Chemistry 11 Stoichiometry Review Assignment

Name: _____ **Date:_____ Block: _____**

Answer the following practice questions on a separate page

Define the following terms:

1. Stoichiometry
2. Stoichiometric ratio
3. Limiting reactant
4. Excess reactant
5. Percent yield

(Mole-Mole Conversions)

6. The combustion of the organic fuel, decane, is outlined in the chemical equation below. You must balance the equation in order to answer the subsequent questions a-c.

   ____$C_{10}H_{22}$ + ____O_2 ⟶ ____CO_2 + ____H_2O
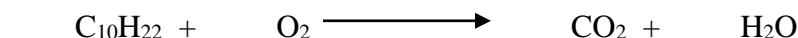
   a. How many moles of CO_2 are produced if 5.0 moles of $C_{10}H_{22}$ react with an excess of O_2?

   b. How many moles of O_2 react with 0.75 moles of $C_{10}H_{22}$?

   c. How many moles of O_2 would be required to produce 4.0 moles of H_2O?

7. Use the following equation to solve the problems below:

   $$3\ SiO_2\ +\ 4\ Al\ \longrightarrow\ 3\ Si\ +\ 2\ Al_2O_3$$

   a. If 6.0 moles of SiO_2 react, how many moles of:

         i. Al react?

         ii. Si are produced?

         iii. Al_2O_3 are produced?

   b. If 2.5 moles of Al_2O_3 are produced, how many moles of:

         i. Al react?

   ii. SiO_2 react?

(Mole-Mass / Mass-Mole Conversions)

8. $N_2 + 2O_2 \rightarrow N_2O_4$

   a) If 15.0g of N_2O_4 was produced, how many moles of O_2 were required?

   b) If 4.0×10^{-3} moles of oxygen reacted, how many grams of N_2 were needed?

9. $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$ How many moles of Cu are needed to react with 3.50g of $AgNO_3$?

10. Mercury (II) oxide decomposes into mercury and oxygen gas.

   a) Write and balance the equation.

   b) How many moles of mercury (II) oxide are needed to produce 125g of oxygen?

   c) How many grams of mercury are produced if 24.5 moles of mercury (II) oxide decomposes?

(Mass-Mass Conversions)

11. $Li_3N_{(s)} + 3H_2O_{(l)} \rightarrow NH_{3(g)} + 3LiOH_{(aq)}$

   a. What mass of lithium hydroxide are produced when 0.38g of lithium nitride react?

   b. How many grams of lithium nitride would react with 4.05g of H_2O?

12. In the combustion of 54.50g of butane (C_4H_6), how many grams of CO_2 are produced? Write and balance the equation before solving.

13. In the following **unbalanced** equation,

   ___ $FeS_2 +$ ___$O_2 \rightarrow$ ___$Fe_2O_3 +$ ___SO_2

   a. How many grams of iron (IV) sulphide are used when 9.0g of O_2 react?

   b. What is the mass of iron (III) oxide produced when 25.0g of iron (IV) sulphide are used?

14. $Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$

   How many grams of silver are produced when 36.92g of copper react?

15. ___$Al_2(SO_4)_3 +$ ___$Ca(OH)_2 \rightarrow$___$Al(OH)_3 +$ ___$CaSO_4$

   Balance and answer the following questions.

   a. What mass of aluminum (III) hydroxide are produced if 165.7g of aluminum (III) sulfate react?

   b. How many grams of calcium hydroxide are needed to form 6.35g of calcium sulphate?

16. Given the following equation:

$3 NO_{2 (g)} + H_2O_{(l)}$ ⟶ $2 HNO_{3 (aq)} + NO_{(g)}$ Assume STP
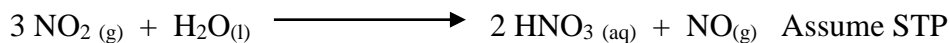
a. What mass of water is required to react with 15.5 L of Nitrogen dioxide?

b. What volume of Nitrogen monoxide would be produced from 100.0 g of water?

c. If 42.0 L of $NO_{(g)}$ is produced, what volume of $NO_{2 (g)}$ reacted?

17. When Magnesium reacts with Nitric Acid, Hydrogen gas and aqueous Magnesium nitrate are formed. What volume of Hydrogen gas will be produced if 40.0 g of Magnesium is reacted with an excess of Nitric Acid?


18. The corrosion (rusting) of iron is represented as follows: (at STP)

$3 O_{2 (g)} + 4 Fe_{(s)}$ ⟶ $2 Fe_2O_{3 (s)}$
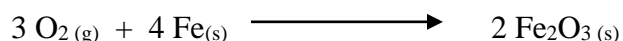
a. What volume of Oxygen gas would be required to produce 16.0 g of Fe_2O_3?

b. What mass of Iron would be required to react with 10.0 L of O_2 gas?

19. Mercury (II) oxide decomposes when heated to produce liquid Mercury and Oxygen gas. What mass of Mercury (II) oxide would be required to produce 30.5 L of Oxygen gas? (Assume STP)
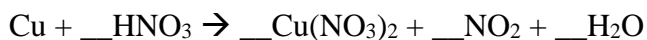

20. How many mL of 2.00M HNO3 is needed to consume 5.4g of aluminum?

$2Al + 6HNO_3$ → $2Al(HNO_3)_3 + 3H_2$
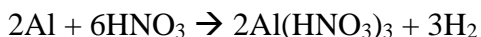
21. 20mL of HCl is needed to consume 2.8g Fe. What is the concentration of HCl?

__Fe + __HCl → __$FeCl_3$ + __H_2
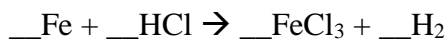
22. What mass of copper will react with 10.0mL of 12.0M nitric acid?

Cu + __HNO_3 → __$Cu(NO_3)_2$ + __NO_2 + __H_2O

REVIEW: Limiting Reagents and Percent Yield
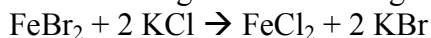
Answer all questions on separate paper and report all answers to the correct number of sig figs.

1. Identify the limiting reactant when 1.22g of O_2 reacts with 1.05g of H_2 to produce water.

2. Identify the limiting reactant when 5.87g of $Mg(OH)_2$ reacts with 12.84g of HCl to form $MgCl_2$ and water.

3. Identify the limiting reactant when 6.33g of sulphuric acid reacts with 5.92g of sodium hydroxide to produce sodium sulphate and water.

4. Identify the reactant in excess if 6.25g of silver nitrate reacts with 4.12g of sodium chloride to form sodium nitrate and silver chloride.

5. If 4.1g of Cr is heated with 9.3g of Cl_2 what mass of $CrCl_3$ will be produced?

6. What mass of sulphur trioxide is produced when 12.4g of sulphur dioxide is reacted with 3.45g of oxygen gas?

7. If 21.4g of aluminum is reacted with 91.3g of iron (III) oxide, the products will be aluminum oxide and iron. What mass of iron will be produced?

8. If 41.6g of N_2O_4 reacts with 20.8g of N_2H_4, the products will be nitrogen gas and water. What mass of nitrogen will be produced?

9. What mass of NaCl will be produced by the reaction of 58.7g of NaI with 29.4g of Cl_2?

10. a. Write the balanced equation for the reaction of lead (II) nitrate with sodium iodide to form sodium nitrate and lead (II) iodide:

    b. If I start with 25.0 grams of lead (II) nitrate and 15.0 grams of sodium iodide, how many grams of sodium nitrate can be formed?

    c. What is the limiting reagent in the reaction?

    d. How much of the excess reagent will be left over from the reaction?

11. You calculate that using a certain amount of beryllium and hydrochloric acid you can produce 10.7g of beryllium chloride. You perform the experiment and only collect 4.5g. What was the percent yield for the reaction?

12. Determine the percent yield for the reaction between 45.9g of NaBr and excess chlorine gas to produce 12.8g of NaCl and an unknown quantity of bromine gas.

13. Determine the percent yield for the reaction between 44.5g of zinc sulphide and 13.3g of oxygen, if 18.4g of zinc oxide is recovered with an unknown amount of sulphur dioxide.

14. A reaction was carried out according to the following equation:
$$FeBr_2 + 2\ KCl \rightarrow FeCl_2 + 2\ KBr$$
a. What is the theoretical yield of iron (II) chloride if 34.00 grams of iron (II) bromide was used in the reaction with excess potassium chloride?

b. What is the percent yield of iron (II) chloride if the actual yield is 4.00 grams?

15. a. What mass of $CS_{2(s)}$ is produced when 17.5 g of $C_{(s)}$ are reacted with 39.5 g of $SO_{2(g)}$ according to the equation: $5\ C_{(s)} + 2\ SO_{2(g)} \rightarrow CS_{2(s)} + 4\ CO_{(g)}$?

b. What mass of the excess reactant will be left over?

16. If 0.250 g of $Ba(OH)_{2(s)}$ is mixed with 15.0 mL of 0.125 M $HBr_{(aq)}$, what mass of $BaBr_{2(aq)}$ can be formed?
$$Ba(OH)_{2(s)} + 2\ HBr_{(aq)} \rightarrow BaBr_{2(aq)} + 2\ H_2O_{(l)}$$
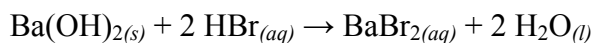
17. The reaction $SiO_{2(s)} + 4\ HF_{(g)} \rightarrow SiF_{4(g)} + 2\ H_2O_{(g)}$ produces 2.50 g of $H_2O_{(g)}$ when 12.20g of $SiO_{2(s)}$ is treated with a small excess of $HF_{(g)}$.

a. What mass of $SiF_{4(g)}$ is formed?

b. What mass of $SiO_{2(s)}$ is left unreacted if only 2.50g of H_2O is formed?

c. What is the percent yield of the $H_2O_{(g)}$?