Stoichiometry Worksheet Chem 30A FALL 2016

Name_____

1) How many moles of CO_2 are produced when 2.5 moles of O_2 react according to the following equation?

$$C_3H_5 + 5\,O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

2) Consider the reaction $N_2\,(g) + O_2\,(g) \rightarrow 2\,NO\,(g)$.

a. How many g NO can be produced when 25.0 g of nitrogen reacts?

b. How many g NO can be produced when 25.0 g of oxygen reacts?

c. Based on your answers in a and b, predict the amount of NO that can be produced when 25.0 g nitrogen is reacted with 25.0 g of oxygen.

d. Explain the reasoning used in part c.

3) In the reaction $2\ C + O_2 \rightarrow 2\ CO$, how many moles of carbon are needed to produce 66.0 g of carbon monoxide?

4) Given the following balanced equation, answer the following:

$$C_2H_5OH + 3\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O$$

a) What is the theoretical yield of carbon dioxide in this reaction if 39.6 g of ethanol is burned in the presence of 54.8 g of oxygen?

b) What is the percent yield for this reaction if the actual amount of carbon dioxide formed is 45.5 grams?

5) The reaction $N_2 + 3\ H_2 \rightarrow 2\ NH_3$ is used to produce ammonia. When 450. g of hydrogen was reacted with nitrogen, 1575 g of ammonia were produced. What is the percent yield of this reaction?

6) How many moles of water are needed to react with 2.2 moles of Li_2O?
Given: $Li_2O + H_2O \rightarrow 2\ LiOH$

7) How many grams of C will be consumed when 5.00 grams of Na_2SO_4 react according to the balanced reaction shown?

$$Na_2SO_4 + 2\ C \rightarrow Na_2S + 2\ CO_2$$

8) Starting with 156 g Li_2O and 33.3 g H_2O, decide which reactant is present in limiting quantities.
Given: $Li_2O + H_2O \rightarrow 2\ LiOH$

9) If the theoretical yield of the reaction below corresponds to 25.3 g and the percent yield of the reaction is known to be reproducibly 81.1%, calculate the actual yield.
Given: $Li_2O + H_2O \rightarrow 2\ LiOH$

10) How many grams of fluorine are required to produce 20.0 grams of FeF_3 from the reaction shown?

$$2\ Fe + 3F_2 \rightarrow 2\ FeF_3$$

1) 1.5

2) a. $25.0\ g\ N_2 \times \frac{1\ mol\ N_2}{28.02\ g\ N_2} \times \frac{2\ mol\ NO}{1\ mol\ N_2} \times \frac{30.01\ g\ NO}{1\ mol\ NO} = 53.55\ g\ NO$

b. $25.0\ g\ O_2 \times \frac{1\ mol\ N_2}{32\ g\ O_2} \times \frac{2\ mol\ NO}{1\ mol\ O_2} \times \frac{30.01\ g\ NO}{1\ mol\ NO} = 46.89\ g\ NO$

c. 46.89 g NO

d. There is only enough oxygen to produce 46.89 g NO. Even though there is enough N_2 to produce more NO, there is not enough O_2 to react with all the N_2 available. Therefore, O_2 is the limiting reactant.

3) 2.36

4) a) This is a limiting reagent problem. First figure out which reagent is limiting.
39.6 g C_2H_5OH × 1 mol/46.0 g × 2 mol CO_2/1 mol C_2H_5OH = 1.72 mol CO_2
54.8 g O_2 × 1 mol/32.0 g × 2 mol CO_2/3 mol O_2 = 1.14 mol CO_2
Therefore O_2 is limiting and only 1.14 mol CO_2 can be formed.
1.14 mol CO_2 × 44.0 g/1 mol = 50.2 g CO_2 is the theoretical yield.

b) 45.5 g/50.2 g × 100 = 90.6% yield

5) 62.1%

6) 2.2

7) 0.844 g

8) water

9) 20.5 g

10) 10.1 g