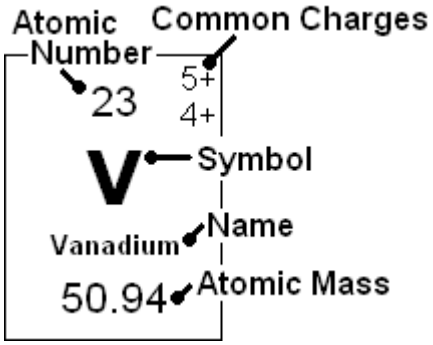
Periodic Table of the Elements



Phase Key

Solid

Liquid

Gas

Electron Placement

1s			
2s	2p		
3s	3p	3d	
4s	4p	4d	4f
5s	5p	5d	5f
6s	6p	6d	
7s	7p		
8s			

	1+ Alkali Metals	2+ Alkaline Earth Metals											3+	4+	3-	2-	1- Halogens	Noble Gases
1	1 **H** Hydrogen 1.01																	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											13 **Al** Aluminum 26.98	14 **Si** Silicon 28.09	15 **P** Phosphorus 30.97	16 **S** Sulfur 32.06	17 **Cl** Chlorine 35.45	18 **Ar** Argon 39.95
4	19 **K** Potassium 39.10	20 **Ca** Calcium 40.08	21 **Sc** +3 Scandium 44.98	22 **Ti** +4 +3 Titanium 47.87	23 **V** +5 +4 Vanadium 50.94	24 **Cr** +3 +2 +6 Chromium 52.00	25 **Mn** +2 +4 Manganese 54.94	26 **Fe** +3 +2 Iron 55.85	27 **Co** +2 +3 Cobalt 58.93	28 **Ni** +2 +3 Nickel 58.69	29 **Cu** +2 +1 Copper 63.55	30 **Zn** +2 Zinc 65.41	31 **Ga** Gallium 69.72	32 **Ge** Germanium 72.64	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** +3 +1 Yttrium 88.91	40 **Zr** +4 +2 +3 Zirconium 91.22	41 **Nb** +5 Niobium 92.91	42 **Mo** +6 +4 +5 Molybdenum 95.94	43 **Tc** +7 +4 Technetium 96.91	44 **Ru** +4 +3 Ruthenium 101.07	45 **Rh** +3 Rhodium 102.91	46 **Pd** +2 +4 Palladium 106.42	47 **Ag** +1 Silver 107.87	48 **Cd** +2 Cadmium 112.41	49 **In** Indium 114.81	50 **Sn** +4 +2 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 137.32	57 **La** +3 Lanthanum 138.91	72 **Hf** +4 Hafnium 178.49	73 **Ta** +5 Tantalum 180.95	74 **W** +6 +4 Tungsten 183.94	75 **Re** +4 Rhenium 186.21	76 **Os** +4 Osmium 190.23	77 **Ir** +4 +3 Iridium 192.21	78 **Pt** +4 +2 Platinum 195.08	79 **Au** +3 +1 Gold 196.97	80 ***Hg*** +2 +1 Mercury 200.59	81 **Tl** +3 +1 Thallium 204.38	82 **Pb** +4 +2 +3 Lead 207.20	83 **Bi** Bismuth 208.98	84 **Po** Polonium (210)	85 **At** Astatine (210)	86 **Rn** Radon (222)
7	87 **Fr** Francium 223.02	88 **Ra** Radium 226.02	89 **Ac** +3 Actinium 227.03	104 **Rf** Rutherfordium 256.10	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (266)	107 **Bh** Bohrium (264)	108 **Hs** Hassium (277)	109 **Mt** Meitnerium (268)	110 **Ds** Darmstadtium (271)	111 **Rg** Roentgenium (272)	112 **Cn** Copernicium (277)	113 **Uut** Ununtrium (284)	114 **Fl** Flerovium (289)	115 **Uup** Ununpentium (288)	116 **Lv** Livermorium (293)	116 **Uus** Ununseptium (294)	118 **Uuh** Ununoctium (294)

58 **Ce** +3 Cerium 140.12	59 **Pr** +3 Praesodymium 140.91	60 **Nd** +3 Neodymium 144.24	61 **Pm** +3 Promethium 144.91	62 **Sm** +3 Samarium 150.36	63 **Eu** +3 +2 Europium 151.96	64 **Gd** +3 Gadolinium 157.25	65 **Tb** +3 Terbium 158.93	66 **Dy** +3 Dysprosium 162.50	67 **Ho** +3 Holmium 164.93	68 **Er** +3 Erbium 167.26	69 **Tm** +3 Thulium 168.93	70 **Yb** +3 Ytterbium 173.04	71 **Lu** +3 Lutetium 174.97
90 **Th** +4 Thorium 232.04	91 **Pa** +5 Protactinium 231.04	92 **U** +6 +4 Uranium 238.00	93 **Np** +5 Neptunium 237.05	94 **Pu** +4 +6 Plutonium 244.06	95 **Am** +3 Americium 243.06	96 **Cm** +3 Curium (247)	97 **Bk** +3 Berkelium (249)	98 **Cf** +3 Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (262)

s-block	d-block	p-block
(D)		

Diatomic Elements

Bromine	Oxygen
Fluorine	Iodine
Nitrogen	Hydrogen
Chlorine	

f-block

s = Soluble i = Insoluble si = Slightly Sol. d = Decomposes * = Does not exist	Acetate	Bromide	Carbonate	Chlorate	Chloride	Hydroxide	Iodide	Nitrate	Oxide	Phosphate	Sulfate	Sulfide
Aluminum	s	s	*	s	s	i	s	s	i	i	*	d
Ammonium	s	s	s	s	s	s	s	s	*	s	s	s
Barium	s	s	i	s	s	s	s	s	s	i	i	s
Cadmium	s	s	i	s	s	i	s	s	i	i	s	i
Calcium	s	s	i	s	s	i	s	s	i	i	i	i
Copper (I)	*	si	i	*	i	i	i	*	i	*	d	i
Copper (II)	s	s	d	s	s	i	*	s	i	i	s	i
Hydrogen	s	s	s	s	s	H_2O	s	s	s	s	s	s
Iron (II)	s	s	i	*	s	i	s	s	i	i	s	i
Iron (III)	i	s	*	*	s	i	*	s	i	i	si	i
Lead (II)	s	si	i	s	si	i	i	s	i	i	i	i
Lead (IV)	d	*	*	*	d	*	*	*	i	*	*	*
Magnesium	s	s	i	s	s	i	s	s	i	i	s	d
Manganese	s	s	i	*	s	i	s	s	i	*	s	i
Mercury (I)	si	i	i	si	i	*	si	sd	i	id	i	i
Mercury (II)	s	si	i	s	s	i	i	s	i	si	d	i
Nickel	s	s	i	s	s	i	s	s	i	i	s	i
Potassium	s	s	s	s	s	s	s	s	d	s	s	s
Silver	s	i	i	s	i	*	i	s	i	i	si	i
Sodium	si	s	s	s	s	s	s	s	d	s	s	s
Tin (II)	*	*	*	*	s	i	s	*	i	*	s	i
Tin (IV)	*	sd	*	*	sd	*	sd	*	i	i	sd	i
Zinc	s	s	i	s	s	i	s	d	i	i	s	i

Solubility is relative. This chart tells whether a recognizable precipitate will form in a Double Replacement Reaction with 1 M concentrations.

Activity Series

Lithium
Potassium
Barium
Calcium
Sodium
Magnesium
Aluminum
Manganese
Zinc
Chromium
Iron
Cadmium
Cobalt
Nickel
Tin
Lead
Hydrogen
Antimony
Bismuth
Arsenic
Copper
Mercury
Silver
Platinum
Gold

1 MOLE =

Atomic Mass in Grams of a substance

6.02×10^{23} particles (atoms, etc)

22.4 L of an Ideal Gas at STP

Temperature Conversions

$^oC = {}^oK - 273$ $^oK = {}^oC + 273$

Wave Equations

$c = \lambda\nu$ $E = h\nu$ $E=mc^2$

$c = 3\times10^8 m/s$ $h = 6.626\times10^{-34}$ Js

Acids and Bases

$pH = -\log[H^+]$ $pOH = -\log[OH^-]$

$10^{-ph} = [H_3O^+]$ $10^{-pOH} = [OH^-]$

$pH + pOH = 14$

$k_w = 1\times10^{-14} = [H_3O^+][OH^-]$

Polyatomic Ions

Ammonium	NH_4^+
Acetate	$C_2H_3O_2^-$
Arsenate	AsO_4^{3-}
Arsenite	AsO_3^-
Bicarbonate	HCO_3^-
Carbonate	CO_3^{2-}
Chlorate	ClO_3^-
Chromate	CrO_4^{2-}
Cyanide	CN^-
Dichromate	$Cr_2O_7^{2-}$
Hydroxide	OH^-
Iodate	IO_3^-
Nitrate	NO_3^-
Nitrite	NO_2^-
Oxalate	$C_2O_4^{2-}$
Permanganate	MnO_4^-
Perchlorate	ClO_4^-
Phosphate	PO_4^{3-}
Phosphite	PO_3^{3-}
Silicate	SiO_3^{2-}
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}
Thiocynate	SCN^-

Gases

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $PV = nRT$ $P_{total} = P_1 + P_2 + P_3\ldots$

Combined Gas Law Pressure **Ideal Gas Law** **Dalton's Law of Partial**

1 atm = 760 mmHg = 760 torr = 14.7 p.s.i. = 101 kPa

STP = 1 atm & 273 ^oK

$R = 0.0821\frac{atm * L}{mol * K}$ $R = 8.31\frac{kPa * L}{mol * K}$

Conversions

1 inch = 2.54 cm
1 mi = 5280 ft
1 mi = 1.61 km
1 lb = 454 g
1 L = 1.06 qt
1 cup = 8 fl oz
1 km = 1000 m
1 m = 100 cm
1 m = 1000 mm

Organic Prefixes

1: meth-	**6: hex-**
2: eth-	**7: hept-**
3: prop-	**8: oct-**
4: but-	**9: non-**
5: pent-	**10: dec-**

Molecular Prefixes

1: mono-	**6: hexa-**
2: di-	**7: hepta-**
3: tri-	**8: octa-**
4: tetra-	**9: nona-**
5: penta-	**10: deca-**

Specific Heat of H_2O

4.184 J / g ^oC

$\Delta H = m\ C\ \Delta T$

Density

D = M / V

Molarity

Molarity = mol / L

$M_1V_1 = M_2V_2$