

# Shape up!

## How does particle motion affect the properties of solids, liquids, and gases?

Imagine what you would see if you put a few ice cubes into a pan on a hot stove. The hard blocks of ice would melt to form liquid water. If the pan is hot enough, the water would boil, giving off steam. Ice, liquid water, and the gaseous water in steam are all made up of the same water molecules. Yet ice looks and behaves differently than water or steam does. The kinetic theory of matter helps to explain the different properties of solids, liquids, and gases.

**Active Reading 8 Identify** Underline words or phrases that describe the properties of solids, liquids, and gases.

### Solids Have a Definite Volume and Shape

The fishbowl at the right contains a small toy castle. When the castle was added to the glass container, the castle kept its original size and shape. The castle, like all solid substances, has a definite shape and volume. The container does not change these properties of the toy. The particles in a solid are in fixed positions and are close together. Although the particles vibrate, they cannot move from one part of the solid to another part. As a result, a solid cannot easily change in shape or volume. If you force the particles apart, you can change the shape of a solid by breaking it into pieces. However, each of those pieces will still be a solid and have its own definite shape.

#### Think Outside the Book Inquiry

**9 Model** Think about the general shape and behavior of particles in solids, liquids, and gases within a container. What objects could be used as a model of particles? How could you model a container for your particles? Gather the materials and make your model. How does your model of solid, liquid, and gas particles compare to the real particles?

### Liquids Have a Definite Volume but Can Change Shape

Unlike the solid toy castle, the water in this fishbowl does not have a definite shape. The water has taken the shape of the round fishbowl. If you poured this same water into a rectangular fish tank, the water would take the shape of that container. However, the water would have the same volume as it did before. It would still take up the same amount of space. Like water, all liquids have a definite volume but no definite shape. The particles in a liquid are close together, but they are not tightly attached to one another as the particles in a solid are. Instead, particles in liquids can slide past one another. As a result, liquids can flow. Instead of having a rigid form, the particles in a liquid move and fill the bottom of the container they are in.

### Gases Can Change in Volume and Shape

The small bubbles in this fishbowl are filled with gas. Gases do not have a definite volume or shape. The particles in a gas are very far apart compared to the particles in a solid or a liquid. The amount of space between the particles in a gas can change more easily. If a rigid container has a certain amount of air inside and more air is pumped in, the volume of the gas does not change. The gas will still fill the entire container. Instead, the particles will become closer together. If the container is opened, the particles will spread out and mix with the air in the atmosphere.



#### Visualize It!

**10 Apply** Identify substances A, B, and C as a solid, a liquid, or a gas by placing a letter in each of the small circles below. In the larger circles, draw models of the particles of each substance.

**Solid**

**Liquid**

**Gas**