Name _____ Class _____ Date _____

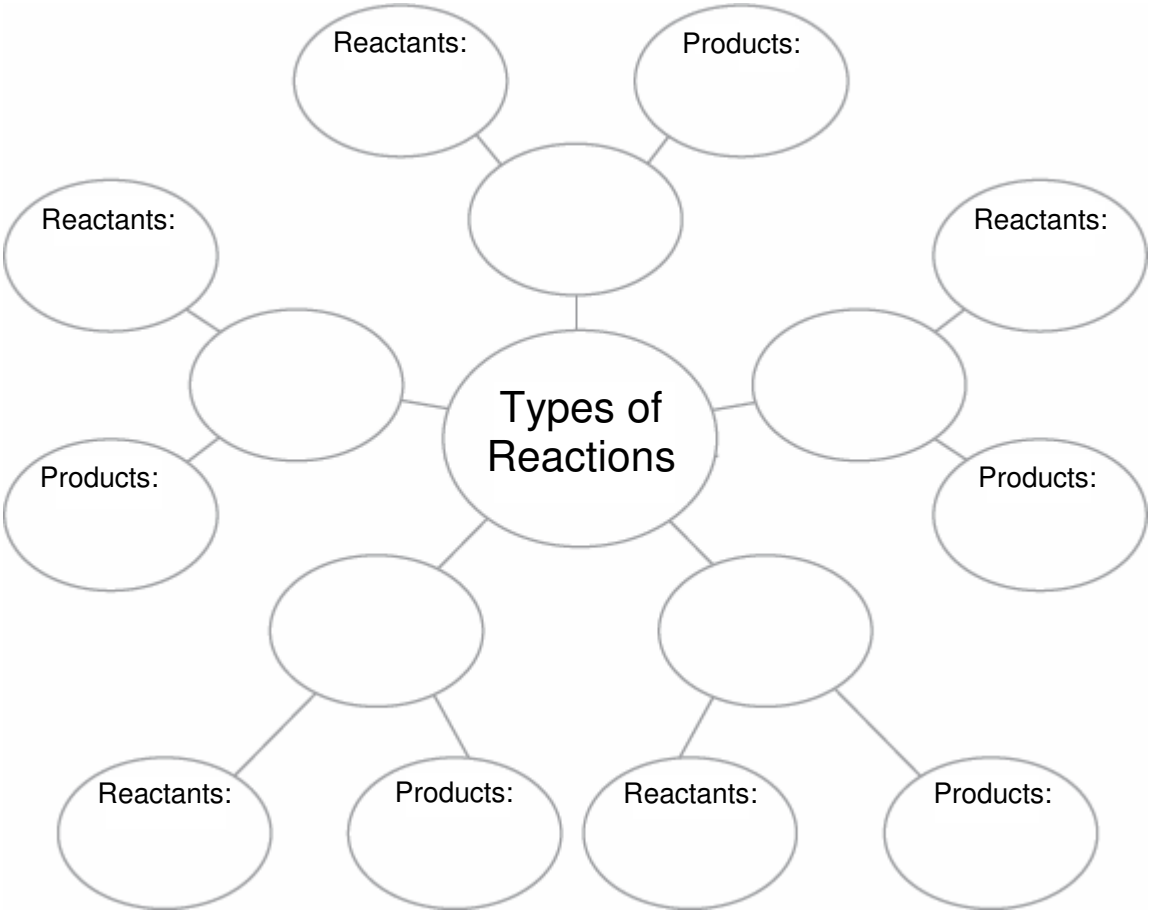
11.2 Types of Chemical Reactions

Essential Understanding There are five types of chemical reactions: combination, combustion, decomposition, single-replacement, and double-replacement reactions.

Reading Strategy

Cluster Diagram Cluster diagrams help you show how concepts are related. To create a cluster diagram, write the main idea or topic in a center circle. Draw lines branching off the main idea, connected to circles that contain concepts related to the main concept. Continue adding facts and details to the branches.

As you read Lesson 11.2, use the cluster diagram below. Fill in each type of reaction, then add details to each.



EXTENSION Write a balanced chemical equation for an example of each type of reaction.

_____

_____

_____

Name _____ Class _____ Date _____

Lesson Summary

Classifying Reactions There are five general types of chemical reactions.

- A combination reaction occurs when a product is formed from two or more reactants, while a decomposition reaction involves breaking down a reactant into two or more simpler substances.
- In single and double-replacement reactions, elements or ions trade places in compounds.
- A compound or an element rapidly combines with oxygen in a combustion reaction.

After reading Lesson 11.2, answer the following questions.

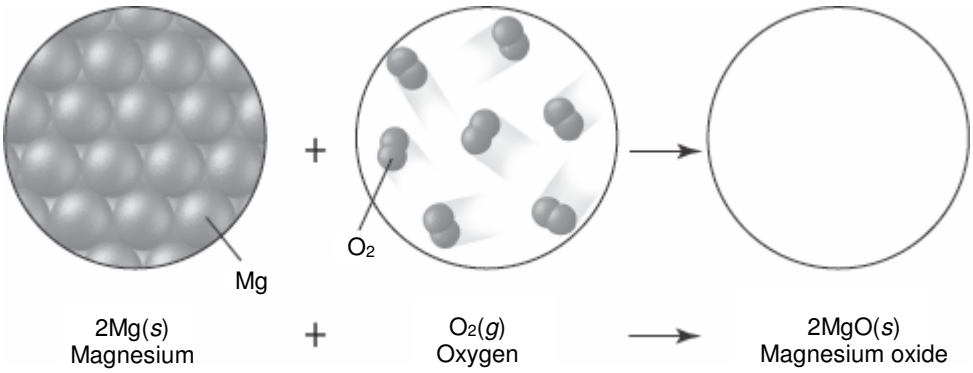
Classifying Reactions

1. There are _____ general types of chemical reactions.

2. Complete the diagram of a combination reaction. Which characteristic of this type of reaction is shown in the diagram?

_____

_____



3. Is the following sentence true or false? The product of a combination reaction is always a molecular compound. _____

4. Circle the letter of each set of reactants that can produce more than one product.

a. two nonmetals

b. a Group A metal and a nonmetal

c. a transition metal and a nonmetal

d. two metals

Name _____ Class _____ Date _____

5. Look at Figure 11.5. Which characteristics of a decomposition reaction are shown in the diagram?

_____

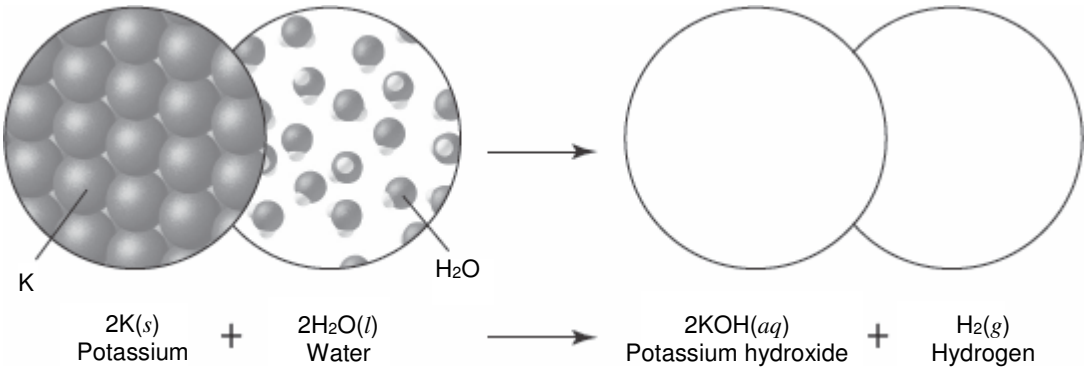
_____

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, state whether the following combinations will produce a reaction or no reaction.

a. $Ag(s) + HCl(aq)$ _____

b. $Cu(s) + AgNO_3(aq)$ _____

10. Look at Figure 11.7. Which characteristics of a double-replacement reaction are shown in the diagram?

_____

_____

11. When solutions of ionic compounds are mixed, what three circumstances might indicate that a double-replacement reaction has occurred?

a. _____

b. _____

c. _____

12. Look at the diagram of a combustion reaction in Figure 11.8. Which characteristics of this type of reaction are shown in the diagram?

_____

_____

Name _____ Class _____ Date _____

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

b. carbon dioxide

c. water

d. glucose

15. Classify the reaction in each of the following equations.

a. $BaCl_2(aq) + K_2CrO_4(aq) \longrightarrow BaCrO_4(s) + 2KCl(aq)$ _____

b. $Si(s) + 2Cl_2(g) \longrightarrow SiCl_4(l)$ _____

c. $2C_6H_6(l) + 15O_2(g) \longrightarrow 6H_2O(l) + 12CO_2(g)$ _____

16. Use the summary of reaction types on pages 366 and 367. The equation for the combustion of pentane is $C_5H_{12} + 8O_2 \longrightarrow 5CO_2 + 6H_2O$. What numbers in this equation are represented by *x* and y in the general equation? _____

Name _____ Date _____ Class _____

11.2 TYPES OF CHEMICAL REACTIONS

Section Review

Objectives

- Describe the five general types of reactions
- Predict the products of the five general types of reactions

Vocabulary

- combination reaction
- decomposition reaction
- single-replacement reaction
- activity series
- double-replacement reaction
- combustion reaction

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

It is possible to ___**1**___ the products of some chemical reactions. In order to do this, you must be able to recognize at least five general types of reactions. For example, in a ___**2**___ reaction, the reactants are two or more ___**3**___ and/or compounds and there is always a ___**4**___ product. In a ___**5**___ reaction, a single compound is broken down into two or more simpler substances.

In a ___**6**___ reaction, the reactants and products are an element and a compound. The ___**7**___ can be used to predict whether most single-replacement reactions will take place. A ___**8**___ reaction involves the exchange of ions between two compounds. This reaction generally takes place between two ionic compounds in ___**9**___ solution. One of the reactants in a combustion reaction is ___**10**___. The products of the complete combustion of a hydrocarbon are ___**11**___ and ___**12**___.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

Name _____ Date _____ Class _____

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

_____ **13.** In a decomposition reaction, there is a single reactant.

_____ **14.** The activity series of metals can be used to predict products in double replacement reactions.

_____ **15.** Carbon dioxide and water are the products of the combustion of hexane (C_6H_{14}).

_____ **16.** A nonmetal can replace another nonmetal from a compound in a single-replacement reaction.

_____ **17.** One of the products of a double-replacement reaction is a gas that bubbles out of the mixture.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
_____ **18.** combination reaction	**a.** reaction in which atoms of one element replace atoms of a second element in a compound
_____ **19.** decomposition reaction	**b.** a reaction in which two or more substances combine to form a single substance
_____ **20.** single-replacement reaction	**c.** reaction of a compound with oxygen to produce energy
_____ **21.** combustion reaction	**d.** reaction in which a single compound is broken down into two or more products

Part D Questions and Problems

Answer the following in the space provided.

22. Identify the type of each of the following reactions.

a. $2C_6H_{14}(l) + 19O_2(g) \rightarrow 12CO_2(g) + 14H_2O(g)$ **b.** $2Fe(s) + 3Br_2(l) \rightarrow 2FeBr_3(s)$

_____ _____

23. Complete and balance the following equation. What must be true of one of the products?

$Li_3PO_4 + Zn(NO_3)_2 \rightarrow$

_____

_____