

**Scientific Model (KS2):**

**Particle Model**

- Use particle diagrams to demonstrate the difference between solids, liquids, and gasses as well as the processes involved in changing states.
- Explain that particles move because they have energy. The more energy they have the quicker they move.

**Scientific Investigations:**

- Observing Changes over Time
- Looking for Naturally- Occurring Patterns and Relationships
- Researching Using Secondary Sources
- Comparative and Fair Testing

**Scientists:**

- Joseph Priestly - the scientist who invented carbonated drinks.
- Anders Celsius - the scientist who invented the scale on which we measure temperature. He used the melting and boiling points of water as his markers making them 0°C and 100°C.

**Scientific Skills Applied:**

ASK

- To ask relevant questions
- To decide when to use secondary sources to find answers
- To make simple predictions based on knowledge of science

BREAKDOWN

- To set up simple tests
- To decide what equipment to use
- To learn how to use new equipment
- To make decisions about the type of enquiry
- To use different enquiry types to test questions

CAPTURE

- To observe carefully
- To measure accurately using standard units
- To measure using a range of equipment
- To gather data and record in different ways
- To make systematic observations
- To identify differences, similarities and changes

DESCRIBE

- To draw simple conclusions
- To present data in different ways
- To explain what they have found out using correct scientific language
- To record finding using correct language in varied ways
- To answer questions based on evidence orally and in writing
- To suggest improvements to tests

**Prior Learning:**

- Distinguish between an object and the material from which it is made (Y1)
- Identity and name a variety of everyday materials. Including wood, plastic, glass, metal, water and rock (Y1)
- Compare and group together a variety of everyday materials and the basis of their simple properties (Y1)
- Identify and compare the suitability of a variety of everyday materials (Y2)
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching (Y2)
- Rocks can be broken down into small particles (Y3)

Curriculum	Learning Intention	Knowledge and Key Vocabulary
<p><b><u>Making links to learning and discuss the model (if needed)</u></b>                      Identification of a range of everyday materials                      Introduction to particles</p>	<p><b>What are materials?</b></p> <ul style="list-style-type: none"> <li>• Sort materials into solids, liquids or gases.</li> </ul>	<p><b>Knowledge:</b></p> <ul style="list-style-type: none"> <li>- Know all things are made up of particles.</li> <li>- Define a solid</li> <li>- Define a liquid</li> <li>- Define a gas</li> </ul>

<p>Use particle diagrams to demonstrate the difference between solids, liquids and gasses as well as the processes involved in changing states. Explain that particles move because they have energy. The more energy they have the quicker they move.</p>	<ul style="list-style-type: none"> <li>Describe the properties of solids, liquids and gases. Show the difference between the particles in solids, liquids and gases.</li> </ul> <p><b>What are particles?</b></p> <ul style="list-style-type: none"> <li>Recap Y3 knowledge of particles being the smallest thing a material can be broken down into</li> <li>Observe results using scientific equipment</li> </ul> <p><b>What is the difference between solids, liquids and gasses?</b></p> <ul style="list-style-type: none"> <li>Observe the structure of particles in a solid, liquid and gas</li> <li>Examine key properties of solids, liquids and gasses.</li> </ul>	<p><b>Vocabulary:</b></p> <ul style="list-style-type: none"> <li>solid, liquid, gas</li> <li>particles, model</li> </ul>
<p><b>Knowledge and skills through investigations</b></p> <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>compare and group materials together, according to whether they are solids, liquids or gases</li> <li>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)</li> <li>identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</li> </ul> <p>Notes and guidance (non-statutory)</p> <ul style="list-style-type: none"> <li>Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). Pupils should observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled.</li> </ul>	<p><b>Does gas have mass?</b></p> <ul style="list-style-type: none"> <li>Design a fair test</li> <li>Investigate mass of a gas</li> <li>Explore the fizzy drinks inventor, Joseph Priestly</li> </ul> <p><b>How do materials change state?</b></p> <ul style="list-style-type: none"> <li>Investigate how heat can cause solids to change to liquids and vice versa.</li> <li>Identify materials that melt at different temperatures.</li> <li>Investigate the melting and freezing temperature of a material</li> <li>Use particle diagrams to explain observations</li> </ul> <p><b>What affects the speed of evaporation?</b></p> <ul style="list-style-type: none"> <li>Investigate how water evaporates.</li> <li>Make systematic, careful and accurate observations and measurements</li> <li>Report on findings from enquiries by displaying results and conclusions.</li> <li>Associate the rate of evaporation with temperature.</li> </ul> <p><b>Where does our water come from?</b></p> <ul style="list-style-type: none"> <li>Identify and describe the different stages of the water cycle.</li> <li>Identify the part played by evaporation and condensation in the water cycle.</li> </ul>	<p><b>Knowledge:</b></p> <ul style="list-style-type: none"> <li>Solid → liquid → gas – heat energy needs to be added.</li> <li>Gas → liquid → solid – heat energy needs to be removed.</li> <li>Know the melting, boiling and freezing points of water</li> <li>Know gas has mass.</li> <li>Know new water cannot be created.</li> </ul> <p><b>Vocabulary:</b></p> <p>matter; solid; liquid; gas; vapour; expand; contract; particles; thermometer; temperature; degrees; Celsius; heating; cooling; freezing; melting; dissolve; soluble; solution; thermometer; energy; change of state; Water Cycle; evaporation; condensation; evaporate; condense; degrees</p>

**Application and Assessment Activity**

4. In solids, liquids or gases the particles behave in different ways. Fill in this table to describe how the particles behave in each one:

State of Matter	How do the particles behave?
Solid	
Liquid	
Gas	

3 marks

**Gases**

5. Joseph Priestley invented fizzy drinks by adding a gas he called 'heavy air'. What is the name of the gas now?

1 mark

6. This same gas that was called 'heavy air' can be cooled to a solid at -78°C, and it becomes a solid.

a) What is it called when it is a solid?

1 mark

b) What is it used for as a solid?

1 mark

10. Match the material to its melting point:

Material	Melting temperature
Ice	36°C
Gold	-219°C
Chocolate	0°C
Oxygen	1060°C

2 marks

**Thinking Deeper:**

- How do snowflakes form? Look at the different between ice forming and snowflakes forming. Look at the different types of snowflakes. The colder the clouds are, the more intricate the snowflakes.
- Can you walk on custard? Non-Newtonian Liquids

**Links to other subjects:**

- Subject Specific links – English – explanations, Maths tables and graphs
- Personal Development – working cooperatively in a team
- SMSC – create awe and wonder with the fact that the water on our planet today has been here for millions of years
- Cultural Capital – Understanding of how the world around us works and the importance of our finite supply of water.
- Careers – Scientist and inventor – Joseph Priestly
- British Values – understand that sometimes laws are passed about when and how much water can be used
- Equality – All children within the groups working together will have high expectations with regards to group investigation outcomes