

Pure Substances

In contrast to a mixture, a pure substance is homogenous as a single entity. A **pure substance** has a fixed composition and differs from a mixture in the following ways:

1. *Every sample of a given pure substance has exactly the same characteristic properties.* All samples of a pure substance have the same characteristic physical and chemical properties. These properties are so specific that they can be used to identify the substance. In contrast, the properties of a mixture depend on the relative amounts of the mixture's components.
2. *Every sample of a given pure substance has exactly the same composition.* Unlike mixtures, all samples of a pure substance have the same makeup. For example, pure water is always 11.2% hydrogen and 88.8% oxygen by mass.

Pure substances are either compounds or elements. A compound can be decomposed, or broken down, into two or more simpler compounds or elements by a chemical change. Water is a compound made of hydrogen and oxygen chemically bonded to form a single substance. Water can be broken down into hydrogen and oxygen through a chemical reaction called electrolysis, as shown in Figure 1-10(a).

Sucrose is made of carbon, hydrogen, and oxygen. Sucrose breaks down to form the other substances shown in Figure 1-10(b). Under intense heating, sucrose breaks down to produce carbon and water.

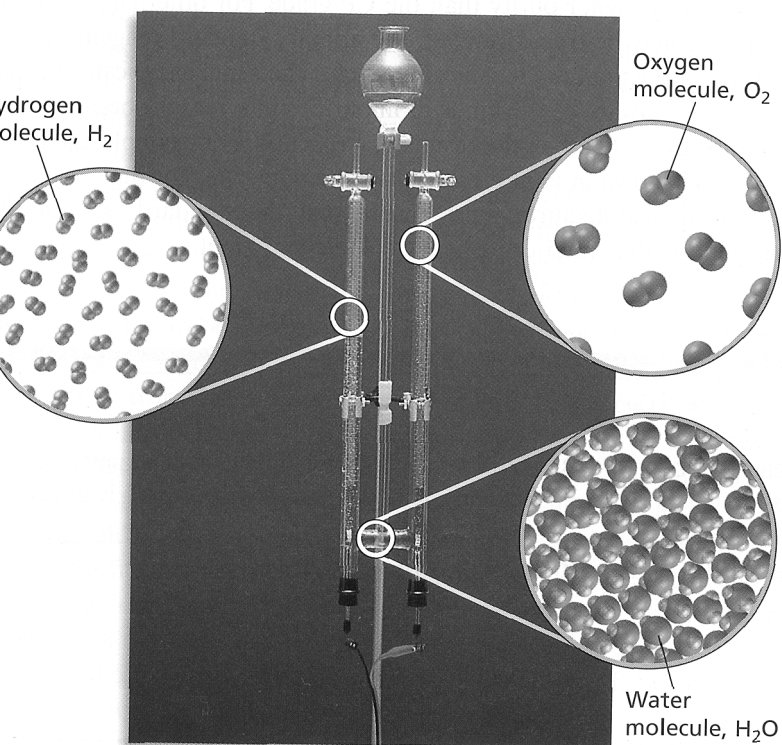
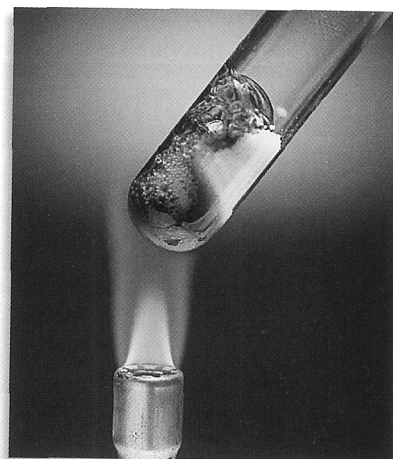


FIGURE 1-10 (a) Passing an electric current through water causes the compound to break down into the elements hydrogen and oxygen, which differ in composition from water. (b) When sucrose is heated, it caramelizes. When it is heated to a high temperature, it breaks down completely into carbon and water.



(b)