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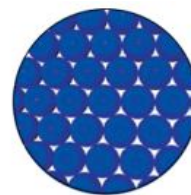
Science
Student # _____

Matter on the Move

Every substance in the universe is made up of matter that can exist in a number of different forms called **states**. Almost all matter on Earth exists in three different states: **solid, liquid and gas**. These states of matter have very different **properties**, or ways they behave and appear. Scientists use a model to explain these different properties called the **particle model**. According to the particle model:

- **All substances are made up of tiny particles.**
- **The particles are attracted towards other surrounding particles.**
- **The particles are always moving.**
- **The hotter the substance is the faster the particles move.**

Solids -In solids the particles are very close together, so they cannot be squeezed. The attraction between nearby particles in a solid is usually strong. Because there are such strong bonds between the particles, solids usually have a fixed shape and a constant volume. The particles in solids cannot move freely; instead they vibrate in a fixed position.



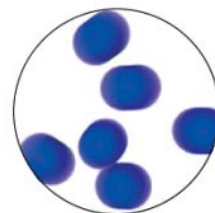
Particles in a solid



Particles in a liquid

In **liquids** the particles are held together by attraction, but the bonds between them are weaker than those in solids. The particle attraction allows the particles to roll over each other, but they can't 'escape'. Liquids have a fixed volume, but the rolling motion of the particles allows them to take the shape of their container. As in solids, the particles are still very close together, so liquids cannot be compressed into smaller spaces.

Gases spread out and will not stay in a container unless it has a lid. The particles in a gas have much more energy than those in solids or liquids, and are constantly moving. The attraction between the particles in a gas is so weak that they can move freely in all directions. They spread out and take up any space that is available, so gases have no fixed shape or volume. Because of the large spaces between particles, gases can be compressed.



Particles in a gas

You have seen that adding heat energy makes molecules move faster and that removing heat energy (cooling) makes molecules slow down. Heating and cooling affect all states of matter—solids, liquids, and gases. Sometimes when matter is heated or cooled enough, we can see pretty dramatic-looking changes. When heated, a solid can become a liquid and then a gas. Or when cooled, a gas can become a liquid and then a solid.