Warm Up

Ex. A compound is composed of 20.4% Si, 51.4% Cl and 28.2% F. Determine the empirical formula.

$$20.4g \; Si \quad \times \quad \frac{1 \; mol \; Si}{28.09 \; g \; Si} = \frac{0.7262 \; mol \; Si}{0.7262 \; mol} = 1$$

$$51.4g \; Cl \quad \times \quad \frac{1 \; mol \; Cl}{35.45g \; Cl} = \frac{1.4499 \; mol \; Cl}{0.7262 \; mol} = 2$$

$$28.2g \; F \quad \times \quad \frac{1 \; mol \; F}{19.00g \; F} = \frac{1.4842 \; mol \; F}{0.7262 \; mol} = 2$$
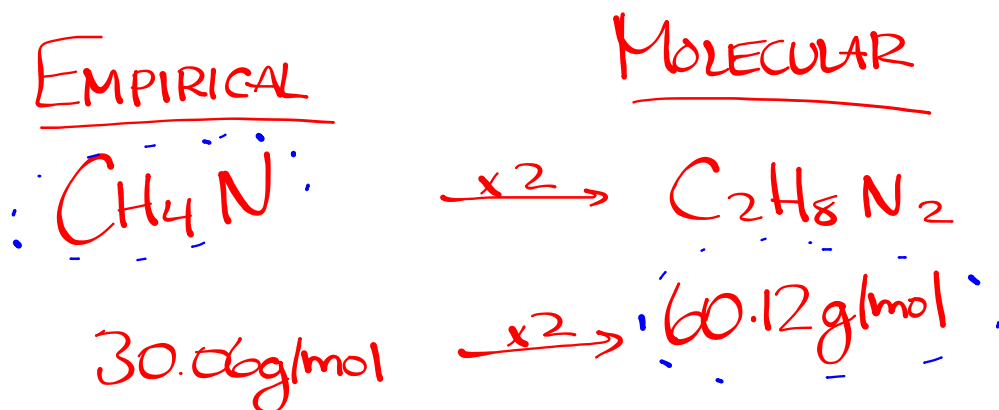
$$Si \; Cl_2 F_2$$

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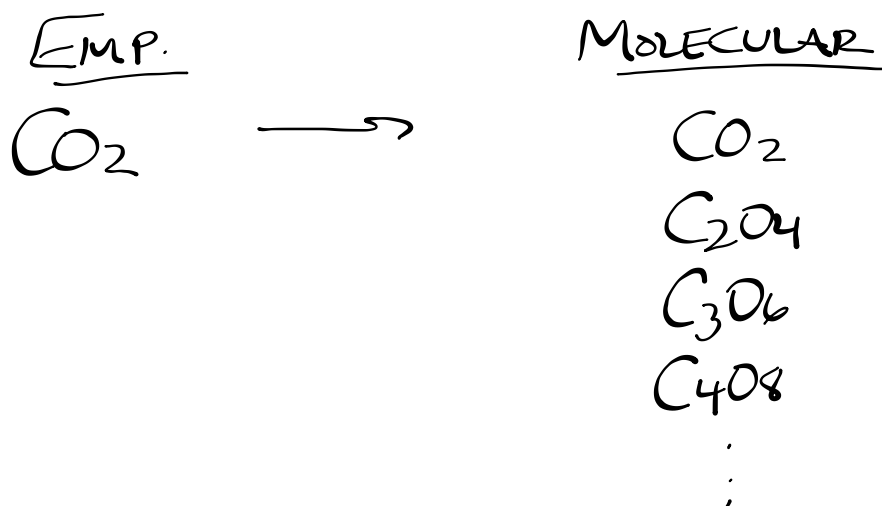
Molecular Formulas

The molecular is the same as the empirical formula of a compound or is a simple whole-number multiple of the empirical formula.

Determining the Molecular Formula of a Compound

Ex. Calculate the molecular formula of a compound whose molar mass is 60.12 g/mol and empirical formula is CH_4N.

EMPIRICAL

CH_4N $\xrightarrow{\times 2}$ $C_2H_8N_2$

30.06g/mol $\xrightarrow{\times 2}$ 60.12 g/mol

MOLECULAR

$CH_4N \rightarrow (1 \times 12.01) + (4 \times 1.01) + (1 \times 14.01) =$

30.06 g/mol

EMP.

CO_2　　　$\longrightarrow$

MOLECULAR

CO_2

C_2O_4

C_3O_6

C_4O_8

$\vdots$

Ex. A compound is composed of 29.4% Ca, 23.6% S and 47.0% O. The molecular molar mass of the compound is 408.42 g/mol. Determine the molecular formula.

$$29.4g \; Ca \times \frac{1 \, mol \, Ca}{40.08g \, Ca} = \frac{0.7335 \, mol \, Ca}{0.7335 \, mol} = 1$$

$$23.6g \, S \times \frac{1 \, mol \, S}{32.06g \, S} = \frac{0.7361 \, mol \, S}{0.7335 \, mol} = 1$$

$$47.0g \, O \times \frac{1 \, mol \, O}{16.00g \, O} = \frac{2.9375 \, mol \, O}{0.7335 \, mol} = 4$$

EMPIRICAL   **MOLECULAR**

$CaSO_4$ $\xrightarrow{\times 3}$ $\boxed{Ca_3S_3O_{12}}$
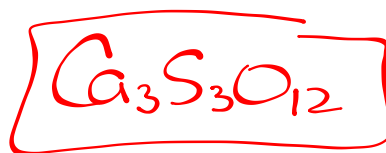
136.14 g/mol $\xrightarrow{\times 3}$ 408.42 g/mol

$CaSO_4 \rightarrow (1 \times 40.08) + (1 \times 32.06) + (4 \times 16.00)$

$= 136.14 \, g/mol$

Homework

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