

Properties and changes of materials – UKS2 - Year A

Definition: Property of a material – anything that describes a material. Its characteristics.

Chemistry definition: the branch of science concerned with the substances of which matter is composed, the investigation of their properties and reactions, and the use of such reactions to form new substances.

POS: Properties and changes of materials

- 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:

- Identify and compare the suitability of a variety of everyday materials for particular uses.
- Some materials can be changed by squashing, bending, twisting and stretching.
- Can group together a variety of everyday materials on the basis of whether they are attracted to a magnet, or whether they are solids, liquids or gases.
- Know that some materials change state when they are heated or cooled
- Understand the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Links to other science topics:

- Everyday materials
- Rocks – properties of rocks
- States of matter – know which processes can be carried out to change from one state to another

Disciplinary concepts:

Cause and effect – why are some changes irreversible?

Changes - why do some mixtures fizz?

Common misconceptions:

The difference between burning and melting. Burning is a chemical reaction in which new products, such as smoke and ash, are produced, whereas melting is a physical change in which a solid turns into a liquid. Burning is irreversible, as it is not possible to turn smoke and ash back into unburned fuel. Melting is reversible, as the liquid can be frozen back into a solid.

To distinguish between smoke and steam. Smoke is a combination of different chemicals that results from an irreversible chemical reaction, whereas steam is a form of water vapour that results from a reversible physical change. If you hold a sheet of glass close to a boiling kettle, you will see the steam condense back into water droplets. When something burns, part of it vanishes and no longer exists.

Core Knowledge:

- 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 and vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.

Wider working knowledge:

There are chemical changes happening all around us, all of the time. Respiration is a chemical change that takes place inside every cell of our bodies, providing us with energy – <https://www.healthline.com/health/famous-athletes-with-asthma> : Understand asthma and athletes who have it. Cooking food causes chemical changes, as does burning fuel in the engine of a car. Some chemical changes create products that are useful, such as plastics or fertilisers, while other chemical changes can create problems, such as when iron or steel rusts and corrodes. Material scientists are creating and developing new materials to improve our lives. These include smaller and longer-lasting batteries for our computers, tougher screens for our mobile phones, and fabrics that don't require ironing.

Working scientifically:

- Recognise that some solids are soluble and explain that they will dissolve in water and can be recovered using evaporation.
- Recognise that some solids are insoluble, remaining as a sediment when mixed with water and can be recovered by filtration and sieving.
- Recognise that some changes result in the formation of new materials and explain that this kind of change is usually irreversible therefore the original materials cannot be recovered.
- 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
- 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

End points:

- To suggest materials appropriate for particular uses based on their properties
- To explain dissolving and separation of solids from liquids using filters, sieves and evaporation.
- To know solids dissolve in water to form a solution
- To separate mixtures using a range of techniques, naming equipment for filtering and sieving
- To describe some simple reversible and non-reversible changes to materials, giving examples