Enriching lives every day; enabling our school community to learn, achieve and flourish through living 'life in all its fullness'

Innovation

Subject: Science

Year group: 5

Term: Summer

Unit name: Properties and changes of Materials

Prior Knowledge - *A variety of everyday materials including wood, plastic, glass, metal, water and rock. The physical properties of a variety of everyday materials (including those that are transparent) and to compare and group materials on the basis of these properties. How materials are suitably used based on their properties. How magnets and electrical circuits work. Some materials which are magnetic. How shapes of solid objects can be changed by squashing, bending, twisting and stretching. Materials that are solids, liquids and gases and their particle structure. Some materials change state when they are heated or cooled and the temperature at which this happens. The roles of melting, evaporation and condensation in the water cycle and the role temperature has on the rate of evaporation. Some rocks are permeable.*

Scientific enquiry	
Classifying	Based on the children's own criteria: classify the materials themselves e.g. samples of wood, metal, plastic, etc. After observing what happens when solids are added to liquids, classify materials based on the outcomes.
Observing over time	Observe rusting with uncoated nails in different liquids. (This can be achieved by removing coating with sandpaper.)
Pattern seeking	Not relevant
Comparative/fair testing	Which material would be good for a tent? Which material would be good to make a tea bag from? Which materials keep things warm/cold? Which material would be good for a bag for different purposes? Test solids for solubility. Compare rates of solubility. Burn different materials (not plastic or toxic substances).
Researching	Not relevant

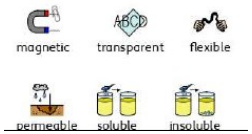
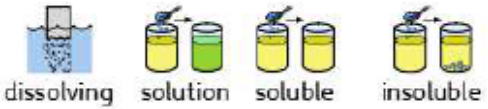
National curriculum:

- 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.

Key vocabulary	
Burning	To produce flames and heat.
Change of state	The physical process where matter moves from one state to another
Condensation	Small drops of water which form when water vapour or steam touches a cold surface, such as a window.
Conductor	A substance that heat or electricity can pass through or along.
dissolve	When a substance is mixed with a liquid and the substance disappears.
Electricity	A form of energy that can be carried by wires and in used for heating and lighting, and to provide power for devices.
evaporation	To turn from liquid into gas; pass away in the form of vapour.
filtering	A device used to remove dirt or other solids from liquids or gases. A filter can be made of paper, charcoal, or other material with tiny holes in it.
Gas	A form of matter that is neither liquid nor solid. A gas rapidly spreads out when it is warmed and contracts when it is cooled.
Insoluble	Impossible to dissolve, esp. in a given liquid.
Insulator	A non-conductor of electricity or heat.
Irreversible change	Impossible to reverse, turn back, or change.
melting	To change from a solid to a liquid state through heat or pressure.
Particles	A tiny amount or small piece.
Reversible change	Able to turn or change back.
Solid	Having a firm shape or form that can be measured in length, width, and height; not like a liquid or a gas.
Soluble	Able to be dissolved.
Solution	A mixture that contains two or more substances combined evenly.
State	The structure or condition of something.
Thermal	Relating to or caused by heat or by changes in temperature.

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

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. Mixtures can be separated by filtering, sieving and evaporation. 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.

To be able to group materials based on their properties using more complex vocabulary.		
To be able to explain the terms thermal insulators and conductors.	Materials which are good thermal conductors allow heat to move through them easily. Thermal conductors are used to make items that require heat to travel through them easily, such as a saucepan which requires heat to travel through to cook food. Thermal insulators do not let heat travel through them easily. Examples of thermal insulators include woollen clothes and flasks for hot drinks.	
To understand that electrical conductors allow electricity to pass through them easily while electrical insulators do not.	Electrical conductors allow electricity to pass through them easily while electrical insulators do not. Electrical insulators have a high resistance which means that it is hard for electricity to pass through these objects.	
To understand the process of dissolving.	When the particles of a solid mix with the particles of a liquid, this is called dissolving. The result is a solution. Materials that dissolve are soluble. Materials that do not dissolve are insoluble.	
To understand that when two or more substances are mixed and remain present the mixture can be separated.	Some materials can be separated after they have been mixed based on their properties - this is called a reversible change. Some methods of separation include the use of a magnet, a filter (for insoluble materials), a sieve (based on the size of the solids) and evaporation. When a mixture cannot be separated back into the original components, this is called an irreversible change. Examples of this include when materials burn or mixing bicarbonate of soda with vinegar.	
To know that materials change state by heating and cooling.		
To know that some changes can be reversed, and some cannot.		
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)	**Activity ideas** 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. 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).	

Spiritual Development

This unit will give children and understanding about changes and that some are reversible but some cannot be reversed. This will help them reflect on change in their own lives and how this might impact them. *Corinthians 5:17: Therefore, if anyone is in Christ, he is a new creation. The old has passed away; behold the new has come.*