Section 13B

1) Calculate the number of moles asked for in each of the following questions:

a) Determine the number of moles of carbon monoxide needed to form 4.88 moles of iron metal.
____ $Fe_2O_{3(s)}$ + ____ $CO_{(g)}$ → ____ $Fe_{(s)}$ + ____ $CO_{2(g)}$

b) Determine the number of moles of silver produced form 1.45 moles of copper.
____ $AgNO_{3(aq)}$ + ____ $Cu_{(s)}$ → ____ $Ag_{(s)}$ + ____ $Cu(NO_3)_{2(aq)}$

c) Determine the number of moles of chromium(III) oxide needed to react with 8.32 moles of dihydrogen sulfide.
____ $Cr_2O_{3(s)}$ + ____ $H_2S_{(g)}$ → ____ $Cr_2S_{3(s)}$ + ____ $H_2O_{(L)}$

2) Answer the following questions about all gas reactions:

a) ____$CH_{4(g)}$ + ____$O_{2(g)}$ → ____$CO_{2(g)}$ + ____$H_2O_{(g)}$
What is the volume of carbon dioxide produced from 5L of methane gas and excess oxygen at 50°C?

b) ____$NO_{(g)}$ + ____$O_{2(g)}$ → ____$NO_{2(g)}$
How many liters of O_2 are necessary to produce 68.9 L of nitrogen dioxide at STP?

c) ____$C_3H_{8(g)}$ + ____$O_{2(g)}$ → ____$CO_{2(g)}$ + ____$H_2O_{(g)}$
How many liters of oxygen gas is needed to react with 2.5 kg of propane gas at 0.0°C and a pressure of 1 atm?

3) Answer the following questions:

a) How many grams of aluminum hydroxide are produced from the reaction of 34.9-g of aluminum sulfide and excess water?
____ $Al_2S_{3(s)}$ + ____ $H_2O_{(L)}$ → ____ $Al(OH)_{3(s)}$ + ____ $H_2S_{(g)}$

b) How many grams of tungsten are produced from the reaction of 150.2-g of tungsten(VI) oxide and excess hydrogen gas?
____ $WO_{3(s)}$ + ____ $H_{2(g)}$ → ____ $W_{(s)}$ + ____ $H_2O_{(L)}$

c) What mass of boron trichloride is needed to react with excess water to form 5.78×10^3 kg of hydrochloric acid?
____ $BCl_{3(g)}$ + ____ $H_2O_{(L)}$ → ____ $H_3BO_{3(s)}$ + ____ $HCl_{(g)}$

4) Determine the percent yield for each of the following reactions:

a) What is the percent yield if 52.0 g of KCN reacts with excess HCl and 17.3 g of HCN is created? ____$KCN_{(aq)}$ + ____$HCl_{(aq)}$ → ____$HCN_{(g)}$ + ____$KCl_{(aq)}$
b) The following reaction runs at a 84.5 % yield. What mass of Bi is required to react with 30.0% HNO_3 in order to create 96.5 g of $Bi(NO_3)_3{\cdot}5H_2O$? ____$Bi_{(s)}$ + ____$HNO_{3(aq)}$ + ____$H_2O_{(L)}$ → ____$Bi(NO_3)_3 \cdot 5H_2O_{(aq)}$ + ____$NO_{(g)}$

5) The following questions are limiting reagent problems

a) Aluminum nitrite and ammonium chloride react to form aluminum chloride, nitrogen, and water. What mass of each product is present after 72.5 g aluminum nitrite reacts with 58.6 g of ammonium chloride react completely?
b) A mixture of 0.0547 g of hydrogen react with 0.0777 g of oxygen in a closed container, what mass of water is produced and what is the mass of the excess reagent?
c) Hydrazine, rocket fuel, reacts with dinitrogen tetroxide to form nitrous and water vapor. What mass of nitrous is produced from the reaction if 100.0 g of each reactant is used?

6) Aspirin is produced from the following reaction:

__$C_6H_4OHCOOH$ + __$CH_3COOCOCH_3$ → __$C_6H_4(COOH)(OCOCH_3)$ + __CH_3COOH
a) What mass of salicylic acid is needed to make 100 g of aspirin?
b) What mass of aspirin can be made from 50.0 g of acetic anhydride and 150.0 g of salicylic acid?
c) What is the concentration of acetic acid if the reaction in (b) is done in 250 mL of water?
d) If we want to make 75.0 g of aspirin and the reaction runs at a 75.0% yield, if we have excess acetic anhydride what mass of salicylic acid is needed to make our desired amount of aspirin?
e) Draw all the compounds in 3D.

7) The following reaction is the final step in making isoamyl ester, the banana smell in anything that smells like bananas:

$(CH_3)_2CHCH_2CH_2OH + CH_3COOH \rightarrow CH_3COOCH_2CH_2CH(CH_3)_2 + H_2O$
a) balance the reaction
b) Draw the 3D or organic structure for each compound
c) What mass of isoamyl ester can be made from 100.0 g isoamyl alcohol and 50.0 g acetic acid?