

Non Sibi High School

Andover's Chem 250: Introductory/Basic Chemistry

Chapter 3, Review Quiz 1 Answers

1

What is the percent by mass of sulfur in $\text{Fe}_2(\text{S}_2\text{O}_3)_3$?

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

2

What is the empirical formula of $\text{C}_{10}\text{H}_{14}\text{N}_2$?

divide all subscripts by 2 to get simplest ratio = $\text{C}_5\text{H}_7\text{N}$

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:

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

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

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

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

empirical formula = $\text{C}_3\text{H}_2\text{I}$

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.

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

$$\text{molecular formula} = \text{C}_3\text{H}_2\text{I} \times 2 = \text{C}_6\text{H}_4\text{I}_2$$

4

After 8.75 grams of the hydrate $\text{LiClO}_4 \cdot x\text{H}_2\text{O}$ 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.

$$8.75 \text{ g} - 5.79 \text{ g} = 2.96 \text{ g H}_2\text{O}$$

$$2.96 \text{ g H}_2\text{O} \left(\frac{1 \text{ mol}}{18.02 \text{ g}} \right) = 0.1643 \text{ mol H}_2\text{O}$$

$$5.79 \text{ g LiClO}_4 \left(\frac{1 \text{ mol}}{106.4 \text{ g}} \right) = 0.05442 \text{ mol LiClO}_4$$

$$x = \frac{0.1643 \text{ mol H}_2\text{O}}{0.05442 \text{ mol LiClO}_4} = 3.02$$

$$\text{most likely formula} = \text{LiClO}_4 \cdot 3\text{H}_2\text{O}$$



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