Naming Ionic Compounds

•ionic compounds are predominately metals bonded to nonmetals
•elements are monatomic ions (single atom ions)
Polyatomic ion- an ion made up of many atoms
•compounds which result from the union of a metal and a nonmetal are binary compounds.
•ionic compounds can also include polyatomic ions.

Rules for naming ionic compounds:

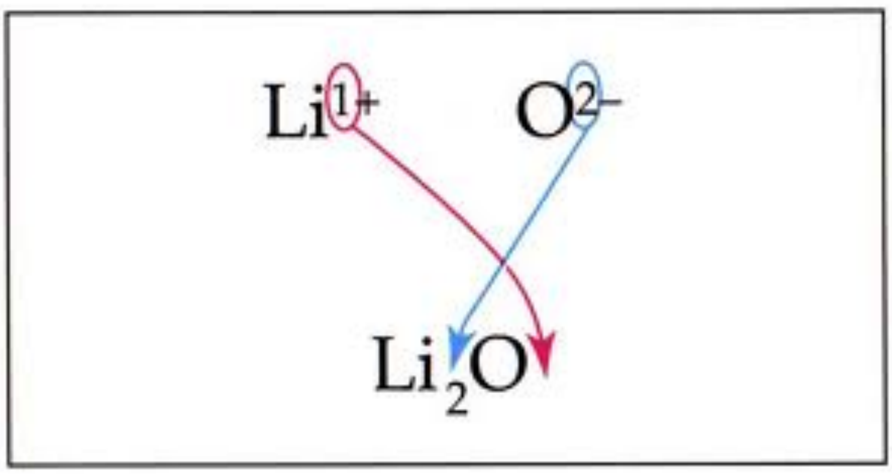
1. Write cation (positive ion) first.
2. Write anion (negative ion) second.
3. Drop the usual ending (-ine, -iun, -ogen, etc.) and replace with -ide

Ex: Li2O => lithium oxide NaF => sodium fluoride

Criss/cross method
4 steps:

1. Write symbols and charges of elements
   1) cation 2) anion
2. Switch charges and drop (+) and (-)
3. Rewrite with charges now as subscripts
4. Reduce charges (ex. Ca2Br2 => CaBr)

	Br^{-2}	O^{-2}
Li^{+}	Li_2Br	Li_2O
Ca^{+2}	$CaBr$	CaO
Zn^{+2}	$ZnBr$	ZnO
Al^{+3}	Al_2Br_3	Al_2O_3



Naming Covalent Compounds

•Covalent bonds are predominately between two non-metals.
•The main basis for naming covalent compounds is prefixes to represent subscripts

Rules for naming covalent compounds:

1. Place most electronegative element last
2. Use a prefix for the first element in a formula, but only if the subscript is greater than 1
3. Always used prefix with the second element by combining the root name and ending -ide

Ex: P2O5 => diphosphate pentoxide
CO2 => carbon dioxide

NUMBER	PREFIX	EXAMPLE
1	NONE	CHLORIDE
2	DI-	DICHLORIDE
3	TRI-	TRICHLORIDE
4	TETRA-	TETRACHLORIDE
5	PENTA-	PENTACHLORIDE
6	HEXA-	HEXACHLORIDE
7	HEPTA-	HEPTACHLORIDE
8	OCTA-	OCTACHLORIDE
9	NONA-	NONACHLORIDE
10	DECA-	DECACHLORIDE

*when writing formulas, the net charge of an ionic solid is zero (neutral)

Naming Multivalent Metals
(metals with 2 charges)

Rules for 2 oxidation states (charges):

1. Use Roman Numerals to represent ion charges
   - CuI => copper+1 CuII=> copper+2
2. Use Latin Root. Add -ous to lower charge ion and add -ic to higher charge ion.

   Cu=cuprum Cuprous= Cu+1
   Cupric = Cu+2

Naming Acids (ionically bonded)

- Acids always start with H

1. Binary Acids- Acid composed of Hydrogen and another element.
   - to name, take hydro + the root of the bonded element + -ic + acid
   EX:

   HCl = hydro chloric acid

2. Oxy-acids- Acid composed of Hydrogen and a polyatomic ion including Oxygen.
   - to name, take the root of the polyatomic ion + -ic (for -ate ions) or -ous (for -ite ions) + acid
   EX: HNO_3 = Nitric acid

Mass Relationships

A.m.u- atomic mass unit
- this is the mass of one atom
- 1H atom is 1 a.m.u.

1 a.m.u.

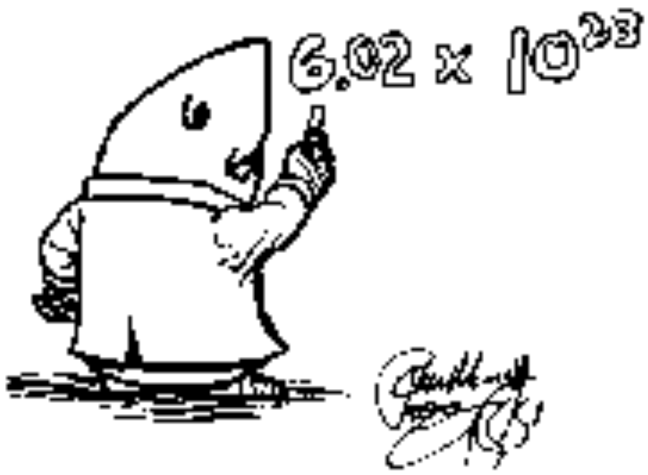
Molecular mass- added masses of all atoms in a compound.

$$AgNO_3 = \begin{array}{r} Ag = 108 \\ N = +\ 14 \\ O = +\ \underline{16 \times 3} \\ 170\ \text{amu} \end{array}$$

One mole = 6.02x10^23
Molar mass- the mass of one 6.02x10^23 of an element or compound.
•the only difference between molar mass and molecular mass is the unit.
•molecular mass is labeled as a.m.u whereas molar mass is in g/mole.

1 Cu = 63.5 amu
1 mole Cu = 63.5 g/mole

grams $\xleftrightarrow[\text{molar mass}]{}$ moles $\xleftrightarrow[6.02 \times 10^{23}]{}$ # of particles



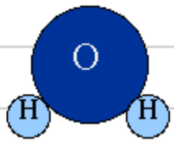
Percent composition

•this is the percent, by mass, of each element in a compound.

$$\frac{\text{Mass of element}}{\text{Mass of compound}} \times 100$$

Formula $\Uparrow$

Percent Composition for the Elements in Water



1 Oxygen	15.994	= 15.9994
2 Hydrogen	1.008	= 2.016
Water		= 18.0154

$$\%\ Oxygen = \frac{Part\ \ O}{Total} x\ 100$$

$$\%\ Oxygen = \frac{15.9994}{18.0154} x\ 100$$

$$\%\ Oxygen = 88.8\%$$

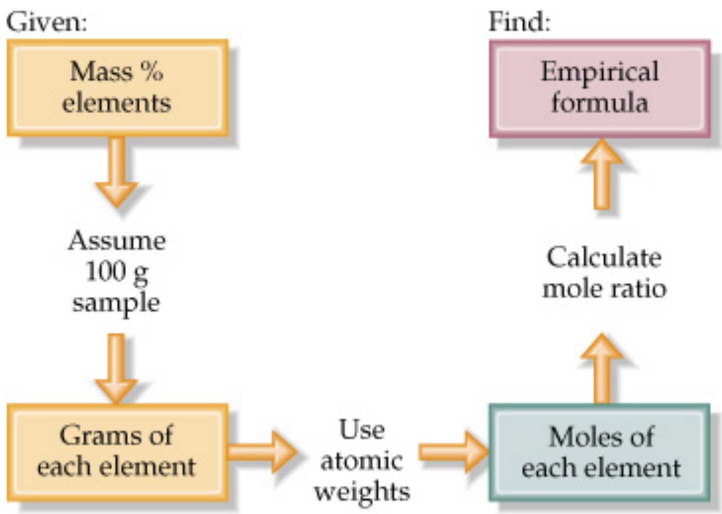
Empirical Formula

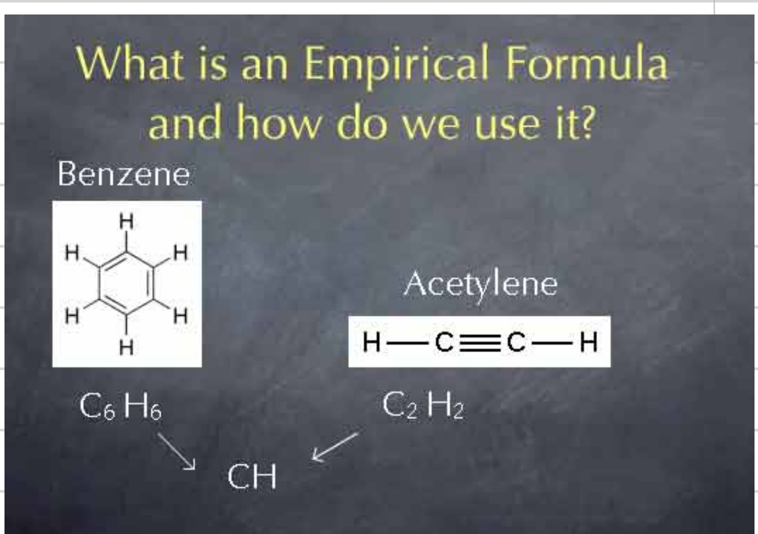
•the formula for a compound that represents the simplest ratio of elements to each other.

Steps:

1. Convert percent to grams
2. Convert grams to moles (molar mass)
3. Find the smallest whole number ratio (by dividing all molar masses by the smallest molar mass. This is so we do not have any ratios less than 1)

*Empirical Formulas are the simplified versions of molecular formulas





Molecular Formula

•Molecular formula is a compounds real formula, as opposed to a compounds empirical formula, which is its simplest ratio.

Steps:

1. Convert percent to empirical formula (steps on previous page)
2. Find the mass of the empirical formula (empirical mass)
3. Divide the molecular mass (which will be given) by the empirical mass
4. Multiply all subscripts in the empirical formula by the ratio found in step 3

Ex: $\frac{4}{1} = 4 \quad (NH_2)_4 = N_4H_8$