Subject	Term	Unit
Science - Year 5	Autumn 2	Properties and changes of materials

Intent

At Hurst Hill, we nurture young scientists by fostering curiosity and developing strong scientific knowledge and enquiry skills. Children learn to investigate, observe and evaluate confidently, understanding how science shapes the past, present and future while building firm foundations for lifelong scientific learning.

Prior knowledge	National Curriculum
• identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. • 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	• 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.

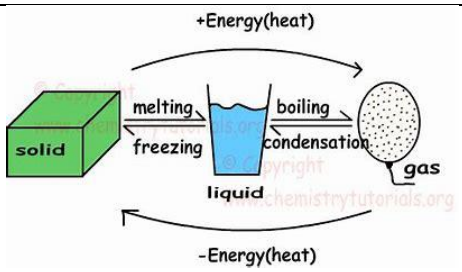
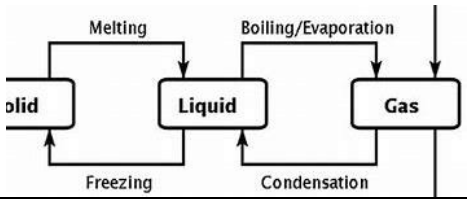
What?	To understand how to group materials at a more complex level than in Year 2. To know the names and processes that can be done to change a material and the reversibility of these changes.
Why?	To understand what will happen when certain processes occur. This can be linked to cooking in DT.
How?	Through testing and enquiry. Mainly through fair test enquiries.

Vocabulary	
Circuit	A complete route which an electric current can flow around.
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.
Dissolves	When a substance is mixed with a **liquid** and the substance disappears .
Electricity	A form of energy that can be carried by wires and used for heating, li ghting and to provide power for devices.
Evaporation	To turn from a **liquid** to a **gas** and pass away in the form of vapour.
Filtering	A device to remove dirt or other **solids** from **liquids** or **gases**. A filt er can be made from paper, charcoal or other material with tiny holes in it.
Flexible	An object or material can be bent easily without breaking.
Gas	A form of matter that is neither **liquid** nor **solid**. A **gas** rapidly spread s out when it is warmed and contracts when it is cooled.
Insoluble	Impossible to **dissolve**, especially in certain **liquids**.
Insulator	A non-**conductor** of **electricity** or heat.
Irreversible	Impossible to reverse, turn back or change.
Liquid	In a form that flows easily and is neither a **solid** nor a **gas**.
Melting	To change from a **solid** to a **liquid state** through heat or pressure.
Particles	A tiny amount or a small piece of something.
Permeable	A substance that either a **gas** or **liquid** can pass through.
Process	A series of actions used to produce something or reach a goal.
Properties	The ways in which an object behaves.
Rate	The speed with which something happens.
Resistance	The opposing power of one force against another.
Reversible	Able to turn or change back.
Solid	Having a firm shape or form that can be measured in length, width and height, and not like a **liquid** or **gas**.
Soluble	Able to be **dissolved**.
Solution	A mixture that contains two or more substances that are combined ev enly.
State	The structure or condition of something.
Temperatur e	A measure of how hot or cold something is.
Thermal	Relating to, or caused by, heat or by changes in **temperature**.
Transparent	An object that can be seen through.
Variable	Something that can change or that has no fixed value.

Learning	
Objective	**Learning**
Can I identify and classify? Blackout blind	**Identifying and Classifying** Use a selection of materials with varying degrees of transparency to investigate this question. Prior learning about light tells us that an object's transparency depends on the type of material it is made from: opaque materials block light so that we can neither see through them nor shine a light through them, translucent materials allow some light to pass through, whilst transparent materials allow light to travel through them freely. How much transparency would you need in a baby's room? Why? Use the fair test boards to plan their own variables.
Can I investigate how to make a bulb brighter in a circuit?	**Pattern Seeking** Electrical conductors allow electricity to pass through them easily, while electric insulators do not. Electrical insulators have a high resistance, which means that it is hard for electricity to pass through these objects. Using your prior learning on electricity, what sort of materials would be good conductors of electricity? Why? Use the circuits to test different materials to find the best conductor. Use the fair test boards to create their own recording table.
Can I identify which materials would be most effective for making a warm jacket?	**Comparative Testing** Materials which are good thermal conductors allow heat to move through them easily, such as a saucepan, which needs heat to travel through it in order to be able to cook food. Thermal insulators do not let heat travel through them easily, with good examples being woollen clothes and flasks for hot drinks. Using this information, do you need to make a thermal conductor or

	a thermal insulator? Why? Apart from wool, what other materials could you investigate? What are the reasons for your choices? Imagine I had some water and some beakers to investigate this question with: what other equipment would I need? What other variables would I must consider ensuring I was carrying out a fair test? How would I record my results? Use different beakers of water and thermometers to measure. Children may not have used thermometers since year 2 so may need to be taught how to use them.
Can I conduct a fair test? Which type of sugar dissolves the fastest? What happens to the rate of dissolving if we change the temperature of the water?	**Comparative Testing** Dissolving takes place when the particles of a solid mix with the particles of a liquid, creating a solution. Materials that are capable of dissolving, such as sugar, are soluble, whilst materials that do not dissolve are insoluble. Using this information, what do you predict will happen in your investigation? Why? What variables will you have to consider to make your testing fair? Use the fair testing boards to plan and create a way to record. Change the material and time how long it takes to dissolve. In concluding make sure the children are aware of the difference between mixtures and solutions.
Can I explain the difference between melting and dissolving?	**Identifying and Classifying** When an object is melted, it changes from a solid state to a liquid state through heating. The object's particles begin to spread out and allow the object to flow, but otherwise the particles are unchanged. When an object is dissolved, it also changes state, but it is mixed with another object to create a new solution. Give the children different materials and classify ones which dissolve and ones which melt. Can we reverse the changes? Can we get back what has melted? Create changes in state diagrams.

	 Chocolate + heat = melted chocolate 
Can I explain the purpose of sieving and filtering?	**Identifying and Classifying** Sieving allows you to separate the particles in two solid objects that are differentsizes, such as sand and salt: the smaller particles will pass through the holes in the sieve whilst the larger particles will be held. Filtration, however, allows youto separate solid and liquid particles from each other. Can you think of any examples where filtration might be the best way to separate substances? Canyou think of any other solids that could be separated using a sieve? Use sand, marbles, salt and paper clips in the mixture. Separate the paper clips with magnets, the marbles through sieving, the sand by filtration and the salt through evaporation. Draw mental models as with previous lesson for each stage.
Can I explain reversible and irreversible changes of state?	**Pattern Seeking** Some materials can be separated after they have been mixed based on their properties – this is called a reversible change. When a mixture cannot be separated back into the original components, this is called an irreversible change. Examples of this include when materials are burnt or when you mix bicarbonate of soda and vinegar. All of these changes are either physical (the appearance or form changes) or chemical (the matter changes and a substance with new properties is formed). Have a range of different things set up- burnt paper, a cake, sugar in tea, ice cubes etc. Which can be reversed? Which can't?

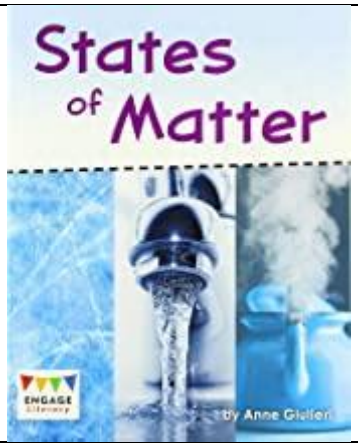
How did Ruth Benerito revolutionise the cotton industry?	**Research** Ruth R. Benerito (1916-2013) https://www.youtube.com/watch?v=UtSdDv-m0E8 American chemist and inventor. Look at the work of Benerito. How has it helped us? How do chemists create new materials?

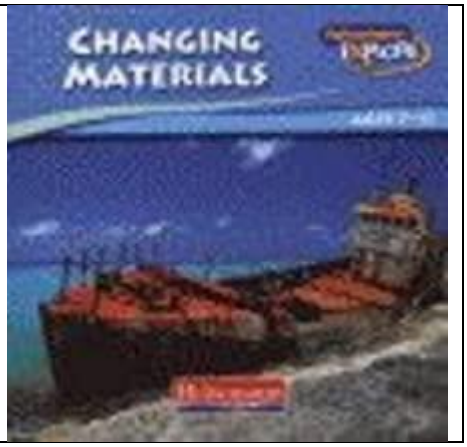
Experiment overtime

How does a nail in salt water change over time?	**Observing Over Time** Most nails are made of iron, which begins to corrode and rust when it is exposed to oxygen and water. The presence of salt in the water means that the process of rusting speeds up. Is there an investigation that could be done to see how quickly the process occurs in salt water compared to in a different kind of environment? What sort of differences would you expect to see? Why?

Websites
Year 5: Properties of materials | STEM Properties And Changes Of Materials Year 5 | KS2 Science (outstandingscience.co.uk) Properties and change of materials - KS2 Science - BBC Bitesize

Recommended Reads





Golden Thread
Earth and space