

Year: 5
Term: Autumn

Properties and Changes of Materials

Prior knowledge

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 together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets)

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)

Key knowledge (lessons)	
Comparing and grouping materials	Materials can be grouped by their properties (is it hard or soft?) or by more than one of their properties (is it hard and magnetic?).
Properties of materials we can compare	
Hard	Difficult to scratch, like the head of a hammer.
Soft	Easy to shape, like fabric.
Soluble	Can be dissolved, like coffee granules.
Insoluble	Cannot be dissolved, like pebbles.
Transparent	See through, like glass.
Opaque	Not see through, like a wooden door.
Electrical conductor	Lets electricity pass through easily, like copper wire.
Electrical insulator	Do not let electricity flow through easily, like plastic or rubber.
Thermal conductor	Lets heat pass through easily, like a metal kettle.
Thermal insulator	Does not let heat pass through easily, like a wood pan handle.
Magnetic	Is attracted to a magnet, like a steel spoon. Note: Not all metals attract to magnets.
Not magnetic	Is not attracted to a magnet, like a wooden spoon.
Knowledge of solids, liquids and gases	
Dissolving	When the particles of a solid mix with the particles of a liquid. Some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Materials that dissolve are soluble, those that do not are insoluble. Examples include: Filtering – recovering solid particles from a liquid Sieving – separating coarse from fine parts of loose matter Evaporating – change from liquid state to gaseous state due to increase in temperature.
Reversible changes	A change between a solid, liquid and gas that can be reversed e.g. dissolving and mixing.
Irreversible changes	A change between a solid, liquid and gas that cannot be reversed e.g. a new material is formed – burning, action of acid on bicarbonate of soda
New materials	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.
Everyday materials	

Particular uses	Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials including metals, wood and plastic.
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Key Vocabulary

Prior vocabulary – Natural, hard, soft, smooth, bumpy, rough, wet, dry, sink, float, properties, material, liquid, surface, object, absorbent, wood, plastic, glass, metal, water, rock, rubber, inflatable, fabric, brick, paper, cardboard, movement, suitability, stretch, twist, waterproof, flexible, rigid

Working scientifically vocabulary – prediction, measurement, enquiry, dependent variable, independent variable, fair test, similar, theory, hypothesis, line graph, relationship, outlier

Conductor	A substance that heat or electricity can pass through or along.
Dissolved	When a substance is mixed with a liquid and the substance disappears
Evaporation	When a liquid turns to a gas due to an increase in temperature.
Filtering	Used to remove dirt or other solids from liquids or gases.
Insoluble	Impossible to dissolve.
Insulator	A non-conductor of electricity or heat.
Irreversible	Impossible to reverse, turn back or change.
Reversible	Able to change back or turn.
Separating	The action of moving things apart.
Soluble	Able to be dissolved.
Solution	A mixture that contains two or more substances combined evenly.
Thermal	Relating to or caused by heat or by changes in temperature.

Additional vocabulary to discuss across the unit – transparent, opaque, sieving

Diagrams and symbols

Filtering

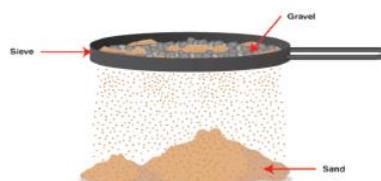
A mixture of water and an insoluble substance like sand can be separated by filtering.

The mixture of sand and water is poured into the filter funnel, which is lined with filter paper. The water can pass through the paper to collect in the beaker. The sand particles cannot pass through the filter paper and collect in the filter funnel.



Sieving

A mixture made of solid particles of different sizes, for example sand and gravel, can be separated by sieving.



Evaporating

By dissolving salt in water we make a solution. The salt dissolves (seems to disappear) into the water. We can separate the salt from the water by boiling a solution. The water will evaporate until it is all gone. The salt will be left behind.



Key skills	
<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. 	
Future Learning	
<p>Chemical reactions as the rearrangement of atoms. (KS3)</p> <p>Representing chemical reactions using formulae and using equations. (KS3)</p> <p>Combustion, thermal decomposition, oxidation and displacement reactions. (KS3)</p> <p>Defining acids and alkalis in terms of neutralisation reactions. (KS3)</p> <p>The pH scale for measuring acidity/alkalinity; and indicators. (KS3)</p>	
Deepening and broadening the knowledge and understanding for GDS learners:	Key Outcomes
<ul style="list-style-type: none"> • knows that certain groups of materials have particular properties but that these are not generic to the whole group, <i>e.g. although materials that are magnetic are metals, not all metals are magnetic</i> • knows that a solution can become saturated when too much solute is added • knows some of the additional vocabulary, <i>e.g. solvent and solute</i> • is aware that some materials do not dissolve and form a mixture (emulsion), <i>e.g. oil droplets in water</i> • separate a mixture of three or more materials that requires separation in order, <i>e.g. sand, salt and lentils using knowledge of solubility and evaporation</i> • recognises that materials are suitable for a purpose due to a combination of • their properties, although one property may be dominant, <i>e.g. glass is used in most windows but not just because it is transparent!</i> • offers alternative suggestions for the use of a material, based on knowledge of properties discovered during testing, <i>e.g. recognises that the best fabric for a raincoat would also be suitable for a tent or caravan awning</i> • gives further examples of reversible change and can talk about their application, <i>e.g. compressing a metal spring (in the front forks of a bike)</i> • recognises that during some irreversible changes heat is produced, <i>e.g. when mixing plaster of Paris</i> • gives further examples of irreversible change and can talk about their application, <i>e.g. reaction of yeast when making bread</i> 	<p>1. Can I compare and group materials based on their properties? <i>Children will investigate properties of materials (e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets)?</i></p> <p>2: How does a material dissolve to form a solution? <i>Children will explore solvents, soluble and insoluble materials and be able to explain the process of dissolving.</i></p> <p>3: How will I recover a substance from a solution or mixture? <i>Children will explore the processes used in recovering the material from the mixture or solution (e.g. salt and water from salt water (solution)) and plan and investigate separating materials (e.g. through filtering, sieving and evaporating) and describe the process and make conclusions.</i></p> <p>4: Which changes are irreversible or reversible and how do I know? <i>Children will e.g explore rusting, observe the changes over time then write a conclusion saying which nail rusts first and reason why.</i></p> <p>5: Can I explain how some changes result in the formation of a new material and that this is usually irreversible? <i>Children will use the outcome of their investigation to explain how new materials are made through irreversible changes and chemical reactions such as burning/ mixing with bicarbonate of soda.</i></p> <p>6: Can I justify why materials should be used for specific purposes using evidence? <i>Children give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.</i></p>