

11

CHEMICAL REACTIONS**SECTION 11.1 DESCRIBING CHEMICAL REACTIONS (pages 321–329)**

This section explains how to write equations describing chemical reactions using appropriate symbols. It also describes how to write balanced chemical equations when given the names or formulas of the reactants and products in a chemical reaction.

► Writing Chemical Equations (pages 321–323)

1. A chemical reaction occurs when one or more _____ change into one or more new substances called _____ .
2. The arrow in a reaction means _____ .
_____ .
3. Is the following sentence true or false? When there are two or more reactants or products, they are separated by an arrow. _____
4. Write a word equation that describes the following reactions.
 - a. Acetylene reacts with oxygen to produce carbon dioxide and water.

 - b. When heated, mercury(II) oxide reacts to form mercury and oxygen.

5. What is a chemical equation?

6. A chemical reaction that shows only the formulas, but not the relative amounts of the reactants and products is a(n) _____ .
7. Identify the reactant(s) and product(s) in the chemical equation $\text{Li} + \text{Br}_2 \longrightarrow \text{LiBr}$.
 - a. reactant(s) _____
 - b. product(s) _____
8. Circle the letter of each statement that is true about a catalyst.
 - a. A catalyst is the new material produced as a result of a chemical reaction.
 - b. A catalyst is not used up in a chemical reaction.
 - c. A catalyst adds heat to a chemical reaction.
 - d. A catalyst speeds up a chemical reaction.

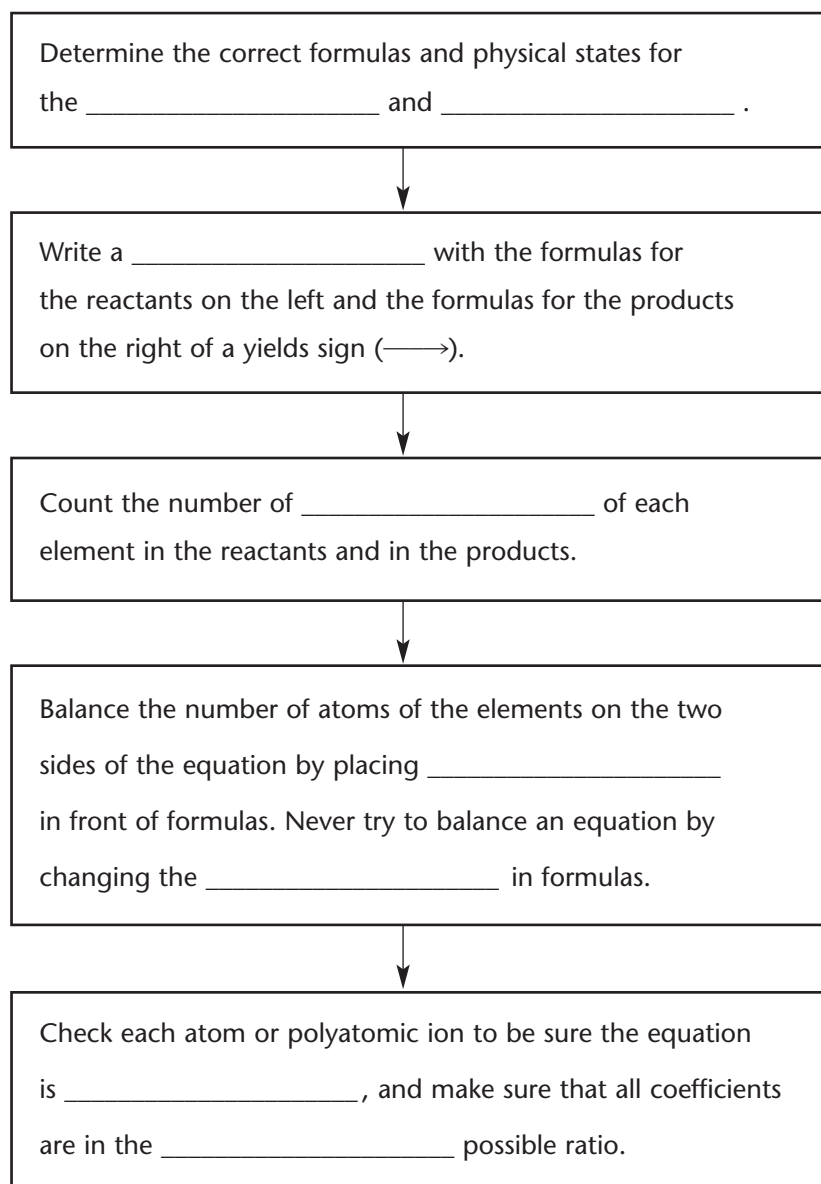
CHAPTER 11, Chemical Reactions *(continued)*

9. Use the symbols in Table 11.1 on page 323 to write a skeleton equation for the following chemical reaction. Hydrochloric acid reacts with zinc to produce aqueous zinc(II) chloride and hydrogen gas.
- _____

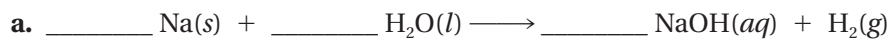
► Balancing Chemical Equations (pages 324–328)

10. What is the law of conservation of mass?
- _____

11. Complete the flowchart for balancing equations.



12. Balance the following chemical equations.

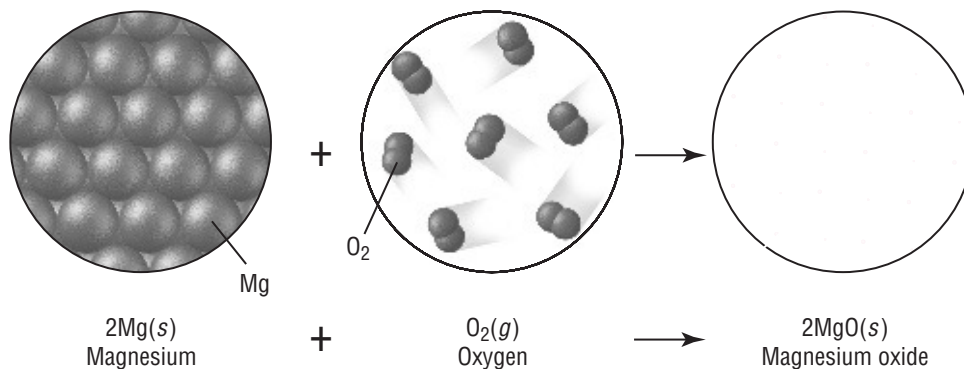


SECTION 11.2 TYPES OF CHEMICAL REACTIONS (pages 330–339)

This section explains how to identify a reaction as a combination, decomposition, single-replacement, double-replacement, or combustion reaction. It also describes how to predict the products of each type of reaction.

► Classifying Reactions (page 330)

- There are _____ general types of chemical reactions.
- Complete the diagram of a combination reaction. Which characteristic of this type of reaction is shown in the diagram?

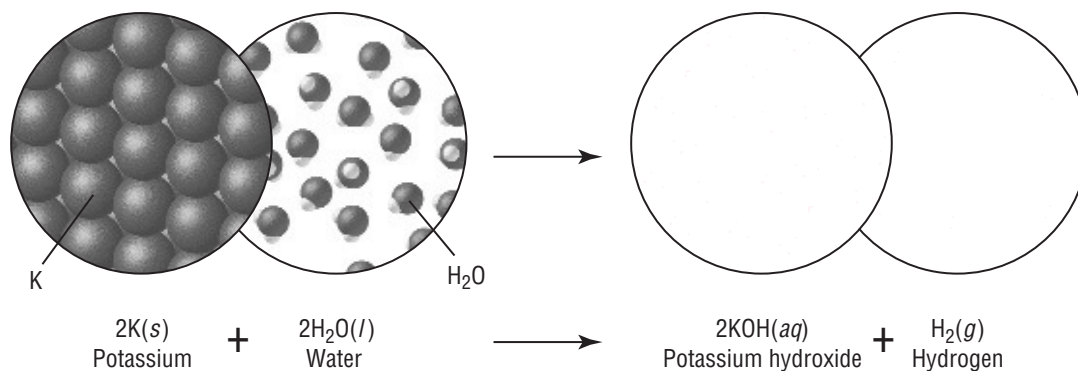


- Is the following sentence true or false? The product of a combination reaction is always a molecular compound. _____
- Circle the letter of each set of reactants that can produce more than one product.

<p>a. two nonmetals</p> <p>b. a Group A metal and a nonmetal</p>	<p>c. a transition metal and a nonmetal</p> <p>d. two metals</p>
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- Look at Figure 11.6 on page 332. Which characteristics of a decomposition reaction are shown in the diagram?

CHAPTER 11, Chemical Reactions *(continued)*

6. Rapid decomposition reactions can cause _____ as a result of the formation of gaseous products and heat.
7. Most decomposition reactions require the addition of _____ in the form of heat, light, or electricity.
8. Complete the diagram of a single replacement reaction. Which characteristics of this type of reaction are shown in the diagram?



9. Using Table 11.2 on page 333, state whether the following combinations will produce a reaction or no reaction.
 - a. $\text{Ag}(s) + \text{HCl}(aq)$ _____
 - b. $\text{Cu}(s) + \text{AgNO}_3(aq)$ _____
10. Look at Figure 11.8 on page 335. Which characteristics of a double-replacement reaction are shown in the diagram?

11. When solutions of ionic compounds are mixed, what three circumstances may indicate that a double-replacement reaction has occurred?
 - a. _____
 - b. _____
 - c. _____
12. Look at the diagram of a combustion reaction in Figure 11.9 on page 336. Which characteristics of this type of reaction are shown in the diagram?

13. Is the following sentence true or false? Hydrocarbons, compounds of hydrogen and carbon, are often the reactants in combustion reactions. _____
14. Circle the letter of each compound that can be produced by combustion reactions.
- a. oxygen c. water
b. carbon dioxide d. glucose

► **Predicting the Products of a Chemical Reaction (pages 337–339)**

15. Classify the reaction in each of the following equations.
- a. $\text{BaCl}_2(aq) + \text{K}_2\text{CrO}_4(aq) \longrightarrow \text{BaCrO}_4(s) + 2\text{KCl}(aq)$ _____
- b. $\text{Si}(s) + 2\text{Cl}_2(g) \longrightarrow \text{SiCl}_4(l)$ _____
- c. $2\text{C}_6\text{H}_6(l) + 15\text{O}_2(g) \longrightarrow 6\text{H}_2\text{O}(l) + 12\text{CO}_2(g)$ _____
16. Use Figure 11.10 on page 339. The equation for the combustion of pentane is $\text{C}_5\text{H}_{12} + 8\text{O}_2 \longrightarrow 5\text{CO}_2 + 6\text{H}_2\text{O}$. What numbers in this equation are represented by x and y in the general equation? _____

SECTION 11.3 REACTIONS IN AQUEOUS SOLUTION (pages 342–344)

This section explains how to write and balance net ionic equations. It also describes the use of solubility rules to predict the formation of precipitates in double-replacement reactions.

► **Net Ionic Equations (pages 342–343)**

- Many important chemical reactions take place in _____.
- An equation that shows dissolved ionic compounds as their free ions is called a(n) _____.
- Is the following sentence true or false? A spectator ion is not directly involved in a reaction. _____
- What is a net ionic equation? _____

CHAPTER 11, Chemical Reactions *(continued)*

5. Circle the letter of each sentence that is true about ionic equations.
 - a. A complete ionic equation shows only the ions involved in the reaction.
 - b. Spectator ions are left out of a net ionic equation.
 - c. Atoms do not need to be balanced in an ionic equation.
 - d. Ionic charges must be balanced in a net ionic equation.

6. Write the balanced net ionic equation for this reaction:
 $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{KI}(\text{aq}) \longrightarrow \text{PbI}_2(\text{s}) + \text{KNO}_3(\text{aq})$. Show your work.

► **Predicting the Formation of a Precipitate** (page 344)

7. What determines whether a precipitate forms when two solutions of ionic compounds are mixed?

8. Use Table 11.3 on page 344 to predict whether the following compounds are soluble or insoluble.
 - a. $\text{Fe}(\text{OH})_3$ _____
 - b. NaOH _____
 - c. $\text{Ca}(\text{ClO}_3)_2$ _____
 - d. HgSO_4 _____



Reading Skill Practice

A flowchart can help you to remember the order in which events occur. On a separate sheet of paper, create a flowchart that describes the steps for writing a balanced net ionic equation. This process is explained on pages 342–343 of your textbook.