

### PERIODIC TABLE OF THE ELEMENTS

1 <b>H</b> 1.0																	2 <b>He</b> 4.0
3 <b>Li</b> 6.9	4 <b>Be</b> 9.0											5 <b>B</b> 10.8	6 <b>C</b> 12.0	7 <b>N</b> 14.0	8 <b>O</b> 16.0	9 <b>F</b> 19.0	10 <b>Ne</b> 20.2
11 <b>Na</b> 23.0	12 <b>Mg</b> 24.3											13 <b>Al</b> 27.0	14 <b>Si</b> 28.1	15 <b>P</b> 31.0	16 <b>S</b> 32.1	17 <b>Cl</b> 35.5	18 <b>Ar</b> 39.9
19 <b>K</b> 39.1	20 <b>Ca</b> 40.1	21 <b>Sc</b> 45.0	22 <b>Ti</b> 47.9	23 <b>V</b> 50.9	24 <b>Cr</b> 52.0	25 <b>Mn</b> 54.9	26 <b>Fe</b> 55.8	27 <b>Co</b> 58.9	28 <b>Ni</b> 58.7	29 <b>Cu</b> 63.5	30 <b>Zn</b> 65.4	31 <b>Ga</b> 69.7	32 <b>Ge</b> 72.6	33 <b>As</b> 74.9	34 <b>Se</b> 79.0	35 <b>Br</b> 79.9	36 <b>Kr</b> 83.8
37 <b>Rb</b> 85.5	38 <b>Sr</b> 87.6	39 <b>Y</b> 88.9	40 <b>Zr</b> 91.2	41 <b>Nb</b> 92.9	42 <b>Mo</b> 95.9	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.9	46 <b>Pd</b> 106.4	47 <b>Ag</b> 107.9	48 <b>Cd</b> 112.4	49 <b>In</b> 114.8	50 <b>Sn</b> 118.7	51 <b>Sb</b> 121.8	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.3
55 <b>Cs</b> 132.9	56 <b>Ba</b> 137.3	57 <b>La*</b> 138.9	72 <b>Hf</b> 178.5	73 <b>Ta</b> 180.9	74 <b>W</b> 183.9	75 <b>Re</b> 186.2	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.1	79 <b>Au</b> 197.0	80 <b>Hg</b> 200.6	81 <b>Tl</b> 204.4	82 <b>Pb</b> 207.2	83 <b>Bi</b> 209.0	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)
87 <b>Fr</b> (223)	88 <b>Ra</b> 226.0	89 <b>Ac†</b> (227.0)	104 <b>Unq</b> (261)	105 <b>Unp</b> (262)	106 <b>Unh</b> (263)	107 <b>Uns</b> (262)	108 <b>Uno</b> (265)	109 <b>Une</b> (267)									

	* 58 <b>Ce</b> 140.1	59 <b>Pr</b> 140.9	60 <b>Nd</b> 144.2	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.4	63 <b>Eu</b> 152.0	64 <b>Gd</b> 157.3	65 <b>Tb</b> 158.9	66 <b>Dy</b> 162.5	67 <b>Ho</b> 164.9	68 <b>Er</b> 167.3	69 <b>Tm</b> 168.9	70 <b>Yb</b> 173.0	71 <b>Lu</b> 175.0
	† 90 <b>Th</b> 232.0	91 <b>Pa</b> (231)	92 <b>U</b> 238.0	93 <b>Np</b> (237)	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (260)

### Charges of some Common Monatomic ions

H 1+																
Li 1+	Be 2+											N 3-	O 2-	F 1-		
Na 1+	Mg 2+											Al 3+		Cl 1-		
K 1+	Ca 2+	Sc 3+	Ti 3+	V 3+	Cr 2+	Mn 2+	Fe 2+	Co 2+	Ni 2+	Cu 1+	Zn 2+			Br 1-		
Rb 1+	Sr 2+								Pd 2+	Ag 1+	Cd 2+		Sn 2+	I 1-		
Cs 1+	Ba 2+								Pt 2+	Au 1+	Hg 2+		Pb 2+			
Fr 1+	Ra 2+										*					

Please note that many of the metals shown here can have more possibilities than I can show here. Vanadium, for example, can be 2+, 3+, 4+ or 5+. I have only shown the more common charges.

\*Mercury can be 1+ in the polyatomic ion  $\text{Hg}_2^{2+}$ .

### Electronegativity Values of Selected Elements

Metallic Elements			Nonmetallic Elements			
<b>Li</b> (1.0)	<b>Be</b> (1.5)	<b>H</b> (2.1)	<b>C</b> (2.5)	<b>N</b> (3.0)	<b>O</b> (3.5)	<b>F</b> (4.0)
<b>Na</b> (1.0)	<b>Mg</b> (1.2)	<b>Al</b> (1.5)		<b>P</b> (2.1)	<b>S</b> (2.5)	<b>Cl</b> (3.0)
<b>K</b> (0.9)	<b>Ca</b> (1.0)	<b>Sc</b> (1.3)			<b>Se</b> (2.4)	<b>Br</b> (2.8)

### Electronegativity

Difference      Bond type

0-0.4              Non polar covalent  
 0.5-1.9          Polar Covalent  
 Metal + non-metal    Ionic

### Gas Laws

$$PV=nRT$$

$$K=273+^{\circ}C \quad 760 \text{ mm Hg} = 760 \text{ torr} = 1 \text{ atm}$$

$$R= 0.08206 \text{ L atm mol}^{-1}\text{K}^{-1}$$

Pressure in force/area.

### pH equations

$$[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14} \quad \text{pH} + \text{pOH} = 14$$

$$\text{pH} = -\log[\text{H}_3\text{O}^+] \quad [\text{H}_3\text{O}^+] = 10^{-\text{pH}}$$

$$\text{pOH} = -\log[\text{OH}^-] \quad [\text{OH}^-] = 10^{-\text{pOH}}$$

### Avogadro's Number:

$$6.02 \times 10^{23}$$

### Dilutions

$$C_1V_1=C_2V_2$$

**TABLE:** Some Acids and Their Conjugate Bases, in Decreasing Order of Acid Strength

Acid	Conjugate Base
HI	I <sup>-</sup> Iodide ion
H <sub>2</sub> SO <sub>4</sub>	HSO <sub>4</sub> <sup>-</sup> Hydrogen sulfate ion
HCl	Cl <sup>-</sup> Chloride ion
HNO <sub>3</sub>	NO <sub>3</sub> <sup>-</sup> Nitrate ion
H <sub>3</sub> O <sup>+</sup>	H <sub>2</sub> O Water
HSO <sub>4</sub> <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup> Sulfate ion
H <sub>3</sub> PO <sub>4</sub>	H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> Dihydrogen phosphate ion
HF	F <sup>-</sup> Fluoride Ion
CH <sub>3</sub> CO <sub>2</sub> H	CH <sub>3</sub> CO <sub>2</sub> <sup>-</sup> Acetate ion
H <sub>2</sub> CO <sub>3</sub>	HCO <sub>3</sub> <sup>-</sup> Bicarbonate ion
H <sub>2</sub> S	HS <sup>-</sup> Hydrogen sulfide ion
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	HPO <sub>4</sub> <sup>2-</sup> Hydrogen phosphate ion
NH <sub>4</sub> <sup>+</sup>	NH <sub>3</sub> Ammonia
C <sub>6</sub> H <sub>5</sub> OH	C <sub>6</sub> H <sub>5</sub> O <sup>-</sup> Phenoxide ion
HCO <sub>3</sub> <sup>-</sup>	CO <sub>3</sub> <sup>2-</sup> Carbonate ion
HPO <sub>4</sub> <sup>2-</sup>	PO <sub>4</sub> <sup>3-</sup> Phosphate ion
H <sub>2</sub> O	OH <sup>-</sup> Hydroxide ion
C <sub>2</sub> H <sub>5</sub> OH	C <sub>2</sub> H <sub>5</sub> O <sup>-</sup> Ethoxide ion

Strong Acids

Weak Bases

Weak Acids

Strong Bases