Changes Between Solid and Gas

If you live where the winters are cold, you may have noticed that snow seems to disappear even when the temperature stays well below freezing. This change is the result of sublimation. **Sublimation** occurs when the surface particles of a solid gain enough energy that they form a gas. **During sublimation, particles of a solid do not pass through the liquid state as they form a gas.**

One example of sublimation occurs with dry ice. Dry ice is the common name for solid carbon dioxide. At ordinary atmospheric pressures, carbon dioxide cannot exist as a liquid. So instead of melting, solid carbon dioxide changes directly into a gas. As it changes state, the carbon dioxide absorbs thermal energy. This property helps keep materials near dry ice cold and dry. For this reason, using dry ice is a way to keep temperature low when a refrigerator is not available. When dry ice becomes a gas, it cools water vapor in the nearby air. The water vapor then condenses into a liquid, forming fog around the dry ice.

Reading Checkpoint **What physical state is skipped during the sublimation of a substance?**

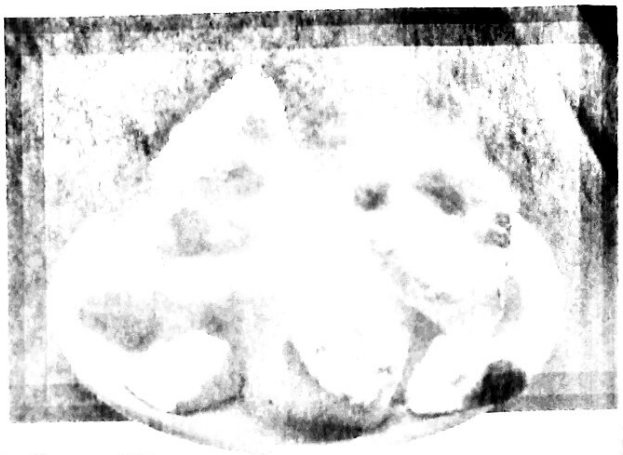

FIGURE 13
Dry Ice
When solid carbon dioxide, called "dry ice," sublimates, it changes directly into a gas. Predicting *If you allowed the dry ice to stand at room temperature for several hours, what would be left in the glass dish? Explain.*

Section Assessment

Target Reading Skill Outlining Use the information in your outline about changes of state to help you answer the questions below.

Reviewing Key Concepts

1. **a.** Reviewing What happens to the particles of a solid as it becomes a liquid?
   b. Applying Concepts How does the thermal energy of solid water change as it melts?
   c. Making Judgments You are stranded in a blizzard. You need water to drink, and you're trying to stay warm. Should you melt snow and then drink it, or just eat snow? Explain.
2. **a.** Describing What is vaporization?
   b. Comparing and Contrasting Name the two types of vaporization. Tell how they are similar and how they differ.
   c. Relating Cause and Effect Why does the evaporation of sweat cool your body on a warm day?
3. **a.** Identifying What process occurs as pieces of dry ice gradually get smaller?
   b. Interpreting Photos What is the fog you see in the air around the dry ice in Figure 13? Why does the fog form?

Writing in Science

Using Analogies Write a short essay in which you create an analogy to describe particle motion. Compare the movements and positions of people dancing with the motions of water molecules in liquid water and in water vapor.