

## Category IV Physical Science Examples

### Representing ideas effectively

#### Material D

In attempting to represent the changes in motion and arrangement of particles that occur as a solid changes to a gas, the material uses different colors to represent particles of a solid, liquid, and gas (p. 105s). By using different colors, the material could lead students to think that solids, liquids, and gases are made of different kinds of molecules (rather than the same kinds of molecules that differ in their motion and arrangement).

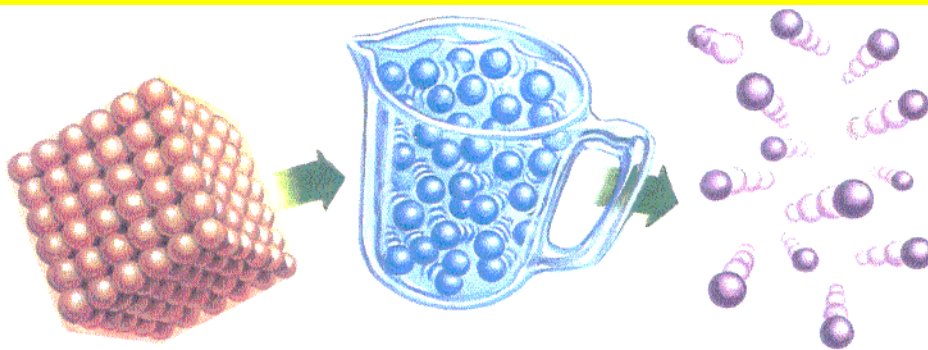
## 1. Invisible Aerobics

Make a table like the one shown here. The first column lists some words that describe the ways particles may move. Which state of matter—solid, liquid, or gas—is most likely to exhibit each kind of movement? Suggest an everyday event that is similar to the way particles move. One has been done for you.

Word	State of matter	Your analogy
Wriggling	Solid	Like students wriggling while sitting in their seats
Vibrating	?	?
Tumbling	?	?
Bouncing	?	?
Flying	?	?
Shaking	?	?
Whirling	?	?
Sliding	?	?

## 2. Changes in Behavior

The following pictures illustrate the behavior of particles in solids, liquids, and gases. Write a sentence or two that would explain to a fifth-grader what is happening in each picture.



105

### FOLLOW-UP

#### Reteaching

Ask students to write a story from the point of view of a particle in the solid phase as it melts and then evaporates.

#### Assessment

Have students draw illustrations or cartoons to show the behavior of particles in a solid, liquid, and gas. Then have them draw what happens when the particles change state.

#### Extension

Inform students that *plasmas* make up a fourth state of matter. Suggest that they do some research on this subject.

#### Closure

Have students develop three quiz questions (with answers) based on the lesson. You may wish to collect and redistribute the questions or have students trade them.



## Answers to Challenge Your Thinking

1. Students may have different interpretations of the motion associated with each movement. Accept all reasonable

responses. Encourage students to think about the range of motion of the individual particles in each state of matter. For instance, particles in a gas are far apart, move very quickly, and move throughout the atmosphere. *Flying* particles, therefore, are likely to be gas particles. Students may disagree about which state of matter is most appropriate for each movement. For instance, some students could defensibly argue that tumbling refers to molecules in a liquid state rather than a gaseous one. In any case, student analogies should emphasize the motion of the particles in the state of matter that they have chosen.

2. Sample answer: In a solid, the particles can jiggle around, but they are locked in place like soldiers standing in a row.

In a liquid, the particles are able to move about within the boundaries of the liquid in the container and take the shape of the container.

In a gas, the particles are able to go anywhere, like a swarm of bees in the air.

### Did You Know...

Radial tires on automobiles may be considered full of air even when they look slightly underinflated. This is because tires heat up as they roll along the ground. Heat is transferred to the air in the tires. The air molecules in each tire thus move faster, and the pressure they exert on the inside walls of the tire increases.

- ★ You may wish to provide students with the Chapter 5 Review Worksheet (Teaching Resources, page 26). Transparency 15 is also available to accompany this Challenge Your Thinking.