Category II Summaries for Physical Science Examples

Addressing commonly held ideas

Material A

A suggested response to a *Science Log* question mentions that "some students may have the mistaken notion that there must be something in between the particles, probably more particles. Point out that this is incorrect" (p. **106t**). This is the only instance in which a specific misconception is explicitly addressed, although just telling students that their idea is incorrect is not likely to help most of them. None of the many commonly held ideas that relate to the kinetic molecular theory is explicitly addressed, nor are there any activities that would help students with their difficulties. Although the material provides teachers with some help in identifying their own students' ideas, it does not provide specific guidance on how to make use of the information.

Answers to *Challenge Your Thinking, continued*

3. Sample answers:
- The particles in a solid do not move much.
- The particles in a liquid slide over one another, allowing the liquid to flow and take the shape of its container.
- The particles in a gas spread out, or diffuse, until they fill the space they occupy and exert pressure on the walls of the container.

Students' own defintions will vary but should demonstrate that they understand the types of movement that occur in solids, liquids, and gases.

4. a. Real air molecules bounce off each other and hit the sides of the balloon, creating pressure.

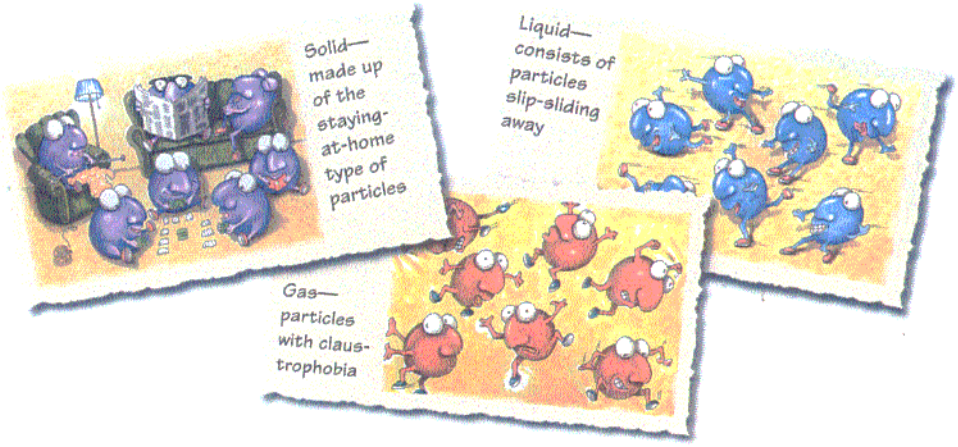
b. Shaking the balloon is like heating the air beause it causes the beads to move faster and farther apart and to strike the sides of the balloon.

c. Doubling the number of beads in the balloon is like doubling the number of air molecules because it increases the number of collisions between the air particles and the sides of the balloon.

d. This is like cooling the air in that an orderly pattern indicates that the molecules are no longer a gas. Instead they have condensed to form a liquid or have solidified.

3. What's the Matter?

Here are some students' descriptions of solids, liquids, and gases. To which particular characteristic of the particles is each student referring?



Now it's your turn to create an unusual definition of each state of matter. Share it with a friend, and see whether he or she can discover which term you are describing.

4. Air Apparent

In Chapter 4, Ramón used plastic beads in a balloon to simulate particles of air. Explain how each of Ramón's observations (listed below) describes the behavior of air and therefore supports the particle model of matter.

a. "When the balloon was shaken gently, the plastic beads rattled around. I could feel and see them hitting the sides of the balloon."

b. "Shaking the balloon harder caused more frequent and harder collisions."

c. "When I doubled the number of plastic beads in the balloon, the number of collisions with the sides of the balloon increased."

d. "When I stopped shaking the balloon, the plastic beads formed an orderly pattern in the bottom of the balloon."

ScienceLog

Review your responses to the ScienceLog questions on page 87. Then revise your original ideas so that they reflect what you've learned.

ScienceLog

The following are sample revised answers:

1. There is nothing in between the particles of matter except vacuum. A vacuum has nothing in it at all. (Some students may have the mistaken notion that there must be something in between the particles, probably more particles. Point out that this is incorrect.)

2. The scientific particle theory of matter is based on observation and inference. Over the course of hundreds of years, scientists have performed countless experiments investigating matter, yielding a large number of observations about its structure. Drawing inferences from these observations, scientists have come to the conclusion that all matter is composed of particles.

3. The liquid water is converted into water vapor, which diffuses into the air. Evidence to suggest that the evaporated water particles have not simply vanished but are actually in the air includes the condensation of water in clouds and on cool objects.