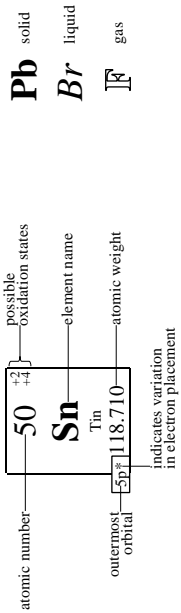


# THE PERIODIC TABLE OF ELEMENTS

NONMETALS

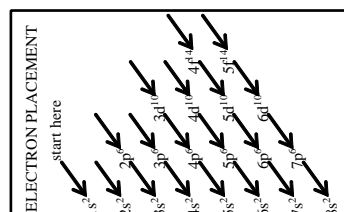
<div style="display: flex; justify-content: space-between; width: 100%;"> <div style="text-align: center;"> <p><b>+1</b></p> <p>Alkali Metals</p> </div> <div style="text-align: center;"> <p><b>+2</b></p> <p>Alkaline Earth Metals</p> </div> <div style="text-align: center;"> <p><b>-1</b></p> <p>Halogens</p> </div> <div style="text-align: center;"> <p><b>-2</b></p> <p>Chalcogens</p> </div> <div style="text-align: center;"> <p><b>-3</b></p> <p>Nitrogen Family</p> </div> <div style="text-align: center;"> <p><b>-4</b></p> <p>Carbon Family</p> </div> <div style="text-align: center;"> <p><b>+3</b></p> <p>Boron Family</p> </div> <div style="text-align: center;"> <p><b>+4</b></p> <p>Carbon Family</p> </div> <div style="text-align: center;"> <p><b>+5</b></p> <p>Nitrogen Family</p> </div> <div style="text-align: center;"> <p><b>+6</b></p> <p>Chalcogens</p> </div> <div style="text-align: center;"> <p><b>+7</b></p> <p>Halogens</p> </div> <div style="text-align: center;"> <p><b>+8</b></p> <p>Noble Gases</p> </div> </div>																	
1 H Hydrogen 1.008	2 He Helium 4.003	3 Li Lithium 6.941	4 Be Beryllium 9.012	5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180	11 Na Sodium 22.990	12 Mg Magnesium 24.305	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.904	54 Xe Xenon 131.29
55 Cs Cesium 132.906	56 Ba Barium 137.327	57 La Lanthanum 138.906	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967	
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	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)	



## TRANSITION METALS

## LANTHANIDES

## ACTINIDES



1 = atomic weight in grams for an element  
 M = molecular weight in grams for a compound  
 O = =6.02x10<sup>23</sup> atoms for an element  
 L = =6.02x10<sup>23</sup> molecules for a compound  
 E = =22.4 liters for a gas at STP  
 E = =24.4 liters for a gas at S.C.

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

- DIATOMIC ELEMENTS
- Bromine
  - Chlorine
  - Fluorine
  - Hydrogen
  - Iodine
  - Nitrogen
  - Oxygen

SOLUBILITY CHART												
	Acetate	Bromide	Carbonate	Chlorate	Chloride	Hydroxide	Iodide	Nitrate	Oxide	Phosphate	Sulfate	Sulfide
s = soluble	s	s	-	s	s	i	s	s	i	i	-	d
I = insoluble	s	s	s	s	s	s	s	s	-	s	s	s
- = does not exist	s	s	i	s	s	s	s	s	s	s	s	s
s/I = partly soluble	s	s	s	s	s	s	s	s	s	s	s	s
d = decomposes	s	s	s	s	s	s	s	s	s	s	s	s
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	s
Calcium	s	s	i	s	s	i	s	s	s	i	i	s
Copper(I) -ous	-	s/i	i	-	i	i	-	i	-	i	-	d
Copper(II) -ic	s	s	d	s	s	i	-	s	i	i	s	i
Hydrogen	s	s	s	s	s	s	s	s	s	s	s	s
Iron(II) -ous	s	s	i	-	s	i	s	s	i	i	s	i
Iron(III) -ic	i	s	-	s	i	-	s	i	i	s/i	i	Fe <sup>+3</sup>
Lead(II) -ous	s	s/i	i	s	s/i	i	i	s	i	i	i	Pb <sup>+2</sup>
Lead(IV) -ic	d	-	-	d	-	-	-	i	-	-	-	Pb <sup>+4</sup>
Magnesium	s	s	i	s	s	i	s	s	i	i	s	d
Manganese	s	s	i	-	s	i	s	s	i	-	s	Mn <sup>+7</sup>
Mercury(I) -ous	s/i	i	i	s/i	i	-	s/i	s/d	i	d	i	Hg <sup>+2</sup>
Mercury(II) -ic	s	s/i	i	s	s	i	i	s	s/i	d	i	Hg <sup>+2</sup>
Nickel	s	s	i	s	s	i	s	s	i	s	i	Ni <sup>+2</sup>
Potassium	s	s	s	s	s	s	s	s	d	s	s	s
Silver	s	i	i	s	i	-	i	s	i	i	s/i	Ag <sup>+</sup>
Sodium	s/i	s	s	s	s	s	s	s	d	s	s	Na <sup>+</sup>
Tin(II) -ous	-	s/d	-	-	s/d	-	s/d	-	i	i	s/d	i
Tin(IV) -ic	s	s	i	s	s	i	s	d	i	i	s	i
Zinc	s	s	s	s	s	s	s	s	s	s	s	Zn <sup>+2</sup>

RULES FOR SIGNIFICANT DIGITS	
1. Digits other than zero are always significant.	96 g      2 significant digits 61.4 g    3 significant digits 0.52 g    2 significant digits
2. One or more final zeros used after the decimal point are always significant.	4.72 km    3 significant digits 4.7200 km 5 significant digits 82.0 m    3 significant digits
3. Zeros between two other significant digits are always significant.	5.029 m    4 significant digits 306 km    3 significant digits
4. Zeros used solely for spacing the decimal point are not significant. The zeros are placeholders only.	7000 g    1 significant digit 0.00783 kg 3 significant digits
5. Counted numbers have an infinite number of significant digits.	32 people    ∞ significant digits 3 cars        ∞ significant digits

# CHEMISTRY STUDY GUIDE

Designed by:  
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Go Cougs! Go Tigers!

METRIC CONVERSIONS		
Multiplication Factor	Prefix	Symbol
1 000 000 000 000	tera	T
1 000 000 000	giga	G
1 000 000	mega	M
1 000	kilo	k
100	hecto	h
10	deka	da
1		
0.1	deci	d
0.01	centi	c
0.001	milli	m
0.000 001	micro	μ
0.000 000 001	nano	n
0.000 000 000 001	pico	p
0.000 000 000 000 001	femto	f
0.000 000 000 000 000 001	atto	a

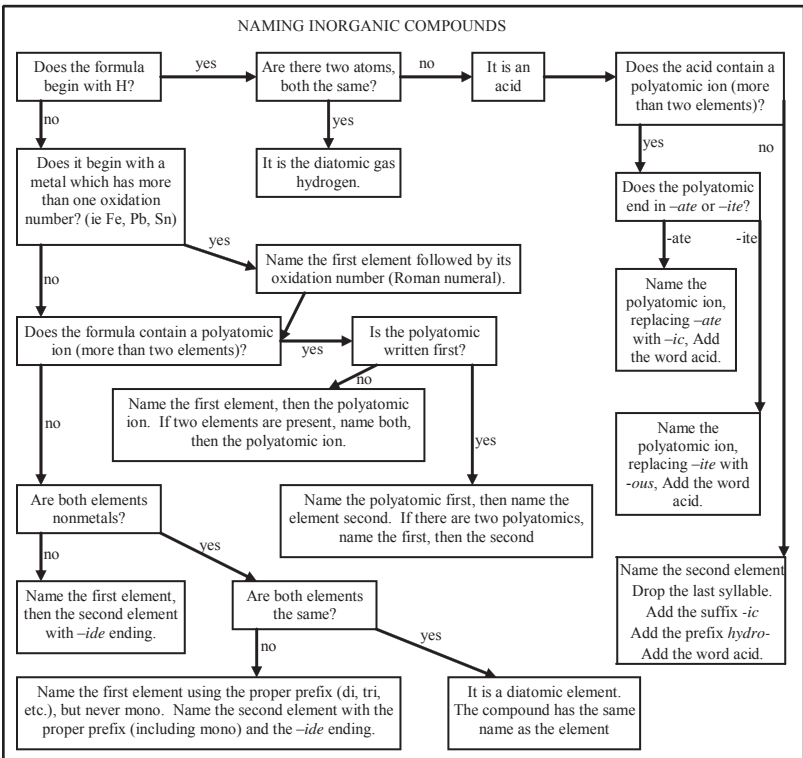
Up=Left  
Down=Right

**SOLUBILITY RULES**

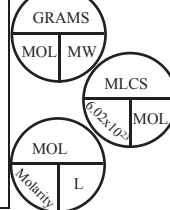
A substance is considered to be soluble if more than 3 grams of a substance dissolve in 100mL of water. The more common rules are listed below.

- All common salts of Group 1 elements and ammonium ion are soluble.
- All common acetates and nitrates are soluble.
- All binary compounds of Group 17 elements (other than F) with metals are soluble except those of silver, mercury(I), and lead.
- All sulfates are soluble except those of barium, strontium, lead, calcium, silver, and mercury(I).
- Except for those in Rule 1, carbonates, hydroxides, oxides, sulfides, and phosphates are insoluble.

STEPS TO DIMENSIONAL ANALYSIS	
<p><b>How many seconds are in 76 years?</b></p> <p><b>Unknown:</b> seconds</p>	<p>1. <b>Determine Unknown:</b></p> <p>a. Establish the units you are trying to get by reading the question.</p>
<p><b>Given:</b> 76 years</p> <p><b>Known Relationships:</b></p> <p>60 sec = 1 min 60 min = 1 hr 24 hr = 1 day 365 days = 1 year</p>	<p>2. <b>Determine the Given and Known Relationships:</b></p> <p>a. Write down the information that is given in the problem. b. Write down any relationships that might help in the conversion.</p>
<p>76 years</p>	<p>3. <b>Setup Diagram:</b></p> <p>a. Start with the given. b. Place the units you are trying to get at the end of the diagram.</p>
<p>76 years   365 days   24 hrs   60 min   60 s</p> <p>1 year   1 day   1 hr   1 min</p>	<p>4. <b>Canceling Units:</b></p> <p>a. This can be done by making sure the units you are trying to cancel are both on top and bottom. b. Keep adding relationships to the dimensional analysis diagram until all units have canceled except the one(s) you are trying to get.</p>
<p>76 years   365 days   24 hrs   60 min   60 s</p> <p>1 year   1 day   1 hr   1 min</p> <p>2,400,000,000 s</p>	<p>5. <b>Check the Setup:</b></p> <p>a. Make sure all unwanted units cancel out. b. Make sure all relationships used are correct.</p>
<p>76 x 365 x 24 x 60 x 60 / (1 x 1 x 1 x 1) = 2,396,736,000 = 2,400,000,000</p>	<p>6. <b>Calculate Results:</b></p> <p>a. Multiply all values on top and divide by all values on the bottom. b. Round to the correct number of significant figures. c. Remember definitions have an infinite number of significant figures.</p>



NAMES & CHARGES OF POLYATOMIC IONS			
1-	2-	3-	4-
Acetate C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup>	Carbonate CO <sub>3</sub> <sup>2-</sup>	Arsenate AsO <sub>4</sub> <sup>3-</sup>	Hexacyanoferrate(II) Fe(CN) <sub>6</sub> <sup>4-</sup>
Amide NH <sub>2</sub> <sup>-</sup>	Chromate CrO <sub>4</sub> <sup>2-</sup>	Arsenite AsO <sub>3</sub> <sup>3-</sup>	Orthosilicate SiO <sub>4</sub> <sup>4-</sup>
Astatae AtO <sub>3</sub> <sup>-</sup>	Dichromate Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	Borate BO <sub>3</sub> <sup>3-</sup>	Diphosphate P <sub>2</sub> O <sub>7</sub> <sup>4-</sup>
Azide N <sub>3</sub> <sup>-</sup>	Hexachloroplatinate PtCl <sub>6</sub> <sup>2-</sup>	Citrate C <sub>6</sub> H <sub>5</sub> O <sub>7</sub> <sup>3-</sup>	
Benzoate C <sub>6</sub> H <sub>5</sub> COO <sup>-</sup>	Hexafluorosilicate SiF <sub>6</sub> <sup>2-</sup>	Hexacyanoferrate(III) Fe(CN) <sub>6</sub> <sup>3-</sup>	
Bismuthate BiO <sub>3</sub> <sup>-</sup>	Molybdate MoO <sub>4</sub> <sup>2-</sup>	Phosphate PO <sub>4</sub> <sup>3-</sup>	
Bromate BrO <sub>3</sub> <sup>-</sup>	Oxalate C <sub>2</sub> O <sub>4</sub> <sup>2-</sup>	Phosphite PO <sub>3</sub> <sup>3-</sup>	
Chlorate ClO <sub>3</sub> <sup>-</sup>	Peroxide O <sub>2</sub> <sup>2-</sup>		
Chlorite ClO <sub>2</sub> <sup>-</sup>	Peroxydisulfate S <sub>2</sub> O <sub>8</sub> <sup>2-</sup>		
Cyanide CN <sup>-</sup>			
Formate HCOO <sup>-</sup>	Ruthenate RuO <sub>4</sub> <sup>2-</sup>	Ammonium NH <sub>4</sub> <sup>+</sup>	Mercury(I) Hg <sub>2</sub> <sup>2+</sup>
Hydroxide OH <sup>-</sup>	Selenate SeO <sub>4</sub> <sup>2-</sup>	Neptunyl(V) NpO <sub>2</sub> <sup>+</sup>	Neptunyl(VI) NpO <sub>2</sub> <sup>2+</sup>
Hypobromite BrO <sup>-</sup>	Selenite SeO <sub>3</sub> <sup>2-</sup>	Plutonyl(V) PuO <sub>2</sub> <sup>+</sup>	Plutonyl(VI) PuO <sub>2</sub> <sup>2+</sup>
Hypochlorite ClO <sup>-</sup>	Silicate SiO <sub>3</sub> <sup>2-</sup>	Uranyl(V) UO <sub>2</sub> <sup>+</sup>	Uranyl(VI) UO <sub>2</sub> <sup>2+</sup>
Hypophosphite H <sub>2</sub> PO <sub>2</sub> <sup>-</sup>	Sulfate SO <sub>4</sub> <sup>2-</sup>	Vanadyl(V) VO <sub>2</sub> <sup>+</sup>	Vanadyl(IV) VO <sup>2+</sup>
Iodate IO <sub>3</sub> <sup>-</sup>	Sulfite SO <sub>3</sub> <sup>2-</sup>		
Nitrate NO <sub>3</sub> <sup>-</sup>	Sulfate SO <sub>4</sub> <sup>2-</sup>		
Nitrite NO <sub>2</sub> <sup>-</sup>	Sulfite SO <sub>3</sub> <sup>2-</sup>		
Perbromate BrO <sub>4</sub> <sup>-</sup>	Tellurate TeO <sub>4</sub> <sup>2-</sup>		
Perchlorate ClO <sub>4</sub> <sup>-</sup>	Tellurite TeO <sub>3</sub> <sup>2-</sup>		
Periodate IO <sub>4</sub> <sup>-</sup>	Tetraborate B <sub>4</sub> O <sub>7</sub> <sup>2-</sup>		
Permanganate MnO <sub>4</sub> <sup>-</sup>	Thiosulfate S <sub>2</sub> O <sub>3</sub> <sup>2-</sup>		
Perrenate ReO <sub>4</sub> <sup>-</sup>	Tungstate WO <sub>4</sub> <sup>2-</sup>		
Thiocyanate SCN <sup>-</sup>			
Vanadate VO <sub>3</sub> <sup>-</sup>			



- ACTIVITY SERIES OF METALS**
- 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