

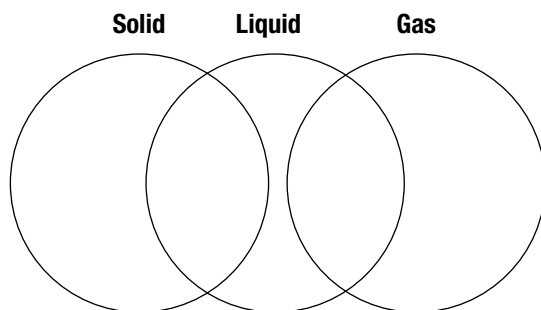
Chapter 3 States of Matter

Section 3.1 Solids, Liquids, and Gases
(pages 68–73)

This section explains how materials are classified as solids, liquids, or gases. It also describes the behavior of these three states of matter.

Reading Strategy (page 68)

Comparing and Contrasting As you read about the states of matter, replace each letter in the diagram below with one of these phrases: *definite volume, definite shape, variable volume, or variable shape*. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



Describing the States of Matter (pages 68–70)

1. What are three common states of matter?
 a. _____ b. _____ c. _____
2. Is the following sentence true or false? The fact that a copper wire can be bent shows that some solids do not have a definite shape.

3. Circle the letter of each phrase that describes how particles at the atomic level are arranged within most solids.
 a. randomly arranged b. packed close together
 c. arranged in a regular pattern d. spaced far apart
4. Is the following sentence true or false? A liquid takes the shape of its container. _____
5. What is the state of matter in which a material has neither a definite shape nor a definite volume? _____
6. Compare and contrast the arrangement of particles at the atomic level for a liquid and a solid. _____

7. What determines the shape and volume of a gas? _____

8. On the sun, where temperatures are extremely high, matter exists in a state known as _____.

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9. The state of matter that can exist at extremely _____ temperatures is called a Bose-Einstein condensate.

10. Complete the table about states of matter.

States of Matter		
State	Shape	Volume
	Definite	
Liquid		
		Not definite

Kinetic Theory (page 71)

11. Describe kinetic energy. _____

12. Circle the letter of the phrase that describes all particles of matter in the kinetic theory of matter.

- a. randomly arranged
- b. constant temperature
- c. in constant motion
- d. orderly arrangement

Explaining the Behavior of Gases (pages 72–73)

13. Is the following sentence true or false? There are forces of attraction among the particles in all matter. _____

14. Why can scientists ignore the forces of attraction among particles in a gas under ordinary conditions? _____

15. Is the following sentence true or false? Because of the constant motion of the particles in a gas, the gas has a definite shape and volume. _____

Explaining the Behavior of Liquids (page 73)

16. Do forces of attraction have a stronger effect on the behavior of the particles in a gas or in a liquid? _____

17. Circle the letter of each factor that affects the behavior of liquids.

- a. fixed location of particles
- b. constant motion of particles
- c. orderly arrangement of particles
- d. forces of attraction among particles

Explaining the Behavior of Solids (page 74)

18. Solids have a(n) _____ volume and shape because particles in a solid vibrate in _____ locations.

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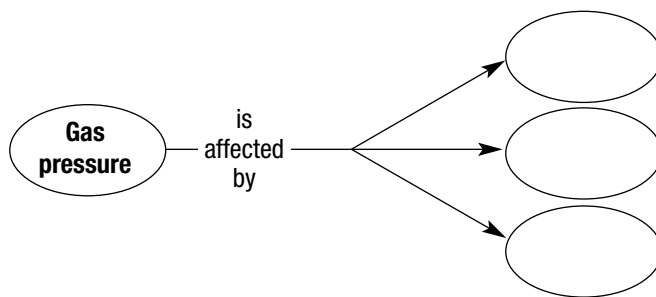
Section 3.2 The Gas Laws

(pages 75–81)

This section discusses gas pressure and the factors that affect it. It also explains the relationships between the temperature, volume, and pressure of a gas.

Reading Strategy (page 75)

Identifying Cause and Effect As you read, identify the variables that affect gas pressure, and write them in the diagram below. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



Pressure (pages 75–76)

1. What is pressure? _____
2. Circle the letter of each unit used to express amounts of pressure.

a. newton	b. joule
c. pascal	d. kilopascal
3. What causes the pressure in a closed container of gas? _____

Factors that Affect Gas Pressure (pages 76–77)

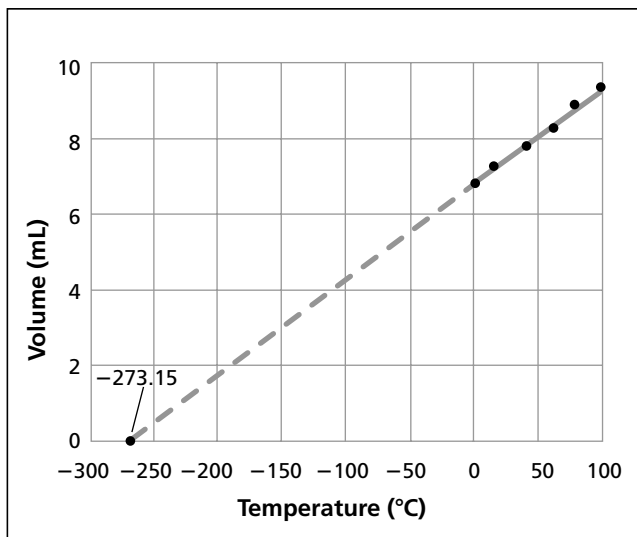
4. Name the factors that affect the pressure of an enclosed gas.

a. _____	b. _____	c. _____
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5. Is the following sentence true or false? In a closed container, increasing the temperature of a gas will decrease the force with which particles hit the walls of the container. _____
6. What effect does raising the temperature of a gas have on its pressure, if the volume of the gas and the number of its particles are kept constant? _____
7. How does reducing the volume of a gas affect its pressure if the temperature of the gas and the number of particles are constant?

8. Increasing the number of particles of a gas will _____ its pressure if the temperature and the volume are constant.

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Charles's Law (page 78)



9. Jacques Charles recorded the behavior of gases on a graph like the one above. The data shows that the volume of a gas increases at the same rate as the _____ of the gas.
10. A temperature equal to 0 K on the Kelvin temperature scale is known as _____.
11. What does Charles's law state? _____

Boyle's Law (page 79)

12. If the temperature and number of particles of gas in a cylinder do not change, and the volume of the cylinder is reduced by half, the pressure of the gas will be _____ as the original pressure.
13. Boyle's law states that there is an inverse relationship between the pressure and volume of a gas. Circle the letter of the correct expression of this relationship.
 - a. $P_1V_1 = P_2V_2$
 - b. $P_1V_2 = P_2V_1$
 - c. $\frac{P_1}{V_1} = \frac{P_2}{V_2}$
 - d. $P_1P_2 = V_1V_2$

The Combined Gas Law (pages 80-81)

14. Circle the letters of the factors that are included in the expression of the combined gas law.

a. temperature	b. number of particles
c. volume	d. pressure

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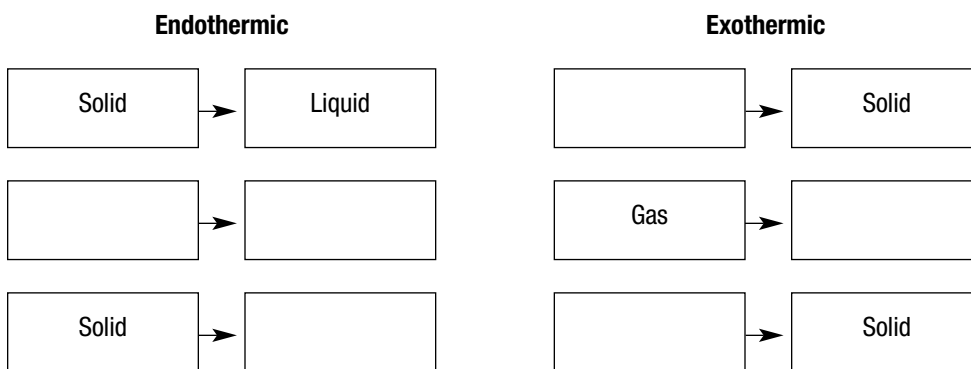
Section 3.3 Phase Changes

(pages 84–91)

This section explains what happens when a substance changes from one state of matter to another and describes six phase changes.

Reading Strategy (page 84)

Summarizing As you read, complete the description of energy flow during phase changes in the diagram below. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



Characteristics of Phase Changes (pages 84–86)

1. What is a phase change? _____

Match each term with the letter of the phase-change description that best describes it.

Term	Phase-Change
_____ 2. freezing	a. Solid to gas
_____ 3. sublimation	b. Liquid to gas
_____ 4. condensation	c. Gas to solid
_____ 5. melting	d. Liquid to solid
_____ 6. deposition	e. Gas to liquid
_____ 7. vaporization	f. Solid to liquid

8. What happens to the temperature of a substance during a phase change? _____

9. Is the following sentence true or false? The temperature at which a substance freezes is lower than the temperature at which it melts. _____

10. Circle the letter that describes the behavior of a substance during a phase change.

- | | |
|--|--------------------------------------|
| a. neither absorbs nor releases energy | b. always absorbs energy |
| c. always releases energy | d. either absorbs or releases energy |

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11. A substance absorbs energy from its surroundings during a(n) _____ change.
12. The energy absorbed by one gram of ice as it melts is known as the _____ for water.
13. As water freezes, it releases heat to its surroundings. Freezing is an example of a(n) _____ change.

Melting and Freezing (page 88)

14. Is the following sentence true or false? Water molecules have a more orderly arrangement in ice than in liquid water. _____
15. When liquid water freezes, the average kinetic energy of its molecules _____, and the arrangement of the molecules becomes more orderly.

Vaporization and Condensation (page 88–90)

16. Vaporization is the phase change in which a substance changes from a(n) _____ into a(n) _____.
17. The energy absorbed by one gram of water as it changes from its liquid phase into water vapor is known as the _____ for water.
18. Is the following sentence true or false? When water vapor collects above the liquid in a closed container, the pressure caused by the collisions of this vapor and the walls of the container is called vapor pressure. _____
19. The phase change in which a substance changes from a gas into a liquid is called _____.
20. Compare and contrast the processes of evaporation and boiling by completing the table below.

Evaporation and Boiling			
Process	Phase Change	Where It Occurs	Temperature
Evaporation			
Boiling			

21. Is the following sentence true or false? A gas absorbs energy as it changes into a liquid. _____

Sublimation and Deposition (page 91)

22. Dry ice can change directly from a solid to a gas without forming a liquid first. This process is an example of _____.
23. What is deposition? _____
