Dougherty Valley HS Chemistry
Chemical Compositions – Combustion Analysis

Worksheet #5

Name: **Period:** **Seat#:**

Directions: Show all work for ANY math problem. Include ALL units. Some answers provided at the end of the question. The answers are underlined.

1) 95.6 g of menthol (molar mass = 156 g/mol) are burned in oxygen gas to give 269 g CO_2 and 110 g H_2O. What is menthol's empirical formula if it contains only C, H and O? *Empirical formula of $C_{10}H_{20}O$*

2) 0.487 grams of quinine (molar mass = 324 g/mol) is combusted and found to produce 1.321 g CO_2, 0.325 g H_2O and 0.0421 g nitrogen. Determine the empirical and molecular formulas. *Empirical formula is $C_{10}H_{12}NO$, molecular formula is $C_{20}H_{24}N_2O_2$*

3) A 1.50 g sample of hydrocarbon undergoes complete combustion to produce 4.40 g of CO_2 and 2.70 g of H_2O. What is the empirical formula of this compound? In addition, its molecular weight has been determined to be about 78. What is the molecular formula? CH_3, C_5H_{15}

4) A 0.250 g sample of hydrocarbon undergoes complete combustion to produce 0.845 g of CO_2 and 0.173 g of H_2O. What is the empirical formula of this compound? CH

5) A 0.2500 g sample of a compound known to contain carbon, hydrogen and oxygen undergoes complete combustion to produce 0.3664 g of CO_2 and 0.1500 g of H_2O. What is the empirical formula of this compound? CH_2O

6) Caffeine, a stimulant found in coffee, tea, and certain soft drinks, contains C, H, O, and N. Combustion of 1.000 mg of caffeine produces 1.813 mg CO_2, 0.4639 mg H_2O, and 0.2885 mg N_2. What is the empirical formula for caffeine? Estimate the molar mass of caffeine, which lies between 150 and 200 g/mol. Show work to justify your estimation. $C_4H_5N_2O$