

# Periodic Table and X-Ray Energies



|                                      |  |                                       |   |   |  |  |                                       |                                     |                                       |                                    |                                     |                                    |                                      |                                      |                                       |                                    |                                    |                                      |                                      |                                       |  |                                      |   |  |                                       |   |   |   |                                      |   |   |   |   |  |   |  |  |  |  |
|--------------------------------------|--|---------------------------------------|---|---|--|--|---------------------------------------|-------------------------------------|---------------------------------------|------------------------------------|-------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|--|--------------------------------------|---|--|---------------------------------------|---|---|---|--------------------------------------|---|---|---|---|--|---|--|--|--|--|
| IA<br><b>H</b><br>1<br>Hydrogen      | Alkali Metals<br>Alkaline Earth Metals |                                       |   |   |  |  |                                       |                                     |                                       |                                    |                                     |                                    |                                      |                                      |                                       |                                    |                                    |                                      |                                      |                                       | VIIIA<br><b>He</b><br>2<br>Helium          |                                      |   |  |                                       |   |   |   |                                      |   |   |   |   |  |   |  |  |  |  |
| IIA<br><b>Li</b><br>3<br>Lithium     |  | IIA<br><b>Be</b><br>4<br>Beryllium    |   | Key To Energy Values<br>$\begin{matrix} K_{\alpha} & K_{\beta} \\ \text{Cd} \\ L_{\alpha} & L_{\beta} \end{matrix}$ |  |  |                                       |                                     |                                       |                                    |                                     |                                    |                                      |                                      |                                       |                                    |                                    |                                      |                                      |                                       |  | IIIA<br><b>B</b><br>5<br>Boron       | IVA<br><b>C</b><br>6<br>Carbon          | VA<br><b>N</b><br>7<br>Nitrogen          | VIA<br><b>O</b><br>8<br>Oxygen        | VIIA<br><b>F</b><br>9<br>Fluorine       | VIIA<br><b>Ne</b><br>10<br>Neon         |   |                                      |   |   |   |   |  |   |  |  |  |  |
| IIA<br><b>Na</b><br>11<br>Sodium     |  | IIA<br><b>Mg</b><br>12<br>Magnesium   |   |   |  |  |                                       |                                     |                                       |                                    |                                     |                                    |                                      |                                      |                                       |                                    |                                    |                                      |                                      |                                       |  | IIIA<br><b>Al</b><br>13<br>Aluminum  | IVA<br><b>Si</b><br>14<br>Silicon       | VA<br><b>P</b><br>15<br>Phosphorus       | VIA<br><b>S</b><br>16<br>Sulfur       | VIIA<br><b>Cl</b><br>17<br>Chlorine     | VIIA<br><b>Ar</b><br>18<br>Argon        |   |                                      |   |   |   |   |  |   |  |  |  |  |
| 3.31<br><b>K</b><br>19<br>Potassium  | 3.61<br><b>Ca</b><br>20<br>Calcium     | 3.69<br><b>Sc</b><br>21<br>Scandium   | 4.04<br><b>Ti</b><br>22<br>Titanium         | 4.09<br><b>V</b><br>23<br>Vanadium  | 4.46<br><b>Cr</b><br>24<br>Chromium      | 4.51<br><b>Mn</b><br>25<br>Manganese   | 4.93<br><b>Fe</b><br>26<br>Iron       | 4.95<br><b>Co</b><br>27<br>Cobalt   | 5.43<br><b>Ni</b><br>28<br>Nickel     | 5.41<br><b>Cu</b><br>29<br>Copper  | 5.95<br><b>Zn</b><br>30<br>Zinc     | 5.90<br><b>Ga</b><br>31<br>Gallium | 6.49<br><b>Ge</b><br>32<br>Germanium | 6.40<br><b>As</b><br>33<br>Arsenic   | 7.06<br><b>Se</b><br>34<br>Selenium   | 6.93<br><b>Br</b><br>35<br>Bromine | 7.65<br><b>Kr</b><br>36<br>Krypton | 7.48<br><b>Rb</b><br>37<br>Rubidium  | 8.26<br><b>Sr</b><br>38<br>Strontium | 8.05<br><b>Y</b><br>39<br>Yttrium     | 8.90<br><b>Zr</b><br>40<br>Zirconium       | 8.64<br><b>Nb</b><br>41<br>Niobium   | 9.57<br><b>Mo</b><br>42<br>Molybdenum   | 9.25<br><b>Tc</b><br>43<br>Technetium    | 10.26<br><b>Ru</b><br>44<br>Ruthenium | 9.89<br><b>Rh</b><br>45<br>Rhodium      | 10.98<br><b>Pd</b><br>46<br>Palladium   | 10.54<br><b>Ag</b><br>47<br>Silver      | 11.73<br><b>Cd</b><br>48<br>Cadmium  | 11.22<br><b>In</b><br>49<br>Indium      | 12.50<br><b>Sn</b><br>50<br>Tin         | 11.92<br><b>Sb</b><br>51<br>Antimony    | 13.29<br><b>Te</b><br>52<br>Tellurium   | 12.65<br><b>I</b><br>53<br>Iodine      | 14.11<br><b>Xe</b><br>54<br>Xenon       |  |  |  |  |
| 13.39<br><b>Rb</b><br>37<br>Rubidium | 14.96<br><b>Sr</b><br>38<br>Strontium  | 14.16<br><b>Y</b><br>39<br>Yttrium    | 15.83<br><b>Zr</b><br>40<br>Zirconium       | 14.96<br><b>Nb</b><br>41<br>Niobium   | 16.74<br><b>Mo</b><br>42<br>Molybdenum   | 15.77<br><b>Tc</b><br>43<br>Technetium | 17.67<br><b>Ru</b><br>44<br>Ruthenium | 16.61<br><b>Rh</b><br>45<br>Rhodium | 18.62<br><b>Pd</b><br>46<br>Palladium | 17.48<br><b>Ag</b><br>47<br>Silver | 19.61<br><b>Cd</b><br>48<br>Cadmium | 18.41<br><b>In</b><br>49<br>Indium | 20.59<br><b>Sn</b><br>50<br>Tin      | 19.28<br><b>Sb</b><br>51<br>Antimony | 21.66<br><b>Te</b><br>52<br>Tellurium | 20.21<br><b>I</b><br>53<br>Iodine  | 22.72<br><b>Xe</b><br>54<br>Xenon  | 21.18<br><b>Cs</b><br>55<br>Cesium   | 23.82<br><b>Ba</b><br>56<br>Barium   | 22.16<br><b>La</b><br>57<br>Lanthanum | 24.94<br><b>Hf</b><br>72<br>Hafnium        | 23.17<br><b>Nb</b><br>73<br>Niobium  | 26.09<br><b>Mo</b><br>74<br>Molybdenum  | 24.21<br><b>Tc</b><br>75<br>Technetium   | 27.27<br><b>Ru</b><br>76<br>Ruthenium | 25.27<br><b>Rh</b><br>77<br>Rhodium     | 28.48<br><b>Pd</b><br>78<br>Palladium   | 26.36<br><b>Ag</b><br>79<br>Silver      | 29.72<br><b>Cd</b><br>80<br>Cadmium  | 27.47<br><b>In</b><br>81<br>Indium      | 30.99<br><b>Sn</b><br>82<br>Tin         | 28.61<br><b>Sb</b><br>83<br>Antimony    | 32.29<br><b>Te</b><br>84<br>Tellurium   | 29.80<br><b>I</b><br>85<br>Iodine      | 33.64<br><b>Xe</b><br>86<br>Xenon       |  |  |  |  |
| 30.97<br><b>Cs</b><br>55<br>Cesium   | 34.98<br><b>Ba</b><br>56<br>Barium     | 32.19<br><b>La</b><br>57<br>Lanthanum | 36.38<br><b>Hf</b><br>72<br>Hafnium         | 33.44<br><b>Nb</b><br>73<br>Niobium   | 37.80<br><b>Mo</b><br>74<br>Molybdenum   | 55.76<br><b>Tc</b><br>75<br>Technetium | 63.21<br><b>Ru</b><br>76<br>Ruthenium | 57.52<br><b>Rh</b><br>77<br>Rhodium | 65.21<br><b>Pd</b><br>78<br>Palladium | 59.31<br><b>Ag</b><br>79<br>Silver | 67.23<br><b>Cd</b><br>80<br>Cadmium | 61.13<br><b>In</b><br>81<br>Indium | 69.30<br><b>Sn</b><br>82<br>Tin      | 62.99<br><b>Sb</b><br>83<br>Antimony | 71.40<br><b>Te</b><br>84<br>Tellurium | 64.89<br><b>I</b><br>85<br>Iodine  | 73.54<br><b>Xe</b><br>86<br>Xenon  | 66.82<br><b>Fr</b><br>87<br>Francium | 75.74<br><b>Ra</b><br>88<br>Radium   | 68.79<br><b>Ac</b><br>89<br>Actinium  | 77.97<br><b>Rf</b><br>104<br>Rutherfordium | 70.82<br><b>Nb</b><br>105<br>Hahnium | 80.26<br><b>Mo</b><br>106<br>Seaborgium | 72.86<br><b>Tc</b><br>107<br>Neilsborium | 82.56<br><b>Ru</b><br>108<br>Hassium  | 74.96<br><b>Rh</b><br>109<br>Meitnerium | 84.92<br><b>Pd</b><br>110<br>Ununnilium | 77.10<br><b>Ag</b><br>111<br>Ununnilium | 87.34<br><b>Cd</b><br>112<br>Element | 79.30<br><b>In</b><br>113<br>Ununnilium | 89.81<br><b>Sn</b><br>114<br>Ununnilium | 81.53<br><b>Sb</b><br>115<br>Ununnilium | 92.32<br><b>Te</b><br>116<br>Ununnilium | 83.80<br><b>I</b><br>117<br>Ununnilium | 94.88<br><b>Xe</b><br>118<br>Ununnilium |  |  |  |  |
| 86.12<br><b>Fr</b><br>87<br>Francium | 97.48<br><b>Ra</b><br>88<br>Radium     | 88.49<br><b>Ac</b><br>89<br>Actinium  | 101.14<br><b>Rf</b><br>104<br>Rutherfordium | 90.89<br><b>Nb</b><br>105<br>Hahnium  | 102.85<br><b>Mo</b><br>106<br>Seaborgium |  |                                       |                                     |                                       |                                    |                                     |                                    |                                      |                                      |                                       |                                    |                                    |                                      |                                      |                                       |  |                                      |   |  |                                       |   |   |   |                                      |   |   |   |   |  |   |  |  |  |  |

Lanthanide Series

Actinide Series

|                                     |   |                                       |  |                                       |  |  |  |  |  |                                       |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------------------|---|---------------------------------------|--|---------------------------------------|--|--|--|--|--|---------------------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 34.72<br><b>Ce</b><br>58<br>Cerium  | 39.26<br><b>Pr</b><br>59<br>Praseodymium  | 36.02<br><b>Nd</b><br>60<br>Neodymium | 40.75<br><b>Pm</b><br>61<br>Promethium | 37.36<br><b>Sm</b><br>62<br>Samarium  | 42.27<br><b>Eu</b><br>63<br>Europium   | 38.65<br><b>Gd</b><br>64<br>Gadolinium | 43.95<br><b>Tb</b><br>65<br>Terbium    | 40.12<br><b>Dy</b><br>66<br>Dysprosium   | 45.40<br><b>Ho</b><br>67<br>Holmium      | 42.98<br><b>Er</b><br>68<br>Erbium    | 48.72<br><b>Tm</b><br>69<br>Thulium       | 44.47<br><b>Yb</b><br>70<br>Ytterbium  | 50.39<br><b>Lu</b><br>71<br>Lutetium     | 45.99<br><b>Ce</b><br>90<br>Thorium        | 52.18<br><b>Pr</b><br>91<br>Protactinium   | 47.53<br><b>Nd</b><br>92<br>Uranium        | 53.93<br><b>Pm</b><br>93<br>Neptunium      | 49.10<br><b>Sm</b><br>94<br>Plutonium      | 55.69<br><b>Eu</b><br>95<br>Americium      | 50.73<br><b>Gd</b><br>96<br>Curium         | 57.58<br><b>Tb</b><br>97<br>Berkelium      | 52.36<br><b>Dy</b><br>98<br>Californium    | 59.35<br><b>Ho</b><br>99<br>Einsteinium    | 51.06<br><b>Er</b><br>100<br>Fermium       | 61.28<br><b>Tm</b><br>101<br>Mendelevium   | 57.65<br><b>Yb</b><br>102<br>Nobelium      | 61.28<br><b>Lu</b><br>103<br>Lawrencium    |
| 93.33<br><b>Th</b><br>90<br>Thorium | 105.59<br><b>Pa</b><br>91<br>Protactinium | 95.85<br><b>U</b><br>92<br>Uranium    | 108.41<br><b>Np</b><br>93<br>Neptunium | 98.43<br><b>Pu</b><br>94<br>Plutonium | 111.29<br><b>Am</b><br>95<br>Americium | 101.01<br><b>Cm</b><br>96<br>Curium    | 114.18<br><b>Bk</b><br>97<br>Berkelium | 103.65<br><b>Cf</b><br>98<br>Californium | 117.15<br><b>Es</b><br>99<br>Einsteinium | 106.35<br><b>Fm</b><br>100<br>Fermium | 120.16<br><b>Md</b><br>101<br>Mendelevium | 109.10<br><b>No</b><br>102<br>Nobelium | 123.24<br><b>Lr</b><br>103<br>Lawrencium | 111.90<br><b>Th</b><br>117<br>Unseptennium | 126.36<br><b>Pa</b><br>118<br>Unseptennium | 114.75<br><b>Nd</b><br>119<br>Unseptennium | 129.54<br><b>Pm</b><br>120<br>Unseptennium | 117.65<br><b>Sm</b><br>121<br>Unseptennium | 132.78<br><b>Eu</b><br>122<br>Unseptennium | 120.60<br><b>Gd</b><br>123<br>Unseptennium | 136.08<br><b>Tb</b><br>124<br>Unseptennium | 116.85<br><b>Dy</b><br>125<br>Unseptennium | 132.78<br><b>Ho</b><br>126<br>Unseptennium | 120.60<br><b>Er</b><br>127<br>Unseptennium | 136.08<br><b>Tm</b><br>128<br>Unseptennium | 116.85<br><b>Yb</b><br>129<br>Unseptennium | 132.78<br><b>Lu</b><br>130<br>Unseptennium |

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