

|                                       |  |                                       |   |  |  |   |  |                                      |   |  |                                       |  |   |  |  |                                       |                                      |                                   |
|---------------------------------------|--|---------------------------------------|---|--|--|---|--|--------------------------------------|---|--|---------------------------------------|--|---|--|--|---------------------------------------|--------------------------------------|-----------------------------------|
| hydrogen<br>1<br><b>H</b><br>1.0079   |  |                                       |   |  |  |   |  |                                      |   |  |                                       |  |   |  |  |                                       | helium<br>2<br><b>He</b><br>4.0026   |                                   |
| lithium<br>3<br><b>Li</b><br>6.941    | beryllium<br>4<br><b>Be</b><br>9.0122  |                                       |   |  |  |   |  |                                      |   |  |                                       | boron<br>5<br><b>B</b><br>10.811       | carbon<br>6<br><b>C</b><br>12.011         | nitrogen<br>7<br><b>N</b><br>14.007    | oxygen<br>8<br><b>O</b><br>15.999      | fluorine<br>9<br><b>F</b><br>18.998   | neon<br>10<br><b>Ne</b><br>20.180    |                                   |
| sodium<br>11<br><b>Na</b><br>22.990   | magnesium<br>12<br><b>Mg</b><br>24.305 |                                       |   |  |  |   |  |                                      |   |  |                                       | aluminium<br>13<br><b>Al</b><br>26.982 | silicon<br>14<br><b>Si</b><br>28.086      | phosphorus<br>15<br><b>P</b><br>30.974 | sulfur<br>16<br><b>S</b><br>32.065     | chlorine<br>17<br><b>Cl</b><br>35.453 | argon<br>18<br><b>Ar</b><br>39.948   |                                   |
| potassium<br>19<br><b>K</b><br>39.098 | calcium<br>20<br><b>Ca</b><br>40.078   | scandium<br>21<br><b>Sc</b><br>44.956 | titanium<br>22<br><b>Ti</b><br>47.867   | vanadium<br>23<br><b>V</b><br>50.942       | chromium<br>24<br><b>Cr</b><br>51.996  | manganese<br>25<br><b>Mn</b><br>54.938  | iron<br>26<br><b>Fe</b><br>55.845      | cobalt<br>27<br><b>Co</b><br>58.933  | nickel<br>28<br><b>Ni</b><br>58.693     | copper<br>29<br><b>Cu</b><br>63.546    | zinc<br>30<br><b>Zn</b><br>65.39      | gallium<br>31<br><b>Ga</b><br>69.723   | germanium<br>32<br><b>Ge</b><br>72.61     | arsenic<br>33<br><b>As</b><br>74.922   | selenium<br>34<br><b>Se</b><br>78.96   | bromine<br>35<br><b>Br</b><br>79.904  | krypton<br>36<br><b>Kr</b><br>83.80  |                                   |
| rubidium<br>37<br><b>Rb</b><br>85.468 | strontium<br>38<br><b>Sr</b><br>87.62  | yttrium<br>39<br><b>Y</b><br>88.906   | zirconium<br>40<br><b>Zr</b><br>91.224  | niobium<br>41<br><b>Nb</b><br>92.906       | molybdenum<br>42<br><b>Mo</b><br>95.94 | technetium<br>43<br><b>Tc</b><br>[98]   | ruthenium<br>44<br><b>Ru</b><br>101.07 | rhodium<br>45<br><b>Rh</b><br>102.91 | palladium<br>46<br><b>Pd</b><br>106.42  | silver<br>47<br><b>Ag</b><br>107.87    | cadmium<br>48<br><b>Cd</b><br>112.41  | indium<br>49<br><b>In</b><br>114.82    | tin<br>50<br><b>Sn</b><br>118.71          | antimony<br>51<br><b>Sb</b><br>121.76  | tellurium<br>52<br><b>Te</b><br>127.60 | iodine<br>53<br><b>I</b><br>126.90    | xenon<br>54<br><b>Xe</b><br>131.29   |                                   |
| caesium<br>55<br><b>Cs</b><br>132.91  | barium<br>56<br><b>Ba</b><br>137.33    | 57-70<br>*                            | lutetium<br>71<br><b>Lu</b><br>174.97   | hafnium<br>72<br><b>Hf</b><br>178.49       | tantalum<br>73<br><b>Ta</b><br>180.95  | tungsten<br>74<br><b>W</b><br>183.84    | rhenium<br>75<br><b>Re</b><br>186.21   | osmium<br>76<br><b>Os</b><br>190.23  | iridium<br>77<br><b>Ir</b><br>192.22    | platinum<br>78<br><b>Pt</b><br>195.08  | gold<br>79<br><b>Au</b><br>196.97     | mercury<br>80<br><b>Hg</b><br>200.59   | thallium<br>81<br><b>Tl</b><br>204.38     | lead<br>82<br><b>Pb</b><br>207.2       | bismuth<br>83<br><b>Bi</b><br>208.98   | polonium<br>84<br><b>Po</b><br>[209]  | astatine<br>85<br><b>At</b><br>[210] | radon<br>86<br><b>Rn</b><br>[222] |
| francium<br>87<br><b>Fr</b><br>[223]  | radium<br>88<br><b>Ra</b><br>[226]     | 89-102<br>**                          | lawrencium<br>103<br><b>Lr</b><br>[262] | rutherfordium<br>104<br><b>Rf</b><br>[261] | dubnium<br>105<br><b>Db</b><br>[262]   | seaborgium<br>106<br><b>Sg</b><br>[266] | bohrium<br>107<br><b>Bh</b><br>[264]   | hassium<br>108<br><b>Hs</b><br>[269] | meitnerium<br>109<br><b>Mt</b><br>[268] | ununnium<br>110<br><b>Uun</b><br>[271] | ununium<br>111<br><b>Uuu</b><br>[272] | unubium<br>112<br><b>Uub</b><br>[277]  | ununquadium<br>114<br><b>Uuq</b><br>[289] |  |  |                                       |                                      |                                   |

\* Lanthanide series

|  |                                     |   |  |  |                                       |                                       |   |                                      |   |                                      |                                     |                                      |  |
|--|-------------------------------------|---|--|--|---------------------------------------|---------------------------------------|---|--------------------------------------|---|--------------------------------------|-------------------------------------|--------------------------------------|--|
| lanthanum<br>57<br><b>La</b><br>138.91 | cerium<br>58<br><b>Ce</b><br>140.12 | praseodymium<br>59<br><b>Pr</b><br>140.91 | neodymium<br>60<br><b>Nd</b><br>144.24 | promethium<br>61<br><b>Pm</b><br>[145] | samarium<br>62<br><b>Sm</b><br>150.36 | europium<br>63<br><b>Eu</b><br>151.96 | gadolinium<br>64<br><b>Gd</b><br>157.25 | terbium<br>65<br><b>Tb</b><br>158.93 | dysprosium<br>66<br><b>Dy</b><br>162.50 | holmium<br>67<br><b>Ho</b><br>164.93 | erbium<br>68<br><b>Er</b><br>167.26 | thulium<br>69<br><b>Tm</b><br>168.93 | ytterbium<br>70<br><b>Yb</b><br>173.04 |
|--|-------------------------------------|---|--|--|---------------------------------------|---------------------------------------|---|--------------------------------------|---|--------------------------------------|-------------------------------------|--------------------------------------|--|

\*\* Actinide series

|                                      |                                      |   |                                     |                                       |                                       |                                       |                                    |                                       |   |   |                                      |  |                                       |
|--------------------------------------|--------------------------------------|---|-------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|---------------------------------------|---|---|--------------------------------------|--|---------------------------------------|
| actinium<br>89<br><b>Ac</b><br>[227] | thorium<br>90<br><b>Th</b><br>232.04 | protactinium<br>91<br><b>Pa</b><br>231.04 | uranium<br>92<br><b>U</b><br>238.03 | neptunium<br>93<br><b>Np</b><br>[237] | plutonium<br>94<br><b>Pu</b><br>[244] | americium<br>95<br><b>Am</b><br>[243] | curium<br>96<br><b>Cm</b><br>[247] | berkelium<br>97<br><b>Bk</b><br>[247] | californium<br>98<br><b>Cf</b><br>[251] | einsteinium<br>99<br><b>Es</b><br>[252] | fermium<br>100<br><b>Fm</b><br>[257] | mendelevium<br>101<br><b>Md</b><br>[258] | nobelium<br>102<br><b>No</b><br>[259] |
|--------------------------------------|--------------------------------------|---|-------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|---------------------------------------|---|---|--------------------------------------|--|---------------------------------------|