



Knowledge

Create a key to categorise objects such as solids, liquids and gases.

Can you group these materials and objects into solids, liquids and gases?

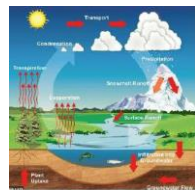
**Pattern Seeking Identifying and Classifying**

The properties of a substance depend on what its particles are like, how they move and how they are arranged. Particles are what materials are made from and they are so small that we cannot see them with our eyes. They behave differently in solids, liquids and gases:

- Solids always take up the same amount of space. They have vibrating particles which are closely packed in and form a regular pattern, which means they have a fixed shape and cannot be poured.
  - Liquids can change shape depending on the shape of the container they are in because they can be poured. Liquid particles are spaced out randomly and close together, which allows them to move over each other.
- The particles in a gas can escape from any container they are placed in. This is because they are spread out and can move in any direction.

What is the difference between evaporation and condensation? What changes of state take place?

**Research**



When a liquid such as water is heated, the particles start to move faster and faster until they have enough energy to move around more freely. The water has evaporated into water vapour, which is a gas. As water vapour starts to cool, the particles start to slow down and move closer together again, eventually returning to a liquid state.

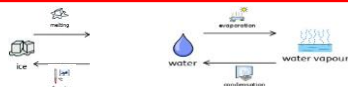
The water cycle is a natural process that uses evaporation and condensation to continually recycle the Earth's water. Water in lakes, oceans and rivers is heated by the Sun and evaporates into the atmosphere, where it cools and condenses into clouds. The clouds then release water as precipitation, which lands on the Earth and finds its way back into the lakes, oceans and rivers to repeat the process again.

What was Anders Celsius' contribution to creating a standard scale for temperature?

**Ideas Over Time**

Anders Celsius (1701-1744)  
<https://www.youtube.com/watch?v=rARnTIPax8E>  
Swedish astronomer, physicist and mathematician.

How does the mass of an ice cube change over time?



**Observing Over Time**

As an ice cube changes state, its surface area changes: the less solid its state, the larger its surface area. Does this mean that the mass of the melted ice is less, more or the same than it would be as a solid ice cube?

How does the effect of temperature on chocolate, butter and cream compare?

**Comparative Testing**

All three substances are usually found in a solid state, but can be reversibly changed through heating. Once they reach their melting point they will become liquids, and as they cool they can be returned to a solid state depending on the temperature. Consider the variables involved in investigating this question – how would fair testing be ensured? What can be changed and by how much? What observations would you expect to find? Why?

Does seawater evaporate quicker than fresh water?

**Comparative Testing**

As part of the water cycle, the evaporation process will still take place regardless of what body of water is involved. However, will the presence of salt in seawater impact on the particles within each liquid? Would you expect the rate of evaporation to be affected by this? Why?

How does the level of water in a container change when left on the windowsill?

**Observing Over Time**

Consider the variables involved in investigating this question – how would fair testing be ensured? Could the windowsill used create any potential problems (e.g.: radiator near the window, season of the year)? What can be measured? What can't be controlled (e.g.: temperature caused by sunlight, position of the Sun throughout the day)? What observations would you expect to find? Why?



## Vocabulary

<b>Condensation</b>	Small drops of water which form when <b>water vapour</b> or steam touches a cold surface, such as a window.
<b>Cooling</b>	Lowering the <b>temperature</b> of something.
<b>Evaporation</b>	To turn from a <b>liquid</b> to a <b>gas</b> and pass away in the form of vapour.
<b>Freezing</b>	When a <b>liquid</b> , or substance containing a liquid, becomes <b>solid</b> because of low <b>temperatures</b> .
<b>Freezing point</b>	The <b>temperature</b> at which a substance freezes. The <b>freezing</b> point of water is 0°C.
<b>Gas</b>	A form of matter that is neither <b>solid</b> nor <b>liquid</b> . A gas rapidly spreads out when it is warmed and contracts when it is cooled.
<b>Heating</b>	Raising the <b>temperature</b> of something.
<b>Liquid</b>	In a form that flows easily and is neither a <b>solid</b> nor a <b>gas</b> .
<b>Melting</b>	To change from a <b>solid</b> to a <b>liquid</b> through <b>heating</b> or pressure.
<b>Melting Point</b>	The <b>temperature</b> at which a substance melts.
<b>Particles</b>	A tiny amount or a small piece of something.
<b>Precipitation</b>	Rain, snow, sleet, dew, etc. formed by <b>condensation</b> of <b>water vapour</b> in the atmosphere.
<b>Process</b>	A series of actions used to produce something or reach a goal.
<b>Properties</b>	The ways in which an object or substance behaves.
<b>Solid</b>	Having a firm shape or form that can be measured in length, width and height and being neither a <b>liquid</b> nor a <b>gas</b> .
<b>Temperature</b>	A measure of how hot or cold something is.
<b>Vibrations</b>	Small, quick, repeated movements caused by an object or substance shaking.
<b>Water cycle</b>	The <b>process</b> by which water on the Earth evaporates, condenses in the atmosphere and returns to the ground in the form of <b>precipitation</b> .
<b>Water vapour</b>	Water in its gaseous state, particularly caused by <b>evaporation</b> at a <b>temperature</b> lower than boiling point.

## Hurst Hill Primary School Knowledge Organiser

Science

States of matter

Year 4

Summer 1

Chemistry

Chemistry is the science that deals with the composition and properties of substances and various elementary forms of matter.

### Statutory requirements

Pupils should be taught to:

- 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.