

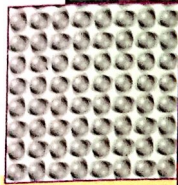
Particles in Motion

How do particles move in solids, liquids, and gases?

All matter is made of atoms or groups of atoms that are in constant motion. This idea is the basis for the *kinetic theory of matter*. How much the particles move and how often they bump into each other determine the state of matter of the substance. This view of a movie theater helps to illustrate the differences between the particle motion in each of the three common states of matter.

In Solids, Particles Vibrate in Place

A **solid** substance has a definite volume and shape. The particles in a solid are close together and do not move freely. The particles vibrate but are fixed in place. Often, the particles in a solid are packed together to form a regular pattern like the one shown at the right.



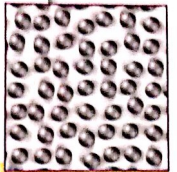
Particles in a solid

For most substances, the particles in a solid are closer together than the particles in a liquid. For example, the atoms in solid steel are closer together than the atoms in liquid steel. Water is an important exception to this rule. The molecules that make up ice actually have more space between them than the molecules in liquid water do.

5 Describe How are particles in a solid like people sitting in a movie theater?

In Liquids, Particles Slide Past One Another

A **liquid** substance has a definite volume but not a definite shape. Particles in a liquid, shown at the right, have more kinetic energy than particles in a solid do. The particles are attracted to one another and are close together. However, particles in a liquid are not fixed in place and can move from one place to another.



Particles in a liquid

6 Describe How are particles in a liquid like people in a movie theater lobby?

In Gases, Particles Move Freely

A **gas** does not have a definite volume or shape. A substance in the gaseous state has particles with the most kinetic energy of the three states. As you can see in the model at the right, gas particles are not as close to one another and can move easily in any direction. There is much more space between gas particles than there is between particles in a liquid or a solid. The space between gas particles can increase or decrease with changes in temperature or pressure.



Particles in a gas

7 Describe How are particles in a gas like people outside of a movie theater?
