Name _____

15.3 Changing Matter Using Energy

Matter and Heat Energy

All changes in matter need some kind of energy. Heat energy can change matter. It causes the molecules in a substance to move faster and farther apart. When enough heat is added, many solids will change to liquids. This is the process of melting. Ice is the solid form of water. When you add enough heat to ice, it melts.

When you add more heat to a liquid, the molecules move even faster. They also move farther apart. With enough heat, molecules will begin to break away from the substance. The substance then changes into a gas. This is the process of evaporation.

Remember
The process of a liquid changing to a gas is called evaporation. Condensation is the process of a gas changing to a liquid.

Heat energy can be taken away from matter. When enough heat is taken away from a gas, the gas turns into a liquid. This is the process of condensation. If you take enough heat away from a liquid, it becomes a solid. This is the process of freezing.

You have probably noticed a light mist of water on the grass in the morning. This is called *dew*. Dew is caused by condensation. At night, the air cools. This cooling causes water vapor in the air to change into liquid water. As the sun warms the ground, the dew will evaporate.

What causes matter to change its state?

Two Ways to Change Matter

Physical Change

A physical change affects only the state, shape, or volume of matter. If you drop a plate and break it, for example, the shape has changed. However, it is still a plate. No chemical change has occurred.

Crushing, tearing, and grinding are all examples of physical changes. Freezing, melting, boiling, and condensation are also physical changes. Ice has the same chemical makeup as water. It just has less heat energy in it.

Chemical Change

In a chemical change, a substance that has new properties is produced. Compounds are always the result of a chemical change. For example, a kind of acid is formed when milk sours. A change in odor tells you a chemical change has taken place.

Another example of a chemical change is burning wood. The wood and oxygen from the air combine to turn the wood into ashes. Several new gases are also released into the air.

Sometimes you know that a chemical change has taken place by the way something looks. When iron rusts, you can tell a new substance has formed by looking at it. But not all chemical changes are easily seen.

One sign that a chemical change has happened is that energy is released, as when a match burns. Or energy might be absorbed, as when a cake bakes. Another sign is the release of a gas, such as the exhaust fumes from a car.

What are the two main kinds of changes matter can undergo?

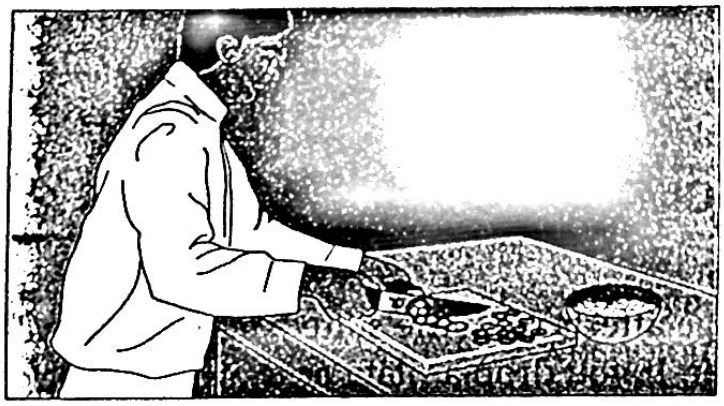

Figure 15-3 *Chopping vegetables causes a physical change.*

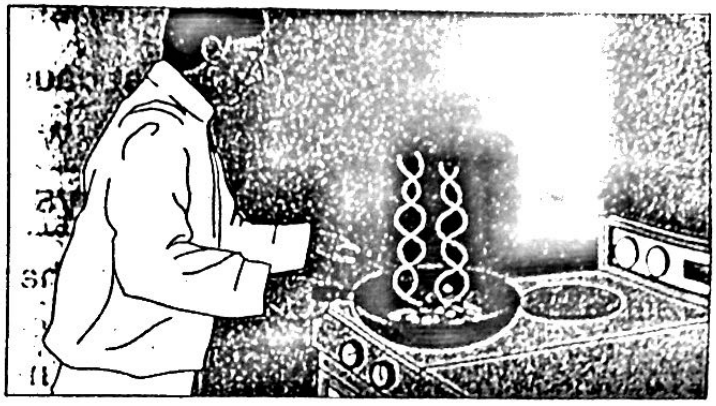

Figure 15-4 *Cooking vegetables causes a chemical change.*