

Solids, Liquids, and Gases ▪ *Guided Reading and Study*

States of Matter

This section explains how shape, volume, and the motion of particles are useful in describing solids, liquids, and gases.

Use Target Reading Skills

A definition states the meaning of a word or phrase by telling about its most important feature or function. After you read the section, reread the paragraphs that contain definitions of Key Terms. Use all the information you have learned to write a definition of each Key Term in your own words.

solid _____

crystalline solid _____

amorphous solid _____

liquid _____

fluid _____

surface tension _____

viscosity _____

gas _____

Solids

1. Which state of matter has a definite volume and a definite shape?

2. Is the following sentence true or false? A solid will keep its volume and its shape in any position and in any container.



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States of Matter *(continued)*

3. Why do solids have a definite shape and a definite volume?

4. Complete the table about types of solids.

Solids			
Type of Solid	Description	Examples	Melting Temperature
a.	Made up of crystals	b.	Specific
c.	Particles not arranged in a regular pattern	d.	Not distinct

5. Circle the letter of each sentence that is true about particles in a solid.

- a. They are completely motionless.
- b. They stay in about the same position.
- c. They vibrate back and forth.
- d. They move around one another freely.

Liquids

6. Which state of matter has no definite shape but does have a definite volume? _____

7. Is the following sentence true or false? A liquid's volume does not change no matter what shape its container has.

8. A substance that flows is called a(n) _____.

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9. What causes surface tension?

10. Circle the letter of the term that means the resistance of a liquid to flowing.

- a. amorphous
- b. solid
- c. viscosity
- d. surface tension

11. Is the following sentence true or false? Liquids with high viscosity flow quickly. _____

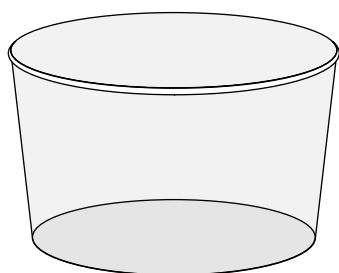
Gases

12. Which state of matter has neither definite shape nor volume?

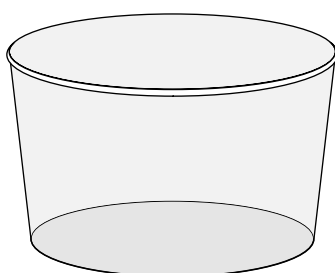
13. If you put a gas into a container with a top, what will the gas do?

14. Is the following sentence true or false? Like a liquid, a gas is a fluid.

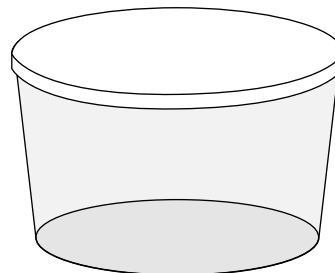
15. In the containers below, draw how the particles are arranged in the three states of matter.



Solid



Liquid



Gas

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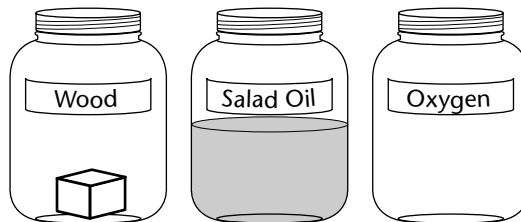
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States of Matter

Understanding Main Ideas

Use the diagram to answer Questions 1 through 3. Write your answers on a separate sheet of paper.

1. Identify the physical state of the substances pictured.
2. What would happen to the shape of each substance if the jars were broken? Use the differences in the physical state of the substances to explain your answer.
3. Would the volume of each substance change if each were moved into a larger container? Explain.



Building Vocabulary

Write a definition for each of the following terms in the spaces provided.

4. solid _____

5. liquid _____

6. gas _____

7. viscosity _____

8. amorphous solid _____

9. crystalline solid _____

10. fluid _____

11. surface tension _____

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Changes of State

This section explains what happens to substances during changes of state.

Use Target Reading Skills

As you read, complete the outline about changes in state. Use the red headings for the main ideas and the blue headings for supporting ideas.

Changes in State
I. Changes Between Solid and Liquid
A. Melting
B.
II. Changes Between Liquid and Gas
A.
B.
C.
D.
III.

Changes Between Solid and Liquid

1. The change in state from a solid to a liquid is called _____.
2. In most pure substances, melting occurs at a specific temperature called the _____.
3. The change of state from liquid to solid is called _____.
4. Is the following sentence true or false? At its freezing point, the particles of a solid are vibrating so fast that they break free from their fixed positions. _____

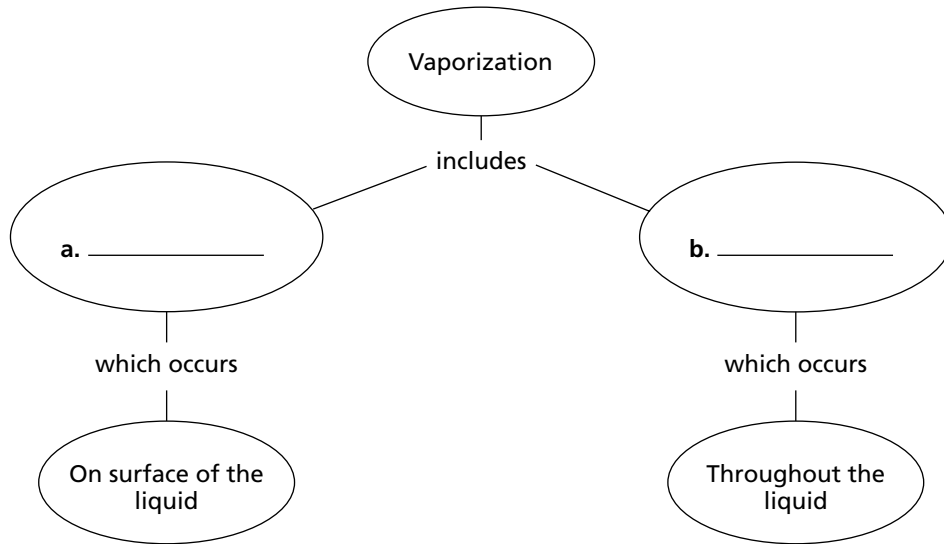
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Changes Between Liquid and Gas

5. The change from a liquid to a gas is called _____.

6. When does vaporization take place?

7. Complete the concept map.



8. Each liquid boils only at a certain temperature, which is called its _____.

9. Why is the boiling point of water lower in the mountains than it is at sea level?

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Changes of State *(continued)*

10. Is the following sentence true or false? Condensation is the opposite of vaporization. _____

11. When condensation occurs, does a gas lose or gain thermal energy?

Match the term with its example.

Term	Example
___ 12. vaporization	a. A pot of water on a stove reaches its boiling point.
___ 13. evaporation	b. Liquid water changes into water vapor.
___ 14. boiling	c. Clouds form from water vapor in the sky.
___ 15. condensation	d. A puddle dries up after a rain shower.

Changes Between Solid and Gas

16. During _____, particles of a solid do not pass through the liquid state as they form a gas.

17. Give an example of sublimation.

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Complete the table by writing whether there is an gain or loss of thermal energy for each change of state and whether the movement of particles increases or decreases.

Change of State	Thermal Energy	Movement of Particles
1. Melting		
2. Freezing		
3. Vaporization		
4. Condensation		
5. Melting		

Building Vocabulary

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

melting point melting sublimation
 boiling point freezing vaporization
 evaporation boiling condensation

6. The temperature at which a liquid boils is called its _____.
7. The change in state from gas to liquid is called _____.
8. The change in state from liquid to gas is called _____.
9. Gas bubbles forming throughout the liquid is called _____.
10. Liquid changing to gas only at the surface is called _____.
11. The change in state from solid to liquid is called _____.
12. The change in state from liquid to solid is called _____.
13. In most pure substances, melting occurs at a specific temperature, called the _____.
14. In _____, particles pass directly from solid to gas.

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Gas Behavior

This section explains how the volume, temperature, and pressure of a gas are related.

Use Target Reading Skills

Before your 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.

Gases

Question	Answer
What measurements are useful in studying gases?	Measurements useful in studying gases include . . .

Measuring Gases

1. List the three measurements that are helpful to know when working with a gas.

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Gas Behavior *(continued)*

2. The volume of a gas is the same as the volume of its _____.
3. What is temperature? _____

4. Is the following sentence true or false? The faster gas particles are moving, the greater their energy and the lower the temperature.

5. The force pushing on a surface divided by the area of that surface is called _____.
6. What is the formula used to calculate pressure?

7. Why does a ball leak air even when it has a tiny hole?

Pressure and Volume

8. What does Boyle’s law say about the relationship between the pressure and volume of a gas?

9. Complete the table about the relationship between the pressure and volume of a gas.

Pressure and Volume of a Gas	
Change	Increases or Decreases?
Pressure decreases	a. Volume
Pressure increases	b. Volume
Volume increases	c. Pressure
Volume decreases	d. Pressure

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Pressure and Temperature

10. Suppose a gas is kept in a closed, rigid container. If the temperature of the gas is increased, what happens to its pressure on the container?

11. If the temperature of that gas in the container is decreased, what happens to its pressure?

12. What can cause tires to burst on long trips in warm weather?

Volume and Temperature

13. What is the principle known as Charles's law?

14. If the temperature of a gas is decreased at constant pressure, what happens to its volume?

15. Why does a hot air balloon rise when the air inside it is heated?



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Complete the following compare and contrast table.

Law	When temperature of a gas ...	If you ...	Then you observe ...
Boyle's Law	stays constant	decrease volume	1.
Boyle's Law	stays constant	increase volume	2.
Charles's Law	increases	keep pressure constant	3.

Answer the following questions in the spaces provided.

4. A gas barbecue grill uses propane gas. The propane is stored in a rigid tank. What happens to the pressure of the propane when the tank is left outside on a very hot summer day? What about on a cold winter day?

5. What is the formula relating pressure, force, and area?

6. How does the speed of the particles of a gas change when the gas is heated?

Building Vocabulary

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

- | | |
|------------------------|--|
| _____ 7. temperature | a. explains the relationship between the pressure and volume of gas at a constant temperature |
| _____ 8. Charles's Law | b. explains the relationship between the temperature and volume of gas kept at a constant pressure |
| _____ 9. pressure | c. a measure of the average energy of motion of the particles of a substance |
| _____ 10. Boyle's Law | d. a measure of the force of the outward push caused by the movement of particles of a gas |