

Key Stage: KS2
Year: 5

Properties and changes to materials

Prior learning:

Yr 1

Pupils should be taught to:

- distinguish between an object and the material from which it is made
- identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock
- describe the simple physical properties of a variety of everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties

Yr 2

Pupils should be taught to:

- identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses
- find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Yr 4

Pupils should be taught to:

- compare and group materials together, according to whether they are solids, liquids or gases
- compare and group materials together, according to whether they are solids, liquids or gases
- 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)
- identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Science PoS

Statutory requirements:

Pupils should be taught to:

- 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
- 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
- know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- 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.

Science PoS

Non statutory requirements:

- Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4.
- They should explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.
- Pupils should explore changes that are difficult to reverse, such as burning, rusting and other reactions, for example vinegar with bicarbonate of soda.

Teacher assessment criteria

- Group and identify materials in different ways according to their properties, based on first-hand observation; and justify the use of different everyday materials for different uses, based on their properties
- Identify and describe what happens when dissolving occurs in everyday situations; and describe how to separate mixtures and solutions into their components
- Identify, with reasons, whether changes in materials are reversible or not

Subject Knowledge:

- Solids retain their fixed shape unless a force is applied to change the shape. The volume of material remains the same even if the shape is changed.
- Liquids will pour and will take the shape of their container. The volume of liquid remains the same when it is poured into a different shaped container.
- Very small solids, like sand, behave like a liquid; they can be poured and they take the shape of their container. However, each individual grain is a solid and behaves as such.
- Gases spread out to fill all the space in a container. In a larger container the amount of gas will remain the same but it will spread out to fill the container and so have a greater volume.
- Evaporation is the process by which water changes its state from a liquid to a gas (water vapour).
- Heat energy is needed to change water into water vapour.
- As water evaporates from the washing the air around becomes full of moisture. The wind moves the air around so that more water can evaporate. On a very damp day the air becomes saturated with water vapour so no more water can evaporate. (This means that the washing will not dry and the puddles won't dry up!).
- The process of condensation occurs when the water vapour in the air cools down and changes state from a gas to a liquid.
- The air around a cold surface cools down and some of the water vapour in the air condenses, forming tiny droplets of water on the cold surface.
- Outside, condensation can be seen in the form of mist or fog; the air becomes saturated with water vapour, some of which starts to condense and hangs in the air as tiny droplets of water.
- Thermometers can be used to take the temperature of gases, liquids or solids. The liquid in the thermometer rises as it gets warmer. The higher the temperature, the higher the liquid will rise. (The liquid expands on heating.) The number of degrees Celsius will be greater as the temperature rises.
- Water boils at 100°C. The temperature of the water will not rise above 100°C, at which point the water will evaporate changing state
- When two or more substances are mixed together and a chemical reaction takes place new substances are formed and the change is irreversible.
- Using different proportions of materials can affect the properties of the new substance that is formed e.g. the new substance can vary in hardness, flexibility, strength according to the proportions of original materials used.
- Bricks can be tested by dropping from successive heights until they break.
- Some substances are more soluble than others i.e. a greater mass will dissolve in a given amount of water.
- Some substances will not dissolve; they are insoluble. Insoluble substances can be separated from liquids by filtering or sieving.
- More solute will dissolve in a greater amount of water.
- In most cases more solute will dissolve in hot water than in cold water.
- A saturated solution will not dissolve any more solute.
- Soluble substances can be recovered by evaporating the liquid from the solution. Evaporation is the process by which water changes its state from a liquid to a gas (water vapour). When the liquid evaporates, the solid substance is left behind.