

	Year	5	Topic	Properties and changes of materials
	<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. 			

Prior learning	Future learning
<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) • Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • 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). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter) 	<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)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
<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>	<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
Key vocabulary	
Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	

Common misconceptions

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.

Some children may think:

- 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.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
<ul style="list-style-type: none"> 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. 	<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

- 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).

- 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

Year 5: Materials: Working Scientifically

Classifying: The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys.

- Children present the same data in different ways in order to help with answering the question.

- Based on the children's own criteria:
 - classify the materials themselves e.g. samples of wood, metal, plastic, etc.
- based on the outcomes.

Observing over time: Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer.

- They talk about how their scientific ideas change due to new evidence that they have gathered.
- They talk about how new discoveries change scientific understanding.
- Observe rusting with uncoated nails in different liquids. (This can be achieved by removing coating with sandpaper.)

Pattern seeking

- Not relevant

Comparative/Fair testing: Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

- 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

	Year	5	Topic	Earth and space
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