

Science

Year 4 - Summer 1 – States of Matter

National Curriculum / End Point Statement

States of Matter

- 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

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings

Step 1 <i>(Teach Science unit so that the Water Cycle is taught before Rivers learning in Geography)</i>	Step 2	Step 3	Step 4	Step 5 (TAPS)	Step 6
Reactivation of previous knowledge – Materials, year 1, 2 and 3. WALT identify solids, liquids and gases	WALT compare and group materials based on whether they are a solid, a liquid or a gas.	WALT observe that some materials change state when cooled or heated	WALT describe the processes of the Water Cycle	WALT set up a fair test (evaporation over time)	WALT measure the temperature at which some materials change state
In Focus - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/white-crystals	In Focus - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/spring-clean	In Focus - https://explorify.wellcome.ac.uk/en/activities/whats-going-on/top-of-the-pops	In Focus - https://explorify.wellcome.ac.uk/en/activities/what-if/water-couldnt-freeze	In Focus - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/glowing-depths	In Focus - https://explorify.wellcome.ac.uk/en/activities/mission-survive/ice-lollies

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Success Criteria					
<p>I know what a solid is I know what a liquid is I know what a gas is I can give examples of all three I can explain the difference between all 3</p>	<p>I can sort everyday items into solids, liquids and gases I can explain how I have sorted the everyday objects I can present data in a variety of ways to answer a question I can use simple, scientific language to explain my findings</p>	<p>I can explain what happens to a solid when it is heated (ice) I can explain what happens to a liquid when it is cooled (water) I can explain what happens to a gas when it is cooled (breath on a cold surface) I can gather evidence in a table or graph</p>	<p>I know what evaporation is I know what condensation is I can explain what precipitation is I can explain the main stages of the Water Cycle</p>	<p>I can set up a fair test I can explain what needs to stay the same I can explain what I am going to measure I can use data to answer a question</p>	<p>I can observe closely I can measure the temperature I can report back on my findings</p>
Suggested Outcome					
<p>Use balloons filled with ice, water and air to demonstrate and discuss the properties.</p>	<p>Children should sort everyday items into the categories according to what they are at room temperature. Venn Diagrams, sorting hoops etc</p>	<p>Place items into transparent bags and drop them into various temperatures of water. Children can record results and the conclusion.</p>	<p>Children use a transparent bag to recreate the processes of the Water Cycle</p>	<p>Children plan a fair test and discuss the variables that will remain the same and the variables that could change. They record their conclusion based on the data.</p>	<p>Children investigate the temperature that chocolate melts and the temperature that ice cream freezes</p>

Vocabulary	NC links
<p>Solid, liquid, gas, Evaporation, condensation, precipitation, collection, vapour, temperature, heated, cooled, Celsius, melt, react, particles</p>	<p>DT Geography Water Cycle Yr4. Yr 3 Science - Rocks and metals can melt but at VERY high temperatures (in preparation for earthquake and volcano work in Yr5)</p>

Key Learning
<p>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.</p> <p>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.</p> <p>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.</p>

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Possible Evidence	Common Misconceptions
<ul style="list-style-type: none">• Can create a concept map, including arrows linking the key vocabulary• Can name properties of solids, liquids and gases• Can give everyday examples of melting and freezing• Can give everyday examples of evaporation and condensation• Can describe the water cycle• Can give reasons to justify why something is a solid liquid or gas• Can give examples of things that melt/freeze and how their melting points vary• From their observations, can give the melting points of some materials• Using their data, can explain what affects how quickly a solid melts• Can measure temperatures using a thermometer• Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup• From their data, can explain how to speed up or slow down evaporation• Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet	<p>Some children may think:</p> <ul style="list-style-type: none">• '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.
Notable Scientists	
Anders Celsius Daniel Fahrenheit Lord Kelvin (discovered absolute zero) George Washington-Carver (chemist) Joseph Priestly (discovered oxygen)	
CPD opportunity	
https://www.reachoutcpd.com/courses/upper-primary/states-of-matter/	
Useful Links	
<ul style="list-style-type: none">• https://central.espresso.co.uk/espresso/modules/curriculum_browse/index.html?subject=nc2014:classification:862733&grade=y4• https://www.bbc.co.uk/teach/class-clips-video/geography-ks1-ks2-the-water-cycle/zbcmxyc• https://www.bbc.co.uk/bitesize/topics/zkqg87h	

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Materials

Early learning goal	<ul style="list-style-type: none">• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.
Year 1	<ul style="list-style-type: none">• Distinguish between an object and the material from which it is made.• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.• Describe the simple physical properties of a variety of everyday materials.• Compare and group together a variety of everyday materials on the basis of their simple physical properties.
Year 2	<ul style="list-style-type: none">• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.
Year 3	<ul style="list-style-type: none">• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Y3 - Rocks)• Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks)• Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets)