NOTES

## Percent Composition

% Composition Formula: $\frac{\text{Molar Mass Element}}{\text{Molar Mass Compound}} \times 100$

Example 1: What percentage of ammonium phosphate is hydrogen?

$NH_4^+ \ (PO_4)^{3-} \Rightarrow (NH_4)_3PO_4$ ← total of 12 H atoms

$$\%\,H = \frac{\text{Mass of 12 H atoms}}{\text{Mass } (NH_4)_3PO_4} \times 100 = \frac{(12)(1.01)}{149.12} \times 100 = \boxed{8.13\%\ H}$$

Example 2: Which of the following compounds contains the greatest percentage of iron by mass?

(a) $FeCl_3$ $\%\,Fe = \frac{\text{Mass of 1 Fe atom}}{\text{Mass } FeCl_3} \times 100 = \frac{55.85}{162.2} \times 100 = 34.43\%\ Fe$

(b) FeO

$$\%\,Fe = \frac{\text{Mass of 1 Fe atom}}{\text{Mass } FeO} \times 100 = \frac{55.85}{71.85} \times 100 = 77.73\%\ Fe$$

(c) $Fe_2O_3$

$$\%\,Fe = \frac{\text{Mass of 2 Fe atoms}}{\text{Mass } Fe_2O_3} \times 100 = \frac{(2)(55.85)}{159.7} \times 100 = 69.94\%\ Fe$$

(d) $FeCl_2$

$$\%\,Fe = \frac{\text{Mass of 1 Fe atom}}{\text{Mass } FeCl_2} \times 100 = \frac{55.85}{126.75} \times 100 = 44.06\%\ Fe$$

## Molecular Formula vs Empirical Formula

An empirical formula is:

A molecular formula is:

**$CH_2O$ is a _____** **$C_6H_{12}O_6$ is a _____**

- Empirical Formula is a _____form of Molecular formula
- Different compounds can have the _____**empirical formula** but _____ **molecular formulas**.

## Empirical Formulas

Step 1: Change ___ sign to _____ - *if you are given grams, skip this step*
Step 2: Convert masses to moles using _____
Step 3: _____ all # of moles by the _____ value.
Step 4: **If dividing gave you** _____, then multiply by _____
Step 5: I**f dividing gave you** ____ **or** ____, then multiply by _____
Step 6: If step 4 or 5 do not apply, then _____ step 3 values to a _____number
Step 7: **Once you know the _____, place them as _____ in the formula**

Practice Problems:

1. A compound contains 3.26g of arsenic and 1.04g of oxygen. What is the empirical formula?

2. Find the empirical formula of a compound that is 33.38% Na, 22.65% S, and 44.90% O.

3. What is the empirical formula of a compound that is 62.10% C, 13.80% H, and 24.10% N?

## Molecular Formulas

**To find the molecular formula you must:**

1. Find the _____ if not given
2. Determine the _____ of the _____
3. $\frac{\textbf{MM molecular formula}}{\textbf{MM empirical formula}} = \textbf{X}$
4. _____ each _____ in the empirical formula by "X"

Practice Problems

1. The empirical formula of a compound is CH; the molecular molar mass is 78.11 g/mol. What is its molecular formula?

2. A compound has an empirical formula of $CH_3O$ and a molecular mass of 62.00 g/mol. What is its molecular formula?

3. A compound is 26.70%C, 2.20% H, and 71.10% O. Its molecular mass is 90.00 g/mol. What is its molecular formula?

**Summary**

Determine the molecular and empirical formula for each:

a. $C_6H_8$ b. $N_2O_6$ c. $C_6H_{12}O_6$ d. $BCl_3$