

Willerby Carr Lane Primary School - Science

Topic: States of Matter

Year: 4

Strand: Chemistry

What should I already know?

- Some materials are heavier than others even though they are the same size e.g. medicine ball in PE.
- Materials change when heated or cooled – observations of cooking / freezing e.g. ice-cream / puddles disappearing.
- Some changes can be reversed – observations of snow melting / ice.

- As the word 'cycle' suggests, there is no starting point. This means that we can begin at any point and follow its path until it gets to where we started again.

What will I know by the end of the unit?

What is matter?	<ul style="list-style-type: none"> • Matter is all around us. It is defined as anything that has mass and takes up space. • Matter is found in 3 major states; solid, liquid and gas. • All matter is made of atoms. • Atoms are the smallest particle of matter. They are so small that you cannot see them with your eyes or even with a standard microscope. • An A4 sheet of paper is about a million atoms thick
What is a reversible or irreversible change?	<ul style="list-style-type: none"> • A reversible change is a change that can be changed back again. For example, if an ice cube is melted it becomes water but we can freeze it again to become an ice cube so it can return to its original state. • Melting and heating are examples of reversible changes. • An irreversible change is a change that cannot be changed back again. For example, if a cake mixture is baked it becomes a cake and we cannot turn it back into a mixture. • The change is irreversible because a chemical reaction has taken place. • Burning or mixing a liquid with bicarbonate of soda are examples of irreversible changes.
What is the 'water cycle'?	<ul style="list-style-type: none"> • The water cycle is the complete journey that water makes, from one place to the other, and from one state to the other. • Water evaporates and forms clouds • Clouds often rise in the atmosphere over hills, where the air is colder • Water in clouds, condenses and falls as rain • Water flows down hills and rivers to the sea

Vocabulary

atom	the smallest part of every substance composed of protons (+), neutrons and electrons (-)
Celsius	a scale of temperature on which water freezes at at 0° (and boils at 100°) under standard conditions.
condensation	condensation is the process of changing a gas into a liquid.
dissolving	dissolving is a way of mixing a solid and a liquid.
evaporation	evaporation is the process of changing a liquid into a gas.
filtering/sieving	filtering and sieving are methods of separating mixtures of solids and liquids.
freezing	freezing is the process of changing a liquid into a solid.
gas	a gas can flow, expand and be squeezed; if it is in an unsealed container it escapes (water in gas form is steam). particles are widely spaced and move around randomly. it fills up the space it is in, and does not have a fixed volume
ice	water in a solid state, formed at 0 degrees Celsius
irreversible	not able to be undone or altered – a chemical change has occurred.
liquid	a liquid flows or runs but can't be shaped or squeezed. it takes the shape of its container. particles are less tightly packed together and have more energy – they can flow, but still touch each other.
matter	objects that take up space and have mass are called matter. everything around you is made up of matter solid a solid holds its shape and has a fixed volume.
melting	melting is the process of changing a solid into a liquid. when a solid dissolves in a liquid it creates a solution, for example when sugar dissolves in water.
molecule	atoms joined together make molecules, the very tiny particles that make matter.
particle	a minute portion of matter.
reversible	capable of being reversed so that the previous state is restored.

solid	a solid holds a firm and stable in shape; not liquid or fluid. particles are packed tightly together in a regular pattern.
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temperature	the degree or intensity of heat present in a substance or object and shown by a thermometer or perceived by touch.
water vapour	water becomes a gas (water vapour) at 100 degrees Celsius

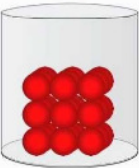
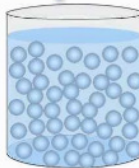
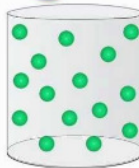
Investigate!

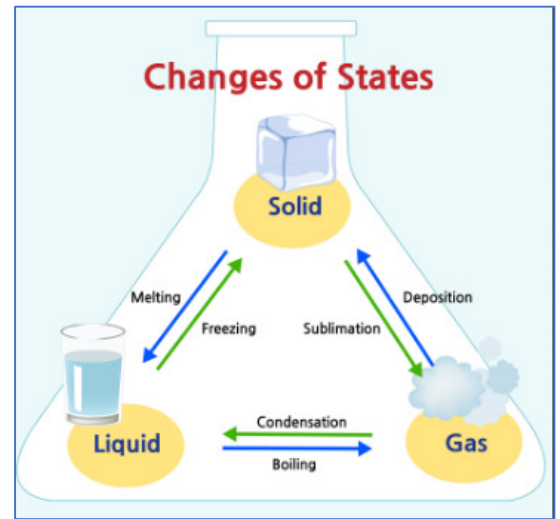
- How molecules differ between solids, liquids and gases – dance.
- Effects of heat
 - reversible (chocolate) measure the temperature at which changes take place.
 - irreversible (biscuits)
- Effect of cooling – water / ice measure the temperature at which changes take place.
- What happens to steam when it cools?
- Investigate the water cycle by creating and observing a cycle.

Common misconceptions

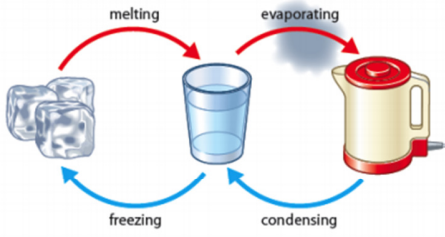
Some children may think:

- 'solid' is another word for hard or opaque
- solids are hard and cannot break or change shape easily and are often in one piece
- substances made of very small particles like sugar or sand cannot be solids
- particles in liquids are further apart than in solids and they take up more space
- when air is pumped into balloons, they become lighter
- water in different forms – steam, water, ice – are all different substances

solid	liquid	gas
		
● rigid	● not rigid	● not rigid
● fixed shape	● no fixed shape	● no fixed shape
● fixed volume	● fixed volume	● no fixed volume
cannot be squashed	cannot be squashed	can be squashed



Heating and cooling water



Warming solid ice makes it **melt** into liquid water.

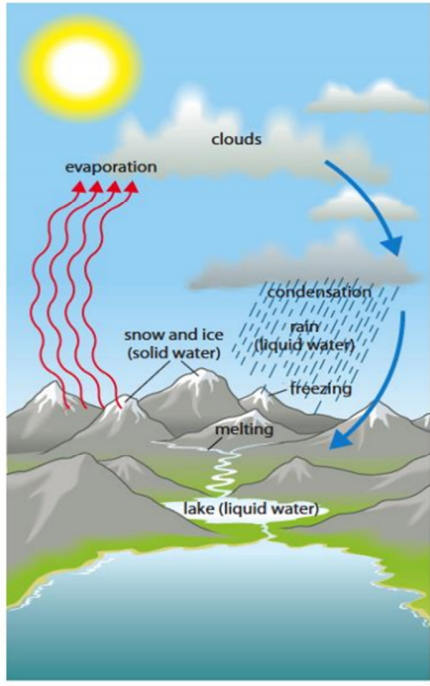
Adding more heat makes it **evaporate** into water vapour.

At 100 °C you see this as steam.

When water vapour is cooled, it **condenses** into liquid water.

If it is cooled to 0°C it **freezes** and forms solid ice.

The water cycle



Water continually moves around the Earth in the water cycle.

The Sun evaporates water into water vapour.

When the water vapour cools down it turns into liquid water and it rains.

In very cold places the water freezes into snow or ice.

Snow and ice, when warmed up, change into liquid water.