

Chemical Reactions ▪ *Guided Reading and Study***Observing Chemical Change**

This section describes how matter can change physically or chemically. It also describes how you can tell when a chemical change in matter has occurred.

Use Target Reading Skills

Before you read, preview the red headings. In the graphic organizer below, ask a what or how question for each heading. As you read, write the answers to your questions.

Properties and Changes of Matter

Question	Answer
What are physical properties of matter?	Physical properties are . . .

Introduction

1. What is matter?

2. The study of matter and how matter changes is called _____.

Properties and Changes of Matter

3. Complete the following table about physical and chemical properties of matter.

Type of Property	How It Can Be Observed	Example
a.	Without changing one substance into another	Color
Chemical	b.	Ability to burn

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Observing Chemical Change *(continued)*

4. Is the following sentence true or false? A physical change never alters the form or appearance of a substance. _____
5. Circle the letter of each choice that is a physical change in matter.
 - a. bending a straw
 - b. boiling water
 - c. burning wood
 - d. braiding hair
6. A change in matter that produces one or more new substances is a(n) _____.
7. What happens to the bonds between atoms when chemical changes occur?

Evidence for Chemical Reactions

8. List the two main kinds of changes that you can observe when chemical reactions occur.

9. If you detect a change in the color of a material, why does this indicate that a chemical reaction might have occurred?

10. A solid that forms during a chemical reaction is called a(n) _____.
11. Suppose you mix two clear liquids together to form a new substance and bubbles form. What type of reaction might this indicate? Explain your answer.

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12. Is the following sentence true or false? A change in energy occurs during a chemical reaction. _____

13. Why does a change in temperature indicate that a chemical reaction may have occurred?

14. Is the following sentence true or false? Endothermic reactions always result in a decrease in temperature. _____

15. Complete the table about changes in energy in chemical reactions.

Type of Reaction	Energy Change	Example
Endothermic	a.	Frying an egg
b.	Energy is released	Burning wood

Chemical Reactions ▪ *Review and Reinforce***Observing Chemical Change****Understanding Main Ideas**

Complete the following table. Describe changes in properties that you might notice during each process and state whether the changes are chemical or physical.

Changes in Matter		
Event	Observable Changes	Type of Change
<i>Baking a cake</i>	1.	2.
<i>Burning a log</i>	3.	4.
<i>Freezing water</i>	5.	6.

Building Vocabulary

From the list below, choose the term that best completes each sentence.

matter

physical change

chemical reaction

endothermic reaction

chemistry

exothermic reaction

precipitate

- Any change that alters a substance without changing it into another substance is a(n) _____.
- _____ is anything that has mass and takes up space.
- A reaction that releases energy in the form of heat is called a(n) _____.
- A(n) _____ is a reaction in which energy is absorbed.
- A chemical change is also referred to as a(n) _____.
- A(n) _____ is a solid formed from a solution during a chemical reaction.
- _____ is the study of the properties of matter and how matter changes.

Chemical Reactions ▪ *Guided Reading and Study*

Describing Chemical Reactions

This section explains how to show chemical reactions with symbols. It also states the principle of conservation of mass, and identifies three categories of chemical reactions.

Use Target Reading Skills

After you read the section, reread the paragraphs that contain definitions of Key Terms. Use all of the information you have learned to write a meaningful sentence using each Key Term.

a. chemical equation: _____

b. reactant: _____

c. product: _____

d. conservation of mass: _____

e. open system: _____

f. closed system: _____

g. coefficient: _____

h. synthesis: _____

i. decomposition: _____

j. replacement: _____

Chemical Reactions ▪ *Guided Reading and Study*

What Are Chemical Equations?

1. What is a chemical equation?

2. Is the following sentence true or false? Chemical equations use symbols instead of words to summarize chemical reactions.

3. If a molecule of carbon dioxide is involved in a chemical reaction, how is it represented in the chemical equation for the reaction?

4. The substances you have at the beginning of a chemical reaction are called the _____.
5. The substances you have when a chemical reaction is complete are called the _____.
6. What do you read the arrow in a chemical equation as meaning?

7. Label each formula in the chemical equation below as either a reactant or a product.
Fe + S → FeS
 a. Fe _____ b. S _____
 c. FeS _____
8. Circle the letter of each statement that is true about chemical equations.
 - a. Chemical equations have no real structure.
 - b. A chemical equation summarizes a reaction.
 - c. The formulas for the reactants are written on the right.
 - d. Symbols in the equation show the reactants and the products.

Conservation of Mass

9. Is the following sentence true or false? All the atoms present at the start of a reaction are present at the end. _____
10. At the end of a chemical reaction, what is the total mass of the reactants compared to the total mass of the products?



Chemical Reactions ▪ *Guided Reading and Study*

Describing Chemical Reactions *(continued)*

11. What is the principle called the conservation of mass?

12. Describe an open system.

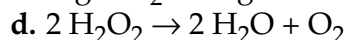
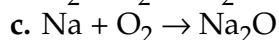
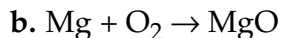
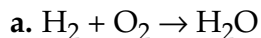
13. What is an example of a closed system?

Balancing Chemical Equations

14. When is a chemical equation balanced?

15. How many atoms of oxygen are there on each side of the following chemical equation: $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$?

16. Circle the letter of each chemical equation that is balanced.

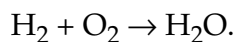


17. A number placed in front of a chemical formula in a chemical equation is called a(n) _____.

18. What does a coefficient tell you?

Chemical Reactions ▪ *Guided Reading and Study*

19. Tell why this chemical equation is not balanced:



20. Write a balanced equation for this reaction: Oxygen reacts with hydrogen to yield water.

Classifying Chemical Reactions

21. In what three categories can chemical reactions be classified?

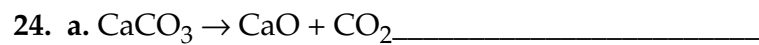
22. Which category of chemical reactions comes from a term that means “to put things together”?

23. Complete the table about the three categories of chemical reactions.

Categories of Chemical Reactions		
Category	Description	Example Chemical Equation
a.	Two or more substances combine to make a more complex compound.	$2 \text{SO}_2 + \text{O}_2 + 2 \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$
Decomposition	b.	$2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$
c.	One element replaces another in a compound, or two elements in different compounds trade places.	$2 \text{CuO} + \text{C} \rightarrow 2 \text{Cu} + \text{CO}_2$

Chemical Reactions ▪ *Guided Reading and Study***Describing Chemical Reactions** *(continued)*

Classify each of the following equations as synthesis, decomposition, or replacement.



Chemical Reactions ▪ *Review and Reinforce***Describing Chemical Reactions****Understanding Main Ideas**

Balance the equations on the lines below. State whether the reaction is a synthesis, decomposition, or replacement reaction.

Given Equation	Balanced Equation	Type of Reaction
1. $\text{FeS} + \text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\text{S}$	a.	b.
2. $\text{Na} + \text{F}_2 \rightarrow \text{NaF}$	a.	b.
3. $\text{HgO} \rightarrow \text{Hg} + \text{O}_2$	a.	b.

Answer questions 4 and 5 on a separate sheet of paper.

- Describe in words the chemical composition of the molecules involved and the reaction represented by the equation: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- Use the principle of conservation of mass to explain why the equation in question 4 is balanced.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

- | | |
|-------------------------------|---|
| ___ 6. chemical equation | a. substance present after a reaction |
| ___ 7. decomposition reaction | b. reaction in which substances combine to form a more complex compound |
| ___ 8. coefficient | c. uses symbols and formulas to show chemical reactions |
| ___ 9. product | d. reaction in which one element replaces another in a compound |
| ___ 10. reactant | e. substance present before a reaction |
| ___ 11. conservation of mass | f. number telling how many molecules of a substance are involved in a chemical reaction |
| ___ 12. synthesis reaction | g. reaction in which compounds are broken down into simpler products |
| ___ 13. replacement reaction | h. principle that states that matter is not created or destroyed during a chemical reaction |

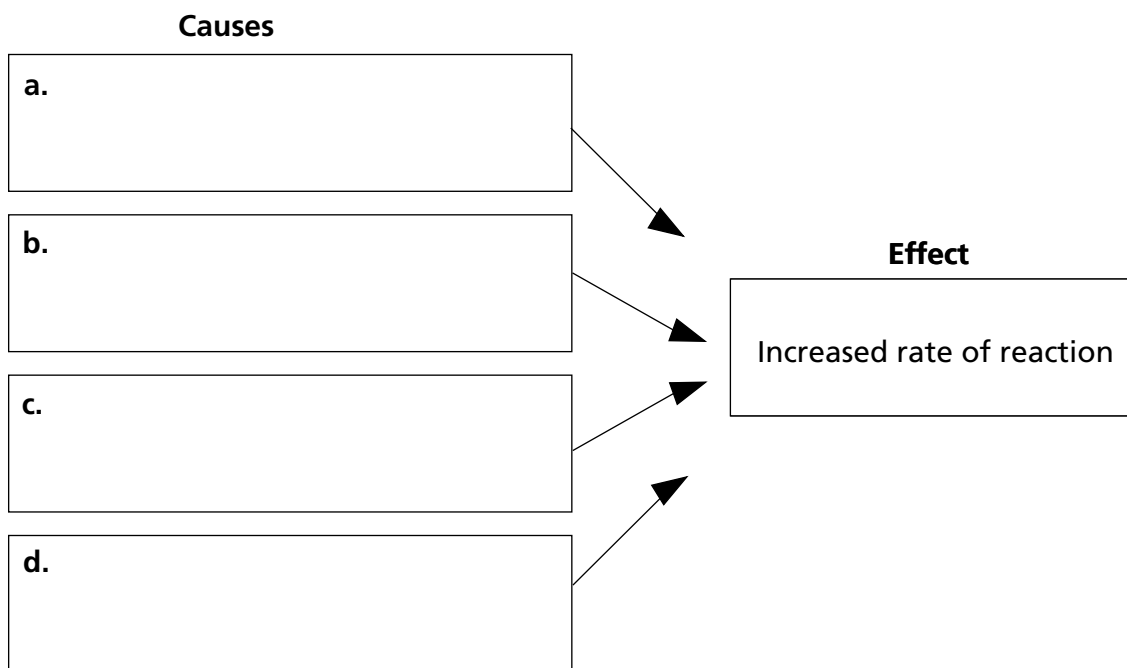
Chemical Reactions ▪ *Guided Reading and Study*

Controlling Chemical Reactions

This section explains how energy is related to chemical reactions. It also describes how the rates of chemical reactions can be controlled.

Use Target Reading Skills

As you read, identify the factors that can cause the rate of a chemical reaction to increase. Write the information in the graphic organizer below.



Chemical Reactions

Energy and Reactions

1. The _____ is the minimum amount of energy needed to start a chemical reaction.
2. Is the following sentence true or false? All chemical reactions need a certain amount of activation energy to get started.

3. In a reaction that makes water from hydrogen gas and oxygen gas, where does the activation energy come from?

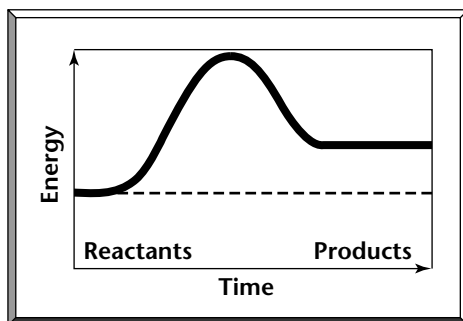
4. A reaction that releases energy is called a(n) _____.
5. A reaction that absorbs energy is called a (n) _____.

Chemical Reactions ▪ *Guided Reading and Study*

Controlling Chemical Reactions *(continued)*

6. Why does an exothermic reaction need activation energy?

7. On the graph below, how does the energy of the products compare with the energy of the reactants?



8. Label the graph above as either an exothermic or endothermic reaction.

9. What part of the graph in question 7 represents the activation energy for the reaction?

Rates of Chemical Reactions

10. What are five factors that affect the rate of a chemical reaction?

11. Why does surface area of a reactant influence the rate of the reaction?

Chemical Reactions ▪ *Guided Reading and Study*

12. In what way is temperature related to chemical reaction rates?

13. Circle the letter of each of the following that would increase the rate of a reaction.

- a. Add heat.
- b. Decrease the surface area.
- c. Increase the surface area.
- d. Reduce heat.

14. The amount of substance in a given volume is called _____.

15. To increase the rate of a reaction, why would you increase the concentration of the reactants?

16. Is the following sentence true or false? Another way to control the rate of a reaction is to change the activation energy needed.

17. What is a catalyst?

18. Is the following sentence true or false? Catalysts are always permanently changed in a reaction. _____

19. A biological catalyst is called a(n) _____.

20. Why must living things rely on thousands of catalysts for chemical reactions necessary for life?



Chemical Reactions ▪ *Guided Reading and Study*

Controlling Chemical Reactions *(continued)*

21. What is an inhibitor?

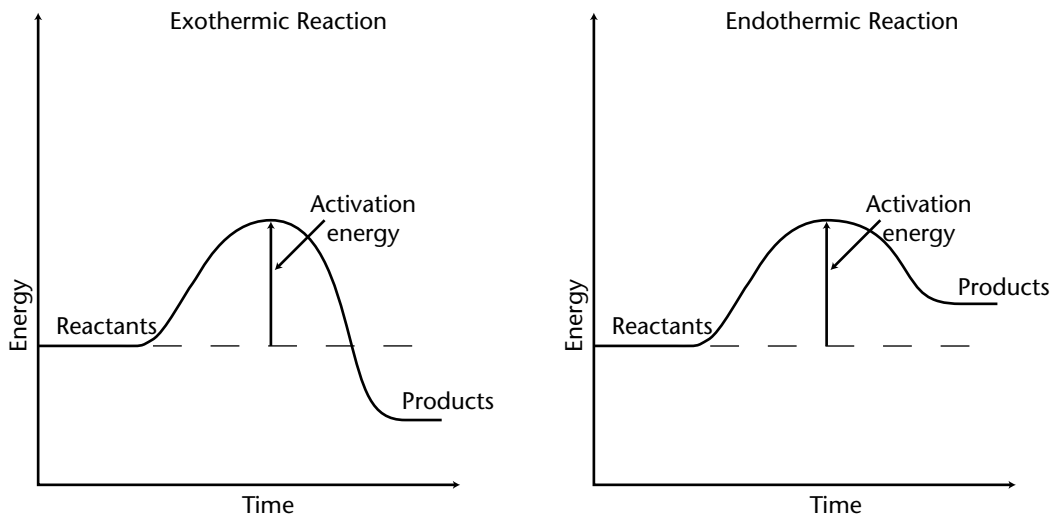
22. How do most inhibitors work?

Chemical Reactions ▪ *Review and Reinforce*

Controlling Chemical Reactions

Understanding Main Ideas

Use the figures to answer questions 1–3. Write your answers on a separate sheet of paper.



1. Use what you know about endothermic and exothermic reactions to explain the differences in the graphs above.
2. Why is the activation energy pictured as a hill in the two diagrams?
3. Explain how adding heat to the reactions shown in the diagram would change the rate of these chemical reactions. Name two other ways to change the rate of a chemical reaction.

Building Vocabulary

Write a definition for each of the following terms on the lines below.

4. concentration _____

5. enzyme _____

6. inhibitor _____

Chemical Reactions