NAME_____ **Lab Section: Mon 11 Wed 11 Wed 2**

College Chemistry 1

Stoichiometry Practice Lab

(These will be graded for CORRECTNESS. You have plenty of time to make sure that you are doing everything correctly, so make sure you take the time to work them carefully! Like an exam, work must be shown for any credit!)

1. Calculate how many moles of NH_3 form when 2.8 mol of N_2H_4 completely reacts according to the following reaction:

   $N_2H_4 \rightarrow NH_3 + N_2$

2. One method for preparing pure iron metal from iron (III) oxide is by reaction with carbon monoxide. The (unbalanced) reaction is shown below:

   $Fe_2O_3(s) + CO(g) \rightarrow Fe(s) + CO_2(g)$

a) How many grams of CO are needed to react with 4.085g Fe_2O_3?

b) How many grams of Fe are prepared when 1.498 kg Fe_2O_3 are reacted in the presence of excess CO?

3. The production of hydroiodic acid (HI) takes place by reaction of iodine and hydrazine:

$$I_2 + \quad N_2H_4 \rightarrow \quad HI + \quad N_2$$

a) According to the balanced reaction, when 1 mole of N_2H_4 reacts, how many moles of HI will be formed? [ ]

b) How many grams of HI are produced when 28.4g I_2 are reacted in excess N_2H_4?

4. Elemental hydrogen and chlorine (remember they are diatomics!) react to produce HCl.

a) Write the balanced equation for this reaction.

b) If I produce 59.63g HCl, how many grams hydrogen reacted?

c) If I produce 59.63g HCl, how many grams chlorine reacted?

5. We prepare a solution by mixing 0.10 L of 0.18 M NaCl with 0.35 L of 0.24M $CaCl_2$. Note that no reaction occurs here.

a) What is the concentration of Cl^- in the resulting mixture?

b) Chloride ions can be precipitated using a solution of $AgNO_3$. Write a balanced net ionic equation for the reaction that occurs between $Cl^-(aq)$ and $AgNO_3(aq)$.

c) What volume of 0.86M $AgNO_3$ is needed to precipitate all of the chloride ions in the solution as AgCl?

6. Urea (CH_4N_2O) is a common fertilizer made by the reaction of NH_3 and carbon dioxide according to the following reaction. In a synthesis of urea, a student combines 136.4 g NH_3 with 211.4 g CO_2 and obtains 168.4 g urea.

$$NH_3 + CO_2 \rightarrow CH_4N_2O + H_2O$$

a) What is the limiting reactant in this reaction?

b) What is the theoretical yield for the reaction?

c) Calculate the percent yield for the reaction.

7. Pennies minted after 1982 are mostly made of zinc (97.5%). If the Zinc from a post-1982 penny having a mass of 2.459g (total mass, not just Zn) is reacted in nitric acid in a solution with a total volume of 250.0 mL, what is the resulting concentration of $Zn(NO_3)_2$?

$$Zn(s) + HNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + H_2(g)$$

8. When 75.0 mL of a 0.100M lead(II) nitrate solution is mixed with 100.0 mL of a 0.190 M solution of potassium iodide, a yellow precipitate appears.

a) Write and balance the precipitation reaction described above.

b) What mass of precipitate is formed if the reaction is assumed to go to completion?

9. A 27.00mL sample of H_2SO_4 is titrated with 0.32M KOH. The titration requires 153.54mL of KOH to reach the equivalence point. What is the molarity of the H_2SO_4 sample?

$$H_2SO_4 + KOH \rightarrow H_2O + K_2SO_4$$

10. A reaction mixture initially contains only P_4 and Cl_2. They react according to the following reaction:

$$P_4 + Cl_2 \rightarrow PCl_3$$

a) A reaction contains 50.86 g P_4 and 125.45 g Cl_2. What is the theoretical yield of PCl_3?

b) How much of the excess reactant remains after the reaction goes to completion?