Gas Stoichiometry Problem Set 3 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Gas Stoichiometry*** Period \_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Book Problems (7 points)***

1. Air bags are activated when a severe impact causes a steel ball to compress a spring and electrically ignite a detonator cap. This causes sodium azide (NaN3) to decompose explosively according to the following reaction:

2 NaN3 (s) 🡪 2 Na (s) + 3 N2 (g)

What mass of NaN3 (s) must be reacted to inflate an air bag to 70.0 L of N2 at STP?

(Zumdahl, 7th edition, Ch. 5, 53)

1. The metabolic oxidation of glucose, C6H12O6, in our bodies produces CO2, which is expelled from our lungs as a gas.

C6H12O6 (aq) + 6 O2 (g) 🡪 6 CO2 (g) + 6 H2O (g)

* 1. Calculate the volume of dry CO2 produced at body temperature (37ºC) and 0.970 atm when 24.5 g of glucose is consumed in this reaction.
  2. Calculate the volume of oxygen you would need, at 1.00 atm and 298 K, to completely oxidize 50.0 g of glucose.

(Brown/Lemay, 12th edition, 10.59)

1. Ethanol (C2H5OH) burns in air:  
    \_\_\_ C2H5OH (l) + \_\_\_ O2 (g) 🡪 \_\_\_ CO2 (g) + \_\_\_ H2O (g)

Balance the equation and determine the volume of air in Liters at 35.0ºC and 790. mm Hg required to burn 227 grams of ethanol. Assume that air is 21.0 percent O2 by volume.

(Chang, 11th edition, 5.62)

1. In alcoholic fermentation, yeast converts glucose to ethanol and carbon dioxide:

C­6H12O6 (s) 🡪 2 C2H5OH (l) + 2 CO2 (g)

If 5.97 g of glucose are reacted and 1.44 L of CO2 gas are collected at 293 K and 0.984 atm, what is the percent yield of the reaction?

(Chang, 11th edition, 5.56)

1. Consider the reaction between 50.0 mL of liquid methyl alcohol, CH3OH (density = 0.850 g/mL), and 22.8 L of O2 at 27ºC and a pressure of 2.00 atm. The products of the reaction are CO2 (g) and H2O (g). Calculate the number of moles of H2O formed if the reaction goes to completion.

(Zumdahl, 7th edition, Ch. 5, 57)

2 NaHCO2 + H2SO4 → 2 CO + 2 H2O + Na2SO4

* A 0.964 gram sample of a mixture of sodium formate and sodium chloride is analyzed by adding sulfuric acid. Sulfuric acid reacts with sodium formate, but not with sodium chloride. The equation for the reaction for sodium formate with sulfuric acid is shown above. The carbon monoxide formed measures 242 milliliters when collected over water at 752 torr and 22.0°C. Calculate the percentage of sodium formate in the original mixture.

**BOOK REFERENCE PAGES = 203-207**