

A **compound** is a substance that can be broken down into simple stable substances. Each compound is made from the atoms of two or more elements that are chemically bonded. Water is an example of a compound. It is made of two elements, hydrogen and oxygen. The atoms of hydrogen and oxygen are chemically bonded to form a water molecule. You will learn more about the particles that make up compounds when you study chemical bonding in Chapter 6. For now, you can think of a *molecule* as the smallest unit of an element or compound that retains all of the properties of that element or compound.

Properties and Changes in Matter

Every substance, whether it is an element or a compound, has characteristic properties. Chemists use properties to distinguish between substances and to separate them. Most chemical investigations are related to or depend on the properties of substances.

A property may be a characteristic that defines an entire set of substances. That property can be used to classify an unknown substance as a member of that group. For example, many elements are classified as metals. The distinguishing property of metals is that they conduct electricity well. Therefore, if an unknown element is tested and found to conduct electricity well, it is a metal.

Properties can help reveal the identity of an unknown substance. However, conclusive identification usually cannot be made based on only one property. Comparisons of several properties can be used together to establish the identity of an unknown. Properties are either intensive or extensive. **Extensive properties** depend on the amount of matter that is present. Such properties include volume, mass, and the amount of energy in a substance. In contrast, **intensive properties** do not depend on the amount of matter present. Such properties include the melting point, boiling point, density, and ability to conduct electricity and to transfer energy as heat. Intensive properties are the same for a given substance regardless of how much of the substance is present. Properties can also be grouped into two general types: physical properties and chemical properties.

Physical Properties and Physical Changes

A **physical property** is a characteristic that can be observed or measured without changing the identity of the substance. Physical properties describe the substance itself, rather than describing how it can change into other substances. Examples of physical properties are melting point and boiling point. Those points are, respectively, the temperature at which a substance melts from solid to liquid and the temperature at which it boils from liquid to gas. For example, water melts from ice to liquid at 0°C (273 K or 32°F). Liquid water boils to vapor at 100°C (373 K or 212°F).

A change in a substance that does not involve a change in the identity of the substance is called a **physical change**. Examples of physical



FIGURE 4 Water boils at 100°C no matter how much water is in the container. Boiling point is an intensive property.