Knowledge Organiser: Year 4 - States of Matter

Careers connected to States of Matter: Chemical Engineer, Pharmacologist, Pharmaceutical pharmacist, Chemist.

Lesson Sequence

1. Compare and group the 3 states of matter
2. Explore how particles behave in solids, liquids and gases
3. Investigate melting points
4. Explore freezing and boiling points
5. Explore evaporation and condensation
6. Understand the water cycle

States of matter

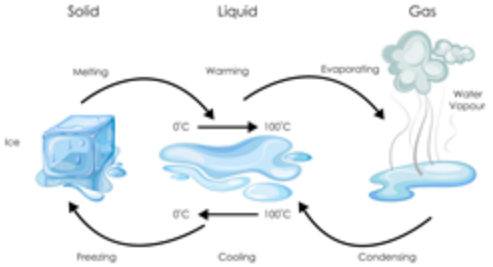
Everything in our universe is made of **matter**. There are 3 states of matter:

Solid **Liquid** **Gas**

Solid particles have **strong** bonds so solids have a fixed shape. **Liquid** particles have **weaker** bonds and more energy so liquids can change shape. **Gas** particles have **really weak** bonds so gases can spread out and move freely.

Changes of state

States of matter can change.
Substances can be **heated** or **cooled** to change from one state to another.



Ice **Water** **Water Vapour**

In water, the **melting** and **freezing** point is **0°C** and the **boiling point** is **100 °C.**
Different substances have different melting, freezing and boiling points.

Condensation

When **water vapour (gas)** touches a **cold** surface, the particles **lose energy** and the bonds become **stronger**, turning the gas into a **liquid**.

Evaporation

Heating **liquid** water **increases** the particle's energy and the bonds become **weaker**, turning it into a **gas**. The **hotter** the temperature, the **faster** the rate of evaporation.

Rocket Words

	thermometer	an instrument that measures temperature in degrees Celsius (˚C) or Fahrenheit (˚F)
	melting point	the point where a solid melts and forms a liquid when heated
	freezing point	the point where a liquid freezes and forms a solid when cooled
	boiling point	the point where a liquid evaporates and forms a gas when heated
	solid	state of matter that holds its form and shape
	liquid	state of matter which flows and forms a pool
	gas	state of matter which flows, can spread out and can be squashed
	evaporation	the process where a liquid turns into a gas when heated
	particles	one very small part of matter
	condensation	the process where a gas forms a liquid when cooled
	water vapour	the name of water as a gas
	substance	the material, or matter, of which something is made

What I already know:

Year 1

- ❑ Describe the simple physical properties of a variety of everyday materials
- ❑ Compare and group together a variety of everyday materials on the basis of their simple physical properties

What I will learn now:

Year 4

- ❑ Compare and group materials together, according to whether they are solids, liquids or gases
- ❑ Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)
- ❑ Identify the part played by evaporation and condensation in the water cycle and associate the rate
- ❑ of evaporation with temperature

What I will learn next:

Year 5

- ❑ Know that some materials will dissolve in liquid to form a solution
- ❑ Describe how to recover a substance from a solution
- ❑ Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
- ❑ Demonstrate that dissolving, mixing and changes of state are reversible changes
- ❑ Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda

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Before & After Test

Tick the correct statements.

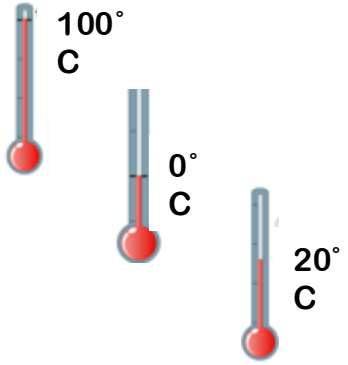
Gas particles have lots of energy.		There are strong particle bonds in liquids.	
Solids are a fixed shape.		Solid particles do not have much energy.	
Liquids cannot change shape.		Ice is a liquid.	
Gases cannot be squashed.		Helium is a solid.	

Draw lines to match the labels to the thermometers:

Room temperature

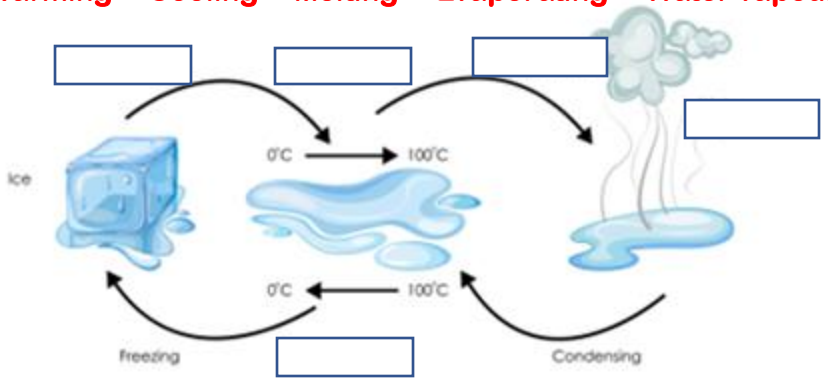
Boiling point of water

Freezing point of water



Add the following labels to the diagram:

Warming **Cooling** **Melting** **Evaporating** **Water vapour**



You have been asked to design an experiment to see whether temperature affects the rate of evaporation.
What is the **variable** you will **change**?

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What is condensation?

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