The Canons CE Primary School

Year 4 – States of Matter

Prior Learning

In EYFS children will be taught to:

- understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

In Year 1 children will be taught to:

- describe why certain materials are used for certain purposes e.g. bricks and houses
- group materials by their properties
- describe the similarities and differences between everyday materials
- describe the properties of everyday materials
- recognise objects and the materials they are made from
- identify and name everyday materials. *(Everyday materials)*

In Year 2 children will be taught to:

- squash, bend, twist and stretch certain objects and describe how the material makes the shape change
- recognise that certain objects can be made using different materials
- recognise that certain materials can be used for more than one purpose e.g. wood can be used for matches and floors
- identify the suitability of everyday materials for particular uses. *(Uses of everyday materials)*

In Year 4

In Year 4 children will be taught to:

- group materials by whether they are a solid, liquid or gas
- compare and describe solids, gases and liquids
- observe how materials change state when heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)
- use the terms evaporation and condensation when describing the water cycle.

Key Vocabulary

solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle

Future Learning

In Year 5 children will be taught to:

- explain that certain changes are irreversible and new materials can be formed e.g. burning
- demonstrate that dissolving, mixing and changing are reversible processes
- use evidence from their tests to decide how to use everyday materials effectively
- use their knowledge of solids, liquids and gases to decide how mixtures might be separated
- describe how to recover a substance from a solution
- recognise that some materials will dissolve in liquid to form a solution
- compare and group everyday materials on the basis of their properties e.g. hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets. *(Properties and changes of materials)*

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Famous Scientists	Common Misconceptions	Possible Evidence to be Secure
• Lord Kelvin – discovered absolute zero • Anders Celsius – Celsius temperature scale • Daniel Fahrenheit – Fahrenheit temperature scale, invention of thermometers • Alfred Barnhard Nobel (1833 - 1896)	Some children may think: • 'solid' is another word for hard or opaque • solids are hard and cannot break or change shape easily and are often in one piece • substances made of very small particles like sugar or sand cannot be solids • particles in liquids are further apart than in solids and they take up more space • when air is pumped into balloons, they become lighter • water in different forms – steam, water, ice – are all different substances • all liquids boil at the same temperature as water (100 degrees) • melting, as a change of state, is the same as dissolving • steam is visible water vapour (only the condensing water droplets can be seen) • 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.	Children can: • create a concept map, including arrows linking the key vocabulary • name properties of solids, liquids and gases • give everyday examples of melting and freezing • give everyday examples of evaporation and condensation • describe the water cycle.

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Working Scientifically

National Curriculum Statutory Requirements

1. Ask relevant questions and use different types of scientific enquiries to answer them.
2. Set up simple practical enquiries, comparative and fair tests.
3. Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.
4. Gather, record, classify and present data in a variety of ways to help in answering questions.
5. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.
6. Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
7. Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.
8. Identify differences, similarities or changes related to simple scientific ideas and processes.
9. Use straightforward scientific evidence to answer questions or to support their findings.

Highlighted = main focus during this topic

Teaching Ideas – Different Types of Scientific Enquiry

Comparative and Fair Testing	Identifying and Classifying	Observation Over Time	Pattern Seeking	Research
Does seawater evaporate quicker than fresh water? How does the mass of a block of ice affect how long it takes to melt? How does the surface area of a container of water affect how long it takes to evaporate?	Can you group these materials and objects into solids, liquids, and gases?	How does the level of water in a glass change when left on the windowsill? How does the mass of an ice cube change over time?	Is there a pattern in how long it takes different sized ice lollies to melt?	What are hurricanes, and why do they happen?

Teaching Ideas – How Pupils Could Work Scientifically

(Bracketed Number = National Curriculum Statutory Requirement Link)

- Observe closely and classify a range of solids. Observe closely and classify a range of liquids. (3)
- Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. (2)
- Classify materials according to whether they are solids, liquids and gases. (4)
- Observe a range of materials melting e.g. ice, chocolate, butter. (3)
- Investigate how to melt ice more quickly. (2)
- Observe the changes when making rocky road cakes or ice-cream. (3)
- Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. (2)
- Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. (2)
- Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration). (3)
- Observe water evaporating and condensing e.g. on cups of icy water and hot water. (3)
- Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. (2)
- Use secondary sources to find out about the water cycle. (6, 9)

Teaching Ideas – Possible Evidence to be Secure

Children can:

- give reasons to justify why something is a solid liquid or gas (9)
- give examples of things that melt/freeze and how their melting points vary (9)
- give the melting points of some materials from their observations (6, 7)
- explain what affects how quickly a solid melts, using their data (6, 8)
- measure temperatures using a thermometer (3)
- explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup (9)
- explain how to speed up or slow down evaporation, from their data (6, 7)
- present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet (6)