Combustion Analysis Practice Problems

1.) Researchers used a combustion method to analyze a compound used as an antiknock additive in gasoline. A 9.394 mg sample of the compound yielded 31.154 mg of carbon dioxide and 7.977 mg of water in the combustion. Calculate the percent composition of the compound.

2.) 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?

3.) 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?

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 CO_2 and 0.1500 g of H_2O. What is the empirical formula of this compound?

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 CO_2, 0.4639 mg H_2O, and 0.2885 mg N_2. Estimate the molar mass of caffeine, which lies between 150 and 200 g/mol.

6.) 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.

7.) 95.6 mg of menthol (molar mass = 156 g/mol) are burned in oxygen gas to give 269 mg CO_2 and 110 mg H_2O. What is menthol's empirical formula?

8.) When 1.00 g of a compound containing only carbon and hydrogen is burned completely, 3.14 g of CO_2 and 1.29 g of H_2O is produced. What is the empirical formula?

9.) Aniline, a starting compound for urethane plastic foams, consists of C, H, and N. Combustion of such compounds yields CO_2 (carbon dioxide), H_2O (water), and N_2 as products. If the combustion of 9.71 mg of Aniline yields 6.63 mg of H_2O and 1.46 mg of N_2, what is its empirical formula? The molecular weight of Aniline is 93 amu. What is its molecular formula?

10.) 0.658 g of a compound containing only carbon, hydrogen, and oxygen is burned in excess O_2. CO_2 (1.285 g) and H_2O (0.658g) are produced. The molar mass of the compound is determined by mass spectrometry to be 90 g/mole. Determine the empirical and molecular formulas