

# PERIODIC TABLE OF HUMAN EMOTIONS

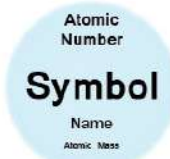
## KEY



|                         |                         |                         |                           |                              |                         |                          |                             |                             |                          |                       |                         |                      |                     |                    |                         |
|-------------------------|-------------------------|-------------------------|---------------------------|------------------------------|-------------------------|--------------------------|-----------------------------|-----------------------------|--------------------------|-----------------------|-------------------------|----------------------|---------------------|--------------------|-------------------------|
| <b>LO</b><br>love       |                         |                         |                           |                              |                         |                          |                             |                             |                          |                       | <b>FE</b><br>fear       |                      |                     |                    |                         |
| <b>GR</b><br>gratitude  | <b>TS</b><br>trust      |                         |                           |                              |                         |                          |                             |                             |                          |                       |                         | <b>NE</b><br>nervous | <b>SS</b><br>stress |                    |                         |
| <b>AD</b><br>admiration | <b>CO</b><br>compassion | <b>DI</b><br>disgust    | <b>CT</b><br>contempt     |                              |                         |                          |                             |                             |                          |                       |                         |                      |                     | <b>SM</b><br>shame | <b>SB</b><br>submission |
| <b>TE</b><br>tenderness | <b>SE</b><br>serenity   | <b>DE</b><br>desire     | <b>OP</b><br>optimism     | <b>AN</b><br>anger           | <b>EV</b><br>envy       | <b>BM</b><br>bad mood    | <b>SA</b><br>sadness        | <b>AB</b><br>abandonment    | <b>LN</b><br>loneliness  | <b>SH</b><br>shy      | <b>TR</b><br>terror     |                      |                     |                    |                         |
| <b>PR</b><br>pride      | <b>EM</b><br>empathy    | <b>EN</b><br>enthusiasm | <b>HA</b><br>happiness    | <b>RB</b><br>rebellion       | <b>RE</b><br>resentment | <b>HT</b><br>hate        | <b>DS</b><br>disappointment | <b>WE</b><br>weariness      | <b>BO</b><br>boredom     | <b>DR</b><br>dread    | <b>IN</b><br>insecurity |                      |                     |                    |                         |
| <b>SY</b><br>sympathy   | <b>HO</b><br>hope       | <b>EA</b><br>ease       | <b>ST</b><br>satisfaction | <b>IC</b><br>incomprehension | <b>AR</b><br>arrogance  | <b>FR</b><br>frustration | <b>PE</b><br>pessimism      | <b>BL</b><br>blame          | <b>ME</b><br>melancholia | <b>SU</b><br>surprise | <b>SP</b><br>suspicion  |                      |                     |                    |                         |
| <b>JO</b><br>joy        | <b>EU</b><br>euphoria   | <b>PL</b><br>pleasure   | <b>EC</b><br>ecstasy      | <b>JE</b><br>jealousy        | <b>HS</b><br>hostility  | <b>RA</b><br>rage        | <b>RS</b><br>resignation    | <b>DC</b><br>discouragement | <b>NO</b><br>nostalgia   | <b>IT</b><br>interest | <b>CF</b><br>confusion  |                      |                     |                    |                         |

# Periodic Table of the Elements

|                                       |  |                                     |  |  |   |   |  |   |   |  |  |   |  |  |  |   |  |                                    |
|---------------------------------------|--|-------------------------------------|--|--|---|---|--|---|---|--|--|---|--|--|--|---|--|------------------------------------|
| 1<br>IA<br>1A                         |  |                                     |  |  |   |   |  |   |   |  |  |   |  |  |  |   | 18<br>VIIIA<br>8A                        |                                    |
| 1<br><b>H</b><br>Hydrogen<br>1.008    |  |                                     |  |  |   |   |  |   |   |  |  |   |  |  |  |   | 2<br><b>He</b><br>Helium<br>4.003        |                                    |
| 3<br><b>Li</b><br>Lithium<br>6.941    | 4<br><b>Be</b><br>Beryllium<br>9.012   |                                     |  |  |   |   |  |   |   |  |  |   |  |  |  |   |  | 10<br><b>Ne</b><br>Neon<br>20.180  |
| 11<br><b>Na</b><br>Sodium<br>22.990   | 12<br><b>Mg</b><br>Magnesium<br>24.305 |                                     |  |  |   |   |  |   |   |  |  |   |  |  |  |   |  | 18<br><b>Ar</b><br>Argon<br>39.948 |
| 19<br><b>K</b><br>Potassium<br>39.098 | 20<br><b>Ca</b><br>Calcium<br>40.078   | 3<br>IIIB<br>3B                     | 4<br>IVB<br>4B                             | 5<br>VB<br>5B                          | 6<br>VIB<br>6B                          | 7<br>VIIB<br>7B                         | 8<br>VIII<br>8                         | 9<br>VIII<br>8                          | 10<br>VIII<br>8                           | 11<br>IB<br>1B                           | 12<br>IIB<br>2B                          | 13<br>IIIA<br>3A                        | 14<br>IVA<br>4A                        | 15<br>VA<br>5A                           | 16<br>VIA<br>6A                          | 17<br>VIIA<br>7A                          | 18<br><b>Ar</b><br>Argon<br>39.948       |                                    |
| 37<br><b>Rb</b><br>Rubidium<br>84.468 | 38<br><b>Sr</b><br>Strontium<br>87.62  | 39<br><b>Y</b><br>Yttrium<br>88.906 | 40<br><b>Zr</b><br>Zirconium<br>91.224     | 41<br><b>Nb</b><br>Niobium<br>92.906   | 42<br><b>Mo</b><br>Molybdenum<br>95.96  | 43<br><b>Tc</b><br>Technetium<br>98.907 | 44<br><b>Ru</b><br>Ruthenium<br>101.07 | 45<br><b>Rh</b><br>Rhodium<br>102.905   | 46<br><b>Pd</b><br>Palladium<br>106.42    | 47<br><b>Ag</b><br>Silver<br>107.868     | 48<br><b>Cd</b><br>Cadmium<br>112.414    | 49<br><b>In</b><br>Indium<br>114.818    | 50<br><b>Sn</b><br>Tin<br>118.710      | 51<br><b>Sb</b><br>Antimony<br>121.750   | 52<br><b>Te</b><br>Tellurium<br>127.6    | 53<br><b>I</b><br>Iodine<br>126.905       | 54<br><b>Xe</b><br>Xenon<br>131.294      |                                    |
| 55<br><b>Cs</b><br>Cesium<br>132.905  | 56<br><b>Ba</b><br>Barium<br>137.327   | 57-71                               | 72<br><b>Hf</b><br>Hafnium<br>178.49       | 73<br><b>Ta</b><br>Tantalum<br>180.948 | 74<br><b>W</b><br>Tungsten<br>183.84    | 75<br><b>Re</b><br>Rhenium<br>186.207   | 76<br><b>Os</b><br>Osmium<br>190.23    | 77<br><b>Ir</b><br>Iridium<br>192.227   | 78<br><b>Pt</b><br>Platinum<br>195.085    | 79<br><b>Au</b><br>Gold<br>196.967       | 80<br><b>Hg</b><br>Mercury<br>200.592    | 81<br><b>Tl</b><br>Thallium<br>204.383  | 82<br><b>Pb</b><br>Lead<br>207.2       | 83<br><b>Bi</b><br>Bismuth<br>208.980    | 84<br><b>Po</b><br>Polonium<br>[209]     | 85<br><b>At</b><br>Astatine<br>[209]      | 86<br><b>Rn</b><br>Radon<br>[222]        |                                    |
| 87<br><b>Fr</b><br>Francium<br>[223]  | 88<br><b>Ra</b><br>Radium<br>[226]     | 89-103                              | 104<br><b>Rf</b><br>Rutherfordium<br>[261] | 105<br><b>Db</b><br>Dubnium<br>[262]   | 106<br><b>Sg</b><br>Seaborgium<br>[266] | 107<br><b>Bh</b><br>Bohrium<br>[264]    | 108<br><b>Hs</b><br>Hassium<br>[285]   | 109<br><b>Mt</b><br>Meitnerium<br>[268] | 110<br><b>Ds</b><br>Darmstadtium<br>[285] | 111<br><b>Rg</b><br>Roentgenium<br>[272] | 112<br><b>Cn</b><br>Copernicium<br>[285] | 113<br><b>Nh</b><br>Nihonium<br>unknown | 114<br><b>Fl</b><br>Flerovium<br>[289] | 115<br><b>Mc</b><br>Moscovium<br>unknown | 116<br><b>Lv</b><br>Livermorium<br>[293] | 117<br><b>Ts</b><br>Tennessine<br>unknown | 118<br><b>Og</b><br>Oganesson<br>unknown |                                    |



|                   |  |   |  |   |  |   |   |   |   |   |   |  |  |   |   |
|-------------------|--|---|--|---|--|---|---|---|---|---|---|--|--|---|---|
| Lanthanide Series | 57<br><b>La</b><br>Lanthanum<br>138.905  | 58<br><b>Ce</b><br>Cerium<br>140.119    | 59<br><b>Pr</b><br>Praseodymium<br>140.908   | 60<br><b>Nd</b><br>Neodymium<br>144.242 | 61<br><b>Pm</b><br>Promethium<br>[144.913] | 62<br><b>Sm</b><br>Samarium<br>150.36     | 63<br><b>Eu</b><br>Europium<br>151.964    | 64<br><b>Gd</b><br>Gadolinium<br>157.25 | 65<br><b>Tb</b><br>Terbium<br>158.925     | 66<br><b>Dy</b><br>Dysprosium<br>162.500    | 67<br><b>Ho</b><br>Holmium<br>164.930   | 68<br><b>Er</b><br>Erbium<br>167.259     | 69<br><b>Tm</b><br>Thulium<br>168.934      | 70<br><b>Yb</b><br>Ytterbium<br>173.055   | 71<br><b>Lu</b><br>Lutetium<br>174.967  |
| Actinide Series   | 89<br><b>Ac</b><br>Actinium<br>[227.028] | 90<br><b>Th</b><br>Thorium<br>[232.038] | 91<br><b>Pa</b><br>Protactinium<br>[231.036] | 92<br><b>U</b><br>Uranium<br>[238.029]  | 93<br><b>Np</b><br>Neptunium<br>[237.048]  | 94<br><b>Pu</b><br>Plutonium<br>[244.064] | 95<br><b>Am</b><br>Americium<br>[243.061] | 96<br><b>Cm</b><br>Curium<br>[247.070]  | 97<br><b>Bk</b><br>Berkelium<br>[247.070] | 98<br><b>Cf</b><br>Californium<br>[251.080] | 99<br><b>Es</b><br>Einsteinium<br>[254] | 100<br><b>Fm</b><br>Fermium<br>[257.095] | 101<br><b>Md</b><br>Mendelevium<br>[268.1] | 102<br><b>No</b><br>Nobelium<br>[259.101] | 103<br><b>Lr</b><br>Lawrencium<br>[262] |

- Alkali Metal
- Alkaline Earth
- Transition Metal
- Basic Metal
- Semimetal
- Nonmetal
- Halogen
- Noble Gas
- Lanthanide
- Actinide

|        |   |         |  |         |  |         |  |         |  |         |  |          |  |         |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |
|--------|---|---------|--|---------|--|---------|--|---------|--|---------|--|----------|--|---------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|
| Period | 1 |         |  |         |  |         |  |         |  |         |  | Group 18 |  |         |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |          |  |
|        | 2 | Group 1 |  | Group 2 |  |         |  |         |  |         |  |          |  |         |  | Group 13 |  | Group 14 |  | Group 15 |  | Group 16 |  | Group 17 |  | Group 18 |  |          |  |          |  |          |  |          |  |          |  |
|        | 3 | Group 1 |  | Group 2 |  |         |  |         |  |         |  |          |  |         |  | Group 13 |  | Group 14 |  | Group 15 |  | Group 16 |  | Group 17 |  | Group 18 |  |          |  |          |  |          |  |          |  |          |  |
|        | 4 | Group 1 |  | Group 2 |  | Group 3 |  | Group 4 |  | Group 5 |  | Group 6  |  | Group 7 |  | Group 8  |  | Group 9  |  | Group 10 |  | Group 11 |  | Group 12 |  | Group 13 |  | Group 14 |  | Group 15 |  | Group 16 |  | Group 17 |  | Group 18 |  |
|        | 5 | Group 1 |  | Group 2 |  | Group 3 |  | Group 4 |  | Group 5 |  | Group 6  |  | Group 7 |  | Group 8  |  | Group 9  |  | Group 10 |  | Group 11 |  | Group 12 |  | Group 13 |  | Group 14 |  | Group 15 |  | Group 16 |  | Group 17 |  | Group 18 |  |
|        | 6 | Group 1 |  | Group 2 |  | Group 3 |  | Group 4 |  | Group 5 |  | Group 6  |  | Group 7 |  | Group 8  |  | Group 9  |  | Group 10 |  | Group 11 |  | Group 12 |  | Group 13 |  | Group 14 |  | Group 15 |  | Group 16 |  | Group 17 |  | Group 18 |  |
|        | 7 | Group 1 |  | Group 2 |  | Group 3 |  | Group 4 |  | Group 5 |  | Group 6  |  | Group 7 |  | Group 8  |  | Group 9  |  | Group 10 |  | Group 11 |  | Group 12 |  | Group 13 |  | Group 14 |  | Group 15 |  | Group 16 |  | Group 17 |  | Group 18 |  |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 |
| Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu |
| 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 |
| Th | Pa | U  | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Md | No | Lr |

# Periodic Table of Discovery

|   |   |  |  |   |   |  |  |  |   |   |   |  |  |  |  |  |  |  |  |  |                                      |   |   |  |                             |                                |   |                             |   |   |  |  |
|---|---|--|--|---|---|--|--|--|---|---|---|--|--|--|--|--|--|--|--|--|--------------------------------------|---|---|--|-----------------------------|--------------------------------|---|-----------------------------|---|---|--|--|
| 1<br>H<br>Hydrogen<br>1766<br>Cavendish           |   |  |  |   |   |  |  |  |   |   |   |  |  |  |  |  | 2<br>He<br>Helium<br>1868<br>Jansen, Lockyer   |  |  |  |                                      |   |   |  |                             |                                |   |                             |   |   |  |  |
| 3<br>Li<br>Lithium<br>1817<br>Arfwedson           | 4<br>Be<br>Beryllium<br>1798<br>Vauquelin     |  |  |   |   |  |  |  |   |   |   |  |  |  |  |  |  | 5<br>B<br>Boron<br>1808<br>Gay-Lussac, Thénard   | 6<br>C<br>Carbon<br>Ancient              | 7<br>N<br>Nitrogen<br>1772<br>Rutherford | 8<br>O<br>Oxygen<br>1771<br>Scheele  | 9<br>F<br>Fluorine<br>1810<br>Ampère    | 10<br>Ne<br>Neon<br>1898<br>Ramsay, Travers   |  |                             |                                |   |                             |   |   |  |  |
| 11<br>Na<br>Sodium<br>1807<br>Davy                | 12<br>Mg<br>Magnesium<br>1755<br>Black        |  |  |   |   |  |  |  |   |   |   |  |  |  |  |  |  | 13<br>Al<br>Aluminum<br>1825<br>Ørsted           | 14<br>Si<br>Silicon<br>1823<br>Berzelius | 15<br>P<br>Phosphorus<br>1669<br>Brand   | 16<br>S<br>Sulfur<br>Ancient         | 17<br>Cl<br>Chlorine<br>1774<br>Scheele | 18<br>Ar<br>Argon<br>1894<br>Rayleigh, Ramsay |  |                             |                                |   |                             |   |   |  |  |
| 19<br>K<br>Potassium<br>1807<br>Davy              | 20<br>Ca<br>Calcium<br>1808<br>Davy           | 21<br>Sc<br>Scandium<br>1879<br>Nilson                               | 22<br>Ti<br>Titanium<br>1791<br>Gregor                         | 23<br>V<br>Vanadium<br>1801<br>M. Del Rio             | 24<br>Cr<br>Chromium<br>1794<br>Vauquelin       | 25<br>Mn<br>Manganese<br>1774<br>Scheele         | 26<br>Fe<br>Iron<br>Ancient                        | 27<br>Co<br>Cobalt<br>1735<br>Brandt                 | 28<br>Ni<br>Nickel<br>1751<br>Cronstedt             | 29<br>Cu<br>Copper<br>Ancient                       | 30<br>Zn<br>Zinc<br>Ancient                                   | 31<br>Ga<br>Gallium<br>1875<br>P.E.L. de Boisbaudran | 32<br>Ge<br>Germanium<br>1886<br>Winkler       | 33<br>As<br>Arsenic<br>Ancient                   | 34<br>Se<br>Selenium<br>1817<br>Berzelius, Gahn          | 35<br>Br<br>Bromine<br>1825<br>Balard, Löwig   | 36<br>Kr<br>Krypton<br>1898<br>Ramsay, Travers |  |  |  |                                      |   |   |  |                             |                                |   |                             |   |   |  |  |
| 37<br>Rb<br>Rubidium<br>1861<br>Bunsen, Kirchhoff | 38<br>Sr<br>Strontium<br>1787<br>Cruikshank   | 39<br>Y<br>Yttrium<br>1794<br>Gadolin                                | 40<br>Zr<br>Zirconium<br>1789<br>Klaproth                      | 41<br>Nb<br>Niobium<br>1801<br>Hatchett               | 42<br>Mo<br>Molybdenum<br>1778<br>Scheele       | 43<br>Tc<br>Technetium<br>1937<br>Perrier, Segrè | 44<br>Ru<br>Ruthenium<br>1844<br>Claus             | 45<br>Rh<br>Rhodium<br>1804<br>Wollaston             | 46<br>Pd<br>Palladium<br>1802<br>Wollaston          | 47<br>Ag<br>Silver<br>Ancient                       | 48<br>Cd<br>Cadmium<br>1817<br>Hermann, Stromeyer, Roloff     | 49<br>In<br>Indium<br>1863<br>Reich, Schöner         | 50<br>Sn<br>Tin<br>Ancient                     | 51<br>Sb<br>Antimony<br>Ancient                  | 52<br>Te<br>Tellurium<br>1782<br>Müller von Reichenstein | 53<br>I<br>Iodine<br>1811<br>Courtois          | 54<br>Xe<br>Xenon<br>1898<br>Ramsay, Travers   |  |  |  |                                      |   |   |  |                             |                                |   |                             |   |   |  |  |
| 55<br>Cs<br>Cesium<br>1860<br>Bunsen, Kirchhoff   | 56<br>Ba<br>Barium<br>1772<br>Scheele         |  |  |   |   |  |  |  |   |   |   |  |  |  |  |  |  | 72<br>Hf<br>Hafnium<br>1922<br>Coster, de Mevesy | 73<br>Ta<br>Tantalum<br>1802<br>Ekeberg  | 74<br>W<br>Tungsten<br>1781<br>Scheele   | 75<br>Re<br>Rhenium<br>1908<br>Ogawa | 76<br>Os<br>Osmium<br>1803<br>Tennant   | 77<br>Ir<br>Iridium<br>1803<br>Tennant        | 78<br>Pt<br>Platinum<br>1735<br>de Ulloa | 79<br>Au<br>Gold<br>Ancient | 80<br>Hg<br>Mercury<br>Ancient | 81<br>Tl<br>Thallium<br>1861<br>Crookes | 82<br>Pb<br>Lead<br>Ancient | 83<br>Bi<br>Bismuth<br>1753<br>Geoffroy | 84<br>Po<br>Polonium<br>1898<br>P. and M. Curie | 85<br>At<br>Astatine<br>1940<br>Corson, MacKenzie, Segrè | 86<br>Rn<br>Radon<br>1899<br>Rutherford, Owens |
| 87<br>Fr<br>Francium<br>1939<br>Perey             | 88<br>Ra<br>Radium<br>1898<br>P. and M. Curie | 104<br>Rf<br>Rutherfordium<br>1969<br>Berkeley Radiation Lab (Dubna) | 105<br>Db<br>Dubnium<br>1970<br>Berkeley Radiation Lab (Dubna) | 106<br>Sg<br>Seaborgium<br>1974<br>Berkeley Radiation | 107<br>Bh<br>Bohrium<br>1981<br>GSI (Darmstadt) | 108<br>Hs<br>Hassium<br>1984<br>GSI (Darmstadt)  | 109<br>Mt<br>Meitnerium<br>1982<br>GSI (Darmstadt) | 110<br>Ds<br>Darmstadtium<br>1994<br>GSI (Darmstadt) | 111<br>Rg<br>Roentgenium<br>1994<br>GSI (Darmstadt) | 112<br>Cn<br>Copernicium<br>1996<br>GSI (Darmstadt) | 113<br>Nh<br>Nihonium<br>2003<br>JINR (Dubna), RIKEN (Aomori) | 114<br>Fl<br>Flerovium<br>1999<br>JINR (Dubna)       | 115<br>Mc<br>Moscovium<br>2003<br>JINR (Dubna) | 116<br>Lv<br>Livermorium<br>1999<br>JINR (Dubna) | 117<br>Ts<br>Tennessine<br>2009<br>JINR (Dubna)          | 118<br>Og<br>Oganesson<br>2002<br>JINR (Dubna) |  |  |  |  |                                      |   |   |  |                             |                                |   |                             |   |   |  |  |

|   |   |   |  |  |   |  |  |  |   |   |  |   |   |  |
|---|---|---|--|--|---|--|--|--|---|---|--|---|---|--|
| 57<br>La<br>Lanthanum<br>1838<br>Mosander | 58<br>Ce<br>Cerium<br>1803<br>Klaproth, Berzelius, Hisinger | 59<br>Pr<br>Praseodymium<br>1885<br>Auer von Welsbach | 60<br>Nd<br>Neodymium<br>1885<br>Auer von Welsbach | 61<br>Pm<br>Promethium<br>1942<br>Wu, Segre, Bach  | 62<br>Sm<br>Samarium<br>1879<br>P.E.L. de Boisbaudran             | 63<br>Eu<br>Europium<br>1896<br>Bemarczy                         | 64<br>Gd<br>Gadolinium<br>1880<br>J. C. G. de Marignac | 65<br>Tb<br>Terbium<br>1843<br>Mosander      | 66<br>Dy<br>Dysprosium<br>1886<br>P.E.L. de Boisbaudran | 67<br>Ho<br>Holmium<br>1878<br>Soret                                | 68<br>Er<br>Erbium<br>1843<br>Mosander                           | 69<br>Tm<br>Thulium<br>1879<br>Cleve                              | 70<br>Yb<br>Ytterbium<br>1878<br>J. C. G. de Marignac | 71<br>Lu<br>Lutetium<br>1906<br>Auer von Welsbach, Urbain        |
| 89<br>Ac<br>Actinium<br>1902<br>Giesel    | 90<br>Th<br>Thorium<br>1829<br>Berzelius                    | 91<br>Pa<br>Protactinium<br>1913<br>Göhring, Fajans   | 92<br>U<br>Uranium<br>1789<br>Klaproth             | 93<br>Np<br>Neptunium<br>1940<br>McMillan, Abelson | 94<br>Pu<br>Plutonium<br>1940<br>Seaborg, Wahl, Kennedy, McMillan | 95<br>Am<br>Americium<br>1944<br>Seaborg, James, Morgan, Ghiorso | 96<br>Cm<br>Curium<br>1944<br>Seaborg, James, Ghiorso  | 97<br>Bk<br>Berkelium<br>1949<br>UC Berkeley | 98<br>Cf<br>Californium<br>1950<br>UC Berkeley          | 99<br>Es<br>Einsteinium<br>1952<br>UC Berkeley, Argonne, Los Alamos | 100<br>Fm<br>Fermium<br>1952<br>UC Berkeley, Argonne, Los Alamos | 101<br>Md<br>Mendelevium<br>1955<br>Berkeley Radiation Laboratory | 102<br>No<br>Nobelium<br>1958<br>JINR (Dubna)         | 103<br>Lr<br>Lawrencium<br>1961<br>Berkeley Radiation Laboratory |

|                       |              |              |              |              |              |                 |
|-----------------------|--------------|--------------|--------------|--------------|--------------|-----------------|
| Known to the Ancients | 1600 to 1799 | 1800 to 1849 | 1850 to 1899 | 1900 to 1949 | 1950 to 1999 | 2000 to Present |
|-----------------------|--------------|--------------|--------------|--------------|--------------|-----------------|

|          |          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1<br>H   |          |          |           |           |           |           |           |           |           |           |           |           |           |           |           |           | 2<br>He   |
| 3<br>Li  | 4<br>Be  |          |           |           |           |           |           |           |           |           |           | 5<br>B    | 6<br>C    | 7<br>N    | 8<br>O    | 9<br>F    | 10<br>Ne  |
| 11<br>Na | 12<br>Mg |          |           |           |           |           |           |           |           |           |           | 13<br>Al  | 14<br>Si  | 15<br>P   | 16<br>S   | 17<br>Cl  | 18<br>Ar  |
| 19<br>K  | 20<br>Ca | 21<br>Sc | 22<br>Ti  | 23<br>V   | 24<br>Cr  | 25<br>Mn  | 26<br>Fe  | 27<br>Co  | 28<br>Ni  | 29<br>Cu  | 30<br>Zn  | 31<br>Ga  | 32<br>Ge  | 33<br>As  | 34<br>Se  | 35<br>Br  | 36<br>Kr  |
| 37<br>Rb | 38<br>Sr | 39<br>Y  | 40<br>Zr  | 41<br>Nb  | 42<br>Mo  | 43<br>Tc  | 44<br>Ru  | 45<br>Rh  | 46<br>Pd  | 47<br>Ag  | 48<br>Cd  | 49<br>In  | 50<br>Sn  | 51<br>Sb  | 52<br>Te  | 53<br>I   | 54<br>Xe  |
| 55<br>Cs | 56<br>Ba | 57-71    | 72<br>Hf  | 73<br>Ta  | 74<br>W   | 75<br>Re  | 76<br>Os  | 77<br>Ir  | 78<br>Pt  | 79<br>Au  | 80<br>Hg  | 81<br>Tl  | 82<br>Pb  | 83<br>Bi  | 84<br>Po  | 85<br>At  | 86<br>Rn  |
| 87<br>Fr | 88<br>Ra | 89-103   | 104<br>Rf | 105<br>Db | 106<br>Sg | 107<br>Bh | 108<br>Hs | 109<br>Mt | 110<br>Ds | 111<br>Rg | 112<br>Cn | 113<br>Nh | 114<br>Fl | 115<br>Mc | 116<br>Lv | 117<br>Ts | 118<br>Og |

Metal

Metalloid

Nonmetal

|          |          |          |          |          |          |          |          |          |          |          |           |           |           |           |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|
| 57<br>La | 58<br>Ce | 59<br>Pr | 60<br>Nd | 61<br>Pm | 62<br>Sm | 63<br>Eu | 64<br>Gd | 65<br>Tb | 66<br>Dy | 67<br>Ho | 68<br>Er  | 69<br>Tm  | 70<br>Yb  | 71<br>Lu  |
| 89<br>Ac | 90<br>Th | 91<br>Pa | 92<br>U  | 93<br>Np | 94<br>Pu | 95<br>Am | 96<br>Cm | 97<br>Bk | 98<br>Cf | 99<br>Es | 100<br>Fm | 101<br>Md | 102<br>No | 103<br>Lr |

# The Periodic Table of Elements

|   |  |   |  |  |   |   |  |  |  |   |  |   |   |  |   |   |  |  |   |   |   |  |  |  |   |  |
|---|--|---|--|--|---|---|--|--|--|---|--|---|---|--|---|---|--|--|---|---|---|--|--|--|---|--|
| 1<br><b>H</b><br>Hydrogen<br>Nonmetal       |  |   |  |  |   |   |  |  |  |   |  |   |   |  |   |   | 2<br><b>He</b><br>Helium<br>Noble Gas              |  |   |   |   |  |  |  |   |  |
| 3<br><b>Li</b><br>Lithium<br>Alkali Metal   | 4<br><b>Be</b><br>Beryllium<br>Alkaline Earth Metal  |   |  |  |   |   |  |  |  |   |  | 5<br><b>B</b><br>Boron<br>Metalloid                   | 6<br><b>C</b><br>Carbon<br>Nonmetal             | 7<br><b>N</b><br>Nitrogen<br>Nonmetal              | 8<br><b>O</b><br>Oxygen<br>Nonmetal             | 9<br><b>F</b><br>Fluorine<br>Halogen            | 10<br><b>Ne</b><br>Neon<br>Noble Gas               |  |   |   |   |  |  |  |   |  |
| 11<br><b>Na</b><br>Sodium<br>Alkali Metal   | 12<br><b>Mg</b><br>Magnesium<br>Alkaline Earth Metal |   |  |  |   |   |  |  |  |   |  | 13<br><b>Al</b><br>Aluminium<br>Post-Transition Metal | 14<br><b>Si</b><br>Silicon<br>Metalloid         | 15<br><b>P</b><br>Phosphorus<br>Nonmetal           | 16<br><b>S</b><br>Sulfur<br>Nonmetal            | 17<br><b>Cl</b><br>Chlorine<br>Halogen          | 18<br><b>Ar</b><br>Argon<br>Noble Gas              |  |   |   |   |  |  |  |   |  |
| 19<br><b>K</b><br>Potassium<br>Alkali Metal | 20<br><b>Ca</b><br>Calcium<br>Alkaline Earth Metal   | 21<br><b>Sc</b><br>Scandium<br>Transition Metal | 22<br><b>Ti</b><br>Titanium<br>Transition Metal  | 23<br><b>V</b><br>Vanadium<br>Transition Metal | 24<br><b>Cr</b><br>Chromium<br>Transition Metal   | 25<br><b>Mn</b><br>Manganese<br>Transition Metal  | 26<br><b>Fe</b><br>Iron<br>Transition Metal      | 27<br><b>Co</b><br>Cobalt<br>Transition Metal  | 28<br><b>Ni</b><br>Nickel<br>Transition Metal    | 29<br><b>Cu</b><br>Copper<br>Transition Metal | 30<br><b>Zn</b><br>Zinc<br>Transition Metal    | 31<br><b>Ga</b><br>Gallium<br>Post-Transition Metal   | 32<br><b>Ge</b><br>Germanium<br>Metalloid       | 33<br><b>As</b><br>Arsenic<br>Metalloid            | 34<br><b>Se</b><br>Selenium<br>Nonmetal         | 35<br><b>Br</b><br>Bromine<br>Halogen           | 36<br><b>Kr</b><br>Krypton<br>Noble Gas            |  |   |   |   |  |  |  |   |  |
| 37<br><b>Rb</b><br>Rubidium<br>Alkali Metal | 38<br><b>Sr</b><br>Strontium<br>Alkaline Earth Metal | 39<br><b>Y</b><br>Yttrium<br>Transition Metal   | 40<br><b>Zr</b><br>Zirconium<br>Transition Metal | 41<br><b>Nb</b><br>Niobium<br>Transition Metal | 42<br><b>Mo</b><br>Molybdenum<br>Transition Metal | 43<br><b>Tc</b><br>Technetium<br>Transition Metal | 44<br><b>Ru</b><br>Ruthenium<br>Transition Metal | 45<br><b>Rh</b><br>Rhodium<br>Transition Metal | 46<br><b>Pd</b><br>Palladium<br>Transition Metal | 47<br><b>Ag</b><br>Silver<br>Transition Metal | 48<br><b>Cd</b><br>Cadmium<br>Transition Metal | 49<br><b>In</b><br>Indium<br>Post-Transition Metal    | 50<br><b>Sn</b><br>Tin<br>Post-Transition Metal | 51<br><b>Sb</b><br>Antimony<br>Metalloid           | 52<br><b>Te</b><br>Tellurium<br>Metalloid       | 53<br><b>I</b><br>Iodine<br>Halogen             | 54<br><b>Xe</b><br>Xenon<br>Noble Gas              |  |   |   |   |  |  |  |   |  |
| 55<br><b>Cs</b><br>Cesium<br>Alkali Metal   | 56<br><b>Ba</b><br>Barium<br>Alkaline Earth Metal    |   |  |  |   |   |  |  |  |   |  | 72<br><b>Hf</b><br>Hafnium<br>Transition Metal        | 73<br><b>Ta</b><br>Tantalum<br>Transition Metal | 74<br><b>W</b><br>Tungsten<br>Transition Metal     | 75<br><b>Re</b><br>Rhenium<br>Transition Metal  | 76<br><b>Os</b><br>Osmium<br>Transition Metal   | 77<br><b>Ir</b><br>Iridium<br>Transition Metal     | 78<br><b>Pt</b><br>Platinum<br>Transition Metal      | 79<br><b>Au</b><br>Gold<br>Transition Metal         | 80<br><b>Hg</b><br>Mercury<br>Transition Metal      | 81<br><b>Tl</b><br>Thallium<br>Post-Transition Metal  | 82<br><b>Pb</b><br>Lead<br>Post-Transition Metal       | 83<br><b>Bi</b><br>Bismuth<br>Post-Transition Metal    | 84<br><b>Po</b><br>Polonium<br>Metalloid                 | 85<br><b>At</b><br>Astatine<br>Halogen    | 86<br><b>Rn</b><br>Radon<br>Noble Gas      |
| 87<br><b>Fr</b><br>Francium<br>Alkali Metal | 88<br><b>Ra</b><br>Radium<br>Alkaline Earth Metal    |   |  |  |   |   |  |  |  |   |  | 104<br><b>Rf</b><br>Rutherfordium<br>Transition Metal | 105<br><b>Db</b><br>Dubnium<br>Transition Metal | 106<br><b>Sg</b><br>Seaborgium<br>Transition Metal | 107<br><b>Bh</b><br>Bohrium<br>Transition Metal | 108<br><b>Hs</b><br>Hassium<br>Transition Metal | 109<br><b>Mt</b><br>Meitnerium<br>Transition Metal | 110<br><b>Ds</b><br>Darmstadtium<br>Transition Metal | 111<br><b>Rg</b><br>Roentgenium<br>Transition Metal | 112<br><b>Cn</b><br>Copernicium<br>Transition Metal | 113<br><b>Nh</b><br>Nihonium<br>Post-Transition Metal | 114<br><b>Fl</b><br>Flerovium<br>Post-Transition Metal | 115<br><b>Mc</b><br>Moscovium<br>Post-Transition Metal | 116<br><b>Lv</b><br>Livermorium<br>Post-Transition Metal | 117<br><b>Ts</b><br>Tennessine<br>Halogen | 118<br><b>Og</b><br>Oganesson<br>Noble Gas |
|   |  | 57<br><b>La</b><br>Lanthanum<br>Lanthanide      | 58<br><b>Ce</b><br>Cerium<br>Lanthanide          | 59<br><b>Pr</b><br>Praseodymium<br>Lanthanide  | 60<br><b>Nd</b><br>Neodymium<br>Lanthanide        | 61<br><b>Pm</b><br>Promethium<br>Lanthanide       | 62<br><b>Sm</b><br>Samarium<br>Lanthanide        | 63<br><b>Eu</b><br>Europium<br>Lanthanide      | 64<br><b>Gd</b><br>Gadolinium<br>Lanthanide      | 65<br><b>Tb</b><br>Terbium<br>Lanthanide      | 66<br><b>Dy</b><br>Dysprosium<br>Lanthanide    | 67<br><b>Ho</b><br>Holmium<br>Lanthanide              | 68<br><b>Er</b><br>Erbium<br>Lanthanide         | 69<br><b>Tm</b><br>Thulium<br>Lanthanide           | 70<br><b>Yb</b><br>Ytterbium<br>Lanthanide      | 71<br><b>Lu</b><br>Lutetium<br>Lanthanide       |  |  |   |   |   |  |  |  |   |  |
|   |  | 89<br><b>Ac</b><br>Actinium<br>Actinide         | 90<br><b>Th</b><br>Thorium<br>Actinide           | 91<br><b>Pa</b><br>Protactinium<br>Actinide    | 92<br><b>U</b><br>Uranium<br>Actinide             | 93<br><b>Np</b><br>Neptunium<br>Actinide          | 94<br><b>Pu</b><br>Plutonium<br>Actinide         | 95<br><b>Am</b><br>Americium<br>Actinide       | 96<br><b>Cm</b><br>Curium<br>Actinide            | 97<br><b>Bk</b><br>Berkelium<br>Actinide      | 98<br><b>Cf</b><br>Californium<br>Actinide     | 99<br><b>Es</b><br>Einsteinium<br>Actinide            | 100<br><b>Fm</b><br>Fermium<br>Actinide         | 101<br><b>Md</b><br>Mendelevium<br>Actinide        | 102<br><b>No</b><br>Nobelium<br>Actinide        | 103<br><b>Lr</b><br>Lawrencium<br>Actinide      |  |  |   |   |   |  |  |  |   |  |

# The Periodic Table of Elements

|   |   |   |  |  |  |   |                                       |                                       |   |  |  |   |                                       |  |  |                                       |                                      |   |                                      |   |  |   |                                      |  |   |   |   |   |                                       |   |   |  |
|---|---|---|--|--|--|---|---------------------------------------|---------------------------------------|---|--|--|---|---------------------------------------|--|--|---------------------------------------|--------------------------------------|---|--------------------------------------|---|--|---|--------------------------------------|--|---|---|---|---|---------------------------------------|---|---|--|
| 1<br><b>H</b><br>Hydrogen<br>1.008        |   |   |  |  |  |   |                                       |                                       |   |  |  |   |                                       |  |  |                                       | 2<br><b>He</b><br>Helium<br>4.00260  |   |                                      |   |  |   |                                      |  |   |   |   |   |                                       |   |   |  |
| 3<br><b>Li</b><br>Lithium<br>7.0          | 4<br><b>Be</b><br>Beryllium<br>9.012183 |   |  |  |  |   |                                       |                                       |   |  |  |   |                                       |  |  |                                       |                                      | 5<br><b>B</b><br>Boron<br>10.81           | 6<br><b>C</b><br>Carbon<br>12.011    | 7<br><b>N</b><br>Nitrogen<br>14.007         | 8<br><b>O</b><br>Oxygen<br>15.999      | 9<br><b>F</b><br>Fluorine<br>18.99840316  | 10<br><b>Ne</b><br>Neon<br>20.180    |  |   |   |   |   |                                       |   |   |  |
| 11<br><b>Na</b><br>Sodium<br>22.98976928  | 12<br><b>Mg</b><br>Magnesium<br>24.305  |   |  |  |  |   |                                       |                                       |   |  |  |   |                                       |  |  |                                       |                                      | 13<br><b>Al</b><br>Aluminum<br>26.9815386 | 14<br><b>Si</b><br>Silicon<br>28.085 | 15<br><b>P</b><br>Phosphorus<br>30.97376200 | 16<br><b>S</b><br>Sulphur<br>32.07     | 17<br><b>Cl</b><br>Chlorine<br>35.45      | 18<br><b>Ar</b><br>Argon<br>39.9     |  |   |   |   |   |                                       |   |   |  |
| 19<br><b>K</b><br>Potassium<br>39.098     | 20<br><b>Ca</b><br>Calcium<br>40.078    | 21<br><b>Sc</b><br>Scandium<br>44.95591 | 22<br><b>Ti</b><br>Titanium<br>47.87     | 23<br><b>V</b><br>Vanadium<br>50.941   | 24<br><b>Cr</b><br>Chromium<br>51.996  | 25<br><b>Mn</b><br>Manganese<br>54.93804  | 26<br><b>Fe</b><br>Iron<br>55.84      | 27<br><b>Co</b><br>Cobalt<br>58.93319 | 28<br><b>Ni</b><br>Nickel<br>58.693     | 29<br><b>Cu</b><br>Copper<br>63.55     | 30<br><b>Zn</b><br>Zinc<br>65.4        | 31<br><b>Ga</b><br>Gallium<br>69.72     | 32<br><b>Ge</b><br>Germanium<br>72.63 | 33<br><b>As</b><br>Arsenic<br>74.83    | 34<br><b>Se</b><br>Selenium<br>78.97   | 35<br><b>Br</b><br>Bromine<br>79.904  | 36<br><b>Kr</b><br>Krypton<br>83.80  |   |                                      |   |  |   |                                      |  |   |   |   |   |                                       |   |   |  |
| 37<br><b>Rb</b><br>Rubidium<br>85.468     | 38<br><b>Sr</b><br>Strontium<br>87.6    | 39<br><b>Y</b><br>Yttrium<br>88.9058    | 40<br><b>Zr</b><br>Zirconium<br>91.22    | 41<br><b>Nb</b><br>Niobium<br>92.906   | 42<br><b>Mo</b><br>Molybdenum<br>95.94 | 43<br><b>Tc</b><br>Technetium<br>97.90721 | 44<br><b>Ru</b><br>Ruthenium<br>101.1 | 45<br><b>Rh</b><br>Rhodium<br>101.07  | 46<br><b>Pd</b><br>Palladium<br>106.42  | 47<br><b>Ag</b><br>Silver<br>107.8682  | 48<br><b>Cd</b><br>Cadmium<br>112.411  | 49<br><b>In</b><br>Indium<br>114.818    | 50<br><b>Sn</b><br>Tin<br>118.710     | 51<br><b>Sb</b><br>Antimony<br>121.757 | 52<br><b>Te</b><br>Tellurium<br>127.6  | 53<br><b>I</b><br>Iodine<br>126.905   | 54<br><b>Xe</b><br>Xenon<br>131.29   |   |                                      |   |  |   |                                      |  |   |   |   |   |                                       |   |   |  |
| 55<br><b>Cs</b><br>Cesium<br>132.90545196 | 56<br><b>Ba</b><br>Barium<br>137.327    | 57-71<br>Lanthanoids                    | 72<br><b>Hf</b><br>Hafnium<br>178.49     | 73<br><b>Ta</b><br>Tantalum<br>180.948 | 74<br><b>W</b><br>Tungsten<br>183.84   | 75<br><b>Re</b><br>Rhenium<br>186.207     | 76<br><b>Os</b><br>Osmium<br>190.23   | 77<br><b>Ir</b><br>Iridium<br>192.222 | 78<br><b>Pt</b><br>Platinum<br>195.084  | 79<br><b>Au</b><br>Gold<br>196.966569  | 80<br><b>Hg</b><br>Mercury<br>200.59   | 81<br><b>Tl</b><br>Thallium<br>204.3833 | 82<br><b>Pb</b><br>Lead<br>207.2      | 83<br><b>Bi</b><br>Bismuth<br>208.9804 | 84<br><b>Po</b><br>Polonium<br>209     | 85<br><b>At</b><br>Astatine<br>209    | 86<br><b>Rn</b><br>Radon<br>222      |   |                                      |   |  |   |                                      |  |   |   |   |   |                                       |   |   |  |
| 87<br><b>Fr</b><br>Francium<br>223        | 88<br><b>Ra</b><br>Radium<br>226        | 89-103<br>Actinoids                     | 104<br><b>Rf</b><br>Rutherfordium<br>261 | 105<br><b>Db</b><br>Dubnium<br>262     | 106<br><b>Sg</b><br>Seaborgium<br>271  | 107<br><b>Bh</b><br>Bohrium<br>274        | 108<br><b>Hs</b><br>Hassium<br>277    | 109<br><b>Mt</b><br>Meitnerium<br>276 | 110<br><b>Ds</b><br>Darmstadtium<br>281 | 111<br><b>Rg</b><br>Roentgenium<br>282 | 112<br><b>Cn</b><br>Copernicium<br>285 | 113<br><b>Nh</b><br>Nihonium<br>284     | 114<br><b>Fl</b><br>Flerovium<br>289  | 115<br><b>Mc</b><br>Moscovium<br>289   | 116<br><b>Lv</b><br>Livermorium<br>293 | 117<br><b>Ts</b><br>Tennessine<br>294 | 118<br><b>Og</b><br>Oganesson<br>294 |   |                                      |   |  |   |                                      |  |   |   |   |   |                                       |   |   |  |
|   |   |   |  |  |  |   |                                       |                                       |   |  |  |   |                                       |  |  |                                       |                                      | 57<br><b>La</b><br>Lanthanum<br>138.9055  | 58<br><b>Ce</b><br>Cerium<br>140.12  | 59<br><b>Pr</b><br>Praseodymium<br>140.9077 | 60<br><b>Nd</b><br>Neodymium<br>144.24 | 61<br><b>Pm</b><br>Promethium<br>144.9127 | 62<br><b>Sm</b><br>Samarium<br>150.4 | 63<br><b>Eu</b><br>Europium<br>151.964 | 64<br><b>Gd</b><br>Gadolinium<br>157.25 | 65<br><b>Tb</b><br>Terbium<br>158.92535 | 66<br><b>Dy</b><br>Dysprosium<br>162.50 | 67<br><b>Ho</b><br>Holmium<br>164.93033 | 68<br><b>Er</b><br>Erbium<br>167.2593 | 69<br><b>Tm</b><br>Thulium<br>168.93422 | 70<br><b>Yb</b><br>Ytterbium<br>173.054 | 71<br><b>Lu</b><br>Lutetium<br>174.967 |
|   |   |   |  |  |  |   |                                       |                                       |   |  |  |   |                                       |  |  |                                       |                                      | 89<br><b>Ac</b><br>Actinium<br>227        | 90<br><b>Th</b><br>Thorium<br>232    | 91<br><b>Pa</b><br>Protactinium<br>231      | 92<br><b>U</b><br>Uranium<br>238       | 93<br><b>Np</b><br>Neptunium<br>237       | 94<br><b>Pu</b><br>Plutonium<br>244  | 95<br><b>Am</b><br>Americium<br>243    | 96<br><b>Cm</b><br>Curium<br>247        | 97<br><b>Bk</b><br>Berkelium<br>247     | 98<br><b>Cf</b><br>Californium<br>251   | 99<br><b>Es</b><br>Einsteinium<br>252   | 100<br><b>Fm</b><br>Fermium<br>257    | 101<br><b>Md</b><br>Mendelevium<br>258  | 102<br><b>No</b><br>Nobelium<br>259     | 103<br><b>Lr</b><br>Lawrencium<br>262  |

Key:

atomic number  
**Symbol**  
name  
Atomic Mass, u



# THE PERIODIC TABLE OF ELEMENTS



|   |  |   |  |  |   |   |  |  |   |   |   |  |  |  |  |  |   |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |
|---|--|---|--|--|---|---|--|--|---|---|---|--|--|--|--|--|---|---|---|--|--|---|--|---|---|--|--|--|---|--|--|---------------------------------------|
| 1<br><b>H</b><br>Hydrogen<br>Nonmetal       |  |   |  |  |   |   |  |  |   |   |   |  |  |  |  |  | 2<br><b>He</b><br>Helium<br>Noble Gas   |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |
| 3<br><b>Li</b><br>Lithium<br>Alkali Metal   | 4<br><b>Be</b><br>Beryllium<br>Alkaline Earth Metal  |   |  |  |   |   |  |  |   |   |   |  |  |  |  |  |   | 5<br><b>B</b><br>Boron<br>Metalloid                   | 6<br><b>C</b><br>Carbon<br>Nonmetal             | 7<br><b>N</b><br>Nitrogen<br>Nonmetal          | 8<br><b>O</b><br>Oxygen<br>Nonmetal            | 9<br><b>F</b><br>Fluorine<br>Halogen          | 10<br><b>Ne</b><br>Neon<br>Noble Gas           |   |   |  |  |  |   |  |  |                                       |
| 11<br><b>Na</b><br>Sodium<br>Alkali Metal   | 12<br><b>Mg</b><br>Magnesium<br>Alkaline Earth Metal |   |  |  |   |   |  |  |   |   |   |  |  |  |  |  |   | 13<br><b>Al</b><br>Aluminium<br>Post-Transition Metal | 14<br><b>Si</b><br>Silicon<br>Metalloid         | 15<br><b>P</b><br>Phosphorus<br>Nonmetal       | 16<br><b>S</b><br>Sulfur<br>Nonmetal           | 17<br><b>Cl</b><br>Chlorine<br>Halogen        | 18<br><b>Ar</b><br>Argon<br>Noble Gas          |   |   |  |  |  |   |  |  |                                       |
| 19<br><b>K</b><br>Potassium<br>Alkali Metal | 20<br><b>Ca</b><br>Calcium<br>Alkaline Earth Metal   | 21<br><b>Sc</b><br>Scandium<br>Transition Metal       | 22<br><b>Ti</b><br>Titanium<br>Transition Metal  | 23<br><b>V</b><br>Vanadium<br>Transition Metal     | 24<br><b>Cr</b><br>Chromium<br>Transition Metal   | 25<br><b>Mn</b><br>Manganese<br>Transition Metal  | 26<br><b>Fe</b><br>Iron<br>Transition Metal        | 27<br><b>Co</b><br>Cobalt<br>Transition Metal        | 28<br><b>Ni</b><br>Nickel<br>Transition Metal       | 29<br><b>Cu</b><br>Copper<br>Transition Metal       | 30<br><b>Zn</b><br>Zinc<br>Transition Metal           | 31<br><b>Ga</b><br>Gallium<br>Post-Transition Metal    | 32<br><b>Ge</b><br>Germanium<br>Metalloid              | 33<br><b>As</b><br>Arsenic<br>Metalloid                  | 34<br><b>Se</b><br>Selenium<br>Nonmetal    | 35<br><b>Br</b><br>Bromine<br>Halogen      | 36<br><b>Kr</b><br>Krypton<br>Noble Gas |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |
| 37<br><b>Rb</b><br>Rubidium<br>Alkali Metal | 38<br><b>Sr</b><br>Strontium<br>Alkaline Earth Metal | 39<br><b>Y</b><br>Yttrium<br>Transition Metal         | 40<br><b>Zr</b><br>Zirconium<br>Transition Metal | 41<br><b>Nb</b><br>Niobium<br>Transition Metal     | 42<br><b>Mo</b><br>Molybdenum<br>Transition Metal | 43<br><b>Tc</b><br>Technetium<br>Transition Metal | 44<br><b>Ru</b><br>Ruthenium<br>Transition Metal   | 45<br><b>Rh</b><br>Rhodium<br>Transition Metal       | 46<br><b>Pd</b><br>Palladium<br>Transition Metal    | 47<br><b>Ag</b><br>Silver<br>Transition Metal       | 48<br><b>Cd</b><br>Cadmium<br>Transition Metal        | 49<br><b>In</b><br>Indium<br>Post-Transition Metal     | 50<br><b>Sn</b><br>Tin<br>Post-Transition Metal        | 51<br><b>Sb</b><br>Antimony<br>Metalloid                 | 52<br><b>Te</b><br>Tellurium<br>Metalloid  | 53<br><b>I</b><br>Iodine<br>Halogen        | 54<br><b>Xe</b><br>Xenon<br>Noble Gas   |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |
| 55<br><b>Cs</b><br>Cesium<br>Alkali Metal   | 56<br><b>Ba</b><br>Barium<br>Alkaline Earth Metal    |   |  |  |   |   |  |  |   |   |   |  |  |  |  |  |   | 72<br><b>Hf</b><br>Hafnium<br>Transition Metal        | 73<br><b>Ta</b><br>Tantalum<br>Transition Metal | 74<br><b>W</b><br>Tungsten<br>Transition Metal | 75<br><b>Re</b><br>Rhenium<br>Transition Metal | 76<br><b>Os</b><br>Osmium<br>Transition Metal | 77<br><b>Ir</b><br>Iridium<br>Transition Metal | 78<br><b>Pt</b><br>Platinum<br>Transition Metal | 79<br><b>Au</b><br>Gold<br>Transition Metal | 80<br><b>Hg</b><br>Mercury<br>Transition Metal | 81<br><b>Tl</b><br>Thallium<br>Post-Transition Metal | 82<br><b>Pb</b><br>Lead<br>Post-Transition Metal | 83<br><b>Bi</b><br>Bismuth<br>Post-Transition Metal | 84<br><b>Po</b><br>Polonium<br>Metalloid | 85<br><b>At</b><br>Astatine<br>Halogen | 86<br><b>Rn</b><br>Radon<br>Noble Gas |
| 87<br><b>Fr</b><br>Francium<br>Alkali Metal | 88<br><b>Ra</b><br>Radium<br>Alkaline Earth Metal    | 104<br><b>Rf</b><br>Rutherfordium<br>Transition Metal | 105<br><b>Db</b><br>Dubnium<br>Transition Metal  | 106<br><b>Sg</b><br>Seaborgium<br>Transition Metal | 107<br><b>Bh</b><br>Bohrium<br>Transition Metal   | 108<br><b>Hs</b><br>Hassium<br>Transition Metal   | 109<br><b>Mt</b><br>Meitnerium<br>Transition Metal | 110<br><b>Ds</b><br>Darmstadtium<br>Transition Metal | 111<br><b>Rg</b><br>Roentgenium<br>Transition Metal | 112<br><b>Cn</b><br>Copernicium<br>Transition Metal | 113<br><b>Nh</b><br>Nihonium<br>Post-Transition Metal | 114<br><b>Fl</b><br>Flerovium<br>Post-Transition Metal | 115<br><b>Mc</b><br>Moscovium<br>Post-Transition Metal | 116<br><b>Lv</b><br>Livermorium<br>Post-Transition Metal | 117<br><b>Ts</b><br>Tennessine<br>Halogen  | 118<br><b>Og</b><br>Oganesson<br>Noble Gas |   |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |
|   |  | 57<br><b>La</b><br>Lanthanum<br>Lanthanide            | 58<br><b>Ce</b><br>Cerium<br>Lanthanide          | 59<br><b>Pr</b><br>Praseodymium<br>Lanthanide      | 60<br><b>Nd</b><br>Neodymium<br>Lanthanide        | 61<br><b>Pm</b><br>Promethium<br>Lanthanide       | 62<br><b>Sm</b><br>Samarium<br>Lanthanide          | 63<br><b>Eu</b><br>Europium<br>Lanthanide            | 64<br><b>Gd</b><br>Gadolinium<br>Lanthanide         | 65<br><b>Tb</b><br>Terbium<br>Lanthanide            | 66<br><b>Dy</b><br>Dysprosium<br>Lanthanide           | 67<br><b>Ho</b><br>Holmium<br>Lanthanide               | 68<br><b>Er</b><br>Erbium<br>Lanthanide                | 69<br><b>Tm</b><br>Thulium<br>Lanthanide                 | 70<br><b>Yb</b><br>Ytterbium<br>Lanthanide | 71<br><b>Lu</b><br>Lutetium<br>Lanthanide  |   |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |
|   |  | 89<br><b>Ac</b><br>Actinium<br>Actinide               | 90<br><b>Th</b><br>Thorium<br>Actinide           | 91<br><b>Pa</b><br>Protactinium<br>Actinide        | 92<br><b>U</b><br>Uranium<br>Actinide             | 93<br><b>Np</b><br>Neptunium<br>Actinide          | 94<br><b>Pu</b><br>Plutonium<br>Actinide           | 95<br><b>Am</b><br>Americium<br>Actinide             | 96<br><b>Cm</b><br>Curium<br>Actinide               | 97<br><b>Bk</b><br>Berkelium<br>Actinide            | 98<br><b>Cf</b><br>Californium<br>Actinide            | 99<br><b>Es</b><br>Einsteinium<br>Actinide             | 100<br><b>Fm</b><br>Fermium<br>Actinide                | 101<br><b>Md</b><br>Mendelevium<br>Actinide              | 102<br><b>No</b><br>Nobelium<br>Actinide   | 103<br><b>Lr</b><br>Lawrencium<br>Actinide |   |   |   |  |  |   |  |   |   |  |  |  |   |  |  |                                       |

Key:

|                      |
|----------------------|
| Atomic Number        |
| Symbol               |
| Name                 |
| Chemical Group Block |



# THE PERIODIC TABLE OF ELEMENTS

|   |  |   |  |   |   |  |  |   |  |  |   |   |   |  |  |  |   |  |
|---|--|---|--|---|---|--|--|---|--|--|---|---|---|--|--|--|---|--|
| 1<br><b>H</b><br>Hydrogen<br>Nonmetal       |  |   |  |   |   |  |  |   |  |  |   |   |   |  |  |  | 2<br><b>He</b><br>Helium<br>Noble Gas     |  |
| 3<br><b>Li</b><br>Lithium<br>Alkali Metal   | 4<br><b>Be</b><br>Beryllium<br>Alkaline Earth Metal  |   |  |   |   |  |  |   |  |  |   |   |   |  |  |  |   | 10<br><b>Ne</b><br>Neon<br>Noble Gas       |
| 11<br><b>Na</b><br>Sodium<br>Alkali Metal   | 12<br><b>Mg</b><br>Magnesium<br>Alkaline Earth Metal |   |  |   |   |  |  |   |  |  |   |   |   |  |  |  |   | 18<br><b>Ar</b><br>Argon<br>Noble Gas      |
| 19<br><b>K</b><br>Potassium<br>Alkali Metal | 20<br><b>Ca</b><br>Calcium<br>Alkaline Earth Metal   | 21<br><b>Sc</b><br>Scandium<br>Transition Metal | 22<br><b>Ti</b><br>Titanium<br>Transition Metal  | 23<br><b>V</b><br>Vanadium<br>Transition Metal        | 24<br><b>Cr</b><br>Chromium<br>Transition Metal   | 25<br><b>Mn</b><br>Manganese<br>Transition Metal   | 26<br><b>Fe</b><br>Iron<br>Transition Metal      | 27<br><b>Co</b><br>Cobalt<br>Transition Metal   | 28<br><b>Ni</b><br>Nickel<br>Transition Metal      | 29<br><b>Cu</b><br>Copper<br>Transition Metal        | 30<br><b>Zn</b><br>Zinc<br>Transition Metal         | 31<br><b>Ga</b><br>Gallium<br>Post-Transition Metal | 32<br><b>Ge</b><br>Germanium<br>Metalloid             | 33<br><b>As</b><br>Arsenic<br>Metalloid                | 34<br><b>Se</b><br>Selenium<br>Nonmetal                | 35<br><b>Br</b><br>Bromine<br>Halogen                    | 36<br><b>Kr</b><br>Krypton<br>Noble Gas   |  |
| 37<br><b>Rb</b><br>Rubidium<br>Alkali Metal | 38<br><b>Sr</b><br>Strontium<br>Alkaline Earth Metal | 39<br><b>Y</b><br>Yttrium<br>Transition Metal   | 40<br><b>Zr</b><br>Zirconium<br>Transition Metal | 41<br><b>Nb</b><br>Niobium<br>Transition Metal        | 42<br><b>Mo</b><br>Molybdenum<br>Transition Metal | 43<br><b>Tc</b><br>Technetium<br>Transition Metal  | 44<br><b>Ru</b><br>Ruthenium<br>Transition Metal | 45<br><b>Rh</b><br>Rhodium<br>Transition Metal  | 46<br><b>Pd</b><br>Palladium<br>Transition Metal   | 47<br><b>Ag</b><br>Silver<br>Transition Metal        | 48<br><b>Cd</b><br>Cadmium<br>Transition Metal      | 49<br><b>In</b><br>Indium<br>Post-Transition Metal  | 50<br><b>Sn</b><br>Tin<br>Post-Transition Metal       | 51<br><b>Sb</b><br>Antimony<br>Metalloid               | 52<br><b>Te</b><br>Tellurium<br>Metalloid              | 53<br><b>I</b><br>Iodine<br>Halogen                      | 54<br><b>Xe</b><br>Xenon<br>Noble Gas     |  |
| 55<br><b>Cs</b><br>Cesium<br>Alkali Metal   | 56<br><b>Ba</b><br>Barium<br>Alkaline Earth Metal    |   |  | 72<br><b>Hf</b><br>Hafnium<br>Transition Metal        | 73<br><b>Ta</b><br>Tantalum<br>Transition Metal   | 74<br><b>W</b><br>Tungsten<br>Transition Metal     | 75<br><b>Re</b><br>Rhenium<br>Transition Metal   | 76<br><b>Os</b><br>Osmium<br>Transition Metal   | 77<br><b>Ir</b><br>Iridium<br>Transition Metal     | 78<br><b>Pt</b><br>Platinum<br>Transition Metal      | 79<br><b>Au</b><br>Gold<br>Transition Metal         | 80<br><b>Hg</b><br>Mercury<br>Transition Metal      | 81<br><b>Tl</b><br>Thallium<br>Post-Transition Metal  | 82<br><b>Pb</b><br>Lead<br>Post-Transition Metal       | 83<br><b>Bi</b><br>Bismuth<br>Post-Transition Metal    | 84<br><b>Po</b><br>Polonium<br>Metalloid                 | 85<br><b>At</b><br>Astatine<br>Halogen    | 86<br><b>Rn</b><br>Radon<br>Noble Gas      |
| 87<br><b>Fr</b><br>Francium<br>Alkali Metal | 88<br><b>Ra</b><br>Radium<br>Alkaline Earth Metal    |   |  | 104<br><b>Rf</b><br>Rutherfordium<br>Transition Metal | 105<br><b>Db</b><br>Dubnium<br>Transition Metal   | 106<br><b>Sg</b><br>Seaborgium<br>Transition Metal | 107<br><b>Bh</b><br>Bohrium<br>Transition Metal  | 108<br><b>Hs</b><br>Hassium<br>Transition Metal | 109<br><b>Mt</b><br>Meitnerium<br>Transition Metal | 110<br><b>Ds</b><br>Darmstadtium<br>Transition Metal | 111<br><b>Rg</b><br>Roentgenium<br>Transition Metal | 112<br><b>Cn</b><br>Copernicium<br>Transition Metal | 113<br><b>Nh</b><br>Nihonium<br>Post-Transition Metal | 114<br><b>Fl</b><br>Flerovium<br>Post-Transition Metal | 115<br><b>Mc</b><br>Moscovium<br>Post-Transition Metal | 116<br><b>Lv</b><br>Livermorium<br>Post-Transition Metal | 117<br><b>Ts</b><br>Tennessine<br>Halogen | 118<br><b>Og</b><br>Oganesson<br>Noble Gas |
|   |  | 57<br><b>La</b><br>Lanthanum<br>Lanthanide      | 58<br><b>Ce</b><br>Cerium<br>Lanthanide          | 59<br><b>Pr</b><br>Praseodymium<br>Lanthanide         | 60<br><b>Nd</b><br>Neodymium<br>Lanthanide        | 61<br><b>Pm</b><br>Promethium<br>Lanthanide        | 62<br><b>Sm</b><br>Samarium<br>Lanthanide        | 63<br><b>Eu</b><br>Europium<br>Lanthanide       | 64<br><b>Gd</b><br>Gadolinium<br>Lanthanide        | 65<br><b>Tb</b><br>Terbium<br>Lanthanide             | 66<br><b>Dy</b><br>Dysprosium<br>Lanthanide         | 67<br><b>Ho</b><br>Holmium<br>Lanthanide            | 68<br><b>Er</b><br>Erbium<br>Lanthanide               | 69<br><b>Tm</b><br>Thulium<br>Lanthanide               | 70<br><b>Yb</b><br>Ytterbium<br>Lanthanide             | 71<br><b>Lu</b><br>Lutetium<br>Lanthanide                |   |  |
|   |  | 89<br><b>Ac</b><br>Actinium<br>Actinide         | 90<br><b>Th</b><br>Thorium<br>Actinide           | 91<br><b>Pa</b><br>Protactinium<br>Actinide           | 92<br><b>U</b><br>Uranium<br>Actinide             | 93<br><b>Np</b><br>Neptunium<br>Actinide           | 94<br><b>Pu</b><br>Plutonium<br>Actinide         | 95<br><b>Am</b><br>Americium<br>Actinide        | 96<br><b>Cm</b><br>Curium<br>Actinide              | 97<br><b>Bk</b><br>Berkelium<br>Actinide             | 98<br><b>Cf</b><br>Californium<br>Actinide          | 99<br><b>Es</b><br>Einsteinium<br>Actinide          | 100<br><b>Fm</b><br>Fermium<br>Actinide               | 101<br><b>Md</b><br>Mendelevium<br>Actinide            | 102<br><b>No</b><br>Nobelium<br>Actinide               | 103<br><b>Lr</b><br>Lawrencium<br>Actinide               |   |  |

# Periodic Table of Elements

|                      |                       |                            |                       |                          |                        |                        |                         |                           |                          |                          |                         |                         |                        |                          |                         |                         |                     |
|----------------------|-----------------------|----------------------------|-----------------------|--------------------------|------------------------|------------------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|-------------------------|------------------------|--------------------------|-------------------------|-------------------------|---------------------|
| 1<br>H<br>hydrogen   |                       |                            |                       |                          |                        |                        |                         |                           |                          |                          |                         |                         |                        |                          |                         |                         | 2<br>He<br>helium   |
| 3<br>Li<br>lithium   | 4<br>Be<br>beryllium  |                            |                       |                          |                        |                        |                         |                           |                          |                          |                         | 5<br>B<br>boron         | 6<br>C<br>carbon       | 7<br>N<br>nitrogen       | 8<br>O<br>oxygen        | 9<br>F<br>fluorine      | 10<br>Ne<br>neon    |
| 11<br>Na<br>sodium   | 12<br>Mg<br>magnesium |                            |                       |                          |                        |                        |                         |                           |                          |                          |                         | 13<br>Al<br>aluminium   | 14<br>Si<br>silicon    | 15<br>P<br>phosphorus    | 16<br>S<br>sulfur       | 17<br>Cl<br>chlorine    | 18<br>Ar<br>argon   |
| 19<br>K<br>potassium | 20<br>Ca<br>calcium   | 21<br>Sc<br>scandium       | 22<br>Ti<br>titanium  | 23<br>V<br>vanadium      | 24<br>Cr<br>chromium   | 25<br>Mn<br>manganese  | 26<br>Fe<br>iron        | 27<br>Co<br>cobalt        | 28<br>Ni<br>nickel       | 29<br>Cu<br>copper       | 30<br>Zn<br>zinc        | 31<br>Ga<br>gallium     | 32<br>Ge<br>germanium  | 33<br>As<br>arsenic      | 34<br>Se<br>selenium    | 35<br>Br<br>bromine     | 36<br>Kr<br>krypton |
| 37<br>Rb<br>rubidium | 38<br>Sr<br>strontium | 39<br>Y<br>yttrium         | 40<br>Zr<br>zirconium | 41<br>Nb<br>niobium      | 42<br>Mo<br>molybdenum | 43<br>Tc<br>technetium | 44<br>Ru<br>ruthenium   | 45<br>Rh<br>rhodium       | 46<br>Pd<br>palladium    | 47<br>Ag<br>silver       | 48<br>Cd<br>cadmium     | 49<br>In<br>indium      | 50<br>Sn<br>tin        | 51<br>Sb<br>antimony     | 52<br>Te<br>tellurium   | 53<br>I<br>iodine       | 54<br>Xe<br>xenon   |
| 55<br>Cs<br>cesium   | 56<br>Ba<br>barium    | 72<br>Hf<br>hafnium        | 73<br>Ta<br>tantalum  | 74<br>W<br>tungsten      | 75<br>Re<br>rhenium    | 76<br>Os<br>osmium     | 77<br>Ir<br>iridium     | 78<br>Pt<br>platinum      | 79<br>Au<br>gold         | 80<br>Hg<br>mercury      | 81<br>Tl<br>thallium    | 82<br>Pb<br>lead        | 83<br>Bi<br>bismuth    | 84<br>Po<br>polonium     | 85<br>At<br>astatine    | 86<br>Rn<br>radon       |                     |
| 87<br>Fr<br>francium | 88<br>Ra<br>radium    | 104<br>Rf<br>rutherfordium | 105<br>Db<br>dubnium  | 106<br>Sg<br>seaborgium  | 107<br>Bh<br>bohrium   | 108<br>Hs<br>hassium   | 109<br>Mt<br>meitnerium | 110<br>Ds<br>darmstadtium | 111<br>Rg<br>roentgenium | 112<br>Cn<br>copernicium | 113<br>Nh<br>nihonium   | 114<br>Fl<br>flerovium  | 115<br>Mc<br>moscovium | 116<br>Lv<br>livermorium | 117<br>Ts<br>tennessine | 118<br>Og<br>oganeson   |                     |
|                      |                       | 57<br>La<br>lanthanum      | 58<br>Ce<br>cerium    | 59<br>Pr<br>praseodymium | 60<br>Nd<br>neodymium  | 61<br>Pm<br>promethium | 62<br>Sm<br>samarium    | 63<br>Eu<br>europium      | 64<br>Gd<br>gadolinium   | 65<br>Tb<br>terbium      | 66<br>Dy<br>dysprosium  | 67<br>Ho<br>holmium     | 68<br>Er<br>erbium     | 69<br>Tm<br>thulium      | 70<br>Yb<br>ytterbium   | 71<br>Lu<br>lutetium    |                     |
|                      |                       | 89<br>Ac<br>actinium       | 90<br>Th<br>thorium   | 91<br>Pa<br>protactinium | 92<br>U<br>uranium     | 93<br>Np<br>neptunium  | 94<br>Pu<br>plutonium   | 95<br>Am<br>americium     | 96<br>Cm<br>curium       | 97<br>Bk<br>berkelium    | 98<br>Cf<br>californium | 99<br>Es<br>einsteinium | 100<br>Fm<br>fermium   | 101<br>Md<br>mendelevium | 102<br>No<br>nobelium   | 103<br>Lr<br>lawrencium |                     |

# Periodic Table of the Elements

|                                |                                 |                                |                                   |                                 |                                 |                                  |                                 |                                |                                  |                                 |                                 |                                 |                                |                                  |                                 |                                  |                                 |                           |                            |                              |                            |                              |                            |
|--------------------------------|---------------------------------|--------------------------------|-----------------------------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|--------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|---------------------------|----------------------------|------------------------------|----------------------------|------------------------------|----------------------------|
| 1<br>IA<br>1A                  |                                 |                                |                                   |                                 |                                 |                                  |                                 |                                |                                  |                                 |                                 |                                 |                                |                                  |                                 |                                  | 18<br>VIIIA<br>8A               |                           |                            |                              |                            |                              |                            |
| 1<br>H<br>Hydrogen<br>1.008    |                                 |                                |                                   |                                 |                                 |                                  |                                 |                                |                                  |                                 |                                 |                                 |                                |                                  |                                 |                                  | 2<br>He<br>Helium<br>4.002      |                           |                            |                              |                            |                              |                            |
| 3<br>IIA<br>2A                 | 4                               |                                |                                   |                                 |                                 |                                  |                                 |                                |                                  |                                 |                                 |                                 |                                |                                  |                                 |                                  |                                 | 5<br>IIIA<br>3A           | 6<br>IVA<br>4A             | 7<br>VA<br>5A                | 8<br>VIA<br>6A             | 9<br>VIIA<br>7A              | 10                         |
| 3<br>Li<br>Lithium<br>6.941    | 4<br>Be<br>Beryllium<br>9.012   |                                |                                   |                                 |                                 |                                  |                                 |                                |                                  |                                 |                                 |                                 |                                |                                  |                                 |                                  |                                 | 5<br>B<br>Boron<br>10.811 | 6<br>C<br>Carbon<br>12.011 | 7<br>N<br>Nitrogen<br>14.007 | 8<br>O<br>Oxygen<br>15.999 | 9<br>F<br>Fluorine<br>18.998 | 10<br>Ne<br>Neon<br>20.180 |
| 11<br>Na<br>Sodium<br>22.990   | 12<br>Mg<br>Magnesium<br>24.305 | 3<br>IIIB<br>3B                | 4<br>IVB<br>4B                    | 5<br>VB<br>5B                   | 6<br>VIB<br>6B                  | 7<br>VIIB<br>7B                  | 8<br>VIII<br>8                  | 9<br>VIII<br>8                 | 10<br>VIII<br>8                  | 11<br>IB<br>1B                  | 12<br>IIB<br>2B                 | 13<br>Al<br>Aluminum<br>26.982  | 14<br>Si<br>Silicon<br>28.086  | 15<br>P<br>Phosphorus<br>30.974  | 16<br>S<br>Sulfur<br>32.065     | 17<br>Cl<br>Chlorine<br>35.453   | 18<br>Ar<br>Argon<br>39.948     |                           |                            |                              |                            |                              |                            |
| 19<br>K<br>Potassium<br>39.098 | 20<br>Ca<br>Calcium<br>40.078   | 21<br>Sc<br>Scandium<br>44.956 | 22<br>Ti<br>Titanium<br>47.88     | 23<br>V<br>Vanadium<br>50.942   | 24<br>Cr<br>Chromium<br>51.996  | 25<br>Mn<br>Manganese<br>54.938  | 26<br>Fe<br>Iron<br>55.845      | 27<br>Co<br>Cobalt<br>58.933   | 28<br>Ni<br>Nickel<br>58.693     | 29<br>Cu<br>Copper<br>63.546    | 30<br>Zn<br>Zinc<br>65.38       | 31<br>Ga<br>Gallium<br>69.723   | 32<br>Ge<br>Germanium<br>72.63 | 33<br>As<br>Arsenic<br>74.922    | 34<br>Se<br>Selenium<br>78.972  | 35<br>Br<br>Bromine<br>79.904    | 36<br>Kr<br>Krypton<br>83.80    |                           |                            |                              |                            |                              |                            |
| 37<br>Rb<br>Rubidium<br>85.468 | 38<br>Sr<br>Strontium<br>87.62  | 39<br>Y<br>Yttrium<br>88.906   | 40<br>Zr<br>Zirconium<br>91.224   | 41<br>Nb<br>Niobium<br>92.906   | 42<br>Mo<br>Molybdenum<br>95.94 | 43<br>Tc<br>Technetium<br>98.907 | 44<br>Ru<br>Ruthenium<br>101.07 | 45<br>Rh<br>Rhodium<br>102.906 | 46<br>Pd<br>Palladium<br>106.42  | 47<br>Ag<br>Silver<br>107.868   | 48<br>Cd<br>Cadmium<br>112.411  | 49<br>In<br>Indium<br>114.818   | 50<br>Sn<br>Tin<br>118.71      | 51<br>Sb<br>Antimony<br>121.760  | 52<br>Te<br>Tellurium<br>127.6  | 53<br>I<br>Iodine<br>126.905     | 54<br>Xe<br>Xenon<br>131.29     |                           |                            |                              |                            |                              |                            |
| 55<br>Cs<br>Cesium<br>132.905  | 56<br>Ba<br>Barium<br>137.327   | 57-71                          | 72<br>Hf<br>Hafnium<br>178.49     | 73<br>Ta<br>Tantalum<br>180.948 | 74<br>W<br>Tungsten<br>183.85   | 75<br>Re<br>Rhenium<br>186.207   | 76<br>Os<br>Osmium<br>190.23    | 77<br>Ir<br>Iridium<br>192.22  | 78<br>Pt<br>Platinum<br>195.08   | 79<br>Au<br>Gold<br>196.967     | 80<br>Hg<br>Mercury<br>200.59   | 81<br>Tl<br>Thallium<br>204.384 | 82<br>Pb<br>Lead<br>207.2      | 83<br>Bi<br>Bismuth<br>208.980   | 84<br>Po<br>Polonium<br>209     | 85<br>At<br>Astatine<br>209      | 86<br>Rn<br>Radon<br>222        |                           |                            |                              |                            |                              |                            |
| 87<br>Fr<br>Francium<br>223    | 88<br>Ra<br>Radium<br>226       | 89-103                         | 104<br>Rf<br>Rutherfordium<br>261 | 105<br>Db<br>Dubnium<br>262     | 106<br>Sg<br>Seaborgium<br>266  | 107<br>Bh<br>Bohrium<br>264      | 108<br>Hs<br>Hassium<br>265     | 109<br>Mt<br>Meitnerium<br>268 | 110<br>Ds<br>Darmstadtium<br>269 | 111<br>Rg<br>Roentgenium<br>271 | 112<br>Cn<br>Copernicium<br>277 | 113<br>Uut<br>Ununtrium<br>278  | 114<br>Fl<br>Flerovium<br>289  | 115<br>Uup<br>Ununpentium<br>288 | 116<br>Lv<br>Livermorium<br>293 | 117<br>Uus<br>Ununseptium<br>289 | 118<br>Uuo<br>Ununoctium<br>294 |                           |                            |                              |                            |                              |                            |

|                   |                                  |                                |                                     |                                 |                                   |                                  |                                  |                                  |                                  |                                    |                                |                                 |                                   |                                  |                                 |
|-------------------|----------------------------------|--------------------------------|-------------------------------------|---------------------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|------------------------------------|--------------------------------|---------------------------------|-----------------------------------|----------------------------------|---------------------------------|
| Lanthanide Series | 57<br>La<br>Lanthanum<br>138.905 | 58<br>Ce<br>Cerium<br>140.12   | 59<br>Pr<br>Praseodymium<br>140.908 | 60<br>Nd<br>Neodymium<br>144.24 | 61<br>Pm<br>Promethium<br>144.913 | 62<br>Sm<br>Samarium<br>150.36   | 63<br>Eu<br>Europium<br>151.964  | 64<br>Gd<br>Gadolinium<br>157.25 | 65<br>Tb<br>Terbium<br>158.925   | 66<br>Dy<br>Dysprosium<br>162.50   | 67<br>Ho<br>Holmium<br>164.930 | 68<br>Er<br>Erbium<br>167.26    | 69<br>Tm<br>Thulium<br>168.934    | 70<br>Yb<br>Ytterbium<br>173.04  | 71<br>Lu<br>Lutetium<br>174.967 |
| Actinide Series   | 89<br>Ac<br>Actinium<br>227.03   | 90<br>Th<br>Thorium<br>232.038 | 91<br>Pa<br>Protactinium<br>231.036 | 92<br>U<br>Uranium<br>238.029   | 93<br>Np<br>Neptunium<br>237.04   | 94<br>Pu<br>Plutonium<br>244.064 | 95<br>Am<br>Americium<br>243.061 | 96<br>Cm<br>Curium<br>247.070    | 97<br>Bk<br>Berkelium<br>247.070 | 98<br>Cf<br>Californium<br>251.080 | 99<br>Es<br>Einsteinium<br>254 | 100<br>Fm<br>Fermium<br>257.095 | 101<br>Md<br>Mendelevium<br>258.1 | 102<br>No<br>Nobelium<br>259.101 | 103<br>Lr<br>Lawrencium<br>262  |

- Alkali Metal
- Alkaline Earth
- Transition Metal
- Basic Metal
- Semimetal
- Nonmetal
- Halogen
- Noble Gas
- Lanthanide
- Actinide

# The Periodic Table of Elements

|  |  |  |   |   |  |  |   |  |  |  |   |   |   |  |   |   |   |
|--|--|--|---|---|--|--|---|--|--|--|---|---|---|--|---|---|---|
| <b>1</b><br><b>H</b><br>Hydrogen<br>1.008        |  |  |   |   |  |  |   |  |  |  |   |   |   |  |   |   | <b>2</b><br><b>He</b><br>Helium<br>4.00260  |
| <b>3</b><br><b>Li</b><br>Lithium<br>7.0          | <b>4</b><br><b>Be</b><br>Beryllium<br>9.012185 |  |   |   |  |  |   |  |  |  |   | <b>5</b><br><b>B</b><br>Boron<br>10.81          | <b>6</b><br><b>C</b><br>Carbon<br>12.011      | <b>7</b><br><b>N</b><br>Nitrogen<br>14.007         | <b>8</b><br><b>O</b><br>Oxygen<br>15.999      | <b>9</b><br><b>F</b><br>Fluorine<br>18.99840316 | <b>10</b><br><b>Ne</b><br>Neon<br>20.180    |
| <b>11</b><br><b>Na</b><br>Sodium<br>22.9897693   | <b>12</b><br><b>Mg</b><br>Magnesium<br>24.305  |  |   |   |  |  |   |  |  |  |   | <b>13</b><br><b>Al</b><br>Aluminum<br>26.981538 | <b>14</b><br><b>Si</b><br>Silicon<br>28.085   | <b>15</b><br><b>P</b><br>Phosphorus<br>30.97376200 | <b>16</b><br><b>S</b><br>Sulphur<br>32.07     | <b>17</b><br><b>Cl</b><br>Chlorine<br>35.45     | <b>18</b><br><b>Ar</b><br>Argon<br>39.9     |
| <b>19</b><br><b>K</b><br>Potassium<br>39.098     | <b>20</b><br><b>Ca</b><br>Calcium<br>40.08     | <b>21</b><br><b>Sc</b><br>Scandium<br>44.95591     | <b>22</b><br><b>Ti</b><br>Titanium<br>47.87     | <b>23</b><br><b>V</b><br>Vanadium<br>50.941       | <b>24</b><br><b>Cr</b><br>Chromium<br>51.996 | <b>25</b><br><b>Mn</b><br>Manganese<br>54.93804  | <b>26</b><br><b>Fe</b><br>Iron<br>55.84       | <b>27</b><br><b>Co</b><br>Cobalt<br>58.93319   | <b>28</b><br><b>Ni</b><br>Nickel<br>58.693     | <b>29</b><br><b>Cu</b><br>Copper<br>63.55      | <b>30</b><br><b>Zn</b><br>Zinc<br>65.4        | <b>31</b><br><b>Ga</b><br>Gallium<br>69.72      | <b>32</b><br><b>Ge</b><br>Germanium<br>72.63  | <b>33</b><br><b>As</b><br>Arsenic<br>74.93         | <b>34</b><br><b>Se</b><br>Selenium<br>78.97   | <b>35</b><br><b>Br</b><br>Bromine<br>79.904     | <b>36</b><br><b>Kr</b><br>Krypton<br>83.80  |
| <b>37</b><br><b>Rb</b><br>Rubidium<br>85.468     | <b>38</b><br><b>Sr</b><br>Strontium<br>87.6    | <b>39</b><br><b>Y</b><br>Yttrium<br>88.9058        | <b>40</b><br><b>Zr</b><br>Zirconium<br>91.22    | <b>41</b><br><b>Nb</b><br>Niobium<br>92.906       | <b>42</b><br><b>Mo</b><br>Molybdenum<br>95.9 | <b>43</b><br><b>Tc</b><br>Technetium<br>97.90721 | <b>44</b><br><b>Ru</b><br>Ruthenium<br>101.1  | <b>45</b><br><b>Rh</b><br>Rhodium<br>101.1     | <b>46</b><br><b>Pd</b><br>Palladium<br>106.4   | <b>47</b><br><b>Ag</b><br>Silver<br>107.868    | <b>48</b><br><b>Cd</b><br>Cadmium<br>112.41   | <b>49</b><br><b>In</b><br>Indium<br>114.82      | <b>50</b><br><b>Sn</b><br>Tin<br>118.71       | <b>51</b><br><b>Sb</b><br>Antimony<br>121.76       | <b>52</b><br><b>Te</b><br>Tellurium<br>127.6  | <b>53</b><br><b>I</b><br>Iodine<br>126.90       | <b>54</b><br><b>Xe</b><br>Xenon<br>131.29   |
| <b>55</b><br><b>Cs</b><br>Caesium<br>132.9054520 | <b>56</b><br><b>Ba</b><br>Barium<br>137.33     | <b>57-71</b><br>Lanthanoids                        | <b>72</b><br><b>Hf</b><br>Hafnium<br>178.5      | <b>73</b><br><b>Ta</b><br>Tantalum<br>178.5       | <b>74</b><br><b>W</b><br>Tungsten<br>183.8   | <b>75</b><br><b>Re</b><br>Rhenium<br>186.21      | <b>76</b><br><b>Os</b><br>Osmium<br>190.2     | <b>77</b><br><b>Ir</b><br>Iridium<br>192.22    | <b>78</b><br><b>Pt</b><br>Platinum<br>195.08   | <b>79</b><br><b>Au</b><br>Gold<br>196.96657    | <b>80</b><br><b>Hg</b><br>Mercury<br>200.59   | <b>81</b><br><b>Tl</b><br>Thallium<br>204.385   | <b>82</b><br><b>Pb</b><br>Lead<br>207         | <b>83</b><br><b>Bi</b><br>Bismuth<br>208.9804      | <b>84</b><br><b>Po</b><br>Polonium<br>209     | <b>85</b><br><b>At</b><br>Astatine<br>209       | <b>86</b><br><b>Rn</b><br>Radon<br>222      |
| <b>87</b><br><b>Fr</b><br>Francium<br>223        | <b>88</b><br><b>Ra</b><br>Radium<br>226        | <b>89-103</b><br>Actinoids                         | <b>104</b><br><b>Rf</b><br>Rutherfordium<br>261 | <b>105</b><br><b>Db</b><br>Dubnium<br>261         | <b>106</b><br><b>Sg</b><br>Seaborgium<br>271 | <b>107</b><br><b>Bh</b><br>Bohrium<br>271        | <b>108</b><br><b>Hs</b><br>Hassium<br>277     | <b>109</b><br><b>Mt</b><br>Meitnerium<br>278   | <b>110</b><br><b>Ds</b><br>Darmstadtium<br>281 | <b>111</b><br><b>Rg</b><br>Roentgenium<br>282  | <b>112</b><br><b>Cn</b><br>Copernicium<br>285 | <b>113</b><br><b>Nh</b><br>Nihonium<br>286      | <b>114</b><br><b>Fl</b><br>Flerovium<br>289   | <b>115</b><br><b>Mc</b><br>Moscovium<br>290        | <b>116</b><br><b>Lv</b><br>Livermorium<br>293 | <b>117</b><br><b>Ts</b><br>Tennessine<br>294    | <b>118</b><br><b>Og</b><br>Oganesson<br>294 |
| <b>57</b><br><b>La</b><br>Lanthanum<br>138.9055  | <b>58</b><br><b>Ce</b><br>Cerium<br>140.12     | <b>59</b><br><b>Pr</b><br>Praseodymium<br>140.9077 | <b>60</b><br><b>Nd</b><br>Neodymium<br>144.24   | <b>61</b><br><b>Pm</b><br>Promethium<br>144.91276 | <b>62</b><br><b>Sm</b><br>Samarium<br>150.4  | <b>63</b><br><b>Eu</b><br>Europium<br>151.96     | <b>64</b><br><b>Gd</b><br>Gadolinium<br>157.2 | <b>65</b><br><b>Tb</b><br>Terbium<br>158.92535 | <b>66</b><br><b>Dy</b><br>Dysprosium<br>162.50 | <b>67</b><br><b>Ho</b><br>Holmium<br>164.93033 | <b>68</b><br><b>Er</b><br>Erbium<br>167.2593  | <b>69</b><br><b>Tm</b><br>Thulium<br>168.93422  | <b>70</b><br><b>Yb</b><br>Ytterbium<br>173.05 | <b>71</b><br><b>Lu</b><br>Lutetium<br>174.967      |   |   |   |
| <b>89</b><br><b>Ac</b><br>Actinium<br>227        | <b>90</b><br><b>Th</b><br>Thorium<br>232       | <b>91</b><br><b>Pa</b><br>Protactinium<br>231      | <b>92</b><br><b>U</b><br>Uranium<br>238         | <b>93</b><br><b>Np</b><br>Neptunium<br>237        | <b>94</b><br><b>Pu</b><br>Plutonium<br>244   | <b>95</b><br><b>Am</b><br>Americium<br>243       | <b>96</b><br><b>Cm</b><br>Curium<br>247       | <b>97</b><br><b>Bk</b><br>Berkelium<br>247     | <b>98</b><br><b>Cf</b><br>Californium<br>251   | <b>99</b><br><b>Es</b><br>Einsteinium<br>252   | <b>100</b><br><b>Fm</b><br>Fermium<br>257     | <b>101</b><br><b>Md</b><br>Mendelevium<br>258   | <b>102</b><br><b>No</b><br>Nobelium<br>259    | <b>103</b><br><b>Lr</b><br>Lawrencium<br>262       |   |   |   |



# Periodic Table of the Elements

Atomic Number → 19

Symbol → **K**

Relative Atomic Mass → 39.0983

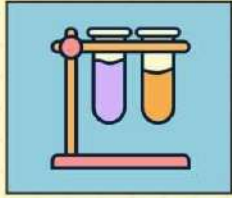
Name → Potassium

Symbol in white: element has no stable nuclides

**Colour Legend**

- Alkali metals
- Alkaline earth metals
- Transition metals
- Other metals
- Other non-metals
- Halogens
- Noble gases
- Lanthanides
- Actinides

| Group | 1                               | 2                                | 3                               | 4                                 | 5                                | 6                                    | 7                                | 8                                | 9                               | 10                               | 11                                | 12                              | 13                                | 14                               | 15                               | 16                               | 17                                | 18                               |
|-------|---------------------------------|----------------------------------|---------------------------------|-----------------------------------|----------------------------------|--------------------------------------|----------------------------------|----------------------------------|---------------------------------|----------------------------------|-----------------------------------|---------------------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| 1     | <b>H</b><br>1.00794<br>Hydrogen |                                  |                                 |                                   |                                  |                                      |                                  |                                  |                                 |                                  |                                   |                                 |                                   |                                  |                                  |                                  |                                   | <b>He</b><br>4.002602<br>Helium  |
| 2     | <b>Li</b><br>6.941<br>Lithium   | <b>Be</b><br>9.0122<br>Beryllium |                                 |                                   |                                  |                                      |                                  |                                  |                                 |                                  |                                   |                                 | <b>B</b><br>10.811<br>Boron       | <b>C</b><br>12.011<br>Carbon     | <b>N</b><br>14.007<br>Nitrogen   | <b>O</b><br>15.999<br>Oxygen     | <b>F</b><br>18.998<br>Fluorine    | <b>Ne</b><br>20.180<br>Neon      |
| 3     | <b>Na</b><br>22.990<br>Sodium   | <b>Mg</b><br>24.305<br>Magnesium |                                 |                                   |                                  |                                      |                                  |                                  |                                 |                                  |                                   |                                 | <b>Al</b><br>26.982<br>Aluminium  | <b>Si</b><br>28.086<br>Silicon   | <b>P</b><br>30.974<br>Phosphorus | <b>S</b><br>32.06<br>Sulfur      | <b>Cl</b><br>35.45<br>Chlorine    | <b>Ar</b><br>39.948<br>Argon     |
| 4     | <b>K</b><br>39.098<br>Potassium | <b>Ca</b><br>40.078<br>Calcium   | <b>Sc</b><br>44.956<br>Scandium | <b>Ti</b><br>47.867<br>Titanium   | <b>V</b><br>50.942<br>Vanadium   | <b>Cr</b><br>51.996<br>Chromium      | <b>Mn</b><br>54.938<br>Manganese | <b>Fe</b><br>55.845<br>Iron      | <b>Co</b><br>58.933<br>Cobalt   | <b>Ni</b><br>58.693<br>Nickel    | <b>Cu</b><br>63.546<br>Copper     | <b>Zn</b><br>65.38<br>Zinc      | <b>Ga</b><br>69.723<br>Gallium    | <b>Ge</b><br>72.64<br>Germanium  | <b>As</b><br>74.922<br>Arsenic   | <b>Se</b><br>78.96<br>Selenium   | <b>Br</b><br>79.904<br>Bromine    | <b>Kr</b><br>83.796<br>Krypton   |
| 5     | <b>Rb</b><br>85.468<br>Rubidium | <b>Sr</b><br>87.62<br>Strontium  | <b>Y</b><br>88.906<br>Yttrium   | <b>Zr</b><br>91.224<br>Zirconium  | <b>Nb</b><br>92.906<br>Niobium   | <b>Mo</b><br>95.94<br>Molybdenum     | <b>Tc</b><br>98<br>Technetium    | <b>Ru</b><br>101.07<br>Ruthenium | <b>Rh</b><br>102.905<br>Rhodium | <b>Pd</b><br>106.42<br>Palladium | <b>Ag</b><br>107.868<br>Silver    | <b>Cd</b><br>112.411<br>Cadmium | <b>In</b><br>114.818<br>Indium    | <b>Sn</b><br>118.710<br>Tin      | <b>Sb</b><br>121.760<br>Antimony | <b>Te</b><br>127.60<br>Tellurium | <b>I</b><br>126.905<br>Iodine     | <b>Xe</b><br>131.29<br>Xenon     |
| 6     | <b>Cs</b><br>132.905<br>Caesium | <b>Ba</b><br>137.327<br>Barium   | <b>La-Lu</b><br>D-Block         | <b>Hf</b><br>178.49<br>Hafnium    | <b>Ta</b><br>180.948<br>Tantalum | <b>W</b><br>183.84<br>Tungsten       | <b>Re</b><br>186.207<br>Rhenium  | <b>Os</b><br>190.23<br>Osmium    | <b>Ir</b><br>192.222<br>Iridium | <b>Pt</b><br>195.084<br>Platinum | <b>Au</b><br>196.967<br>Gold      | <b>Hg</b><br>200.59<br>Mercury  | <b>Tl</b><br>204.387<br>Thallium  | <b>Pb</b><br>207.2<br>Lead       | <b>Bi</b><br>208.980<br>Bismuth  | <b>Po</b><br>209<br>Polonium     | <b>At</b><br>210<br>Astatine      | <b>Rn</b><br>222<br>Radon        |
| 7     | <b>Fr</b><br>223<br>Francium    | <b>Ra</b><br>226<br>Radium       | <b>Ac-Lr</b><br>F-Block         | <b>Rf</b><br>261<br>Rutherfordium | <b>Db</b><br>262<br>Dubnium      | <b>Sg</b><br>263<br>Seaborgium       | <b>Bh</b><br>264<br>Bohrium      | <b>Hs</b><br>265<br>Hassium      | <b>Mt</b><br>266<br>Meitnerium  | <b>Ds</b><br>267<br>Darmstadtium | <b>Rg</b><br>268<br>Roentgenium   | <b>Cn</b><br>269<br>Copernicium | <b>Uut</b><br>270<br>Ununtrium    | <b>Uuq</b><br>271<br>Ununquadium | <b>Uup</b><br>272<br>Ununpentium | <b>Uuh</b><br>273<br>Ununhexium  |                                   | <b>Uuo</b><br>274<br>Ununoctium  |
|       |                                 |                                  |                                 | <b>La</b><br>138.905<br>Lanthanum | <b>Ce</b><br>140.12<br>Cerium    | <b>Pr</b><br>140.908<br>Praseodymium | <b>Nd</b><br>144.24<br>Neodymium | <b>Pm</b><br>145<br>Promethium   | <b>Sm</b><br>150.36<br>Samarium | <b>Eu</b><br>151.964<br>Europium | <b>Gd</b><br>157.25<br>Gadolinium | <b>Tb</b><br>158.925<br>Terbium | <b>Dy</b><br>162.50<br>Dysprosium | <b>Ho</b><br>164.930<br>Holmium  | <b>Er</b><br>167.259<br>Erbium   | <b>Tm</b><br>168.930<br>Thulium  | <b>Yb</b><br>173.054<br>Ytterbium | <b>Lu</b><br>174.967<br>Lutetium |
|       |                                 |                                  |                                 | <b>Ac</b><br>227<br>Actinium      | <b>Th</b><br>232.038<br>Thorium  | <b>Pa</b><br>231.036<br>Protactinium | <b>U</b><br>238.029<br>Uranium   | <b>Np</b><br>237<br>Neptunium    | <b>Pu</b><br>244<br>Plutonium   | <b>Am</b><br>243<br>Americium    | <b>Cm</b><br>247<br>Curium        | <b>Bk</b><br>247<br>Berkelium   | <b>Cf</b><br>251<br>Californium   | <b>Es</b><br>252<br>Einsteinium  | <b>Fm</b><br>257<br>Fermium      | <b>Md</b><br>258<br>Mendelevium  | <b>No</b><br>259<br>Nobelium      | <b>Lr</b><br>260<br>Lawrencium   |



# The Periodic Table of Elements



|   |   |   |  |  |   |   |  |   |   |  |  |   |  |  |  |   |  |  |                                      |   |                                    |  |                                   |
|---|---|---|--|--|---|---|--|---|---|--|--|---|--|--|--|---|--|--|--------------------------------------|---|------------------------------------|--|-----------------------------------|
| 1<br><b>H</b><br>Hydrogen<br>1.008        |   |   |  |  |   |   |  |   |   |  |  |   |  |  |  |   | 2<br><b>He</b><br>Helium<br>4.00260      |  |                                      |   |                                    |  |                                   |
| 3<br><b>Li</b><br>Lithium<br>7.0          | 4<br><b>Be</b><br>Beryllium<br>9.012183 |   |  |  |   |   |  |   |   |  |  |   |  |  |  |   |  | 5<br><b>B</b><br>Boron<br>10.81          | 6<br><b>C</b><br>Carbon<br>12.011    | 7<br><b>N</b><br>Nitrogen<br>14.007         | 8<br><b>O</b><br>Oxygen<br>15.999  | 9<br><b>F</b><br>Fluorine<br>18.99840316 | 10<br><b>Ne</b><br>Neon<br>20.180 |
| 11<br><b>Na</b><br>Sodium<br>22.9897693   | 12<br><b>Mg</b><br>Magnesium<br>24.305  |   |  |  |   |   |  |   |   |  |  |   |  |  |  |   |  | 13<br><b>Al</b><br>Aluminum<br>26.981538 | 14<br><b>Si</b><br>Silicon<br>28.085 | 15<br><b>P</b><br>Phosphorus<br>30.97376200 | 16<br><b>S</b><br>Sulphur<br>32.07 | 17<br><b>Cl</b><br>Chlorine<br>35.45     | 18<br><b>Ar</b><br>Argon<br>39.9  |
| 19<br><b>K</b><br>Potassium<br>39.098     | 20<br><b>Ca</b><br>Calcium<br>40.08     | 21<br><b>Sc</b><br>Scandium<br>44.95591 | 22<br><b>Ti</b><br>Titanium<br>47.87         | 23<br><b>V</b><br>Vanadium<br>50.941   | 24<br><b>Cr</b><br>Chromium<br>51.996     | 25<br><b>Mn</b><br>Manganese<br>54.93804  | 26<br><b>Fe</b><br>Iron<br>55.84       | 27<br><b>Co</b><br>Cobalt<br>58.93319     | 28<br><b>Ni</b><br>Nickel<br>58.693         | 29<br><b>Cu</b><br>Copper<br>63.55         | 30<br><b>Zn</b><br>Zinc<br>65.4            | 31<br><b>Ga</b><br>Gallium<br>69.72     | 32<br><b>Ge</b><br>Germanium<br>72.63    | 33<br><b>As</b><br>Arsenic<br>74.92      | 34<br><b>Se</b><br>Selenium<br>78.97       | 35<br><b>Br</b><br>Bromine<br>79.904      | 36<br><b>Kr</b><br>Krypton<br>83.80      |  |                                      |   |                                    |  |                                   |
| 37<br><b>Rb</b><br>Rubidium<br>85.468     | 38<br><b>Sr</b><br>Strontium<br>87.6    | 39<br><b>Y</b><br>Yttrium<br>88.9058    | 40<br><b>Zr</b><br>Zirconium<br>91.22        | 41<br><b>Nb</b><br>Niobium<br>92.906   | 42<br><b>Mo</b><br>Molybdenum             | 43<br><b>Tc</b><br>Technetium<br>97.90721 | 44<br><b>Ru</b><br>Ruthenium<br>101.1  | 45<br><b>Rh</b><br>Rhodium<br>101.1       | 46<br><b>Pd</b><br>Palladium<br>106.4       | 47<br><b>Ag</b><br>Silver<br>107.868       | 48<br><b>Cd</b><br>Cadmium<br>112.41       | 49<br><b>In</b><br>Indium<br>114.82     | 50<br><b>Sn</b><br>Tin<br>118.71         | 51<br><b>Sb</b><br>Antimony<br>121.76    | 52<br><b>Te</b><br>Tellurium<br>127.6      | 53<br><b>I</b><br>Iodine<br>126.90        | 54<br><b>Xe</b><br>Xenon<br>131.29       |  |                                      |   |                                    |  |                                   |
| 55<br><b>Cs</b><br>Caesium<br>132.9054520 | 56<br><b>Ba</b><br>Barium<br>137.33     | 57-71<br>Lanthanoids                    | 72<br><b>Hf</b><br>Hafnium<br>178.5          | 73<br><b>Ta</b><br>Tantalum<br>178.5   | 74<br><b>W</b><br>Tungsten<br>183.8       | 75<br><b>Re</b><br>Rhenium<br>186.21      | 76<br><b>Os</b><br>Osmium<br>190.2     | 77<br><b>Ir</b><br>Iridium<br>192.22      | 78<br><b>Pt</b><br>Platinum<br>195.08       | 79<br><b>Au</b><br>Gold<br>196.96657       | 80<br><b>Hg</b><br>Mercury<br>200.59       | 81<br><b>Tl</b><br>Thallium<br>204.385  | 82<br><b>Pb</b><br>Lead<br>207           | 83<br><b>Bi</b><br>Bismuth<br>208.9804   | 84<br><b>Po</b><br>Polonium<br>208.98243   | 85<br><b>At</b><br>Astatine<br>209.98715  | 86<br><b>Rn</b><br>Radon<br>222.01758    |  |                                      |   |                                    |  |                                   |
| 87<br><b>Fr</b><br>Francium<br>223.01973  | 88<br><b>Ra</b><br>Radium<br>226.02541  | 89-103<br>Actinoids                     | 104<br><b>Rf</b><br>Rutherfordium<br>276.122 | 105<br><b>Db</b><br>Dubnium<br>268.126 | 106<br><b>Sg</b><br>Seaborgium<br>271.134 | 107<br><b>Bh</b><br>Bohrium<br>274.144    | 108<br><b>Hs</b><br>Hassium<br>277.152 | 109<br><b>Mt</b><br>Meitnerium<br>278.156 | 110<br><b>Ds</b><br>Darmstadtium<br>281.165 | 111<br><b>Rg</b><br>Roentgenium<br>282.169 | 112<br><b>Cn</b><br>Copernicium<br>285.177 | 113<br><b>Nh</b><br>Nihonium<br>286.183 | 114<br><b>Fl</b><br>Flerovium<br>287.191 | 115<br><b>Mc</b><br>Moscovium<br>290.196 | 116<br><b>Lv</b><br>Livermorium<br>293.205 | 117<br><b>Ts</b><br>Tennessine<br>294.211 | 118<br><b>Og</b><br>Oganesson<br>294.214 |  |                                      |   |                                    |  |                                   |

**Key:**

atomic number  
**Symbol**  
name  
Atomic Mass, u



|  |                                       |   |  |  |   |   |  |   |   |  |  |  |   |  |
|--|---------------------------------------|---|--|--|---|---|--|---|---|--|--|--|---|--|
| 57<br><b>La</b><br>Lanthanum<br>138.9055 | 58<br><b>Ce</b><br>Cerium<br>140.12   | 59<br><b>Pr</b><br>Praseodymium<br>140.9077 | 60<br><b>Nd</b><br>Neodymium<br>144.24 | 61<br><b>Pm</b><br>Promethium<br>144.91276 | 62<br><b>Sm</b><br>Samarium<br>150.4      | 63<br><b>Eu</b><br>Europium<br>151.96     | 64<br><b>Gd</b><br>Gadolinium<br>157.2 | 65<br><b>Tb</b><br>Terbium<br>158.92535   | 66<br><b>Dy</b><br>Dysprosium<br>162.50 | 67<br><b>Ho</b><br>Holmium<br>164.93032    | 68<br><b>Er</b><br>Erbium<br>167.2593    | 69<br><b>Tm</b><br>Thulium<br>168.93422      | 70<br><b>Yb</b><br>Ytterbium<br>173.05    | 71<br><b>Lu</b><br>Lutetium<br>174.967   |
| 89<br><b>Ac</b><br>Actinium<br>227.02773 | 90<br><b>Th</b><br>Thorium<br>232.038 | 91<br><b>Pa</b><br>Protactinium<br>231.0369 | 92<br><b>U</b><br>Uranium<br>238.0289  | 93<br><b>Np</b><br>Neptunium<br>237.04817  | 94<br><b>Pu</b><br>Plutonium<br>244.06420 | 95<br><b>Am</b><br>Americium<br>243.06136 | 96<br><b>Cm</b><br>Curium<br>247.07535 | 97<br><b>Bk</b><br>Berkelium<br>247.07535 | 98<br><b>Cf</b><br>Californium<br>251   | 99<br><b>Es</b><br>Einsteinium<br>252.0830 | 100<br><b>Fm</b><br>Fermium<br>257.09511 | 101<br><b>Md</b><br>Mendelevium<br>258.09843 | 102<br><b>No</b><br>Nobelium<br>259.10300 | 103<br><b>Lr</b><br>Lawrencium<br>262.10 |