**Name: Period: Seat#:**

**Worksheet #5**

**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 CO2 and 110 g H2O. What is menthol's empirical formula if it contains only C, H and O? *Empirical formula of C10H20O*

1. 0.487 grams of quinine (molar mass = 324 g/mol) is combusted and found to produce 1.321 g CO2, 0.325 g H2O and 0.0421 g nitrogen. Determine the empirical and molecular formulas. *Empirical formula is C10H12NO, molecular formula is C20H24N2O2*
2. A 1.50 g sample of hydrocarbon undergoes complete combustion to produce 4.40 g of CO2 and 2.70 g of H2O. 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? CH3, C5H15
3. A 0.250 g sample of hydrocarbon undergoes complete combustion to produce 0.845 g of CO2 and 0.173 g of H2O. What is the empirical formula of this compound? CH
4. A 0.2500 g sample of a compound known to contain carbon, hydrogen and oxygen undergoes complete combustion to produce 0.3664 g of CO2 and 0.1500 g of H2O. What is the empirical formula of this compound? CH2O
5. 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 CO2, 0.4639 mg H2O, and 0.2885 mg N2. 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. C4H5N2O