Section 7.4 Complete the following assignment in your class notebook with the heading: **Percent Composition and Empirical/Molecular Formula**

KEY

1.) Find the percent composition of plumbic bromide.

$PbBr_4$ $207.2 + 4(79.91) = 526.8\,g$

$\%\,Pb = \frac{207.2\,g}{526.8\,g} \times 100 = 39.33\%$ $\%\,Br = \frac{4(79.91\,g)}{526.8\,g} \times 100 = 60.68\%$

2.) Determine the percent composition of calcium nitrate.

3.) A compound was analyzed and found to contain 9.8 g of nitrogen, 0.70 g of hydrogen, and 33.6 g of oxygen. What is the empirical formula of the compound?

$9.8\,g\,N \times \frac{1\,mol}{14.01\,g} = 0.70\,mol\,N$

$0.70\,g\,H \times \frac{1\,mol}{1.01\,g} = 0.69\,mol\,H$

$33.6\,g\,O \times \frac{1\,mol}{16.00\,g} = 2.10\,mol\,O$

$\frac{0.70\,mol\,N}{0.69\,mol\,H} \simeq \frac{1\,mol\,N}{1\,mol\,H}$

$\frac{2.10\,mol\,O}{0.69\,mol\,O} \simeq \frac{3\,mol\,O}{1\,mol\,H}$

HNO_3

4.) Determine the empirical formula of a compound containing 3.6 g carbon, 0.90 g hydrogen, and 2.4 g oxygen.

$3.6\,g\,C \times \frac{1\,mol}{12.01\,g} = 0.30\,mol\,C$

$0.90\,g\,H \times \frac{1\,mol}{1.01\,g} = 0.89\,mol\,H$

$2.4\,g\,O \times \frac{1\,mol}{16.00\,g} = 0.15\,mol\,O$

$\frac{0.30\,mol\,C}{0.15\,mol\,O} \simeq \frac{2\,mol\,C}{1\,mol\,O}$

$\frac{0.89\,mol\,H}{0.15\,mol\,O} \simeq \frac{6\,mol\,H}{1\,mol\,O}$

C_2H_6O

5.) Determine the empirical formula of a compound containing 1.37 g of barium, 0.32 g of sulfur, and 0.64 g oxygen.

6.) A certain sugar has a chemical composition of 40.0% carbon, 6.6% hydrogen, and 53.3% oxygen.

a.) Determine the empirical formula for this sugar.

$40.0\,g\,C \times \frac{1\,mol}{12.01\,g} = 3.33\,mol\,C$

$6.6\,g\,H \times \frac{1\,mol}{1.01\,g} = 6.5\,mol\,H$

$53.3\,g\,O \times \frac{1\,mol}{16.00\,g} = 3.33\,mol\,O$

$\frac{6.5\,mol\,H}{3.33\,mol\,C} \approx \frac{2\,mol\,H}{1\,mol\,C}$

$\frac{3.33\,mol\,O}{3.33\,mol\,C} \approx \frac{1\,mol\,O}{1\,mol\,C}$

$\boxed{CH_2O}$

b.) Determine the molecular formula if its molar mass is found to be 180.0 g.

$CH_2O \quad 12.01 + 2(1.01) + 16.00 = 30.03\,g$

$n = \frac{180.0\,g}{30.03\,g} \approx 6$

$6(CH_2O) \Rightarrow \boxed{C_6H_{12}O_6}$

7.) If the empirical formula for nicotine is C_5H_7N, what is its molecular formula if its molecular mass has been determined to be 162.1 grams?