

**Subject: Science      Year: Y5 - Properties and changes of materials**  
**NC/PoS:**

- 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 (what pupils already know and do)**

Objects can be made from one or more materials. Know water, wood, rock and air are natural materials. know that a solid material is firm and stable in shape. know that a liquid material is a substance that flows freely but is a constant volume. know that a gas is a substance which will expand freely to fill the whole of a container. Know that a solid material can change its state into a liquid when heated, this is melting. know that a liquid can change its state into a gas when heated, this is evaporation. know that a gas can change its state into a liquid when cooled, this is condensation. know that a liquid can change its state into a solid when cooled, this is freezing. Know water evaporates faster if the temperature is higher.

**End goals (what children MUST know and remember)**

- Know that heat travels from warmer materials to colder ones
- Know that some materials let heat pass through them easily; these are thermal conductors (metals and sedimentary rocks)
- Know some materials do not let heat pass through them; these are called thermal insulators (plastic, cork, wood, and fabrics)
- Know that thermal insulators are good for keeping heat out as well as in
- Know soluble materials dissolve in water
- Know if a material does not dissolve, it is insoluble
- Know dissolving a solid in water makes a solution
- Know there are three ways to separate mixtures: sieving, filtering, and evaporation
- Know sieving is when you pass a mixture of solids of varied sizes through mesh
- Know filtering is when you pass a mixture of a solid and liquid through a mesh
- Know evaporation separates soluble solids from water; the water evaporates and leaves the solid behind
- Know in a reversible change a material turns into something that looks and feels different but is not changed forever – it can be changed back
- Know all changes of state are reversible
- Know mixing and dissolving are reversible changes
- Know in an irreversible change a completely new material is formed and cannot be changed back
- Know some things, react when you mix them (vinegar and bicarbonate of soda) to make new materials

## Medium Term Plan: Supporting Implementation of LTP/Progression Grid

**Key Vocabulary:** matter, natural, filtering, sieving, evaporation, condensation, freezing, melting, dissolving, solute, solvent, solution, soluble, insoluble, decanting, waterproof, absorbent, thermal conductor, insulator, reversible, irreversible, formation

### **Session 1: Review prior learning –properties of materials**

Compare and group every day materials including liquids and gases (water in a balloon, air in a balloon) Show me an item that is a natural material, a conductor of heat etc.  
Revisit rocks, states of matter

### **Session 2: Recap: what are the properties of solids, liquids and gases?**

Children learn soluble materials dissolve in water and if a material does not dissolve, it is insoluble

Lo: Using observation to recognise soluble and insoluble materials

<https://www.youtube.com/watch?v=73Iu9RzZ9tI> soluble vs insoluble Watch up to the first part showing that sugar is soluble

Give children a variety of materials to test: flour, oil, salt, coffee, vinegar, sand

**Vocabulary:** soluble, insoluble, solubility

### **Session 3: Recap- name materials that are soluble in water**

Children learn dissolving a solid in water makes a solution.

FOCUS: To record and present results linked to dissolving

<https://www.youtube.com/watch?v=k3MhImN8Jmc> dissolving

Children investigate increasing the time taken to dissolve through:

- Number of stirs or time stirring
- Increasing temperature of water
- Changing size of solute

How might I get my solute back? Evaporating the water off.

Model this through putting salt or sugar solution in a warm place to evaporate

**Vocabulary:** solute, solvent, solution, dissolve, dissolving, evaporate, evaporation

### **Session 4: Recap- what is a solution?**

Children learn there are three ways to separate mixtures: sieving, filtering, and evaporation. Sieving is when you pass a mixture of solids of varied sizes through mesh. Filtering is when you pass a mixture of a solid and liquid through a mesh. Evaporation separates soluble solids from water; the water evaporates and leaves the solid behind

FOCUS: To record the method for separating a mixture

<https://www.youtube.com/watch?v=JJYe-muIqhw> separation techniques

Children separate a mixture e.g. sand, salt and stones. The children could prepare their own mixture to separate

**Vocabulary:** sieving, filtering, mixture, separation, evaporation, decanting

### **Session 5: Recap - what are filtering, sieving and evaporation?**

Children learn that heat travels from warmer materials to colder ones. That some materials let heat pass through them easily; these are thermal conductors (metals and sedimentary rocks). Some materials do not let heat pass through them; these are called thermal insulators (plastic, cork, wood, and fabrics). Thermal insulators are good for keeping heat out as well as in.

FOCUS: to compare materials and give reasons for their effectiveness

Watch: [https://www.youtube.com/watch?v=\\_5xOyWvYwOM](https://www.youtube.com/watch?v=_5xOyWvYwOM) Spoon test

## Medium Term Plan: Supporting Implementation of LTP/Progression Grid

<https://www.youtube.com/watch?v=f2iJi7l9B2w> thermal energy transfer

Children to complete investigations:

- Different types of cups to keep a drink warm (wood, plastic, ceramic, polystyrene)
- Test the thermal conductivity of varied materials

Ensure there is a variety of materials for them to choose from

**Vocabulary:** thermal conductor, insulator

### **Session 6: Recap – name good thermal conductors and good thermal insulators**

Children learn in a reversible change a material turns into something that looks and feels different but is not changed forever – it can be changed back. All changes of state are reversible and mixing and dissolving are reversible changes. In an irreversible change a completely new material is formed and cannot be changed back and some things, react when you mix them (vinegar and bicarbonate of soda) to make new materials

Lo: to research reversible and irreversible changes

<https://www.youtube.com/watch?v=U6cxHOnEBo4>

<https://www.youtube.com/watch?v=bHIP1lRc0Tg> irreversible reactions

Also show let children explore irreversible reaction: e.g. vinegar and bicarbonate of soda; Denture tablet in water; vitamin C tablet etc.

Common misconception: burning

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.

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. When something burns, part of it vanishes and no longer exists.

**Vocabulary:** reversible, irreversible, formation

Career: Materials engineer

Chemist <https://www.youtube.com/watch?v=8tRv0Cs2GR8>

Scientists who have helped develop understanding in this field: Spencer Silver

<https://www.youtube.com/watch?v=ij9bgRRY6x8> and Ruth Benerito

<https://www.youtube.com/watch?v=UtSdDv-m0E8>