

## Stoichiometry Percent Composition

1. (brady107) A sample of a liquid with a mass of 8.657g was decomposed into its elements and gave 5.217g of carbon, 0.9620g of hydrogen, and 2.478g of oxygen. What is the percent composition by mass of this compound?

$$C = \frac{5.217}{8.657} \times 100 = 60.2\% \quad H = \frac{0.9620}{8.657} \times 100 = 10.2\% \quad O = \frac{2.478}{8.657} \times 100 =$$

2. (brady115) Styrene, the raw material for polystyrene foam plastics, has an empirical formula of CH. Its molecular mass is 104g/mol. What is its molecular formula?

$$\begin{array}{c} CH \\ 1 \quad 1 \\ \hline 12 \quad 1 = 13 \end{array} \xrightarrow{\times 8} \frac{104}{13} = 8 \quad C_8H_8$$

3. (Brown77) Calculate the percent composition by mass of Sucrose  $C_{12}H_{22}O_{11}$ .

$$C_{12}H_{22}O_{11} = 342 \text{ g/mol} \quad C: 12(12) = \frac{144}{342} \times 100 = 42\% \quad H: 22(1) = \frac{22}{342} \times 100 = 6.4\% \quad O: 11(16) = \frac{176}{342} = 51.4\%$$

4. (Brown84) Ascorbic Acid (Vitamin C) contains 40.92% C, 4.58% H, and 54.50% O by mass. What is the empirical formula.

100g sample

$$\begin{array}{l} C: 40.92g \cdot \frac{1 \text{ mol}}{12} = 3.41 \text{ mol} / 3.4 = 1 \quad (\times 3) = 3 \\ H: 4.58g \cdot \frac{1 \text{ mol}}{1} = 4.58 \text{ mol} / 3.4 = 1.34 \quad (\times 3) = 4.0 \\ O: 54.5g \cdot \frac{1 \text{ mol}}{16} = 3.4 \text{ mol} / 3.4 = 1 \quad (\times 3) = 3 \end{array} \quad C_3H_4O_3$$

5. (brady108) Do the mass percentages of 25.94% N and 74.06% O match the formula for dinitrogen tetraoxide.

$$N_2O_4 \quad \begin{array}{l} 14(2) = 28 \\ 16(4) = 64 \\ \hline 92 \end{array} \quad \frac{28}{92} \times 100 = 30.4\% \text{ N} \quad \text{NO}$$

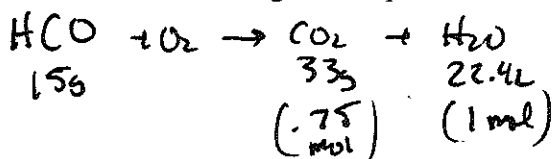
6. 15.0 g of an unknown compound containing HCO is burned in air to produce 22.4L of water and 33g of  $CO_2$ .

- a. Determine the mass of each element of the unknown substance.

$$C: 75 \cdot 12 = 9g \quad H: 1.25 \cdot 1 = 1.25g \quad O: 15 - 11 = 4g$$

- b. Determine the empirical formula.

- c. The original compound has a Molecular weight of 60g/mol. Determine the molecular formula.



Empirical

$$C = .75 / .25 = 3 \quad H = 1.25 / .25 = 5 \quad O = .25 / .25 = 1$$

$$C_3H_5O \quad \text{Both empirical molecular} \quad \text{add} = 60 \text{ g/mol}$$