Stoichiometry Practice 3

Name: Key

STUDENT NOTE: As I have discussed in chemistry several times, you MUST work outside of class time. This is a class that requires you to work out of class. Waiting until the last minute is not beneficial in this class.

Directions: Complete these three stoichiometry practice problems. These three problems are due at the START of next class. You may write the answers on a sheet of paper or you may print out this paper (at home) and complete the assignment.

1. Ethylene (C_2H_4) burns in excess oxygen to form carbon dioxide and water vapor.

$$C_2H_4 + 3O_2 = 2CO_2 + 2H_2O$$

What I'm looking for!

a. If 35 grams of C_2H_4 is reacted with 20 grams of O_2, how many grams of water will be produced?

HINT: You are going from grams of one substance to grams of a totally different substance. This means you are going to complete a 3-step conversion. You know on the test I will not tell you how many conversion steps need to take place.

$$\frac{35\text{ g } C_2H_4}{1} \left| \frac{1\text{ mole } C_2H_4}{28.06\text{ g } C_2H_4} \right| \frac{2\text{ mols } H_2O}{1\text{ mol } C_2H_4} \left| \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} \right. = 44.95\text{ g } H_2O$$

$$\frac{20\text{ g } O_2}{1} \left| \frac{1\text{ mole } O_2}{32\text{ g } O_2} \right| \frac{2\text{ mols } H_2O}{3\text{ mols } O_2} \left| \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} \right. = 7.51\text{ g } H_2O$$

ANSWER: 7.51 g H_2O

b. How many liters of water can be formed if 1.25 liters of ethylene are consumed in this reaction?

HINT: We did practice stoichiometry using mixed units. Time to practice it again. Ask yourself, what are you being required to do? You are going from liters of one substance of a totally different substance. This means you are going to complete a 3-step conversion. Think about the facts you know -- 22.4 L/1 mole. You know on the test I will not tell you how many conversion steps need to take place.

$$\frac{1.25\text{ L } C_2H_4}{1} \left| \frac{1\text{ mols } C_2H_4}{22.4\text{ L } C_2H_4} \right| \frac{2\text{ mols } H_2O}{1\text{ mol } C_2H_4} \left| \frac{22.4\text{ L } H_2O}{1\text{ mol } H_2O} \right. = 2.5\text{ L } H_2O$$

ANSWER: 2.5 L H_2O

c. If 35 grams of C_2H_4 is reacted with 20 grams of O_2, how many grams of carbon dioxide will be Produced?

HINT: You are going from grams of one substance to grams of a totally different substance. This means you are going to complete a 3-step conversion. You know on the test I will not tell you how many conversion steps need to take place.

* Use the limiting reagent from part 1a!

$$\frac{20\text{ g } O_2}{1} \left| \frac{1\text{ mole } O_2}{32\text{ g } O_2} \right| \frac{2\text{ mols } CO_2}{3\text{ mols } O_2} \left| \frac{44.01\text{ g } CO_2}{1\text{ mol } CO_2} \right. = 18.34\text{ g } CO_2$$

ANSWER: 18.34 g CO_2

2. Balance the equation below BEFORE answering parts a, b, and c.

* I am going to have you balance simple equations like this one on your test.

$$Pb(SO_4)_2 + 4LiNO_3 \rightarrow Pb(NO_3)_4 + 2Li_2SO_4$$

a. How many moles of lithium nitrate will be needed to make 40 moles of lithium sulfate? Assume you have an adequate amount of lead(IV) sulfate to complete the reaction.

* Always ask yourself "What am I being asked to do?" After, you have figured this out make a plan! It saves you time and you won't be as stressed.

$$\frac{40 \text{ moles } LiNO_3}{1} \left| \frac{1 \text{ mole } Pb(NO_3)_4}{4 \text{ moles } LiNO_3} \right. = 10 \text{ moles } Pb(NO_3)_4$$

b. How many moles of lead(IV) nitrate are produced if 25 moles of lithium sulfate are produced?

$$\frac{25 \text{ moles } Li_2SO_4}{1} \left| \frac{1 \text{ mole } Pb(NO_3)_4}{2 \text{ moles } Li_2SO_4} \right. = 12.5 \text{ moles } Pb(NO_3)_4$$

c. You have 10.2 grams of lead(IV) sulfate and 7.6 grams of lithium nitrate. What is the limiting reagent?

HINT: It doesn't matter which product you select in the balanced equation to find the limiting reagent.

I'm going to pick $Pb(NO_3)_4$ to solve for limiting reagent. Why? I have to pick one product to solve this problem.

$$\frac{10.2 \text{ grams } Pb(SO_4)_2}{1 \text{ mole}} \left| \frac{1 \text{ mole } Pb(SO_4)_2}{399.34 \text{ g } Pb(SO_4)_2} \right| \frac{1 \text{ mole } Pb(NO_3)_4}{1 \text{ mole } Pb(SO_4)_2} \left| \frac{455.24 \text{ g } Pb(NO_3)_4}{1 \text{ mole } Pb(NO_3)_4} \right. = 11.6 \text{ g } Pb(NO_3)_4$$

$$\frac{7.6 \text{ g } LiNO_3}{1 \text{ mole}} \left| \frac{1 \text{ mole } LiNO_3}{68.95 \text{ g } LiNO_3} \right| \frac{1 \text{ mole } Pb(NO_3)_4}{4 \text{ moles } LiNO_3} \left| \frac{455.24 \text{ g } Pb(NO_3)_4}{1 \text{ mole } Pb(NO_3)_4} \right. = 12.5 \text{ g } Pb(NO_3)_4$$

Answer to 2c: The limiting reagent is lithium nitrate!

d. How many grams of lithium sulfate will you make?

* Always use the limiting reagent to solve this problem!

$$\frac{7.6 \text{ g } LiNO_3}{1} \left| \frac{1 \text{ mole } LiNO_3}{68.95 \text{ g } LiNO_3} \right| \frac{2 \text{ moles } Li_2SO_4}{4 \text{ moles } LiNO_3} \left| \frac{109.95 \text{ g } Li_2SO_4}{1 \text{ mole } Li_2SO_4} \right. = 6.1 \text{ g } Li_2SO_4$$