | 3+             | 2.2414 m 12             | 4642.25 14 |
| <sup>28</sup> P  | 0          | ECp  | 3+             | 270.3 ms 5              | 11230 160  |
|                  | 0          | EC   | 3+             | 270.3 ms 5              | 14332 4    |
| <sup>28</sup> S  | 0          | β+   | 0+             | 125 ms 10               | 11230 160  |
| <sup>29</sup> Na | 0          | β-n  | 3/2            | 44.9 ms 12              | 13280 90   |
|                  | 0          | β-   | 3/2            | 44.9 ms 12              | 13280 90   |
| <sup>29</sup> Mg | 0          | β-   | 3/2+           | 1.30 s 12               | 7550 30    |
| <sup>29</sup> Al | 0          | β-   | 5/2+           | 6.56 m 6                | 3679.5 12  |
| <sup>29</sup> P  | 0          | β+   | 1/2+           | 4.140 s 15              | 4943.1 7   |
| <sup>29</sup> S  | 0          | ECp  |                | 187 ms                  | 9410 50    |
|                  | 0          | EC   |                | 187 ms 4                | 13790 50   |
| <sup>30</sup> Na | 0          | β-2n | 2+             | 48 ms                   | 17480 110  |
|                  | 0          | β-n  | 2+             | 48 ms 2                 | 17480 110  |
|                  | 0          | β-   | 2+             | 48 ms 2                 | 17480 110  |
| <sup>30</sup> Mg | 0          | β-   | 0+             | 335 ms 17               | 6990 70    |
| <sup>30</sup> Al | 0          | β-   | 3+             | 3.60 s 6                | 8561 14    |
| <sup>30</sup> P  | 0          | β+   | 1+             | 2.498 m 4               | 4232.3 4   |
| <sup>30</sup> S  | 0          | β+   | 0+             | 1.178 s 5               | 6138 3     |

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|------------------|----------|------|----------------|--------------------------|------------|
| <sup>31</sup> Na | 0        | β-n  |                | 17.0 ms 4                | 15880 180  |
|                  | 0        | β-   |                | 17.0 ms 4                | 15880 180  |
| <sup>31</sup> Mg | 0        | β-   |                | 230 ms 20                | 11740 80   |
| <sup>31</sup> Al | 0        | β-   | (3/2,5/2)+     | 644 ms 25                | 7995 20    |
| <sup>31</sup> Si | 0        | β-   | 3/2+           | 157.3 m 3                | 1492.02 20 |
| <sup>31</sup> S  | 0        | β+   | 1/2+           | 2.572 s 13               | 5396.1 15  |
| <sup>31</sup> Cl | 0        | EC   |                | 150 ms 25                | 11980 50   |
| <sup>31</sup> Ar | 0        | EC   |                | 15.1 ms +13-1            | (18360)    |
| <sup>32</sup> Na | 0        | β-2n |                | 13.2 ms                  | 19100 50   |
|                  | 0        | β-n  |                | 13.2 ms 4                | 20300 150  |
|                  | 0        | β-   |                | 13.2 ms 4                | 19100 50   |
| <sup>32</sup> Mg | 0        | β-   | 0+             | 120 ms 20                | 10270 130  |
| <sup>32</sup> Al | 0        | β-   | 1+             | 33 ms 4                  | 13020 90   |
| <sup>32</sup> Si | 0        | β-   | 0+             | 172 y 4                  | 224.4 22   |
| <sup>32</sup> P  | 0        | β-   | 1+             | 14.262 d 14              | 1710.6 3   |
| <sup>32</sup> Cl | 0        | β+   | 1+             | 298 ms 1                 | 12685 7    |
| <sup>32</sup> Ar | 0        | ECp  | 0+             | 98 ms 2                  | 8680 170   |
|                  | 0        | β+   | 0+             | 98 ms 2                  | 11150 50   |
| <sup>33</sup> Na | 0        | β-n  |                | 8.2 ms 4                 | 20300 150  |
|                  | 0        | β-   |                | 8.2 ms 4                 | 20300 150  |
| <sup>33</sup> Mg | 0        | β-n  |                | 90 ms 20                 | 13710 160  |
|                  | 0        | β-   |                | 90 ms 20                 | 13710 160  |
| <sup>33</sup> Si | 0        | β-   |                | 6.18 s 18                | 5845 16    |
| <sup>33</sup> P  | 0        | β-   | 1/2+           | 25.34 d 12               | 248.5 11   |
| <sup>33</sup> Cl | 0        | EC   | 3/2+           | 2.511 s 3                | 5582.7 5   |
| <sup>33</sup> Ar | 0        | ECp  | 1/2+           | 173.0 ms 20              | 8650 60    |
|                  | 0        | EC   | 1/2+           | 173.0 ms 20              | 11620 30   |
| <sup>34</sup> Na | 0        | β-2n |                | 5.5 ms 10                | (24100)    |
|                  | 0        | β-n  |                | 5.5 ms 10                | (24100)    |
|                  | 0        | β-   |                | 5.5 ms 10                | (24100)    |
| <sup>34</sup> Mg | 0        | β-n  | 0+             | 20 ms 10                 | 11300 30   |
|                  | 0        | β-   | 0+             | 20 ms 10                 | 11300 30   |
| <sup>34</sup> Al | 0        | β-n  |                | 60 ms 18                 | 17090 90   |
|                  | 0        | β-   |                | 60 ms 18                 | 17090 90   |
| <sup>34</sup> Si | 0        | β-   | 0+             | 2.77 s 20                | 4601 15    |
| <sup>34</sup> P  | 0        | β-   | 1+             | 12.43 s 8                | 5374 5     |
| <sup>34</sup> Cl | 0        | EC   | 0+             | 1.5264 s 14              | 5492.20 16 |
|                  | 146.36 3 | EC   | 3+             | 32.00 m 4                | 5492.20 16 |
| <sup>34</sup> Ar | 0        | EC   | 0+             | 844.5 ms 34              | 6061 3     |
| <sup>35</sup> Na | 0        | β-n  |                | 1.5 ms 5                 | (24900)    |
|                  | 0        | β-   |                | 1.5 ms 5                 | (24900)    |
| <sup>35</sup> Al | 0        | β-n  |                | 150 ms 50                | 14300 150  |
|                  | 0        | β-   |                | 150 ms 50                | 14300 150  |
| <sup>35</sup> Si | 0        | β-   |                | 0.78 s 12                | 10500 40   |
| <sup>35</sup> P  | 0        | β-   | 1/2+           | 47.3 s 7                 | 3988.7 19  |
| <sup>35</sup> S  | 0        | β-   | 3/2+           | 87.51 d 12               | 167.18 12  |
| <sup>35</sup> Ar | 0        | EC   | 3/2+           | 1.775 s 4                | 5965.3 8   |
| <sup>35</sup> K  | 0        | ECp  | 3/2+           | 190 ms 30                | 6530 50    |
|                  | 0        | β+   | 3/2+           | 190 ms 30                | 11881 20   |
| <sup>35</sup> Ca | 0        | EC2p |                | 50 ms 30                 | 15610 70   |
|                  | 0        | β+   |                | 50 ms 30                 | (156)      |
| <sup>36</sup> Si | 0        | β-   | 0+             | 0.45 s 6                 | 7850 100   |
| <sup>36</sup> P  | 0        | β-   |                | 5.6 s 3                  | 10413 13   |
| <sup>36</sup> Cl | 0        | EC   | 2+             | 3.01×10 <sup>5</sup> y 2 | 1142.07 25 |
|                  | 0        | β-   | 2+             | 3.01×10 <sup>5</sup> y 2 | 708.6 3    |
| <sup>36</sup> K  | 0        | ECα  | 2+             | 342 ms 2                 | 10990 40   |
|                  | 0        | EC   | 2+             | 342 ms 2                 | 12805 8    |
| <sup>36</sup> Ca | 0        | EC   | 0+             | 100 ms +90-40            | 10990 40   |
| <sup>37</sup> P  | 0        | β-   |                | 2.31 s 13                | 7900 40    |
| <sup>37</sup> S  | 0        | β-   | 7/2-           | 5.05 m 2                 | 4865.30 25 |
| <sup>37</sup> Ar | 0        | EC   | 3/2+           | 35.04 d 4                | 813.5 3    |
| <sup>37</sup> K  | 0        | EC   | 3/2+           | 1.226 s 7                | 6148.8 4   |
| <sup>37</sup> Ca | 0        | EC   | 3/2+           | 175 ms 3                 | 11639 22   |

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|------------------|-----------|------|----------------|---------------------------|------------|
| <sup>38</sup> P  | 0         | β-   |                | 0.64 s 14                 | 12390 140  |
| <sup>38</sup> S  | 0         | β-   | 0+             | 170.3 m 7                 | 2937 7     |
| <sup>38</sup> Cl | 0         | β-   | 2-             | 37.24 m 5                 | 4916.8 5   |
| <sup>38</sup> K  | 0         | EC   | 3+             | 7.636 m 18                | 5913.1 6   |
|                  | 130.4 3   | EC   | 0+             | 923.9 ms 6                | 5913.1 6   |
| <sup>38</sup> Ca | 0         | EC   | 0+             | 440 ms 8                  | 6743 5     |
| <sup>39</sup> P  | 0         | β-   |                | 0.16 s +30-1              | 10510 160  |
| <sup>39</sup> S  | 0         | β-   | (3/2,5/2,7/2)- | 11.5 s 5                  | 6640 50    |
| <sup>39</sup> Cl | 0         | β-   | 3/2+           | 55.6 m 2                  | 3442 5     |
| <sup>39</sup> Ar | 0         | β-   | 7/2-           | 269 y 3                   | 565 5      |
| <sup>39</sup> Ca | 0         | EC   | 3/2+           | 859.6 ms 14               | 6530.6 18  |
| <sup>39</sup> Ti | 0         | EC   | (3/2+)         | 26 ms +8-7                | (15400)    |
| <sup>40</sup> P  | 0         | β-n  |                | 260 ms 80                 | 14500 30   |
|                  | 0         | β-   |                | 260 ms 80                 | 14500 30   |
| <sup>40</sup> S  | 0         | β-   | 0+             | 8.8 s 22                  | 4710 240   |
| <sup>40</sup> Cl | 0         | β-   | 2-             | 1.35 m 2                  | 7480 30    |
| <sup>40</sup> K  | 0         | EC   | 4-             | 1.277×10 <sup>9</sup> y 8 | 1504.9 3   |
|                  | 0         | β-   | 4-             | 1.277×10 <sup>9</sup> y 8 | 1311.09 12 |
| <sup>40</sup> Sc | 0         | EC   | 4-             | 182.3 ms 7                | 14320 4    |
| <sup>40</sup> Ti | 0         | EC   | 0+             | 50 ms 15                  | 11680 160  |
| <sup>41</sup> P  | 0         | β-n  |                | 120 ms 20                 | 13800 50   |
|                  | 0         | β-   |                | 120 ms 20                 | 13800 50   |
| <sup>41</sup> Cl | 0         | β-   | (1/2,3/2)+     | 38.4 s 8                  | 5730 60    |
| <sup>41</sup> Ar | 0         | β-   | 7/2-           | 109.34 m 12               | 2491.6 7   |
| <sup>41</sup> Ca | 0         | EC   | 7/2-           | 1.03×10 <sup>5</sup> y 4  | 421.4 3    |
| <sup>41</sup> Sc | 0         | EC   | 7/2-           | 596.3 ms 17               | 6495.3 3   |
| <sup>41</sup> Ti | 0         | ECp  | 3/2+           | 80 ms 2                   | (50)       |
|                  | 0         | EC   | 3/2+           | 80 ms 2                   | (129)      |
| <sup>42</sup> P  | 0         | β-n  |                | 110 ms 30                 | (17300)    |
|                  | 0         | β-   |                | 110 ms 30                 | (17300)    |
| <sup>42</sup> Cl | 0         | β-   |                | 6.8 s 3                   | 9430 120   |
| <sup>42</sup> Ar | 0         | β-   | 0+             | 32.9 y 11                 | 600 40     |
| <sup>42</sup> K  | 0         | β-   | 2-             | 12.360 h 3                | 3525.4 3   |
| <sup>42</sup> Sc | 0         | EC   | 0+             | 681.3 ms 7                | 6425.85 13 |
|                  | 616.28 6  | EC   | 7+,(5+,6+)     | 61.7 s 4                  | 6425.85 13 |
| <sup>42</sup> Ti | 0         | EC   | 0+             | 199 ms 6                  | 7000 5     |
| <sup>43</sup> S  | 0         | β-n  |                | 220 ms 65                 | 11500 90   |
|                  | 0         | β-   |                | 220 ms 65                 | 11500 90   |
| <sup>43</sup> Cl | 0         | β-   |                | 3.3 s 2                   | 7950 180   |
| <sup>43</sup> Ar | 0         | β-   | (3/2,5/2)      | 5.37 m 6                  | 4620 70    |
| <sup>43</sup> K  | 0         | β-   | 3/2+           | 22.3 h 1                  | 1815 9     |
| <sup>43</sup> Sc | 0         | EC   | 7/2-           | 3.891 h 12                | 2220.8 19  |
| <sup>43</sup> Ti | 0         | EC   | 7/2-           | 509 ms 5                  | 6867 7     |
| <sup>44</sup> S  | 0         | β-n  | 0+             | 200 ms 40                 | (9100)     |
|                  | 0         | β-   | 0+             | 200 ms 40                 | (9100)     |
| <sup>44</sup> Ar | 0         | β-   | 0+             | 11.87 m 5                 | 3550 40    |
| <sup>44</sup> K  | 0         | β-   | 2-             | 22.13 m 19                | 5660 40    |
| <sup>44</sup> Sc | 0         | EC   | 2+             | 3.927 h 8                 | 3653.3 19  |
|                  | 271.13 11 | EC   | 6+             | 58.6 h 1                  | 3653.3 19  |
| <sup>44</sup> Ti | 0         | EC   | 0+             | 49 y 3                    | 267.5 19   |
| <sup>44</sup> V  | 0         | ECα  |                | 90 ms 25                  | (10310)    |
|                  | 0         | EC   |                | 90 ms 25                  | (137)      |
| <sup>45</sup> Cl | 0         | β-   |                | 405 ms 35                 | 10800 70   |
| <sup>45</sup> Ar | 0         | β-   |                | 21.48 s 15                | 6890 60    |
| <sup>45</sup> K  | 0         | β-   | 3/2+           | 17.3 m 6                  | 4204 10    |
| <sup>45</sup> Ca | 0         | β-   | 7/2-           | 163.8 d 18                | 256.8 9    |
| <sup>45</sup> Ti | 0         | EC   | 7/2-           | 184.8 m 5                 | 2062.4 5   |
| <sup>45</sup> V  | 0         | β+   | 7/2-           | 547 ms 6                  | 7133 17    |
| <sup>45</sup> Cr | 0         | β+   | (7/2-)         | 50 ms 6                   | (12460)    |
| <sup>46</sup> Cl | 0         | β-   |                | 202 ms 50                 | (14900)    |
| <sup>46</sup> Ar | 0         | β-   | 0+             | 8.4 s 6                   | 5700 40    |

Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>                     | Q(keV)    |
|------------------|------------|------|----------------|--------------------------------------|-----------|
| <sup>46</sup> K  | 0          | β-   | (2-)           | 105 s 10                             | 7716 16   |
| <sup>46</sup> Sc | 0          | β-   | 4+             | 83.79 d 4                            | 2366.7 7  |
| <sup>46</sup> V  | 0          | β+   | 0+             | 422.37 ms 20                         | 7051.4 10 |
| <sup>46</sup> Cr | 0          | EC   | 0+             | 0.26 s 6                             | 7603 20   |
| <sup>47</sup> K  | 0          | β-   | 1/2+           | 17.5 s 3                             | 6643 8    |
| <sup>47</sup> Ca | 0          | β-   | 7/2-           | 4.536 d 2                            | 1991.9 12 |
| <sup>47</sup> Sc | 0          | β-   | 7/2-           | 3.345 d 3                            | 600.1 19  |
| <sup>47</sup> V  | 0          | β+   | 3/2-           | 32.6 m 3                             | 2927.8 10 |
| <sup>47</sup> Cr | 0          | EC   | 3/2-           | 508 ms 10                            | 7451 14   |
| <sup>48</sup> K  | 0          | β-   | (2-)           | 6.8 s 2                              | 12090 24  |
| <sup>48</sup> Sc | 0          | β-   | 6+             | 43.67 h 9                            | 3994 5    |
| <sup>48</sup> V  | 0          | EC   | 4+             | 15.9735 d 25                         | 4012.3 24 |
| <sup>48</sup> Cr | 0          | EC   | 0+             | 21.56 h 3                            | 1659 8    |
| <sup>48</sup> Mn | 0          | EC   | 4+             | 158.1 ms 22                          | (135)     |
| <sup>49</sup> K  | 0          | β-n  | (1/2+,3/2+)    | 1.26 s 5                             | 10970 70  |
|                  | 0          | β-   | (1/2+,3/2+)    | 1.26 s 5                             | 10970 70  |
| <sup>49</sup> Ca | 0          | β-   | 3/2-           | 8.715 m 23                           | 5262 3    |
| <sup>49</sup> Sc | 0          | β-   | 7/2-           | 57.2 m 2                             | 2006 4    |
| <sup>49</sup> V  | 0          | EC   | 7/2-           | 330 d 15                             | 601.9 8   |
| <sup>49</sup> Cr | 0          | β+   | 5/2-           | 42.3 m 1                             | 2631 3    |
| <sup>49</sup> Mn | 0          | β+   | 5/2-           | 384 ms 17                            | 7715 24   |
| <sup>49</sup> Fe | 0          | ECp  | (7/2-)         | 75 ms 10                             | (7600)    |
|                  | 0          | β+   | (7/2-)         | 75 ms 10                             | (13030)   |
| <sup>50</sup> K  | 0          | β-n  | (0-,1,2-)      | 472 ms 4                             | 14200 30  |
|                  | 0          | β-   | (0-,1,2-)      | 472 ms 4                             | 14200 30  |
| <sup>50</sup> Ca | 0          | β-   | 0+             | 13.9 s 6                             | 4966 17   |
| <sup>50</sup> Sc | 0          | β-   | 5+             | 102.5 s 5                            | 6888 16   |
|                  | 256.895 10 | β-   | 2+,3+          | 0.35 s 4                             | 6888 16   |
| <sup>50</sup> V  | 0          | EC   | 6+             | 1.4×10 <sup>17</sup> y +3-72208.2 11 |           |
|                  | 0          | β-   | 6+             | 1.4×10 <sup>17</sup> y +4-31036.9 4  |           |
| <sup>50</sup> Cr | 0          | ECEC | 0+             | >1.8×10 <sup>17</sup> y              | 8554.1 15 |
| <sup>50</sup> Mn | 0          | β+   | 0+             | 283.0 ms 4                           | 7633.0 3  |
|                  | 229 7      | β+   | 5+             | 1.75 m 3                             | 7633.0 3  |
| <sup>51</sup> K  | 0          | β-n  | (1/2+,3/2+)    | 365 ms 5                             |           |
|                  | 0          | β-   | (1/2+,3/2+)    | 365 ms 5                             |           |
| <sup>51</sup> Ca | 0          | β-   | (3/2-)         | 10.0 s 8                             | 7310 90   |
| <sup>51</sup> Sc | 0          | β-   | (7/2-)         | 12.4 s 1                             | 6508 20   |
| <sup>51</sup> Ti | 0          | β-   | 3/2-           | 5.76 m 1                             | 2470.7 15 |
| <sup>51</sup> Cr | 0          | EC   | 7/2-           | 27.702 d 4                           | 752.73 24 |
| <sup>51</sup> Mn | 0          | EC   | 5/2-           | 46.2 m 1                             | 3207.8 5  |
| <sup>51</sup> Fe | 0          | EC   | (5/2-)         | 305 ms 5                             | 8020 15   |
| <sup>52</sup> K  | 0          | β-n  |                | 105 ms 5                             |           |
|                  | 0          | β-   |                | 105 ms 5                             |           |
| <sup>52</sup> Ca | 0          | β-   | 0+             | 4.6 s 3                              | 7900 50   |
| <sup>52</sup> Sc | 0          | β-   | 3+             | 8.2 s 2                              | 9010 160  |
| <sup>52</sup> Ti | 0          | β-   | 0+             | 1.7 m 1                              | 1973 7    |
| <sup>52</sup> V  | 0          | β-   | 3+             | 3.75 m 1                             | 3975.6 12 |
| <sup>52</sup> Mn | 0          | EC   | 6+             | 5.591 d 3                            | 4711.9 20 |
|                  | 377.740 5  | EC   | 2+             | 21.1 m 2                             | 4711.9 20 |
| <sup>52</sup> Fe | 0          | EC   | 0+             | 8.275 h 8                            | 2372 10   |
|                  | 6.82E+3 13 | EC   | (12+)          | 45.9 s 6                             | 2372 10   |
| <sup>52</sup> Co | 0          | EC   |                | 18 ms 13                             | (140)     |
| <sup>53</sup> K  | 0          | β-   | (3/2+)         | 30 ms 5                              |           |
| <sup>53</sup> Ti | 0          | β-   | (3/2-)         | 32.7 s 9                             | 5020 100  |
| <sup>53</sup> V  | 0          | β-   | 7/2-           | 1.61 m 4                             | 3436 3    |
| <sup>53</sup> Mn | 0          | EC   | 7/2-           | 3.74×10 <sup>6</sup> y 4             | 597.0 4   |
| <sup>53</sup> Fe | 0          | EC   | 7/2-           | 8.51 m 2                             | 3742.6 18 |
| <sup>53</sup> Co | 0          | EC   | (7/2-)         | 240 ms 20                            | 8302 18   |
|                  | 3190       | p    | (19/2-)        | 247 ms 12                            |           |
|                  | 3190       | EC   | (19/2-)        | 247 ms 12                            | 8302 18   |
| <sup>53</sup> Ni | 0          | EC   | (7/2-)         | 45 ms 15                             | (13260)   |

Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)  | Mode | J <sup>π</sup> | t <sub>1/2</sub>        | Q(keV)     |
|------------------|---------|------|----------------|-------------------------|------------|
| <sup>54</sup> V  | 0       | β-   | 3+             | 49.8 s 5                | 7042 15    |
| <sup>54</sup> Mn | 0       | EC   | 3+             | 312.3 d 4               | 1377.1 10  |
| <sup>54</sup> Co | 0       | EC   | 0+             | 193.23 ms 14            | 8243.09 22 |
|                  | 199 4   | EC   | (7)+           | 1.48 m 2                | 8243.09 22 |
| <sup>55</sup> V  | 0       | β-   | (7/2-)         | 6.54 s 15               | 5960 100   |
| <sup>55</sup> Cr | 0       | β-   | 3/2-           | 3.497 m 3               | 2603.1 5   |
| <sup>55</sup> Fe | 0       | EC   | 3/2-           | 2.73 y 3                | 231.6 3    |
| <sup>55</sup> Co | 0       | EC   | 7/2-           | 17.53 h 3               | 3451.3 4   |
| <sup>55</sup> Ni | 0       | EC   | 7/2-           | 212.1 ms 38             | 8694 11    |
| <sup>56</sup> Cr | 0       | β-   | 0+             | 5.94 m 10               | 1617 9     |
| <sup>56</sup> Mn | 0       | β-   | 3+             | 2.5785 h 2              | 3695.4 3   |
| <sup>56</sup> Co | 0       | EC   | 4+             | 77.27 d 3               | 4566.0 20  |
| <sup>56</sup> Ni | 0       | EC   | 0+             | 5.9 d 1                 | 2136 11    |
| <sup>57</sup> Cr | 0       | β-   | 3/2-,5/2-,7/2- | 21.1 s 10               | 5090 90    |
| <sup>57</sup> Mn | 0       | β-   | 5/2-           | 87.2 s 8                | 2691 3     |
| <sup>57</sup> Co | 0       | EC   | 7/2-           | 271.79 d 9              | 836.1 4    |
| <sup>57</sup> Ni | 0       | β+   | 3/2-           | 35.60 h 6               | 3264 3     |
| <sup>57</sup> Cu | 0       | β+   | 3/2-           | 199.4 ms 32             | 8770 16    |
| <sup>57</sup> Zn | 0       | ECp  | (7/2-)         | 40 ms 10                | (5730)     |
|                  | 0       | β+   | (7/2-)         | 40 ms 10                | (14620)    |
| <sup>58</sup> Cr | 0       | β-   | 0+             | 7.0 s 3                 | 4010 160   |
| <sup>58</sup> Mn | 0+Y     | β-   | +              | 3.0 s 1                 | 6250 30    |
|                  | 0       | β-   | 3+             | 65.3 s 7                | 6250 30    |
| <sup>58</sup> Co | 0       | EC   | 2+             | 70.82 d 3               | 2307.4 11  |
| <sup>58</sup> Cu | 0       | EC   | 1+             | 3.204 s 7               | 8563.0 21  |
| <sup>59</sup> Cr | 0       | β-   |                | 0.74 s 24               | 7700 170   |
| <sup>59</sup> Mn | 0       | β-   | 3/2-,5/2-      | 4.6 s 1                 | 5190 30    |
| <sup>59</sup> Fe | 0       | β-   | 3/2-           | 44.503 d 6              | 1565.1 6   |
| <sup>59</sup> Ni | 0       | EC   | 3/2-           | 7.6×10 <sup>4</sup> y 5 | 1072.5 6   |
| <sup>59</sup> Cu | 0       | EC   | 3/2-           | 81.5 s 5                | 4799.6 9   |
| <sup>59</sup> Zn | 0       | EC   | 3/2-           | 182.0 ms 18             | 9090 40    |
| <sup>60</sup> Cr | 0       | β-   | 0+             | 0.57 s 6                | 5900 30    |
| <sup>60</sup> Mn | 0       | β-   | (0+)           | 51 s 6                  | 8630 190   |
|                  | 271.8   | β-   | 3+             | 1.77 s 2                | 8630 190   |
| <sup>60</sup> Fe | 0       | β-   | 0+             | 1.5×10 <sup>6</sup> y 3 | 237 3      |
| <sup>60</sup> Co | 0       | β-   | 5+             | 5.2714 y 5              | 2823.9 5   |
|                  | 58.59 1 | β-   | 2+             | 10.47 m 4               | 2823.9 5   |
| <sup>60</sup> Cu | 0       | EC   | 2+             | 23.7 m 4                | 6126.9 21  |
| <sup>60</sup> Zn | 0       | EC   | 0+             | 2.38 m 5                | 4158 11    |
| <sup>61</sup> Mn | 0       | β-   | (5/2-)         | 0.71 s 1                | 7350 190   |
| <sup>61</sup> Fe | 0       | β-   | 3/2-,5/2-      | 5.98 m 6                | 3978 20    |
| <sup>61</sup> Co | 0       | β-   | 7/2-           | 1.650 h 5               | 1321.7 9   |
| <sup>61</sup> Cu | 0       | EC   | 3/2-           | 3.333 h 5               | 2237.1 12  |
| <sup>61</sup> Zn | 0       | EC   | 3/2-           | 89.1 s 2                | 5637 16    |
| <sup>61</sup> Ge | 0       | EC   | (3/2-)         | 40 ms 15                | (13600)    |
| <sup>62</sup> Mn | 0       | β-   | (3+)           | 0.88 s 15               | 10400 30   |
| <sup>62</sup> Fe | 0       | β-   | 0+             | 68 s 2                  | 2530 25    |
| <sup>62</sup> Co | 0       | β-   | 2+             | 1.50 m 4                | 5315 20    |
|                  | 22 5    | β-   | 5+             | 13.91 m 5               | 5315 20    |
| <sup>62</sup> Cu | 0       | β+   | 1+             | 9.74 m 2                | 3948 4     |
| <sup>62</sup> Zn | 0       | EC   | 0+             | 9.186 h 13              | 1627 11    |
| <sup>62</sup> Ga | 0       | EC   | 0+             | 116.12 ms 23            | 9170 30    |
| <sup>63</sup> Fe | 0       | β-   | (5/2-)         | 6.1 s 6                 | 6320 150   |
| <sup>63</sup> Co | 0       | β-   | (7/2-)         | 27.4 s 5                | 3672 20    |
| <sup>63</sup> Ni | 0       | β-   | 1/2-           | 100.1 y 20              | 66.945 4   |
| <sup>63</sup> Zn | 0       | EC   | 3/2-           | 38.47 m 5               | 3366.8 16  |
| <sup>63</sup> Ga | 0       | EC   | 3/2-,5/2-      | 32.4 s 5                | 5520 100   |
| <sup>64</sup> Fe | 0       | β-   | 0+             | 2.0 s 2                 | 4890 220   |
| <sup>64</sup> Co | 0       | β-   | 1+             | 0.30 s 3                | 7307 20    |
| <sup>64</sup> Cu | 0       | EC   | 1+             | 12.700 h 2              | 1675.10 20 |

Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)   | Mode            | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|------------------|----------|-----------------|----------------|------------------|-----------|
|                  | 0        | β-              | 1+             | 12.700 h 2       | 578.8 9   |
| <sup>64</sup> Ga | 0        | EC              | 0+             | 2.630 m 11       | 7165 4    |
| <sup>64</sup> Ge | 0        | EC              | 0+             | 63.7 s 25        | 4410 250  |
| <sup>65</sup> Co | 0        | β-              | (7/2)-         | 1.20 s 6         | 5958 13   |
| <sup>65</sup> Ni | 0        | β-              | 5/2-           | 2.5172 h 3       | 2136.7 10 |
| <sup>65</sup> Zn | 0        | EC              | 5/2-           | 244.26 d 26      | 1351.4 4  |
| <sup>65</sup> Ga | 0        | EC              | 3/2-           | 15.2 m 2         | 3254.9 9  |
| <sup>65</sup> Ge | 0        | EC              | (3/2)-         | 30.9 s 5         | 6240 100  |
| <sup>66</sup> Co | 0        | β-              | (3+)           | 0.23 s 2         | 10000 30  |
| <sup>66</sup> Ni | 0        | β-              | 0+             | 54.6 h 4         | 225 16    |
| <sup>66</sup> Cu | 0        | β-              | 1+             | 5.088 m 11       | 2642.4 13 |
| <sup>66</sup> Ga | 0        | EC              | 0+             | 9.49 h 7         | 5175 3    |
| <sup>66</sup> Ge | 0        | EC              | 0+             | 2.26 h 5         | 2100 30   |
| <sup>66</sup> As | 0        | EC              |                | 95.77 ms 23      | (9800)    |
| <sup>67</sup> Co | 0        | β-              | (7/2-)         | 0.42 s 7         | 8400 30   |
| <sup>67</sup> Ni | 0        | β-              | (1/2-)         | 21 s 1           | 3558 21   |
| <sup>67</sup> Cu | 0        | β-              | 3/2-           | 61.83 h 12       | 577 8     |
| <sup>67</sup> Ga | 0        | EC              | 3/2-           | 3.2612 d 6       | 1000.5 13 |
| <sup>67</sup> Ge | 0        | EC              | 1/2-           | 18.9 m 3         | 4223 5    |
| <sup>67</sup> As | 0        | EC              | (5/2-)         | 42.5 s 12        | 6010 100  |
| <sup>68</sup> Ni | 0        | β-              | 0+             | 19 s 5           | 2060 50   |
| <sup>68</sup> Cu | 0        | β-              | 1+             | 31.1 s 15        | 4460 50   |
|                  | 721.6 7  | β-              | (6-)           | 3.75 m 5         | 4460 50   |
| <sup>68</sup> Ga | 0        | EC              | 1+             | 67.629 m 24      | 2921.1 12 |
| <sup>68</sup> Ge | 0        | EC              | 0+             | 270.82 d 27      | 106 6     |
| <sup>68</sup> As | 0        | EC              | 3              | 151.6 s 8        | 8100 100  |
| <sup>69</sup> Ni | 0        | β-              |                | 11.4 s 3         | 5360 140  |
| <sup>69</sup> Cu | 0        | β-              | 3/2-           | 2.85 m 15        | 2675 8    |
| <sup>69</sup> Zn | 0        | β-              | 1/2-           | 56.4 m 9         | 906 3     |
|                  | 438.64 2 | β-              | 9/2+           | 13.76 h 2        | 906 3     |
| <sup>69</sup> Ge | 0        | EC              | 5/2-           | 39.05 h 10       | 2227.3 6  |
| <sup>69</sup> As | 0        | EC              | 5/2-           | 15.2 m 2         | 4010 30   |
| <sup>69</sup> Se | 0        | EC <sub>p</sub> | (3/2-)         | 27.4 s 2         | 2310 110  |
|                  | 0        | EC              | (3/2-)         | 27.4 s 2         | 6780 40   |
| <sup>70</sup> Cu | 0        | β-              | (1+)           | 4.5 s 10         | 6599 14   |
|                  | 140 6    | β-              | (4-)           | 47 s             | 6599 14   |
| <sup>70</sup> Ga | 0        | EC              | 1+             | 21.14 m 3        | 654.7 16  |
|                  | 0        | β-              | 1+             | 21.14 m 3        | 1656 3    |
| <sup>70</sup> As | 0        | EC              | 4(+)           | 52.6 m 3         | 6220 50   |
| <sup>70</sup> Se | 0        | β+              | 0+             | 41.1 m 3         | (2400)    |
| <sup>71</sup> Cu | 0        | β-              | (3/2-)         | 19.5 s 16        | 4560 40   |
| <sup>71</sup> Zn | 0        | β-              | 1/2-           | 2.45 m 10        | 2813 11   |
|                  | 157.7 13 | β-              | 9/2+           | 3.96 h 5         | 2813 11   |
| <sup>71</sup> Ge | 0        | EC              | 1/2-           | 11.43 d 3        | 229.4 7   |
| <sup>71</sup> As | 0        | EC              | 5/2-           | 65.28 h 15       | 2013 4    |
| <sup>71</sup> Se | 0        | EC              | 3/2-,5/2-      | 4.74 m 5         | (4800)    |
| <sup>71</sup> Br | 0        | β+              | 5/2-           | 21.4 s 6         | (6500)    |
| <sup>71</sup> Kr | 0        | β+              |                | 97 ms 9          | (10500)   |
| <sup>72</sup> Cu | 0        | β-              |                | 6.6 s 1          | (8220)    |
| <sup>72</sup> Zn | 0        | β-              | 0+             | 46.5 h 1         | 458 6     |
| <sup>72</sup> Ga | 0        | β-              | 3-             | 14.10 h 2        | 4001.1 23 |
| <sup>72</sup> As | 0        | EC              | 2-             | 26.0 h 1         | 4356 4    |
| <sup>72</sup> Se | 0        | EC              | 0+             | 8.40 d 8         | 335 13    |
| <sup>72</sup> Br | 0        | EC              | (3)+           | 78.6 s 24        | 8700 30   |
| <sup>72</sup> Kr | 0        | EC              | 0+             | 17.2 s 3         | 5040 80   |
| <sup>73</sup> Cu | 0        | β-              |                | 3.9 s 3          | (6300)    |
| <sup>73</sup> Zn | 0        | β-              | (1/2)-         | 23.5 s 10        | 4290 40   |
|                  | 195.5    | β-              | (7/2+)         | 5.8 s 8          | 4290 40   |
| <sup>73</sup> Ga | 0        | β-              | 3/2-           | 4.86 h 3         | 1593 6    |
| <sup>73</sup> As | 0        | EC              | 3/2-           | 80.30 d 6        | 341 4     |

Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)   | Mode | J <sup>π</sup> | t <sub>1/2</sub>       | Q(keV)    |
|------------------|----------|------|----------------|------------------------|-----------|
| <sup>73</sup> Se | 0        | EC   | 9/2+           | 7.15 h 8               | 2740 10   |
|                  | 25.71 4  | EC   | 3/2-           | 39.8 m 13              | 2740 10   |
| <sup>73</sup> Br | 0        | EC   | 1/2-           | 3.4 m 2                | 4660 130  |
| <sup>73</sup> Kr | 0        | ECp  | 5/2-           | 27.0 s 12              | 3010 140  |
|                  | 0        | EC   | 5/2-           | 27.0 s 12              | 6670 190  |
| <sup>74</sup> Zn | 0        | β-   | 0+             | 96 s 1                 | 2340 90   |
| <sup>74</sup> Ga | 0        | β-   | (3-)           | 8.12 m 12              | 5370 70   |
| <sup>74</sup> As | 0        | EC   | 2-             | 17.77 d 2              | 2562.4 17 |
|                  | 0        | β-   | 2-             | 17.77 d 2              | 1353.0 18 |
| <sup>74</sup> Br | 0        | EC   | (0-,1)         | 25.4 m 3               | 6907 15   |
|                  | 0+X      | EC   | 4(-)           | 46 m 2                 | 6907 15   |
| <sup>74</sup> Kr | 0        | EC   | 0+             | 11.50 m 11             | 3140 60   |
| <sup>74</sup> Rb | 0        | EC   | (0+)           | 64.9 ms 5              | 10400 40  |
| <sup>75</sup> Cu | 0        | β-n  |                | 1.224 s 3              | (7900)    |
| <sup>75</sup> Zn | 0        | β-   | (7/2+)         | 10.2 s 2               | 6000 70   |
| <sup>75</sup> Ga | 0        | β-   | 3/2-           | 126 s 2                | 3392 7    |
| <sup>75</sup> Ge | 0        | β-   | 1/2-           | 82.78 m 4              | 1176.6 10 |
|                  | 139.69 3 | β-   | 7/2+           | 47.7 s 5               | 1176.6 10 |
| <sup>75</sup> Se | 0        | EC   | 5/2+           | 119.779 d 4            | 863.6 8   |
| <sup>75</sup> Br | 0        | EC   | 3/2-           | 96.7 m 13              | 3030 14   |
| <sup>75</sup> Kr | 0        | EC   | (5/2)+         | 4.3 m 2                | 4899 21   |
| <sup>75</sup> Rb | 0        | EC   | (3/2-,5/2-)    | 19.0 s 12              | 7020 17   |
| <sup>76</sup> Zn | 0        | β-   | 0+             | 5.7 s 3                | 4160 80   |
| <sup>76</sup> Ga | 0        | β-   | (3-)           | 32.6 s 6               | 7010 90   |
| <sup>76</sup> As | 0        | β-   | 2-             | 26.32 h 7              | 2962.0 8  |
| <sup>76</sup> Br | 0        | EC   | 1-             | 16.2 h 2               | 4963 9    |
|                  | 102.58 3 | EC   | (4)+           | 1.31 s 2               | 4963 9    |
| <sup>76</sup> Kr | 0        | EC   | 0+             | 14.8 h 1               | 1311 14   |
| <sup>76</sup> Rb | 0        | EC   | 1              | 39.1 s 6               | 8500 13   |
| <sup>77</sup> Cu | 0        | β-   |                | 469 ms 8               | (9500)    |
| <sup>77</sup> Zn | 0        | β-   | (7/2+)         | 2.08 s 5               | 7270 120  |
| <sup>77</sup> Ga | 0        | β-   | (3/2-)         | 13.2 s 2               | 5340 60   |
| <sup>77</sup> Ge | 0        | β-   | 7/2+           | 11.30 h 1              | 2702.0 21 |
|                  | 159.7 1  | β-   | 1/2-           | 52.9 s 6               | 2702.0 21 |
| <sup>77</sup> As | 0        | β-   | 3/2-           | 38.83 h 5              | 682.9 18  |
| <sup>77</sup> Br | 0        | EC   | 3/2-           | 57.036 h 6             | 1365 3    |
| <sup>77</sup> Kr | 0        | EC   | 5/2+           | 74.4 m 6               | 3064 9    |
| <sup>77</sup> Rb | 0        | EC   | 3/2-           | 3.75 m 8               | 5344 11   |
| <sup>77</sup> Sr | 0        | ECp  | (5/2+,7/2+)    | 9.0 s 2                | 3510 200  |
|                  | 0        | EC   | (5/2+,7/2+)    | 9.0 s 2                | 6850 150  |
| <sup>78</sup> Zn | 0        | β-   | 0+             | 1.47 s 15              | 6440 140  |
| <sup>78</sup> Ga | 0        | β-   | (3+)           | 5.09 s 5               | 8200 80   |
| <sup>78</sup> Ge | 0        | β-   | 0+             | 88.0 m 10              | 954 10    |
| <sup>78</sup> As | 0        | β-   | 2-             | 90.7 m 2               | 4210 10   |
| <sup>78</sup> Br | 0        | EC   | 1+             | 6.46 m 4               | 3574 4    |
|                  | 0        | β-   | 1+             | 6.46 m 4               | 706 8     |
| <sup>78</sup> Rb | 0        | EC   | 0(+)           | 17.66 m 8              | 7224 10   |
|                  | 103.3+X  | EC   | 4(-)           | 5.74 m 6               | 7224 10   |
| <sup>78</sup> Sr | 0        | EC   | 0+             | 2.5 m 3                | 3762 10   |
| <sup>79</sup> Cu | 0        | β-   |                | 188 ms 25              | (10700)   |
| <sup>79</sup> Zn | 0        | β-   |                | 995 ms 19              | (9090)    |
| <sup>79</sup> Ga | 0        | β-   | (3/2-)         | 2.847 s 9              | 7000 80   |
| <sup>79</sup> Ge | 0        | β-   | (1/2-)         | 19.1 s 3               | 4150 90   |
|                  | 185.95 4 | β-   | (7/2+)         | 39.0 s 10              | 4150 90   |
| <sup>79</sup> As | 0        | β-   | 3/2-           | 9.01 m 15              | 2281 6    |
| <sup>79</sup> Se | 0        | β-   | 7/2+           | <6.5×10 <sup>4</sup> y | 150.7 18  |
| <sup>79</sup> Kr | 0        | EC   | 1/2-           | 35.04 h 10             | 1626 3    |
| <sup>79</sup> Rb | 0        | EC   | 5/2+           | 22.9 m 5               | 3649 8    |
| <sup>79</sup> Sr | 0        | EC   | (3/2-)         | 2.25 m 10              | 5318 11   |
| <sup>80</sup> Zn | 0        | β-   | 0+             | 0.545 s 16             | 7290 120  |
| <sup>80</sup> Ga | 0        | β-n  | (3)            | 1.697 s 11             | 10380 120 |
|                  | 0        | β-   | (3)            | 1.697 s 11             | 10380 120 |



Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)    | Mode            | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|------------------|-----------|-----------------|----------------|---------------------------|-----------|
| <sup>80</sup> Ge | 0         | β-              | 0+             | 29.5 s 4                  | 2670 18   |
| <sup>80</sup> As | 0         | β-              | 1+             | 15.2 s 2                  | 5641 21   |
| <sup>80</sup> Br | 0         | EC              | 1+             | 17.68 m 2                 | 1870.6 3  |
|                  | 0         | β-              | 1+             | 17.68 m 2                 | 2004 4    |
| <sup>80</sup> Rb | 0         | EC              | 1+             | 34 s 4                    | 5723 8    |
| <sup>80</sup> Sr | 0         | EC              | 0+             | 106.3 m 15                | 1868 10   |
| <sup>80</sup> Y  | 0         | EC              | (3,4,5)        | 35 s 2                    | (9100)    |
| <sup>81</sup> Zn | 0         | β-n             |                | 0.29 s 5                  | (11900)   |
| <sup>81</sup> Ga | 0         | β-n             | (5/2-)         | 1.222 s 4                 | 8320 150  |
|                  | 0         | β-              | (5/2-)         | 1.221 s 5                 | 8320 150  |
| <sup>81</sup> Ge | 0         | β-              | (9/2+)         | 7.6 s 6                   | 6230 120  |
|                  | 679.13 4  | β-              | (1/2+)         | 7.6 s 6                   | 6230 120  |
| <sup>81</sup> As | 0         | β-              | 3/2-           | 33.3 s 8                  | 3856 5    |
| <sup>81</sup> Se | 0         | β-              | 1/2-           | 18.45 m 12                | 1585 3    |
|                  | 102.99 6  | β-              | 7/2+           | 57.28 m 2                 | 1585 3    |
| <sup>81</sup> Kr | 0         | EC              | 7/2+           | 2.29×10 <sup>5</sup> y 11 | 280.7 5   |
|                  | 190.53 4  | EC              | 1/2-           | 13.10 s 3                 | 280.7 5   |
| <sup>81</sup> Rb | 0         | EC              | 3/2-           | 4.576 h 5                 | 2238 6    |
|                  | 86.31 7   | EC              | 9/2+           | 30.5 m 3                  | 2238 6    |
| <sup>81</sup> Sr | 0         | EC              | 1/2-           | 22.3 m 4                  | 3932 10   |
| <sup>81</sup> Y  | 0         | EC              | (5/2+)         | 72.4 s 13                 | 5510 60   |
| <sup>81</sup> Zr | 0         | EC <sub>p</sub> |                | 15 s 5                    | 3300 30   |
|                  | 0         | EC              |                | 15 s 5                    | 7200 30   |
| <sup>82</sup> Ga | 0         | β-n             | (1,2,3)        | 0.602 s 6                 | (12600)   |
|                  | 0         | β-              | (1,2,3)        | 0.602 s 6                 | (12600)   |
| <sup>82</sup> Ge | 0         | β-              | 0+             | 4.60 s 35                 | 4700 140  |
| <sup>82</sup> As | 0+X       | β-              | (5-)           | 13.6 s 4                  | 7350 70   |
|                  | 0         | β-              | (1+)           | 19.1 s 5                  | 7350 70   |
| <sup>82</sup> Se | 0         | β-β-            | 0+             | 1.4×10 <sup>20</sup> y 4  | 97.6 24   |
| <sup>82</sup> Br | 0         | β-              | 5-             | 35.30 h 2                 | 3092.6 15 |
|                  | 45.949 1  | β-              | 2-             | 6.13 m 5                  | 3092.6 15 |
| <sup>82</sup> Rb | 0         | β+              | 1+             | 1.273 m 2                 | 4401 7    |
|                  | 80 23     | β+              | 5-             | 6.472 h 6                 | 4401 7    |
| <sup>82</sup> Sr | 0         | EC              | 0+             | 25.55 d 15                | 180 9     |
| <sup>82</sup> Y  | 0         | β+              | 1+             | 9.5 s 3                   | 7820 100  |
| <sup>82</sup> Zr | 0         | β+              | 0+             | 32 s 5                    | 4000 50   |
| <sup>83</sup> Ga | 0         | β-n             |                | 0.31 s 1                  | (11500)   |
| <sup>83</sup> Ge | 0         | β-              | (5/2+)         | 1.85 s 6                  | (8900)    |
| <sup>83</sup> As | 0         | β-              | (5/2-,3/2-)    | 13.4 s 3                  | 5460 220  |
| <sup>83</sup> Se | 0         | β-              | 9/2+           | 22.3 m 3                  | 3668 5    |
|                  | 228.5 2   | β-              | 1/2-           | 70.1 s 4                  | 3668 5    |
| <sup>83</sup> Br | 0         | β-              | 3/2-           | 2.40 h 2                  | 972 4     |
| <sup>83</sup> Rb | 0         | EC              | 5/2-           | 86.2 d 1                  | 910 7     |
| <sup>83</sup> Sr | 0         | β+              | 7/2+           | 32.41 h 3                 | 2276 6    |
| <sup>83</sup> Y  | 0         | β+              | (9/2+)         | 7.08 m 6                  | 4470 40   |
|                  | 62.0 2    | β+              | (3/2-)         | 2.85 m 2                  | 4470 40   |
| <sup>83</sup> Zr | 0         | EC              | (1/2-)         | 44 s 1                    | 5870 90   |
| <sup>83</sup> Nb | 0         | EC              | (5/2+)         | 4.1 s 3                   | 7500 30   |
| <sup>84</sup> As | 0         | β-              | (0-,1-,2-)     | 5.5 s 3                   | (9900)    |
|                  | 0+X       | β-              |                | 0.65 s 15                 | (9900)    |
| <sup>84</sup> Se | 0         | β-              | 0+             | 3.1 m 1                   | 1830 30   |
| <sup>84</sup> Br | 0         | β-              | 2-             | 31.80 m 8                 | 4654 25   |
|                  | 3.2E+2 10 | β-              | (5-,6-)        | 6.0 m 2                   | 4654 25   |
| <sup>84</sup> Rb | 0         | EC              | 2-             | 32.77 d 14                | 2681.3 23 |
|                  | 0         | β-              | 2-             | 32.77 d 14                | 894 3     |
| <sup>84</sup> Y  | 0         | β+              | 1+             | 4.6 s 2                   | 6410 170  |
|                  | 500       | β+              | (5-)           | 40 m 1                    | 6410 170  |
| <sup>84</sup> Zr | 0         | β+              | 0+             | 25.9 m 8                  | (2700)    |
| <sup>84</sup> Nb | 0         | β+              | (3+)           | 12 s 3                    | (9600)    |
| <sup>85</sup> As | 0         | β-n             | (3/2-)         | 2.028 s 12                | (8900)    |
|                  | 0         | β-              | (3/2-)         | 2.028 s 12                | (8900)    |
| <sup>85</sup> Se | 0         | β-              | (5/2+)         | 31.7 s 9                  | 6182 23   |
| <sup>85</sup> Br | 0         | β-              | 3/2-           | 2.90 m 6                  | 2870 19   |
| <sup>85</sup> Kr | 0         | β-              | 9/2+           | 10.756 y 18               | 687.0 19  |

Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|------------------|------------|------|----------------|---------------------------|-----------|
|                  | 304.871 20 | β-   | 1/2-           | 4.480 h 8                 | 687.0 19  |
| <sup>85</sup> Sr | 0          | EC   | 9/2+           | 64.84 d 2                 | 1065 3    |
|                  | 238.66 6   | EC   | 1/2-           | 67.63 m 4                 | 1065 3    |
| <sup>85</sup> Y  | 0          | EC   | (1/2)-         | 2.68 h 5                  | 3255 25   |
|                  | 19.8 5     | EC   | 9/2+           | 4.86 h 13                 | 3255 25   |
| <sup>85</sup> Zr | 0          | β+   | 7/2+           | 7.86 m 4                  | 4690 100  |
|                  | 292.2 3    | β+   | (1/2-)         | 10.9 s 3                  | 4690 100  |
| <sup>85</sup> Nb | 0          | β+   | (9/2+)         | 20.9 s 7                  | 6000 200  |
| <sup>86</sup> As | 0          | β-   |                | 0.9 s 2                   | (11100)   |
| <sup>86</sup> Se | 0          | β-   | 0+             | 15.3 s 9                  | 5099 11   |
| <sup>86</sup> Br | 0          | β-   | (2-)           | 55.1 s 4                  | 7626 11   |
| <sup>86</sup> Rb | 0          | EC   | 2-             | 18.631 d 18               | 517 5     |
|                  | 0          | β-   | 2-             | 18.631 d 18               | 1774.7 14 |
| <sup>86</sup> Y  | 0          | EC   | 4-             | 14.74 h 2                 | 5240 14   |
|                  | 218.30 20  | EC   | (8+)           | 48 m 1                    | 5240 14   |
| <sup>86</sup> Zr | 0          | EC   | 0+             | 16.5 h 1                  | 1470 30   |
| <sup>86</sup> Nb | 0          | EC   | (5+)           | 88 s 1                    | 7980 80   |
| <sup>87</sup> Se | 0          | β-   | (5/2+)         | 5.85 s 15                 | 7280 40   |
| <sup>87</sup> Br | 0          | β-n  | 3/2-           | 55.60 s 15                | 6853 18   |
|                  | 0          | β-   | 3/2-           | 55.60 s 15                | 6853 18   |
| <sup>87</sup> Kr | 0          | β-   | 5/2+           | 76.3 m 6                  | 3887 5    |
| <sup>87</sup> Rb | 0          | β-   | 3/2-           | 4.75×10 <sup>10</sup> y 4 | 283.3 15  |
| <sup>87</sup> Sr | 388.532 3  | EC   | 1/2-           | 2.803 h 3                 | -283.3 15 |
| <sup>87</sup> Y  | 0          | EC   | 1/2-           | 79.8 h 3                  | 1861.6 14 |
|                  | 380.79 7   | EC   | 9/2+           | 13.37 h 3                 | 1861.6 14 |
| <sup>87</sup> Zr | 0          | β+   | (9/2)+         | 1.68 h 1                  | 3665 9    |
| <sup>87</sup> Nb | 0          | β+   | (9/2+)         | 2.6 m 1                   | 5170 60   |
|                  | 0+X        | β+   | (1/2-)         | 3.7 m 1                   | 5170 60   |
| <sup>87</sup> Mo | 0          | ECp  | (7/2+)         | 13.4 s 4                  | 3660 240  |
|                  | 0          | β+   | (7/2+)         | 13.4 s 4                  | 6490 210  |
| <sup>88</sup> Se | 0          | β-   | 0+             | 1.52 s 3                  | 6850 30   |
| <sup>88</sup> Br | 0          | β-n  | (1,2-)         | 16.5 s 1                  | 8960 40   |
|                  | 0          | β-   | (1,2-)         | 16.5 s 1                  | 8960 40   |
| <sup>88</sup> Kr | 0          | β-   | 0+             | 2.84 h 3                  | 2914 14   |
| <sup>88</sup> Rb | 0          | β-   | 2-             | 17.78 m 11                | 5316 3    |
| <sup>88</sup> Y  | 0          | β+   | 4-             | 106.65 d 4                | 3622.6 15 |
| <sup>88</sup> Zr | 0          | EC   | 0+             | 83.4 d 3                  | 670 10    |
| <sup>88</sup> Nb | 0          | β+   | (8+)           | 14.5 m 1                  | (7200)    |
|                  | 0+X        | β+   | (4-)           | 7.8 m 1                   | (7200)    |
| <sup>88</sup> Mo | 0          | β+   | 0+             | 8.0 m 2                   | (3720)    |
| <sup>89</sup> Se | 0          | β-   | (5/2+)         | 0.41 s 4                  | (9000)    |
| <sup>89</sup> Br | 0          | β-n  | (3/2-,5/2-)    | 4.40 s                    | 8160 30   |
|                  | 0          | β-   | (3/2-,5/2-)    | 4.40 s 3                  | 8160 30   |
| <sup>89</sup> Kr | 0          | β-   | (3/2+,5/2+)    | 3.15 m 4                  | 4990 50   |
| <sup>89</sup> Rb | 0          | β-   | 3/2-           | 15.15 m 12                | 4501 6    |
| <sup>89</sup> Sr | 0          | β-   | 5/2+           | 50.53 d 7                 | 1496.6 23 |
| <sup>89</sup> Zr | 0          | β+   | 9/2+           | 78.41 h 12                | 2832.3 25 |
|                  | 587.84 9   | β+   | 1/2-           | 4.18 m 1                  | 2832.3 25 |
| <sup>89</sup> Nb | 0+Y        | EC   | (1/2)-         | 1.18 h 10                 | 4290 40   |
|                  | 0+X        | EC   | (9/2+)         | 1.9 h 2                   | 4290 40   |
| <sup>89</sup> Mo | 0          | β+   | (9/2+)         | 2.04 m 11                 | 5580 40   |
| <sup>89</sup> Tc | 0+X        | EC   | (9/2+)         | 12.8 s 9                  | 7510 210  |
|                  | 0+Y        | EC   | (1/2-)         | 12.9 s 8                  | 7510 210  |
| <sup>90</sup> Br | 0          | β-n  |                | 1.92 s 2                  | 4392 17   |
|                  | 0          | β-   |                | 1.92 s 2                  | 10350 80  |
| <sup>90</sup> Kr | 0          | β-   | 0+             | 32.32 s 9                 | 4392 17   |
| <sup>90</sup> Rb | 0          | β-   | 0-             | 158 s 5                   | 6590 8    |
|                  | 106.90 3   | β-   | 3-             | 258 s 4                   | 6590 8    |
| <sup>90</sup> Sr | 0          | β-   | 0+             | 28.78 y 4                 | 546.2 14  |
| <sup>90</sup> Y  | 0          | β-   | 2-             | 64.10 h 8                 | 2282.0 17 |
|                  | 682.03 6   | β-   | 7+             | 3.19 h 1                  | 2282.0 17 |
| <sup>90</sup> Nb | 0          | EC   | 8+             | 14.60 h 5                 | 6111 4    |
| <sup>90</sup> Mo | 0          | EC   | 0+             | 5.67 h 5                  | 2489 4    |
| <sup>90</sup> Tc | 0          | EC   | 1+             | 8.7 s 2                   | (9100)    |

Parent Nuclides from the *Table of Isotopes*

| Parent           | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|------------------|-----------|------|----------------|---------------------------|-----------|
| <sup>90</sup> Ru | 50E+1 43  | EC   | 4,5,6          | 49.2 s 4                  | (9100)    |
|                  | 0         | EC   | 0+             | 13 s 5                    | (5600)    |
| <sup>91</sup> Br | 0         | β-   |                | 0.541 s 5                 | 9800 40   |
| <sup>91</sup> Kr | 0         | β-   | (5/2+)         | 8.57 s 4                  | 6440 60   |
| <sup>91</sup> Rb | 0         | β-   | 3/2(-)         | 58.4 s 4                  | 5861 5    |
| <sup>91</sup> Sr | 0         | β-   | 5/2+           | 9.63 h 5                  | 2699 7    |
| <sup>91</sup> Y  | 0         | β-   | 1/2-           | 58.51 d 6                 | 1544.0 20 |
| <sup>91</sup> Nb | 0         | EC   | 9/2+           | 680 y 13                  | 1253.4 24 |
|                  | 104.49 9  | EC   | 1/2-           | 60.86 d 22                | 1253.4 24 |
| <sup>91</sup> Mo | 0         | EC   | 9/2+           | 15.49 m 1                 | 4434 13   |
|                  | 653.01 9  | EC   | 1/2-           | 65.0 s 7                  | 4434 13   |
| <sup>91</sup> Tc | 0         | EC   | (9/2)+         | 3.14 m 2                  | 6220 200  |
|                  | <350      | EC   | (1/2)-         | 3.3 m 1                   | 6220 200  |
| <sup>91</sup> Ru | 0         | EC   | (9/2+)         | 9 s 1                     | 7400 50   |
|                  | 0+X       | EC   | (1/2-)         | 7.6 s 8                   | 7400 50   |
| <sup>92</sup> Br | 0         | β-   | (2-)           | 0.343 s 15                | 12200 50  |
| <sup>92</sup> Kr | 0         | β-   | 0+             | 1.840 s 8                 | 5987 10   |
| <sup>92</sup> Rb | 0         | β-   | 0-             | 4.492 s 20                | 8105 8    |
| <sup>92</sup> Sr | 0         | β-   | 0+             | 2.71 h 1                  | 1911 12   |
| <sup>92</sup> Y  | 0         | β-   | 2-             | 3.54 h 1                  | 3625 10   |
| <sup>92</sup> Nb | 0         | EC   | (7)+           | 3.47×10 <sup>7</sup> y 24 | 2005.7 18 |
|                  | 135.5 4   | EC   | (2)+           | 10.15 d 2                 | 2005.7 18 |
| <sup>92</sup> Tc | 0         | EC   | (8)+           | 4.23 m 15                 | 7870 30   |
| <sup>92</sup> Ru | 0         | EC   | 0+             | 3.65 m 5                  | (4500)    |
| <sup>93</sup> Kr | 0         | β-   | (1/2+)         | 1.286 s 10                | 8600 100  |
| <sup>93</sup> Rb | 0         | β-n  | 5/2-           | 5.84 s 2                  | 7460 9    |
|                  | 0         | β-   | 5/2-           | 5.84 s 2                  | 7460 9    |
| <sup>93</sup> Sr | 0         | β-   | 5/2+           | 7.423 m 24                | 4083 14   |
| <sup>93</sup> Y  | 0         | β-   | 1/2-           | 10.18 h 8                 | 2874 11   |
| <sup>93</sup> Zr | 0         | β-   | 5/2+           | 1.53×10 <sup>6</sup> y 10 | 91.1 16   |
| <sup>93</sup> Mo | 0         | EC   | 5/2+           | 4.0×10 <sup>3</sup> y 8   | 405 4     |
|                  | 2424.89 3 | EC   | 21/2+          | 6.85 h 7                  | 405 4     |
| <sup>93</sup> Tc | 0         | EC   | 9/2+           | 2.75 h 5                  | 3200.9 10 |
|                  | 391.84 8  | EC   | 1/2-           | 43.5 m 10                 | 3200.9 10 |
| <sup>93</sup> Ru | 0         | EC   | (9/2)+         | 59.7 s 6                  | 6340 90   |
|                  | 734.40 10 | EC   | (1/2)-         | 10.8 s 3                  | 6340 90   |
| <sup>94</sup> Kr | 0         | β-   | 0+             | 0.20 s 1                  | (7300)    |
| <sup>94</sup> Rb | 0         | β-n  | 3(-)           | 2.702 s 5                 | 10307 13  |
|                  | 0         | β-   | 3(-)           | 2.702 s 5                 | 10307 13  |
| <sup>94</sup> Sr | 0         | β-   | 0+             | 75.3 s 2                  | 3511 5    |
| <sup>94</sup> Y  | 0         | β-   | 2-             | 18.7 m 1                  | 4919 5    |
| <sup>94</sup> Nb | 0         | β-   | (6)+           | 2.03×10 <sup>4</sup> y 16 | 2045.1 19 |
|                  | 40.902 12 | β-   | 3+             | 6.263 m 4                 | 2045.1 19 |
| <sup>94</sup> Tc | 0         | β+   | 7+             | 293 m 1                   | 4256 4    |
|                  | 75.5 19   | β+   | (2)+           | 52.0 m 10                 | 4256 4    |
| <sup>94</sup> Ru | 0         | EC   | 0+             | 51.8 m 6                  | 1593 14   |
| <sup>94</sup> Rh | 0+Y       | EC   | (8+)           | 25.8 s 2                  | (9600)    |
|                  | 0+X       | EC   | (3+)           | 70.6 s 6                  | (9600)    |
| <sup>94</sup> Pd | 0         | EC   | 0+             | 9.0 s 5                   | (6600)    |
| <sup>95</sup> Kr | 0         | β-   |                | 0.78 s 3                  | (9700)    |
| <sup>95</sup> Rb | 0         | β-n  | 5/2-           | 377.5 ms 8                | 9296 18   |
|                  | 0         | β-   | 5/2-           | 377.5 ms 8                | 9296 18   |
| <sup>95</sup> Sr | 0         | β-   | 1/2+           | 23.90 s 14                | 6080 9    |
| <sup>95</sup> Y  | 0         | β-   | 1/2-           | 10.3 m 1                  | 4420 10   |
| <sup>95</sup> Zr | 0         | β-   | 5/2+           | 64.02 d 5                 | 1124.5 19 |
| <sup>95</sup> Nb | 0         | β-   | 9/2+           | 34.975 d 7                | 925.6 5   |
|                  | 235.68 2  | β-   | 1/2-           | 86.6 h 8                  | 925.6 5   |
| <sup>95</sup> Tc | 0         | EC   | 9/2+           | 20.0 h 1                  | 1691 5    |
|                  | 38.89 5   | EC   | 1/2-           | 61 d 2                    | 1691 5    |
| <sup>95</sup> Ru | 0         | EC   | 5/2+           | 1.643 h 14                | 2572 13   |
| <sup>95</sup> Rh | 0         | EC   | (9/2)+         | 5.02 m 10                 | 5110 150  |
|                  | 543.3 3   | EC   | (1/2)-         | 1.96 m 4                  | 5110 150  |
| <sup>95</sup> Pd | 2000      | ECp  | (21/2+)        | 13.3 s 3                  | (4000)    |
|                  | 2000      | EC   | (21/2+)        | 13.3 s 3                  | (8200)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)      | Mode | J <sup>π</sup> | t <sub>1/2</sub>           | Q(keV)    |
|-------------------|-------------|------|----------------|----------------------------|-----------|
| <sup>96</sup> Rb  | 0           | β-n  | 2+             | 0.199 s 3                  | 11756 21  |
|                   | 0           | β-   | 2+             | 0.199 s 3                  | 11756 21  |
| <sup>96</sup> Sr  | 0           | β-   | 0+             | 1.07 s 1                   | 5371 8    |
| <sup>96</sup> Y   | 0           | β-   | 0-             | 5.34 s 5                   | 7087 12   |
|                   | 0+X         | β-   | (8+)           | 9.6 s 2                    | 7087 12   |
| <sup>96</sup> Nb  | 0           | β-   | 6+             | 23.35 h 5                  | 3187 3    |
| <sup>96</sup> Tc  | 0           | EC   | 7+             | 4.28 d 7                   | 2973 5    |
|                   | 34.28 7     | EC   | 4+             | 51.5 m 10                  | 2973 5    |
| <sup>96</sup> Rh  | 0           | EC   | 6+             | 9.90 m 10                  | 6446 10   |
|                   | 52.0 1      | EC   | 3+             | 1.51 m 2                   | 6446 10   |
| <sup>96</sup> Pd  | 0           | EC   | 0+             | 122 s 2                    | 3450 150  |
| <sup>96</sup> Ag  | 0           | EC   | (8+,9+)        | 5.1 s 4                    | (11600)   |
| <sup>97</sup> Rb  | 0           | β-n  | 3/2(+)         | 169.9 ms 7                 | 10420 24  |
|                   | 0           | β-   | 3/2(+)         | 169.9 ms 7                 | 10420 24  |
| <sup>97</sup> Sr  | 0           | β-   | 1/2+           | 426 ms 5                   | 7467 15   |
| <sup>97</sup> Y   | 0           | β-   | (1/2-)         | 3.75 s 3                   | 6688 10   |
|                   | 667.51 23   | β-   | (9/2)+         | 1.17 s 3                   | 6688 10   |
| <sup>97</sup> Zr  | 0           | β-   | 1/2+           | 16.91 h 5                  | 2658.1 19 |
| <sup>97</sup> Nb  | 0           | β-   | 9/2+           | 72.1 m 7                   | 1933.9 19 |
| <sup>97</sup> Tc  | 0           | EC   | 9/2+           | 2.6×10 <sup>6</sup> y 4    | 320 4     |
| <sup>97</sup> Ru  | 0           | EC   | 5/2+           | 2.9 d 1                    | 1115 10   |
| <sup>97</sup> Rh  | 0           | EC   | (9/2)+         | 30.7 m 6                   | 3520 40   |
|                   | 258.85 17   | EC   | (1/2)-         | 46.2 m 16                  | 3520 40   |
| <sup>97</sup> Pd  | 0           | EC   | (5/2+)         | 3.10 m 9                   | 4800 30   |
| <sup>97</sup> Ag  | 0           | EC   | (9/2+)         | 19 s 2                     | (7000)    |
| <sup>97</sup> Cd  | X           | EC   |                | 3 s +4-2                   |           |
| <sup>98</sup> Rb  | 0           | β-2n | (1,0)          | 114 ms 5                   | 12344 23  |
|                   | 0           | β-n  | (1,0)          | 114 ms 5                   | 12344 23  |
|                   | 0           | β-   | (1,0)          | 114 ms 5                   | 12344 23  |
|                   | 270         | β-   | (4,5)          | 96 ms 3                    | 12344 23  |
| <sup>98</sup> Sr  | 0           | β-n  | 0+             | 0.653 s 2                  | 5826 10   |
|                   | 0           | β-   | 0+             | 0.653 s 2                  | 5826 10   |
| <sup>98</sup> Y   | 0           | β-n  | (0)-           | 0.548 s 2                  | 8830 14   |
|                   | 0+X         | β-n  | (4,5)          | 2.0 s 2                    | 8830 14   |
|                   | 0+X         | β-   | (4,5)          | 2.0 s 2                    | 8830 14   |
|                   | 0           | β-   | (0)-           | 0.548 s 2                  | 8830 14   |
| <sup>98</sup> Zr  | 0           | β-   | 0+             | 30.7 s 4                   | 2261 20   |
| <sup>98</sup> Nb  | 0           | β-   | 1+             | 2.86 s 6                   | 4586 6    |
|                   | 84 4        | β-   | (5+)           | 51.3 m 4                   | 4586 6    |
| <sup>98</sup> Tc  | 0           | β-   | (6+)           | 4.2×10 <sup>6</sup> y 3    | 1796 7    |
| <sup>98</sup> Rh  | 0           | EC   | (2)+           | 8.7 m 2                    | 5057 10   |
|                   | 0+X         | EC   | (5+)           | 3.5 m 3                    | 5057 10   |
| <sup>98</sup> Pd  | 0           | EC   | 0+             | 17.7 m 3                   | 1873 25   |
| <sup>98</sup> Ag  | 0           | EC   | (5+)           | 46.7 s 9                   | 8420 150  |
| <sup>98</sup> Cd  | 0           | EC   | 0+             | 9.2 s 3                    | (5420)    |
| <sup>99</sup> Rb  | 0           | β-n  | (5/2+)         | 59 ms 1                    | 11250 100 |
|                   | 0           | β-   | (5/2+)         | 59 ms 1                    | 11250 100 |
| <sup>99</sup> Sr  | 0           | β-n  | 3/2+           | 0.269 s 1                  | 8030 120  |
|                   | 0           | β-   | 3/2+           | 0.269 s 1                  | 8030 120  |
| <sup>99</sup> Y   | 0           | β-n  | 5/2+           | 1.470 s 7                  | 7567 14   |
|                   | 0           | β-   | 5/2+           | 1.470 s 7                  | 7567 14   |
| <sup>99</sup> Zr  | 0           | β-   | 1/2+           | 2.1 s 1                    | 4558 15   |
| <sup>99</sup> Nb  | 0           | β-   | 9/2+           | 15.0 s 2                   | 3639 13   |
|                   | 365.29 14   | β-   | 1/2-           | 2.6 m 2                    | 3639 13   |
| <sup>99</sup> Mo  | 0           | β-   | 1/2+           | 65.94 h 1                  | 1357.2 10 |
| <sup>99</sup> Tc  | 0           | β-   | 9/2+           | 2.111×10 <sup>5</sup> y 12 | 293.5 14  |
|                   | 142.6833 11 | β-   | 1/2-           | 6.01 h 1                   | 293.5 14  |
| <sup>99</sup> Rh  | 0           | β+   | (1/2-)         | 16.1 d 2                   | 2103 10   |
|                   | 64.3 4      | β+   | 9/2+           | 4.7 h 1                    | 2103 10   |
| <sup>99</sup> Pd  | 0           | β+   | (5/2)+         | 21.4 m 2                   | 3365 20   |
| <sup>99</sup> Ag  | 0           | EC   | (9/2)+         | 124 s 3                    | 5430 150  |
| <sup>99</sup> Cd  | 0           | ECp  | (5/2+)         | 16 s 3                     | (2100)    |
|                   | 0           | β+   | (5/2+)         | 16 s 3                     | (6900)    |
| <sup>100</sup> Rb | 0           | β-2n |                | 51 ms 8                    | (13500)   |
|                   | 0           | β-n  |                | 51 ms 8                    | (13500)   |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)      |
|-------------------|-----------|------|----------------|------------------|-------------|
|                   | 0         | β-   |                | 51 ms            | 8 (13100)   |
| <sup>100</sup> Sr | 0         | β-n  | 0+             | 202 ms           | 3 7080 100  |
|                   | 0         | β-   | 0+             | 202 ms           | 3 7520 140  |
| <sup>100</sup> Y  | 0         | β-n  | 1-,2-          | 735 ms           | 7 9310 70   |
|                   | 0         | β-   | 1-,2-          | 735 ms           | 7 9310 70   |
|                   | 0+X       | β-   | (3,4,5)        | 0.94 s           | 3 9310 70   |
| <sup>100</sup> Zr | 0         | β-   | 0+             | 7.1 s            | 4 3335 25   |
| <sup>100</sup> Nb | 0         | β-   | 1+             | 1.5 s            | 2 6245 25   |
|                   | 480 80    | β-   | (4+,5+)        | 2.99 s           | 11 6245 25  |
| <sup>100</sup> Tc | 0         | β-   | 1+             | 15.8 s           | 1 3201.8 17 |
| <sup>100</sup> Rh | 0         | EC   | 1-             | 20.8 h           | 1 3630 20   |
|                   | 107.6     | EC   | (5+)           | 4.6 m            | 3 3630 20   |
| <sup>100</sup> Pd | 0         | EC   | 0+             | 3.63 d           | 9 361 23    |
| <sup>100</sup> Ag | 0         | EC   | (5)+           | 2.01 m           | 9 7050 90   |
|                   | 15.52 16  | EC   | (2)+           | 2.24 m           | 13 7050 90  |
| <sup>100</sup> Cd | 0         | EC   | 0+             | 49.1 s           | 5 3890 70   |
| <sup>101</sup> Rb | 0         | β-   |                | 32 ms            | 4 11810 110 |
| <sup>101</sup> Sr | 0         | β-n  | (5/2)          | 118 ms           | 3 (9300)    |
|                   | 0         | β-   | (5/2)          | 118 ms           | 3 9510 80   |
| <sup>101</sup> Y  | 0         | β-   | (5/2+)         | 448 ms           | 19 8550 90  |
| <sup>101</sup> Zr | 0         | β-   | (3/2+)         | 2.1 s            | 3 5485 25   |
| <sup>101</sup> Nb | 0         | β-   | +              | 7.1 s            | 3 4569 18   |
| <sup>101</sup> Mo | 0         | β-   | 1/2+           | 14.61 m          | 3 2824 24   |
| <sup>101</sup> Tc | 0         | β-   | (9/2)+         | 14.22 m          | 1 1614 24   |
| <sup>101</sup> Rh | 0         | EC   | 1/2-           | 3.3 y            | 3 542 17    |
|                   | 157.32 4  | EC   | 9/2+           | 4.34 d           | 1 542 17    |
| <sup>101</sup> Pd | 0         | EC   | (5/2+)         | 8.47 h           | 6 1980 4    |
| <sup>101</sup> Ag | 0         | EC   | 9/2+           | 11.1 m           | 3 4200 100  |
| <sup>101</sup> Cd | 0         | EC   | (5/2+)         | 1.2 m            | 2 5480 110  |
| <sup>101</sup> In | 0         | β+   |                | 16 s             | 3 (7300)    |
| <sup>102</sup> Sr | 0         | β-   | 0+             | 69 ms            | 6 8820 70   |
| <sup>102</sup> Y  | 0+Y       | β-   |                | 0.36 s           | 4           |
|                   | 0+X       | β-   |                | 0.30 s           | 1           |
| <sup>102</sup> Zr | 0         | β-   | 0+             | 2.9 s            | 2 4610 30   |
| <sup>102</sup> Nb | 0+X       | β-   | 1+             | 1.3 s            | 2 7210 40   |
|                   | 0+Y       | β-   |                | 4.3 s            | 4 7210 40   |
| <sup>102</sup> Mo | 0         | β-   | 0+             | 11.3 m           | 2 1010 23   |
| <sup>102</sup> Tc | 0+X       | β-   | (4,5)          | 4.35 m           | 7 4530 9    |
|                   | 0         | β-   | 1+             | 5.28 s           | 15 4530 9   |
| <sup>102</sup> Rh | 0         | EC   | (1-,2-)        | 207 d            | 3 2323 5    |
|                   | 0         | β-   | (1-,2-)        | 207 d            | 3 1150 5    |
|                   | 140.75 8  | EC   | 6(+)           | 2.9 y            | 2323 5      |
| <sup>102</sup> Ag | 0         | EC   | 5+             | 12.9 m           | 3 5920 50   |
|                   | 9.3 4     | EC   | 2+             | 7.7 m            | 5 5920 50   |
| <sup>102</sup> Cd | 0         | EC   | 0+             | 5.5 m            | 5 2587 8    |
| <sup>102</sup> In | 0         | EC   | (5)            | 24 s             | 4 8900 30   |
| <sup>103</sup> Zr | 0         | β-   | (5/2)          | 1.3 s            | 1 6950 90   |
| <sup>103</sup> Nb | 0         | β-   | (5/2+)         | 1.5 s            | 2 5530 30   |
| <sup>103</sup> Mo | 0         | β-   | (3/2+)         | 67.5 s           | 15 3750 60  |
| <sup>103</sup> Tc | 0         | β-   | 5/2+           | 54.2 s           | 8 2660 10   |
| <sup>103</sup> Ru | 0         | β-   | 3/2+           | 39.26 d          | 2 763.3 21  |
| <sup>103</sup> Pd | 0         | EC   | 5/2+           | 16.991 d         | 19 543.1 8  |
| <sup>103</sup> Ag | 0         | EC   | 7/2+           | 65.7 m           | 7 2688 17   |
| <sup>103</sup> Cd | 0         | EC   | (5/2+)         | 7.3 m            | 1 4142 10   |
| <sup>103</sup> In | 0         | EC   | (9/2+)         | 65 s             | 7 6050 20   |
| <sup>104</sup> Zr | 0         | β-   | 0+             | 1.2 s            | 3 (5900)    |
| <sup>104</sup> Nb | 0         | β-   | (1+)           | 4.8 s            | 4 8110 90   |
|                   | 215 12    | β-   |                | 0.92 s           | 4 8110 90   |
| <sup>104</sup> Mo | 0         | β-   | 0+             | 60 s             | 2 2160 40   |
| <sup>104</sup> Tc | 0         | β-   | (3+)           | 18.3 m           | 3 5600 50   |
| <sup>104</sup> Rh | 0         | EC   | 1+             | 42.3 s           | 4 1141 4    |
|                   | 0         | β-   | 1+             | 42.3 s           | 4 2441 5    |
|                   | 128.970 4 | β-   | 5+             | 4.34 m           | 3 2441 5    |
| <sup>104</sup> Ag | 0         | EC   | 5+             | 69.2 m           | 10 4279 4   |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>        | Q(keV)    |
|-------------------|-----------|------|----------------|-------------------------|-----------|
|                   | 6.9 4     | EC   | 2+             | 33.5 m 20               | 4279 4    |
| <sup>104</sup> Cd | 0         | EC   | 0+             | 57.7 m 10               | 1137 11   |
| <sup>104</sup> In | 0         | EC   | (6+)           | 1.8 m 2                 | 7910 140  |
|                   | 93.5 1    | EC   | (3+)           | 15.7 s 5                | 7910 140  |
| <sup>104</sup> Sn | 0         | EC   | 0+             | 20.8 s 5                | 4520 60   |
| <sup>105</sup> Nb | 0         | β-   | (5/2+)         | 2.95 s 6                | 6490 70   |
| <sup>105</sup> Mo | 0         | β-   | (5/2-)         | 35.6 s 16               | 4950 50   |
| <sup>105</sup> Tc | 0         | β-   | (3/2-)         | 7.6 m 1                 | 3640 60   |
| <sup>105</sup> Ru | 0         | β-   | 3/2+           | 4.44 h 2                | 1917 4    |
| <sup>105</sup> Rh | 0         | β-   | 7/2+           | 35.36 h 6               | 566.7 25  |
| <sup>105</sup> Ag | 0         | EC   | 1/2-           | 41.29 d 7               | 1346 11   |
|                   | 25.465 12 | EC   | 7/2+           | 7.23 m 16               | 1346 11   |
| <sup>105</sup> Cd | 0         | EC   | 5/2+           | 55.5 m 4                | 2739 4    |
| <sup>105</sup> In | 0         | EC   | (9/2)+         | 5.07 m 7                | 4849 13   |
| <sup>106</sup> Nb | 0         | β-   |                | 1.02 s 5                | (9300)    |
| <sup>106</sup> Mo | 0         | β-   | 0+             | 8.4 s 5                 | 3520 17   |
| <sup>106</sup> Tc | 0         | β-   | (1,2)          | 35.6 s 6                | 6547 11   |
| <sup>106</sup> Ru | 0         | β-   | 0+             | 373.59 d 15             | 39.40 21  |
| <sup>106</sup> Rh | 0         | β-   | 1+             | 29.80 s 8               | 3541 6    |
|                   | 137 13    | β-   | (6+)           | 131 m 2                 | 3541 6    |
| <sup>106</sup> Ag | 0         | EC   | 1+             | 23.96 m 4               | 2965 3    |
|                   | 0         | β-   | 1+             | 23.96 m 4               | 195 8     |
|                   | 89.66 7   | EC   | 6+             | 8.28 d 2                | 2965 3    |
| <sup>106</sup> In | 0         | EC   | 7+             | 6.2 m 1                 | 6521 11   |
|                   | 28.6 3    | EC   | (3+)           | 5.2 m 1                 | 6521 11   |
| <sup>106</sup> Sn | 0         | EC   | 0+             | 115 s 5                 | 3180 50   |
| <sup>106</sup> Te | 0         | α    | 0+             | 70 us 20                | 4320 30   |
| <sup>107</sup> Mo | 0         | β-   |                | 3.5 s 5                 | 6160 60   |
| <sup>107</sup> Tc | 0         | β-   |                | 21.2 s 2                | 4820 90   |
| <sup>107</sup> Ru | 0         | β-   | (5/2)+         | 3.75 m 5                | 2940 120  |
| <sup>107</sup> Rh | 0         | β-   | 7/2+           | 21.7 m 4                | 1511 13   |
| <sup>107</sup> Pd | 0         | β-   | 5/2+           | 6.5×10 <sup>6</sup> y 3 | 33 3      |
| <sup>107</sup> Cd | 0         | EC   | 5/2+           | 6.50 h 2                | 1417 4    |
| <sup>107</sup> In | 0         | EC   | 9/2+           | 32.4 m 3                | 3426 11   |
| <sup>107</sup> Sn | 0         | EC   | (5/2+)         | 2.90 m 5                | 5000 90   |
| <sup>107</sup> Te | X         | α    |                | 3.6 ms +6-4             | 4000 50   |
| <sup>108</sup> Mo | 0         | β-   | 0+             | 1.5 s 4                 | (46)      |
| <sup>108</sup> Tc | X         | β-   | (2-,3)         | 5.17 s 7                | 7720 50   |
| <sup>108</sup> Ru | 0         | β-   | 0+             | 4.55 m 5                | 1360 60   |
| <sup>108</sup> Rh | 0+X       | β-   | 1+             | 16.8 s 5                | 4510 110  |
|                   | 0+Y       | β-   | (5+)           | 6.0 m 3                 | 4510 110  |
| <sup>108</sup> Ag | 0         | EC   | 1+             | 2.37 m 1                | 1918 6    |
|                   | 0         | β-   | 1+             | 2.37 m 1                | 1649 8    |
|                   | 109.440 7 | EC   | 6+             | 418 y 21                | 1918 6    |
| <sup>108</sup> In | 0         | EC   | 7+             | 58.0 m 12               | 5148 11   |
|                   | 29.75 5   | EC   | 2+             | 39.6 m 7                | 5148 11   |
| <sup>108</sup> Sn | 0         | EC   | 0+             | 10.30 m 8               | 2092 25   |
| <sup>108</sup> Sb | 0         | EC   | (4+)           | 7.0 s 5                 | (9510)    |
| <sup>108</sup> Te | 0         | α    | 0+             | 2.1 s 1                 | 3442 4    |
|                   | 0         | EC   | 0+             | 2.1 s                   | (68)      |
| <sup>109</sup> Tc | 0         | β-   |                | 0.87 s 4                | (60)      |
| <sup>109</sup> Ru | 0         | β-   | (5/2+)         | 34.5 s 10               | 4160 70   |
| <sup>109</sup> Rh | 0         | β-   | 7/2+           | 80 s 2                  | 2591 12   |
| <sup>109</sup> Pd | 0         | β-   | 5/2+           | 13.7012 h 24            | 1115.9 20 |
| <sup>109</sup> Cd | 0         | EC   | 5/2+           | 462.6 d 4               | 214 3     |
| <sup>109</sup> In | 0         | β+   | 9/2+           | 4.2 h 1                 | 2020 6    |
| <sup>109</sup> Sn | 0         | β+   | 5/2(+)         | 18.0 m 2                | 3850 11   |
| <sup>109</sup> Sb | 0         | β+   | (5/2+)         | 17.0 s 7                | 6380 16   |
| <sup>109</sup> Te | 0         | α    |                | 4.6 s 3                 | 3230 50   |
|                   | 0         | EC   |                | 4.6 s                   | (87)      |
| <sup>109</sup> I  | 0         | p    |                | 0.11 ms 2               | (820)     |
| <sup>110</sup> Tc | 0         | β-   |                | 0.92 s 3                | (8800)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|-------------------|-----------|------|----------------|---------------------------|-----------|
| <sup>110</sup> Ru | 0         | β-   | 0+             | 14.6 s 10                 | 2810 50   |
| <sup>110</sup> Rh | 0+Y       | β-   | (GE 4)         | 28.5 s 15                 | 5400 220  |
|                   | 0+X       | β-   | 1+             | 3.2 s 2                   | 5400 220  |
| <sup>110</sup> Ag | 0         | EC   | 1+             | 24.6 s 2                  | 893 11    |
|                   | 0         | β-   | 1+             | 24.6 s 2                  | 2892.1 15 |
|                   | 117.59    | β-   | 6+             | 249.79 d 4                | 2892.1 15 |
| <sup>110</sup> In | 0         | EC   | 7+             | 4.9 h 1                   | 3878 12   |
|                   | 62.09 4   | EC   | 2+             | 69.1 m 5                  | 3878 12   |
| <sup>110</sup> Sn | 0         | EC   | 0+             | 4.11 h 10                 | 638 19    |
| <sup>110</sup> Sb | 0         | EC   | 3+             | 23.0 s 4                  | (8300)    |
| <sup>110</sup> Te | 0         | α    | 0+             | 18.6 s 8                  | 2723 16   |
|                   | 0         | EC   | 0+             | 18.6 s 8                  | (5250)    |
| <sup>110</sup> I  | 0         | α    |                | 0.65 s 2                  | 3580 50   |
|                   | 0         | EC   |                | 0.65 s 2                  | (11900)   |
| <sup>110</sup> Xe | 0         | α    | 0+             | 0.2 s                     | 3886 14   |
|                   | 0         | EC   | 0+             | 0.2 s                     | (8700)    |
| <sup>111</sup> Tc | 0         | β-   |                | 0.30 s 3                  | (7000)    |
| <sup>111</sup> Ru | 0         | β-   |                | 2.12 s 7                  | (5500)    |
| <sup>111</sup> Rh | 0         | β-   | (7/2+)         | 11 s 1                    | (3740)    |
| <sup>111</sup> Pd | 0         | β-   | 5/2+           | 23.4 m 2                  | 2190 40   |
|                   | 172.2 1   | β-   | 11/2-          | 5.5 h 1                   | 2190 40   |
| <sup>111</sup> Ag | 0         | β-   | 1/2-           | 7.45 d 1                  | 1036.8 14 |
|                   | 59.82 4   | β-   | 7/2+           | 64.8 s 8                  | 1036.8 14 |
| <sup>111</sup> In | 0         | EC   | 9/2+           | 2.8049 d 1                | 866 5     |
| <sup>111</sup> Sn | 0         | EC   | 7/2+           | 35.3 m 6                  | 2445 8    |
| <sup>111</sup> Sb | 0         | EC   | (5/2+)         | 75 s 1                    | (5100)    |
| <sup>111</sup> Te | 0         | EC   |                | 19.3 s 4                  | (7370)    |
| <sup>111</sup> I  | 0         | α    |                | 2.5 s 2                   | 3280 50   |
| <sup>111</sup> Xe | X         | α    |                | 0.74 s 2                  | 3710 50   |
| <sup>112</sup> Ru | 0         | β-   | 0+             | 1.75 s 7                  | (37)      |
| <sup>112</sup> Rh | 0+X       | β-   | 1+             | 3.8 s 6                   | (6800)    |
|                   | 0+Y       | β-   | GE 4           | 6.8 s 2                   | (6800)    |
| <sup>112</sup> Pd | 0         | β-   | 0+             | 21.03 h 5                 | 288 17    |
| <sup>112</sup> Ag | 0         | β-   | 2(-)           | 3.130 h 9                 | 3956 17   |
| <sup>112</sup> In | 0         | EC   | 1+             | 14.97 m 10                | 2586 5    |
|                   | 0         | β-   | 1+             | 14.97 m 10                | 663 5     |
| <sup>112</sup> Sb | 0         | EC   | 3+             | 51.4 s 10                 | 7055 23   |
| <sup>112</sup> Te | 0         | EC   | 0+             | 2.0 m 2                   | 4340 160  |
| <sup>112</sup> I  | 0         | α    |                | 3.42 s 11                 | 2990 50   |
|                   | 0         | EC   |                | 3.42 s 11                 | (10200)   |
| <sup>112</sup> Xe | 0         | α    | 0+             | 2.7 s 8                   | 3317 12   |
| <sup>113</sup> Ru | X         | β-   |                | 0.80 s 5                  | (6600)    |
| <sup>113</sup> Rh | 0         | β-   |                | 2.72 s 22                 | (4900)    |
| <sup>113</sup> Pd | 0         | β-   | (5/2)+         | 93 s 5                    | 3340 40   |
| <sup>113</sup> Ag | 0         | β-   | 1/2-           | 5.37 h 5                  | 2016 17   |
|                   | 43.5 1    | β-   | 7/2+           | 68.7 s 16                 | 2016 17   |
| <sup>113</sup> Cd | 0         | β-   | 1/2+           | 9.3×10 <sup>15</sup> y 19 | 316 3     |
|                   | 263.59 12 | β-   | 11/2-          | 14.1 y 5                  | 316 3     |
| <sup>113</sup> Sn | 0         | EC   | 1/2+           | 115.09 d 4                | 1036 3    |
|                   | 77.389 19 | EC   | 7/2+           | 21.4 m 4                  | 1036 3    |
| <sup>113</sup> Sb | 0         | EC   | 5/2+           | 6.67 m 7                  | 3905 24   |
| <sup>113</sup> Te | 0         | EC   | (7/2+)         | 1.7 m 2                   | (6100)    |
| <sup>113</sup> I  | X         | α    |                | 6.6 s 2                   | 2710 50   |
|                   | >0        | EC   |                | 6.6 s 2                   | (7200)    |
| <sup>113</sup> Xe | X         | α    |                | 2.74 s 8                  | 3100 50   |
| <sup>113</sup> Cs | X         | p    |                | 33 us 7                   | (10)      |
| <sup>114</sup> Rh | 0         | β-   | (1+)           | 1.85 s 5                  | (7900)    |
|                   | 0+X       | β-   | (GE4)          | 1.85 s 5                  | (7900)    |
| <sup>114</sup> Pd | 0         | β-   | 0+             | 2.42 m 6                  | 1451 25   |
| <sup>114</sup> Ag | 0         | β-   | 1+             | 4.6 s 1                   | 5080 30   |
| <sup>114</sup> In | 0         | EC   | 1+             | 71.9 s 1                  | 1453 3    |
|                   | 0         | β-   | 1+             | 71.9 s 1                  | 1988.7 7  |
|                   | 190.34 6  | EC   | 5+             | 49.51 d 1                 | 1453 3    |
| <sup>114</sup> Sb | 0         | β+   | 3+             | 3.49 m 3                  | 5880 200  |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>           | Q(keV)   |
|-------------------|------------|------|----------------|----------------------------|----------|
| <sup>114</sup> Te | 0          | EC   | 0+             | 15.2 m 7                   | (2700)   |
| <sup>114</sup> I  | 0          | β+   |                | 2.1 s 2                    | (9100)   |
| <sup>114</sup> Xe | 0          | β+   | 0+             | 10.0 s 4                   | (5900)   |
| <sup>114</sup> Cs | 0          | α    | (1+)           | 0.57 s 2                   | 3360 50  |
|                   | 0          | ECp  | (1+)           | 0.57 s 2                   | 3360 50  |
|                   | 0          | β+   | (1+)           | 0.57 s 2                   | (12400)  |
| <sup>115</sup> Rh | 0          | β-   | (7/2+)         | 0.99 s 5                   | 6000 50  |
| <sup>115</sup> Pd | 0          | β-   | (5/2+)         | 25 s 2                     | 4580 50  |
|                   | 89.3 2     | β-   | (11/2-)        | 50 s 3                     | 4580 50  |
| <sup>115</sup> Ag | 0          | β-   | 1/2-           | 20.0 m 5                   | 3100 30  |
|                   | 41.1 2     | β-   | 7/2+           | 18.0 s 7                   | 3100 30  |
| <sup>115</sup> Cd | 0          | β-   | 1/2+           | 53.46 h 10                 | 1446 4   |
|                   | 181.0 5    | β-   | 11/2-          | 44.6 d 3                   | 1446 4   |
| <sup>115</sup> In | 0          | β-   | 9/2+           | 4.41×10 <sup>14</sup> y 25 | 495 4    |
|                   | 336.24 3   | β-   | 1/2-           | 4.486 h 4                  | 495 4    |
| <sup>115</sup> Sb | 0          | EC   | 5/2+           | 32.1 m 3                   | 3030 20  |
| <sup>115</sup> Te | 0          | EC   | 7/2+           | 5.8 m 2                    | 4640 110 |
|                   | <20        | EC   | (1/2)+         | 6.7 m 4                    | 4640 110 |
| <sup>115</sup> I  | 0          | β+   | (5/2+)         | 1.3 m 2                    | (6000)   |
| <sup>115</sup> Xe | 0          | β+   | (5/2+)         | 18 s 4                     | (8000)   |
| <sup>116</sup> Rh | 0+X        | β-   | 1+             | 0.68 s 6                   | (8900)   |
|                   | 0+Y        | β-   | (5,6,7)        | 0.9 s 4                    | (8900)   |
| <sup>116</sup> Pd | 0          | β-   | 0+             | 12.4 s 5                   | 2610 30  |
| <sup>116</sup> Ag | 0          | β-   | (2-)           | 2.68 m 1                   | 6160 40  |
|                   | 81         | β-   | (5+)           | 10.4 s 8                   | 6160 40  |
| <sup>116</sup> In | 0          | β-   | 1+             | 14.10 s 3                  | 3274 4   |
|                   | 127.267 6  | β-   | 5+             | 54.41 m 3                  | 3274 4   |
| <sup>116</sup> Sb | 0          | EC   | 3+             | 15.8 m 8                   | 4707 5   |
|                   | 383 40     | EC   | 8-             | 60.3 m 6                   | 4707 5   |
| <sup>116</sup> Te | 0          | EC   | 0+             | 2.49 h 4                   | 1500 90  |
| <sup>116</sup> I  | 0          | β+   | 1+             | 2.91 s 15                  | 7750 110 |
| <sup>116</sup> Xe | 0          | EC   | 0+             | 56 s 2                     | (4660)   |
| <sup>116</sup> Cs | 0+X        | β+   | >4+            | 3.84 s 16                  | (10500)  |
|                   | 0+Y        | β+   | (1+)           | 0.70 s 4                   | (10500)  |
| <sup>117</sup> Rh | 0          | β-   | (7/2+)         | 0.44 s 4                   | (7000)   |
| <sup>117</sup> Pd | 0          | β-   | (5/2+)         | 4.3 s 3                    | (5700)   |
| <sup>117</sup> Ag | 0          | β-   | (1/2-)         | 72.8 s +20-7               | 4180 40  |
|                   | 28.6 2     | β-   | (7/2+)         | 5.34 s 5                   | 4180 40  |
| <sup>117</sup> Cd | 0          | β-   | 1/2+           | 2.49 h 4                   | 2516 6   |
|                   | 136.4 2    | β-   | (11/2)-        | 3.36 h 5                   | 2516 6   |
| <sup>117</sup> In | 0          | β-   | 9/2+           | 43.2 m 3                   | 1455 4   |
|                   | 315.302 12 | β-   | 1/2-           | 116.2 m 3                  | 1455 4   |
| <sup>117</sup> Sb | 0          | EC   | 5/2+           | 2.80 h 1                   | 1757 9   |
| <sup>117</sup> Te | 0          | β+   | 1/2+           | 62 m 2                     | 3535 17  |
| <sup>117</sup> I  | 0          | β+   | (5/2+)         | 2.22 m 4                   | 4650 70  |
| <sup>117</sup> Xe | 0          | ECp  | 5/2(+)         | 61 s 2                     | (1900)   |
|                   | 0          | β+   | 5/2(+)         | 61 s 2                     | 6450 180 |
| <sup>117</sup> Cs | 0+X        | EC   |                | 8.4 s 6                    | 7520 200 |
|                   | 0+Y        | EC   |                | 6.5 s 4                    | 7520 200 |
| <sup>118</sup> Pd | 0          | β-   | 0+             | 1.9 s 1                    | 4100 200 |
| <sup>118</sup> Ag | 0          | β-   | (1)-           | 3.76 s 15                  | 7060 100 |
|                   | 127.63 10  | β-   | (4)+           | 2.0 s 2                    | 7060 100 |
| <sup>118</sup> Cd | 0          | β-   | 0+             | 50.3 m 2                   | 520 22   |
| <sup>118</sup> In | 0          | β-   | 1+             | 5.0 s 5                    | 4423 8   |
|                   | 60         | β-   | 5+             | 4.45 m 5                   | 4423 8   |
|                   | 200        | β-   | 8-             | 8.5 s 3                    | 4423 8   |
| <sup>118</sup> Sb | 0          | EC   | 1+             | 3.6 m 1                    | 3657 3   |
|                   | 249 6      | EC   | 8-             | 5.00 h 2                   | 3657 3   |
| <sup>118</sup> Te | 0          | EC   | 0+             | 6.00 d 2                   | 278 16   |
| <sup>118</sup> I  | 0          | β+   | 2-             | 13.7 m 5                   | 7040 80  |
|                   | 0+X        | β+   | (7-)           | 8.5 m 5                    | 7040 80  |
| <sup>118</sup> Xe | 0          | β+   | 0+             | 6 m 1                      | 2900 100 |
| <sup>118</sup> Cs | 0+X        | EC   | 2              | 14 s 2                     | 9300 100 |
|                   | 0+Y        | EC   | 6,7,8          | 17 s 3                     | 9300 100 |



Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>      | Q(keV)    |
|-------------------|-----------|------|----------------|-----------------------|-----------|
| <sup>119</sup> Pd | X         | β-   |                | 0.92 s 13             | (6500)    |
| <sup>119</sup> Ag | 0+X       | β-   | (7/2+)         | 2.1 s 1               | 5350 40   |
|                   | 0+Y       | β-   | (1/2-)         | 6.0 s 5               | 5350 40   |
| <sup>119</sup> Cd | 0         | β-   | 3/2+           | 2.69 m 2              | 3800 60   |
|                   | 146.54 11 | β-   | (11/2-)        | 2.20 m 2              | 3800 60   |
| <sup>119</sup> In | 0         | β-   | 9/2+           | 2.4 m 1               | 2364 7    |
|                   | 311.37 3  | β-   | 1/2-           | 18.0 m 3              | 2364 7    |
| <sup>119</sup> Sb | 0         | EC   | 5/2+           | 38.19 h 22            | 594 8     |
| <sup>119</sup> Te | 0         | EC   | 1/2+           | 16.03 h 5             | 2293.0 20 |
|                   | 260.96 5  | EC   | 11/2-          | 4.70 d 4              | 2293.0 20 |
| <sup>119</sup> I  | 0         | EC   | 5/2+           | 19.1 m 4              | 3510 60   |
| <sup>119</sup> Xe | 0         | β+   | (5/2+)         | 5.8 m 3               | 5000 110  |
| <sup>119</sup> Cs | 0         | β+   | 9/2+           | 43.0 s 2              | 6330 120  |
|                   | 0+X       | β+   | 3/2(+)         | 30.4 s 1              | 6330 120  |
| <sup>120</sup> Ag | 0         | β-   |                | 1.23 s 3              | 8200 100  |
|                   | 203 1     | β-   |                | 0.32 s 4              | 8200 100  |
| <sup>120</sup> Cd | 0         | β-   | 0+             | 50.80 s 21            | 1760 40   |
| <sup>120</sup> In | 0         | β-   | 1+             | 3.08 s 8              | 5370 40   |
|                   | 0+Y       | β-   | (8-)           | 47.3 s 5              | 5370 40   |
|                   | 0+X       | β-   | (3,4,5)+       | 46.2 s 8              | 5370 40   |
| <sup>120</sup> Sb | 0         | β+   | 1+             | 15.89 m 4             | 2681 7    |
|                   | 0+X       | EC   | 8-             | 5.76 d 2              | 2681 7    |
| <sup>120</sup> I  | 0         | β+   | 2-             | 81.0 m 6              | 5615 15   |
|                   | 0+X       | β+   | 4 TO 8         | 53 m 4                | 5615 15   |
| <sup>120</sup> Xe | 0         | β+   | 0+             | 40 m 1                | 1960 40   |
| <sup>120</sup> Cs | 0+X       | EC   | 2              | 64 s 3                | 7920 50   |
|                   | 0+Y       | EC   |                | 57 s 6                | 7920 50   |
| <sup>120</sup> Ba | 0         | β+   | 0+             | 32 s 5                | 5000 30   |
| <sup>121</sup> Ag | 0         | β-   | (7/2+)         | 0.78 s 1              | 6400 120  |
| <sup>121</sup> Cd | 0         | β-   | (3/2+)         | 13.5 s 3              | 4890 150  |
|                   | 214.89 10 | β-   | (11/2-)        | 8.3 s 8               | 4890 150  |
| <sup>121</sup> In | 0         | β-   | 9/2+           | 23.1 s 6              | 3360 30   |
|                   | 313.69 10 | β-   | 1/2-           | 3.88 m 10             | 3360 30   |
| <sup>121</sup> Sn | 0         | β-   | 3/2+           | 27.06 h 4             | 388.1 19  |
|                   | 6.30 8    | β-   | 11/2-          | 55 y 5                | 388.1 19  |
| <sup>121</sup> Te | 0         | EC   | 1/2+           | 16.78 d 35            | 1036 25   |
|                   | 293.98 3  | EC   | 11/2-          | 154 d 7               | 1036 25   |
| <sup>121</sup> I  | 0         | EC   | 5/2+           | 2.12 h 1              | 2270 30   |
| <sup>121</sup> Xe | 0         | β+   | 5/2(+)         | 40.1 m 20             | 3730 30   |
| <sup>121</sup> Cs | 0         | EC   | 3/2(+)         | 155 s 4               | 5400 20   |
|                   | 68.5 3    | EC   | 9/2(+)         | 122 s 3               | 5400 20   |
| <sup>121</sup> Ba | 0         | EC   | 5/2(+)         | 29.7 s 15             | 6800 30   |
| <sup>121</sup> La | 0         | EC   |                | 5.3 s 2               | (7900)    |
| <sup>122</sup> Ag | 0         | β-   | (3+)           | 0.48 s 8              | (9100)    |
|                   | 0+X       | β-   |                | 1.5 s 5               | (9100)    |
| <sup>122</sup> Cd | 0         | β-   | 0+             | 5.24 s 3              | (3000)    |
| <sup>122</sup> In | 0         | β-   | 1+             | 1.5 s 3               | 6370 50   |
|                   | 0+X       | β-   | 5+             | 10.3 s 6              | 6370 50   |
|                   | 220       | β-   | 8-             | 10.8 s 4              | 6370 50   |
| <sup>122</sup> Sb | 0         | EC   | 2-             | 2.70 d 1              | 1620 3    |
|                   | 0         | β-   | 2-             | 2.70 d 1              | 1978.6 22 |
| <sup>122</sup> I  | 0         | β+   | 1+             | 3.63 m 6              | 4234 5    |
| <sup>122</sup> Xe | 0         | EC   | 0+             | 20.1 h 1              | 890 90    |
| <sup>122</sup> Cs | 0         | β+   | 1+             | 21.0 s 7              | 7050 90   |
|                   | 500       | β+   | 8-             | 4.5 m 2               | 7050 90   |
| <sup>122</sup> Ba | 0         | β+   | 0+             | 1.95 m 15             | (3800)    |
| <sup>123</sup> Ag | 0         | β-   | (7/2+)         | 0.309 s 15            | (7400)    |
| <sup>123</sup> Cd | 0         | β-   | (3/2+)         | 2.10 s 2              | 6120 30   |
|                   | 316.52 23 | β-   | (11/2-)        | 1.82 s 3              | 6120 30   |
| <sup>123</sup> In | 0         | β-   | 9/2+           | 5.98 s 6              | 4391 23   |
|                   | 327.21 4  | β-   | 1/2-           | 47.8 s 5              | 4391 23   |
| <sup>123</sup> Sn | 0         | β-   | 11/2-          | 129.2 d 4             | 1404 3    |
|                   | 24.6 4    | β-   | 3/2+           | 40.06 m 1             | 1404 3    |
| <sup>123</sup> Te | 0         | EC   | 1/2+           | >1×10 <sup>13</sup> y | 51.3 19   |
| <sup>123</sup> I  | 0         | EC   | 5/2+           | 13.27 h 8             | 1242 4    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>    | Q(keV)    |
|-------------------|------------|------|----------------|---------------------|-----------|
| <sup>123</sup> Xe | 0          | β+   | (1/2)+         | 2.08 h 2            | 2676 15   |
| <sup>123</sup> Cs | 0          | EC   | 1/2+           | 5.94 m 4            | 4200 19   |
| <sup>123</sup> Ba | 0          | EC   | 5/2+           | 2.7 m 4             | (5500)    |
| <sup>123</sup> La | 0          | β+   |                | 17 s 3              | (6900)    |
| <sup>124</sup> Cd | 0          | β-   | 0+             | 0.9 s 2             | 4170 40   |
| <sup>124</sup> In | 0          | β-   | 3+             | 3.17 s 5            | 7360 50   |
|                   | 1.9E+2 26  | β-   | (5 TO 8)       | 2.4 s 4             | 7360 50   |
| <sup>124</sup> Sb | 0          | β-   | 3-             | 60.20 d 3           | 2905.4 15 |
|                   | 10.8633 11 | β-   | 5+             | 93 s 5              | 2905.4 15 |
| <sup>124</sup> I  | 0          | EC   | 2-             | 4.18 d 2            | 3159.6 19 |
| <sup>124</sup> Cs | 0          | EC   | 1+             | 30.8 s 5            | 5917 12   |
| <sup>124</sup> Ba | 0          | EC   | 0+             | 11.9 m 10           | 2646 18   |
| <sup>125</sup> Cd | 0          | β-   | (3/2+)         | 0.65 s 2            | 7160 40   |
|                   | 49 71      | β-   | (11/2-)        | 0.57 s 9            | 7160 40   |
| <sup>125</sup> In | 0          | β-   | 9/2(+)         | 2.36 s 4            | 5418 25   |
|                   | 360.12 9   | β-   | 1/2(-)         | 12.2 s 2            | 5418 25   |
| <sup>125</sup> Sn | 0          | β-   | 11/2-          | 9.64 d 3            | 2364 3    |
|                   | 27.50 14   | β-   | 3/2+           | 9.52 m 5            | 2364 3    |
| <sup>125</sup> Sb | 0          | β-   | 7/2+           | 2.7582 y 11         | 766.7 21  |
| <sup>125</sup> I  | 0          | EC   | 5/2+           | 59.408 d 8          | 186.1 3   |
| <sup>125</sup> Xe | 0          | EC   | (1/2)+         | 16.9 h 2            | 1652 3    |
| <sup>125</sup> Cs | 0          | EC   | (1/2+)         | 45 m 1              | 3092 9    |
| <sup>125</sup> Ba | 0          | EC   | 1/2(+)         | 3.5 m 4             | 4560 250  |
| <sup>125</sup> La | 0          | EC   | (11/2-)        | 76 s 6              | (5600)    |
| <sup>125</sup> Ce | 0          | EC   | (5/2+)         | 9.0 s 6             | (7300)    |
| <sup>126</sup> Cd | 0          | β-   | 0+             | 0.506 s 7           | 5490 40   |
| <sup>126</sup> In | 0          | β-   | 3(+)           | 1.60 s 10           | 8210 40   |
|                   | 102 64     | β-   | 7-,8-,9-       | 1.64 s 5            | 8210 40   |
| <sup>126</sup> Sn | 0          | β-   | 0+             | 1×10 <sup>5</sup> y | 380 30    |
| <sup>126</sup> Sb | 0          | β-   | (8)-           | 12.46 d 3           | 3670 30   |
|                   | 17.7 3     | β-   | (5)+           | 19.15 m 8           | 3670 30   |
| <sup>126</sup> I  | 0          | EC   | 2-             | 13.11 d 5           | 2155 4    |
|                   | 0          | β-   | 2-             | 13.11 d 5           | 1258 5    |
| <sup>126</sup> Cs | 0          | EC   | 1+             | 1.64 m 2            | 4826 13   |
| <sup>126</sup> Ba | 0          | β+   | 0+             | 100 m 2             | 1673 18   |
| <sup>126</sup> La | 0          | β+   |                | 54 s 2              | (7600)    |
| <sup>126</sup> Ce | 0          | EC   | 0+             | 50 s 3              | (4400)    |
| <sup>126</sup> Pr | 0          | β+   |                | 3.1 s 3             | (10400)   |
| <sup>127</sup> Cd | 0          | β-   | (3/2+)         | 0.43 s 3            | 8470 60   |
| <sup>127</sup> In | 0          | β-   | (9/2+)         | 1.09 s 1            | 6510 30   |
|                   | 462 71     | β-   | (1/2-)         | 3.66 s 4            | 6510 30   |
| <sup>127</sup> Sn | 0          | β-   | (11/2-)        | 2.10 h 4            | 3201 24   |
|                   | 4.7 3      | β-   | (3/2+)         | 4.13 m 3            | 3201 24   |
| <sup>127</sup> Sb | 0          | β-   | 7/2+           | 3.85 d 5            | 1581 5    |
| <sup>127</sup> Te | 0          | β-   | 3/2+           | 9.35 h 7            | 698 4     |
|                   | 88.26 8    | β-   | 11/2-          | 109 d 2             | 698 4     |
| <sup>127</sup> Xe | 0          | EC   | 1/2+           | 36.4 d 1            | 662.3 20  |
| <sup>127</sup> Cs | 0          | β+   | 1/2(+)         | 6.25 h 10           | 2081 8    |
| <sup>127</sup> Ba | 0          | EC   | 1/2(+)         | 12.7 m 4            | 3450 100  |
| <sup>127</sup> La | 0          | EC   | (3/2+)         | 3.8 m 5             | (4700)    |
| <sup>127</sup> Ce | 0          | β+   |                | 32 s 4              | (6100)    |
| <sup>127</sup> Pr | 0          | EC   |                |                     | (7500)    |
| <sup>127</sup> Nd | X          | EC   |                | 1.8 s 4             |           |
| <sup>128</sup> Cd | 0          | β-   | 0+             | 0.34 s 3            | 7100 30   |
| <sup>128</sup> In | 0          | β-   | (3+)           | 0.84 s 6            | 8980 40   |
|                   | 340 60     | β-   | (8-)           | 0.72 s 10           | 8980 40   |
| <sup>128</sup> Sn | 0          | β-   | 0+             | 59.07 m 14          | 1274 15   |
| <sup>128</sup> Sb | 0          | β-   | 8-             | 9.01 h 3            | 4384 25   |
|                   | 0+X        | β-   | 5+             | 10.4 m 2            | 4384 25   |
| <sup>128</sup> I  | 0          | EC   | 1+             | 24.99 m 2           | 1251 4    |
|                   | 0          | β-   | 1+             | 24.99 m 2           | 2118 4    |
| <sup>128</sup> Cs | 0          | EC   | 1+             | 3.66 m 2            | 3930 5    |
| <sup>128</sup> Ba | 0          | EC   | 0+             | 2.43 d 5            | 521 12    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)    |
|-------------------|------------|------|----------------|--------------------------|-----------|
| <sup>128</sup> La | 0          | β+   | 4-,5-          | 5.0 m 3                  | 6700 40   |
| <sup>128</sup> Pr | 0          | EC   | 4,5,6          | 3.1 s 2                  | (9300)    |
| <sup>128</sup> Nd | 0          | EC   | 0+             | 4 s 2                    | (6100)    |
| <sup>129</sup> Cd | 0          | β-   |                | 0.27 s 4                 |           |
| <sup>129</sup> In | 0          | β-   | (9/2+)         | 0.61 s 1                 | 7660 30   |
|                   | 380 70     | β-   | (1/2-)         | 1.23 s 3                 | 7660 30   |
| <sup>129</sup> Sn | 0          | β-   | (3/2+)         | 2.23 m 4                 | 4000 120  |
|                   | 35.2 3     | β-   | (11/2-)        | 6.9 m 1                  | 4000 120  |
| <sup>129</sup> Sb | 0          | β-   | 7/2+           | 4.40 h 1                 | 2380 21   |
|                   | 1851.05 10 | β-   | (19/2-)        | 17.7 m 1                 | 2380 21   |
| <sup>129</sup> Te | 0          | β-   | 3/2+           | 69.6 m 3                 | 1498 3    |
|                   | 105.50 5   | β-   | 11/2-          | 33.6 d 1                 | 1498 3    |
| <sup>129</sup> I  | 0          | β-   | 7/2+           | 1.57×10 <sup>7</sup> y 4 | 194 3     |
| <sup>129</sup> Cs | 0          | EC   | 1/2+           | 32.06 h 6                | 1195 5    |
| <sup>129</sup> Ba | 0          | β+   | 1/2+           | 2.23 h 11                | 2433 11   |
|                   | 8.42 5     | β+   | 7/2+           | 2.17 h 4                 | 2433 11   |
| <sup>129</sup> La | 0          | EC   | 3/2+           | 11.6 m 2                 | 3720 50   |
| <sup>129</sup> Ce | 0          | EC   |                | 3.5 m 5                  | (5050)    |
| <sup>129</sup> Nd | 0          | EC   | (5/2+)         | 4.9 s 2                  | (7800)    |
| <sup>130</sup> In | 0          | β-   | 1(-)           | 0.32 s 2                 | 10250 40  |
|                   | 50 50      | β-   | (10-)          | 0.55 s 1                 | 10250 40  |
|                   | 400 60     | β-   | (5+)           | 0.55 s 1                 | 10250 40  |
| <sup>130</sup> Sn | 0          | β-   | 0+             | 3.72 m 4                 | 2150 13   |
|                   | 1946.88 10 | β-   | (7-)           | 1.7 m 1                  | 2150 13   |
| <sup>130</sup> Sb | 0+X        | β-   | (5+)           | 6.3 m 2                  | 4960 25   |
|                   | 0          | β-   | (8-)           | 39.5 m 8                 | 4960 25   |
| <sup>130</sup> I  | 0          | β-   | 5+             | 12.36 h 3                | 2949 3    |
|                   | 39.9525 13 | β-   | 2+             | 9.0 m 1                  | 2949 3    |
| <sup>130</sup> Cs | 0          | EC   | 1+             | 29.21 m 4                | 2983 8    |
|                   | 0          | β-   | 1+             | 29.21 m 4                | 373 11    |
|                   | 163.25 11  | EC   | 5-             | 3.46 m 6                 | 2983 8    |
| <sup>130</sup> La | 0          | EC   | 3(+)           | 8.7 m 1                  | (5600)    |
| <sup>130</sup> Ce | 0          | EC   | 0+             | 25 m 2                   | (2200)    |
| <sup>130</sup> Pr | 0          | EC   |                | 40.0 s 4                 | (8100)    |
| <sup>131</sup> In | 0          | β-   | (9/2+)         | 0.282 s 5                | 9180 30   |
|                   | 363 37     | β-   | (1/2-)         | 0.35 s 5                 | 9180 30   |
|                   | 4.27E+3 17 | β-   | (21/2+)        | 0.32 s 6                 | 9180 30   |
| <sup>131</sup> Sn | 0          | β-   | (3/2+)         | 56.0 s 5                 | 4638 20   |
|                   | 0          | β-   | (3/2+)         | 56.0 s 5                 | 4638 20   |
|                   | 241.8 8    | β-   | (11/2-)        | 58.4 s 5                 | 4638 20   |
| <sup>131</sup> Sb | 0          | β-   | (7/2+)         | 23.03 m 4                | 3190 70   |
| <sup>131</sup> Te | 0          | β-   | 3/2+           | 25.0 m 1                 | 2233 3    |
|                   | 182.250 20 | β-   | 11/2-          | 30 h 2                   | 2233 3    |
| <sup>131</sup> I  | 0          | β-   | 7/2+           | 8.02070 d 11             | 970.8 6   |
| <sup>131</sup> Cs | 0          | EC   | 5/2+           | 9.689 d 16               | 352 5     |
| <sup>131</sup> Ba | 0          | EC   | 1/2+           | 11.50 d 6                | 1370 7    |
| <sup>131</sup> La | 0          | EC   | 3/2+           | 59 m 2                   | 2960 100  |
| <sup>131</sup> Ce | 0          | EC   | (7/2+)         | 10.3 m 3                 | 4000 40   |
|                   | 0+X        | EC   | (1/2+)         | 5.0 m 10                 | 4000 40   |
| <sup>131</sup> Pr | 0          | EC   | (3/2+)         | 1.53 m 5                 | 5250 150  |
|                   | 152.0 14   | EC   | (11/2-)        | 5.7 s 2                  | 5250 150  |
| <sup>131</sup> Nd | 0          | ECp  | (5/2)          | 27 s 2                   |           |
|                   | 0          | EC   | (5/2)          | 27 s 2                   | 6560 150  |
| <sup>131</sup> Sm | 0          | ECp  |                | 1.2 s 2                  | (2200)    |
|                   | 0          | EC   |                | 1.2 s 2                  |           |
| <sup>132</sup> In | 0          | β-   | (7-)           | 0.201 s 13               | 13600 40  |
| <sup>132</sup> Sn | 0          | β-   | 0+             | 39.7 s 5                 | 3300 50   |
| <sup>132</sup> Sb | 0          | β-   | (4+)           | 2.79 m 5                 | 5290 50   |
|                   | 0+X        | β-   | (8-)           | 4.10 m 5                 | 5290 50   |
| <sup>132</sup> Te | 0          | β-   | 0+             | 3.204 d 13               | 493 4     |
| <sup>132</sup> I  | 0          | β-   | 4+             | 2.295 h 13               | 3577 11   |
|                   | 120        | β-   | (8-)           | 1.387 h 15               | 3577 11   |
| <sup>132</sup> Cs | 0          | EC   | 2+             | 6.479 d 7                | 2120 3    |
|                   | 0          | β-   | 2+             | 6.479 d 7                | 1279.5 22 |
| <sup>132</sup> La | 0          | EC   | 2-             | 4.8 h 2                  | 4710 40   |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>        | Q(keV)    |
|-------------------|------------|------|----------------|-------------------------|-----------|
|                   | 188.18 11  | EC   | 6-             | 24.3 m 5                | 4710 40   |
| <sup>132</sup> Ce | 0          | EC   | 0+             | 3.51 h 11               | (1290)    |
| <sup>132</sup> Pr | 0          | EC   |                | 1.6 m 3                 | (7100)    |
| <sup>132</sup> Pm | 0          | EC   | (3+)           | 6.3 s 7                 | (9900)    |
| <sup>132</sup> Sm | 0          | EC   | 0+             | 4.0 s 3                 |           |
| <sup>133</sup> Sn | 0          | β-   | (7/2-)         | 1.44 s 4                | 7830 70   |
| <sup>133</sup> Sb | 0          | β-   | (7/2+)         | 2.5 m 1                 | 4003 13   |
| <sup>133</sup> Te | 0          | β-   | (3/2+)         | 12.5 m 3                | 2920 70   |
|                   | 334.26 4   | β-   | (11/2-)        | 55.4 m 4                | 2920 70   |
| <sup>133</sup> I  | 0          | β-   | 7/2+           | 20.8 h 1                | 1770 30   |
| <sup>133</sup> Xe | 0          | β-   | 3/2+           | 5.243 d 1               | 427.4 24  |
| <sup>133</sup> Ba | 0          | EC   | 1/2+           | 10.52 y 13              | 517.4 10  |
|                   | 288.247 9  | EC   | 11/2-          | 38.9 h 1                | 517.4 10  |
| <sup>133</sup> La | 0          | EC   | 5/2+           | 3.912 h 8               | 2230 200  |
| <sup>133</sup> Ce | 0          | EC   | 9/2-           | 4.9 h 4                 | (2900)    |
|                   | 0+X        | EC   | 1/2+           | 97 m 4                  | (2900)    |
| <sup>133</sup> Pr | 0          | EC   | 5/2(+)         | 6.5 m 3                 | (4300)    |
| <sup>133</sup> Sm | 0          | EC   | (5/2+)         | 32.0 s 4                | (2700)    |
| <sup>134</sup> Sn | 0          | β-n  | 0+             | 1.04 s 2                |           |
|                   | 0          | β-   | 0+             | 1.04 s 2                | (68)      |
| <sup>134</sup> Sb | 0+X        | β-   | (0-)           | 0.85 s 10               | 8420 110  |
|                   | 0+Y        | β-   | (7-)           | 10.43 s 14              | 8420 110  |
| <sup>134</sup> Te | 0          | β-   | 0+             | 41.8 m 8                | 1560 90   |
| <sup>134</sup> I  | 0          | β-   | 4+             | 52.6 m 4                | 4170 60   |
|                   | 316.3 4    | β-   | 8-             | 3.69 m 7                | 4170 60   |
| <sup>134</sup> Cs | 0          | EC   | 4+             | 2.062 y 5               | 1229 3    |
|                   | 0          | β-   | 4+             | 2.062 y 5               | 2058.7 4  |
| <sup>134</sup> La | 0          | EC   | 1+             | 6.45 m 16               | 3710 30   |
| <sup>134</sup> Ce | 0          | EC   | 0+             | 75.9 h 9                | 500 200   |
| <sup>134</sup> Pr | 0+X        | EC   |                | 11 m                    | (6200)    |
|                   | 0          | EC   | 2-             | 17 m 2                  | (6200)    |
| <sup>134</sup> Nd | 0          | EC   | 0+             | 8.5 m 15                | 2770 150  |
| <sup>134</sup> Pm | X          | EC   |                | 24 s 2                  | (8900)    |
| <sup>135</sup> Sb | 0          | β-   | (7/2+)         | 1.71 s 2                | 8120 50   |
| <sup>135</sup> Te | 0          | β-   | (7/2-)         | 19.0 s 2                | 5960 90   |
| <sup>135</sup> I  | 0          | β-   | 7/2+           | 6.57 h 2                | 2648 24   |
| <sup>135</sup> Xe | 0          | β-   | 3/2+           | 9.14 h 2                | 1151 10   |
|                   | 526.551 13 | β-   | 11/2-          | 15.29 m 5               | 1151 10   |
| <sup>135</sup> Cs | 0          | β-   | 7/2+           | 2.3×10 <sup>6</sup> y 3 | 268.6 11  |
| <sup>135</sup> La | 0          | EC   | 5/2+           | 19.5 h 2                | 1200 10   |
| <sup>135</sup> Ce | 0          | EC   | 1/2(+)         | 17.7 h 2                | 2026 5    |
| <sup>135</sup> Pr | 0          | EC   | 3/2(+)         | 24 m 2                  | 3720 150  |
| <sup>135</sup> Nd | 0          | EC   | 9/2(-)         | 12.4 m 6                | (4750)    |
|                   | 0+X        | EC   |                | 5.5 m 5                 | (4750)    |
| <sup>135</sup> Pm | 0          | EC   | (11/2-)        | 49 s 7                  | (6000)    |
| <sup>136</sup> Te | 0          | β-n  | 0+             | 17.5 s 2                | 5070 60   |
|                   | 0          | β-   | 0+             | 17.5 s 2                | 5070 60   |
| <sup>136</sup> I  | 0          | β-   | (1-)           | 83.4 s 10               | 6930 50   |
|                   | 6.4E2 11   | β-   | (6-)           | 46.9 s 10               | 6930 50   |
|                   | 6.4E2 11   | β-   | (6-)           | 46.9 s 10               | 6930 50   |
| <sup>136</sup> Cs | 0          | β-   | 5+             | 13.16 d 3               | 2548.2 19 |
|                   | 0+X        | β-   | 8-             | 19 s 2                  | 2548.2 19 |
| <sup>136</sup> La | 0          | EC   | 1+             | 9.87 m 3                | 2870 70   |
| <sup>136</sup> Pr | 0          | EC   | 2+             | 13.1 m 1                | 5126 18   |
| <sup>136</sup> Nd | 0          | EC   | 0+             | 50.65 m 33              | 2211 25   |
| <sup>136</sup> Pm | 0+Y        | EC   | 5(+),6-        | 107 s 6                 | 7850 200  |
|                   | 0+X        | EC   | (2+)           | 47 s 6                  | 7850 200  |
|                   | 0+Y        | EC   | 5(+),6-        | 107 s 6                 | 7850 200  |
| <sup>136</sup> Sm | 0          | EC   | 0+             | 47 s 2                  | (4500)    |
| <sup>136</sup> Eu | 0+X        | EC   | (7+)           | 3.3 s 3                 | (10400)   |
|                   | 0+Y        | EC   | (3+)           | 3.7 s 3                 | (10400)   |
| <sup>137</sup> Te | 0          | β-n  | (7/2-)         | 2.49 s 5                | 6940 120  |
|                   | 0          | β-   | (7/2-)         | 2.49 s 5                | 6940 120  |
| <sup>137</sup> I  | 0          | β-n  | (7/2+)         | 24.5 s 2                | 5880 30   |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)   | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)     |
|-------------------|----------|------|----------------|---------------------------|------------|
|                   | 0        | β-   | (7/2+)         | 24.5 s 2                  | 5880 30    |
| <sup>137</sup> Xe | 0        | β-   | 7/2-           | 3.818 m 13                | 4172 7     |
| <sup>137</sup> Cs | 0        | β-   | 7/2+           | 30.07 y 3                 | 1175.63 17 |
| <sup>137</sup> La | 0        | EC   | 7/2+           | 6×10 <sup>4</sup> y 2     | 600 50     |
| <sup>137</sup> Ce | 0        | EC   | 3/2+           | 9.0 h 3                   | 1222.1 16  |
|                   | 254.29 5 | EC   | 11/2-          | 34.4 h 3                  | 1222.1 16  |
| <sup>137</sup> Pr | 0        | EC   | 5/2+           | 1.28 h 3                  | 2702 10    |
| <sup>137</sup> Nd | 0        | EC   | 1/2+           | 38.5 m 15                 | 3690 50    |
| <sup>137</sup> Pm | 0        | EC   | 11/2-          | 2.4 m 1                   | (5580)     |
| <sup>137</sup> Sm | 0        | EC   | (9/2-)         | 45 s 1                    | (6100)     |
| <sup>138</sup> I  | 0        | β-n  | (2-)           | 6.49 s 7                  | 7820 70    |
|                   | 0        | β-   | (2-)           | 6.49 s 7                  | 7820 70    |
| <sup>138</sup> Xe | 0        | β-   | 0+             | 14.08 m 8                 | 2770 40    |
| <sup>138</sup> Cs | 0        | β-   | 3-             | 33.41 m 18                | 5373 9     |
|                   | 79.9     | β-   | 6-             | 2.91 m 8                  | 5373 9     |
| <sup>138</sup> La | 0        | EC   | 5+             | 1.05×10 <sup>11</sup> y 2 | 1737 4     |
|                   | 0        | β-   | 5+             | 1.05×10 <sup>11</sup> y 2 | 1044 11    |
| <sup>138</sup> Pr | 0        | EC   | 1+             | 1.45 m 5                  | 4437 10    |
|                   | 364 23   | EC   | 7-             | 2.12 h 4                  | 4437 10    |
| <sup>138</sup> Nd | 0        | EC   | 0+             | 5.04 h 9                  | (1100)     |
| <sup>138</sup> Pm | 0        | EC   | 1+             | 10 s 2                    | 6900 40    |
|                   | 0+X      | EC   | (3+)           | 3.24 m 5                  | 6900 40    |
|                   | 0+X      | EC   | (3+)           | 3.24 m 5                  | 6900 40    |
| <sup>138</sup> Sm | 0        | EC   | 0+             | 3.1 m 2                   | (3900)     |
| <sup>138</sup> Eu | 0        | EC   | (6-)           | 12.1 s 6                  | (9200)     |
| <sup>139</sup> I  | 0        | β-n  | (7/2+)         | 2.29 s 2                  | 6806 23    |
|                   | 0        | β-   | (7/2+)         | 2.29 s 2                  | 6806 23    |
| <sup>139</sup> Xe | 0        | β-   | 3/2-           | 39.68 s 14                | 5057 21    |
| <sup>139</sup> Cs | 0        | β-   | 7/2+           | 9.27 m 5                  | 4213 3     |
| <sup>139</sup> Ba | 0        | β-   | 7/2-           | 83.06 m 28                | 2317 3     |
| <sup>139</sup> Ce | 0        | EC   | 3/2+           | 137.640 d 23              | 278 7      |
| <sup>139</sup> Pr | 0        | EC   | 5/2+           | 4.41 h 4                  | 2129 3     |
| <sup>139</sup> Nd | 0        | EC   | 3/2+           | 29.7 m 5                  | 2790 40    |
|                   | 231.15 5 | EC   | 11/2-          | 5.50 h 20                 | 2790 40    |
| <sup>139</sup> Pm | 0        | EC   | (5/2)+         | 4.15 m 5                  | 4520 40    |
|                   | 188.7 3  | EC   | (11/2)-        | 180 ms 20                 | 4520 40    |
| <sup>139</sup> Sm | 0        | EC   | (1/2)+         | 2.57 m 10                 | 5460 110   |
|                   | 457.8 4  | EC   | (11/2)-        | 10.7 s 6                  | 5460 110   |
| <sup>139</sup> Eu | 0        | EC   | (11/2)-        | 17.9 s 6                  | (6700)     |
| <sup>139</sup> Gd | 0        | ECp  |                | 4.9 s 10                  | (77)       |
| <sup>140</sup> I  | 0        | β-   | (3)            | 0.86 s 4                  | (8760)     |
| <sup>140</sup> Xe | 0        | β-   | 0+             | 13.60 s 10                | 4060 60    |
| <sup>140</sup> Cs | 0        | β-   | 1-             | 63.7 s 3                  | 6219 12    |
| <sup>140</sup> Ba | 0        | β-   | 0+             | 12.752 d 3                | 1047 8     |
| <sup>140</sup> La | 0        | β-   | 3-             | 1.6781 d 3                | 3761.9 19  |
| <sup>140</sup> Pr | 0        | EC   | 1+             | 3.39 m 1                  | 3388 6     |
| <sup>140</sup> Nd | 0        | EC   | 0+             | 3.37 d 2                  | 222 20     |
| <sup>140</sup> Pm | 0        | EC   | 1+             | 9.2 s 2                   | 6090 40    |
|                   | 0+X      | EC   | 7-             | 5.95 m 5                  | 6090 40    |
| <sup>140</sup> Sm | 0        | EC   | 0+             | 14.82 m 12                | (3020)     |
| <sup>140</sup> Eu | 0        | EC   | 1+             | 1.51 s 2                  | 8400 40    |
| <sup>140</sup> Gd | 0        | EC   | 0+             | 15.8 s 4                  | (5500)     |
| <sup>140</sup> Tb | 0        | EC   |                | 2.4 s 2                   | (10800)    |
| <sup>141</sup> I  | 0        | β-   |                | 0.43 s 2                  | (7800)     |
| <sup>141</sup> Xe | 0        | β-   | 5/2+           | 1.73 s 1                  | 6150 90    |
| <sup>141</sup> Cs | 0        | β-   | 7/2+           | 24.94 s 6                 | 5255 12    |
| <sup>141</sup> Ba | 0        | β-   | 3/2-           | 18.27 m 7                 | 3216 10    |
| <sup>141</sup> La | 0        | β-   | (7/2+)         | 3.92 h 3                  | 2502 4     |
| <sup>141</sup> Ce | 0        | β-   | 7/2-           | 32.501 d 5                | 580.7 11   |
| <sup>141</sup> Nd | 0        | EC   | 3/2+           | 2.49 h 3                  | 1823 3     |
| <sup>141</sup> Pm | 0        | EC   | 5/2+           | 20.90 m 5                 | 3715 24    |
| <sup>141</sup> Sm | 0        | EC   | 1/2+           | 10.2 m 2                  | 4543 23    |
|                   | 175.8 3  | EC   | 11/2-          | 22.6 m 2                  | 4543 23    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)  | Mode            | J <sup>π</sup> | t <sub>1/2</sub>           | Q(keV)    |
|-------------------|---------|-----------------|----------------|----------------------------|-----------|
| <sup>141</sup> Eu | 0       | EC              | 5/2+           | 40.0 s 7                   | 5550 100  |
|                   | 96.4    | EC              | 11/2-          | 2.7 s 3                    | 5550 100  |
| <sup>141</sup> Gd | 0       | EC              | (1/2+)         | 14 s 4                     | (7200)    |
|                   | 377.8 2 | EC              | (11/2-)        | 24.5 s 5                   | (7200)    |
|                   | 377.8   | IT              | (11/2-)        | 24.5 s 5                   | (8300)    |
| <sup>141</sup> Tb | 0       | EC              | (5/2-)         | 3.5 s 2                    | (8300)    |
| <sup>141</sup> Dy | 0       | EC <sub>p</sub> | (9/2-)         | 0.9 s 2                    |           |
|                   | 0       | EC              | (9/2-)         | 0.9 s 2                    | (9300)    |
| <sup>142</sup> Xe | 0       | β-              | 0+             | 1.22 s 2                   | 5040 100  |
| <sup>142</sup> Cs | 0       | β-              | 0-             | 1.70 s 2                   | 7306 12   |
| <sup>142</sup> Ba | 0       | β-              | 0+             | 10.6 m 2                   | 2212 5    |
| <sup>142</sup> La | 0       | β-              | 2-             | 91.1 m 5                   | 4505 5    |
| <sup>142</sup> Pr | 0       | EC              | 2-             | 19.12 h 4                  | 745.2 24  |
|                   | 0       | β-              | 2-             | 19.12 h 4                  | 2162.3 15 |
| <sup>142</sup> Pm | 0       | EC              | 1+             | 40.5 s 5                   | 4870 40   |
| <sup>142</sup> Sm | 0       | EC              | 0+             | 72.49 m 5                  | 2100 50   |
| <sup>142</sup> Eu | 0       | EC              | 1+             | 2.34 s 12                  | 7360 90   |
|                   | 0+X     | EC              | 8-             | 1.22 m 2                   | 7360 90   |
| <sup>142</sup> Gd | 0       | EC              | 0+             | 70.2 s 6                   | (4500)    |
| <sup>142</sup> Tb | 0       | EC              | 1+             | 597 ms 17                  | (10100)   |
| <sup>142</sup> Dy | 0       | EC              | 0+             | 2.3 s 3                    | (6900)    |
| <sup>143</sup> Xe | 0       | β-              | 5/2-           | 0.30 s 3                   | (7310)    |
| <sup>143</sup> Cs | 0       | β-              | 3/2+           | 1.78 s 1                   | 6243 18   |
| <sup>143</sup> Ba | 0       | β-              | 5/2-           | 14.33 s 8                  | 4243 17   |
| <sup>143</sup> La | 0       | β-              | (7/2)+         | 14.2 m 1                   | 3425 15   |
| <sup>143</sup> Ce | 0       | β-              | 3/2-           | 33.039 h 6                 | 1461.6 18 |
| <sup>143</sup> Pr | 0       | β-              | 7/2+           | 13.57 d 2                  | 934.0 14  |
| <sup>143</sup> Pm | 0       | EC              | 5/2+           | 265 d 7                    | 1041.4 24 |
| <sup>143</sup> Sm | 0       | EC              | 3/2+           | 8.83 m 1                   | 3443 4    |
|                   | 754.0 2 | EC              | 11/2-          | 66 s 2                     | 3443 4    |
| <sup>143</sup> Eu | 0       | EC              | 5/2+           | 2.63 m 5                   | 5170 40   |
| <sup>143</sup> Gd | 0       | EC              | (1/2)+         | 39 s 2                     | 6010 200  |
|                   | 152.6   | EC              | (11/2-)        | 112 s 2                    | 6010 200  |
| <sup>143</sup> Tb | 0       | EC              | (11/2-)        | 12 s 1                     | (7400)    |
| <sup>144</sup> Cs | 0       | β-              | 1              | 1.01 s 1                   | 8465 24   |
|                   | 0+X     | β-              | (GE 4)         | <1 s                       | 8465 24   |
| <sup>144</sup> Ba | 0       | β-              | 0+             | 11.5 s 2                   | 3120 60   |
| <sup>144</sup> La | 0       | β-              | (3-)           | 40.8 s 4                   | 5540 60   |
| <sup>144</sup> Ce | 0       | β-              | 0+             | 284.893 d 8                | 318.7 8   |
| <sup>144</sup> Pr | 0       | β-              | 0-             | 17.28 m 5                  | 2997.5 24 |
|                   | 59.03 3 | β-              | 3-             | 7.2 m 3                    | 2997.5 24 |
| <sup>144</sup> Nd | 0       | α               | 0+             | 2.29×10 <sup>15</sup> y 16 | 1905.1 18 |
| <sup>144</sup> Pm | 0       | EC              | 5-             | 363 d 14                   | 2331.8 22 |
| <sup>144</sup> Eu | 0       | EC              | 1+             | 10.2 s 1                   | 6329 21   |
| <sup>144</sup> Gd | 0       | EC              | 0+             | 4.5 m 1                    | (3740)    |
| <sup>144</sup> Tb | 0       | EC              | (1+)           | 1 s                        | (8900)    |
|                   | 396.9   | EC              | (6-)           | 4.25 s 15                  | (8900)    |
| <sup>144</sup> Dy | 0       | EC              | 0+             | 9.1 s 4                    | (6200)    |
| <sup>145</sup> Cs | 0       | β-              | 3/2+           | 0.594 s 13                 | 7890 40   |
| <sup>145</sup> Ba | 0       | β-              | 5/2-           | 4.31 s 16                  | 4930 60   |
| <sup>145</sup> La | 0       | β-              |                | 24.8 s 20                  | 4120 60   |
| <sup>145</sup> Ce | 0       | β-              | (3/2)-         | 3.01 m 6                   | 2540 40   |
| <sup>145</sup> Pr | 0       | β-              | 7/2+           | 5.984 h 10                 | 1805 7    |
| <sup>145</sup> Pm | 0       | α               | 5/2+           | 17.7 y 4                   | 2322 3    |
|                   | 0       | EC              | 5/2+           | 17.7 y 4                   | 163.2 22  |
| <sup>145</sup> Sm | 0       | EC              | 7/2-           | 340 d 3                    | 616.7 24  |
| <sup>145</sup> Eu | 0       | EC              | 5/2+           | 5.93 d 4                   | 2660 3    |
| <sup>145</sup> Gd | 0       | EC              | 1/2+           | 23.0 m 4                   | 5050 40   |
|                   | 748.7 1 | EC              | 11/2-          | 85 s 3                     | 5050 40   |
| <sup>145</sup> Tb | 0+Y     | EC              | (11/2-)        | 29.5 s 10                  | 6510 120  |
| <sup>145</sup> Dy | 0 2     | EC              | (1/2+)         | 10 s 1                     | (7720)    |
|                   | 118.2 2 | EC              | (11/2-)        | 13.6 s 10                  | (7720)    |
| <sup>145</sup> Ho | 0       | EC              | (11/2-)        | 2.4 s 1                    | (9100)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)   | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|-------------------|----------|------|----------------|---------------------------|-----------|
| <sup>146</sup> Cs | 0        | β-   | 1-             | 0.343 s 7                 | 9380 40   |
| <sup>146</sup> Ba | 0        | β-   | 0+             | 2.22 s 7                  | 4120 40   |
| <sup>146</sup> La | 0        | β-   | 2-             | 6.27 s 10                 | 6550 50   |
|                   | 0+X      | β-   | (6-)           | 10.0 s 1                  | 6550 50   |
| <sup>146</sup> Ce | 0        | β-   | 0+             | 13.52 m 13                | 1040 40   |
| <sup>146</sup> Pr | 0        | β-   | (2)-           | 24.15 m 18                | 4200 60   |
| <sup>146</sup> Pm | 0        | EC   | 3-             | 5.53 y 5                  | 1472 4    |
|                   | 0        | β-   | 3-             | 5.53 y 5                  | 1542 3    |
| <sup>146</sup> Sm | 0        | α    | 0+             | 1.03×10 <sup>8</sup> y 5  | 2529 3    |
| <sup>146</sup> Eu | 0        | EC   | 4-             | 4.59 d 3                  | 3878 6    |
| <sup>146</sup> Gd | 0        | EC   | 0+             | 48.27 d 10                | 1030 8    |
| <sup>146</sup> Tb | 0+X      | EC   | 5-             | 23 s 2                    | 8080 110  |
|                   | 0        | EC   | 1+             | 8 s 4                     | 8080 110  |
| <sup>146</sup> Dy | 0        | EC   | 0+             | 29 s 3                    | 5160 100  |
| <sup>146</sup> Ho | 0        | EC   | (10+)          | 3.6 s 3                   | (10700)   |
| <sup>147</sup> Cs | 0        | β-   | (3/2+)         | 0.225 s 5                 | 9250 140  |
| <sup>147</sup> Ba | 0        | β-   | (3/2-)         | 0.893 s 1                 | 5750 50   |
| <sup>147</sup> La | 0        | β-   | (3/2+,5/2+)    | 4.015 s 8                 | 4950 60   |
| <sup>147</sup> Ce | 0        | β-   | (5/2-)         | 56.4 s 10                 | 3290 40   |
| <sup>147</sup> Pr | 0        | β-   | (3/2+)         | 13.4 m 4                  | 2690 40   |
| <sup>147</sup> Nd | 0        | β-   | 5/2-           | 10.98 d 1                 | 896.1 9   |
| <sup>147</sup> Pm | 0        | β-   | 7/2+           | 2.6234 y 2                | 224.1 3   |
| <sup>147</sup> Sm | 0        | α    | 7/2-           | 1.06×10 <sup>11</sup> y 2 | 2310.3 11 |
| <sup>147</sup> Eu | 0        | α    | 5/2+           | 24.1 d 6                  | 2990 3    |
|                   | 0        | EC   | 5/2+           | 24.1 d 6                  | 1721.5 23 |
| <sup>147</sup> Gd | 0        | EC   | 7/2-           | 38.06 h 12                | 2188 3    |
| <sup>147</sup> Tb | 0        | EC   | (1/2+)         | 1.7 h 1                   | 4611 12   |
|                   | 50.6     | EC   | (11/2)-        | 1.83 m 6                  | 4611 12   |
| <sup>147</sup> Dy | 0        | EC   | 1/2+           | 40 s 10                   | 6370 50   |
|                   | 750.5 4  | EC   | 11/2-          | 55 s 1                    | 6370 50   |
| <sup>147</sup> Ho | 0        | EC   | (11/2-)        | 5.8 s 4                   | (8100)    |
| <sup>147</sup> Tm | 0        | p    | (11/2-)        | 0.56 s 4                  | (10700)   |
|                   | 0        | EC   | (11/2-)        | 0.56 s 4                  | (10700)   |
|                   | 67 4     | p    | (1/2+,3/2+)    | 360 us 80                 | (10700)   |
| <sup>148</sup> Cs | 0        | β-   |                | 158 ms 7                  | 10500 40  |
| <sup>148</sup> Ba | 0        | β-   | 0+             | 0.607 s 25                | 5120 60   |
| <sup>148</sup> La | 0        | β-   | (2-)           | 1.05 s 1                  | 7260 50   |
| <sup>148</sup> Ce | 0        | β-   | 0+             | 56 s 1                    | 2060 210  |
| <sup>148</sup> Pr | 0        | β-   | 1-             | 2.27 m 4                  | 4930 220  |
|                   | <90      | β-   | (4)            | 2.0 m 1                   | 4930 220  |
| <sup>148</sup> Pm | 0        | β-   | 1-             | 5.370 d 9                 | 2468 6    |
|                   | 137.9    | β-   | 6-             | 41.29 d 11                | 2468 6    |
| <sup>148</sup> Sm | 0        | α    | 0+             | 7×10 <sup>15</sup> y 3    | 1985.8 12 |
| <sup>148</sup> Eu | 0        | α    | 5-             | 54.5 d 5                  | 2761 17   |
|                   | 0        | EC   | 5-             | 54.5 d 5                  | 3107 17   |
| <sup>148</sup> Gd | 0        | α    | 0+             | 74.6 y 30                 | 3271.21 3 |
| <sup>148</sup> Tb | 0        | EC   | 2-             | 60 m 1                    | 5690 30   |
|                   | 90.1 3   | EC   | 9+             | 2.20 m 5                  | 5690 30   |
| <sup>148</sup> Dy | 0        | EC   | 0+             | 3.1 m 1                   | 2678 10   |
| <sup>148</sup> Ho | 0        | EC   | 1+             | 2.2 s 11                  | (9400)    |
|                   | 0+Y      | EC   | 6-             | 9.59 s 15                 | (9400)    |
| <sup>148</sup> Er | 0        | ECp  | 0+             | 4.6 s 2                   |           |
|                   | 0        | EC   | 0+             | 4.6 s 2                   | (6800)    |
| <sup>148</sup> Tm | X        | EC   | (10+)          | 0.7 s 2                   | (12000)   |
| <sup>149</sup> Ce | 0        | β-   |                | 5.3 s 2                   | 4190 80   |
| <sup>149</sup> Pr | 0        | β-   | (5/2+)         | 2.26 m 7                  | 3397 10   |
| <sup>149</sup> Nd | 0        | β-   | 5/2-           | 1.728 h 1                 | 1691 3    |
| <sup>149</sup> Pm | 0        | β-   | 7/2+           | 53.08 h 5                 | 1071 4    |
| <sup>149</sup> Eu | 0        | EC   | 5/2+           | 93.1 d 4                  | 692 5     |
| <sup>149</sup> Gd | 0        | α    | 7/2(-)         | 9.4 d 3                   | 3101 3    |
|                   | 0        | EC   | 7/2-           | 9.28 d 10                 | 1319 6    |
| <sup>149</sup> Tb | 0        | α    | 1/2+           | 4.13 h 2                  | 4077.3 24 |
|                   | 0        | EC   | 1/2+           | 4.118 h 25                | 3636 5    |
|                   | 35.78 13 | EC   | 11/2-          | 4.16 m 4                  | 3636 5    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|-------------------|-----------|------|----------------|---------------------------|-----------|
|                   | 36.0 3    | α    | 11/2-          | 4.16 m 4                  | 4077.3 24 |
| <sup>149</sup> Dy | 0         | EC   | (7/2-)         | 4.20 m 14                 | 3812 10   |
|                   | 2661.1 4  | EC   | (27/2-)        | 0.490 s 15                | 3812 10   |
| <sup>149</sup> Ho | 0         | EC   | (11/2-)        | 21.1 s 2                  | 6014 19   |
|                   | 48.8 2    | EC   | (1/2+)         | 58 s 3                    | 6014 19   |
| <sup>149</sup> Er | 0         | EC   | (1/2+)         | 4 s 2                     | (7700)    |
|                   | 741.8 2   | EC   | (11/2-)        | 8.9 s 2                   | (7700)    |
| <sup>149</sup> Tm | 0         | EC   | (11/2-)        | 0.9 s 2                   | (9600)    |
| <sup>150</sup> La | 0         | β-n  |                | 0.86 s 5                  | (7800)    |
| <sup>150</sup> Pr | 0         | β-   | 1(-)           | 6.19 s 16                 | 5690 80   |
| <sup>150</sup> Pm | 0         | β-   | (1-)           | 2.68 h 2                  | 3454 20   |
| <sup>150</sup> Eu | 0         | EC   | 5(-)           | 35.8 y 10                 | 2261 6    |
|                   | 42.1      | EC   | 0(-)           | 12.8 h 1                  | 2261 6    |
|                   | 42.1      | β-   | 0(-)           | 12.8 h 1                  | 971 4     |
| <sup>150</sup> Gd | 0         | α    | 0+             | 1.79×10 <sup>6</sup> y 8  | 2809 6    |
| <sup>150</sup> Tb | 0+Y       | α    | (2-)           | 3.48 h 16                 | 3587 5    |
|                   | 0+X       | EC   | (8+,9+)        | 5.8 m 2                   | 4656 9    |
|                   | 0+Y       | EC   | (2-)           | 3.48 h 16                 | 4656 9    |
| <sup>150</sup> Dy | 0         | α    | 0+             | 7.17 m 5                  | 4351.1 15 |
|                   | 0         | EC   | 0+             | 7.17 m 5                  | 1794 9    |
| <sup>150</sup> Ho | 0+Y       | EC   | (9+)           | 26 s 2                    | (7240)    |
|                   | 0+X       | EC   | (2-)           | 72 s 4                    | (7240)    |
| <sup>150</sup> Er | 0         | EC   | 0+             | 18.5 s 7                  | 4108 15   |
| <sup>150</sup> Tm | 0         | ECp  | (6-)           | 2.2 s 2                   | (2600)    |
|                   | 0         | EC   | (6-)           | 2.2 s 2                   | (10800)   |
| <sup>150</sup> Lu | 0+X       | p    | (5-,6-)        | 35 ms 10                  | 1270 4    |
| <sup>151</sup> Ce | 0         | β-   |                | 1.02 s 6                  | (5300)    |
| <sup>151</sup> Pr | 0         | β-   | (1/2 TO 5/2-)  | 18.90 s 7                 | 4170 80   |
| <sup>151</sup> Nd | 0         | β-   | (3/2)+         | 12.44 m 7                 | 2442 4    |
| <sup>151</sup> Pm | 0         | β-   | 5/2+           | 28.40 h 4                 | 1187 5    |
| <sup>151</sup> Sm | 0         | β-   | 5/2-           | 90 y 8                    | 76.8 5    |
| <sup>151</sup> Gd | 0         | α    | 7/2-           | 124 d 1                   | 2653 3    |
|                   | 0         | EC   | 7/2-           | 124 d 1                   | 464 3     |
| <sup>151</sup> Tb | 0         | α    | 1/2(+)         | 17.609 h 1                | 3496 4    |
|                   | 0         | EC   | 1/2(+)         | 17.609 h 1                | 2565 4    |
|                   | 99.54 6   | EC   | (11/2-)        | 25 s 3                    | 2565 4    |
| <sup>151</sup> Dy | 0         | α    | 7/2(-)         | 17.9 m 3                  | 4180 3    |
|                   | 0         | EC   | 7/2(-)         | 17.9 m 3                  | 2871 5    |
| <sup>151</sup> Ho | 0         | α    | (11/2-)        | 35.2 s 1                  | 4695.8 19 |
|                   | 0         | EC   | (11/2-)        | 35.2 s 1                  | 5128 12   |
|                   | 41.4 9    | α    | (1/2+)         | 47.2 s 10                 | 4695.8 19 |
| <sup>151</sup> Er | 0         | EC   | (7/2-)         | 23.5 s 13                 | (5200)    |
|                   | 2585.5 6  | EC   | (27/2-)        | 0.58 s 2                  | (5200)    |
| <sup>151</sup> Tm | 0+Y       | EC   | (11/2-)        | 4.13 s 11                 | (7530)    |
|                   | 0+X       | EC   | (1/2+)         | 5.2 s 20                  | (7530)    |
| <sup>151</sup> Yb | 0+X       | ECp  | (1/2+)         | 1.6 s                     | (3000)    |
|                   | 0+X       | EC   | (1/2+)         | 1.6 s                     | (9200)    |
|                   | 0+Y       | EC   | (11/2-)        | 1.6 s                     | (9200)    |
| <sup>151</sup> Lu | X         | p    |                | 85 ms 10                  | (11000)   |
| <sup>152</sup> Pr | 0         | β-   |                | 3.24 s 19                 | (6700)    |
| <sup>152</sup> Nd | 0         | β-   | 0+             | 11.4 m 2                  | 1110 80   |
| <sup>152</sup> Pm | 0         | β-   | 1+             | 4.1 m 1                   | 3500 70   |
|                   | 170+X     | β-   | (8)            | 13.8 m 2                  | 3500 70   |
|                   | 1.7E+2 13 | β-   | 4-             | 7.52 m 8                  | 3500 70   |
| <sup>152</sup> Eu | 0         | EC   | 3-             | 13.542 y 10               | 1874.1 7  |
|                   | 0         | β-   | 3-             | 13.542 y 10               | 1818.2 11 |
|                   | 45.5994 4 | EC   | 0-             | 9.274 h 9                 | 1874.1 7  |
|                   | 45.5994 4 | β-   | 0-             | 9.274 h 9                 | 1818.2 11 |
| <sup>152</sup> Gd | 0         | α    | 0+             | 1.08×10 <sup>14</sup> y 8 | 2205.0 15 |
| <sup>152</sup> Tb | 0         | EC   | 2-             | 17.5 h 1                  | 3990 40   |
|                   | 501.74 19 | EC   | 8+             | 4.2 m 1                   | 3990 40   |
| <sup>152</sup> Dy | 0         | α    | 0+             | 2.38 h 2                  | 3727 4    |
|                   | 0         | EC   | 0+             | 2.38 h 2                  | 600 40    |
| <sup>152</sup> Ho | 0         | α    | 2-             | 161.8 s 3                 | 4507.4 13 |
|                   | 0         | EC   | 2-             | 161.8 s 3                 | 6470 30   |
|                   | 160 1     | α    | 9+             | 49.5 s 3                  | 4507.4 13 |



Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)   | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)    |
|-------------------|----------|------|----------------|--------------------------|-----------|
|                   | 160 1    | EC   | 9+             | 49.5 s 3                 | 6470 30   |
| <sup>152</sup> Er | 0        | α    | 0+             | 10.3 s 1                 | 4934.4 16 |
|                   | 0        | EC   | 0+             | 10.3 s 1                 | 3105 10   |
| <sup>152</sup> Tm | 0        | EC   | (9+)           | 5.2 s 6                  | (8700)    |
|                   | 0+X      | EC   | (2-)           | 8.0 s 10                 | (8700)    |
| <sup>152</sup> Yb | 0        | EC   | 0+             | 3.1 s 2                  | 5470 200  |
| <sup>152</sup> Lu | 0        | EC   | (6-,5-)        | 0.7 s 1                  | (12300)   |
| <sup>153</sup> Nd | 0        | β-   | (1/2,3/2,5/2)  | 28.9 s 4                 | (3600)    |
| <sup>153</sup> Pm | 0        | β-   | 5/2-           | 5.4 m 2                  | 1900 16   |
| <sup>153</sup> Sm | 0        | β-   | 3/2+           | 46.27 h 1                | 808.4 8   |
| <sup>153</sup> Gd | 0        | EC   | 3/2-           | 241.6 d 2                | 484.8 11  |
| <sup>153</sup> Tb | 0        | EC   | 5/2+           | 2.34 d 1                 | 1570 4    |
| <sup>153</sup> Dy | 0        | α    | 7/2(-)         | 6.4 h 1                  | 3559 4    |
|                   | 0        | EC   | 7/2(-)         | 6.4 h 1                  | 2170.6 19 |
| <sup>153</sup> Ho | 0        | α    | 11/2-          | 2.0 m 1                  | 4051 5    |
|                   | 0        | EC   | 11/2-          | 2.0 m 1                  | 4129 7    |
|                   | 68 7     | α    | 1/2+           | 9.3 m 5                  | 4051 5    |
|                   | 68 7     | EC   | 1/2+           | 9.3 m 5                  | 4129 7    |
| <sup>153</sup> Er | 0        | α    | (7/2-)         | 37.1 s 2                 | 4802.7 15 |
| <sup>153</sup> Tm | 0        | α    | (11/2-)        | 1.48 s 1                 | 5248.1 14 |
|                   | 0        | EC   | (11/2-)        | 1.48 s 1                 | 6459 19   |
|                   | 43.2     | α    | (1/2+)         | 2.5 s 2                  | 5248.1 14 |
|                   | 43.2     | EC   | (1/2+)         | 2.5 s 2                  | 6459 19   |
| <sup>153</sup> Yb | 0        | α    |                | 4.2 s 1                  | (4200)    |
|                   | 0        | EC   | 7/2-           | 4.2 s 1                  | (6700)    |
| <sup>154</sup> Pr | 0        | β-   | (3+,2+)        | 2.3 s 1                  | (7900)    |
| <sup>154</sup> Nd | 0        | β-   | 0+             | 25.9 s 2                 | (2800)    |
| <sup>154</sup> Pm | 0        | β-   | (0,1)          | 1.73 m 10                | 4050 110  |
|                   | 0+X      | β-   | (3,4)          | 2.68 m 7                 | 4050 110  |
| <sup>154</sup> Eu | 0        | EC   | 3-             | 8.593 y 4                | 717.1 11  |
|                   | 0        | β-   | 3-             | 8.593 y 8                | 1968.5 11 |
| <sup>154</sup> Tb | 0+V      | EC   | 3-             | 9.4 h 4                  | 3560 50   |
|                   | 0        | EC   | 0              | 21.5 h 4                 | 3560 50   |
|                   | 0+W      | EC   | 7-             | 22.7 h 4                 | 3560 50   |
| <sup>154</sup> Dy | 0        | α    | 0+             | 3.0×10 <sup>6</sup> y 15 | 2947 5    |
| <sup>154</sup> Ho | 0        | α    | (2)-           | 11.76 m 19               | 4042 4    |
|                   | 0        | EC   | (2)-           | 11.76 m 19               | 5751 11   |
|                   | 3.2E2 11 | α    | 8+             | 3.10 m 14                | 4042 4    |
|                   | 320      | EC   | 8+             | 3.10 m 14                | 5751 11   |
| <sup>154</sup> Er | 0        | α    | 0+             | 3.73 m 9                 | 4280 3    |
|                   | 0        | EC   | 0+             | 3.73 m 9                 | 2032 10   |
| <sup>154</sup> Tm | 0+X      | α    | (9+)           | 3.30 s 7                 | 5090 50   |
|                   | 0        | α    | (2-)           | 8.1 s 3                  | 5090 50   |
|                   | 0+X      | EC   | (9+)           | 3.30 s 7                 | (8050)    |
|                   | 0        | EC   | (2-)           | 8.1 s 3                  | (8050)    |
| <sup>154</sup> Yb | 0        | α    | 0+             | 0.404 s 14               | 5474.3 19 |
|                   | 0        | EC   | 0+             | 0.404 s 14               | 4490 50   |
| <sup>154</sup> Lu | 0+X      | EC   | (7+)           | 1.12 s 8                 | (10100)   |
| <sup>155</sup> Nd | 0        | β-   |                | 8.9 s 2                  | (5000)    |
| <sup>155</sup> Pm | 0        | β-   | (5/2-)         | 41.5 s 2                 | (3170)    |
| <sup>155</sup> Sm | 0        | β-   | 3/2-           | 22.3 m 2                 | 1627.1 12 |
| <sup>155</sup> Eu | 0        | β-   | 5/2+           | 4.7611 y 13              | 252.2 11  |
| <sup>155</sup> Tb | 0        | EC   | 3/2+           | 5.32 d 6                 | 821 12    |
| <sup>155</sup> Dy | 0        | EC   | 3/2-           | 9.9 h 2                  | 2094.5 19 |
| <sup>155</sup> Ho | 0        | EC   | 5/2+           | 48 m 1                   | 3102 20   |
| <sup>155</sup> Er | 0        | α    | 7/2-           | 5.3 m 3                  | 4120 50   |
|                   | 0        | EC   | 7/2-           | 5.3 m 3                  | 3840 60   |
| <sup>155</sup> Tm | 0        | α    | (11/2-)        | 21.6 s 7                 | 4569 6    |
|                   | 0        | EC   | (11/2-)        | 21.6 s 2                 | 5580 50   |
|                   | 41 6     | α    | (1/2+)         | 45 s 3                   | 4569 6    |
|                   | 41 6     | EC   | (1/2+)         | 45 s 3                   | 5580 50   |
| <sup>155</sup> Yb | 0        | α    | (7/2-)         | 1.75 s 5                 | 5337 3    |
|                   | 0        | EC   | (7/2-)         | 1.75 s 5                 | (6000)    |
| <sup>155</sup> Lu | 0+X      | α    | (11/2-)        | 68 ms 5                  | (58)      |
|                   | 0+Y      | α    | (1/2,3/2+)     | 140 ms 20                | (58)      |
|                   | 0        | EC   | (11/2-)        | 68 ms 5                  | (7970)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|-----------|------|----------------|------------------|-----------|
|                   | 1798 12   | α    | (25/2-)        | 2.60 ms 7        | (58)      |
| <sup>155</sup> Hf | >0        | α    |                | 0.89 s 12        |           |
|                   | 0         | EC   |                | 0.89 s 12        | (8000)    |
| <sup>156</sup> Nd | 0         | β-   | 0+             | 5.47 s 11        | (4100)    |
| <sup>156</sup> Pm | 0         | β-   | 4(-)           | 26.70 s 10       | 5160 40   |
| <sup>156</sup> Sm | 0         | β-   | 0+             | 9.4 h 2          | 722 8     |
| <sup>156</sup> Eu | 0         | β-   | 0+             | 15.19 d 8        | 2451 5    |
| <sup>156</sup> Tb | 0         | EC   | 3-             | 5.35 d 10        | 2444 4    |
|                   | 88.4      | EC   | (0+)           | 5.3 h 2          | 2444 4    |
| <sup>156</sup> Ho | 0         | EC   | (4+)           | 56 m 1           | (5060)    |
| <sup>156</sup> Er | 0         | EC   | 0+             | 19.5 m 10        | (1370)    |
| <sup>156</sup> Tm | 0         | α    | 2-             | 83.8 s 18        | 4340 50   |
|                   | 0+X       | α    |                | 19 s 3           |           |
|                   | 0         | EC   | 2-             | 83.8 s 18        | (7200)    |
| <sup>156</sup> Yb | 0         | α    | 0+             | 26.1 s 7         | 4812 7    |
|                   | 0         | EC   | 0+             | 26.1 s 7         | 3570 50   |
| <sup>156</sup> Lu | 0+X       | α    |                | 0.5 s            | 5590 50   |
|                   | 0+Y       | α    |                | 180 ms 20        | 5590 50   |
|                   | 0+X       | EC   |                | 0.5 s            | (9400)    |
|                   | 0+Y       | EC   |                | 180 ms 20        | (9400)    |
| <sup>156</sup> Hf | 0         | α    | 0+             | 25 ms 4          | 6033 10   |
|                   | 0         | EC   | 0+             | 25 ms 4          | 5910 200  |
|                   | 1977 18   | α    |                | 444 us 17        | 6033 10   |
| <sup>156</sup> Ta | X         | EC   | (9+)           | >10 ms           | (11600)   |
| <sup>157</sup> Pm | 0         | β-   | (5/2-)         | 10.56 s 10       | (4500)    |
| <sup>157</sup> Sm | 0         | β-   | (3/2-)         | 482 s 4          | 2700 200  |
| <sup>157</sup> Eu | 0         | β-   | 5/2+           | 15.18 h 3        | 1363 6    |
| <sup>157</sup> Tb | 0         | EC   | 3/2+           | 99 y 10          | 60.1 3    |
| <sup>157</sup> Dy | 0         | EC   | 3/2-           | 8.14 h 4         | 1341 6    |
| <sup>157</sup> Ho | 0         | EC   | 7/2-           | 12.6 m 2         | 2540 50   |
| <sup>157</sup> Er | 0         | EC   | 3/2-           | 18.65 m 10       | 3470 80   |
| <sup>157</sup> Tm | 0         | EC   | 1/2+           | 3.63 m 9         | 4480 100  |
| <sup>157</sup> Yb | 0         | α    | (7/2-)         | 38.6 s 10        | 4620 50   |
|                   | 0         | EC   | 7/2-           | 38.6 s 10        | 5530 150  |
| <sup>157</sup> Lu | 0         | α    | (1/2+,3/2+)    | 7.4 s 14         | 5096 3    |
|                   | 26 7      | α    | (11/2-)        | 5.0 d 4          | 5096 3    |
|                   | 26 7      | EC   | (11/2-)        | 5.0 s 4          | 6930 50   |
| <sup>157</sup> Hf | 0         | α    |                | 110 ms 6         | 5880 50   |
|                   | 0         | α    |                | 110 ms 6         |           |
| <sup>157</sup> Ta | 0         | α    |                | 5.3 ms 18        | 6380 50   |
| <sup>158</sup> Pm | 0         | β-   |                | 4.8 s 5          | (6300)    |
| <sup>158</sup> Sm | 0         | β-   | 0+             | 5.30 m 3         | (1950)    |
| <sup>158</sup> Eu | 0         | β-   | (1-)           | 45.9 m 2         | 3490 80   |
| <sup>158</sup> Tb | 0         | EC   | 3-             | 180 y 11         | 1220.0 9  |
|                   | 0         | β-   | 3-             | 180 y 11         | 936.8 24  |
| <sup>158</sup> Ho | 0         | EC   | 5+             | 11.3 m 4         | 4240 30   |
|                   | 67.200 10 | EC   | 2-             | 28 m 2           | 4240 30   |
|                   | 180       | EC   | (9+)           | 21.3 m 23        | 4240 30   |
| <sup>158</sup> Er | 0         | EC   | 0+             | 2.29 h 6         | (900)     |
| <sup>158</sup> Tm | 0         | EC   | 2-             | 3.98 m 6         | 6530 100  |
| <sup>158</sup> Yb | 0         | α    | 0+             | 1.49 m 13        | 4171 8    |
|                   | 0         | EC   | 0+             | 1.49 m 13        | (2730)    |
| <sup>158</sup> Lu | X         | α    |                | 10.4 s 1         | 4790 50   |
|                   | X         | EC   |                | 10.4 s 1         | (8670)    |
| <sup>158</sup> Hf | 0         | α    | 0+             | 2.86 s 2         | 5403 4    |
|                   | 0         | EC   | 0+             | 2.86 s 2         | 5100 70   |
| <sup>158</sup> Ta | >0        | α    |                | 36.8 ms 16       | 6210 50   |
|                   | X         | EC   |                | 36.8 ms 16       | (109)     |
| <sup>158</sup> W  | 0         | α    | 0+             | 1.4 ms           | 6600 30   |
| <sup>159</sup> Sm | 0         | β-   | (5/2-)         | 11.37 s 15       | (3800)    |
| <sup>159</sup> Eu | 0         | β-   | 5/2+           | 18.1 m 1         | 2514 7    |
| <sup>159</sup> Gd | 0         | β-   | 3/2-           | 18.479 h 4       | 970.6 7   |
| <sup>159</sup> Dy | 0         | EC   | 3/2-           | 144.4 d 2        | 365.6 12  |
| <sup>159</sup> Ho | 0         | EC   | 7/2-           | 33.05 m 11       | 1838 3    |
| <sup>159</sup> Er | 0         | EC   | 3/2-           | 36 m 1           | 2768.5 20 |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)  | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|---------|------|----------------|------------------|-----------|
| <sup>159</sup> Tm | 0       | EC   | 5/2+           | 9.13 m 16        | 3850 100  |
| <sup>159</sup> Yb | 0       | EC   | 5/2(-)         | 1.58 m 14        | 5050 200  |
| <sup>159</sup> Lu | 0       | α    |                | 12.1 s 10        | 4530 50   |
|                   | 0       | EC   |                | 12.1 s 10        | 5990 230  |
| <sup>159</sup> Hf | 0       | α    |                | 5.6 s 4          | 5220 50   |
|                   | 0       | EC   |                | 5.6 s 4          | (6700)    |
| <sup>159</sup> Ta | 0       | α    |                | 0.57 s 18        | 5750 50   |
|                   | 0       | EC   |                | 0.57 s 18        | (8490)    |
| <sup>159</sup> W  | 0       | α    |                | 7.3 ms 27        | 6440 50   |
|                   | 0       | EC   |                | 7.3 ms 27        | (8700)    |
| <sup>160</sup> Sm | 0       | β-   | 0+             | 9.6 s 3          | (3100)    |
| <sup>160</sup> Eu | 0       | β-   | 1(-)           | 38 s 4           | (4580)    |
| <sup>160</sup> Tb | 0       | β-   | 3-             | 72.3 d 2         | 1835.3 13 |
| <sup>160</sup> Ho | 0       | EC   | 5+             | 25.6 m 3         | 3292 11   |
|                   | 59.98 3 | EC   | 2-             | 5.02 h 5         | 3292 11   |
| <sup>160</sup> Er | 0       | EC   | 0+             | 28.58 h 9        | 330 50    |
| <sup>160</sup> Tm | 0       | EC   | 1-             | 9.4 m 3          | 5890 100  |
|                   | 70 20   | EC   | 5              | 74.5 s 15        | 5890 100  |
| <sup>160</sup> Yb | 0       | EC   | 0+             | 4.8 m 2          | (2010)    |
| <sup>160</sup> Lu | 0+X     | α    |                | 40 s 1           | (4180)    |
|                   | 0+X     | EC   |                | 36.1 s 3         | (7880)    |
|                   | 0+Y     | EC   |                | 40 s 1           | (7880)    |
| <sup>160</sup> Hf | 0       | α    | 0+             | 13.0 s 15        | 4903 3    |
| <sup>160</sup> Ta | 0       | α    |                | 1.5 s 2          | 5550 50   |
|                   | 0       | EC   |                | 1.5 s 2          | (10100)   |
| <sup>160</sup> W  | 0       | α    | 0+             | 81 ms 15         | 6072 10   |
| <sup>160</sup> Re | 0       | α    |                | 0.79 ms 16       | 6699 13   |
|                   | 0       | p    |                | 0.79 ms 16       | 1290 50   |
| <sup>161</sup> Eu | 0       | β-   |                | 26 s 3           | (3700)    |
| <sup>161</sup> Gd | 0       | β-   | 5/2-           | 3.66 m 5         | 1955.6 14 |
| <sup>161</sup> Tb | 0       | β-   | 3/2+           | 6.88 d 3         | 593.1 14  |
| <sup>161</sup> Ho | 0       | EC   | 7/2-           | 2.48 h 5         | 859 3     |
| <sup>161</sup> Er | 0       | EC   | 3/2-           | 3.21 h 3         | 2003 9    |
| <sup>161</sup> Tm | 0       | EC   | 7/2+           | 33 m 3           | 3160 90   |
| <sup>161</sup> Yb | 0       | EC   | 3/2-           | 4.2 m 2          | (4150)    |
| <sup>161</sup> Lu | 0       | EC   | (5/2+)         | 77 s 2           | 5300 100  |
| <sup>161</sup> Hf | X       | α    |                | 16.8 s 8         | 4720 50   |
|                   | X       | EC   |                | 16.8 s 8         | (6320)    |
| <sup>161</sup> Ta | X       | α    |                | 2.7 s 2          | 5280 50   |
|                   | X       | EC   |                | 2.7 s 2          | 7490 90   |
| <sup>161</sup> W  | X       | α    |                | 410 ms 40        | 5920 50   |
| <sup>161</sup> Re | X       | α    |                | 10 ms +15-5      | 6440 50   |
| <sup>162</sup> Gd | 0       | β-   | 0+             | 8.4 m 2          | 1390 40   |
| <sup>162</sup> Tb | 0       | β-   | 1-             | 7.60 m 15        | 2510 40   |
| <sup>162</sup> Ho | 0       | EC   | 1+             | 15.0 m 10        | 2140 4    |
|                   | 106     | EC   | 6-             | 67.0 m 7         | 2140 4    |
| <sup>162</sup> Tm | 0       | EC   | 1-             | 21.70 m 19       | 4810 40   |
|                   | 66.9+X  | EC   | 5+             | 24.3 s 17        | 4810 40   |
| <sup>162</sup> Yb | 0       | EC   | 0+             | 18.87 m 19       | (1690)    |
| <sup>162</sup> Lu | 0       | EC   | (1-)           | 1.37 m 2         | (7220)    |
|                   | 0+X     | EC   | (4-)           | 1.5 m            | (7220)    |
|                   | 0+Y     | EC   |                | 1.9 m            | (7220)    |
| <sup>162</sup> Hf | 0       | α    | 0+             | 37.6 s 8         | 4417 6    |
|                   | 0       | EC   | 0+             | 37.6 s 8         | (3450)    |
| <sup>162</sup> Ta | X       | α    |                | 3.52 s 12        | 5010 50   |
|                   | X       | EC   |                | 3.52 s 12        | (9260)    |
| <sup>162</sup> W  | 0       | α    | 0+             | 1.39 s 4         | 5674 3    |
|                   | 0       | EC   | 0+             | 1.39 s 4         |           |
| <sup>162</sup> Re | X       | α    |                | 100 ms 3         | 6270 50   |
|                   | X       | EC   |                | 0.10 s 3         | (11500)   |
| <sup>162</sup> Os | 0       | α    | 0+             | 1.9 ms 7         | 6780 30   |
| <sup>163</sup> Gd | 0       | β-   | (5/2-)         | 68 s 3           | (3100)    |
| <sup>163</sup> Tb | 0       | β-   | 3/2+           | 19.5 m 3         | 1785 4    |
| <sup>163</sup> Ho | 0       | EC   | 7/2-           | 4570 y 25        | 2.576 16  |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|-------------------|-----------|------|----------------|---------------------------|-----------|
| <sup>163</sup> Er | 0         | EC   | 5/2-           | 75.0 m 4                  | 1210 5    |
| <sup>163</sup> Tm | 0         | EC   | 1/2+           | 1.810 h 5                 |           |
| <sup>163</sup> Yb | 0         | EC   | 3/2-           | 11.05 m 25                | 3370 100  |
| <sup>163</sup> Lu | 0         | EC   | (1/2-)         | 238 s 8                   | 4600 200  |
| <sup>163</sup> Hf | 0         | EC   |                | 40.0 s 6                  | (5500)    |
| <sup>163</sup> Ta | 0         | α    |                | 10.6 s 10                 | 4750 50   |
|                   | 0         | EC   |                | 10.6 s 10                 | (6800)    |
| <sup>163</sup> W  | 0         | α    |                | 2.75 s 25                 | 5520 50   |
|                   | 0         | EC   |                | 2.75 s 25                 | (7400)    |
| <sup>163</sup> Re | 0         | α    |                | 260 ms 40                 | 6070 50   |
|                   | 0         | EC   |                | 260 ms 40                 | (9030)    |
| <sup>163</sup> Os | X         | α    |                |                           | 6670 50   |
|                   | X         | EC   |                |                           | (9300)    |
| <sup>164</sup> Tb | 0         | β-   | (5+)           | 3.0 m 1                   | 3890 100  |
| <sup>164</sup> Ho | 0         | EC   | 1+             | 29 m 1                    | 986.7 22  |
|                   | 0         | β-   | 1+             | 29 m 1                    | 962.5 23  |
| <sup>164</sup> Tm | 0         | EC   | 1+             | 2.0 m 1                   | 3962 20   |
|                   | 0+X       | EC   | 6-             | 5.1 m 1                   | 3962 20   |
| <sup>164</sup> Yb | 0         | EC   | 0+             | 75.8 m 17                 | (1000)    |
| <sup>164</sup> Lu | 0         | EC   |                | 3.14 m 3                  | 6250 90   |
| <sup>164</sup> Hf | 0         | EC   | 0+             | 111 s 8                   | (2970)    |
| <sup>164</sup> Ta | 0         | EC   | (3+)           | 14.2 s 3                  | (8500)    |
| <sup>164</sup> W  | 0         | α    | 0+             | 6.0 s 3                   | 5278.8 21 |
|                   | 0         | EC   | 0+             | 6.0 s 3                   | (5000)    |
| <sup>164</sup> Re | 0         | α    |                | 0.88 s 24                 | 5920 50   |
|                   | 0         | EC   |                | 0.88 s 24                 | (10700)   |
| <sup>164</sup> Os | 0         | α    | 0+             | 41 ms 20                  | 6478 21   |
|                   | 0         | EC   | 0+             | 41 ms 20                  | 6990 210  |
| <sup>165</sup> Tb | 0         | β-   | (3/2+)         | 2.11 m 10                 | (3000)    |
| <sup>165</sup> Dy | 0         | β-   | 7/2+           | 2.334 h 1                 | 1286.2 19 |
|                   | 108.160 3 | β-   | 1/2-           | 1.257 m 6                 | 1286.2 19 |
| <sup>165</sup> Er | 0         | EC   | 5/2-           | 10.36 h 4                 | 376.3 21  |
| <sup>165</sup> Tm | 0         | EC   | 1/2+           | 30.06 h 3                 | 1592.5 15 |
| <sup>165</sup> Yb | 0         | EC   | 5/2-           | 9.9 m 3                   | 2762 20   |
| <sup>165</sup> Lu | 0+X       | EC   | (7/2+)         | 10.74 m 10                | 3920 80   |
| <sup>165</sup> Hf | 0         | EC   | (5/2-)         | 76 s 4                    | (4600)    |
| <sup>165</sup> Ta | 0         | EC   |                | 31.0 s 15                 | (5800)    |
| <sup>165</sup> W  | 0         | α    |                | 5.1 s 5                   | 5030 50   |
|                   | 0         | EC   |                | 5.1 s 5                   | (7010)    |
| <sup>165</sup> Re | 0         | α    |                | 2.4 s 6                   | 5660 50   |
|                   | 0         | EC   |                | 2.4 s 6                   | 8120 110  |
| <sup>165</sup> Os | X         | α    |                | 65 ms +70-30              | 6320 50   |
|                   | X         | EC   |                | 65 ms +70-30              | (8800)    |
| <sup>166</sup> Dy | 0         | β-   | 0+             | 81.6 h 1                  | 486.3 19  |
| <sup>166</sup> Ho | 0         | β-   | 0-             | 26.83 h 2                 | 1854.5 9  |
|                   | 5.985 18  | β-   | (7)-           | 1.20×10 <sup>3</sup> y 18 | 1854.5 9  |
| <sup>166</sup> Tm | 0         | EC   | 2+             | 7.70 h 3                  | 3040 11   |
| <sup>166</sup> Yb | 0         | EC   | 0+             | 56.7 h 1                  | 304 14    |
| <sup>166</sup> Lu | 0         | EC   | (6-)           | 2.65 m 10                 | 5480 160  |
|                   | 34.37     | EC   | (3-)           | 1.41 m 10                 | 5480 160  |
|                   | 42.9      | EC   | (0-)           | 2.12 m 10                 | 5480 160  |
| <sup>166</sup> Hf | 0         | EC   | 0+             | 6.77 m 30                 | (2300)    |
| <sup>166</sup> Ta | 0         | EC   | (2)+           | 34.4 s 5                  | (7700)    |
| <sup>166</sup> W  | 0         | α    | 0+             | 18.8 s 4                  | 4857 4    |
|                   | 0         | EC   | 0+             | 18.8 s 4                  | (4200)    |
| <sup>166</sup> Re | 0         | α    |                | 2.8 s 3                   | 5640 50   |
| <sup>166</sup> Os | 0         | α    | 0+             | 181 ms 38                 | 6131 6    |
|                   | 0         | EC   | 0+             | 181 ms 38                 | 6260 100  |
| <sup>166</sup> Ir | 0         | α    |                | >5 ms                     | 6700 50   |
| <sup>167</sup> Dy | 0         | β-   | (1/2-)         | 6.20 m 8                  | 2350 60   |
| <sup>167</sup> Ho | 0         | β-   | 7/2-           | 3.1 h 1                   | 1007 5    |
| <sup>167</sup> Tm | 0         | EC   | 1/2+           | 9.25 d 2                  | 748.3 15  |
| <sup>167</sup> Yb | 0         | EC   | 5/2-           | 17.5 m 2                  | 1954 4    |
| <sup>167</sup> Lu | 0         | EC   | 7/2+           | 51.5 m 10                 | 3130 100  |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|-----------|------|----------------|------------------|-----------|
| <sup>167</sup> Hf | 0         | EC   | (5/2-)         | 2.05 m 5         | (4000)    |
| <sup>167</sup> Ta | 0         | EC   |                | 1.4 m 3          | (5000)    |
| <sup>167</sup> W  | 0+Y       | α    |                | 19.9 s 5         | 4670 50   |
|                   | 0+Y       | EC   |                | 19.9 s 5         | (4500)    |
| <sup>167</sup> Re | 0         | α    |                | 6.1 s 2          | (5240)    |
|                   | 0         | EC   |                | 6.1 s 2          | (7400)    |
| <sup>167</sup> Os | 0         | α    |                | 0.83 s 12        | 5980 50   |
|                   | 0         | EC   |                | 0.83 s 12        | (8200)    |
| <sup>167</sup> Ir | 0         | α    |                | >5 ms            | 6540 50   |
| <sup>168</sup> Dy | 0         | β-   | 0+             | 8.7 m 3          | (1600)    |
| <sup>168</sup> Ho | 0         | β-   | 3+             | 2.99 m 7         | 2910 30   |
| <sup>168</sup> Tm | 0         | EC   | 3(+)           | 93.1 d 2         | 1679.0 19 |
|                   | 0         | β-   | 3(+)           | 93.1 d 2         | 257 4     |
| <sup>168</sup> Lu | 0         | EC   | (6-)           | 5.5 m 1          | 4480 80   |
|                   | 2.2E+2 13 | EC   | 3+             | 6.7 m 4          | 4480 80   |
| <sup>168</sup> Hf | 0         | EC   | 0+             | 25.95 m 20       | (1800)    |
| <sup>168</sup> Ta | 0         | EC   | (3+)           | 2.0 m 1          | (6700)    |
| <sup>168</sup> W  | 0         | EC   | 0+             | 51 s 2           | (3800)    |
| <sup>168</sup> Re | 0         | α    | (6+)           | 4.4 s 1          | 5063 13   |
|                   | 0         | EC   | (6+)           | 4.4 s 1          | (9100)    |
| <sup>168</sup> Os | 0         | α    | 0+             | 2.2 s 1          | 5819 3    |
|                   | 0         | EC   | 0+             | 2.2 s 1          | (57)      |
| <sup>168</sup> Ir | 0         | α    |                |                  | 6410 50   |
| <sup>168</sup> Pt | 0         | α    | 0+             |                  | 6991 20   |
| <sup>169</sup> Dy | 0         | β-   | (5/2-)         | 39 s 8           | 3200 30   |
| <sup>169</sup> Ho | 0         | β-   | 7/2-           | 4.7 m 1          | 2124 20   |
| <sup>169</sup> Er | 0         | β-   | 1/2-           | 9.40 d 2         | 351.2 11  |
| <sup>169</sup> Yb | 0         | EC   | 7/2+           | 32.026 d 5       | 909 4     |
| <sup>169</sup> Lu | 0         | EC   | 7/2+           | 34.06 h 5        | 2293 3    |
| <sup>169</sup> Hf | 0         | EC   | (5/2-)         | 3.24 m 4         | 3270 80   |
| <sup>169</sup> Ta | 0         | EC   | (5/2-)         | 4.9 m 4          | (4440)    |
| <sup>169</sup> Re | 0+X       | α    |                | 12.9 s 11        | (50)      |
| <sup>169</sup> Os | 0         | α    |                | 3.4 s 2          | 5720 50   |
|                   | 0         | EC   |                | 3.4 s 2          | (7680)    |
| <sup>169</sup> Ir | 0         | α    |                | 0.4 s 1          | 6280 50   |
|                   | 0         | EC   |                | 2.5 ms +25-1     | 8680 130  |
| <sup>169</sup> Pt | 0         | α    |                | 2.5 ms +25-10    | 6840 50   |
| <sup>170</sup> Ho | 0         | β-   | (6+)           | 2.76 m 5         | 3870 50   |
|                   | 120 70    | β-   | 1(+)           | 43 s 2           | 3870 50   |
| <sup>170</sup> Tm | 0         | EC   | 1-             | 128.6 d 3        | 314.4 18  |
|                   | 0         | β-   | 1-             | 128.6 d 3        | 968.0 8   |
| <sup>170</sup> Lu | 0         | EC   | 0+             | 2.00 d 3         | 3459 19   |
| <sup>170</sup> Hf | 0         | EC   | 0+             | 16.01 h 13       | (1100)    |
| <sup>170</sup> Ta | 0         | EC   | (3+)           | 6.76 m 6         | (6000)    |
| <sup>170</sup> Re | 0         | EC   | (5)            | 8.0 s 5          | (8300)    |
| <sup>170</sup> Os | 0         | α    | 0+             | 7.1 s 2          | 5540 4    |
|                   | 0         | EC   | 0+             | 7.1 s 2          | (5000)    |
| <sup>170</sup> Ir | 0         | α    |                | 1.05 s 15        | 6170 50   |
|                   | 0         | EC   |                | 1.05 s 15        | (10680)   |
| <sup>170</sup> Pt | 0         | α    | 0+             | 6 ms +5-2        | 6704 6    |
| <sup>171</sup> Ho | 0         | β-   | (7/2-)         | 53 s 2           | 3200 60   |
| <sup>171</sup> Er | 0         | β-   | 5/2-           | 7.516 h 2        | 1490.5 13 |
| <sup>171</sup> Tm | 0         | β-   | 1/2+           | 1.92 y 1         | 96.4 10   |
| <sup>171</sup> Lu | 0         | EC   | 7/2+           | 8.24 d 3         | 1478.8 19 |
| <sup>171</sup> Hf | 0         | EC   | (7/2+)         | 12.1 h 4         | (2400)    |
| <sup>171</sup> Ta | 0         | EC   | (5/2-)         | 23.3 m 3         | (3700)    |
| <sup>171</sup> W  | 0         | EC   | (5/2-)         | 2.38 m 4         | (4600)    |
| <sup>171</sup> Re | 0         | EC   | (9/2-)         | 15.2 s 4         | 5670 200  |
| <sup>171</sup> Os | 0         | α    | (5/2-)         | 8.0 s 7          | 5370 50   |
|                   | 0         | EC   | (5/2-)         | 8.0 s 7          | (7100)    |
| <sup>171</sup> Ir | 0         | α    |                | 1.5 s 1          | 6159 4    |
| <sup>171</sup> Pt | 0         | α    |                | 25 ms 9          | 6610 50   |
|                   | 0         | EC   |                | 25 ms 9          | (8600)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)   | Mode | J <sup>π</sup>  | t <sub>1/2</sub>          | Q(keV)    |
|-------------------|----------|------|-----------------|---------------------------|-----------|
| <sup>172</sup> Ho | 0        | β-   |                 | 25 s 3                    |           |
| <sup>172</sup> Er | 0        | β-   | 0+              | 49.3 h 3                  | 891 5     |
| <sup>172</sup> Tm | 0        | β-   | 2-              | 63.6 h 2                  | 1880 6    |
| <sup>172</sup> Lu | 0        | EC   | 4-              | 6.70 d 3                  | 2519.3 24 |
| <sup>172</sup> Hf | 0        | EC   | 0+              | 1.87 y 3                  | 350 50    |
| <sup>172</sup> Ta | 0        | EC   | (3+)            | 36.8 m 3                  | 4920 180  |
| <sup>172</sup> W  | 0        | EC   | 0+              | 6.6 m 9                   | (2500)    |
| <sup>172</sup> Re | 0        | EC   | (5)             | 15 s 3                    | (7300)    |
|                   | 0+X      | EC   | (2)             | 55 s 5                    | (7300)    |
| <sup>172</sup> Os | 0        | α    | 0+              | 19 s 2                    | 5227 10   |
|                   | 0        | EC   | 0+              | 19 s 2                    | (4500)    |
| <sup>172</sup> Ir | 0        | α    | (3+)            | 4.4 s 3                   | 5991 10   |
|                   | 0        | EC   | (3+)            | 4.4 s 3                   | (9800)    |
|                   | 139 10   | EC   | (7+)            | 2.0 s 1                   | (9800)    |
|                   | 140 11   | α    | (7+)            | 2.0 s 1                   | 5991 10   |
| <sup>172</sup> Pt | 0        | α    | 0+              | 0.104 s 7                 | 6465 4    |
|                   | 0        | EC   | 0+              | 0.10 s 1                  | (6200)    |
| <sup>173</sup> Er | 0        | β-   | (7/2-)          | 1.4 m 1                   | (2600)    |
| <sup>173</sup> Tm | 0        | β-   | (1/2+)          | 8.24 h 8                  | 1298 5    |
| <sup>173</sup> Lu | 0        | EC   | 7/2+            | 1.37 y 1                  | 670.8 17  |
| <sup>173</sup> Hf | 0        | EC   | 1/2-            | 23.6 h 1                  | (1610)    |
| <sup>173</sup> Ta | 0        | EC   | 5/2-            | 3.14 h 13                 | (2790)    |
| <sup>173</sup> W  | 0        | EC   | 5/2-            | 7.5 m 3                   | 4000 30   |
| <sup>173</sup> Re | 0        | EC   | (5/2-)          | 1.98 m 26                 | (4800)    |
| <sup>173</sup> Os | 0        | α    |                 | 16 s 5                    | 5060 50   |
|                   | 0        | EC   | (5/2-)          | 16 s 5                    | (6300)    |
| <sup>173</sup> Ir | 0        | α    |                 | 3.0 s 10                  | (5840)    |
|                   | 0+X      | EC   | (11/2-)         | 2.20 s 5                  | (7400)    |
|                   | 0+Y      | EC   | (3/2+,5/2+)     | 9.8 s 14                  | (7400)    |
| <sup>173</sup> Pt | 0        | α    |                 | 342 ms 18                 | 6350 50   |
|                   | 0        | EC   |                 | 342 ms 18                 | (8190)    |
| <sup>173</sup> Au | 0        | α    |                 | 59 ms +45-18              | 6900 50   |
| <sup>174</sup> Er | 0        | β-   | 0+              | 3.3 m 2                   | (1800)    |
| <sup>174</sup> Tm | 0        | β-   | (4-)            | 5.4 m 1                   | 3080 40   |
| <sup>174</sup> Lu | 0        | EC   | (1-)            | 3.31 y 5                  | 1374.3 16 |
|                   | 170.83 5 | EC   | (6-)            | 142 d 2                   | 1374.3 16 |
| <sup>174</sup> Hf | 0        | α    | 0+              | 2.0×10 <sup>15</sup> y 4  | 2496 3    |
| <sup>174</sup> Ta | 0        | EC   | 3(+)            | 1.05 h 3                  | 3850 80   |
| <sup>174</sup> W  | 0        | EC   | 0+              | 31 m 1                    | (1900)    |
| <sup>174</sup> Re | 0        | EC   |                 | 2.40 m 4                  | (6500)    |
| <sup>174</sup> Os | 0        | α    | 0+              | 44 s 4                    | 4872 10   |
|                   | 0        | EC   | 0+              | 44 s 4                    | (3700)    |
| <sup>174</sup> Ir | 0        | α    |                 | 4 s 1                     | 5624 10   |
|                   | 0        | EC   |                 | 4 s 1                     | (90)      |
| <sup>174</sup> Pt | 0        | α    | 0+              | 0.90 s 1                  | 6184 5    |
|                   | 0        | EC   | 0+              | 0.90 s 1                  | (5600)    |
| <sup>174</sup> Au | 0        | α    |                 | 120 ms 20                 | 6782 10   |
| <sup>175</sup> Tm | 0        | β-   | (1/2+ AND 3/2+) | 5.2 m 5                   | 2390 50   |
| <sup>175</sup> Yb | 0        | β-   | 7/2-            | 4.185 d 1                 | 470.0 13  |
| <sup>175</sup> Hf | 0        | EC   | 5/2-            | 70 d 2                    | 685.8 22  |
| <sup>175</sup> Ta | 0        | EC   | 7/2+            | 10.5 h 2                  | (2000)    |
| <sup>175</sup> W  | 0        | EC   | (1/2-)          | 35.2 m 6                  | (2910)    |
| <sup>175</sup> Re | 0        | EC   | (5/2-)          | 5.89 m 5                  | (4300)    |
| <sup>175</sup> Os | 0        | EC   | (5/2-)          | 1.4 m 1                   | (5300)    |
| <sup>175</sup> Ir | 0        | α    | (5/2-)          | 9 s 2                     | 5620 70   |
|                   | 0        | EC   | (5/2-)          | 9 s 2                     | (6600)    |
| <sup>175</sup> Pt | 0        | α    |                 | 2.52 s 8                  | 6179 4    |
|                   | 0        | EC   |                 | 2.52 s 8                  | (7600)    |
| <sup>175</sup> Au | 0        | α    |                 | 200 ms 22                 | 6778 7    |
| <sup>175</sup> Hg | 0        | α    |                 | 20 ms +40-13              | 7040 50   |
| <sup>176</sup> Tm | 0        | β-   | (4+)            | 1.9 m 1                   | (3880)    |
| <sup>176</sup> Lu | 0        | β-   | 7-              | 3.78×10 <sup>10</sup> y 2 | 1191.7 13 |
|                   | 123.0 14 | EC   | 1-              | 3.635 h 3                 | 106.2 17  |
|                   | 123.0 14 | β-   | 1-              | 3.635 h 3                 | 1191.7 13 |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)      | Mode            | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|-------------|-----------------|----------------|------------------|-----------|
| <sup>176</sup> Ta | 0           | EC              | (1)-           | 8.09 h 5         | 3110 100  |
| <sup>176</sup> W  | 0           | EC              | 0+             | 2.5 h 1          | (790)     |
| <sup>176</sup> Re | 0           | EC              | 3(+)           | 5.3 m 3          | (5600)    |
| <sup>176</sup> Os | 0           | EC              | 0+             | 3.6 m 5          | (3200)    |
| <sup>176</sup> Ir | 0           | α               |                | 8 s 1            | 5240 50   |
|                   | 0           | EC              |                | 8 s 1            | (8000)    |
| <sup>176</sup> Pt | 0           | α               | 0+             | 6.33 s 15        | 5886.0 22 |
|                   | 0           | EC              | 0+             | 6.33 s 15        | (5100)    |
| <sup>176</sup> Au | 0           | α               |                | 1.08 s 17        | 6542 10   |
|                   | 0           | EC              |                | 1.08 s 17        | (10500)   |
| <sup>176</sup> Hg | 0           | α               | 0+             | 34 ms +18-9      | 6925 10   |
| <sup>177</sup> Tm | 0           | β-              | (1/2+)         | 85 s +10-15      | (3200)    |
| <sup>177</sup> Yb | 0           | β-              | (9/2+)         | 1.911 h 3        | 1399.2 20 |
| <sup>177</sup> Lu | 0           | β-              | 7/2+           | 6.734 d 12       | 498.2 9   |
|                   | 970.1749 25 | β-              | 23/2-          | 160.4 d 3        | 498.2 9   |
| <sup>177</sup> Ta | 0           | EC              | 7/2+           | 56.56 h 6        | 1166 3    |
| <sup>177</sup> W  | 0           | EC              | (1/2-)         | 135 m 3          | (2000)    |
| <sup>177</sup> Re | 0           | EC              | (5/2-)         | 14 m 1           | (3400)    |
| <sup>177</sup> Os | 0           | EC              | (1/2-)         | 2.8 m 3          | (4500)    |
| <sup>177</sup> Ir | 0           | α               | (5/2-)         | 30 s 2           | 5130 50   |
|                   | 0           | EC              | (5/2-)         | 30 s 2           | (5700)    |
| <sup>177</sup> Pt | 0           | α               | (5/2-)         | 11 s 1           | 5644 3    |
|                   | 0           | EC              | (5/2-)         | 11 s 1           | (6800)    |
| <sup>177</sup> Au | 0           | α               |                | 1.18 s 7         | 6427 10   |
| <sup>177</sup> Hg | 0           | α               |                | 0.130 s 5        | 6740 50   |
| <sup>178</sup> Yb | 0           | β-              | 0+             | 74 m 3           | 645 10    |
| <sup>178</sup> Lu | 0           | β-              | 1(+)           | 28.4 m 2         | 2099.1 21 |
|                   | 120 3       | β-              | (9-)           | 23.1 m 3         | 2099.1 21 |
| <sup>178</sup> Ta | Y+0         | EC              | 1+             | 9.31 m 3         | 1910 100  |
|                   | X+0         | EC              | (7)-           | 2.36 h 8         | 1910 100  |
| <sup>178</sup> W  | 0           | EC              | 0+             | 21.6 d 3         | 91.3 20   |
| <sup>178</sup> Re | 0           | EC              | (3+)           | 13.2 m 2         | 4660 180  |
| <sup>178</sup> Os | 0           | EC              | 0+             | 5.0 m 4          | 2300 30   |
| <sup>178</sup> Ir | 0           | EC              |                | 12 s 2           | (7200)    |
| <sup>178</sup> Pt | 0           | α               | 0+             | 21.1 s 6         | 5574 3    |
|                   | 0           | EC              | 0+             | 21.1 s 6         | (4300)    |
| <sup>178</sup> Au | 0           | α               |                | 2.6 s 5          | 6120 50   |
|                   | 0           | EC              |                | 2.6 s 5          | (96)      |
| <sup>178</sup> Hg | 0           | α               | 0+             | 0.254 s 19       | 6578 6    |
|                   | 0           | EC              | 0+             | 0.254 s 19       | (6100)    |
| <sup>179</sup> Yb | 0           | β-              | (1/2-)         | 8.0 m 4          | (2400)    |
| <sup>179</sup> Lu | 0           | β-              | 7/2(+)         | 4.59 h 6         | 1405 5    |
| <sup>179</sup> Ta | 0           | EC              | 7/2+           | 1.82 y 3         | 110 5     |
| <sup>179</sup> W  | 0           | EC              | (7/2)-         | 37.05 m 16       | 1060 16   |
|                   | 221.926 8   | EC              | (1/2)-         | 6.40 m 7         | 1060 16   |
| <sup>179</sup> Re | 0           | EC              | (5/2)+         | 19.5 m 1         | 2710 50   |
| <sup>179</sup> Os | 0           | EC              | (1/2-)         | 6.5 m 3          | (3680)    |
| <sup>179</sup> Ir | 0           | EC              | (5/2)-         | 79 s 1           | (4900)    |
| <sup>179</sup> Pt | 0           | α               | 1/2-           | 21.2 s 4         | 5280 50   |
|                   | 0           | EC              | 1/2-           | 21.2 s 4         | (5700)    |
| <sup>179</sup> Au | 0           | α               |                | 7.1 s 3          | 6082 21   |
|                   | 0           | EC              |                | 7.5 s 4          | (74)      |
| <sup>179</sup> Hg | 0           | α               |                | 1.09 s 4         | 6431 5    |
|                   | 0           | EC <sub>p</sub> |                | 1.09 s 4         | 6431 5    |
|                   | 0           | EC              |                | 1.09 s 4         | (80)      |
| <sup>179</sup> Tl | 0           | α               |                | 0.16 s +9-4      | (6860)    |
|                   | 0+X         | α               |                | 1.4 ms 5         | (6860)    |
| <sup>180</sup> Yb | 0           | β-              | 0+             | 2.4 m 5          |           |
| <sup>180</sup> Lu | 0           | β-              | (3)+           | 5.7 m 1          | 3100 70   |
| <sup>180</sup> Hf | 1141.48 4   | β-              | 8-             | 5.5 h 1          | -854 3    |
| <sup>180</sup> Ta | 0           | EC              | 1+             | 8.152 h 6        | 854 3     |
|                   | 0           | β-              | 1+             | 8.152 h 6        | 708 4     |
| <sup>180</sup> Re | 0           | EC              | (1)-           | 2.44 m 6         | 3800 30   |
| <sup>180</sup> Os | 0           | EC              | 0+             | 21.5 m 4         | (1470)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>      | Q(keV)    |
|-------------------|------------|------|----------------|-----------------------|-----------|
| <sup>180</sup> Ir | 0          | EC   |                | 1.5 m 1               | (6400)    |
| <sup>180</sup> Pt | 0          | α    | 0+             | 52 s 3                | 5257 10   |
|                   | 0          | EC   | 0+             | 52 s 3                | (3700)    |
| <sup>180</sup> Au | 0          | α    |                | 8.1 s 3               | 5850 40   |
|                   | 0          | EC   |                | 8.1 s 3               | (8600)    |
| <sup>180</sup> Hg | 0          | α    | 0+             | 2.8 s 2               | 6258 5    |
|                   | 0          | EC   | 0+             | 2.8 s 2               | (5500)    |
| <sup>180</sup> Tl | 0          | EC   |                | 0.70 s +12-9          | (11100)   |
| <sup>181</sup> Lu | 0          | β-   | (7/2+)         | 3.5 m 3               | (2500)    |
| <sup>181</sup> Hf | 0          | β-   | 1/2-           | 42.39 d 6             | 1027 3    |
| <sup>181</sup> W  | 0          | EC   | 9/2+           | 121.2 d 2             | 188 5     |
| <sup>181</sup> Re | 0          | EC   | 5/2+           | 19.9 h 7              | 1739 15   |
| <sup>181</sup> Os | 0          | EC   | 1/2-           | 105 m 3               | (2930)    |
|                   | 49.0 7     | EC   | (7/2)-         | 2.7 m 1               | (2930)    |
| <sup>181</sup> Ir | 0          | EC   | (5/2)-         | 4.90 m 15             | 4070 80   |
| <sup>181</sup> Pt | 0          | α    | 1/2-           | 51 s 5                | 5130 50   |
|                   | 0          | EC   | 1/2-           | 51 s 5                | (5200)    |
| <sup>181</sup> Au | 0          | α    | 5/2-           | 11.4 s 5              | 5752 3    |
|                   | 0          | EC   | 5/2-           | 11.4 s 5              | (6300)    |
| <sup>181</sup> Hg | 0          | α    | 1/2(-)         | 3.6 s 3               | 6287 4    |
|                   | 0          | ECp  | 1/2(-)         | 3.6 s 3               | 6287 4    |
|                   | 0          | EC   | 1/2(-)         | 3.6 s 3               | (7300)    |
| <sup>181</sup> Pb | 0+X        | α    | (13/2+)        | 50 ms +40-30          | 7370 50   |
| <sup>182</sup> Lu | 0          | β-   | (0,1,2)        | 2.0 m 2               |           |
| <sup>182</sup> Hf | 0          | β-   | 0+             | 9×10 <sup>6</sup> y 2 | 373 7     |
|                   | 1172.88 18 | β-   | 8-             | 61.5 m 15             | 373 7     |
| <sup>182</sup> Ta | 0          | β-   | 3-             | 114.43 d 3            | 1813.6 18 |
| <sup>182</sup> Re | 0+X        | EC   | 2+             | 12.7 h 2              | 2800 100  |
|                   | 0          | EC   | 7+             | 64.0 h 5              | 2800 100  |
| <sup>182</sup> Os | 0          | EC   | 0+             | 22.10 h 25            | 910 100   |
| <sup>182</sup> Ir | 0          | EC   | (5+)           | 15 m 1                | 5610 140  |
| <sup>182</sup> Pt | 0          | α    | 0+             | 2.6 m 1               | 4943 17   |
|                   | 0          | EC   | 0+             | 2.6 m 1               | 2850 140  |
| <sup>182</sup> Au | 0          | α    |                | 21 s 1                | 5525 5    |
|                   | 0          | EC   |                | 21 s 1                | (7800)    |
| <sup>182</sup> Hg | 0          | α    | 0+             | 10.83 s 5             | 5998 5    |
|                   | 0          | EC   | 0+             | 10.83 s 5             |           |
| <sup>182</sup> Tl | 0          | α    | (7+)           | 3.1 s 10              | 6550 10   |
|                   | 0          | EC   | (7+)           | 3.1 s 10              | (10100)   |
| <sup>182</sup> Pb | 0          | α    | 0+             | 55 ms +40-35          | 7076 9    |
| <sup>183</sup> Lu | 0          | β-   | (7/2+)         | 58 s 4                |           |
| <sup>183</sup> Hf | 0          | β-   | (3/2-)         | 1.067 h 17            | 2010 30   |
| <sup>183</sup> Ta | 0          | β-   | 7/2+           | 5.1 d 1               | 1070.1 18 |
| <sup>183</sup> Re | 0          | EC   | 5/2+           | 70.0 d 11             | 556 8     |
| <sup>183</sup> Os | 0          | EC   | 9/2+           | 13.0 h 5              | (2130)    |
|                   | 170.71 5   | EC   | 1/2-           | 9.9 h 3               | (2130)    |
| <sup>183</sup> Ir | 0          | EC   | 5/2-           | 58 m 6                | 3450 100  |
| <sup>183</sup> Pt | 0          | α    | 1/2-           | 6.5 m 10              | 4840 50   |
|                   | 0          | EC   | 1/2-           | 6.5 m 10              | (4600)    |
|                   | 34.50 8    | α    | (7/2)-         | 43 s 5                | 4840 50   |
|                   | 34.50 8    | EC   | (7/2)-         | 43 s 5                | (4600)    |
| <sup>183</sup> Au | 0          | α    | (5/2)-         | 42.0 s 12             | 5470 50   |
|                   | 0          | EC   | (5/2)-         | 42.0 s 12             | (5500)    |
| <sup>183</sup> Hg | 0          | α    | 1/2-           | 9.4 s 7               | 6039 4    |
|                   | 0          | ECp  | 1/2-           | 8.8 s 5               | 6039 4    |
|                   | 0          | EC   | 1/2-           | 9.4 s 7               | (6300)    |
| <sup>183</sup> Tl | 550        | α    | (9/2-)         | 60 ms 15              | (6300)    |
| <sup>183</sup> Pb | 0+X        | α    | (1/2-)         | 300 ms 80             | 7030 50   |
|                   | 0+X        | EC   | (1/2-)         | 300 ms 80             | 7030 50   |
| <sup>184</sup> Lu | 0+X        | β-   |                | 20 s                  |           |
|                   | 0+Y        | β-   |                |                       |           |
| <sup>184</sup> Hf | 0          | β-   | 0+             | 4.12 h 5              | 1340 30   |
| <sup>184</sup> Ta | 0          | β-   | (5-)           | 8.7 h 1               | 2870 30   |
| <sup>184</sup> Re | 0          | EC   | 3(-)           | 38.0 d 5              | 1483 4    |
|                   | 188.01 4   | EC   | 8(+)           | 169 d 8               | 1483 4    |



Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)  | Mode | J <sup>π</sup> | t <sub>1/2</sub>           | Q(keV)    |
|-------------------|---------|------|----------------|----------------------------|-----------|
| <sup>184</sup> Ir | 0       | EC   | 5-             | 3.09 h 3                   | 4600 30   |
| <sup>184</sup> Pt | 0       | α    | 0+             | 17.3 m 2                   | 4590 14   |
|                   | 0       | EC   | 0+             | 17.3 m 2                   | (2300)    |
| <sup>184</sup> Au | 0       | α    | 3+             | 53.0 s 14                  | 5300 50   |
|                   | 0       | EC   | 3+             | 53.0 s 14                  | (7100)    |
| <sup>184</sup> Hg | 0       | α    | 0+             | 30.6 s 3                   | 5662 5    |
|                   | 0       | EC   | 0+             | 30.6 s 3                   | (4100)    |
| <sup>184</sup> Tl | 0+X     | α    |                | 11 s 1                     | 6300 50   |
|                   | 0+X     | EC   |                | 11 s 1                     | (9200)    |
| <sup>184</sup> Pb | 0       | α    | 0+             | 0.55 s 6                   | 6775 6    |
| <sup>185</sup> Hf | 0       | β-   |                | 3.5 m 6                    |           |
| <sup>185</sup> Ta | 0       | β-   | (7/2+)         | 49.4 m 15                  | 1992 14   |
| <sup>185</sup> W  | 0       | β-   | 3/2-           | 75.1 d 3                   | 433.0 9   |
| <sup>185</sup> Os | 0       | EC   | 1/2-           | 93.6 d 5                   | 1012.8 5  |
| <sup>185</sup> Ir | 0       | EC   | 5/2-           | 14.4 h 1                   | (2370)    |
| <sup>185</sup> Pt | 0       | α    | 9/2+           | 70.9 m 24                  | 4540 50   |
|                   | 0       | EC   | 9/2+           | 70.9 m 24                  | (3800)    |
|                   | 103.4 2 | EC   | 1/2-           | 33.0 m 8                   | (3800)    |
| <sup>185</sup> Au | 0       | α    | 5/2-           | 4.25 m 6                   | 5180 50   |
|                   | 0       | EC   | 5/2-           | 4.25 m 6                   | 4710 40   |
|                   | 0+X     | EC   |                | 6.8 m 3                    | 4710 40   |
| <sup>185</sup> Hg | 0       | α    | 1/2-           | 49.1 s 10                  | 5778 11   |
|                   | 0       | EC   | 1/2-           | 49 s 1                     | (5800)    |
|                   | 99.3 5  | α    | 13/2+          | 21.6 s 15                  | 5778 11   |
|                   | 99.3 5  | EC   | 13/2+          | 21.6 s 15                  | (5800)    |
| <sup>185</sup> Tl | 0       | EC   | (1/2+)         | 19.5 s 5                   | (6600)    |
|                   | 454 5   | α    | (9/2-)         | 1.83 s 12                  | (6100)    |
| <sup>185</sup> Pb | 0       | α    |                | 4.1 s 3                    | 6680 50   |
| <sup>186</sup> Ta | 0       | β-   | 2,3            | 10.5 m 5                   | 3900 60   |
| <sup>186</sup> Re | 0       | EC   | 1-             | 90.64 h 9                  | 581.6 17  |
|                   | 0       | β-   | 1-             | 90.64 h 9                  | 1069.5 9  |
| <sup>186</sup> Os | 0       | α    | 0+             | 2.0×10 <sup>15</sup> y 11  | 2822.0 17 |
| <sup>186</sup> Ir | 0       | EC   | 5+             | 16.64 h 3                  | 3831 20   |
|                   | 0+X     | EC   | 2-             | 2.0 h 1                    | 3831 20   |
| <sup>186</sup> Pt | 0       | α    | 0+             | 2.0 h 1                    | 4324 20   |
|                   | 0       | EC   | 0+             | 2.0 h 1                    | 1380 40   |
| <sup>186</sup> Au | 0       | EC   | 3-             | 10.7 m 5                   | 6040 140  |
| <sup>186</sup> Hg | 0       | α    | 0+             | 1.38 m 7                   | 5206 15   |
|                   | 0       | EC   | 0+             | 1.38 m 7                   | 3300 140  |
| <sup>186</sup> Tl | 0+X     | α    | (7+)           | 27.5 s 10                  | 5890 50   |
|                   | 0+X     | EC   | (7+)           | 27.5 s 10                  | (8500)    |
| <sup>186</sup> Pb | 0       | α    | 0+             | 4.79 s 5                   | 6471 7    |
| <sup>187</sup> W  | 0       | β-   | 3/2-           | 23.72 h 6                  | 1311.2 13 |
| <sup>187</sup> Re | 0       | β-   | 5/2+           | 4.35×10 <sup>10</sup> y 13 | 2.663 19  |
| <sup>187</sup> Ir | 0       | EC   | 3/2+           | 10.5 h 3                   | 1502 6    |
| <sup>187</sup> Pt | 0       | EC   | 3/2-           | 2.35 h 3                   | (3110)    |
| <sup>187</sup> Au | 0       | α    | 1/2+           | 8.4 m 3                    | 4790 50   |
|                   | 0       | EC   | 1/2+           | 8.4 m 3                    | 3600 40   |
| <sup>187</sup> Hg | 0       | α    | 13/2+          | 2.4 m 3                    | (51)      |
|                   | 0       | EC   | 13/2+          | 2.4 m 3                    | (4900)    |
|                   | 134 20  | α    | 3/2-           | 1.9 m 3                    | (51)      |
|                   | 134 20  | EC   | 3/2-           | 1.9 m 3                    | (4900)    |
| <sup>187</sup> Tl | 0       | α    | (1/2+)         | 51 s                       | 5539 8    |
|                   | 0       | EC   | (1/2+)         | 51 s                       | (5900)    |
|                   | 335 7   | α    | (9/2-)         | 15.60 s 12                 | 5539 8    |
|                   | 335 7   | EC   | (9/2-)         | 15.60 s 12                 | (5900)    |
| <sup>187</sup> Pb | 0+X     | α    | (13/2+)        | 18.3 s 3                   | 6395 7    |
|                   | 0+Y     | α    |                | 15.2 s 3                   | 6395 7    |
|                   | 0+X     | EC   | (13/2+)        | 18.3 s 3                   | (7200)    |
|                   | 0+Y     | EC   |                | 15.2 s 3                   | (7200)    |
| <sup>187</sup> Bi | 0       | α    | (9/2-)         | 35 ms 4                    | (77)      |
|                   | 60      | α    | (1/2+)         | 0.8 ms 6                   | (77)      |
| <sup>188</sup> W  | 0       | β-   | 0+             | 69.4 d 5                   | 349 3     |
| <sup>188</sup> Re | 0       | β-   | 1-             | 16.98 h 2                  | 2120.4 4  |
| <sup>188</sup> Ir | 0       | EC   | 1-             | 41.5 h 5                   | 2809 7    |
| <sup>188</sup> Pt | 0       | α    | 0+             | 10.2 d 3                   | 4007 5    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)     | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)    |
|-------------------|------------|------|----------------|--------------------------|-----------|
|                   | 0          | EC   | 0+             | 10.2 d 3                 | 507 7     |
| <sup>188</sup> Au | 0          | EC   | 1(-)           | 8.84 m 6                 | (5300)    |
| <sup>188</sup> Hg | 0          | α    | 0+             | 3.25 m 15                | 4710 20   |
|                   | 0          | EC   | 0+             | 3.25 m 15                | (2300)    |
| <sup>188</sup> Tl | 0+X        | EC   | (7+)           | 71 s 2                   | (7800)    |
|                   | 0+Y        | EC   | (2-)           | 71 s 2                   | (7800)    |
| <sup>188</sup> Pb | 0          | α    | 0+             | 24.2 s 10                | 6111 4    |
|                   | 0          | EC   | 0+             | 24.2 s 10                | (4800)    |
| <sup>188</sup> Bi | 0+X        | α    |                | 0.21 s 9                 | 7275 25   |
|                   | 0+Y        | α    |                | 44 ms 3                  | 7275 25   |
|                   | 0+X        | EC   |                | 0.21 s 9                 | (10400)   |
|                   | 0+Y        | EC   |                | 44 ms 3                  | (10400)   |
| <sup>189</sup> W  | 0          | β-   | (3/2-)         | 11.5 m 3                 | 2500 200  |
| <sup>189</sup> Re | 0          | β-   | 5/2+           | 24.3 h 4                 | 1009 8    |
| <sup>189</sup> Ir | 0          | EC   | 3/2+           | 13.2 d 1                 | 532 13    |
| <sup>189</sup> Pt | 0          | EC   | 3/2-           | 10.87 h 12               | 1971 14   |
| <sup>189</sup> Au | 0          | EC   | 1/2+           | 28.7 m 3                 | (2850)    |
|                   | 247.23 17  | EC   | 11/2-          | 4.59 m 11                | (2850)    |
| <sup>189</sup> Hg | 0          | EC   | 3/2-           | 7.6 m 1                  | (3950)    |
|                   | 0+X        | EC   | 13/2+          | 8.6 m 1                  | (3950)    |
| <sup>189</sup> Tl | 0          | EC   | (1/2+)         | 2.3 m 2                  | 5180 200  |
|                   | 281 7      | EC   | (9/2-)         | 1.4 m 1                  | 5180 200  |
| <sup>189</sup> Pb | X          | α    |                | 51 s 3                   | 5850 50   |
|                   | X          | EC   |                | 51 s 3                   | (6700)    |
| <sup>189</sup> Bi | 0          | α    | (9/2-)         | 680 ms 30                | 7270 4    |
|                   | 0          | EC   | (9/2-)         | 680 ms 30                | (80)      |
|                   | 0          | EC   | (1/2+)         | 5 ms                     | (80)      |
|                   | 92 7       | α    | (1/2+)         | 5 ms                     | 7270 4    |
| <sup>190</sup> W  | 0          | β-   | 0+             | 30.0 m 15                | 1270 70   |
| <sup>190</sup> Re | 0          | β-   | (2-)           | 3.1 m 3                  | 3150 150  |
|                   | 119.12+X 5 | β-   | (6-)           | 3.2 h 2                  | 3150 150  |
| <sup>190</sup> Ir | 0          | EC   | (4)+           | 11.78 d 10               | 2000 200  |
|                   | 175.0 1    | EC   | (11)-          | 3.25 h 20                | 2000 200  |
| <sup>190</sup> Pt | 0          | α    | 0+             | 6.5×10 <sup>11</sup> y 3 | 3249 6    |
| <sup>190</sup> Au | 0          | EC   | 1-             | 42.8 m 10                | 4442 15   |
| <sup>190</sup> Hg | 0          | EC   | 0+             | 20.0 m 5                 | (1470)    |
| <sup>190</sup> Tl | 0+Y        | EC   | (7+)           | 3.7 m 3                  | 7000 40   |
|                   | 0+X        | EC   | (2-)           | 2.6 m 3                  | 7000 40   |
| <sup>190</sup> Pb | 0          | α    | 0+             | 1.2 m 1                  | 5698 5    |
|                   | 0          | EC   | 0+             | 1.2 m 1                  | (4100)    |
| <sup>190</sup> Bi | 0+X        | α    |                | 6.3 s 1                  | 6862 5    |
|                   | 0+Y        | α    |                | 6.2 s 1                  | 6862 5    |
|                   | 0+X        | EC   |                | 6.3 s 1                  | (9600)    |
|                   | 0+Y        | EC   |                | 6.2 s 1                  | (9600)    |
| <sup>191</sup> Re | 0          | β-   | (3/2+,1/2+)    | 9.8 m 5                  | 2045 10   |
| <sup>191</sup> Os | 0          | β-   | 9/2-           | 15.4 d 1                 | 313.7 11  |
| <sup>191</sup> Pt | 0          | EC   | 3/2-           | 2.9 d 1                  | 1019 4    |
| <sup>191</sup> Au | 0          | EC   | 3/2+           | 3.18 h 8                 | 1830 50   |
| <sup>191</sup> Hg | 0+X        | EC   | 13/2+          | 50.8 m 15                | 3180 70   |
|                   | 0          | EC   | (3/2-)         | 49 m 10                  | 3180 70   |
| <sup>191</sup> Tl | 299 7      | EC   | 9/2(-)         | 5.22 m 16                | (4490)    |
| <sup>191</sup> Pb | 0          | α    |                | 1.33 m 8                 | (5410)    |
|                   | 0+X        | α    | (13/2+)        | 2.18 m 8                 | (5410)    |
|                   | 0          | EC   |                | 1.33 m 8                 | (5900)    |
|                   | 138        | EC   | (13/2+)        | 2.18 m 8                 | (5900)    |
| <sup>191</sup> Bi | 0          | α    | (9/2-)         | 12 s 1                   | 6781 5    |
|                   | 0          | EC   | (9/2-)         | 12 s 1                   | (73)      |
|                   | 242        | α    | (1/2+)         | 150 ms 15                | 6781 5    |
|                   | 242        | EC   | (1/2+)         | 150 ms 15                | (73)      |
| <sup>192</sup> Re | 0          | β-   |                | 16 s 1                   | (4170)    |
| <sup>192</sup> Os | 2015.39    | β-   | (10-)          | 5.9 s 1                  | (-1046)   |
| <sup>192</sup> Ir | 0          | EC   | 4(+)           | 73.831 d 8               | 1046.2 23 |
|                   | 0          | β-   | 4(+)           | 73.831 d 8               | 1459.7 19 |
|                   | 56.74 9    | β-   | 1(-)           | 1.45 m 5                 | 1459.7 19 |
| <sup>192</sup> Au | 0          | EC   | 1-             | 4.94 h 9                 | 3516 16   |
| <sup>192</sup> Hg | 0          | EC   | 0+             | 4.85 h 20                | (700)     |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|-----------|------|----------------|------------------|-----------|
| <sup>192</sup> Tl | 0+X       | EC   | (2-)           | 9.6 m 4          | (6120)    |
|                   | 0+Y       | EC   | (7+)           | 10.8 m 2         | (6120)    |
| <sup>192</sup> Pb | 0         | α    | 0+             | 3.5 m 1          | 5221 5    |
|                   | 0         | EC   | 0+             | 3.5 m 1          | (3400)    |
| <sup>192</sup> Bi | 0+X       | α    | (2+,3+)        | 37 s 3           | 6376 5    |
|                   | 0+X       | EC   | (2+,3+)        | 37 s 3           | (9000)    |
|                   | 105+X     | α    | (10-)          | 39.6 s 3         | 6376 5    |
|                   | 105+X     | EC   | (10-)          | 39.6 s 4         | (9000)    |
| <sup>192</sup> Po | 0         | α    | 0+             | 0.034 s 3        | 7320 7    |
|                   | 0         | EC   | 0+             | 0.034 s 3        | (57)      |
| <sup>193</sup> Os | 0         | β-   | 3/2-           | 30.5 h 4         | 1140.6 24 |
| <sup>193</sup> Pt | 0         | EC   | 1/2-           | 50 y 9           | 56.6 3    |
| <sup>193</sup> Au | 0         | EC   | 3/2+           | 17.65 h 15       | 1069 9    |
|                   | 290.17 4  | EC   | 11/2-          | 3.9 s 3          | 1069 9    |
| <sup>193</sup> Hg | 0         | EC   | 3/2-           | 3.80 h 15        | 2340 17   |
|                   | 140.76 5  | EC   | 13/2+          | 11.8 h 2         | 2340 17   |
| <sup>193</sup> Tl | 0         | EC   | 1/2(+)         | 21.6 m 8         | (3640)    |
|                   | 365.2+X   | EC   | (9/2-)         | 2.11 m 15        | (3640)    |
| <sup>193</sup> Pb | 0         | EC   | (3/2-)         |                  | (5150)    |
|                   | 100       | EC   | (13/2+)        | 5.8 m 2          | (5150)    |
| <sup>193</sup> Bi | 0         | α    | (9/2-)         | 67 s 3           | 6305 5    |
|                   | 0         | EC   | (9/2-)         | 67 s 3           | (6500)    |
|                   | 307 7     | α    | (1/2+)         | 3.2 s 7          | 6305 5    |
|                   | 307 7     | EC   | (1/2+)         | 3.2 s 7          | (6500)    |
| <sup>193</sup> Po | 0+Y       | α    |                | 260 ms 20        | 7100 50   |
|                   | 0+X       | α    |                | 360 ms 50        | 7100 50   |
| <sup>194</sup> Os | 0         | β-   | 0+             | 6.0 y 2          | 96.6 20   |
| <sup>194</sup> Ir | 0         | β-   | 1-             | 19.15 h 3        | 2246.9 16 |
|                   | 190+X     | β-   | (10,11)        | 171 d 11         | 2246.9 16 |
| <sup>194</sup> Au | 0         | EC   | 1-             | 38.02 h 10       | 2492 11   |
| <sup>194</sup> Hg | 0         | EC   | 0+             | 520 y 32         | 40 20     |
| <sup>194</sup> Tl | 0         | EC   | 2-             | 33.0 m 5         | (5280)    |
|                   | 0+S       | EC   | (7+)           | 32.8 m 2         | (5280)    |
| <sup>194</sup> Pb | 0         | α    | 0+             | 12.0 m 5         | 4738 20   |
|                   | 0         | EC   | 0+             | 12.0 m 5         | (2720)    |
| <sup>194</sup> Bi | 0+X       | α    | (6+,7+)        | 92 s 5           | 5918 5    |
|                   | 0+Y       | α    | (10-)          | 125 s 2          | 5918 5    |
|                   | 0         | EC   | (2+,3+)        | 106 s 3          | 8200 40   |
|                   | 0+X       | EC   | (6+,7+)        | 92 s 5           | 8200 40   |
|                   | 0+Y       | EC   | (10-)          | 125 s 2          | 8200 40   |
| <sup>194</sup> Po | 0         | α    | 0+             | 0.44 s 6         | 6987 3    |
| <sup>194</sup> At | 0         | α    |                | 0.18 s 8         | (7500)    |
| <sup>195</sup> Os | 0         | β-   |                | 6.5 m            | 2000 50   |
| <sup>195</sup> Ir | 0         | β-   | 3/2+           | 2.5 h 2          | 1120.1 16 |
|                   | 100 5     | β-   | 11/2-          | 3.8 h 2          | 1120.1 16 |
| <sup>195</sup> Au | 0         | EC   | 3/2+           | 186.09 d 4       | 226.8 10  |
| <sup>195</sup> Hg | 0         | EC   | 1/2-           | 9.9 h 5          | 1510 50   |
|                   | 176.07 4  | EC   | 13/2+          | 41.6 h 8         | 1510 50   |
| <sup>195</sup> Tl | 0         | EC   | 1/2+           | 1.16 h 5         | (2800)    |
| <sup>195</sup> Pb | 0         | EC   | 3/2-           | 15 m             | (4500)    |
|                   | 203.0 7   | EC   | 13/2+          | 15.0 m 12        | (4500)    |
| <sup>195</sup> Bi | 0         | α    | (9/2-)         | 183 s 4          | 5833 5    |
|                   | 0         | EC   | (9/2-)         | 183 s 4          | (5900)    |
|                   | 401 7     | α    | (1/2+)         | 87 s 1           | 5833 5    |
|                   | 401 7     | EC   | (1/2+)         | 87 s 1           | (5900)    |
| <sup>195</sup> Po | 0         | α    | (3/2-)         | 4.64 s 9         | 6750 50   |
|                   | 0         | EC   | (3/2-)         | 4.64 s 9         | (68)      |
|                   | 230       | α    | (13/2+)        | 1.92 s 2         | 6750 50   |
|                   | 230       | EC   | (13/2+)        | 1.92 s 2         | (68)      |
| <sup>195</sup> At | 0         | α    |                |                  | (7400)    |
| <sup>196</sup> Os | 0         | β-   | 0+             | 34.9 m 2         | 1160 60   |
| <sup>196</sup> Ir | 0         | β-   | (0-)           | 52 s 1           | 3210 40   |
|                   | 4.1E+2 11 | β-   | (10,11-)       | 1.40 h 2         | 3210 40   |
| <sup>196</sup> Au | 0         | EC   | 2-             | 6.183 d 10       | 1506 3    |
|                   | 0         | β-   | 2-             | 6.183 d 10       | 686 3     |
| <sup>196</sup> Tl | 0         | EC   | 2-             | 1.84 h 3         | (4380)    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|-----------|------|----------------|------------------|-----------|
|                   | 394.2 7   | EC   | (7+)           | 1.41 h 2         | (4380)    |
| <sup>196</sup> Pb | 0         | EC   | 0+             | 37 m 3           | (2050)    |
| <sup>196</sup> Bi | 0         | α    | (3+)           | 308 s 12         | (55)      |
|                   | 0         | EC   | (3+)           | 308 s 12         | (7400)    |
|                   | 260.3+X   | α    | (10-)          | 240 s 3          | (55)      |
|                   | 260.3+X   | EC   | (10-)          | 240 s 3          | (7400)    |
| <sup>196</sup> Po | 0         | α    | 0+             | 5.8 s 2          | 6657 3    |
|                   | 0         | EC   | 0+             | 5.8 s 2          | (46)      |
| <sup>196</sup> At | 0         | α    |                | 0.3 s 1          | 7200 50   |
|                   | 0         | EC   |                | 0.3 s 1          | (95)      |
| <sup>197</sup> Ir | 0         | β-   | 3/2+           | 5.8 m 5          | 2155 20   |
|                   | 115 5     | β-   | 11/2-          | 8.9 m 3          | 2155 20   |
| <sup>197</sup> Pt | 0         | β-   | 1/2-           | 18.3 h 3         | 718.9 6   |
|                   | 399.59 20 | β-   | 13/2+          | 95.41 m 18       | 718.9 6   |
| <sup>197</sup> Hg | 0         | EC   | 1/2-           | 64.14 h 5        | 600 3     |
|                   | 298.93 8  | EC   | 13/2+          | 23.8 h 1         | 600 3     |
| <sup>197</sup> Tl | 0         | EC   | 1/2+           | 2.84 h 4         | 2180 30   |
| <sup>197</sup> Pb | 0         | EC   | 3/2-           | 8 m 2            | (3580)    |
|                   | 319.3 7   | EC   | 13/2+          | 43 m 1           | (3580)    |
| <sup>197</sup> Bi | 0         | α    | (9/2-)         | 1 m              | (54)      |
|                   | 0         | EC   | (9/2-)         | 1 m              | (52)      |
|                   | 500       | α    | (1/2+)         | 5.2 m 6          | (54)      |
|                   | 500       | EC   | (1/2+)         | 5.2 m 6          | (52)      |
| <sup>197</sup> Po | 0         | α    | (3/2-)         | 56 s 3           | 6410 50   |
|                   | 0         | EC   | (3/2-)         | 56 s 3           | (62)      |
|                   | 204       | α    | (13/2+)        | 26 s 2           | 6410 50   |
|                   | 204       | EC   | (13/2+)        | 26 s 2           | (62)      |
| <sup>197</sup> At | 0         | α    | (9/2-)         | 0.35 s 4         | 7100 50   |
|                   | 0         | EC   | (9/2-)         | 0.35 s 4         | (72)      |
|                   | 52 10     | α    | (1/2+)         | 3.7 s 25         | 7100 50   |
|                   | 52 10     | EC   | (1/2+)         | 3.7 s 25         | (72)      |
| <sup>198</sup> Ir | 0         | β-   |                | 8 s 1            | (4100)    |
| <sup>198</sup> Au | 0         | β-   | 2-             | 2.69517 d 21     | 1372.4 5  |
| <sup>198</sup> Tl | 0         | EC   | 2-             | 5.3 h 5          | 3460 80   |
|                   | 543.5 4   | EC   | 7+             | 1.87 h 3         | 3460 80   |
| <sup>198</sup> Pb | 0         | EC   | 0+             | 2.40 h 10        | (1410)    |
| <sup>198</sup> Bi | X         | EC   | (7+)           | 693 s 18         | (6560)    |
| <sup>198</sup> Po | 0         | α    | 0+             | 1.76 m 3         | 6309.1 20 |
|                   | 0         | EC   | 0+             | 1.76 m 3         | (4030)    |
| <sup>198</sup> At | 0         | α    | (3+)           | 4.2 s 3          | 6893 3    |
|                   | 0         | EC   | (3+)           | 4.2 s 3          | 8800 40   |
|                   | >100      | α    | (10-)          | 1.0 s 2          | 6893 3    |
|                   | 102+X     | EC   | (10-)          | 1.0 s 2          | 8800 40   |
| <sup>198</sup> Rn | 0         | α    | 0+             | 50 ms 9          | 7345 10   |
|                   | 0         | EC   | 0+             | 50 ms 9          | (5600)    |
| <sup>199</sup> Pt | 0         | β-   | 5/2-           | 30.80 m 21       | 1702 3    |
| <sup>199</sup> Au | 0         | β-   | 3/2+           | 3.139 d 7        | 452.6 7   |
| <sup>199</sup> Tl | 0         | EC   | 1/2+           | 7.42 h 8         | 1440 100  |
| <sup>199</sup> Pb | 0         | EC   | 3/2-           | 90 m 10          | 2880 90   |
|                   | 430 5     | EC   | 13/2+          | 12.2 m 3         | 2880 90   |
| <sup>199</sup> Bi | 0         | EC   | 9/2-           | 27 m 1           | 4340 100  |
|                   | 680       | α    | (1/2+)         | 24.70 m 15       | (50)      |
|                   | 680       | EC   | (1/2+)         | 24.70 m 15       | 4340 100  |
| <sup>199</sup> Po | 0         | α    | 3/2-           | 5.48 m 16        | 6074.3 20 |
|                   | 0         | EC   | 3/2-           | 5.48 m 16        | (5600)    |
|                   | 310 2     | α    | 13/2+          | 4.13 m 6         | 6074.3 20 |
|                   | 310 2     | EC   | 13/2+          | 4.13 m 6         | (5600)    |
| <sup>199</sup> At | 0         | α    | (9/2-)         | 7.2 s 5          | 6780 50   |
|                   | 0         | EC   | (9/2-)         | 7.2 s 5          | (66)      |
| <sup>199</sup> Rn | 0         | α    | (3/2-)         | 0.62 s 3         | 7140 50   |
|                   | 0+X       | α    | (13/2+)        | 0.32 s 2         | 7140 50   |
|                   | 0         | EC   | (3/2-)         | 0.62 s 3         | (72)      |
|                   | 0+X       | EC   | (13/2+)        | 0.32 s 2         | (72)      |
| <sup>200</sup> Pt | 0         | β-   | 0+             | 12.5 h 3         | 660 60    |
| <sup>200</sup> Au | 0         | β-   | 1(-)           | 48.4 m 3         | 2240 50   |
|                   | 962 70    | β-   | 12-            | 18.7 h 5         | 2240 50   |
| <sup>200</sup> Tl | 0         | EC   | 2-             | 26.1 h 1         | 2456 6    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)    |
|-------------------|-----------|------|----------------|---------------------------|-----------|
| <sup>200</sup> Pb | 0         | EC   | 0+             | 21.5 h 4                  | 810 14    |
| <sup>200</sup> Bi | 0         | EC   | 7+             | 36.4 m 5                  | 5890 90   |
|                   | 100       | EC   | (2+)           | 31 m 2                    | 5890 90   |
| <sup>200</sup> Po | 0         | α    | 0+             | 11.5 m 1                  | 5981.5 20 |
|                   | 0         | EC   | 0+             | 11.5 m 1                  | (3350)    |
| <sup>200</sup> At | 0         | α    | (3+)           | 43 s 2                    | 6596.5 14 |
|                   | 0         | EC   | (3+)           | 43 s 1                    | (8000)    |
|                   | 104 4     | EC   | (7+)           | 47 s 1                    | (8000)    |
|                   | 109       | α    | (7+)           | 44.0 s                    | 6596.5 14 |
|                   | 340       | α    | (10-)          | 4.3 s 3                   | 6596.5 14 |
| <sup>200</sup> Rn | 0         | α    | 0+             | 1.06 s 2                  | 7043.5 25 |
|                   | 0         | EC   | 0+             | 1.06 s 2                  | (50)      |
| <sup>201</sup> Pt | 0         | β-   | (5/2-)         | 2.5 m 1                   | 2660 50   |
| <sup>201</sup> Au | 0         | β-   | 3/2+           | 26 m 1                    | 1275 15   |
| <sup>201</sup> Tl | 0         | EC   | 1/2+           | 72.912 h 17               | 483 15    |
| <sup>201</sup> Pb | 0         | EC   | 5/2-           | 9.33 h 3                  | 1900 30   |
| <sup>201</sup> Bi | 0         | EC   | 9/2-           | 108 m 3                   | 3840 40   |
|                   | 846.4 5   | α    | 1/2+           | 59.1 m 6                  | 4500 6    |
|                   | 846.4 5   | EC   | 1/2+           | 59.1 m 6                  | 3840 40   |
| <sup>201</sup> Po | 0         | α    | 3/2-           | 15.3 m 2                  | 5799.0 17 |
|                   | 0         | EC   | 3/2-           | 15.3 m 2                  | (4880)    |
|                   | 424 3     | EC   | 13/2+          | 8.9 m 2                   | (4880)    |
|                   | 424.4 30  | α    | 13/2+          | 8.9 m 2                   | 5799.0 17 |
| <sup>201</sup> At | 0         | α    | (9/2-)         | 89 s 3                    | 6473.4 16 |
|                   | 0         | EC   | (9/2-)         | 89 s 3                    | (5850)    |
| <sup>201</sup> Rn | 0         | α    | (3/2-)         | 7.0 s 4                   | 6860 50   |
|                   | 0         | EC   | (3/2-)         | 7.0 s 4                   | (6560)    |
|                   | 280       | α    | (13/2+)        | 3.8 s 4                   | 6860 50   |
|                   | 280       | EC   | (13/2+)        | 3.8 s 4                   | (6560)    |
| <sup>201</sup> Fr | 0         | α    | (9/2-)         | 48 ms 15                  | 7540 50   |
| <sup>202</sup> Pt | 0         | β-   | 0+             | 44 h 15                   | (16)      |
| <sup>202</sup> Au | 0         | β-   | (1-)           | 28.8 s 19                 | 2950 170  |
| <sup>202</sup> Tl | 0         | EC   | 2-             | 12.23 d 2                 | 1364 15   |
| <sup>202</sup> Pb | 0         | α    | 0+             | 5.25×10 <sup>4</sup> y 28 | 2598 10   |
|                   | 0         | EC   | 0+             | 5.25×10 <sup>4</sup> y 28 | 50 15     |
|                   | 2169.84 9 | EC   | 9-             | 3.53 h 1                  | 50 15     |
| <sup>202</sup> Bi | 0         | EC   | 5+             | 1.72 h 5                  | 5160 50   |
| <sup>202</sup> Po | 0         | α    | 0+             | 44.7 m 5                  | 5701.0 17 |
|                   | 0         | EC   | 0+             | 44.7 m 5                  | (2820)    |
| <sup>202</sup> At | 0         | α    | (2+,3+)        | 184 s 1                   | 6353.4 15 |
|                   | X         | α    | (7+)           | 182 s 1                   | 6353.4 15 |
|                   | 0         | EC   | (5+)           | 181 s 3                   | (7210)    |
|                   | 392+X     | α    | (10-)          | 0.46 s 5                  | 6353.4 15 |
| <sup>202</sup> Rn | 0         | α    | 0+             | 9.85 s 20                 | 6773.6 20 |
|                   | 0         | EC   | 0+             | 9.85 s 20                 | (4450)    |
| <sup>202</sup> Fr | 0         | α    |                | 0.34 s 4                  | 7389 9    |
|                   | 0         | EC   |                | 0.34 s 4                  | 9400 400  |
| <sup>203</sup> Au | 0         | β-   | 3/2+           | 53 s 2                    | 2139 15   |
| <sup>203</sup> Hg | 0         | β-   | 5/2-           | 46.612 d 18               | 491.9 12  |
| <sup>203</sup> Pb | 0         | EC   | 5/2-           | 51.873 h 9                | 975 6     |
| <sup>203</sup> Bi | 0         | α    | 9/2-           | 11.76 h 5                 | 4150 100  |
|                   | 0         | EC   | 9/2-           | 11.76 h 5                 | 3253 21   |
| <sup>203</sup> Po | 0         | α    | 5/2-           | 36.7 m 5                  | 5496 5    |
|                   | 0         | EC   | 5/2-           | 36.7 m 5                  | 4230 60   |
| <sup>203</sup> At | 0         | α    | 9/2-           | 7.4 m 2                   | 6210.2 9  |
|                   | 0         | EC   | 9/2-           | 7.4 m 2                   | 5060 100  |
| <sup>203</sup> Rn | 0         | α    | (3/2,5/2)-     | 45 s 3                    | 6629.9 23 |
|                   | 0         | EC   | (3/2,5/2)-     | 45 s 3                    | (60)      |
|                   | 361 6     | α    | (13/2+)        | 28 s 2                    | 6629.9 23 |
|                   | 361 6     | EC   | (13/2+)        | 28 s 2                    | (60)      |
| <sup>203</sup> Fr | 0         | α    | (9/2-)         | 0.55 s 2                  | 7280 50   |
|                   | 0         | EC   | (9/2-)         | 0.55 s 2                  | (72)      |
| <sup>204</sup> Au | 0         | β-   | (2-)           | 39.8 s 9                  | (3800)    |
| <sup>204</sup> Tl | 0         | EC   | 2-             | 3.78 y 2                  | 347.3 15  |
|                   | 0         | β-   | 2-             | 3.78 y 2                  | 763.70 18 |
| <sup>204</sup> Bi | 0         | EC   | 6+             | 11.22 h 10                | 4438 22   |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)    |
|-------------------|-----------|------|----------------|--------------------------|-----------|
| <sup>204</sup> Po | 0         | α    | 0+             | 3.53 h 2                 | 5484.9 14 |
|                   | 0         | EC   | 0+             | 3.53 h 2                 | 2342 25   |
| <sup>204</sup> At | 0         | α    | 7+             | 9.2 m 2                  | 6070 50   |
|                   | 0         | EC   | 7+             | 9.2 m 2                  | 6480 70   |
| <sup>204</sup> Rn | 0         | α    | 0+             | 1.24 m 3                 | 6546.2 20 |
|                   | 0         | EC   | 0+             | 1.24 m 3                 | (38)      |
| <sup>204</sup> Fr | 0         | α    | (3+)           | 1.7 s 3                  | 7170 3    |
|                   | 0         | EC   | (3+)           | 1.7 s 3                  | (86)      |
|                   | 41 7      | α    | (7+)           | 2.6 s 3                  | 7170 3    |
|                   | 316 7     | α    | (10-)          | 1 s                      | 7170 3    |
| <sup>205</sup> Hg | 0         | β-   | 1/2-           | 5.2 m 1                  | 1531 4    |
| <sup>205</sup> Pb | 0         | EC   | 5/2-           | 1.53×10 <sup>7</sup> y 7 | 51.2 5    |
| <sup>205</sup> Bi | 0         | EC   | 9/2-           | 15.31 d 4                | 2708 7    |
| <sup>205</sup> Po | 0         | α    | 5/2-           | 1.66 h 2                 | 5324 10   |
|                   | 0         | EC   | 5/2-           | 1.66 h 2                 | 3530 30   |
| <sup>205</sup> At | 0         | α    | 9/2-           | 26.2 m 5                 | 6019.7 17 |
|                   | 0         | EC   | 9/2-           | 26.2 m 5                 | 4540 40   |
| <sup>205</sup> Rn | 0         | α    | (5/2)-         | 2.8 m 1                  | 6390 50   |
|                   | 0         | EC   | 5/2-           | 2.8 m 1                  | (5240)    |
| <sup>205</sup> Fr | 0         | α    | (9/2-)         | 3.85 s 10                | 7060 50   |
| <sup>205</sup> Ra | 0         | α    |                | 0.22 s 6                 | 7510 50   |
| <sup>206</sup> Hg | 0         | β-   | 0+             | 8.15 m 10                | 1308 20   |
| <sup>206</sup> Tl | 0         | β-   | 0-             | 4.199 m 15               | 1533.2 7  |
| <sup>206</sup> Bi | 0         | EC   | 6(+)           | 6.243 d 3                | 3758 8    |
| <sup>206</sup> Po | 0         | α    | 0+             | 8.8 d 1                  | 5326.5 13 |
|                   | 0         | EC   | 0+             | 8.8 d 1                  | 1846 12   |
| <sup>206</sup> At | 0         | α    | (5)+           | 30.0 m 6                 | 5888.4 19 |
|                   | 0         | EC   | (5)+           | 30.0 m 6                 | 5720 50   |
| <sup>206</sup> Rn | 0         | α    | 0+             | 5.67 m 17                | 6383.8 16 |
|                   | 0         | EC   | 0+             | 5.67 m 17                | (3310)    |
| <sup>206</sup> Fr | 0         | α    | (5+)           | 15.9 s 2                 | 6926 4    |
|                   | 0         | EC   | (5+)           | 15.9 s 2                 | (7750)    |
|                   | 531       | α    |                | 0.7 s 1                  | 6926 4    |
| <sup>206</sup> Ra | 0         | α    | 0+             | 0.24 s 2                 | 7416 5    |
| <sup>207</sup> Hg | 0         | β-   | (9/2+)         | 2.9 m 2                  | 4780 150  |
| <sup>207</sup> Tl | 0         | β-   | 1/2+           | 4.77 m 2                 | 1423 5    |
| <sup>207</sup> Bi | 0         | EC   | 9/2-           | 31.55 y 5                | 2398.8 21 |
| <sup>207</sup> Po | 0         | α    | 5/2-           | 5.80 h 2                 | 5215.9 10 |
|                   | 0         | EC   | 5/2-           | 5.80 h 2                 | 2909 6    |
| <sup>207</sup> At | 0         | α    | 9/2-           | 1.80 h 4                 | 5873 3    |
|                   | 0         | EC   | 9/2-           | 1.80 h 4                 | 3910 21   |
| <sup>207</sup> Rn | 0         | α    | 5/2-           | 9.25 m 17                | 6251.0 16 |
|                   | 0         | EC   | 5/2-           | 9.25 m 17                | 4610 60   |
| <sup>207</sup> Fr | 0         | α    | 9/2-           | 14.8 s 1                 | 6900 50   |
|                   | 0         | EC   | 9/2-           | 14.8 s 1                 | 5710 100  |
| <sup>207</sup> Ra | 0         | α    | (5/2,3/2)-     | 1.3 s 2                  | 7270 50   |
|                   | 0         | EC   | (5/2,3/2)-     | 1.3 s 2                  | (64)      |
|                   | 4.7E+2 10 | α    | (13/2+)        | 55 ms 10                 | 7270 50   |
|                   | 4.7E2 10  | EC   | (13/2+)        | 55 ms 10                 | (64)      |
| <sup>208</sup> Tl | 0         | β-   | 5(+)           | 3.053 m 4                | 5000.9 17 |
| <sup>208</sup> Bi | 0         | EC   | (5)+           | 3.68×10 <sup>5</sup> y 4 | 2879.7 20 |
| <sup>208</sup> Po | 0         | α    | 0+             | 2.898 y 2                | 5215.5 13 |
|                   | 0         | EC   | 0+             | 2.898 y 2                | 1400.6 24 |
| <sup>208</sup> At | 0         | α    | 6+             | 1.63 h 3                 | 5751.1 22 |
|                   | 0         | EC   | 6+             | 1.63 h 3                 | 4973 22   |
| <sup>208</sup> Rn | 0         | α    | 0+             | 24.35 m 14               | 6260.5 17 |
|                   | 0         | EC   | 0+             | 24.35 m 14               | 2851 25   |
| <sup>208</sup> Fr | 0         | α    | 7+             | 59.1 s 3                 | 6770 50   |
|                   | 0         | EC   | 7+             | 59.1 s 3                 | 6990 50   |
| <sup>208</sup> Ra | 0         | α    | 0+             | 1.3 s 2                  | 7273 5    |
|                   | 0         | EC   | 0+             | 1.3 s 2                  | (43)      |
| <sup>208</sup> Ac | 0         | α    | (3+)           | 95 ms +24-16             | 7176 6    |
|                   | 506 26    | α    | (10-)          | 25 ms +9-5               | 7176 6    |
| <sup>209</sup> Tl | 0         | β-   | (1/2+)         | 2.20 m 7                 | 3980 10   |
| <sup>209</sup> Pb | 0         | β-   | 9/2+           | 3.253 h 14               | 644.1 11  |

Parent Nuclides from the *Table of Isotopes*

| Parent | E(keV)    | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)     |
|--------|-----------|------|----------------|--------------------------|------------|
| 209Po  | 0         | α    | 1/2-           | 102 y 5                  | 4979.2 14  |
|        | 0         | EC   | 1/2-           | 102 y 5                  | 1892.6 16  |
| 209At  | 0         | α    | 9/2-           | 5.41 h 5                 | 5757.3 20  |
|        | 0         | EC   | 9/2-           | 5.41 h 5                 | 3486 7     |
| 209Rn  | 0         | α    | 5/2-           | 28.5 m 10                | 6155.3 20  |
|        | 0         | EC   | 5/2-           | 28.5 m 10                | 3930 30    |
| 209Fr  | 0         | α    | 9/2-           | 50.0 s 3                 | 6777 4     |
|        | 0         | EC   | 9/2-           | 50.0 s 3                 | 5160 40    |
| 209Ra  | 0         | α    | 5/2-           | 4.6 s 2                  | 7150 50    |
|        | 0         | EC   | 5/2-           | 4.6 s 2                  | (56)       |
| 209Ac  | 0         | α    | (9/2-)         | 0.10 s 5                 | 7730 50    |
|        | 0         | EC   | (9/2-)         | 0.10 s 5                 | (71)       |
| 210Tl  | 0         | β-   | (5+)           | 1.30 m 3                 | 5484 12    |
| 210Pb  | 0         | α    | 0+             | 22.3 y 2                 | 3792 20    |
|        | 0         | β-   | 0+             | 22.3 y 2                 | 63.5 5     |
| 210Bi  | 0         | α    | 1-             | 5.013 d 5                | 5036.9 8   |
|        | 0         | β-   | 1-             | 5.013 d 5                | 1162.7 8   |
|        | 271.31 11 | α    | 9-             | 3.04×10 <sup>6</sup> y 6 | 5036.9 8   |
| 210Po  | 0         | α    | 0+             | 138.376 d 2              | 5407.46 7  |
| 210At  | 0         | α    | (5)+           | 8.1 h 4                  | 5631.4 10  |
|        | 0         | EC   | (5)+           | 8.1 h 4                  | 3981 8     |
| 210Rn  | 0         | α    | 0+             | 2.4 h 1                  | 6158.5 22  |
|        | 0         | EC   | 0+             | 2.4 h 1                  | 2374 12    |
| 210Fr  | 0         | α    | 6+             | 3.18 m 6                 | 6700 50    |
|        | 0         | EC   | 6+             | 3.18 m 6                 | 6262 23    |
| 210Ra  | 0         | α    | 0+             | 3.7 s 2                  | 7157 5     |
|        | 0         | EC   | 0+             | 3.7 s 2                  | (38)       |
| 210Ac  | X         | α    |                | 0.35 s 5                 | 7610 50    |
|        | X         | EC   |                | 0.35 s 5                 | (82)       |
| 211Pb  | 0         | β-   | 9/2+           | 36.1 m 2                 | 1373 6     |
| 211Bi  | 0         | α    | 9/2-           | 2.14 m 2                 | 6750.5 5   |
|        | 0         | β-   | 9/2-           | 2.14 m 2                 | 579 6      |
| 211Po  | 0         | α    | 9/2+           | 0.516 s 3                | 7594.5 5   |
|        | 1462 6    | α    | (25/2+)        | 25.2 s 6                 | 7594.5 5   |
| 211At  | 0         | α    | 9/2-           | 7.214 h 7                | 5982.4 13  |
|        | 0         | EC   | 9/2-           | 7.214 h 7                | 786.7 25   |
| 211Rn  | 0         | α    | 1/2-           | 14.6 h 2                 | 5965.2 14  |
|        | 0         | EC   | 1/2-           | 14.6 h 2                 | 2891 7     |
| 211Fr  | 0         | α    | 9/2-           | 3.10 m 2                 | 6660 5     |
|        | 0         | EC   | 9/2-           | 3.10 m 2                 | 4605 20    |
| 211Ra  | 0         | α    | 5/2(-)         | 13 s 2                   | 7046 5     |
|        | 0         | EC   | 5/2(-)         | 13 s 2                   | 5000 60    |
| 211Ac  | 0         | α    |                | 0.25 s 5                 | 7620 50    |
| 212Pb  | 0         | β-   | 0+             | 10.64 h 1                | 573.7 20   |
| 212Bi  | 0         | α    | 1(-)           | 60.55 m 6                | 6207.14 4  |
|        | 0         | β-α  | 1(-)           | 60.55 m 6                |            |
|        | 0         | β-   | 1(-)           | 60.55 m 6                | 2254.0 17  |
|        | 250       | α    | (9-)           | 25.0 m 2                 | 6207.14 4  |
|        | 250       | β-α  | (9-)           | 25.0 m 2                 |            |
|        | 250       | β-   | (9-)           | 25.0 m 2                 | 2254.0 17  |
|        | >1910     | β-   |                | 7.0 m 3                  | 2254.0 17  |
| 212Po  | 0         | α    | 0+             | 0.299 us 2               | 8954.13 11 |
|        | 2922 15   | α    | (18+)          | 45.1 s 6                 | 8954.13 11 |
| 212At  | 0         | α    | (1-)           | 0.314 s 2                | 7828.9 20  |
|        | 222 6     | α    | (9-)           | 0.119 s 3                | 7828.9 20  |
| 212Rn  | 0         | α    | 0+             | 23.9 m 12                | 6385 3     |
| 212Fr  | 0         | α    | 5+             | 20.0 m 6                 | 6529.0 18  |
|        | 0         | EC   | 5+             | 20.0 m 6                 | 5117 22    |
| 212Ra  | 0         | α    | 0+             | 13.0 s 2                 | 7031.9 18  |
|        | 0         | EC   | 0+             | 13.0 s 2                 | 3354 25    |
| 212Ac  | 0         | α    |                | 0.93 s 5                 | 7520 50    |
|        | 0         | EC   |                | 0.93 s 5                 | 7480 70    |
| 212Th  | 0         | α    | 0+             | 30 ms +20-10             | 7952 10    |
|        | 0         | EC   | 0+             | 30 ms +20-10             | (48)       |
| 213Pb  | 0         | β-   | (9/2+)         | 10.2 m 3                 | (2070)     |
| 213Bi  | 0         | α    | 9/2-           | 45.59 m 6                | 5982 6     |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)   | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|----------|------|----------------|------------------|-----------|
|                   | 0        | β-   | 9/2-           | 45.59 m 6        | 1426 7    |
| <sup>213</sup> Po | 0        | α    | 9/2+           | 4.2 us 8         | 8537 3    |
| <sup>213</sup> At | 0        | α    | 9/2-           | 125 ns 6         | 9254 5    |
| <sup>213</sup> Rn | 0        | α    | (9/2+)         | 25.0 ms 2        | 8243 6    |
| <sup>213</sup> Fr | 0        | α    | 9/2-           | 34.6 s 3         | 6905.1 18 |
|                   | 0        | EC   | 9/2-           | 34.6 s 3         | 2148 10   |
| <sup>213</sup> Ra | 0        | α    | 1/2-           | 2.74 m 6         | 6859 4    |
|                   | 0        | EC   | 1/2-           | 2.74 m 6         | 3880 30   |
|                   | 1770 8   | α    |                | 2.1 ms 1         | 6859 4    |
| <sup>213</sup> Ac | 0        | α    |                | 0.80 s 5         | 7500 50   |
| <sup>213</sup> Th | 0        | α    |                | 140 ms 25        | 7840 50   |
| <sup>213</sup> Pa | 0        | α    |                | 5.3 ms +40-16    | 8394 20   |
| <sup>214</sup> Pb | 0        | β-   | 0+             | 26.8 m 9         | 1023 11   |
| <sup>214</sup> Bi | 0        | α    | 1-             | 19.9 m 4         | 5621 3    |
|                   | 0        | β-α  | 1-             | 19.9 m 4         | 1023 11   |
|                   | 0        | β-   | 1-             | 19.9 m 4         | 3272 11   |
| <sup>214</sup> Po | 0        | α    | 0+             | 164.3 us 20      | 7833.46 6 |
| <sup>214</sup> At | 0        | α    | 1-             | 558 ns 10        | 8987 4    |
|                   | 59 9     | α    |                | 265 ns 30        | 8987 4    |
|                   | 231 6    | α    | 9-             | 760 ns 15        | 8987 4    |
| <sup>214</sup> Rn | 0        | α    | 0+             | 0.27 us 2        | 9208 9    |
|                   | 1442.7   | α    | 6+             | 0.7 ns 3         | 9208 9    |
|                   | 1625.1   | α    | 8+             | 6.5 ns 30        | 9208 9    |
| <sup>214</sup> Fr | 0        | α    | (1-)           | 5.0 ms 2         | 8588 4    |
|                   | 122 7    | α    | (9-)           | 3.35 ms 5        | 8588 4    |
| <sup>214</sup> Ra | 0        | α    | 0+             | 2.46 s 3         | 7273 4    |
|                   | 0        | EC   | 0+             | 2.46 s 3         | 1059 14   |
| <sup>214</sup> Ac | 0        | α    |                | 8.2 s 2          | 7350 50   |
|                   | 0        | EC   |                | 8.2 s 2          | 6340 5    |
| <sup>214</sup> Th | 0        | α    | 0+             | 100 ms 25        | 7826 7    |
| <sup>214</sup> Pa | 0        | α    |                | 17 ms 3          | 8270 20   |
| <sup>215</sup> Bi | 0        | β-   |                | 7.6 m 2          | 2250 100  |
| <sup>215</sup> Po | 0        | α    | 9/2+           | 1.781 ms 4       | 7526.4 8  |
|                   | 0        | β-   | 9/2+           | 1.781 ms 4       | 721 7     |
| <sup>215</sup> At | 0        | α    | 9/2-           | 0.10 ms 2        | 8178 4    |
| <sup>215</sup> Rn | 0        | α    | 9/2+           | 2.30 us 10       | 8839 8    |
| <sup>215</sup> Fr | 0        | α    | 9/2-           | 86 ns 5          | 9540 7    |
|                   | 1573.1 2 | α    | (23/2)-        | 3.5 ns 4         | 9540 7    |
| <sup>215</sup> Ra | 0        | α    | (9/2+)         | 1.59 ms 9        | 8864 4    |
| <sup>215</sup> Ac | 0        | α    | 9/2-           | 0.17 s 1         | 7750 50   |
|                   | 0        | EC   | 9/2-           | 0.17 s 1         | 3490 50   |
| <sup>215</sup> Th | 0        | α    | (1/2-)         | 1.2 s 2          | 7666 6    |
| <sup>215</sup> Pa | 0        | α    |                | 14 ms +20-3      | 8170 50   |
| <sup>216</sup> Bi | 0        | β-   |                | 3.6 s 4          | (40)      |
| <sup>216</sup> Po | 0        | α    | 0+             | 0.145 s 2        | 6906.5 5  |
| <sup>216</sup> At | 0        | α    | 1(-)           | 0.30 ms 3        | 7949 3    |
|                   | 413      | α    | (9-)           | 0.1 ms           | 7949 3    |
| <sup>216</sup> Rn | 0        | α    | 0+             | 45 us 5          | 8200 7    |
| <sup>216</sup> Fr | 0        | α    | (1-)           | 0.70 us 2        | 9175 12   |
| <sup>216</sup> Ra | 0        | α    | 0+             | 182 ns 10        | 9526 8    |
| <sup>216</sup> Ac | 0        | α    | (1-)           | 0.33 ms          | 9243 8    |
|                   | 37 10    | α    | (9-)           | 0.33 ms 2        | 9243 8    |
| <sup>216</sup> Th | 0        | α    | 0+             | 0.028 s 2        | 8071 8    |
|                   | 2028 22  | α    | (8+,11-)       | 180 us 40        | 8071 8    |
| <sup>216</sup> Pa | 0        | α    |                | 0.20 s 4         | 8010 50   |
|                   | 0        | EC   |                | 0.20 s 4         | 7420 90   |
| <sup>217</sup> Po | 0        | α    |                | <10 s            | 6660 4    |
|                   | 0        | β-   |                | <10 s            | (15)      |
| <sup>217</sup> At | 0        | α    | 9/2-           | 32.3 ms 4        | 7201.9 14 |
|                   | 0        | β-   | 9/2-           | 32.3 ms 4        |           |
| <sup>217</sup> Rn | 0        | α    | 9/2+           | 0.54 ms 5        | 7889 3    |
| <sup>217</sup> Fr | 0        | α    | 9/2-           | 22 us 5          | 8469 4    |
| <sup>217</sup> Ra | 0        | α    | (9/2+)         | 1.6 us 2         | 9161 6    |
| <sup>217</sup> Ac | 0        | α    | 9/2-           | 69 ns 4          | 9832 10   |
|                   | 2013 2   | α    | (29/2)+        | 740 ns 40        |           |



Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV) | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)     |
|-------------------|--------|------|----------------|------------------|------------|
| <sup>217</sup> Th | 0      | α    | (9/2+)         | 0.252 ms 7       | 9424 9     |
| <sup>217</sup> Pa | 0      | α    |                | 4.9 ms 6         | 8490 50    |
|                   | 1854   | α    |                | 1.6 ms 10        | 8490 50    |
| <sup>218</sup> Po | 0      | α    | 0+             | 3.10 m 1         | 6114.68 9  |
|                   | 0      | β-   | 0+             | 3.10 m 1         | 264 12     |
| <sup>218</sup> At | 0      | α    | (2-)           | 1.6 s 4          | 6874 3     |
|                   | 0      | β-   | (2-)           | 1.6 s 4          | 2883 12    |
| <sup>218</sup> Rn | 0      | α    | 0+             | 35 ms 5          | 7262.6 20  |
| <sup>218</sup> Fr | 0      | α    | (1-)           | 1.0 ms 6         | 8014.3 20  |
|                   | 86 8   | α    |                | 22.0 ms 5        | 8014.3 20  |
| <sup>218</sup> Ra | 0      | α    | 0+             | 25.6 us 11       | 8546 6     |
| <sup>218</sup> Ac | 0      | α    |                | 1.12 us 11       | 9380 50    |
| <sup>218</sup> Th | 0      | α    | 0+             | 109 ns 13        | 9849 9     |
| <sup>218</sup> Pa | 0      | α    |                | 0.12 ms +4-2     | 9790 50    |
| <sup>218</sup> U  | 0      | α    | 0+             | 1.5 ms +73-7     | 8786 25    |
| <sup>219</sup> At | 0      | α    |                | 56 s 3           | 6390 50    |
|                   | 0      | β-   |                | 56 s 3           | 1700 80    |
| <sup>219</sup> Rn | 0      | α    | 5/2+           | 3.96 s 1         | 6946.1 3   |
| <sup>219</sup> Fr | 0      | α    | 9/2-           | 20 ms 2          | 7448.5 18  |
| <sup>219</sup> Ra | 0      | α    | (7/2)+         | 10 ms 3          | 8130 8     |
| <sup>219</sup> Ac | 0      | α    | 9/2-           | 11.8 us 15       | 8830 50    |
| <sup>219</sup> Th | 0      | α    |                | 1.05 us 3        | 9510 50    |
| <sup>219</sup> Pa | 0      | α    | 9/2-           | 53 ns 10         | 10080 50   |
| <sup>219</sup> U  | 0      | α    |                | 42 us +34-13     | (99)       |
| <sup>220</sup> At | 0      | α    |                | 224 s 8          | 6053 6     |
|                   | 0      | β-   |                | 224 s 8          | (3650)     |
| <sup>220</sup> Rn | 0      | α    | 0+             | 55.6 s 1         | 6404.67 10 |
| <sup>220</sup> Fr | 0      | α    | 1+             | 27.4 s 3         | 6800.7 19  |
|                   | 0      | β-   | 1+             | 27.4 s 3         | 1209 11    |
| <sup>220</sup> Ra | 0      | α    | 0+             | 25 ms 5          | 7595 7     |
| <sup>220</sup> Ac | 0      | α    |                | 26.1 ms 5        | 8350 50    |
| <sup>220</sup> Th | 0      | α    | 0+             | 9.7 us 6         | 8953 20    |
| <sup>221</sup> At | 0      | β-   |                | 2.3 m 2          |            |
| <sup>221</sup> Rn | 0      | α    | 7/2(+)         | 25 m 2           | 6146 3     |
|                   | 0      | β-   | 7/2(+)         | 25 m 2           | (1220)     |
| <sup>221</sup> Fr | 0      | α    | 5/2-           | 4.9 m 2          | 6458.1 14  |
| <sup>221</sup> Ra | 0      | α    | 5/2+           | 28 s 2           | 6886 5     |
| <sup>221</sup> Ac | 0      | α    | (3/2-)         | 52 ms 2          | 7780 50    |
| <sup>221</sup> Th | 0      | α    | (7/2+)         | 1.68 ms 6        | 8628 4     |
| <sup>221</sup> Pa | 0      | α    | 9/2-           | 5.9 us 17        | 9250 50    |
| <sup>222</sup> At | 0      | β-   |                | 54 s 10          | (38)       |
| <sup>222</sup> Rn | 0      | α    | 0+             | 3.8235 d 3       | 5590.3 3   |
| <sup>222</sup> Fr | 0      | β-   | 2-             | 14.2 m 3         | 2032 21    |
| <sup>222</sup> Ra | 0      | α    | 0+             | 38.0 s 5         | 6681 4     |
| <sup>222</sup> Ac | 0      | α    | (1-)           | 5.0 s 5          | 7129 20    |
|                   | 0+X    | α    |                | 63 s 4           | 7129 20    |
|                   | 0      | EC   | (1-)           | 5.0 s 5          | 2290 21    |
|                   | 0+X    | EC   |                | 63 s 4           | 2290 21    |
| <sup>222</sup> Th | 0      | α    | 0+             | 2.8 ms 3         | 8129 6     |
| <sup>222</sup> Pa | 0      | α    |                | 2.9 ms +6-4      | (88)       |
| <sup>222</sup> U  | 0      | α    | 0+             | 1.0 us +10-4     | (9500)     |
| <sup>223</sup> At | 0      | β-   |                | 50 s 7           |            |
| <sup>223</sup> Rn | 0      | β-   | 7/2            | 23.2 m 4         | (15)       |
| <sup>223</sup> Fr | 0      | α    | 3/2(-)         | 21.8 m 4         | 5430 80    |
|                   | 0      | β-   | 3/2(-)         | 21.8 m 4         | 1149.1 9   |
| <sup>223</sup> Ra | 0      | 14C  | 3/2+           | 11.435 d 4       | 31800 2000 |
|                   | 0      | α    | 3/2+           | 11.435 d 4       | 5979.31 21 |
| <sup>223</sup> Ac | 0      | α    | (5/2-)         | 2.10 m 5         | 6783.3 10  |
|                   | 0      | EC   | (5/2-)         | 2.10 m 5         | 586 7      |
| <sup>223</sup> Th | 0      | α    | (5/2)+         | 0.60 s 2         | 7567 4     |
| <sup>223</sup> Pa | 0      | α    |                | 6.5 ms 10        | 8340 50    |
| <sup>223</sup> U  | 0      | α    |                | 18 us +10-5      | 8940 50    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV) | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)     |
|-------------------|--------|------|----------------|------------------|------------|
| <sup>224</sup> Rn | 0      | β-   | 0+             | 107 m 3          |            |
| <sup>224</sup> Fr | 0      | β-   | 1(-)           | 3.30 m 10        | 2820 50    |
| <sup>224</sup> Ra | 0      | α    | 0+             | 3.66 d 4         | 5788.87 15 |
| <sup>224</sup> Ac | 0      | α    | 0-             | 2.9 h 2          | 6326.9 7   |
|                   | 0      | EC   | 0-             | 2.9 h 2          | 1403 4     |
| <sup>224</sup> Th | 0      | α    | 0+             | 1.05 s 2         | 7304 7     |
| <sup>224</sup> Pa | 0      | α    |                | 0.95 s 15        | 7695 4     |
|                   | 0      | EC   |                | 0.95 s 15        | 3870 50    |
| <sup>224</sup> U  | 0      | α    | 0+             | 1.0 ms 4         | 8620 12    |
| <sup>225</sup> Rn | 0      | β-   | 7/2-           | 4.5 m 3          |            |
| <sup>225</sup> Fr | 0      | β-   | 3/2-           | 4.0 m 2          | 1866 10    |
| <sup>225</sup> Ra | 0      | β-   | 1/2+           | 14.9 d 2         | 357 7      |
| <sup>225</sup> Ac | 0      | α    | (3/2-)         | 10.0 d 1         | 5935.1 14  |
| <sup>225</sup> Th | 0      | α    | (3/2)+         | 8.72 m 4         | 6921.6 21  |
|                   | 0      | EC   | (3/2)+         | 8.72 m 4         | 675 10     |
| <sup>225</sup> Pa | 0+X    | α    |                | 1.7 s 2          | 7390 50    |
| <sup>225</sup> U  | 0      | α    |                | 95 ms 15         | 8020 50    |
| <sup>225</sup> Np | 0      | α    |                | 6 ms +4-2        | 8790 50    |
| <sup>226</sup> Rn | 0      | β-   | 0+             | 6.0 m 5          |            |
| <sup>226</sup> Fr | 0      | β-   | 1              | 48 s 1           | 3630 80    |
| <sup>226</sup> Ra | 0      | α    | 0+             | 1600 y 7         | 4870.63 25 |
| <sup>226</sup> Ac | 0      | α    | (1)            | 29 h             | 5536 21    |
|                   | 0      | EC   | (1)            | 29 h             | 640 3      |
|                   | 0      | β-   | (1)            | 29 h             | 1116 5     |
| <sup>226</sup> Th | 0      | α    | 0+             | 30.9 m           | 6451.5 10  |
| <sup>226</sup> Pa | 0      | α    |                | 1.8 m 2          | 6987 10    |
|                   | 0      | EC   |                | 1.8 m 2          | 2825 24    |
| <sup>226</sup> U  | 0      | α    | 0+             | 0.5 s 2          | 7707 15    |
| <sup>226</sup> Np | 0      | α    |                | 31 ms 8          | 8200 50    |
| <sup>227</sup> Rn | 0      | β-   |                | 22.5 s 7         |            |
| <sup>227</sup> Fr | 0      | β-   | 1/2+           | 2.47 m 3         | 2490 90    |
| <sup>227</sup> Ra | 0      | β-   | 3/2+           | 42.2 m 5         | 1325.1 24  |
| <sup>227</sup> Ac | 0      | α    | 3/2-           | 21.773 y 3       | 5042.19 14 |
|                   | 0      | β-   | 3/2-           | 21.773 y 3       | 44.8 8     |
| <sup>227</sup> Th | 0      | α    | (1/2+)         | 18.72 d 2        | 6146.43 15 |
| <sup>227</sup> Pa | 0      | α    | (5/2-)         | 38.3 m 3         | 6580.0 21  |
|                   | 0      | EC   | (5/2-)         | 38.3 m 3         | 1019 8     |
| <sup>227</sup> U  | 0      | α    | (3/2+)         | 1.1 m 1          | 7211 14    |
| <sup>227</sup> Np | 0      | α    |                | 0.51 s 6         | 7816 14    |
| <sup>228</sup> Fr | 0      | β-   | 2-             | 39 s 1           | 4300 40    |
| <sup>228</sup> Ra | 0      | β-   | 0+             | 5.75 y 3         | 45.9 9     |
| <sup>228</sup> Ac | 0      | α    | 3(+)           | 6.15 h 2         | 4830 50    |
|                   | 0      | β-   | 3(+)           | 6.15 h 2         | 2127 3     |
| <sup>228</sup> Th | 0      | α    | 0+             | 1.9131 y 9       | 5520.12 22 |
| <sup>228</sup> Pa | 0      | α    | (3+)           | 22 h 1           | 6228 3     |
|                   | 0      | EC   | (3+)           | 22 h 1           | 2111 5     |
| <sup>228</sup> U  | 0      | α    | 0+             | 9.1 m 2          | 6804 10    |
|                   | 0      | EC   | 0+             | 9.1 m 2          | 343 16     |
| <sup>228</sup> Pu | 0      | α    | 0+             |                  | 7950 50    |
| <sup>229</sup> Fr | 0      | β-   |                | 50 s 20          | (31)       |
| <sup>229</sup> Ra | 0      | β-   | 5/2(+)         | 4.0 m 2          | 1760 40    |
| <sup>229</sup> Ac | 0      | β-   | (3/2+)         | 62.7 m 5         | 1100 50    |
| <sup>229</sup> Th | 0      | α    | 5/2+           | 7340 y 160       | 5167.9 10  |
| <sup>229</sup> Pa | 0      | α    | (5/2+)         | 1.50 d 5         | 5841 5     |
|                   | 0      | EC   | (5/2+)         | 1.50 d 5         | 316 9      |
| <sup>229</sup> U  | 0      | α    | (3/2+)         | 58 m 3           | 6475 3     |
|                   | 0      | EC   | (3/2+)         | 58 m 3           | 1309 11    |
| <sup>229</sup> Np | 0      | α    |                | 4.0 m 2          | 7010 50    |
|                   | 0      | EC   |                | 4.0 m 2          |            |
| <sup>229</sup> Pu | 0      | α    |                |                  | 7600 50    |
| <sup>230</sup> Fr | 0      | β-   |                | 19.1 s 5         |            |
| <sup>230</sup> Ra | 0      | β-   | 0+             | 93 m 2           | 990 110    |
| <sup>230</sup> Ac | 0      | β-   | (1+)           | 122 s 3          | 2700 100   |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)  | Mode | J <sup>π</sup> | t <sub>1/2</sub>         | Q(keV)       |
|-------------------|---------|------|----------------|--------------------------|--------------|
| <sup>230</sup> Th | 0       | α    | 0+             | 7.538×10 <sup>4</sup> y  | 30 4770.0 15 |
| <sup>230</sup> Pa | 0       | α    | (2-)           | 17.4 d                   | 5 5439.4 7   |
|                   | 0       | EC   | (2-)           | 17.4 d                   | 5 1310 3     |
|                   | 0       | β-   | (2-)           | 17.4 d                   | 5 563 5      |
| <sup>230</sup> U  | 0       | α    | 0+             | 20.8 d                   | 5992.7 7     |
| <sup>230</sup> Np | 0       | α    |                | 4.6 m                    | 3 6780 50    |
|                   | 0       | EC   |                | 4.6 m                    | 3 3610 60    |
| <sup>231</sup> Fr | 0       | β-   |                | 17.5 s                   | 8            |
| <sup>231</sup> Ra | 0       | β-   | (7/2-, 1/2+)   | 103 s                    | 3            |
| <sup>231</sup> Ac | 0       | β-   | (1/2+)         | 7.5 m                    | 1 2100 100   |
| <sup>231</sup> Th | 0       | β-   | 5/2+           | 25.52 h                  | 1 389.5 17   |
| <sup>231</sup> Pa | 0       | α    | 3/2-           | 32760 y                  | 110 5148.9 6 |
| <sup>231</sup> U  | 0       | α    | (5/2-)         | 4.2 d                    | 1 5550 50    |
|                   | 0       | EC   | (5/2-)         | 4.2 d                    | 1 360 50     |
| <sup>231</sup> Np | 0       | α    | (5/2)          | 48.8 m                   | 2 6370 50    |
|                   | 0       | EC   | (5/2)          | 48.8 m                   | 2 1840 70    |
| <sup>232</sup> Fr | 0       | β-   |                | 5 s                      | 1 (39)       |
| <sup>232</sup> Ra | 0       | β-   | 0+             | 250 s                    | 50           |
| <sup>232</sup> Ac | 0       | β-   | (1+)           | 119 s                    | 5 3700 100   |
| <sup>232</sup> Th | 0       | α    | 0+             | 1.405×10 <sup>10</sup> y | 6 4082.8 14  |
| <sup>232</sup> Pa | 0       | EC   | (2-)           | 1.31 d                   | 2 495 8      |
|                   | 0       | β-   | (2-)           | 1.31 d                   | 2 1337 7     |
| <sup>232</sup> U  | 0       | α    | 0+             | 68.9 y                   | 4 5413.55 14 |
| <sup>232</sup> Np | 0       | EC   | (4+)           | 14.7 m                   | 3 (2700)     |
| <sup>232</sup> Pu | 0       | α    | 0+             | 34.1 m                   | 7 6716 10    |
|                   | 0       | EC   | 0+             | 34.1 m                   | 7 (1060)     |
| <sup>232</sup> Am | 0       | EC   |                | 79 s                     | 2 (48)       |
| <sup>233</sup> Ra | 0       | β-   |                | 30 s                     | 5 (46)       |
| <sup>233</sup> Ac | 0       | β-   | (1/2+)         | 145 s                    | 10           |
| <sup>233</sup> Th | 0       | β-   | 1/2+           | 22.3 m                   | 1 1245.2 14  |
| <sup>233</sup> Pa | 0       | β-   | 3/2-           | 26.967 d                 | 2 570.5 22   |
| <sup>233</sup> U  | 0       | α    | 5/2+           | 1.592×10 <sup>5</sup> y  | 2 4908.5 12  |
| <sup>233</sup> Np | 0       | α    | (5/2+)         | 36.2 m                   | 1 (5830)     |
|                   | 0       | EC   | (5/2+)         | 36.2 m                   | 1 (1230)     |
| <sup>233</sup> Pu | 0       | α    |                | 20.9 m                   | 4 6420 50    |
|                   | 0       | EC   |                | 20.9 m                   | 4 (1900)     |
| <sup>234</sup> Ra | 0       | β-   | 0+             | 30 s                     | 10 (25)      |
| <sup>234</sup> Ac | 0       | β-   |                | 44 s                     | 7            |
| <sup>234</sup> Th | 0       | β-   | 0+             | 24.10 d                  | 3 273 3      |
| <sup>234</sup> Pa | 0       | β-   | 4+             | 6.70 h                   | 5 2197 5     |
|                   | 73.92+X | β-   | (0-)           | 1.17 m                   | 3 2197 5     |
| <sup>234</sup> U  | 0       | α    | 0+             | 2.455×10 <sup>5</sup> y  | 6 4858.5 7   |
| <sup>234</sup> Np | 0       | EC   | (0+)           | 4.4 d                    | 1 1810 8     |
| <sup>234</sup> Pu | 0       | α    | 0+             | 8.8 h                    | 1 6310 5     |
|                   | 0       | EC   | 0+             | 8.8 h                    | 1 388 11     |
| <sup>234</sup> Am | 0       | α    |                | 2.32 m                   | 8 (6870)     |
|                   | 0       | EC   |                | 2.32 m                   | 8 (4170)     |
| <sup>235</sup> Th | 0       | β-   | (1/2+)         | 7.1 m                    | 2 1930 70    |
| <sup>235</sup> Pa | 0       | β-   | (3/2-)         | 24.5 m                   | 2 1410 50    |
| <sup>235</sup> U  | 0       | α    | 7/2-           | 7.038×10 <sup>8</sup> y  | 5 4678.7 7   |
| <sup>235</sup> Np | 0       | α    | 5/2+           | 396.1 d                  | 12 5191.9 18 |
|                   | 0       | EC   | 5/2+           | 396.1 d                  | 12 123.7 9   |
| <sup>235</sup> Pu | 0       | α    | (5/2+)         | 25.3 m                   | 10 (60)      |
|                   | 0       | EC   | (5/2+)         | 25.3 m                   | 5 (12)       |
| <sup>236</sup> Th | 0       | β-   | 0+             | 37.5 m                   | 2            |
| <sup>236</sup> Pa | 0       | β-   | 1(-)           | 9.1 m                    | 1 2900 200   |
| <sup>236</sup> U  | 0       | α    | 0+             | 2.342×10 <sup>7</sup> y  | 3 4572.0 9   |
| <sup>236</sup> Np | 0       | α    | (6-)           | 1.54×10 <sup>5</sup> y   | 6 5020 50    |
|                   | 0       | EC   | (6-)           | 1.54×10 <sup>5</sup> y   | 6 940 50     |
|                   | 0       | β-   | (6-)           | 1.54×10 <sup>5</sup> y   | 6 490 50     |
|                   | 60 50   | EC   | 1              | 22.5 h                   | 4 940 50     |
|                   | 60 50   | β-   | 1              | 22.5 h                   | 4 490 50     |
| <sup>236</sup> Pu | 0       | α    | 0+             | 2.858 y                  | 8 5867.07 8  |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)  | Mode | J <sup>π</sup> | t <sub>1/2</sub>           | Q(keV)     |
|-------------------|---------|------|----------------|----------------------------|------------|
| <sup>237</sup> Th | 0       | β-   |                | 5.0 m 9                    | (40)       |
| <sup>237</sup> Pa | 0       | β-   | (1/2+)         | 8.7 m 2                    | 2250 100   |
| <sup>237</sup> U  | 0       | β-   | 1/2+           | 6.75 d 1                   | 518.6 6    |
| <sup>237</sup> Np | 0       | α    | 5/2+           | 2.14×10 <sup>6</sup> y 1   | 4959.1 12  |
| <sup>237</sup> Pu | 0       | α    | 7/2-           | 45.2 d 1                   | 5750.3     |
|                   | 0       | EC   | 7/2-           | 45.2 d 1                   | 220.3 13   |
| <sup>237</sup> Am | 0       | α    | 5/2(-)         | 73.0 m 10                  | (6250)     |
|                   | 0       | EC   | 5/2(-)         | 73.0 m 10                  | (1730)     |
| <sup>238</sup> Pa | 0       | β-   | (3-)           | 2.3 m 1                    | 3460 60    |
| <sup>238</sup> U  | 0       | α    | 0+             | 4.468×10 <sup>9</sup> y 3  | 4270 3     |
| <sup>238</sup> Np | 0       | β-   | 2+             | 2.117 d 2                  | 1292.0 7   |
| <sup>238</sup> Pu | 0       | α    | 0+             | 87.74 y 3                  | 5593.20 19 |
| <sup>238</sup> Am | 0       | α    | 1+             | 98 m 2                     | 6040 50    |
|                   | 0       | EC   | 1+             | 98 m 2                     | 2260 50    |
| <sup>238</sup> Cm | 0       | α    | 0+             | 2.4 h 1                    | 6620 40    |
|                   | 0       | EC   | 0+             | 2.4 h 1                    | 970 60     |
| <sup>238</sup> Bk | 0       | EC   |                | 144 s 5                    | (5000)     |
| <sup>239</sup> U  | 0       | β-   | 5/2+           | 23.45 m 2                  | 1265.2 16  |
| <sup>239</sup> Np | 0       | β-   | 5/2+           | 2.3565 d 4                 | 721.8 9    |
| <sup>239</sup> Pu | 0       | α    | 1/2+           | 24110 y 30                 | 5244.50 23 |
| <sup>239</sup> Am | 0       | α    | (5/2)-         | 11.9 h 1                   | 5923.7 18  |
|                   | 0       | EC   | (5/2)-         | 11.9 h 1                   | 802.9 20   |
| <sup>239</sup> Cm | 0       | EC   | (7/2-)         | 2.9 h                      | (1700)     |
| <sup>239</sup> Cf | 0       | α    |                | 39 s +37-12                |            |
| <sup>240</sup> U  | 0       | β-   | 0+             | 14.1 h 1                   | 388 16     |
| <sup>240</sup> Np | 0       | β-   | (5+)           | 61.9 m 2                   | 2200 15    |
|                   | X+0     | β-   | 1(+)           | 7.22 m 2                   | 2200 15    |
| <sup>240</sup> Pu | 0       | α    | 0+             | 6563 y 7                   | 5255.78 15 |
| <sup>240</sup> Am | 0       | α    | (3-)           | 50.8 h 3                   | 5690 50    |
|                   | 0       | EC   | (3-)           | 50.8 h 3                   | 1379 14    |
| <sup>240</sup> Cm | 0       | α    | 0+             | 27 d 1                     | 6397.2 6   |
| <sup>240</sup> Bk | 0       | EC   |                | 4.8 m 8                    | (3940)     |
| <sup>240</sup> Cf | 0       | α    | 0+             | 1.06 m 15                  | 7719 10    |
| <sup>241</sup> Np | 0       | β-   | (5/2+)         | 13.9 m 2                   | 1310 70    |
| <sup>241</sup> Pu | 0       | α    | 5/2+           | 14.35 y 10                 | 5140.1 5   |
|                   | 0       | β-   | 5/2+           | 14.35 y 10                 | 20.81 20   |
| <sup>241</sup> Am | 0       | α    | 5/2-           | 432.2 y 5                  | 5637.81 12 |
| <sup>241</sup> Cm | 0       | α    | 1/2+           | 32.8 d 2                   | 6185.0 6   |
|                   | 0       | EC   | 1/2+           | 32.8 d 2                   | 767.5 12   |
| <sup>241</sup> Cf | 0       | α    |                | 3.78 m 70                  | (7660)     |
|                   | 0       | EC   |                | 3.78 m 70                  | (3300)     |
| <sup>241</sup> Es | 0       | α    |                | 9 s +6-3                   | 8043 20    |
| <sup>242</sup> U  | 0       | β-   | 0+             | 16.8 m 5                   |            |
| <sup>242</sup> Np | 0+Y     | β-   | (1+)           | 2.2 m 2                    | 2700 200   |
|                   | 0+X     | β-   | (6)            | 5.5 m 1                    | 2700 200   |
| <sup>242</sup> Pu | 0       | α    | 0+             | 3.733×10 <sup>5</sup> y 12 | 4982.7 12  |
| <sup>242</sup> Am | 0       | EC   | 1-             | 16.02 h 2                  | 751.0 7    |
|                   | 0       | β-   | 1-             | 16.02 h 2                  | 664.8 7    |
|                   | 48.63 5 | α    | 5-             | 141 y 2                    | 5588.33 25 |
| <sup>242</sup> Cm | 0       | α    | 0+             | 162.8 d 2                  | 6215.56 8  |
| <sup>242</sup> Bk | 0       | EC   |                | 7.0 m 13                   | (3000)     |
| <sup>242</sup> Cf | 0       | α    | 0+             | 3.49 m 12                  | 7516 4     |
| <sup>242</sup> Es | 0       | α    |                | 40 s +40-20                | 8043 20    |
| <sup>243</sup> Np | 0       | β-   | (5/2-)         | 1.8 m 3                    | 2170 11    |
| <sup>243</sup> Pu | 0       | β-   | 7/2+           | 4.956 h 3                  | 582 3      |
| <sup>243</sup> Am | 0       | α    | 5/2-           | 7370 y 40                  | 5438.1 9   |
| <sup>243</sup> Cm | 0       | α    | 5/2+           | 29.1 y 1                   | 6168.8 10  |
|                   | 0       | EC   | 5/2+           | 29.1 y 1                   | 8.9 14     |
| <sup>243</sup> Bk | 0       | α    | (3/2-)         | 4.5 h 2                    | 6874 4     |
|                   | 0       | EC   | (3/2-)         | 4.5 h 2                    | 1508 5     |
| <sup>243</sup> Cf | 0       | α    | (1/2+)         | 10.7 m 5                   | (74)       |
|                   | 0       | EC   | (1/2+)         | 10.7 m 5                   | (2220)     |
| <sup>243</sup> Es | 0       | α    |                | 21 s 2                     | 8072 10    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV)  | Mode | J <sup>π</sup> | t <sub>1/2</sub>          | Q(keV)     |
|-------------------|---------|------|----------------|---------------------------|------------|
|                   | 0       | EC   |                | 21 s 2                    | (4000)     |
| <sup>243</sup> Fm | 0       | α    |                | 0.18 s +8-4               | 8690 50    |
|                   | 0       | EC   |                | 0.18 s +8-4               | (4500)     |
| <sup>244</sup> Np | 0       | β-   | (7-)           | 2.29 m 16                 | (31)       |
| <sup>244</sup> Pu | 0       | α    | 0+             | 8.08×10 <sup>7</sup> y 10 | 4665.5 10  |
| <sup>244</sup> Am | 0       | β-   | (6-)           | 10.1 h 1                  | 1428.1 9   |
|                   | 88.0 30 | EC   | 1+             | 26 m                      | 76 5       |
|                   | 88.0 30 | β-   | 1+             | 26 m                      | 1428.1 9   |
| <sup>244</sup> Cm | 0       | α    | 0+             | 18.10 y 2                 | 5901.61 5  |
| <sup>244</sup> Bk | 0       | α    | (1-)           | 4.35 h 15                 | 6780 50    |
|                   | 0       | EC   | (1-)           | 4.35 h 15                 | 2260 50    |
| <sup>244</sup> Cf | 0       | α    | 0+             | 19.4 m 6                  | 7329.1 18  |
| <sup>244</sup> Es | 0       | α    |                | 37 s 4                    | (7950)     |
|                   | 0       | EC   |                | 37 s 4                    | (46)       |
| <sup>245</sup> Pu | 0       | β-   | (9/2-)         | 10.5 h 1                  | 1205 15    |
| <sup>245</sup> Am | 0       | β-   | (5/2)+         | 2.05 h 1                  | 894.0 18   |
| <sup>245</sup> Cm | 0       | α    | 7/2+           | 8500 y 100                | 5623.5 19  |
| <sup>245</sup> Bk | 0       | α    | 3/2-           | 4.94 d 3                  | 6454.5 15  |
|                   | 0       | EC   | 3/2-           | 4.94 d 3                  | 810.2 24   |
| <sup>245</sup> Cf | 0       | α    | (5/2+)         | 45.0 m 15                 | 7255.6 20  |
|                   | 0       | EC   | (5/2+)         | 45.0 m 15                 | 1569 3     |
| <sup>245</sup> Es | 0       | α    | (3/2-)         | 1.1 m 1                   | 7909 3     |
|                   | 0       | EC   | (3/2-)         | 1.1 m 1                   | (3050)     |
| <sup>245</sup> Fm | 0       | α    |                | 4.2 s 13                  | (8440)     |
| <sup>245</sup> Md | 0       | α    | (7/2)          | 0.35 s +23-18             | (8440)     |
| <sup>246</sup> Pu | 0       | β-   | 0+             | 10.84 d 2                 | 401 14     |
| <sup>246</sup> Am | 0+X     | β-   | 2(-)           | 25.0 m 2                  | 2376 18    |
|                   | 0       | β-   | (7-)           | 39 m 3                    | 2376 18    |
| <sup>246</sup> Cm | 0       | α    | 0+             | 4730 y 100                | 5474.8 10  |
| <sup>246</sup> Bk | 0       | EC   | 2(-)           | 1.80 d 2                  | 1350 60    |
| <sup>246</sup> Cf | 0       | α    | 0+             | 35.7 h 5                  | 6861.6 10  |
| <sup>246</sup> Es | 0       | α    | (4-,6+)        | 7.7 m 5                   | (7740)     |
|                   | 0       | EC   | (4-,6+)        | 7.7 m 5                   | (39)       |
| <sup>246</sup> Fm | 0       | α    | 0+             | 1.1 s 2                   | 8374 14    |
| <sup>246</sup> Md | 0       | α    |                | 1.0 s 4                   | 8884 20    |
| <sup>247</sup> Pu | 0       | β-   |                | 2.27 d 23                 | (34)       |
| <sup>247</sup> Am | 0       | β-   | (5/2)          | 23.0 m 13                 | (1700)     |
| <sup>247</sup> Cm | 0       | α    | 9/2-           | 1.56×10 <sup>7</sup> y 5  | 5353 3     |
| <sup>247</sup> Bk | 0       | α    | (3/2-)         | 1380 y 250                | 5889 5     |
| <sup>247</sup> Cf | 0       | α    | (7/2+)         | 3.11 h 3                  | 6527 8     |
|                   | 0       | EC   | (7/2+)         | 3.11 h 3                  | 646 6      |
| <sup>247</sup> Es | 0       | α    | (7/2+)         | 4.55 m 26                 | (75)       |
|                   | 0       | EC   | (7/2+)         | 4.55 m 26                 | (25)       |
| <sup>247</sup> Fm | 0       | α    |                | 35 s 4                    | 8190 50    |
|                   | 0+X     | EC   |                | 35 s 4                    | (2910)     |
|                   | 150     | α    |                | 9.2 s 23                  | 8190 50    |
| <sup>247</sup> Md | 0       | α    |                | 1.12 s 22                 | (8820)     |
| <sup>248</sup> Cm | 0       | α    | 0+             | 3.40×10 <sup>5</sup> y 4  | 5161.73 25 |
| <sup>248</sup> Bk | >0      | EC   | 1(-)           | 23.7 h 2                  | 717 21     |
|                   | >0      | β-   | 1(-)           | 23.7 h 2                  | 870 20     |
| <sup>248</sup> Cf | 0       | α    | 0+             | 333.5 d 28                | 6361 5     |
| <sup>248</sup> Es | 0       | α    | (2-,0+)        | 27 m 4                    | 7166 20    |
|                   | 0       | EC   | (2-,0+)        | 27 m 4                    | 3060 60    |
| <sup>248</sup> Fm | 0       | α    | 0+             | 36 s 3                    | 8002 11    |
|                   | 0       | EC   | 0+             | 36 s 3                    | 1600 60    |
| <sup>248</sup> Md | 0       | α    |                | 7 s 3                     | (8700)     |
|                   | 0       | EC   |                | 7 s 3                     | (53)       |
| <sup>249</sup> Cm | 0       | β-   | 1/2(+)         | 64.15 m 3                 | 900 5      |
| <sup>249</sup> Bk | 0       | α    | 7/2+           | 320 d 6                   | 5525.9 10  |
|                   | 0       | β-   | 7/2+           | 320 d 6                   | 124.9 14   |
| <sup>249</sup> Cf | 0       | α    | 9/2-           | 351 y 2                   | 6295.0 7   |
| <sup>249</sup> Es | 0       | α    | 7/2(+)         | 102.2 m 6                 | (69)       |
|                   | 0       | EC   | 7/2(+)         | 102.2 m 6                 | (15)       |
| <sup>249</sup> Fm | 0       | α    | (7/2+)         | 2.6 m 7                   | (7810)     |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV) | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)     |
|-------------------|--------|------|----------------|------------------|------------|
|                   | 0      | EC   | (7/2+)         | 2.6 m 7          | (24)       |
| <sup>249</sup> Md | 0      | α    |                | 24 s 4           | (8460)     |
|                   | 0      | EC   |                | 24 s 4           | (3700)     |
| <sup>250</sup> Cm | 0      | β-   | 0+             | 9000 y           | 37 12      |
| <sup>250</sup> Bk | 0      | β-   | 2-             | 3.217 h 5        | 1780 3     |
| <sup>250</sup> Cf | 0      | α    | 0+             | 13.08 y 9        | 6128.36 20 |
| <sup>250</sup> Es | >0     | EC   | 1(-)           | 2.22 h 5         | (2100)     |
|                   | 0      | EC   | (6+)           | 8.6 h 1          | (2100)     |
| <sup>250</sup> Fm | 0      | α    | 0+             | 30 m 3           | 7557 12    |
| <sup>250</sup> Md | 0      | α    |                | 52 s 6           | (8310)     |
|                   | 0      | EC   |                | 52 s 6           | (4600)     |
| <sup>251</sup> Cm | 0      | β-   | (1/2+)         | 16.8 m 2         | 1420 20    |
| <sup>251</sup> Bk | 0      | β-   | (3/2-)         | 55.6 m 11        | 1093 10    |
| <sup>251</sup> Cf | 0      | α    | 1/2+           | 898 y 44         | 6175.8 10  |
| <sup>251</sup> Es | 0      | α    | (3/2-)         | 33 h 1           | 6597 3     |
|                   | 0      | EC   | (3/2-)         | 33 h 1           | 376 7      |
| <sup>251</sup> Fm | 0      | α    | (9/2-)         | 5.30 h 8         | 7425.1 20  |
|                   | 0      | EC   | (9/2-)         | 5.30 h 8         | 1474 7     |
| <sup>251</sup> Md | 0      | α    |                | 4.0 m 5          | (8020)     |
|                   | 0      | EC   |                | 4.0 m 5          | (31)       |
| <sup>251</sup> No | 0      | α    |                | 0.8 s 3          | (89)       |
| <sup>252</sup> Cm | 0      | β-   | 0+             | <2 d             |            |
| <sup>252</sup> Cf | 0      | α    | 0+             | 2.645 y 8        | 6216.87 4  |
| <sup>252</sup> Es | 0      | α    | (5-)           | 471.7 d 19       | 6760 50    |
|                   | 0      | EC   | (5-)           | 471.7 d 19       | 1260 50    |
| <sup>252</sup> Fm | 0      | α    | 0+             | 25.39 h 5        | 7152.6 20  |
| <sup>252</sup> Md | 0      | EC   |                | 2.3 m 8          | (39)       |
| <sup>252</sup> No | 0      | α    | 0+             | 2.30 s 22        | 8549 5     |
| <sup>253</sup> Cf | 0      | α    | (7/2+)         | 17.81 d 8        | 6124 5     |
|                   | 0      | β-   | (7/2+)         | 17.81 d 8        | 285 7      |
| <sup>253</sup> Es | 0      | α    | 7/2+           | 20.47 d 3        | 6739.16 5  |
| <sup>253</sup> Fm | 0      | α    | 1/2+           | 3.00 d 12        | 7197 4     |
|                   | 0      | EC   | 1/2+           | 3.00 d 12        | 333 4      |
| <sup>253</sup> Md | 0      | EC   |                | 6 m              | (1960)     |
| <sup>253</sup> No | 0+X    | α    | (9/2-)         | 1.7 m 3          | (8440)     |
|                   | 0+X    | EC   | (9/2-)         | 1.7 m 3          | (32)       |
| <sup>253</sup> Lr | 0      | α    |                | 1.3 s +6-3       | (90)       |
| <sup>254</sup> Cf | 0      | α    | 0+             | 60.5 d 2         | 5926 5     |
| <sup>254</sup> Es | 0      | α    | (7+)           | 275.7 d 5        | 6618.0 21  |
|                   | 0      | β-   | (7+)           | 275.7 d 5        | 1090 4     |
|                   | 78 2   | α    | 2+             | 39.3 h 2         | 6618.0 21  |
|                   | 78 2   | EC   | 2+             | 39.3 h 2         | 654 13     |
|                   | 78 2   | β-   | 2+             | 39.3 h 2         | 1090 4     |
| <sup>254</sup> Fm | 0      | α    | 0+             | 3.240 h 2        | 7307.2 20  |
| <sup>254</sup> Md | 0+X    | EC   |                | 10 m 3           | (27)       |
|                   | 0+Y    | EC   |                | 28 m 8           | (27)       |
| <sup>254</sup> No | 0      | α    | 0+             | 55 s 3           | 8226 13    |
| <sup>254</sup> Lr | 0      | α    |                | 13 s 2           | (8750)     |
| <sup>255</sup> Cf | 0      | β-   | (9/2+)         | 85 m 18          | (700)      |
| <sup>255</sup> Es | 0      | α    | (7/2+)         | 39.8 d 12        | 6435.6 15  |
|                   | 0      | β-   | (7/2+)         | 39.8 d 12        | 288 10     |
| <sup>255</sup> Fm | 0      | α    | 7/2+           | 20.07 h 7        | 7240.6 14  |
| <sup>255</sup> Md | 0      | α    | (7/2-)         | 27 m 2           | 7907 4     |
|                   | 0      | EC   | (7/2-)         | 27 m 2           | 1042 8     |
| <sup>255</sup> No | 0      | α    | (1/2+)         | 3.1 m 2          | 8445 9     |
|                   | 0      | EC   | (1/2+)         | 3.1 m 2          | 2012 12    |
| <sup>255</sup> Lr | 0      | α    |                | 22 s 4           | (8620)     |
| <sup>255</sup> Rf | 0      | α    | (9/2-)         | 1.5 s 2          | (9300)     |
| <sup>256</sup> Es | 0+X    | β-   | (8+)           | 7.6 h            | (1670)     |
|                   | 0      | β-   | (1+)           | 25.4 m 24        | (1670)     |
| <sup>256</sup> Fm | 0      | α    | 0+             | 157.6 m 13       | 7027 5     |
| <sup>256</sup> Md | 0      | α    | (0-,1-)        | 78.1 m 18        | 7897 16    |
|                   | 0      | EC   | (0-,1-)        | 78.1 m 18        | 2130 50    |

Parent Nuclides from the *Table of Isotopes*

| Parent            | E(keV) | Mode | J <sup>π</sup> | t <sub>1/2</sub> | Q(keV)    |
|-------------------|--------|------|----------------|------------------|-----------|
| <sup>256</sup> No | 0      | α    | 0+             | 3.3 s 2          | 8581 5    |
| <sup>256</sup> Lr | 0      | α    |                | 28 s 3           | (8880)    |
|                   | 0      | EC   |                | 28 s 3           | (42)      |
| <sup>256</sup> Rf | 0      | α    | 0+             | 6.7 ms 2         | 8952 23   |
| <sup>256</sup> Ha | 0      | EC   |                | 2.6 s +14-8      | (60)      |
| <sup>257</sup> Fm | 0      | α    | (9/2+)         | 100.5 d 2        | 6863.8 14 |
| <sup>257</sup> Md | 0      | α    | (7/2-)         | 5.52 h 5         | 7557.6 10 |
|                   | 0      | EC   | (7/2-)         | 5.52 h 5         | 409 8     |
| <sup>257</sup> No | 0      | α    | (7/2+)         | 25 s 2           | 8450 30   |
| <sup>257</sup> Lr | 0      | α    | (9/2+)         | 0.646 s 25       | 9010 50   |
| <sup>257</sup> Rf | 0      | α    | (7/2+)         | 4.7 s 3          | (9250)    |
|                   | 0      | EC   | (7/2+)         | 4.7 s 3          | (34)      |
| <sup>257</sup> Ha | 0      | α    |                | 1.3 s +5-3       | (93)      |
| <sup>258</sup> Md | 0      | α    | (8-)           | 51.5 d 3         | 7271.2 19 |
|                   | 0+X    | EC   | (1-)           | 57.0 m 9         | (1230)    |
| <sup>258</sup> Lr | 0      | α    |                | 3.9 s +4-3       | 8900 20   |
| <sup>258</sup> Rf | 0      | α    | 0+             | 12 ms 2          | (9250)    |
| <sup>258</sup> Ha | 0      | α    |                | 4.4 s +9-6       | (96)      |
|                   | 0      | EC   |                | 4.4 s +9-6       | (54)      |
|                   | 0+X    | EC   |                | 20 s 10          | (54)      |
| <sup>259</sup> n  | 0      | α    | (1/2+)         | 0.48 s +28-13    | (9870)    |
| <sup>259</sup> No | 0      | α    | (9/2+)         | 58 m 5           | (7910)    |
|                   | 0      | EC   | (9/2+)         | 58 m 5           | (500)     |
| <sup>259</sup> Lr | 0      | α    |                | 6.3 s +5-4       | (87)      |
| <sup>259</sup> Rf | 0      | α    |                | 3.1 s 7          | (91)      |
| <sup>260</sup> n  | 0      | α    | 0+             | 3.6 ms +9-6      | 9920 30   |
| <sup>260</sup> Lr | 0      | α    |                | 180 s 30         | (8310)    |
|                   | 0      | EC   |                | 180 s 30         | (27)      |
| <sup>260</sup> Ha | 0      | α    |                | 1.52 s 13        | 9370 70   |
| <sup>261</sup> n  | 0      | α    |                | 0.23 s 3         | (98)      |
| <sup>261</sup> Rf | 0      | α    |                | 65 s 10          | (8810)    |
| <sup>261</sup> Ha | 0      | α    |                | 1.8 s 4          | (9270)    |
| <sup>261</sup> Ns | 0      | α    |                | 11.8 ms +53-28   | 10560 50  |
| <sup>262</sup> Ha | 0      | α    |                | 34 s 4           | (9210)    |
|                   | 0      | EC   |                | 34 s 4           | (40)      |
| <sup>262</sup> Ns | 0      | α    |                | 102 ms 26        | (10420)   |
|                   | 120    | α    |                | 8.0 ms 21        | (10420)   |
| <sup>263</sup> n  | 0+X    | α    |                | 0.8 s 2          | (9690)    |
|                   | 0+Y    | α    |                | 0.31 s +16-8     | (9690)    |
| <sup>263</sup> Ha | 0      | α    |                | 27 s +10-7       | (9030)    |
| <sup>264</sup> Ns | 0      | α    |                | 0.44 s +60-16    | 9767 20   |
| <sup>264</sup> Hs | 0      | α    | 0+             | 0.85 s           |           |
| <sup>265</sup> Hs | 0+X    | α    |                | 0.9 ms +9-3      | (10820)   |
|                   | 0+Y    | α    |                | 1.6 ms           | (10820)   |
| <sup>266</sup> Mt | 0      | α    |                | 3.4 ms +16-13    | (11280)   |
| <sup>267</sup> Hs | 0+X    | α    |                | 60 ms +30-15     | 10030 20  |
| <sup>268</sup> Mt | 0      | α    |                | 0.07 s +10-3     | 10395 20  |
| <sup>269</sup> n  | 0      | α    |                | 0.17 ms +16-6    | 11280 20  |
| <sup>271</sup> n  | 0+X    | α    |                | 1.1 ms +6-3      | 10900 20  |
|                   | 0+Y    | α    |                | 0.06 s +26-3     | 10900 20  |
| <sup>272</sup> n  | 0      | α    |                | 1.5 ms +20-5     | 10980 20  |