

Subject: Science
Year group: 4
Term: Autumn
Unit name: Materials- States of matter

Prior Knowledge - Distinguish between an object and the material from which it is made. (Y1 - Everyday materials). Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials)
Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials). Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials. 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). 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)

Scientific enquiry

Classifying	Based on the children's own criteria: ▪ classify solids (including grains, crystals, powders: physical properties) ▪ classify liquids.
Observing over time	Watch ice melt (ice hands). Watch hand prints dry e.g. water hand prints on coloured paper towel. Watch frozen liquids melt.
Pattern seeking	Not relevant
Comparative/fair testing	What affects the melting rate of chocolate (size of pieces, temperature of water, type of chocolate)? What affects the rate an 'ice pole' melts? What affects the rate of evaporation? Test the 'runniness' of liquids.
Researching	Research the melting point of metals. Research the water cycle. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT, etc.)

National curriculum:

- 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

Key vocabulary

Solid	melting point boiling point evaporation temperature water cycle
Liquid	
Gas	
state change	
melting	
freezing	

Spiritual Development *Isaiah 43:19*

"See, I am doing a new thing! Now it springs up; do you not perceive it? I am making a way in the wilderness and streams in the wasteland."

Assessment for Learning

Recapping prior knowledge- beginning of unit- what do children already know?

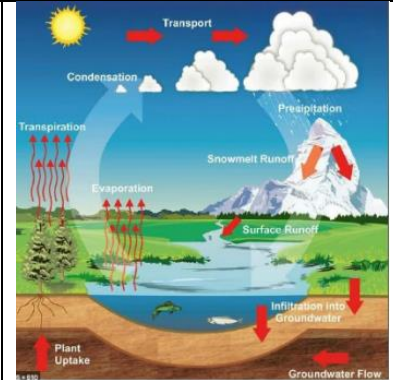
Beginning of each lesson- focus on recall of previous learning (quick quizzes)

Key Learning- what will the children know by the end of the unit?

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. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0oC. 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 100oC. 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. 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.

To answer the question: what is a particle?	Particles are what materials are made from. They are so small that we cannot see them with our eyes. The properties of a substance depend on what its particles are like, how they move and how they are arranged Particles behave differently in solids, liquids and gases.
To answer the question: what is a solid?	In the solid state, the material holds its shape. Solids have vibrating particles which are closely packed in and form a regular pattern. This explains the fixed shape of a solid and why it can't poured. Solids always take up the same amount of space.
To answer the question: what is a liquid?	In the liquid state, the material holds the shape of the container it is in. This means that liquids can change shape, depending on the container. Liquids have particles which are close together but random. Liquid particles can move over each other. Liquids can be poured.
To answer the question: what is a gas?	In the gas state, particles can escape from open containers. Gases have particles which are spread out and move in all directions.
To answer the question: what happens to the particles in water when it is heated or cooled?	When water (in its liquid form) is heated, the particles start to move faster and faster until they have enough energy to move about more freely. The water has evaporated into a water vapour. When water is cooled, the particles start to slow down until a solid structure (ice) is formed. The water has frozen. The temperature at which water turns to ice is called the freezing point. This happens at 0o C.

To understand the water cycle.



Activity Ideas

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