Non Sibi High School

Andover's Chem 300: Accelerated/Honors Chemistry

Chapter 3, Review Quiz 1 Answers

1

What is the percent by mass of sulfur in $Fe_2(S_2O_3)_3$?

$$\frac{6(32.07)}{2(55.85) + 6(32.07) + 9(16.00)} = 42.94\% \text{ S by mass}$$

2

What is the empirical formula of $C_{10}H_{14}N_2$?

$$\text{divide all subscripts by 2 to get simplest ratio} = C_5H_7N$$

3

a. An unknown compound was found to be 21.84% carbon and 76.93% iodine by mass, with the remainder being hydrogen. Determine the empirical formula of the compound.

$$100\% - 21.84\% \text{ C} - 76.93\% \text{ I} = 1.23\% \text{ H}$$

Assume one hundred grams of unknown compound:

$$21.84 \text{ g C} \left(\frac{1 \text{ mol}}{12.01 \text{ g}} \right) = 1.818 \text{ mol C}$$

$$1.23 \text{ g H} \left(\frac{1 \text{ mol}}{1.008 \text{ g}} \right) = 1.22 \text{ mol H}$$

$$76.93 \text{ g I} \left(\frac{1 \text{ mol}}{126.9 \text{ g}} \right) = 0.6062 \text{ mol I}$$

$$\frac{1.818}{0.6062} \text{ mol C} : \frac{1.22}{0.6062} \text{ mol H} : \frac{0.6062}{0.6062} \text{ mol I}$$

$$\text{empirical formula} = C_3H_2I$$

b. In a separate experiment, the molar mass of the compound was found to be about 330 g/mol. Determine the molecular formula of the compound.

$$\frac{M}{EM} = \frac{330}{164.9} = 2$$

$$\text{molecular formula} = C_3H_2I \times 2 = C_6H_4I_2$$

4

After 8.75 grams of the hydrate $LiClO_4 \cdot xH_2O$ was heated, the mass of anhydrous $LiClO_4$ remaining was 5.79 grams. Determine the value of x to the correct number of significant figures and the most likely formula of the hydrate.

$$8.75\,g - 5.79\,g = 2.96\,g\,H_2O$$

$$2.96\,g\,H_2O\left(\frac{1\,mol}{18.02\,g}\right) = 0.1643\,mol\,H_2O$$

$$5.79\,g\,LiClO_4\left(\frac{1\,mol}{106.4\,g}\right) = 0.05442\,mol\,LiClO_4$$

$$x = \frac{0.1643\,mol\,H_2O}{0.05442\,mol\,LiClO_4} = 3.02$$

$$\text{most likely formula} = LiClO_4 \cdot 3H_2O$$