**Stoichiometry Problem Set**

1. Calculate the molar mass of the following compounds to two decimal places.

a. AlCl3

b. Na2SO4

c. Cr2(CO3)3

d. C7H5N3O6

e. CuSO4∙5H2O

2. Given 115 grams of Na2SO4, find:

a. the number of moles of sodium sulfate.

b. the number of moles of sodium ions

c. the number of moles of sulfate ions

d. the number of moles of sulfur

e. the number of moles of oxygen

3. Given 3.5 moles of K2CO3, find:

a. the number of grams of potassium carbonate

b. the number of moles of potassium ions

c. the number of moles of carbonate ions

d. the number of potassium ions

e. the number of carbon atoms

4. Balance the following reactions by inspection:

a. S8 + F2 → SF4

b. CH4 + Cl2 → CCl4 + HCl

c. C5H12 + O2 → CO2 + H2O

d. Ba(NO3)2 + Na2CO3 → BaCO3 + NaNO3

e. CaCl2 + K3PO4 → Ca3(PO4)2 + KCl

5. If 12.5 grams of propane, C3H8, react with excess oxygen according to the following unbalanced reaction:

C3H8 + O2 → CO2 + H2O

Calculate the following:

a. the moles of oxygen gas needed

b. the moles of carbon dioxide formed

c. the grams of carbon dioxide formed

d. the percent yield, if 35.2 grams of carbon dioxide are actually isolated

e. the molecules of carbon dioxide formed

6. If 5.39 x 1024 copper atoms react with excess nitric acid according to the reaction:

Cu(s) + 4 HNO3(aq) → Cu(NO3)2(aq) + 2NO2(g) + 2 H2O(l)

Calculate the following:

a. the number of grams of copper atoms

b. the number of moles of nitric acid needed

c. the number of grams of copper(II) nitrate formed

d. the number of molecules of nitrogen dioxide formed

e. the number of moles of water formed

7. If 6.20 grams of ethane, C2H6, reacts with 92.0 grams bromine liquid to form hexabromoethane, C2Br6 and hydrogen bromide gas according to the following reaction:

C2H6 (g) + 6 Br2 (l) → C2Br6 (l) + 6 HBr (g)

a. Find the limiting reactant

b. Calculate the moles of HBr formed

c. Calculate the theoretical yield of C2Br6

d. If the actual yield of hexabromoethane is 45.9 grams, what is the percent yield?

e. Calculate the grams of reactant left over in excess

8. If 14.7 grams of copper reacts with 450.0 mL of 2.50 M HNO3 according to the reaction:

Cu(s) + 4 HNO3(aq) → Cu(NO3)2(aq) + 2NO2(g) + 2 H2O(l)

Calculate the following:

a. the grams of copper(II) nitrate formed

b. the molarity of the the copper(II) nitrate in solution (assume volume of Cu is negligible)

c. the molecules of nitrogen dioxide formed

d. the moles of excess reactant

e. If 39.5 grams of copper(II) nitrate is isolated, what is the percent yield?