Physical changes need not involve a change of state. Pulverizing an aspirin tablet into a powder and cutting a piece of adhesive tape into small pieces are physical changes that involve only the solid state.

Solution

a. *Physical.* The table leg is still wood. No new substances have been formed.
b. *Chemical.* A new substance, hydrogen, is produced.
c. *Physical.* The piece of iron is still a piece of iron.
d. *Chemical.* New gaseous substances, as well as heat and light, are produced as the match burns.

Practice Exercise 1.2

Complete each of the following statements about changes in matter by placing the word *physical* or *chemical* in the blank.

a. The destruction of a newspaper through burning involves a _____ change.
b. The grating of a piece of cheese is a _____ change.
c. The heating of a blue powdered material to produce a white glassy substance and a gas is a _____ change.
d. The crushing of ice cubes to make ice chips is a _____ change.

Answers: **a.** chemical; **b.** physical; **c.** chemical; **d.** physical

Chemists study the nature of changes in matter to learn how to bring about favorable changes and prevent undesirable ones. The control of chemical change has been a major factor in attainment of the modern standard of living now enjoyed by most people in the developed world. The many plastics, synthetic fibers, and prescription drugs now in common use are derived via controlled chemical change.

The Chemistry at a Glance feature below reviews the ways in which the terms *physical* and *chemical* are used to describe the properties of substances and the changes

CHEMISTRY AT A GLANCE

Use of the Terms *Physical* and *Chemical*

PHYSICAL

This term conveys the idea that the composition (chemical identity) of a substance DOES NOT CHANGE.

Physical Properties

Properties observable without changing composition

- Color and shape
- Solid, liquid, or gas
- Boiling point, melting point

Physical Changes

Changes observable without changing composition

- Change in physical state (melting, boiling, freezing, etc.)
- Change in state of subdivision with no change in physical state (pulverizing a solid)

CHEMICAL

This term conveys the idea that the composition (chemical identity) of a substance DOES CHANGE.

Chemical Properties

Properties that describe how a substance changes (or resists change) to form a new substance

- Flammability (or non-flammability)
- Decomposition at a high temperature (or lack of decomposition)
- Reaction with chlorine (or lack of reaction with chlorine)

Chemical Changes

Changes in which one or more new substances are formed

- Decomposition
- Reaction with another substance