

Phases of Matter

Know that matter exists in one of three states.

Solid.

Liquid.

Gas.

Can't think of anything more fun than this. But the state of matter is determined by the position or location of its particles, which are its molecules and atoms. In a solid, the molecules are very close together. Because there is very little space between molecules, they can't be squeezed much closer together. This gives the solid a definite shape. In fact, they are packed together so tightly that each molecule stays in the same place and just vibrates.

Particles in solids are arranged in a particular order or pattern. A solid has a definite shape and a definite volume. In this case, definite means that it stays the same. They have the same volume no matter what container they are placed in.

Solids can expand, or spread out-- get bigger, a bit, when heated, and contract, or move closer together-- get smaller, in a sense, when they're cooled. The solid materials that make up a bridge or sidewalk expand then warmed. If the sections are assembled tightly on a normal day, they will expand against each other on very hot days. I'm sure you've seen how this expansion can cause cracks to form, like in sidewalks. To make sure these cracks don't form, engineers will leave some space between the sections and fill it with a flexible material.

Now, in liquids, molecules are not packed together as tightly as in solids, so they move more freely. Molecules in a liquid are able to slide past one another, and that is why liquids change their shape. You can see the motion of particles in a liquid by placing a drop of dye in a glass of water. As the particles bump into one another, the dye slowly spreads through the water.

Liquids take on the shape of their container. When you pour milk, a liquid, from a jug into a glass, the shape of the milk changes to fit the container. If you pour liquid from one container into another, the amount of matter in the liquid stays the same. However, liquids do have a definite volume. For instance, a cup of milk is a cup of milk, whether it's in a measuring cup or spilled on the floor, making a mess.

Here's something interesting. Like solids, liquids can expand when heated or contract when cooled. Thermometers have liquid mercury or colored alcohol in a bowl connected to a very thin tube. The liquid expands, moving up when it's hotter, and contracts, moving down when it's cooler. We use this characteristic to help us determine temperature. The position of the liquid in the tube shows the temperature of the substance the thermometer is in.

And finally, gas. The molecules in a gas are packed together the least. Because the molecules in gases have more freedom to move around than solids or liquids, these particles move the fastest.

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Like molecules and liquids, the molecules in gases are not arranged in any pattern. Unlike molecules of liquids, however, molecules in gases don't stay close together.

And a gas does not have a definite shape or volume. Now, the air we breathe is a mixture of gases that fill up the room and the Earth's atmosphere. If you put air into a tire, it takes the same shape as the tire. And even when the tire seems full, you can put more air into it.

Unlike liquids, gases always fill the full volume of their containers. If only the volume of the gas changes, the mass remains the same. The molecules just spread further and further apart. And like solids and liquids, gases expand or contract with changing temperature. Of all the states of matter, gas molecules tend to spread out the most.
