

**CHAPTER 05****Materials and Things****State of the materials:**

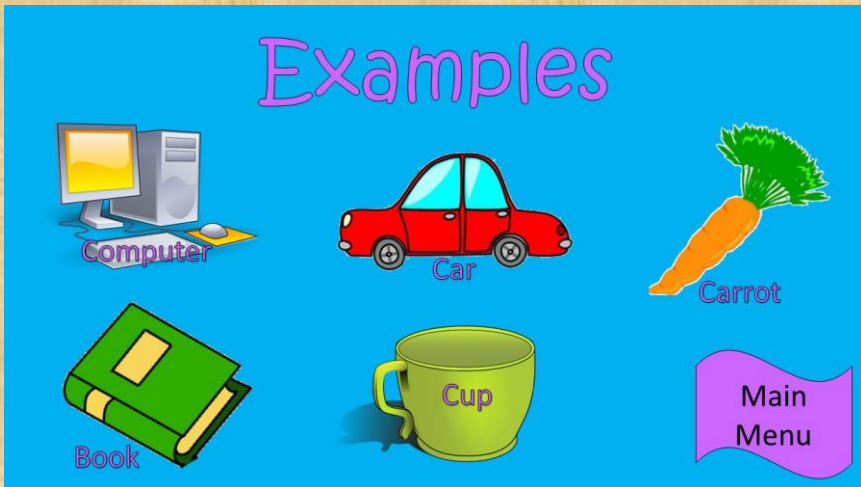
Everything around you is matter like you and me. The air you breathe, the water you drink, the food you eat. They are all matter. But, they are all different kinds of matter. Things that are not matter include songs, feelings and dreams.

On Earth, all matter exists in one of three main states: solid, liquid or gas.

The three main forms of matter all have weight and take up space. A desk, pencil, computer and toy truck are solid. Water and milk are liquids. The air around us is a gas. Every material has to exist in one of these three forms.

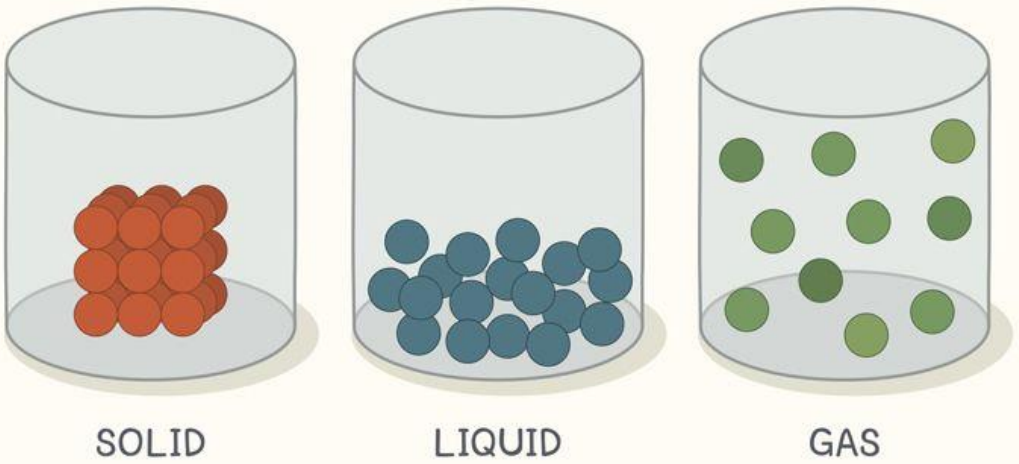
**What is a solid?**

Solids keep their shape. They do not flow like liquids. Solids stay in one place and can be held. They always take up the same amount of space. They do not spread out like gases.



For instance if you throw a cricket ball it still keeps its shape. Many things that are solid can become liquid if they are heated. They can be cut or shaped or poured like sugar, salt and flour. Each particle of salt keeps the same shape and volume.

Solids are made of little pieces called particles. They are packed closely together and they have no space to move around. In addition, solids can be hot or cold, light or heavy and indoors or outdoors.



## Particles arrangement in solids, liquids and gases

### What is a liquid?

Liquids take the shape of their container, such as a bucket, jug or coffee pot. Liquids include things like water, juice and soda. All liquids also have weight and take up space.

They can flow or poured easily. They are not easy to hold. They change their shape depending on the container they are in.

Even when the liquids change their shape, they take up the same amount of space. Their volume stays the same.



Water can fill a round bowl, square pan or a tall glass.

Liquids are also made of little pieces called particles. The particles of a liquid are held together loosely.

They move and slide across each other.

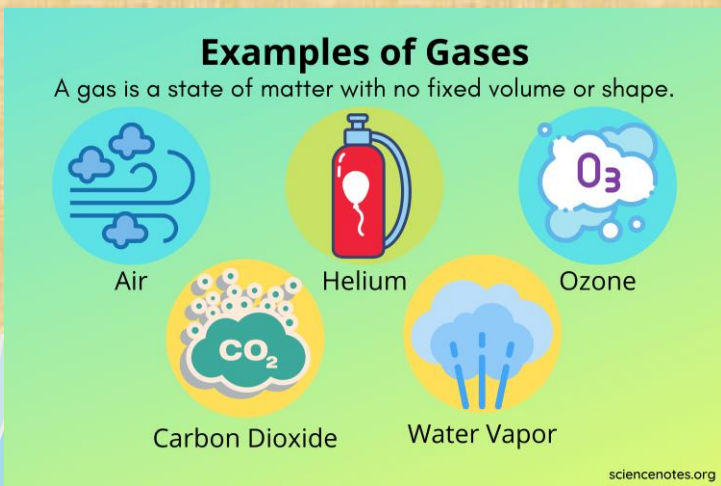
Water, orange juice and milk are all liquids. These liquids have something in common that solids do not have, which is their ability to take the shape of the container you place them in.

### What is a gas?

Gases fill their entire container. When you blow into a balloon, you fill it up with air which is a gas. Air is all around us. Some liquids like soda have tiny gas bubbles in them.

Gases are often invisible. They do not have a fixed shape. They spread out and change their shape and volume to fill up whatever container they are in.

Gas particles are not held together. They float away and fill up the space they're in. Gases can be light or heavy.



A gas called helium is lighter than air. Hence a helium balloon stays up!

### Changing states:

Some materials can 'change state'. Solids and liquids can change from one state to another by heating or cooling.

Heat melts a solid and changes it into a liquid. When a substance changes from a solid to a liquid, we say it melts. Substances need heat to do this.

Ex: ice melts to water at zero degrees.



Every substance has its own, different melting point. Milk chocolate melts at around 40 degrees.

When a substance changes from a liquid state to a solid state, we say it freezes. They need to be cooled to do this. It is the opposite of melting.

Ex: When liquid water is subjected to very low temperatures, it changes to solid form, ice by the process of freezing.



## Story behind:

In a solid, the particles have little energy and are packed tightly together. This causes solids to tend to keep their shape.

When we heat a solid, we are giving the particles more energy. When the particles get enough energy they stop being packed together and start to slide over one another. The solid has become a liquid.

When a solid is heated and changes state to become a liquid, it is called melting. The temperature at which it happens is the melting point and it differs from material to material.

The melting point of water is  $0^{\circ}\text{C}$ .

If we keep on adding energy to this liquid, eventually the particles will have enough energy to change state again and become a gas. When a liquid becomes a gas, this is called evaporation. The temperature at which the liquid boils into a gas is called boiling point.

Some materials change their state from solid to liquid, liquid to gas on being heated and from gas to liquid, liquid to solid on being cooled. We sort materials as solids, liquids or gases based on their state at normal temperature.

## Light a candle:

You might have lit a candle with a matchstick many times, holding the burning matchstick to touch the wick of the candle until the wick catches fire.

Can you light the candle without touching the wick with a burning matchstick? Do you think this is impossible?

Let us see how to do it. Place a candle in a safe place and light it. The first time, the candle cannot be lit without touching the wick with the burning matchstick. So do just that the first time. Let the candle burn for some time. After about two minutes, hold a burning matchstick in one hand and blow the candle out.


What did you notice? Did you see a column of white smoke rising from the wick as soon as you extinguish the flame?

Now quickly bring the burning matchstick close to this smoke, but do not touch the wick with it.

What happens? Could the candle catch fire from a distance?

The candle lightens up. Here the white smoke represent the candle wax in the state of gas.



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