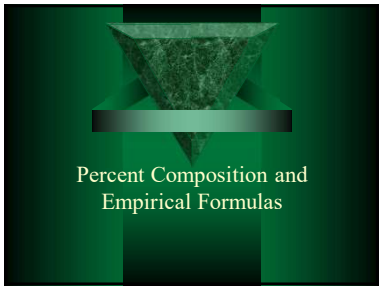

Percent Composition and Empirical Formulas

Percent Composition

- ~percent by mass of atoms present in a compound
- = (mass of atom)÷(total molar mass) x 100
- water is 88.81 % Oxygen and 11.19 % Hydrogen
- O- 16.00/18.016 x 100 = 88.81 %
- H- 2.016/18.016 x 100 = 11.19 %

Example

- Potassium Carbonate
- K_2CO_3
- 39.1 x 2 + 12.01 + 16.00 x 3 =
- 138.21 g/mol
- K – 39.10x2/138.21 x 100 = 56.58 %
- C – 12.01/138.21 x 100 = 8.690 %
- O – 16.00x3/138.21 x 100 = 34.73 %

Empirical Formulas

- ~simplest ratio among elements in a compound
- this is similar to the molecular formulas we have been writing but reduced even further
- NH_4NO_2 would be …
- NH_2O
- Or Sodium Oxalate
- $Na_2C_2O_4$
- Could reduce to $NaCO_2$
- Percent composition is used to determine the empirical formula

Getting empirical formulas from percent composition

- 1. Convert the percentage to grams (it is easiest to use 100 g of the substance)
- 2. Convert the grams of each substance to moles
- 3. find the lowest common ratio between elements

Example

- A compound is 70.9 % K and 29.1 % S, what is its empirical formula?
- step one (assume you have 100 g)
- So you have 70.9 g of K and 29.1 g of S
- step two

$$\frac{70.9\text{ g K}}{} \left|\frac{1\text{ mol K}}{39.10\text{ g K}}\right. = 1.81\text{ mol} \qquad \frac{29.1\text{ g S}}{} \left|\frac{1\text{ mol S}}{32.07\text{ g S}}\right. = .907\text{ mol}$$

Step Three

- (divide each number by the lowest number)

1.81 mol of K	.907 mol of S
.907	.907
=2.00 mol of K	1 mol of S

- so the formula is
- K_2S

More

- A substance is 78.3 % Ba, and 21.7 % F. What is its empirical formula?
- BaF_2
- A substance is 30.3 % Li, and 69.7 % O. What is its empirical formula?
- LiO

More Still

- A substance is 15.8 % Al, 28.1 % S, and 56.1 % O. What is its empirical formula?
- $Al_2 S_3 O_{12}$
- A substance is 25.7 % Ca, 33.3 % Cr, and 41.0 % O. What is its empirical formula?
- $CaCrO_4$