

11-3 Review and Reinforcement

Limiting Reactants and Percent Yield

If the statement is true, write "true." If it is false, change the underlined word or words to make the statement true. Write your answer on the line provided.

- _____ 1. When quantities of reactants are available in the exact ratio described by the balanced equation, they are said to be in molar proportions.
- _____ 2. The reactant that limits the amount of product that can be formed is the limiting reactant.
- _____ 3. Identifying the limiting reactant in a reaction is similar to solving a mass-volume problem.
- _____ 4. If the amount of the limiting reactant is known, it is possible to predict the amount of all products formed by the reaction.
- _____ 5. Even though it is possible to predict the amount of reactants formed in a chemical reaction, the expected yield often differs from this prediction.
- _____ 6. The actual yield of a chemical reaction is never more than the expected yield.

Answer each of the following questions in the space provided below.

7. Describe the steps you would take to determine which of two reactants in a given equation is the limiting reactant.
8. What is percent yield and how is it determined?

Solve each of the following problems as directed. Show all your work.

9. Identify the limiting reactant when 2.2 g of magnesium react with 4.5 L of oxygen at STP to produce magnesium oxide.

11-3 Review and Reinforcement (continued)

10. Hydrogen is produced when methane (CH_4) reacts with water. The other product is CO_2 . Using 80.0 g of methane and 16.3 g of water, how many liters of H_2 can be produced at STP? What is the limiting reactant?
11. Methyl alcohol (CH_3OH) is made by reacting carbon monoxide with H_2 . Starting with 2.5 g of H_2 and 30.0 L of CO , what mass of methyl alcohol could be produced at STP? Which is the limiting reactant?
12. In a reaction of 15.3 g of NaCl with 60.8 g of $\text{Pb}(\text{NO}_3)_2$, how many grams of lead(II) chloride will be produced? What is the limiting reactant?
13. Diborane (B_2H_6) is widely used in the synthesis of organic compounds. Diborane itself is made by the reaction $2\text{NaBH}_4 + \text{I}_2 \rightarrow \text{B}_2\text{H}_6 + 2\text{NaI} + \text{H}_2$. If 6.3 g of NaBH_4 are reacted with excess I_2 , how many grams of diborane could theoretically be isolated? If 1.9 g of diborane is actually produced, what is the percent yield of the reaction?
14. Ammonia gas can be produced by reacting CaO with NH_4Cl . Water and calcium chloride are produced in addition to ammonia. If 23.0 g of CaO and 50.0 g of NH_4Cl are mixed, what is the maximum possible volume of NH_3 that can be produced at STP? If 16.1 L of NH_3 are actually produced, what is the percent yield of NH_3 ?