

Properties and Changes of Materials

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: Y5 Properties and changes of materials (ref NC red doc)

- 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:

- To know what a material is Name objects and their properties
- Classify objects based on their properties
- Identify solids, liquids and gases
- Evaporation is the same state change as boiling (liquid to gas) but it happens slowly at lower temperatures
- Condensation is the change back from a gas to a liquid caused by cooling.

Links to other science topics:

- Everyday materials Y2
- 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 not reversible 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
- 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
- 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 explain which changes are reversible and which are not reversible.