

## Words to Know

<b>density</b>	the measure of how much mass something has for its size
<b>solid</b>	matter that has a definite shape and volume
<b>liquid</b>	matter that has a definite volume but no definite shape
<b>gas</b>	matter that has no definite shape or volume
<b>compound</b>	a substance that is formed when the atoms of two or more elements join together chemically
<b>mixture</b>	a substance made of two or more elements or compounds that are mixed together but not chemically joined
<b>solution</b>	a kind of mixture in which one substance dissolves, or seems to disappear, into another substance

## Telling Things Apart

The properties of a substance make it possible to tell it apart from another substance. A few properties of matter are color, shape, odor, and hardness. You could describe an element such as mercury as silver-colored and a liquid. It also does not have a strong smell.

Another property of a substance is its mass. Mass is the amount of matter in something. For example, a volleyball is about the same size as a bowling ball. However, there is much more matter in a bowling ball than in a volleyball. It has a greater mass.

Another property of matter is **density**. Density is the measure of how much mass something has for its size. Scientists define density as the *measure of mass per unit volume*. The meaning of *per unit volume* is "for any given space." So, density is the amount of mass in a given space.



### Science Fact

Iron pyrite is often called "fool's gold." It has many of the same properties as gold. However, a few drops of acid will dissolve iron pyrite and give off a bad smell. Real gold will not change under "the acid test."

Think of a loaf of bread. Imagine balling it up and squeezing it together as tightly as possible. The balled-up bread would take up less space than the original loaf. It would have a smaller volume than it did before you balled it up. The amount of bread would be the same. The mass per volume, or density, however, would be greater.

Now think of a cork in water. The cork is less dense than water. This causes the cork to float. Lead, however, is denser than water. It sinks to the bottom.

✓ How are mass and density related?

### The Three States of Matter

Matter has three different states, or ways of existing. These states are solid, liquid, and gas. A **solid** is matter that has a definite shape and volume. A **liquid** is matter that has a definite volume but no definite shape. A **gas** is matter that has no definite shape or volume.

Matter can change between the different states. For example, water is usually in liquid form. If you freeze water, it becomes a solid, as ice. When a solid melts, it turns back into a liquid. When you heat water, it turns to a colorless gas called water vapor and then disappears. This is called *evaporation*. A gas changes back to liquid during *condensation*. When a cold window fogs up, the fog is water vapor that has turned back into a liquid.

Like solids, liquids have a definite volume. However, they do not have a definite shape. Think of a glass of water. If you poured that water into a bowl, the volume of water would still be the same. It would take up the same amount of space. The shape of the water would change, though. It would take on the shape of the bowl. Now think about moving a solid, such as a peach, from a glass to a bowl. The peach would not change shape or volume.

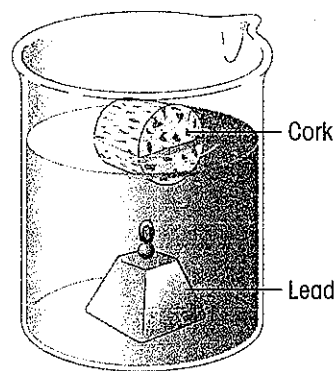


Figure 14-3  
Cork floats in water while lead sinks.

Gas is also matter. That is, it takes up space. However, it does not have a definite shape or a definite volume. A gas will spread out over a container of any size or any shape.

Think of a small bathroom after a hot shower. The water vapor fills the whole bathroom. Suppose you took a shower in a much bigger bathroom. The same amount of water vapor would spread out in the bigger room. Air, hydrogen, helium, oxygen, and carbon dioxide are all gases.

The molecules in all substances are constantly moving. However, the molecules in solids are packed very tightly together. They move very little. The molecules in liquids have more room. They move around more freely. The molecules in gases have even more room to move.

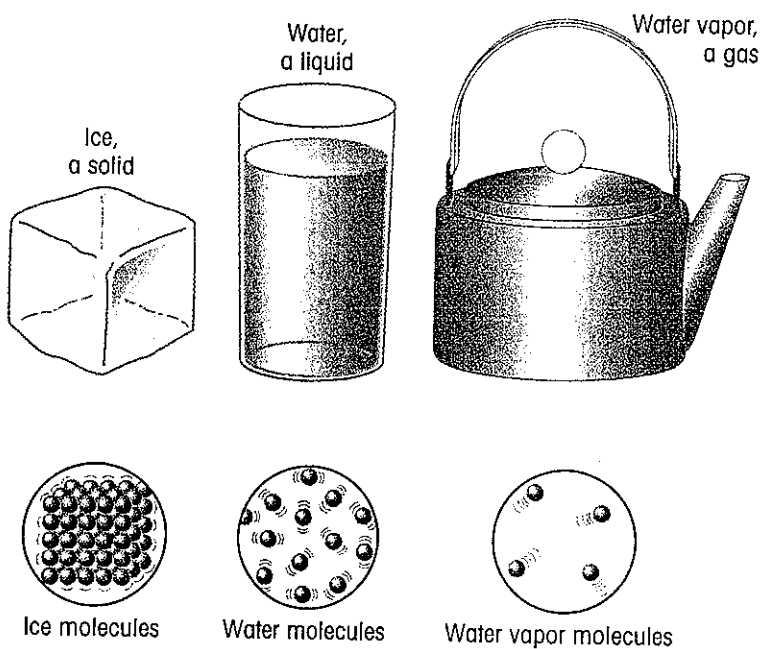


Figure 14-4 *The three states of matter are solid, liquid, and gas.*

✓ **What are the three states of matter?**