

ST.HUGH'S CATHOLIC PRIMARY – SCIENCE MEDIUM TERM PLANNING - KEYSTAGE 2



Materials

Year 3/4 - Year B	Year 5/6 - Year A
<p>Forces and Magnets</p> <p><i>Pupils should be taught to:</i></p> <ul style="list-style-type: none"> ♣ 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 	<p>Properties and changes of materials.</p> <p><i>Pupils should be taught to:</i></p> <ul style="list-style-type: none"> ♣ compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. ♣ know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution ♣ use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating ♣ give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic ♣ demonstrate that dissolving, mixing and changes of state are reversible changes ♣ explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.
<p>Prior Learning : KS 1</p> <ul style="list-style-type: none"> • 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) 	<p>Future Learning: KS 3</p> <ul style="list-style-type: none"> • Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations. (KS3) • Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/alkalinity; and indicators. (KS3)

<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. (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) 	
<p>Key Vocabulary</p> <p>Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle</p>	<p>Key Vocabulary</p> <p>Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material</p>
<p>Common Misconceptions</p> <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) 	<p>Common Misconceptions</p> <p>Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.

LEARNING CHALLENGES AND ACTIVITIES

What is the difference between a solid and a liquid?

Children will identify and group a variety of objects based on whether they are a solid or liquid. They then need to consider the structure and properties of each, looking at particles and how they are different in each state of matter.

The rice will pour like a liquid so why isn't it a liquid?

Get the children to handle the rice as this will help to clarify that some solids made of small particles can be poured, but this does not make them a liquid. How many grains of rice do they have? Then pour the grains of rice from one person's hand to another. Can you still pour the rice if you only have one grain?

Observing and classifying

Key Learning

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.

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.

How can materials be grouped according to their properties?

Children will need to understand the term "property" and will explore the following properties: magnetic, reflective, transparent, translucent, absorbent, permeable, flexible, hard, electrical conductor, thermal conductor.

What are the properties of liquids?

Following on from the first lesson children to explore liquids in more depth.

Fill a variety of different shaped containers of different height and width with the same volume of liquid. Children to observe how the level of the liquid changes in each container. Why?

Observe what happens when the containers are tilted. What happens if the liquid is tipped out onto a surface?

How do the properties of materials make them suitable for different uses?

Children are challenged to think about the properties they have studied and everyday objects around them. They have the opportunity to carry out their own investigation to help them decide which material would be most suited for a certain purpose.

<p>Observing</p> <p>Key Learning 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.</p>	
<p>What are the properties of gases?</p> <p>Children build on the first lesson by investigating the properties of a gas, again looking at the behaviour of particles. They will investigate the weight of a gas and look at uses of gases.</p> <p>Possible activities:</p> <ul style="list-style-type: none"> - yeast to produce carbon dioxide. Catch the gas using a balloon over a measuring cylinder. - What happens if a balloon is heated? (See concept cartoon). - What happens to the weight of lemonade if the top is left off? (See concept cartoon). - Raisin in lemonade <p>Observing. Making predictions, drawing conclusions</p> <p>Key Learning A gas fills all available space; it has no fixed shape or volume.</p>	<p>What happens when different solids and liquids are mixed?</p> <p>Children will need to understand the terms dissolve, soluble, insoluble, solution and suspension.</p>
<p>What causes materials to change state?</p> <p>Melting: Observe a range of materials melting e.g. ice, chocolate, butter. Start with initial observations of a variety of solids and liquids at room temperature. Include solids which melt at room temperature.</p> <p>Children then need to investigate the melting points of different materials e.g. ice, margarine, butter and chocolate.</p> <p>Freezing: Explore freezing different liquids e.g. tomato ketchup, oil, shampoo.</p> <p>Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water.</p>	<p>How does temperature affect the rate at which sugar dissolves in water?</p> <p>Independent investigation: explore factors affecting sugar dissolving.</p>

<p>Investigation: How can we make ice melt more quickly?</p> <p>Key Learning 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.</p>	
<p>What is evaporation?</p> <p>Demonstration – watch a kettle boiling and measure the temperature of the water.</p> <p>Children explore further examples of the process of evaporation through observing everyday liquids e.g. perfume, nail varnish remover, puddles drying, clothes drying on a washing line.</p> <p>Investigation to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers.</p> <p>Key Learning 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.</p> <p>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.</p>	<p>How can mixtures of different materials be separated?</p> <p>The lesson will consist of three parts:</p> <p>Separating mixtures of solids and solids (sieving and the use of magnets).</p> <p>Separating mixtures liquids and liquids (decanting) Separating mixtures of solids and liquids (filtering and evaporation)</p> <p>Throughout this section, children need to be made aware that these changes are reversible. Children need to be familiar with this language.</p>
<p>What is condensation?</p> <p>Children use everyday examples to explore the process of condensation. e.g. Observe water evaporating and condensing on cups of icy water and hot water.</p> <p>Key Learning Condensation is the change back from a gas to a liquid caused by cooling.</p>	<p>Can you always separate a mixture of two materials?</p> <p>Children will explore irreversible changes and understand that these result in the formation of new changes. Examples include burning or adding vinegar to bicarbonate of soda.</p> <p>Children need to be familiar with the language “irreversible changes”.</p>

By the end of this section children need to understand the following:

+heat \longrightarrow solid-liquid-gas

-heat \longleftarrow gas – liquid - solid

What part does evaporation and condensation play in the water cycle?

Use **secondary sources** to find out about the Water Cycle.

Geography links:

The water cycle is picked up in the UKS2 Rivers topic (Geography).

The focus in Science LS2 needs to be on the changes in state for water, not the additional geographical vocabulary (e.g. run off).

Key Learning

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 called the water cycle.

Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat.

- Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate.
- Investigate rates of dissolving by carrying out comparative and fair test. Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture.
- Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning.

	<ul style="list-style-type: none"> • Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced? • Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton).
	<p>Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.</p> <p>Mixtures can be separated by filtering, sieving and evaporation.</p> <p>Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.</p>
<p>Assessment: show understanding of a concept using scientific vocabulary correctly Possible evidence:</p>	
<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 	<ul style="list-style-type: none"> • Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings • Can explain what dissolving means, giving examples • Can name equipment used for filtering and sieving • Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving • Can describe some simple reversible and non-reversible changes to materials, giving examples
<p>Assessment: apply knowledge in familiar related contexts, including a range of enquiries Possible evidence:</p>	
<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Can create a chart or table grouping/comparing everyday materials by different properties • Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose

- 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

- Can group solids based on their observations when mixing them with water
- Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water
- Can explain the results from their investigations