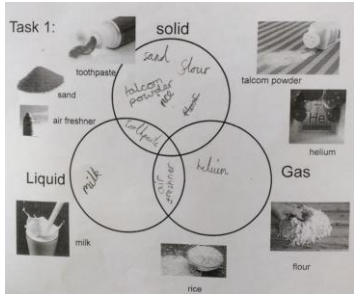




Hartford Primary School

YEAR GROUP	4	SUBJECT	Science	TERM	Autumn – State of Matter
National Curriculum Statements	<ul style="list-style-type: none">compare and group materials together, according to whether they are solids, liquids or gasesobserve 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.				
Prior Learning (What should they already know)	<ul style="list-style-type: none">Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants)Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans)Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans)Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)				
Misconceptions	<ul style="list-style-type: none">‘solid’ is another word for hard or opaquesolids are hard and cannot break or change shape easily and are often in one piecesubstances made of very small particles like sugar or sand cannot be solidsparticles in liquids are further apart than in solids and they take up more spacewhen air is pumped into balloons, they become lighterwater in different forms – steam, water, ice – are all different substancesall liquids boil at the same temperature as water (100 degrees)melting, as a change of state, is the same as dissolvingsteam is visible water vapour (only the condensing water droplets can be seen)clouds are made of water vapour or steamthe substance on windows etc. is condensation rather than waterthe changing states of water (illustrated by the water cycle) are irreversibleevaporating or boiling water makes it vanishevaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.				
RETRIEVAL VOCABULARY	object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, opaque, transparent and translucent, reflective, non-reflective, flexible, rigid			NEW VOCABULARY	solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle

	Essential Learning for this lesson	Suggested teaching tasks/approaches	New Knowledge – What I'm leaving the lesson with
LESSON 1	I can compare and group materials together, according to whether they are solids, liquids or gases (using explanations such as: solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container).	<p>Identify properties of liquids, gases and solids.</p> <p>Children explore 'what is a solid, liquid or gas?' – by putting different things in containers, squeezing/compressing objects such as sponge, playdough, foam ball, wooden block, water, coloured squash, washing up liquid, honey, inflated balloon, sealed plastic bottle, bubble wrap, air in syringe to show compression etc.</p> <p>Link this activity to 'PLAN examples of work Venn diagram' activity:</p>  <p>Begin to understand why solids and liquids behave differently by looking at a simple explanation of how particles are arranged in each. Act out particles game, teacher to shout solid, liquid or gas and children spread themselves out as the particles. Extend by shouting out or holding up objects for children to decide which is which.</p>	<ul style="list-style-type: none"> • All materials are made of particles • Solids keep their shape, liquids flow and take the shape of their container, gases spread out to fill the space available • Solids, liquids, and gases can be identified by observing their properties • Materials like sand, rice, or jelly may confuse children – explain how they behave overall (sand is a collection of solid grains).
LESSON 2	I can observe that some materials change state when they are heated.	<p>Show the children an ice cube – discuss what state of matter it is and what will happen if it is left on the table or in hands. Introduce concept of melting and that this is the process of a material changing state when heated.</p> <p>Introduce skill of taking measurements with thermometer – (activity from TAPS) Ask children to put one hand in cold and one hand in warm water, then put both in tap water. What do you think the temperature of</p>	<ul style="list-style-type: none"> • Melting is a change of state from solid to liquid caused by heating. • Thermometers are tools for measuring temperature (usually in degrees Celsius). • How to use thermometers accurately (avoid touching surfaces, read at eye level).

		<p>the water is for this hand, for that hand? How accurate is your hand? Need a thermometer.</p> <p>Demonstrate accurate reading: keeping thermometer in the water, head down to the level, explain how to use the scale, how to estimate numbers between lines and what accuracy to aim for (e.g to nearest 1 or 5 degrees C.)</p> <p>Investigation - melting chocolate in pie dishes in a tray of warm water. Measure temperature of water with thermometers to record in table when they melt. Compare milk, dark, and white chocolate.</p> <p>http://www.stpetersbrayblog.com/2019/04/29/melting-chocolate-experiment-stem-fourth-class/</p>	
LESSON 3	I can observe that some materials change state when they are heated and measure (for water/ice below 50°C)	<p>Recap temperatures recorded last lesson, was it different for the different chocolate types? Introduce idea of melting points and that different materials will melt at different temperatures, link to water and that it freezes to become ice at 0 degrees Celsius and so it will melt back to water at anything above this.</p> <p>Comparative test from PLAN examples of work: Overnight prior to the lesson freeze different liquids in ice cube trays (enough for children to have one per group) – observe states at 0 degrees Celsius (some may still be liquid). Children predict either temperatures of the melting points for the different materials or the order that they will melt in. Observe how they melt. Take temperatures with thermometers when liquid and record measurements in table to show what temperature they have melted at.</p>	<ul style="list-style-type: none"> • Different materials melt at different temperatures. • Melting point of ice is 0°C • Not all solids melt at 0°C – chocolate, butter, etc. melt at different (and lower) temperatures than water-based ice.
LESSON 4	I can observe that some materials change state when they are cooled.	<p>Teacher to demonstrate the process of melting chocolate using induction hob highlighting the change of state as it goes from a solid to a liquid again to recap.</p> <p>Children to make crispy cakes and observe as the liquid chocolate hardens into a solid when cooled. Ensure that children are clear that this process is freezing as a common misconception is that only water freezes because it feels much colder than solid chocolate does.</p>	<ul style="list-style-type: none"> • Freezing is the reverse of melting – liquid to solid. • Cooling removes energy, causing particles to slow and settle into a fixed structure. • Freezing is the change of state of a liquid to a solid – it does not mean 'cold'!
LESSON 5	I know that some materials change state when they are heated or	Show a cold drink bottle or glass from the fridge. Ask: Why is there water on the outside? Discuss misconceptions (e.g., "the water is leaking").	<ul style="list-style-type: none"> • Condensation is the process where water vapour (gas) cools and turns back into liquid water.

	<p>cooled and can research (for water above 50°C) the temperature at which this happens in °C.</p>	<p>Set up a condensation station: Place metal tins or glasses filled with ice water around the room. Have students observe and record what happens on the outside of the containers. Use magnifying glasses to look at water droplets forming. Try placing cling film over a bowl of hot water and placing ice cubes on top. Watch condensation form on the underside of the film and drip back down—like rain!</p> <p>Link to the water cycle and real-life examples (bathroom mirrors, windows, glasses).</p> <p>Children draw and label a diagram showing condensation and explain it using key vocabulary.</p>	<ul style="list-style-type: none"> • Condensation happens when warm, moist air touches a cooler surface (e.g. windows, cold drink bottles). • Water droplets that form on surfaces are not from inside the object—they come from the air. • Condensation is a key part of the water cycle and happens naturally in many everyday situations.
LESSON 6	<p>I know that some materials change state when they are heated or cooled and can research (for water above 50°C) the temperature at which this happens in °C.</p> <p>I know that you can speed up the rate of evaporation by increasing the heat.</p>	<p>Recap the different states of matter, the water cycle and condensation and evaporation.</p> <p>Investigate if the rate of evaporation can be sped up. In groups, children are given small pieces of wet fabric (or paper towels) and must design an experiment to test how to dry them the fastest.</p> <p>Possible variables they could explore: Location (sunny window, near a heater, in a cupboard) Air movement (fan vs. still air) Surface area (spread out vs. folded) Material (cotton vs. synthetic, if available)</p> <p>Equipment: thermometers, timers, fans, pegs, string, trays, etc.</p> <p>Children set up their drying stations and record how long it takes for the fabric to dry. They observe and measure temperature where possible.</p> <p>Each group presents their method and results. Discuss: What helped the water evaporate faster? Why? Link back to key vocabulary including evaporation.</p>	<ul style="list-style-type: none"> • Evaporation is the process where liquid water turns into water vapour (gas). • The rate of evaporation increases with: <ul style="list-style-type: none"> ○ Higher temperature ○ Greater air movement (e.g. wind or fans) ○ Larger surface area (e.g. spreading out fabric) • Evaporation happens at the surface of a liquid and does not require boiling. • Understanding evaporation helps solve real-world problems like drying clothes quickly.

LESSON 7	I can identify the role of evaporation and condensation in the water cycle.	<p>Teacher demonstrate how water changes state using a pan and induction hob with creating steam and showing water on pan lid. Ask what will happen when the water on the lid drips down into the pan and heats up again?</p> <p>Introduce the water cycle and the terms evaporation and condensation.</p> <p>Puddle experiment - Children go out onto playground and find a puddle, draw around with it chalk and take the temperature of water and outdoor temperature, observing changes throughout the day and recording temperatures as a class. (Wet handprint on paper towels and observe it dry if wrong weather conditions).</p> <p>Children to create their own 'water cycle in a bag' in groups to tape onto windows. Observe changes overtime throughout the week (ideally same time every day) and revisit next lesson. Throughout the week draw attention to the weather to prompt children to begin to build links that they might observe differences on a warmer/sunnier day as opposed to a cooler/cloudier day - a room thermometer on window would be a great enhancement.</p>	<ul style="list-style-type: none"> • Melting point of ice is 0°C; boiling point of water is 100°C. • Evaporation is when liquid water turns into water vapour (gas). • Condensation is when water vapour cools and turns back into liquid. • Water constantly changes state in nature. • Evaporation can happen below boiling point. • Condensation often happens on cool surfaces (e.g. windows, drink bottles). • Water vapour is invisible – steam is tiny droplets of water.
LESSON 8	I can identify the role of evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	<p>Check status of water cycle in a bag on windows and discuss the changes you have observed across the week. Children to draw and label diagram of water cycle in books and write their own explanation of how it works using key vocabulary: heats/heated, evaporates/evaporation, cools/cooled and condenses/condensation.</p> <p>Show the children a shallow dish of water – we want this water to evaporate, where should we put it? Does it matter? Will it evaporate better/quicker in some places rather than others?</p> <p>Set up investigation to again observe changes throughout the week, place several shallow containers (same) with a small, equal amount of water and place in different places around the room, identifying warm places and cool places. Place with a thermometer next to each water dish. Observe changes overtime throughout the week (ideally same time every day) are some evaporating quicker than others? Have any</p>	<ul style="list-style-type: none"> • Heat speeds up evaporation. • Rate of evaporation depends on temperature, surface area, air movement. • Evaporation happens at the surface of the liquid. • Evaporation is a surface phenomenon, not like boiling. • More energy (heat) means faster-moving particles, leading to quicker escape as vapour.

		completely evaporated yet? Is it the ones in warmer places, etc. Check thermometer temperatures and record as a class.	
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Helpful resources to reference	
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