

Pure Substances and Mixtures

6.1

As you have already learned, all matter is made up of particles. There are many different kinds of particles. Different substances have different properties because they contain different kinds of particles.

Pure Substances

A substance that contains only one kind of particle is called a **pure substance**. There are millions of pure substances, but only a few can be found in nature. For example, water is a pure substance, but pure water is difficult to find in nature. Even the clearest spring water contains dissolved minerals. In nature, pure substances tend to mix with other substances. Diamonds are one of the few exceptions (**Figure 1**). They are formed deep within Earth, in only a very few areas.



Figure 1

A diamond is an example of a pure substance. All the particles in a diamond are the same.

Most of the pure substances that you encounter in your daily life have been made pure by people through refining. Aluminum foil is a pure substance, and so is table sugar (**Figure 2**).



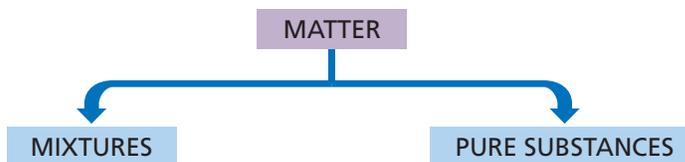
Figure 2

Aluminum foil and sugar are pure substances.



▶ LEARNING TIP

Before you read this chapter, begin a graphic organizer that shows how different types of matter can be classified. The first level in your organizer will look like the diagram to the right. As you work through this chapter, add more levels to your organizer.



All samples of a pure substance have the same properties, no matter what size the samples are or where in the world the samples are found. For instance, all samples of pure gold have the same melting and boiling points and the same density. Because every sample of a pure substance has the same properties, scientists have made reference lists of pure substances and their properties. These reference lists can help you to identify an unknown substance based on its properties.

Mixtures

Almost all the natural substances and manufactured products in the world are mixtures of pure substances. A **mixture** contains two or more pure substances, as shown in **Figure 3**.

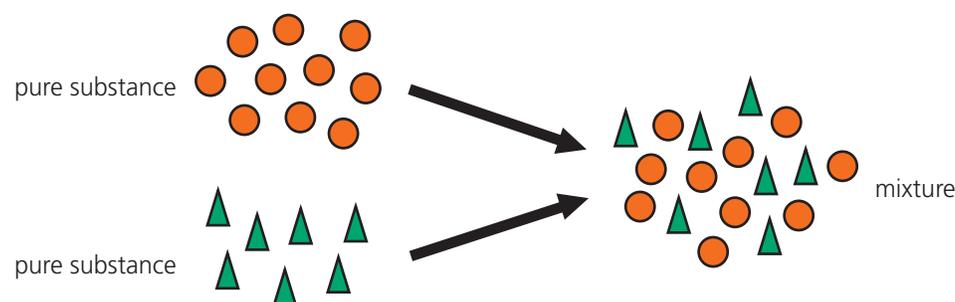


Figure 3

Most substances that you encounter are mixtures. Mixtures contain at least two pure substances.

Mixtures can be any combination of solids, liquids, and gases. For example, soft drinks are mixtures made from liquid water, solid sugar, and carbon dioxide gas (**Figure 4**).



Figure 4

Soft drinks may look like pure substances, but they are mixtures.

Breads are mixtures of yeast, flour, sugar, water, air, and other chemicals (Figure 5). The properties of mixtures may be different in different samples because there may be more or less of the different kinds of particles. For example, breads do not always have the same number of yeast or sugar particles in them.



Figure 5

Bread is a mixture of different substances.

TRY THIS: TEST INK

Skills Focus: observing, interpreting data

1. Cut a “tongue” in a piece of filter paper.
2. About 1 cm from the end of the tongue, draw a large dot with a black water-soluble marker.
3. Put the filter paper on top of a 250-mL beaker, with the tongue bent down into the beaker.
4. Carefully add water until it touches the filter paper tongue but does not touch the dot. Observe what happens as the water soaks into the filter paper. Is ink a pure substance or a mixture?



▶ CHECK YOUR UNDERSTANDING

1. Explain the difference between a pure substance and a mixture, using examples of each.
2. Explain the difference between a pure substance and a mixture, using the particle model.
3. Give three examples of pure substances and three examples of mixtures.