

# Study Guide

## Interactive Textbook

- Complete student edition
- Section and chapter self-assessment
- Assessment reports for teachers

### Help Students Read

L1

#### Building Vocabulary

**Words in Context** Help students learn the meaning of new words or phrases by examining context. Tell students to look for familiar words or phrases that surround a new term—these are clues to the new term’s meaning. Have students reread the second paragraph under the heading *Properties of Matter* (in *Describing Matter*). Ask: **What word in the same sentence as *substance* helps you to remember its meaning?** (*Pure*)

**Word/Part Analysis** Have students look up the prefixes *endo-* and *exo-* in a dictionary. They should find that *endo-* means “inside” or “within” and *exo-* means “outside” or “external.” Then, have students write definitions for *endothermic* and *exothermic* using the definitions they learned for the prefixes. *Endothermic* means “heat is inside” and *exothermic* means “heat is outside.”

#### Connecting Concepts

**Concept Maps** Help students develop one way to show how the information in this chapter is related. Chemistry is the study of matter and how matter changes. When matter changes, energy often changes form. Have students brainstorm to identify the key concepts, key terms, details, and examples. Then write each item on a self-stick note and attach it at random to chart paper or to the board.

Tell students that this concept map will be organized in hierarchical order and to begin at the top with the key concepts. Ask students these questions to guide them to categorize the information on the self-stick notes: **What is matter? How is matter measured? How does matter change? What forms of energy are related to changes in matter?**

### 1 Describing Matter

#### Key Concepts

- Every form of matter has two kinds of properties—physical properties and chemical properties.
- Elements are the simplest substances.
- When elements are chemically combined, they form compounds having properties that are different from those of the uncombined elements.
- Each substance in a mixture keeps its individual properties. Also, the parts of a mixture are not combined in a set ratio.

#### Key Terms

matter	compound
chemistry	chemical formula
substance	mixture
physical property	heterogeneous
chemical property	mixture
element	homogeneous
atom	mixture
chemical bond	solution
molecule	

### 2 Measuring Matter

#### Key Concepts

- Unlike weight, mass does not change with location, even when the force of gravity on an object changes.
- Common units of volume include the liter (L), milliliter (mL), and cubic centimeter (cm<sup>3</sup>).
- Volume = Length × Width × Height
- You can determine the density of a sample of matter by dividing its mass by its volume.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

#### Key Terms

weight
mass
International System of Units
volume
density



### 3 Changes in Matter

#### Key Concepts

- A substance that undergoes a physical change is still the same substance after the change.
- Unlike a physical change, a chemical change produces new substances with properties different from those of the original substances.
- Every chemical or physical change in matter includes a change in energy.

#### Key Terms

physical change
chemical change
law of conservation of mass
energy
temperature
thermal energy
endothermic change
exothermic change

### 4 Energy and Matter

#### Key Concepts

- Forms of energy related to changes in matter include kinetic, potential, chemical, electromagnetic, electrical, and thermal energy.
- During a chemical change, chemical energy may be changed to other forms of energy. Other forms of energy may also be changed to chemical energy.

#### Key Terms

kinetic energy	electromagnetic energy
potential energy	electrical energy
chemical energy	electrode

Prompt students by using connecting words or phrases, such as “includes,” “results in,” and “occurs when,” to indicate the basis for the organization of the map. The phrases should form a sentence between or among a set of concepts.

#### Answer

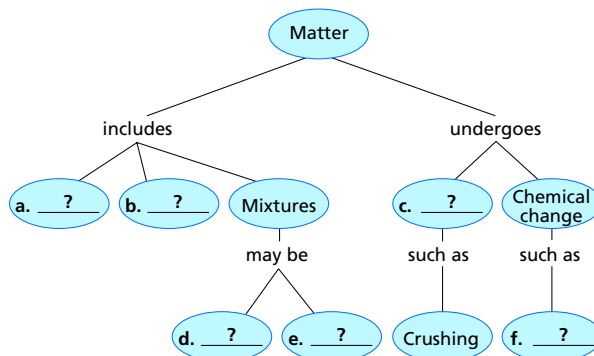
Accept logical presentations by students.

#### All in One Teaching Resources

- [Key Terms Review: Introduction to Matter](#)
- [Connecting Concepts: Introduction to Matter](#)

## Organizing Information

**Concept Mapping** Copy the concept map about matter onto a separate sheet of paper. Then complete the map by adding in the correct missing words or phrases. (For more on Concept Mapping, see the Skills Handbook.)



## Reviewing Key Terms

Choose the letter of the best answer.

- The ability to dissolve in water and to conduct electricity are examples of
  - physical properties.
  - chemical changes.
  - chemical properties.
  - chemical bonding.
- Water is an example of
  - an element.
  - a homogeneous mixture.
  - a compound.
  - a heterogeneous mixture.
- Density relates the mass of a material to the material's
 

a. temperature.	b. volume.
c. weight.	d. length.
- New substances are always formed when matter undergoes a
  - change in shape.
  - physical change.
  - change in temperature.
  - chemical change.
- Chemical energy is the potential energy of
  - temperature.
  - bonds between atoms.
  - electricity.
  - light.

If the statement is true, write *true*. If it is false, change the underlined word or words to make the statement true.

- Energy is anything that has mass and takes up space.
- A mixture is made of two or more elements that are chemically combined.
- The weight of an object changes if the force of gravity changes.
- Energy is taken in during an exothermic change.
- Light is an example of electromagnetic energy.

## Writing in Science

**How-to Paragraph** Suppose you are preparing for a long journey on the ocean or in space. Write a journal entry that describes your plan for having fresh, drinkable water throughout your entire trip.



## Organizing Information

- Elements (or Compounds)
- Compounds (or Elements)
- Physical change
- Heterogeneous (or Homogeneous)
- Homogeneous (or Heterogeneous)
- Sample answer: Combustion

## Reviewing Key Terms

- a
- c
- b
- d
- b
- Matter
- compound
- true
- endothermic
- true

## Writing in Science

**Writing Mode** Exposition/How-to

### Scoring Rubric

- 4** Exceeds criteria; includes highly detailed, step-by-step directions that describe how to build and use a device to get fresh water from the ocean
- 3** Meets criteria
- 2** Includes brief directions that contain a few errors or omissions
- 1** Includes sketchy directions with serious errors



Discovery Channel  
**SCHOOL**  
Video Assessment

### Introduction to Matter

Show the Video Assessment to review chapter content and as a prompt for the writing assignment. Discussion questions: **What is the difference between a compound and a mixture?** (*Compounds are chemically combined elements; mixtures are not chemically combined.*) **How are NASA engineers planning to provide astronauts with drinking water during space voyages?** (*By recycling the water they bring with them using water purification technology*)

Students can take a practice test online that is automatically scored.

## All in One Teaching Resources

- [Transparency K8](#)
- [Chapter Test](#)
- [Performance Assessment Teacher Notes](#)
- [Performance Assessment Student Worksheet](#)
- [Performance Assessment Scoring Rubric](#)



**ExamView® Computer Test Bank CD-ROM**

# Review and Assessment

## Checking Concepts

**11.** Compounds: made up of two or more elements chemically combined, elements combined in a specific ratio, properties differ from those of combined elements; mixtures: made up of two or more elements and/or compounds not chemically combined, parts not combined in a specific ratio, mixed substances retain individual properties

**12.** Mass and volume

**13.** The material is less dense than water.

**14.** The burning wax releases energy in the form of light (electromagnetic energy) and heat (thermal energy). A change that gives off energy is an exothermic change.

**15.** Sample answer: Kinetic energy is the energy of matter in motion. Moving cars have kinetic energy.

## Thinking Critically

**16.** Clear lemon soda is a solution because its parts retain their individual properties but are evenly mixed.

**17.** The 5-cm diagonal is not needed because volume is calculated by multiplying the length, width, and height of an object.

**18.** The volume of a kilogram of water increases when it freezes to ice.

**19.** Sample answer: The solution would taste salty so the salt would still be present. Boiling the liquid separates the water from the salt.

## Math Practice

**20.** 2 : 5; the compound  $P_2O_5$  has two atoms of phosphorus for every five atoms of oxygen.

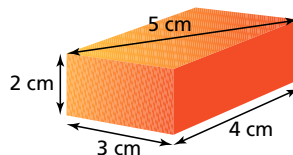
**21.**  $1.74 \text{ g/cm}^3$

## Checking Concepts

11. What are three ways that compounds and mixtures differ?
12. What two quantities do you need to measure in order to determine the density of an object?
13. What can you infer about the density of a material if a sample of it floats in water?
14. How do you know that the burning of candle wax is an exothermic change?
15. What is kinetic energy? Give an example of a use of kinetic energy that you saw today.

## Thinking Critically

16. **Classifying** Which of the following is a solution: pure water, clear lemon soda, cereal and milk in a bowl? Explain how you know.
17. **Making Judgments** Which measurement shown in the diagram is not needed to find the volume of the box? Explain.



18. **Inferring** Ice has a lower density than liquid water. How does the volume of a kilogram of water change when it freezes to ice?
19. **Problem Solving** Suppose you dissolve some table salt in a glass of water. How could you prove to someone that the dissolving was a physical change, not a chemical change?

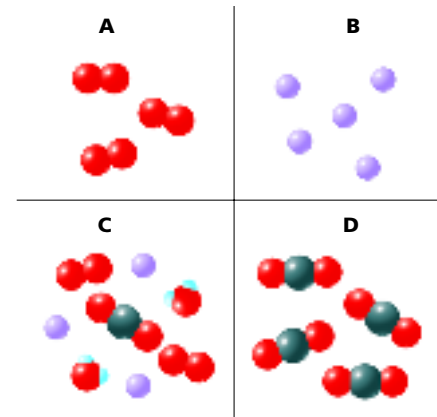
## Math Practice

20. **Ratios** The elements phosphorus and oxygen form a compound with the formula  $P_2O_5$ . What is the ratio of phosphorus atoms to oxygen atoms in the compound?
21. **Calculating Density** A piece of magnesium metal has a mass of 56.5 g and a volume of  $32.5 \text{ cm}^3$ . What is the density of the magnesium?

## Applying Skills

Use the information and the diagrams below to answer Questions 22–25. Some questions may have more than one answer.

Each diagram below represents a different kind of matter. Each ball represents an atom. Balls of the same color represent the same kind of atom.



22. **Interpreting Diagrams** Which diagrams represent a single element? Explain.
23. **Classifying** Which diagrams represent pure substances? Explain.
24. **Interpreting Data** How do the molecules in diagram A differ from those in diagram D?
25. **Interpreting Diagrams** Which diagram represents a mixture? Explain.

## Lab zone Chapter Project

**Performance Assessment** Present a brief summary of your experience with building your density-calculating system. Describe the most difficult part of construction. What steps were easiest? Defend the accuracy and reliability of your system, and describe its limitations.

## Lab zone Chapter Project

L3

**Performance Assessment** Provide class time for student presentations. In their presentations, students should summarize their design and construction process and describe the most difficult part and the easiest part of the construction. Make sure students also describe the accuracy and reliability of their systems and highlight the limitations.

# Standardized Test Prep

## Test-Taking Tip

### Anticipating the Answer

You may be able to figure out the answer to a question before looking at the answer choices. After thinking of your own answer, compare it with the choices provided. Select the answer that most closely matches your own. This strategy can be especially useful for questions that test vocabulary. Try to answer the question below before looking at the answer choices.

### Sample Question

Which two pieces of laboratory equipment would be most useful for measuring the mass and volume of a rectangular aluminum block?

- A metric ruler and stopwatch
- B balance and metric ruler
- C thermometer and graduated cylinder
- D balance and stopwatch

### Answer

The correct answer is **B**. Mass is measured with a balance. The volume of a rectangular solid is found by multiplying length  $\times$  width  $\times$  height, which are measured with a metric ruler. Choices **A** and **D** each contain only one of the necessary pieces of equipment. A stopwatch measures time. In Choice **C**, the graduated cylinder measures volume, but a thermometer measures temperature, not mass.

### Choose the letter of the best answer.

A scientist did an experiment, described by the words and symbols below, to demonstrate the law of conservation of mass. Use the information and your knowledge of science to answer Questions 1 to 2.

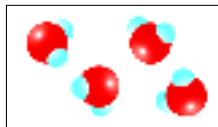


1. The scientist found that 2 grams of hydrogen reacted completely with 16 grams of oxygen. What was the total mass of water produced?  
A 8 grams                      B 14 grams  
C 18 grams                      D 32 grams

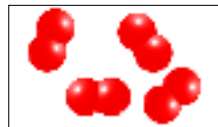
2. Which pair of terms best describes the type of change that occurred in the reaction?  
F chemical and exothermic  
G chemical and endothermic  
H physical and exothermic  
J physical and endothermic
3. What is the best title for the chart below?

?	
Helium	Colorless; less dense than air
Iron	Attracted to a magnet; melting point of 1,535°C
Oxygen	Odorless; gas at room temperature

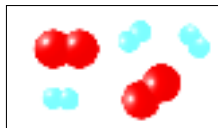
- A The Periodic Table of the Elements
  - B Gases Found in Air
  - C Chemical Properties of Some Compounds
  - D Physical Properties of Some Elements
4. Which diagram best represents a mixture of two kinds of gas molecules?



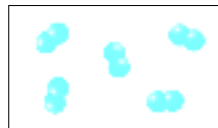
F



G



H



J

5. The density of a substance equals its mass divided by its volume. The density of sulfur is 2.0 g/cm<sup>3</sup>. What is the mass of a sample of sulfur that has a volume of 6.0 cm<sup>3</sup>?  
A 3.0 g                      B 4.0 g  
C 8.0 g                      D 12 g

### Constructed Response

6. Describe three forms of energy related to changes in matter and provide an example of each.

## Applying Skills

22. Diagrams A and B represent single elements because each is made up of a single type of atom.
23. Diagrams A, B, and D represent pure substances. Diagrams A and B represent elements. Diagram D represents a compound because its two kinds of atoms are chemically combined in a set ratio.
24. A—a single kind of atom; D—two kinds of atoms
25. Diagram C represents a mixture because it contains several different kinds of substances that are not chemically combined.

## Standardized Test Prep

1. C    2. F    3. D    4. H    5. D
6. Sample answer: Chemical energy is the potential energy in the chemical bonds between atoms. During chemical reactions, chemical energy may be converted to other forms of energy. For example, when wood burns, energy is released in the form of heat and light. Microwaves, one form of electromagnetic energy, can be used to cook food. Adding thermal energy can melt ice.