STOICHIOMETRIC PROBLEMS

SHEET #7 – PERCENT YIELD PROBLEMS

1. 225 g of calcium carbonate is decomposed to yield calcium oxide and carbon dioxide. Only 28.2 L of carbon dioxide is recovered at S.T.P.
   a) Write a balanced chemical equation for the reaction.
   b) Calculate the theoretical yield of CO_2 as a volume of gas at S.T.P.
   c) Using the actual yield stated in the problem, determine the percent yield of the reaction.

2. 50 g of iron metal is reacted with 150 g of copper (II)sulphate (anhydrous). The reaction produces iron (II) sulphate and copper metal. 43 g of copper metal is recovered.
   a) Determine the limiting reagent in this reaction.
   b) Calculate the theoretical yield of copper metal as a mass.
   c) Using the actual yield stated in the problem, determine the percent yield for the reaction.

3. 40 g of ethane gas (C_2H_6) is burned in air. 60 g of water is recovered. If the only products of the burning are carbon dioxide and water, what is the percent yield of the reaction?

4. 50.0 g of magnesium nitride is mixed with 30.0 g of water. The reaction produces a certain volume of ammonia gas and 40 g of magnesium hydroxide? What is the percent yield of magnesium hydroxide? What is the maximum possible volume (theoretical yield) of ammonia gas collected at 25 °C and 98 kPa? What would the volume of ammonia gas be if its percent yield is the same as the percent yield of magnesium hydroxide?

5. 10 L of nitrogen gas at S.T.P. is reacted with 25 L of hydrogen gas at S.T.P. The gases are found to react to produce 15 L of ammonia gas at S.T.P. What is the percent yield of the reaction?

6. 5 L of oxygen gas at S.T.P. is reacted with 2 g of aluminum metal. What is the percent yield if 2.95 g of aluminum oxide is recovered?

7. In the thermal decomposition of 500 g of mercurous oxide 6.95 L of a gas is recovered at 185 °C and 1 atm. pressure.
   a) What is the percent yield of the reaction?
   b) What is the theoretical yield of mercury metal?
   c) What would the yield of mercury metal be if it had the same percent yield as the gas collected?
   d) Which mass of mercury you have just calculated is likely to be closest to experimental observations? Explain.

8. An industrial decomposition process for Fe_2O_3 has a 85.5 % efficiency. Calculate the mass of iron metal that can be produced by this process using 12200 t of iron ore that is 56.1 % pure.

Answers:
1. b) 50.4 L CO_2, c) 56.0 %
2. b) 56.9 g Cu, c) 75.6 %
3. 83.5 %
4. 82.4 %, 14.0 L NH_3, 11.6 L NH_3
5. 89.6 %
6. 78.1 %
7. a) 30.8 %, b) 481 g Hg, c)148 g Hg
8. 4090 t Fe