

**CHAPTER 3.4** STUDY GUIDE FOR CONTENT MASTERY

**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.

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

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

- silicon \_\_\_\_\_
- sodium chloride \_\_\_\_\_
- francium \_\_\_\_\_
- neon \_\_\_\_\_
- calcium \_\_\_\_\_
- iron \_\_\_\_\_
- nickel \_\_\_\_\_
- ice \_\_\_\_\_
- titanium \_\_\_\_\_
- fluorine \_\_\_\_\_

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

- neon \_\_\_\_\_
- calcium \_\_\_\_\_
- iron \_\_\_\_\_
- titanium \_\_\_\_\_
- 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.

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

- 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.

**CHAPTER 3.4** STUDY GUIDE FOR CONTENT MASTERY

**Section 3.4 continued**

- Sucrose is 51.30% oxygen. How many grams of oxygen are in 20.0 g of sucrose? Show your work.

- 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.

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

*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.

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

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 <sub>2</sub> O	14.6 g	2 g	22.
H <sub>2</sub> O <sub>2</sub>	32 g	2 g	23.

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

- Are H<sub>2</sub>O and H<sub>2</sub>O<sub>2</sub> the same compound? Explain your answer.

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?

- Answer the following question. Write an equation showing conservation of mass of reactants and products.
21. The starting substances in a chemical reaction are called \_\_\_\_\_.
20. States that mass is neither created nor destroyed during a chemical reaction.
19. Shows the relationship between the reactants and products in a chemical equation.
18. A chemical reaction that involves one or more substances changing into new substances.
17. The new substances that are formed in a chemical reaction are called \_\_\_\_\_.

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

- |          |                                |
|----------|--------------------------------|
| Column A | Column B                       |
| 1. _____ | a. chemical change             |
| 2. _____ | b. reactants                   |
| 3. _____ | c. products                    |
| 4. _____ | d. chemical equation           |
| 5. _____ | e. law of conservation of mass |
| 6. _____ |                                |
| 7. _____ |                                |
| 8. _____ |                                |

Physical Change	Chemical Change
boil	explode
burn	crush
condense	ferment
corrode	melt
	rust
	tarnish
	vaporize

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

**Section 3.2 Changes in Matter**

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

14  
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**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.
- Matter is anything with (1) \_\_\_\_\_ and volume. A substance is a form of matter with a uniform and unchanging composition. Substances have specific, unchanging (2) \_\_\_\_\_ that can be observed. Substances have both physical and chemical properties. (3) \_\_\_\_\_ properties can be observed without changing a substance's chemical composition. Color, hardness, and (5) \_\_\_\_\_ are examples. Other properties cannot be observed without changing the composition of a substance. These are called (6) \_\_\_\_\_ properties. An example is the tendency of iron to form rust when exposed to air.
- Label each property as either physical or chemical.
7. Chemical formula  $H_2O$
  8. Forms green carbonate when exposed to moist air
  9. Remains unchanged when in the presence of nitrogen
  10. Colorless
  11. Solid at normal temperatures and pressures
  12. Ability to combine with another substance
  13. Melting point
  14. Liquid at normal temperatures and pressures
  15. Boiling point is  $100^\circ C$
  16. Conducts electricity
  17. Density is  $\frac{1g}{cm^3}$

15  
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**Section 3.1 Properties of Matter**

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

chemical density mass properties physical substance

16  
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**Section 3.1 Properties of Matter**

In your textbook, read about physical states of matter.

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



17  
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**Section 3.1 Properties of Matter**

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   | Column B           |
| 7. Separates substances on the basis of the boiling points of the substances | a. filtration      |
| 8. Separates by formation of solid, pure particles from a solution           | b. distillation    |
| 9. Separates substances based on their movement through a special paper      | c. crystallization |
| 10. Separates solids from liquids by using a porous barrier                  | d. chromatography  |

18  
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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.



19  
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| 10. Separates solids from liquids by using a porous barrier                  | d. chromatography  |

20  
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**Section 3.3 Mixtures of Matter**

In your textbook, read about separating mixtures.

Use the words below to complete the concept map.



21  
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22  
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23  
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24  
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25  
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26  
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27  
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28  
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29  
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30  
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31  
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32  
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33  
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34  
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35  
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36  
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37  
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38  
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39  
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40  
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41  
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42  
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43  
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44  
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45  
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46  
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47  
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48  
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49  
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