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?

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

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?

CH $\times 8$ $\quad \frac{104}{13} = 8$ $\quad C_8H_8$

$12 + 1 = 13$

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

$C_{12}H_{22}O_{11} = 342$ g/mol

C: $12(12) = \frac{144}{342} \times 100 = 42\%$ $\quad H: 1(22) = \frac{22}{342} \times 100 = 6.4\%$ $\quad O: 11(16) = \frac{176}{342} = 51.4\%$

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

C: $40.92g \cdot \frac{1\ mol}{12\ g} = 3.41\ mol / 3.4 = 1\ (\times 3) = 3$

H: $4.58g \cdot \frac{1\ mol}{1\ g} = 4.58\ mol / 3.4 = 1.34\ (\times 3) = 4.0$

O: $54.5g \cdot \frac{1}{16} = 3.4\ mol / 3.4 = 1\ (\times 3) = 3$

$C_3H_4O_3$

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

N_2O_4 $\quad 14(2) = 28$ $\quad 16(4) = 64$ $\quad 92$

NO $\quad \frac{28}{92} \times 100 = 30.4\%\ N$

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: $.75 \cdot 12 = 9g$ $\quad H: 1 \cdot 2g/mol = 2g$ $\quad O: 15 - 11 = 4g$

   b. Determine the empirical formula.

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

HCO + $O_2 \rightarrow CO_2 + H_2O$

15g $\quad$ 33g $\quad$ 22.4L

(.75 mol) $\quad$ (1 mol)

Empirical

C: $.75/.25 = 3$

H: $2/.25 = 8$

O: $.25/.25 = 1$

C_3H_8O ← Both empirical & molecular

add = 60g/mol