

States of Matter

Key Concepts

- How can you describe the motion of particles in a solid?
- How can you describe the motion of particles in a liquid?
- How can you describe the motion of particles in a gas?

Matter can be classified as solids, liquids, or gases. These three states of matter are defined mainly by the way they hold their volume and shape.

A **solid** has a definite volume and a definite shape. The particles that make up a solid are packed very closely together. Each particle is tightly fixed in one position. **The particles in a solid are closely locked in position and can only vibrate.** This fixed, closely packed arrangement of particles causes a solid to have a definite shape and volume.

In many solids, the particles form a regular, repeating pattern. These patterns create crystals. Solids that are made up of crystals are called **crystalline solids**. Table salt, table sugar, and snow are examples of crystalline solids. When a crystalline solid is heated, it melts at a specific temperature.

In other solids, called **amorphous solids**, the particles are not arranged in a regular pattern. Amorphous solids include plastics, rubber, and glass. Unlike a crystalline solid, an amorphous solid does not melt at a distinct temperature. Instead, when it is heated it may become softer and softer or change into other substances.

A **liquid** has a definite volume but no shape of its own. A liquid takes on the shape of its container. Without a container, a liquid can spread into a wide, shallow puddle. **Compared to particles in a solid, the particles in a liquid are more loosely connected and can collide with and move past one another.** Because its particles are free to move, a liquid has no definite shape. However, it does have a definite volume.

A liquid can flow from place to place. For this reason, a liquid is also called a **fluid**, meaning "a substance that flows."

One property of liquids, **surface tension**, is caused by the inward pull of the molecules making up a liquid. This pull brings the molecules on the surface closer together. This property explains why water forms droplets and supports the weight of certain insects on its surface.

Another property of water, **viscosity**, is a liquid's resistance to flowing. Viscosity depends on the size and shape of the particles of a liquid. It also depends on the attractions between particles. Liquids with high viscosity flow slowly. Liquids with low viscosity flow quickly.

Unlike solids and liquids, a **gas** can change volume very easily. **In gases, the atoms and molecules are free to move independently, colliding frequently.** As they move, gas particles spread apart, filling all the space available. Thus, a gas has neither definite shape nor definite volume.

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Solids (pp. 91–92)

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.

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.

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States of Matter *(continued)*

Liquids (pp. 93–94)

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) _____.

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. _____

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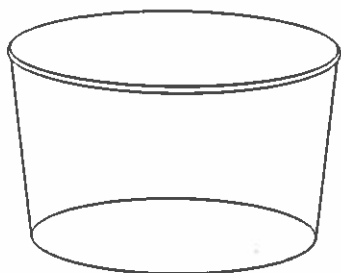
Gases (p. 95)

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

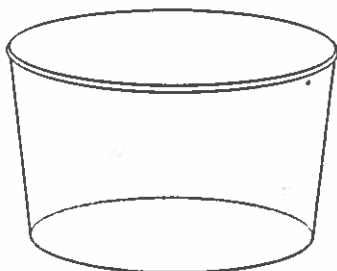
13. If you put a gas into a container with a top, what will the gas do?

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

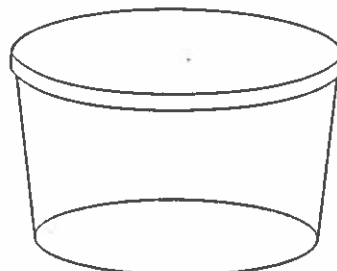
15. In the containers below, draw how the particles are arranged in the three states of matter.



Solid



Liquid



Gas