## Dougherty Valley HS Chemistry Adv. Chemical Ratios – Combustion Analysis

## Name:

Period:

Seat#:

Worksheet #9\*

**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<sub>2</sub> and 110 g H<sub>2</sub>O. What is menthol's empirical formula if it contains only C, H and O? <u>Empirical formula of C<sub>10</sub>H<sub>20</sub>O</u>

2) 0.487 grams of quinine (molar mass = 324 g/mol) is combusted and found to produce 1.321 g CO<sub>2</sub>, 0.325 g H<sub>2</sub>O and 0.0421 g nitrogen. Determine the empirical and molecular formulas. <u>Empirical formula is C<sub>10</sub>H<sub>12</sub>NO, molecular formula is C<sub>20</sub>H<sub>24</sub>N<sub>2</sub>O<sub>2</sub></u>

3) 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

4) A 0.250 g sample of hydrocarbon undergoes complete combustion to produce 0.845 g of CO<sub>2</sub> and 0.173 g of H<sub>2</sub>O. What is the empirical formula of this compound? <u>CH</u>

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<sub>2</sub> and 0.1500 g of H<sub>2</sub>O. What is the empirical formula of this compound? <u>CH<sub>2</sub>O</u>

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<sub>2</sub>, 0.4639 mg H<sub>2</sub>O, and 0.2885 mg N<sub>2</sub>. 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. <u>C<sub>4</sub>H<sub>5</sub>N<sub>2</sub>O</u>