NAME_____

WORKSHOP 6A: Moles, Empirical Formula & Combustion Analysis

Show calculation setups and answers for all problems below.

1. How many molecules are there in a 600.0 g sample of $Na_3PO_4(s)$? How many Na^+ ions are present?

2. A compound of copper and sulfur was produced in the lab by heating copper and sulfur together in a crucible. Determine the empirical formula of this compound if the following data was collected:

Mass of crucible and cover	28.71 g
Mass of crucible, cover, and copper	30.25 g
Mass of crucible, cover, and copper-sulfur compound	30.64g

3. The compound XYZ_3 has a molar mass of 100.09 g/mol and a percent composition of 40.04% X, 12.00% Y, and 47.96% Z. What is the compound?

4. Isopentyl acetate ($C_7H_{14}O_2$), the compound responsible for the scent of bananas, can be produced commercially. Calculate the percent composition of $C_7H_{14}O_2$.

5. A compound consisting of mainly cetyl palmitate is comprised entirely of carbon, hydrogen, and oxygen. Combustion of a 2.3836 g sample of cetyl palmitate produced 6.9807 g of CO_2 and 2.8575 g of H_2O. Determine the empirical formula of the compound. If the formula weight of the compound is 480.9 g/mol, what is the molecular formula of this compound?

6. A compound contains only carbon, hydrogen, and oxygen. Combustion of 10.68 mg of the compound yields 16.01 mg of CO_2 and 4.37 mg of H_2O. The molar mass of the compound is 176.1 g/mol. What are the empirical and molecular formulas of the compound?

7. A sample of bismuth weighing 0.687 g was converted to bismuth chloride by reacting it first with nitric acid, then with hydrochloric acid, followed by careful evaporation to dryness. The weight of the bismuth chloride obtained was 1.032 g. What is the empirical formula of bismuth chloride based on this data?

8. Washing soda, a compound used to prepare hard water for laundry, is a hydrate whose formula can be written as $Na_2CO_3 \bullet xH_2O$. When a 2.558 g sample of washing soda is heated at 125℃, all the water of hydration is lost, leaving behind 0.948 g of the anhydrous salt. Determine the value of *x*.