

Science Project Overview Year 4 States of matter

<p><b>Subject Knowledge (PoS)</b> <b>Substantive knowledge</b></p> <ul style="list-style-type: none"> <li>• Materials can be grouped into solids, liquids and gases</li> <li>• Solids have a fixed shape and volume. Particles are closely packed and are rigid.</li> <li>• Liquids do not hold their shape it takes the shape of its container.</li> <li>• Gases have no fixed shape and no volume. All gases escape.</li> <li>• When heated materials can change state e.g. melting, cooking burning.</li> <li>• When cooled materials can change state e.g. freezing, setting.</li> <li>• Evaporation is when liquid turns into a gas.</li> <li>• Condensation changes from a gas to a liquid.</li> <li>• The water cycle describes how water evaporates from the surface of the earth, rises into the atmosphere, cools and condenses into rain, hail, sleet or snow and falls to the surface as precipitation.</li> </ul>	<p><b>Working Scientifically (PoS+Overview)</b> <b>Disciplinary knowledge</b></p> <p>During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:</p> <ul style="list-style-type: none"> <li>• ask their own questions about what they observe</li> <li>• Make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including: observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources.</li> <li>• asking relevant questions and using different types of scientific enquiries to answer them</li> <li>• setting up simple practical enquiries, comparative and fair tests</li> <li>• making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</li> <li>• gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</li> <li>• recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</li> <li>• reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</li> <li>• using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>• identifying differences, similarities or changes related to simple scientific ideas and processes</li> <li>• using straightforward scientific evidence to answer questions or to support their findings.</li> <li>• draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.</li> </ul>	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li>• Chocolate buttons,</li> <li>• straws,</li> <li>• feathers,</li> <li>• paper,</li> <li>• bucket,</li> <li>• chalk,</li> <li>• paintbrushes,</li> <li>• mirrors,</li> <li>• thermometers,</li> <li>• data loggers</li> </ul>
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<p><b>Previous learning:</b></p> <ul style="list-style-type: none"> <li>• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials)</li> <li>• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials)</li> <li>• Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials)</li> <li>• Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)</li> <li>• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)</li> <li>• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)</li> </ul>	<p><b>Preparing for learning:</b></p> <ul style="list-style-type: none"> <li>• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)</li> <li>• Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials)</li> <li>• Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials)</li> <li>• Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials)</li> <li>• Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials)</li> <li>• 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. (Y5 - Properties and changes of materials)</li> </ul>	<p><b>Bespoke to our school:</b></p> <p>A big emphasis is on the teaching of vocabulary and children are given lots of practical opportunities to support the understanding of evaporation, condensation, temperature and the water cycle.</p>
<p><b>Vocabulary:</b> air, boil, boiling point, carbon dioxide, carbon monoxide, change state, condense, condensation, cooled, cooling, crystals, degrees Celsius, dissolve, evaporate, evaporation, examples of solids / liquids / gases, filter, freeze, fuel, gas, grain/granular, heated/heating, helium, ice/water/steam, insoluble, liquid, melt, melting point, methane, mix, mixture, molten, natural gas, nitrogen, odour, oxygen, pour, powder, precipitation, properties, separate, sieve, solid, solidify, soluble, solution, states of matter, suspension, temperature, thermometer, transpiration, undissolved, water cycle, water vapour.</p>		
<p><b>Misconceptions:</b></p> <ul style="list-style-type: none"> <li>• 'solid' is another word for hard or opaque</li> <li>• solids are hard and cannot break or change shape easily and are often in one piece</li> <li>• substances made of very small particles like sugar or sand cannot be solids</li> <li>• particles in liquids are further apart than in solids and they take up more space</li> <li>• when air is pumped into balloons, they become lighter</li> <li>• water in different forms – steam, water, ice – are all different substances</li> <li>• all liquids boil at the same temperature as water (100 degrees)</li> <li>• melting, as a change of state, is the same as dissolving</li> <li>• steam is visible water vapour (only the condensing water droplets can be seen)</li> </ul>		

- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

**English Links:**

**Texts:**, Charlie and the Chocolate Factory (Roald Dahl)

Non Chronological Reports

**Maths links:**

**Statistics:**

Use bar charts and time graphs to present discrete/continuous data

Use bar charts, pictograms, tables and other graphs to solve comparison, sum and difference problems

**Measurements:**

Know how to measure and calculate the perimeter of rectilinear shapes (when looking at evaporation)

Solve problems using a different range of measures;

**History/Geography links:**

Why is the River Humber so important to local businesses? Link to water cycle and position of river in that cycle.

**Explorify links:**

[Top of the pops](#)

[Multiple liquid densities](#)

[Nifty naturals](#)

[Totally organic](#)

[Branching out](#)

[Water carriers](#)

[Ice lollies](#)

[How do smells travel?](#)

[What if water couldn't freeze? What if the sea was gloopy \(like ketchup\)?](#)

**Possible careers/jobs:**

Architect (designs buildings) Builder (builds structures) Chemical engineer (solves problems involving chemicals) Chemist (studies chemistry, can focus on a broad range of disciplines within chemistry), Geologist (studies the Earth and what it is made of, including rocks) , Materials scientist (researches structures and properties of materials) , Mechanical engineer (designs, analyses and manufactures mechanical systems)

