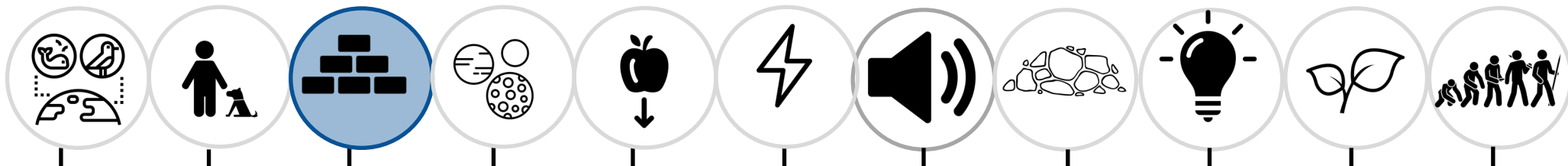
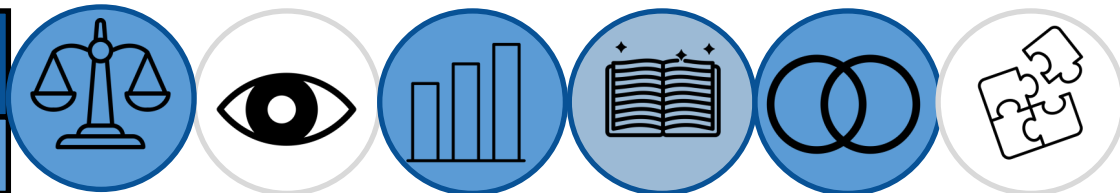


# Year 4: States of matter

SCIENTIFIC CONTEXT: Physics



## KEY VOCABULARY:

Solid	The shape of a solid does not change on its own – it is rigid . They also have a fixed volume.
Liquid	The shape of a liquid does change, it is not rigid. They also have a fixed volume.
Gas	Gases do not have a shape, they completely fill any container they are put into.
Heating	Heat is a. form of energy. Heat flows from hot objects to cool objects.
Cooling	Cooling is when you lower the temperature
State change	The process of one state of matter (solid, liquid or gas) changing to another.
Melting point	The temperature at which it changes from a solid to a liquid.
Freezing point	The temperature at which a liquid changes to a solid .
Boling point	The temperature at which a liquid changes into a gas.
Evaporation	If water (liquid) is heated, it changes to water vapour (gas).
Condensation	If water vapour (gas) is cooled down, it changes into water (liquid).
Temperature	Temperature is the amount of heat in something.
Water cycle	The path that all water follows as it moves around Earth in different states.

## As scientists we will:

- 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.

### Working Scientifically:

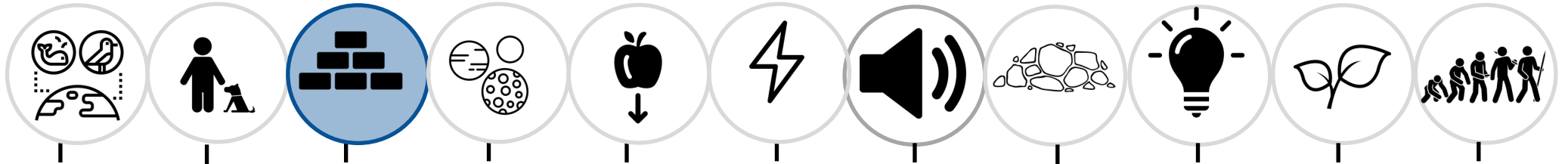
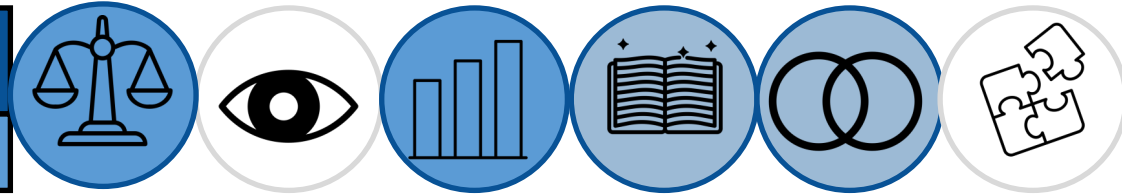
- Classify and present data,
- Set up simple practical enquiries,
- Record findings using tables,
- Report on findings using written explanations.

### Key Questions

- 1) Can you compare and group materials together, according to whether they are solids, liquids or gases?
- 2) What happens to the state of materials when they are heated or cooled?
- 3) At what temperature do changes of state happen?
- 4) What part do evaporation and condensation play in the water cycle and how does temperature affect evaporation?

# Year 4: States of matter

## SCIENTIFIC CONTEXT: Physics



### **What I need to know:**

A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0°C. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100°C. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.

### **Opportunities for science capital:**

#### **Opportunities for trips outside of school:**

- Water Cycle workshop at We are the Curious
- Splash and Bubble science show at We are the Curious

#### **Opportunities for visitors in school:**

- Workshops with *Working Science*

Part of science capital includes scientific media consumption- documentaries, reports etc. So, I have added a couple of links which give daily science news for children. Checking in on these every now and then would be beneficial to help children see science in the wider world.

<https://www.sciencenewsforstudents.org/>

<https://www.sciencejournalforkids.org/>

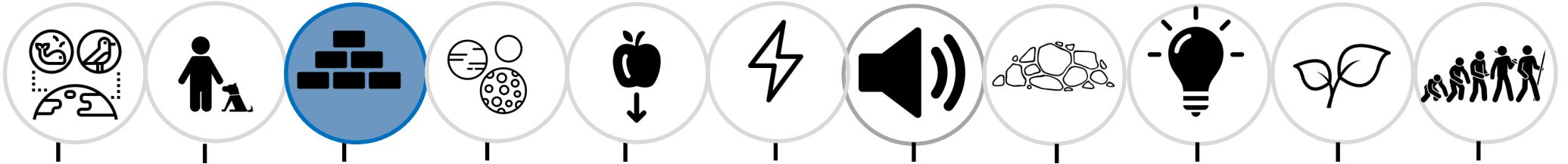
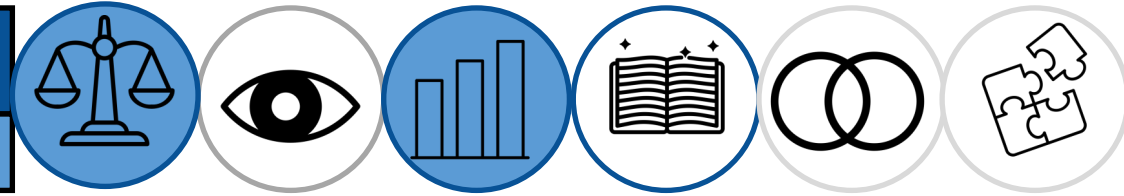
### **Assessment:**

By the end of this topic, pupils will be able to: compare and group materials together, according to whether they are solids, liquids or gases; explain that some materials change state when they are heated or cooled, and say the temperature at which this happens in degrees Celsius (°C); and explain the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

When working scientifically, pupils will be able to: classify and present data, set up simple practical enquiries, record findings using tables and report on findings using written explanations.

# Year 4: States of matter

## SCIENTIFIC CONTEXT: Physics



## Theme 1: Solid, liquid or gas?

### **Starter:**

KWL grid

Recap key learning from Y1 and Y2 (can be found on KWL grid) and address any gaps/misconceptions.

### **Main:**

#### **Substantive knowledge**

##### **Solids:**

Watch video: <https://www.tigtagworld.co.uk/film/what-is-a-solid-PRM00007/>

Show a diagram of particles in a solid. Get the children to discuss what they notice about the particles (e.g. tightly packed together). Explain that this determines the properties of solids.

Common misconception: Address common misconceptions with true or false clip: <https://www.tigtagworld.co.uk/film/solids-true-or-false-PRM00516/>

##### **Liquids:**

Watch video: <https://www.tigtagworld.co.uk/film/everyday-liquids-PRM00169/>

Show a diagram of particles in a liquid. Get the children to discuss what they notice about the particles. Explain that this determines the properties of liquids.

##### **Gases:**

Watch video: <https://www.tigtagworld.co.uk/film/what-is-a-gas-PRM00171/>

Show a diagram of particles in a gas. Get the children to discuss what they notice about the particles. Explain that this determines the properties of gases.

### **Plenary/ assessment:**

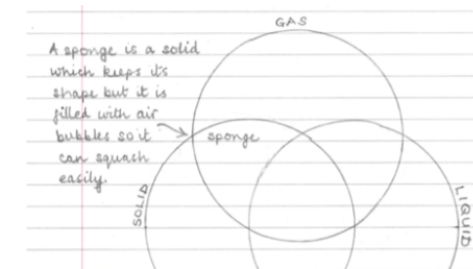
#### **Disciplinary knowledge:**

#### **Grouping & comparing**

#### **Working scientifically objective: classifying and presenting data**

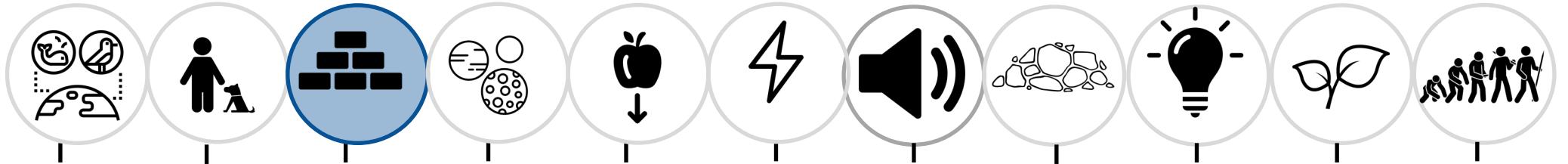
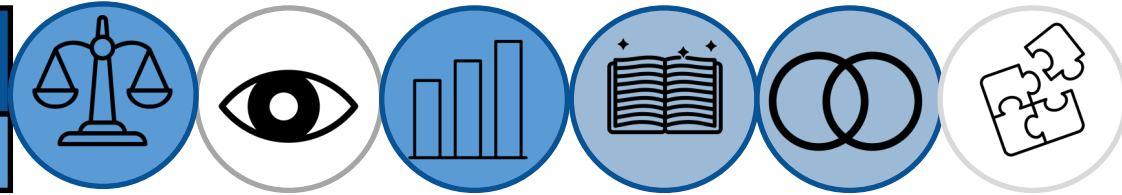
Provide 10 different items for children to sort into solids, liquids and gases. For HA children, you could provide items that are trickier to classify e.g. fizzy drinks as they're both liquid and gas. Whereas, for you may choose more easily sorted items for LA.

Allow children to get hands-on with the items and carry out simple observations to then sort the items into solids, liquids and gases and present their findings on a venn diagram with short explanations as to why they placed the item there. See next page for useful phrases to aid explanations. LA could sort items without explanations. E.g.



# Year 4: States of matter

SCIENTIFIC CONTEXT: Physics



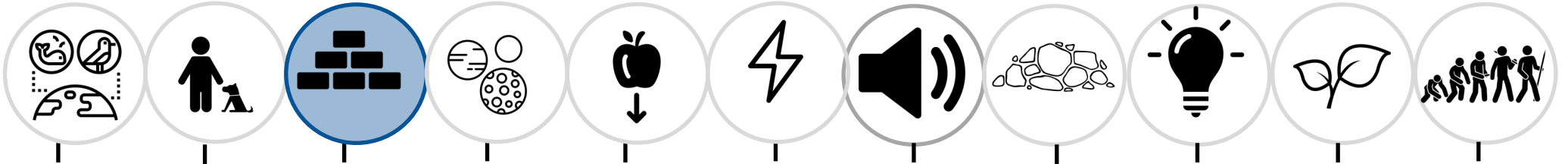
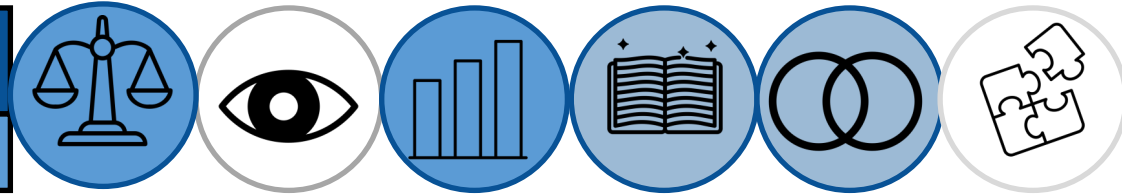
## Theme 1: Solid, liquid or gas? Continued.

### Useful phrases to help explain groupings:

- Keeps its shape
- Changes its shape
- Fits the container
- Can be twisted, or stretched
- Can be squashed
- Can be cut
- Can/cannot be poured
- Is invisible
- Has a fixed volume
- Spreads out
- Fills the available space
- Forms a heap
- Forms a puddle
- Keep a level, horizontal surface

# Year 4: States of matter

## SCIENTIFIC CONTEXT: Physics



## Theme 2: Changes of state

### Starter:

Recap

Deeper thinking opportunity:

<https://explorify.uk/en/activities/what-if/the-sea-was-gloopy-like-ketchup>

### Main:

#### Substantive knowledge

Work through all videos, activities and questions from main activity:  
<https://www.tigtagworld.co.uk/mindmap/#/lessons/CLASS00257/activities/main>

Then, ask children to complete the changing states activity sheet:  
[chrome-extension://efaidnbmnnnibpcajpcgiclfndmkaj/https://cdn-media.tigtagworld.com/learning-materials/material-processes/solids-liquids-and-gasses/activity-sheets/Changing\\_states\\_of\\_water\\_Activity\\_sheet.pdf](https://cdn-media.tigtagworld.com/learning-materials/material-processes/solids-liquids-and-gasses/activity-sheets/Changing_states_of_water_Activity_sheet.pdf)

Research the temperature at which different materials change state in degrees Celsius ( $^{\circ}\text{C}$ ) and record in books.

### Plenary/ assessment:

#### Disciplinary knowledge

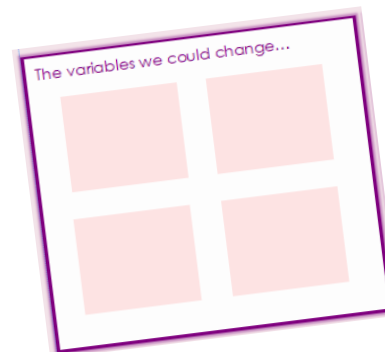
#### Comparative test

**Working scientifically objective: setting up simple practical enquiries, comparative and fair tests and recording findings using tables.**

Freeze several small ice cubes or shapes of the same size. Give each pupil the first square of the planning investigation sheet (variables we could change). Explain to children that you're going to investigate the speed at which ice melts. To help prompt children with ideas for variables they could change, ask them:

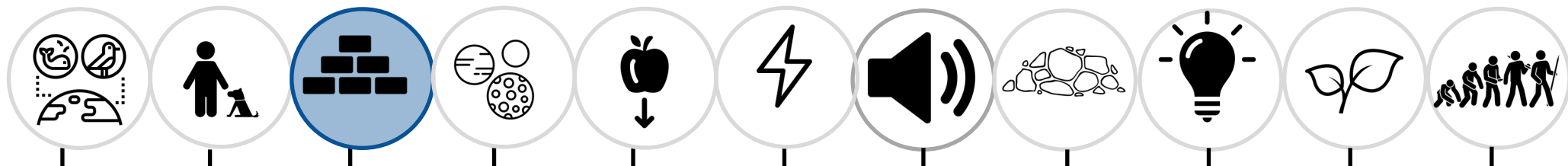
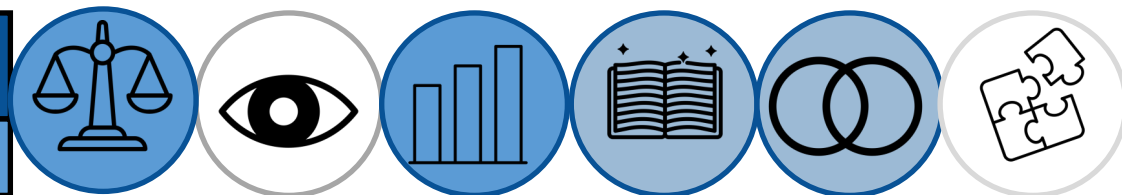
What would happen to how quickly the ice melted if I...

(e.g: put warm water on it, poured salt on it, left it outside in the sun, left it inside etc.). Get them to record their independent ideas on that square from the planning grid. Explain that they are now going to investigate the variables they have come up and time how long it takes each ice cube to melt. Model how to draw a results table and how to record results. Pupils then run the investigation timing how long it takes for the ice to melt and recording results on a table in their books.



# Year 4: States of matter

## SCIENTIFIC CONTEXT: Physics



## Theme 3: The Water Cycle

### **Starter:**

Recap: draw diagrams of the particles in solids, liquids and gases.

### **Main:**

#### **Substantive knowledge**

Work through activities and videos up to slide 5:

<https://onedrive.live.com/view.aspx?resid=54CF08BDFC25132B!24316&ithint=file%2cpptx&authkey=!AHqmghVTG6QYqo0>

### **Plenary/ assessment:**

#### **Disciplinary knowledge**

#### **Observation over time**

#### **Working scientifically objective: reporting on findings from enquiries, written explanations**

Chose one of the water cycle models on slide 6. Everyone could do the same, or you may wish for different groups to do different models.

Get children to observe their models throughout the day, or into the next day if required. Discuss findings with each other. Get children to report on their findings by writing an explanation of the part evaporation and condensation plays in the water cycle. E.g.

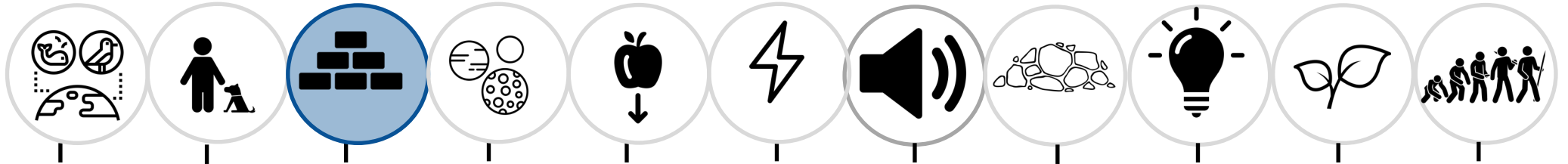
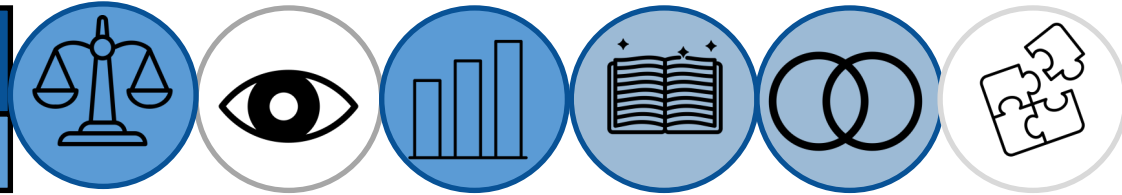
Water in seas, lakes, rivers, puddles, and damp ground warm up and evaporate into water vapour, a gas. Water vapour rises and cools. It condenses back into liquid water droplets which form clouds.

You could do this as sentences stems for those pupils that need it.

Deeper thinking: What if water didn't evaporate? <https://explorify.uk/en/activities/what-if/water-didn-t-evaporate>

# Year 4: States of matter

SCIENTIFIC CONTEXT: Physics



## Theme 4: Rate of evaporation

### **Starter:**

Recap & deeper thinking: [Evaporation](#),

### **Main:**

**Disciplinary knowledge**

**Fair test**

**Working scientifically objective: set up a fair test**

*Today we are going to be materials engineers*

Using the comparative/fair test planning grids, complete the TAPS investigation– drying.

[Y4plan Drying - Plan.docx](#)

### **Plenary/ assessment:**

End of topic kahoot quiz

Complete KWL grid