Unit 1.3/1.4
Composition of Pure Substances & Mixtures

1. Two separate pure samples of carbon dioxide were analyzed. Both samples were found to contain 27.29% carbon by mass. Justify these finding on the basis of atomic molecular theory.

2. Calculate the mass percent of each element in a pure sample of Na_2SO_4.

3. A vitamin C table from a certain company contains 70.0 mg of ascorbic acid (Vitamin C). The entire tablet, however, has a mass of 0.825 g. Calculate the mass percent of Vitamin C in the tablet.

4. A sample of sodium bicarbonate ($NaHCO_3$) is known to contain some impurities. It is found that Na^+ makes up 18.00% of the entire mass of the sample. All of the Na^+ comes from the $NaHCO_3$ compound. Find the mass percent of $NaHCO_3$ in the sample.

5. What is the empirical formula for the following?
   (a) C_4H_{10} (b) $C_2H_4H_2$

6. Is CO_2 an empirical formula, a molecular formula, or both? Explain.

7. A sample of a hydrocarbon (a compound that contains only hydrogen and carbon) is found to be 74.5% carbon by mass.

    (a) Find the empirical formula for the compound.

    (b) If the molar mass of the compound is 16.05 g/mol, find its molecular formula.

8. It was found that a pure sample of a compound contains 68.1% carbon, 13.7% hydrogen and 18.2% oxygen by mass.

    1. Find the empirical formula for the compound.

    2. If the molar mass of the compound is 176.34 g/mol, what is its molecular formula?

9. A 1.0857 gram pure sample of a compound containing only carbon, hydrogen and oxygen was burned in excess oxygen gas. 3.190 g of carbon dioxide and 0.9360 g of water were produced. Find the empirical formula of the compound.