Name Key Date Class

CHAPTER 3 STUDY GUIDE

Matter—Properties and Changes

Section 3.1 Properties of Matter

In your textbook, read about physical properties and chemical properties of matter.

Use each of the terms below just once to complete the passage.

chemical	mass	physical
density	properties	substance

Matter is anything with **(1)** MASS and volume. A **(2)** Substance is a form of matter with a uniform and unchanging composition. Substances have specific, unchanging **(3)** Properties that can be observed. Substances have both physical and chemical properties. **(4)** Physical properties can be observed without changing a substance's chemical composition. Color, hardness, and **(5)** Density are examples. Other properties cannot be observed without changing the composition of a substance. These are called **(6)** Chemical properties. An example is the tendency of iron to form rust when exposed to air.

Label each property as either *physical* or *chemical*.

Physical **7.** Chemical formula H_2O

Chemical **8.** Forms green carbonate when exposed to moist air

Chemical **9.** Remains unchanged when in the presence of nitrogen

Physical **10.** Colorless

Physical **11.** Solid at normal temperatures and pressures

Chemical **12.** Ability to combine with another substance

Physical **13.** Melting point

Physical **14.** Liquid at normal temperatures and pressures

Physical **15.** Boiling point is 100°C

Physical **16.** Conducts electricity

Physical **17.** Density is $\frac{1g}{cm^3}$

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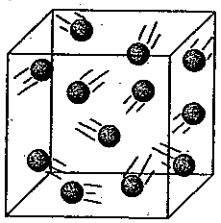
Section 3.1 *continued*

In your textbook, read about states of matter.

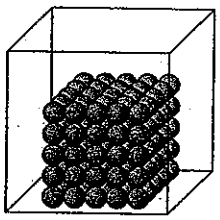
Label each drawing with one of these words: *solid, liquid, gas*.

18.



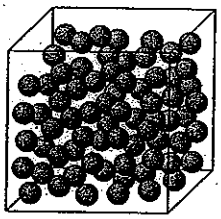
GAS

19.



Solid

20.



Liquid

For each statement below, write *true* or *false*.

True **21.** All matter that we encounter in everyday life exists in one of three physical forms.

True **22.** A solid has definite shape and volume.

False **23.** A liquid has a definite shape and takes on the volume of its container.

True **24.** A gas has both the shape and the volume of its container.

False **25.** The particles in a gas cannot be compressed into a smaller volume.

False **26.** Liquids tend to contract when heated.

False **27.** The particles in a solid are spaced far apart.

False **28.** The words *gas* and *vapor* can be used interchangeably.

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CHAPTER 3 STUDY GUIDE

Section 3.2 Changes in Matter

In your textbook, read about physical change and chemical change.

What kinds of changes do these words indicate? Write each word under the correct heading. Use each word only once.

boil	crumple	crush	explode
burn	ferment	freeze	grind
condense	melt	oxidize	rot
corrode	rust	tarnish	vaporize

Physical Change

1. Boil
2. Freeze
3. Condense
4. Vaporize
5. melt
6. Grind
7. Crumple
8. Crush

Chemical Change

9. explode
10. rust
11. oxidize
12. Corrode
13. Tranish
14. ferment
15. Burn
16. Rot

For each item in Column A, write the letter of the matching item in Column B.

Column A

C 17. The new substances that are formed in a chemical reaction

A 18. A chemical reaction that involves one or more substances changing into new substances

d 19. Shows the relationship between the reactants and products in a chemical reaction

e 20. States that mass is neither created nor destroyed in any process

B 21. The starting substances in a chemical reaction

Column B

a. chemical change
b. reactants
c. products
d. chemical equation
e. law of conservation of mass

Answer the following question. Write an equation showing conservation of mass of reactants and products.

22. In a laboratory, 178.8 g of water is separated into hydrogen gas and oxygen gas. The hydrogen gas has a mass of 20.0 g. What is the mass of the oxygen gas produced?

MASS Water = MASS Oxygen + MASS Hydrogen

178.8g H_2O = ? + 20.0g Hydrogen

MASS Oxygen = 158.8g

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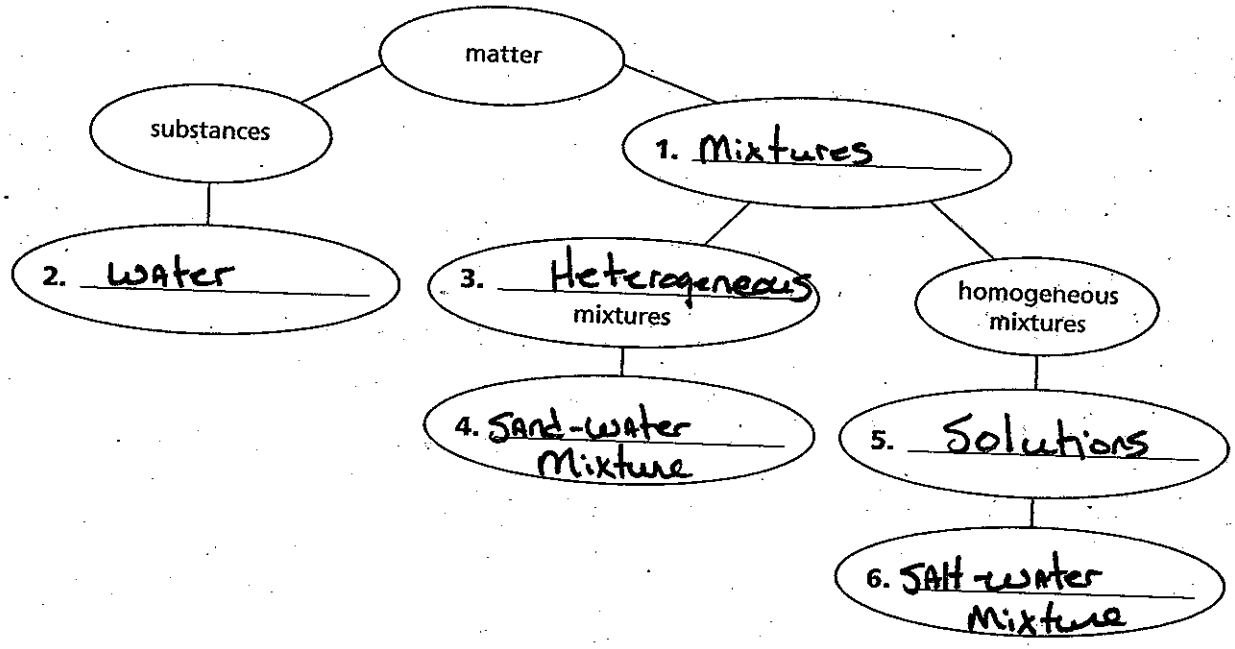
Section 3.3 Mixtures of Matter

In your textbook, read about pure substances and mixtures.

Use the words below to complete the concept map.

heterogeneous mixtures	salt–water mixture	sand–water mixture
	solutions	water



In your textbook, read about separating mixtures.

For each item in Column A, write the letter of the matching item in Column B.

Column A

B 7. Separates substances on the basis of the boiling points of the substances

C 8. Separates by formation of solid, pure particles from a solution

D 9. Separates substances based on their movement through a special paper

A 10. Separates solids from liquids by using a porous barrier

Column B

a. filtration

b. distillation

c. crystallization

d. chromatography

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Section 3.4 Elements and Compounds

In your textbook, read about elements and compounds.

Circle the letter of the choice that best completes the statement or answers the question.

1. A substance that cannot be separated into simpler substances by physical or chemical means is a(n)
   a. compound. b. mixture. c. element. d. period.
2. A chemical combination of two or more different elements is a(n)
   a. solution. b. compound. c. element. d. period.
3. Which of the following is an example of an element?
   a. water b. air c. sugar d. oxygen
4. Which of the following is an example of a compound?
   a. gold b. silver c. aspirin d. copper
5. What are the horizontal rows in the periodic table called?
   a. block elements b. groups or families c. grids d. periods
6. What are the vertical columns in the periodic table called?
   a. block elements b. groups or families c. grids d. periods

Label each substance as either an *element* or a *compound*.

Element 7. silicon
Compound 8. sodium chloride
Element 9. francium
Element 10. nickel
Compound 11. ice

Write the symbol for each element. Use the periodic table on pages 72–73 in your textbook if you need help.

Ne 12. neon
Ca 13. calcium
Fe 14. iron
Ti 15. titanium
F 16. fluorine

In your textbook, read about the law of definite proportions.

Use the law of definite proportions and the equation below to answer the questions.

The law of definite proportions states that regardless of the amount, a compound is always composed of the same elements in the same proportion by mass.

$$\text{Mass percentage of an element (\%)} = \frac{\text{mass of element}}{\text{mass of compound}} \times 100\%$$

17. A 20.0-g sample of sucrose contains 8.4 g of carbon. What is the mass percentage of carbon in sucrose? Show your work.

$\frac{8.4g}{20.0g} \times 100\% = 42\%$

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18. Sucrose is 51.50% oxygen. How many grams of oxygen are in 20.0 g of sucrose? Show your work.

(20.0g)(.5150) = 10.3 g Oxygen

19. A 2-g sample of sucrose is 6.50% hydrogen. What is the mass percentage of hydrogen in 300 g of sucrose? Explain your reasoning.

6.50% of the 300g of Sucrose will be Hydrogen; this is consistent Regardless of Amount

20. Two compound samples are found to have the same mass percentages of the same elements. What can you conclude about the two samples?

They are Same Compound

In your textbook, read about the law of multiple proportions.

Use the law of multiple proportions to answer the questions and complete the table below.

The law of multiple proportions states that if the elements X and Y form two compounds, the different masses of Y that combine with a fixed mass of X can be expressed as a ratio of small whole numbers.

21. Two compound samples are composed of the same elements, but in different proportions. What can you conclude about the two samples?

They are Not Same Compound

For each compound in the table, fill in the ratio of the mass of oxygen to the mass of hydrogen.

Compound	Mass of Oxygen	Mass of Hydrogen	Mass O/Mass H
H_2O	16 g	2 g	**22.** 8g O/1g H
H_2O_2	32 g	2 g	**23.** 16g O/1g H

24. Write a brief statement comparing the two mass ratios from the table.

8:1 vs 16:1 2x Amount of O in H_2O_2

25. Are H_2O and H_2O_2 the same compound? Explain your answer.

No - different Ratio or %

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CHAPTER 3 CHAPTER ASSESSMENT

Matter—Properties and Changes

Reviewing Vocabulary

Match the definition in Column A with the term in Column B.

Column A

f 1. A homogeneous mixture

D 2. States that mass is neither created nor destroyed in a chemical reaction

E 3. States that regardless of the amount, a compound is always composed of the same elements in the same proportion by mass

A 4. States that different masses of one element combine with the same relative mass of another element to form different compounds

C 5. The grid organizing elements into periods and groups

B 6. The ratio of the mass of each element to the total mass of the compound

I 7. Three physical forms that describe all matter that exists on Earth

G 8. A separation technique that results in the formation of pure solid particles from a solution

H 9. A technique that separates the components of a mixture

K 10. A form of matter with a constant volume that takes the shape of its container

J 11. A form of matter with a definite shape and volume

Column B

a. law of multiple proportions

b. percent by mass

c. periodic table

d. law of conservation of mass

e. law of definite proportions

f. solution

g. crystallization

h. chromatography

i. states of matter

j. solid

k. liquid

Compare and contrast each pair of related terms.

12. chemical property, physical property

Both are Characterstics of Substance: Physical Properties can be observed without changing the Substance, while Chemical Properties will change Substance

13. substance, mixture

Both are Kinds of matter. Substance can not be Broken down more, while mixture can be be separated by Physical means.

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