

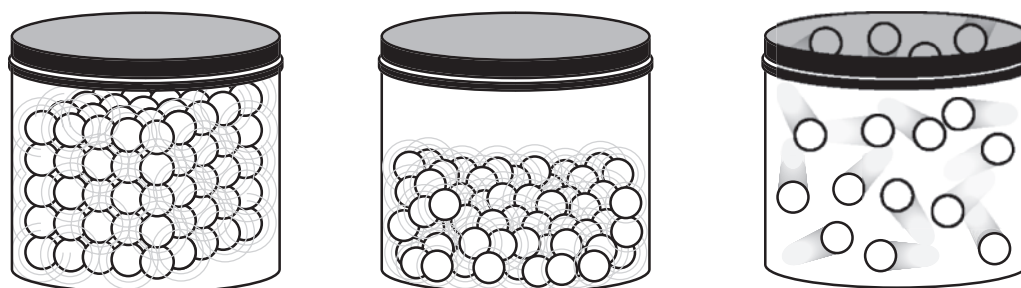
## Chapter 3 Structure of Matter

### Solids, Liquids, and Gases

3. e. *Students know* that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.

States of matter depend on molecular motion. However, forces of attraction among the particles of a substance resist molecular motion. The balance between the particles' motions and attractive forces determines the state of matter.

In a solid, the particles are closely locked in position. The particles have little freedom to move. Particles in a solid have only enough energy to vibrate, or move back and forth slightly. As a result, solids have a definite shape and a definite volume.



Particles in a solid

Particles in a liquid

Particles in a gas

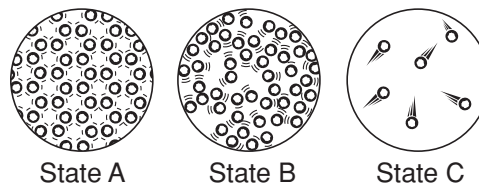
**Figure 3-8 Particles in a solid, a liquid, and a gas** Particles in a solid are locked in position. Particles in a liquid move more freely. Particles in a gas are free to move independently.

The particles in a liquid are more loosely connected than particles in a solid. In a liquid, the particles move more freely; they are packed close together, but they can collide with and move past one another. As a result, a liquid flows and has no definite shape.

A liquid is an example of a **fluid**, which is a substance that flows. Another example of a fluid is a gas. Particles in a gas are free to move independently, and they collide frequently with one another. The distance between particles in a gas is much greater than the distance between particles in a solid or liquid. A gas has neither a definite shape nor a definite volume. If you put a gas in a closed container, the gas particles will either spread apart or be squeezed together as they fill that container.

**Chapter 3 Structure of Matter****Standard 3. e. Check**

- 18** In a liquid, the particles
- A have no freedom to move.
  - B collide with and move past one another.
  - C are free to move independently.
  - D only have enough energy to vibrate.
- 19** The distance between particles in a gas is
- A much greater than the distance between particles in a liquid.
  - B about the same as the distance between particles in a solid.
  - C much less than the distance between particles in a liquid.
  - D much less than the distance between particles in a solid.
- 20** In which state of matter do atoms and molecules have the *most* freedom of motion?
- A solid
  - B liquid
  - C gas
  - D non-fluid

**21**

The diagrams represent matter in three different states. The particles in State A

- A collide frequently with one another.
- B can slide past one another.
- C vibrate in their fixed positions.
- D flow freely.