Periodic System of Elements

first conceived by Dimitri Mendeleev (1869)

Explanation

11 — 23.0 — **Na** — Sodium — $3s^1$

- 23.0: Atomic mass
- 11: Atomic number (*i. e.* # of protons)
- $3s^1$: Outer shell electron configuration

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIII
1 1.01 **H** Hydrogen $1s^1$																	2 4.00 **He** Helium $1s^2$
3 6.94 **Li** Lithium $2s^1$	4 9.01 **Be** Beryllium $2s^2$											5 10.8 **B** Boron $2p^1$	6 12.0 **C** Carbon $2p^2$	7 14.0 **N** Nitrogen $2p^3$	8 16.0 **O** Oxygen $2p^4$	9 19.0 **F** Fluorine $2p^5$	10 20.2 **Ne** Neon $2p^6$
11 23.0 **Na** Sodium $3s^1$	12 24.3 **Mg** Magnesium $3s^2$											13 27.0 **Al** Aluminum $3p^1$	14 28.1 **Si** Silicon $3p^2$	15 31.0 **P** Phosphorous $3p^3$	16 32.1 **S** Sulfur $3p^4$	17 35.5 **Cl** Chlorine $3p^5$	18 40.0 **Ar** Argon $3p^6$
19 39.1 **K** Potassium $4s^1$	20 40.1 **Ca** Calcium $4s^2$	21 45.0 **Sc** Scandium $3d^1 4s^2$	22 47.9 **Ti** Titanium $3d^2 4s^2$	23 50.9 **V** Vanadium $3d^3 4s^2$	24 52.0 **Cr** Chromium $3d^5 4s^1$	25 54.9 **Mn** Manganese $3d^5 4s^2$	26 55.9 **Fe** Iron $3d^6 4s^2$	27 58.9 **Co** Cobalt $3d^7 4s^2$	28 58.7 **Ni** Nickel $3d^8 4s^2$	29 63.5 **Cu** Copper $3d^{10} 4s^1$	30 65.4 **Zn** Zinc $3d^{10} 4s^2$	31 69.7 **Ga** Gallium $4p^1$	32 72.6 **Ge** Germanium $4p^2$	33 74.9 **As** Arsenic $4p^3$	34 79.0 **Se** Selenium $4p^4$	35 79.9 **Br** Bromine $4p^5$	36 83.8 **Kr** Krypton $4p^6$
37 85.5 **Rb** Rubidium $5s^1$	38 87.6 **Sr** Strontium $5s^2$	39 88.9 **Y** Yttrium $4d^1 5s^2$	40 91.2 **Zr** Zirconium $4d^2 5s^2$	41 92.9 **Nb** Niobium $4d^4 5s^1$	42 95.9 **Mo** Molybdenum $4d^5 5s^1$	43 98 **Tc** Technetium $4d^5 5s^2$	44 101 **Ru** Ruthenium $4d^7 5s^1$	45 103 **Rh** Rhodium $4d^8 5s^1$	46 106 **Pd** Palladium $4d^{10}$	47 108 **Ag** Silver $4d^{10} 5s^1$	48 112 **Cd** Cadmium $4d^{10} 5s^2$	49 115 **In** Indium $5p^1$	50 119 **Sn** Tin $5p^2$	51 122 **Sb** Antimony $5p^3$	52 128 **Te** Tellurium $5p^4$	53 127 **I** Iodine $5p^5$	54 131 **Xe** Xenon $5p^6$
55 133 **Cs** Cesium $6s^1$	56 137 **Ba** Barium $6s^2$	57 139 **La*** Lanthanum $5d^1 6s^2$	72 178 **Hf** Hafnium $5d^2 6s^2$	73 181 **Ta** Tantalum $5d^3 6s^2$	74 184 **W** Tungsten $5d^4 6s^2$	75 186 **Re** Rhenium $5d^5 6s^2$	76 190 **Os** Osmium $5d^6 6s^2$	77 192 **Ir** Iridium $5d^7 6s^2$	78 195 **Pt** Platinum $5d^9 6s^1$	79 197 **Au** Gold $5d^{10} 6s^1$	80 201 **Hg** Mercury $5d^{10} 6s^2$	81 204 **Tl** Thallium $6p^1$	82 207 **Pb** Lead $6p^2$	83 209 **Bi** Bismuth $6p^3$	84 209 **Po** Polonium $6p^4$	85 210 **At** Astatine $6p^5$	86 222 **Rn** Radon $6p^6$
87 223 **Fr** Francium $7s^1$	88 226 **Ra** Radium $7s^2$	89 227 **Ac**** Actinium $6d^1 7s^2$															

Coinage metals

Elemental semiconductors

Halogens

Noble gases

Alkaline metals

Alkaline-earth metals

Transition metals (partially filled *d*-electron shell)

Metals — Non-metals

Lanthanides*	58 140 **Ce** Cerium $4f^1 5d^1 6s^2$	59 141 **Pr** Praseodymium $4f^3 6s^2$	60 144 **Nd** Neodymium $4f^4 6s^2$	61 145 **Pm** Promethium $4f^5 6s^2$	62 150 **Sm** Samarium $4f^6 6s^2$	63 152 **Eu** Europium $4f^7 6s^2$	64 157 **Gd** Gadolinium $4f^7 5d^1 6s^2$	65 159 **Tb** Terbium $4f^9 6s^2$	66 163 **Dy** Dysprosium $4f^{10} 6s^2$	67 157 **Ho** Holmium $4f^{11} 6s^2$	68 167 **Er** Erbium $4f^{12} 6s^2$	69 169 **Tm** Thulium $4f^{13} 6s^2$	70 173 **Yb** Ytterbium $4f^{14} 6s^2$	71 175 **Lu** Lutetium $5d^1 6s^2$
Actinides**	90 232 **Th** Thorium $6d^2 7s^2$	91 231 **Pa** Protactinium $5f^1 6d^1 7s^2$	92 238 **U** Uranium $5f^3 6d^1 7s^2$	93 237 **Np** Neptunium $5f^4 6d^1 7s^2$	94 244 **Pu** Plutonium $5f^6 7s^2$	95 243 **Am** Americium $5f^7 7s^2$	96 247 **Cm** Curium $5f^7 6d^1 7s^2$	97 247 **Bk** Berkelium $5f^9 7s^2$	98 251 **Cf** Californium $5f^{10} 7s^2$	99 252 **Es** Einsteinium $5f^{11} 7s^2$	100 257 **Fm** Fermium $5f^{11} 7s^2$	101 258 **Md** Mendelevium $5f^{11} 7s^2$	102 259 **No** Nobelium $5f^{11} 7s^2$	103 260 **Lr** Lawrencium $6d^1 7s^2$

Rare-earth elements

Note: s-electron shell can be occupied by at most 2 electrons; p-electron shell by at most 6 electrons; d-electron shell by at most 10 electrons; f-electron shell by at most 14 electrons; Noble gases have 2 (He), 10 (Ne), 18 (Ar), 36 (Kr), 54 (Xe), and 86 (Rn) electrons