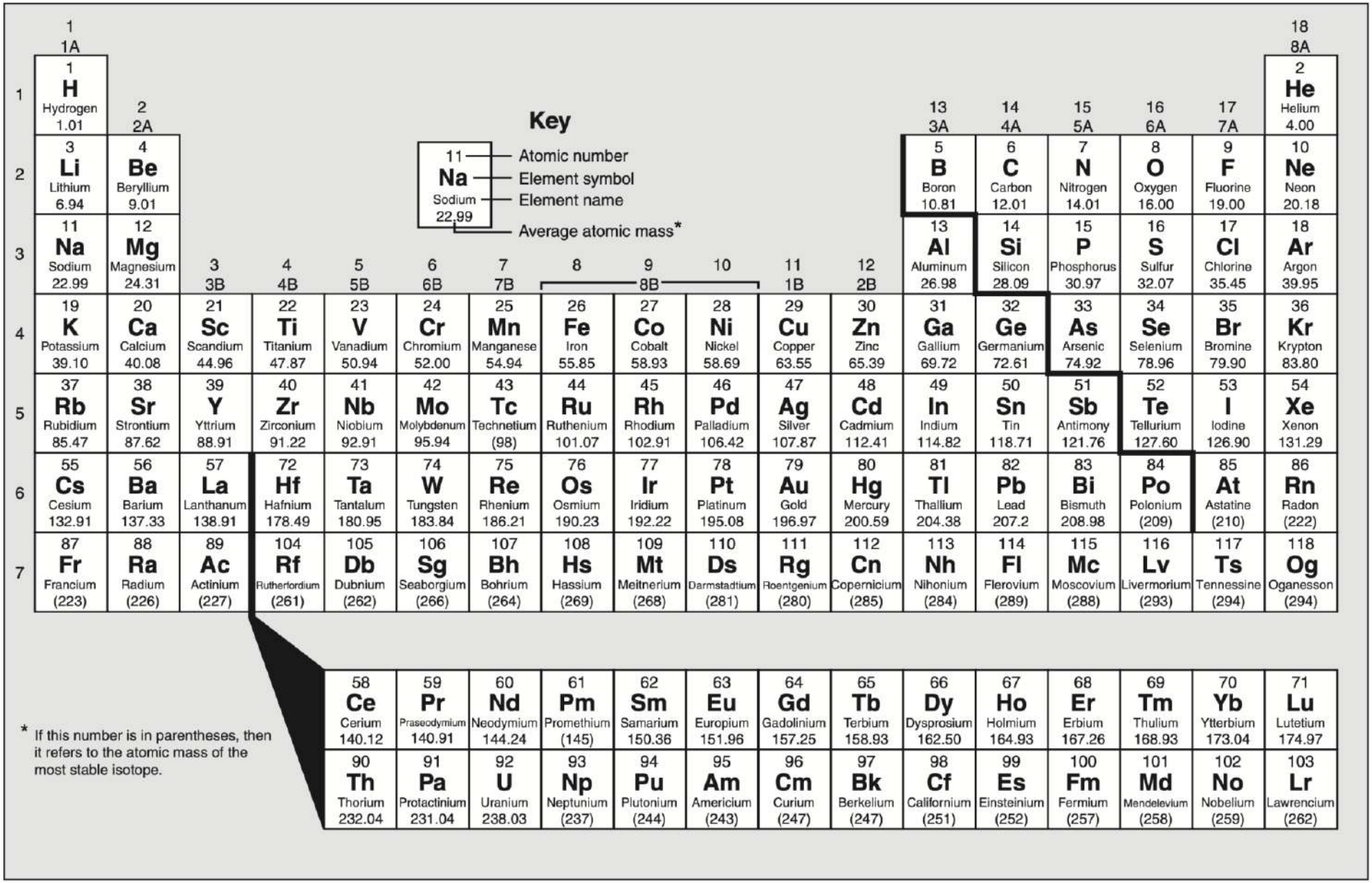
The Periodic Table of Elements



	1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 H Hydrogen 1.01	2 2A																2 He Helium 4.00
2	3 Li Lithium 6.94	4 Be Beryllium 9.01											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
3	11 Na Sodium 22.99	12 Mg Magnesium 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
4	19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.87	23 V Vanadium 50.94	24 Cr Chromium 52.00	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.61	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
6	55 Cs Cesium 132.91	56 Ba Barium 137.33	57 La Lanthanum 138.91	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (269)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (280)	112 Cn Copernicium (285)	113 Nh Nihonium (284)	114 Fl Flerovium (289)	115 Mc Moscovium (288)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)

58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.97
90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)

Common Polyatomic Ions

-1 Charge

acetate.....$C_2H_3O_2^{-1}$ or CH_3COO^{-1}
bromate….....BrO_3^{-1}
chlorate….....ClO_3^{-1}
chlorite.....ClO_2^{-1}
cyanide…..... CN^{-1}
dihydrogen phosphate….....$H_2PO_4^{-1}$
hydrogen carbonate (bicarbonate)…..HCO_3^{-1}
hydrogen sulfate (bisulfate)….....HSO_4^{-1}
hydrogen sulfite (bisulfite)…..…HSO_3^{-1}
hydroxide……..…..…OH^{-1}
hypochlorite…..…....ClO^{-1}
nitrate……..…....NO_3^{-1}
nitrite……..…....NO_2^{-1}
permanganate..…….....MnO_4^{-1}
perchlorate……...…..ClO_4^{-1}

-2 Charge

carbonate.....CO_3^{-2}
chromate.....CrO_4^{-2}
dichromate.....$Cr_2O_7^{-2}$
hydrogen phosphate....HPO_4^{-2}
oxalate.....$C_2O_4^{-2}$
peroxide.....O_2^{-2}
silicate.....SiO_3^{-2}
sulfate.....SO_4^{-2}
sulfite.....SO_3^{-2}

-3 Charge

arsenate.....AsO_4^{-3}
phosphate.....PO_4^{-3}
phosphite.....PO_3^{-3}

+1 Charge

ammonium.....NH_4^{+1}

Basic Chem Equations

$$\%\ \text{yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

$$\%\ \text{error} = \frac{\text{theo-experimental}}{\text{theoretical}} \times 100$$

1 g = 1000 mg = 0.001 kg

1 ml = 1 cm^3

1 g H_2O ≈ 1 ml H_2O

0°C = 273 K

°C = 0.556(°F - 32)

$$D = \frac{M}{V}$$

Gases

1 atm = 101.3 kPa = 760 mmHg

$P_{total} = P_1 + P_2 + P_3 \ldots$

$P_1V_1 = P_2V_2$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \qquad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

PV = n R T

R values:

8.31 $\frac{\text{L• kPa}}{\text{K •mol}}$
0.0821 $\frac{\text{L• atm}}{\text{K• mol}}$
62.4 $\frac{\text{L• mmHg}}{\text{K • mol}}$

$$\frac{\text{Rate}_A}{\text{Rate}_B} = \frac{\sqrt{\text{GFM}_B}}{\sqrt{\text{GFM}_A}}$$

Solutions

$$M = \frac{\text{moles solute}}{\text{L of solution}}$$

$$m = \frac{\text{moles of solute}}{\text{kg of solvent}}$$

$M_1V_1 = M_2V_2$

$\Delta T_b = K_b\ m\ i$

$\Delta T_f = K_f\ m\ i$

$H_2O\ K_b = 0.512$ °C/m

$H_2O\ K_f = 1.86$ °C/m

Equilibrium

$aA + bB \rightleftharpoons cC + dD$

$$K_{eq} = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

Half Life

$A = A_0\ (0.5)^n$

Light

$c = \lambda \nu$

$E = h \nu$

$E = h\ (c/\lambda)$

$c = 3.0 \times 10^8$ m/s

$h = 6.63 \times 10^{-34}$ J*s

Thermo

1 cal = 4.18 J

$q = c\ m\ \Delta T$

$$c = \frac{q}{(m\Delta T)}$$

c of H_2O *(l)* = 4.18 J/mol * K

c of H_2O *(s)* = 2.06 J/mol * K

c of H_2O *(g)* = 1.87 J/mol * K

$q_{melt} = \Delta H_{fus}$ * moles

$q_{boil} = \Delta H_{vap}$ * moles

ΔH_{fus} for water is 6.01 kJ/mol

ΔH_{vap} for water is 40.7 kJ/mol

$\Delta H = H_{products} - H_{reactants}$

$\Delta G = \Delta H - T\Delta S$

Acids and Bases

$pH = -\log [H_3O^+]$

$pOH = -\log [OH^-]$

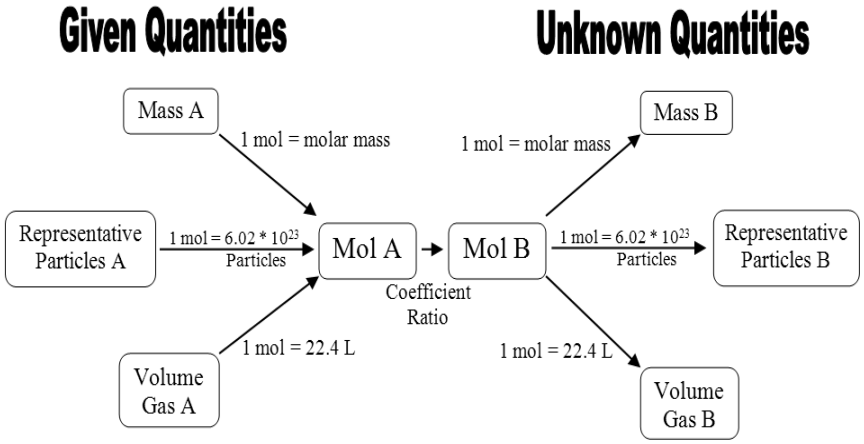
$10^{-pH} = [H_3O^+]$

$10^{-pOH} = [OH^-]$

$pH + pOH = 14$

$[H_3O^+] \times [OH^-] = 1 \times 10^{-14}$

$M_aV_an_a = M_bV_bn_b$



1 mole = 6.02 x 10^{23} particles = molar mass (GFM) = 22.4 L of gas at STP