



# Science Knowledge Organiser:

## Science unit: States of Matter Year group: Y4



### Overview: What will we learn in this unit?



In this unit, pupils should be taught to

- Compare and group materials together, according to whether they are solids, liquids or gases;
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature;
- 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)



### Key vocabulary

#### Scientific language



|              |                                                                                                                                                             |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature  | The measure of warmth or coldness of an object.                                                                                                             |
| Celsius (°C) | The common scale in the UK for measuring temperature.                                                                                                       |
| Freezing     | When a liquid turns into a solid eg water turning to ice; the freezing point of water is 0 °C.                                                              |
| Melting      | When something changes from a solid to a liquid eg ice melting back to liquid water (For ice this happens at 0 °C so 0 °C is also the melting point of ice) |
| Boiling      | To become so hot that liquid bubbles and turns into a gas, or 'evaporates' (For water this happens at 100°C)                                                |
| Evaporation  | The process of turning from liquid into vapour                                                                                                              |
| Condensation | The process of changing from a gas to a liquid                                                                                                              |

### Key knowledge

#### Grouping Materials

- know materials can be grouped into **Solids, Liquids and Gases**
- recognise there are also tricky ones like gels, foams, mists and paste (also plasma - not part of our curriculum)

#### How to identify each type of material

- Solids** stay in one place and can be held. Solids always take up the same amount of space and usually keep their shape. They do not spread out like gases or flow like liquids (although some solids like sand or salt can be 'poured')
- Liquids** can flow or be poured easily. They are not easy to hold. Liquids change their shape depending on the container they are in.
- Gases** are often invisible. Gases do not keep their shape. They spread out and change their shape and volume to fill up whatever container they are in.

**Changes of state. When a material changes from one material type to another, we say 'it has changed state.'**

What are the changes of state?

| Explanation                                              | Name of process | Example                                                                                                     |
|----------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------|
| When a solid <b>melts</b> it changes to a liquid.        | Melting         | When an ice cube melts.                                                                                     |
| A liquid <b>evaporates</b> into a gas when it is heated. | Evaporation     | When water boils in a kettle and turns to steam<br>When water in a puddle is warmed up and turns to vapour. |
| When a gas it cooled it <b>condenses</b> into a liquid.  | Condensation    | When steam from the shower cools on the mirror it turns back to water.                                      |
| When a liquid <b>freezes</b> it turns into a solid.      | Freezing        | When the water in a pond freezes, it turns to ice.                                                          |

#### At what temperature does each process happen?

- Water boils at exactly 100°C** (A hot bath is about 40°C)
  - Ice melts at 0 degrees Celsius (0°C).** Chocolate melts at about 35°C
- Different solids melt at different temperatures Find out: When metals melt.
- Water freezes at 0 degrees Celsius (0°C).**
  - Water can evaporate and condense at any temperature.**
- However, the warmer it is, the faster the evaporation takes place.



### Key skills including

#### Working Scientifically



Make careful observations and take accurate measurements using equipment including thermometers

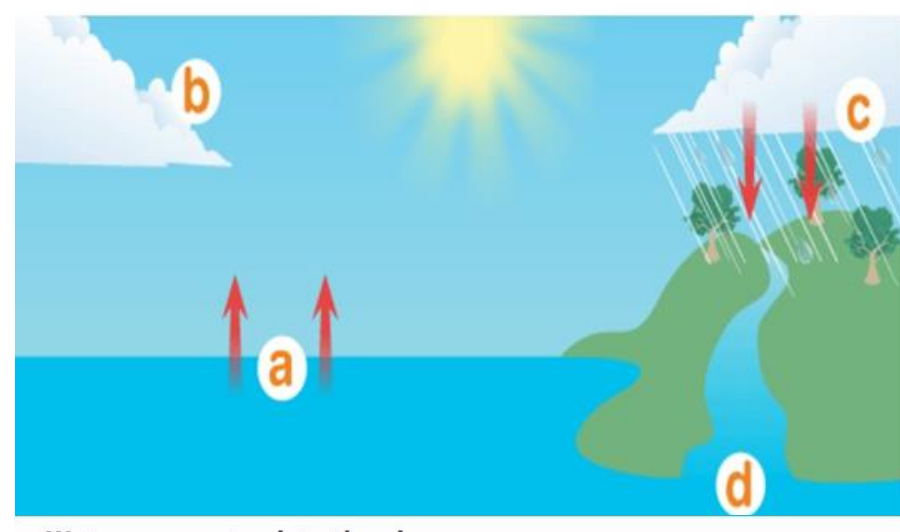
Carry out practical enquiries and 'fair tests', thinking about variables that need to be changed or kept the same

Report on findings from enquiries using scientific language, and labelled diagrams, and present results in different ways – tables, bar charts or graphs. Use results to draw conclusions.

### Diagrams and symbols

#### The water cycle

Water on the earth is constantly moving. It is recycled over and over again. This recycling process is called the **water cycle**.



##### a. Water evaporates into the air

The sun heats up water on land, and in rivers, lakes and seas and turns it into water vapour. The water vapour rises into the air.

##### b. Water vapour condenses into clouds

Water vapour in the air cools down and changes back into tiny drops of liquid water, forming clouds.

##### c. Water falls as rain

The clouds get heavy and water falls back to the earth in the form of rain or snow.

##### d. Water returns to the sea

Rain water runs over the land and collects in lakes or rivers, which take it back to the sea. The cycle starts all over again.

### Possible experiences / research

- Investigate varying melting points of foods, eg chocolate, butter, and research melting points of other materials, eg metals
- Investigate how to get washing to dry faster (Fair test)
- Observe what happens to water in sealed containers and make observations over time to help understand the water cycle

### Curriculum links



#### Links to

- Geography - understanding /explaining the water cycle
- Maths - measuring temperature using scales on thermometers; negative numbers
- English – writing reports, using subheadings

#### Useful websites:

<https://www.bbc.com/bitesize/articles/z3wpp39>

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