

# Chemical Reactions

## Section 10.1 Reactions and Equations

*In your textbook, read about evidence of chemical reactions.*

**For each statement, write *yes* if evidence of a chemical reaction is present. Write *no* if there is no evidence of a chemical reaction.**

- \_\_\_\_\_ 1. A tomato smells rotten.
- \_\_\_\_\_ 2. A drinking glass breaks into smaller pieces.
- \_\_\_\_\_ 3. A piece of ice melts.
- \_\_\_\_\_ 4. Drain cleaner is mixed with water and the solution becomes warm.
- \_\_\_\_\_ 5. Candle wax burns.
- \_\_\_\_\_ 6. Molten candle wax solidifies.
- \_\_\_\_\_ 7. Green leaves turn yellow and red as the seasons change.
- \_\_\_\_\_ 8. Baking powder produces a gas that makes a cake rise.

*In your textbook, read about how to represent chemical reactions and how to balance chemical equations.*

**Use the terms below to complete the passage. Each term may be used once, more than once, or not at all.**

arrow	plus sign	(s)	(l)
reactant	product	(g)	(aq)

The fuel for the space shuttle is hydrogen, which burns in oxygen to produce water vapor and energy. In this chemical reaction, hydrogen is a(n) **(9)** \_\_\_\_\_, oxygen is a(n) **(10)** \_\_\_\_\_, and water vapor is a(n) **(11)** \_\_\_\_\_. In a chemical equation for this reaction, a(n) **(12)** \_\_\_\_\_ is used to separate hydrogen and oxygen from water vapor and energy. A(n) **(13)** \_\_\_\_\_ is used to separate the symbols for hydrogen and oxygen. A(n) **(14)** \_\_\_\_\_ symbol is used to tell the state of hydrogen in the reaction, a(n) **(15)** \_\_\_\_\_ symbol is used for the state of oxygen, and a(n) **(16)** \_\_\_\_\_ symbol is used for the state of water vapor.

**Section 10.1** *continued*

For each of the following chemical reactions, write a word equation, a skeleton equation, and a balanced chemical equation. Be sure to show the state of each reactant and product. If you need more help writing formulas or determining the state of a substance, refer to Chapters 8 and 9 and the periodic table on pages 156–157.

17. Solid mercury(II) oxide breaks down when heated, forming the elements mercury and oxygen.

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18. Sodium metal reacts with water vapor in air to form solid sodium hydroxide and hydrogen.

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19. In the first step of refining zinc metal from its zinc sulfide ore, the ore is heated in the presence of oxygen. The products are solid zinc oxide and sulfur dioxide gas.

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20. The next step of refining zinc involves heating the zinc oxide in the presence of carbon. This reaction produces zinc vapor and carbon monoxide gas.

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21. Certain pollutants in the air react with water vapor to form acids. For example, sulfur trioxide reacts with water vapor to form sulfuric acid.

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22. Solid calcium carbonate is commonly used in antacids because it reacts with the hydrochloric acid found in the stomach. The products of this reaction are aqueous calcium chloride, carbon dioxide, and water.

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## Section 10.2 Classifying Chemical Reactions

In your textbook, read about synthesis, combustion, decomposition, and replacement reactions.

Assume that Q, T, X, and Z are symbols for elements. Match each equation in Column A with the reaction type it represents in Column B.

### Column A

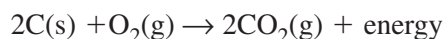
- \_\_\_\_\_ 1.  $Q + XZ \rightarrow X + QZ$   
 \_\_\_\_\_ 2.  $Q + Z \rightarrow QZ$   
 \_\_\_\_\_ 3.  $QT \rightarrow Q + T$   
 \_\_\_\_\_ 4.  $QT + XZ \rightarrow QZ + XT$

### Column B

- a. decomposition  
 b. double-replacement  
 c. single-replacement  
 d. synthesis

Answer the following questions.

5. Does the following equation represent a combustion reaction, a synthesis reaction, or both? Explain your answer.




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6. Why is it sometimes incorrect to state that a compound is broken down into its component elements in a decomposition reaction?

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7. When soap is added to hard water, solid soap scum forms. When water is added to baking powder, carbon dioxide bubbles form. When lemon juice is added to household ammonia solution, water is one of the products. Tell how you know a double-replacement reaction has occurred in each case.

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8. Explain how you can use an activity series to determine whether a single-replacement reaction will occur.

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**Section 10.2** *continued*

In your textbook, read about the activity series for metal and halogens.

Examine each of the following pairs of potential reactants. Use Figure 10-10 in your textbook to help you decide whether or not a reaction would occur. If a reaction occurs, write the balanced equation. If no reaction occurs, write *NR*.

9. calcium and water \_\_\_\_\_
10. magnesium and water \_\_\_\_\_
11. rubidium and lithium chloride \_\_\_\_\_
12. potassium and aluminum oxide \_\_\_\_\_
13. silver and calcium nitrate \_\_\_\_\_
14. fluorine and potassium iodide \_\_\_\_\_
15. magnesium bromide and chlorine \_\_\_\_\_
16. copper and iron(III) sulfate \_\_\_\_\_

Match each example of a chemical reaction in Column A to the type(s) listed in Column B. List all types from Column B that apply.

## Column A

- \_\_\_\_\_ 17. Aluminum lawn furniture becomes coated with a layer of aluminum oxide when it sits out in the air.
- \_\_\_\_\_ 18. Chlorine gas is bubbled through a calcium bromide solution. The solution turns brown, the color of bromine.
- \_\_\_\_\_ 19. Lime is added to acid water in a lake. Water and a salt form.
- \_\_\_\_\_ 20. Propane is a common household fuel. When burned, water and carbon dioxide are produced.
- \_\_\_\_\_ 21. Steel wool burns, forming an iron oxide.
- \_\_\_\_\_ 22. When an electric current is passed through molten potassium bromide, potassium and bromine form.
- \_\_\_\_\_ 23. When solutions of sodium iodide and lead nitrate are combined, a yellow solid forms.

## Column B

- a. combustion
- b. decomposition
- c. double-replacement
- d. single-replacement
- e. synthesis