

National Curriculum Objectives:

(Statutory Requirements)

- a) compare and group materials together, according to whether they are solids, liquids or gases
- b) 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)
- c) identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature

Experimental and investigative work focuses on:

Planning an investigation:	Obtaining and evaluating evidence:
<ul style="list-style-type: none"> 1. Asking relevant questions and using different types of scientific enquiries to answer them. 2. Setting up simple practical enquiries, comparative and fair tests. 	<ul style="list-style-type: none"> 3. Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment. 4. Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. 5. Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. 6. Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions 7. Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. 8. Identifying differences, similarities or changes related to simple scientific ideas and processes. 9. Using straightforward scientific evidence to answer questions or to support their findings.

Most children will:

- Describe the properties of solids, liquids and gases.
- Explain that melting and freezing are opposite processes that change the state of a material.
- Identify the melting and freezing point of several different materials.
- Explain that heating causes evaporation and cooling causes condensation.
- Explain that evaporation and condensation are opposite processes that change the state of a material.
- Explain that the higher the temperature, the quicker water evaporates.
- Explain what happens to water at the different stages of the water cycle.

Some will progress less and will:

- Sort materials into solids, liquids and gases.
- Explain that heating causes melting, and cooling causes freezing.
- Identify the melting and freezing point of water.
- Describe evaporation and condensation using practical examples.
- Describe the effect of temperature on evaporation referring to their investigation.
- Identify the stages of the water cycle.

Others will progress further and will also:

- Explain the behaviour of the particles in solids, liquids and gases.
- Explain how heating and cooling causes materials to melt and freeze.

- Explain why a material's melting and freezing point is the same temperature.
- Explain how heating and cooling can cause materials to evaporate and condense.
- Explain why a higher temperature will speed up evaporation.
- Use the water cycle to explain why the water we have on Earth today is the same water that has been here for millions of years.

Key vocabulary:

New: Solid, liquid, gas, particles, state, material, properties.

Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
1	<p>To compare and group materials together, according to whether they are solids, liquids or gases by sorting and describing materials into solids, liquids and gases.</p> <p>Assessment: A,1</p>	<p>Give the children a selection of materials (e.g. water, milk, wool, clay, cardboard, rocks, fabric, pebble, metal, plastic, paper, a picture of a cloud, cream, a picture of steam, a blown up balloon, oxygen). Ask them to sort them into solid, liquid or gases on sugar paper. Ask them to annotate the sugar paper with adjectives to describe. Photograph for evidence. Show them the flipchart page on solids, liquids and gases. Point out and explain the trickier materials: honey is a liquid even though it is viscous; a sponge is a solid, but the spaces inside the sponge are full of air, which is a gas; and the bubbles are a thin film of soapy water (liquid) surrounding air (gas). Ask HA children to feedback on the words they thought of to describe the materials and states. Explain the properties of solids, liquids and gases</p>	<p>Give the children the properties of different states and ask them to sort them into whether they think they are solids, liquids or gases. Stick into their books. Show them the flipchart pages about particles. Show them the video clip http://www.bbc.co.uk/education/clips/zpbvr82 about particles. Give out the particle information cards to groups (x3) and ask them to prepare their demonstration to show to the rest of the class. Ask them to explain to the rest of the class what is happening.</p> <p>Children to write an explanation of each type of material (solids, liquids and gases) in their books. They can use diagrams and words to explain each material.</p> <p>Show the children the video clip http://www.bbc.co.uk/education/clips/zrdkjsx Pause the film at various points to show the children the different states of matter.</p>	<p>Can children sort materials into solids, liquids or Gases? Can you describe the properties of solids, liquids and gases? Can you show the difference between the particles in solids, liquids and gases?</p>	<p>Flipchart Materials Particle information cards Properties of different states cards</p>
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2	<p>To compare and group materials together, according to whether they are solids, liquids or gases by investigating uses and their uses.</p> <p>Assessment: a, 1, 2,3, 7</p>	<p>Place a clear bottle of fizzy drink (lemonade) on each table. Children identify the materials they can see (bottle – solid, lemonade – liquid and bubbles – gas), as well as their states.</p> <p>Explain using the flipchart how all three states can be seen in the fizzy drink bottle.</p> <p>Look more closely at the bubbles in the fizzy drink. Children discuss the questions on the flipchart.</p>	<p>Show this film http://www.bbc.co.uk/education/clips/zcbygk7 to introduce Joseph Priestley, the scientist who discovered carbon dioxide and invented fizzy drinks.</p> <p>Bubbles of Gas: Discuss further uses of carbon dioxide using the information on the flipchart.</p> <p>Do Gases Weigh Anything? Show children the concept cartoon on the flipchart and ask them to talk to a partner about which child they agree with and why. Show this film http://www.bbc.co.uk/education/clips/zhbygk7 to watch an investigation to find out whether gases weigh anything. Discuss the conclusion of the investigation and ensure that children understand that gases do have mass and do weigh something. Ask them to write an explanation into their books.</p> <p>Explain the context and method of the investigation to the children using the flipchER. Ensure that they understand how to find the weight of the carbon dioxide present in each drink. Children complete predictions, method and then write a conclusion using the questions on the flipchart.</p>	<p>Children decide if the statements on the flipchart are true or false (remove each one for the answer).</p>	<p>Flipchart, Table of results (LA) Lemonade bottle per group 3-5 different drinks per table Digital weighing scales Beakers or plastic cups.</p>

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3	To 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) by investigating how heating and cooling can change a material's state.	What Makes Materials Change State? Ask the children to choose the correct labels for the diagram on the flipchart. Explain the processes of melting and freezing, and how a material's particles behave when they change state using the information and diagrams on the flipchart. Address any misconceptions or issues.	Melting and Freezing Points: Explain freezing and melting points, using the diagram on the Lesson Presentation to illustrate this concept. Melting and Freezing Points: Children match materials with their melting and freezing points using the Melting and Freezing Points Activity Sheet. Reveal the answers using the Lesson Presentation. Melting Chocolate: Introduce the context for the investigation using the Lesson Presentation. Model the investigation by placing a square of chocolate in three different foil tins, and then floating the tins on trays of water, each of which has a different temperature. State that they will observe how long it takes the chocolate at each temperature to melt. Children should plan their investigation and make a prediction on their differentiated Melting Chocolate Investigation Activity Sheet and then conduct the investigation. Look for children who have a good understanding of how materials change state by heating and cooling.	Do they understand that heat can cause solids to change to liquids and vice versa. Can they identify materials that melt at different temperatures? Can they investigate the melting and freezing temperature of a materials.	Thermometers Foil tins Chocolate Three trays per group (each tray filled with a different temp of water approx. 5, 30 and 40 degrees) Stop watches
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4	To 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) by exploring how water can change its state to a solid, liquid or a	The Three States of Water: Children work in groups to find answers to the questions on their Three States of Water Questions Activity Sheet. Place the eight Three States of Water Answer Cards at the front of the classroom. Each group should choose one child to come to the front to choose an answer card, then bring it back to their group. The group should work together to decide which question it answers, then write the answer card's letter next to the question. Finally, they choose a different group member to take the answer card back and swap it for a new one.	Play the BBC schools game http://www.bbc.co.uk/schools/scienceclips/ages/9_10/changing_state.shtml On changing states. Exploring the Processes: Explain and clarify the children's understanding of the process of melting, freezing, evaporation and condensation using the diagram on the flipchart Ice Cube Investigation, Reversing Changes and Salt and Ice: Organise the children into groups. The children should draw and label their observations on their differentiated Changing State Activity Sheet as they work through the carousel of activities as described on the flipchart. Look for children who can identify the different states that the water is in, and who can explain the processes that change the state of the water.	I can identify the different states water can be in. I can identify the temperatures at which water changes state. I can identify and observe the processes that cause water to change state.	Changing State Game Container of warm water with cling film stretched over it (warm water may need to be replenished as groups move round the activities) Ice cubes Kettle Plate Beakers Teaspoon Salt

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	gas.	They should continue until they have matched all the answers with their questions.			
5	To associate the rate of evaporation with temperature by investigating the effect of temperature on drying washing. To make systematic, careful and accurate observations and measurements and report on findings from enquiries by displaying results and conclusions by investigating the effect of temperature on drying washing.	How Do Wet Clothes Dry? Recap the process of evaporation using the diagram on the Lesson Presentation. Explain that evaporation is responsible for the fact that clothes dry when you hang them on a washing line. Children read the Evaporation Statements stuck around the room, and think about whether they disagree or agree with each one. They can write their thoughts and ideas around the statements. Share the answer using the flipchart and address any misconceptions.	Does the Temperature Affect How Fast Towels Dry? Introduce the investigation. Ensure that children understand that when the towels dry, the water will evaporate from them. Describe the equipment the children will have access to. Encourage the children to think about the points on the flipchart. If necessary, point out the measuring jug and suggest they pour the same amount of water over each towel, or soak each towel in the same amount of water. You may want to point out the scales, and suggest they weigh the wet towels at the start, and then weigh them again at the end. The difference between the two weights will show how much water has evaporated from each towel. Ask the children to plan their investigation using their differentiated Evaporation Investigation Activity Sheet. Look for children who can plan and carry out their investigation accurately. Finding the Answer: Children carry out the investigation and record their results on their differentiated Evaporation Investigation Activity Sheet. Displaying Your Conclusions: Ask the children to look at their results. They should describe their results and come to a conclusion using their differentiated Washing Line Conclusions Activity Sheet. This sheet is designed for display, allowing the children to share their thoughts with others. Look for children who can describe and explain the effect of temperature on evaporation in the context of drying washing.	I can explain the effect of temperature on the process of evaporation. I can plan and carry out a comparative test using equipment accurately and display my results.	Tea towels - 3 per group Water and measuring jugs - 1 per group Weighing scales - 1 set per group Three washing lines and pegs Thermometers - 1 per group Clock Access to places in different temperatures, where the washing lines can be set up
6	To identify the part played by evaporation and condensation in the water cycle by creating a model of the	What Is the Water Cycle? Ask the children to watch the film of the water cycle and listen out for the answers to the questions on the flipchart. Play the film again if the children need another opportunity to hear the	The Stages of the Water Cycle: Use the diagrams and information on the flipchart to explain the four stages of the water cycle: evaporation, condensation, precipitation and collection. Ensure children understand that the water changes state as a result of these processes. Address any misconceptions. Mini Water Worlds: Ask the children to work in pairs to make mini water worlds using the Mini Water Worlds Activity Sheet. Children will be able to view evaporation, condensation and precipitation in action over the next few days. You could take photos of the water worlds as they develop, and stick the printed photos into the children's books.	I can describe the different stages of the water cycle. I can explain the role of evaporation and condensation in the water cycle	The Water Cycle clip Clear plastic cup - 1 per pair Compost Cress seeds Cling film

	water cycle.	relevant information. Reveal the answers using the flipchart	Water Wheel: Children use the differentiated Water Wheel Activity Sheet to create an interactive model of the water cycle. Look for children who know the stages of the water cycle and can explain what happens at each stage.		
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