

## Properties and Changes of Materials

A material is any substance that has a name. For example: chalk, paper, wood, iron, air, water, clay, plastic, rubber, stone, leather, wax. Everything is made up of materials. When we want to make something, we need to choose the best material for the job. This unit will be focusing on the properties of materials and how their state can be changed by: heat or cold; reacting or mixing with another material; along with if they can be changed back afterwards.

Key facts	Key Vocabulary	
The property of a material is something about it that we can measure, see or feel and helps us decide whether or not it is the best material.	<b>Burning</b>	An irreversible chemical reaction between heat, fuel and oxygen.
Most materials have more than one property and can be natural, man-made, strong, weak, heavy, light in weight, rough, smooth, shiny, dull, hard, soft, flexible, brittle, magnetic, non-magnetic, transparent, opaque, electrical conductor, electrical insulator, conductor of heat, thermal (heat) insulator, burns when heated, does not burn, melt easily or not melt easily.	<b>Condensation</b>	The process of water vapor turning into liquid water.
	<b>Conductivity</b>	How well a material allows heat (thermal conductivity) or electricity (electrical conductivity) to pass along it or through it.
Materials exist in three states: a solid, a liquid or a gas. Materials can sometimes be changed from one state to another, perhaps by heating them – for example, ice is a solid which becomes a liquid when it's heated.	<b>Dissolve</b>	To become absorbed in a liquid solution, or make a solid do this.
Some materials can be changed. They can be mixed with other materials (for example when the ingredients are mixed together to make a cake) and then changed again by heating. Because this change cannot be 'undone' we say that it is irreversible. Some changes, though, are reversible. For example, when ice is heated it melts and becomes water, but this change can be reversed by re-freezing the water into ice.	<b>Evaporation</b>	The process of a liquid turning into a gas.
	<b>Flexibility</b>	The ability to bend or be bent repeatedly without damage or injury.
<p><b>Changes of state:</b></p>	<b>Freezing</b>	The process of a liquid turning into a solid.
	<b>Hardness</b>	Resistance to scratching or pressure. Hardwood does not mark as easily as softwood.
	<b>Insoluble</b>	Unable to dissolve.
	<b>Irreversible</b>	Impossible to reverse or undo.
	<b>Man-made</b>	Made by human beings and not occurring naturally
	<b>Melting</b>	The process of a solid turning into a liquid.
	<b>Natural</b>	Present in or produced by nature, not artificial or synthetic (e.g. wood)
	<b>Reversible</b>	Able to be changed or undone.
	<b>Solution</b>	A substance consisting of two or more materials mixed together.
	<b>Transparency</b>	How easy it is to see through a material.

## Prior Learning

### Everyday Materials in Year 1:

- > Identify a variety of common materials and objects made from them e.g. glass beaker and material called glass, paper exercise book and paper as a material (taking lots of different forms)
- > Identify and name a variety of everyday materials, e.g. a variety of objects/items made of wood, plastic, glass, metal, water, and rock
- > use simple language to describe the physical properties of a variety of everyday materials, e.g. soft/hard, rough/smooth, shiny/dull
- > use the physical properties of a variety of everyday materials to compare and group them

### Uses of Everyday Materials in Year 2:

- > Identify and compare the properties of a variety of everyday materials, to assess their suitability for particular purposes
- > discover (through investigation) how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

### Rocks in Year 3:

- > Compare and group rocks in different ways according to their properties based on first-hand observation.
- > Explain in simple terms that soils are made when rocks are weathered and breakdown into small particles, which combine with organic matter to become soil.

### Forces and Magnets Year 3:

- > Describe using key vocab how magnetic forces can act at a distance and in different ways e.g. when poles of magnets face each other when a variety of materials are tested.
- > Identify based on practical investigation that some materials are magnetic whilst others are not.

### States of Matter Year 4:

- > Group solids, liquids, gases based on their properties.
- > Describe how a variety of materials change state when they are heated or cooled.
- > Describe the water cycle and the part played by evaporation and condensation in that process.

### Electricity Year 4:

- > Name a variety of common appliances that run on mains and battery power – five or more
- > Name common conductors (such as metals and water) and insulators (such as wood, plastic), and, given information about how an unknown material behaves in a circuit, classify it as a conductor or insulator.

## Following on:

### Evolution and Inheritance in Year 6:

- > Describe how fossils provide evidence for evolution.

## Working Scientifically:

- > Ask questions and identify most appropriate types of enquiry to use, controlling variables where necessary, including: Observing changes over different periods of time, noticing patterns, grouping and classifying, comparative and fair tests
- > Research using a wide range of secondary sources of information
- > Use a range of scientific equipment to take increasingly accurate and precise measurements or readings, with repeat readings where appropriate.
- > Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
- > Use observations and test results (presented e.g. in tables and graphs) to make predictions and raise further questions that could be investigated
- > Report and present findings from enquiries, including conclusions, explanations, validity of results, in different forms
- > Suggest how evidence from scientific enquiries and subject knowledge supports or refutes ideas or arguments, e.g. 'our bird and bee surveys (at school) suggest that there is a need to re-establish our meadow planting, only cutting once per year. Then we will see a return of the butterflies and birds that used to be seen'.

