



# Amazing changes



## About this topic

Curriculum Link: Year 5, Properties and changes of materials

### SUMMARY:

In this topic, the children learn about materials, how they change and which changes are reversible and irreversible. The topic concludes by looking at how these properties are applied in the real world.

### UNITS:

6.1: Getting a reaction

6.2: Real-world reactions

### ACTIVITY RESOURCES:

- 6.1: Inflating a balloon
- 6.2: Burning fabrics

### ONLINE RESOURCES:

Teaching slides (PowerPoint): Amazing changes

Interactive activity: Amazing changes

CPD video: Amazing changes

Pupil video: Amazing changes

Word mat: Amazing changes

Editable Planning: Amazing changes

Topic Test: Amazing changes

## Learning objectives

**This topic covers the following learning objectives:**

- 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.

## Working scientifically skills

**This topic develops the following working scientifically skills:**

- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

- Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.
- Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
- Use test results to make predictions to set up further comparative and fair tests.
- Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.
- Identify scientific evidence that has been used to support or refute ideas or arguments.



## CROSS-CURRICULAR LINKS

**This topic offers the following cross-curricular opportunities:**

### English

- Use irreversible changes as starting points for poems.
- Evaluate the quality of each other's presentations of findings.
- Produce a piece of creative writing about 'goosey materials'.

- Create a poster to teach others about burning.
- Write a fire safety leaflet.
- Research Antoine Lavoisier who researched burning.
- Creating patterns, e.g. fire flames.
- Research new materials and smart materials using the Internet.

### Numeracy and mathematics

- Use data properly to produce an accurate bar or a line graph.
- Handle data from activities.

- Use a timer, e.g. stopwatch or the timer on an iPad.
- Understand ratio.
- Take accurate measurements.

## History

- Investigate fireworks used on Bonfire Night and New Year's Eve.
- Look at the effects of burning in The Great Fire of London.
- Research Humphrey Davy's safety lamp.

## Design technology

- Producing new materials: applications of use.
- Research flame retardant materials and the uses of the materials.
- Cookery: producing new materials and irreversible changes.

## RE

- Light festivals.

## PSHE

- Safety in the home.

## STEAM (SCIENCE TECHNOLOGY ENGINEERING ART AND MATHS) OPPORTUNITIES

### Invite into class

- Someone from the local fire service to talk about their work and safety in the home.
- A chemist from a university to talk about and show activities on burning and combustion.
- A local manufacturer that makes materials to discuss the properties of materials.
- Artists to create a range of artwork using different materials, e.g. sculptures, painting and collage.
- A parent to whom children can demonstrate / share their activities and explain what they know about reversible changes.

### Visit

- Local industry, e.g. furniture makers, chemical businesses.
- Local secondary school to use Bunsen burners and fume cupboards to test materials.

## HEALTH AND SAFETY

When using hydrogen peroxide, make sure adults and children wear goggles as well as a 'science lab coat' because spills can leave bleached areas. Always wash hands afterwards.

Adult supervision is required if heating hot milk.

See ASE Be Safe! Or the CLEAPSS website for further advice on burning samples of materials in the classroom.

See individual activities for specific health and safety guidance.

## TEACHER SUBJECT KNOWLEDGE

Reversible (physical) changes do not produce a new substance or change the amount of a substance. Reversible changes include liquid water to ice to liquid water.

Irreversible (chemical) changes do produce new substances. Although no matter is lost or destroyed, some may become gas and float away. This sort of change is usually permanent and very difficult to reverse. Burning, rusting and chemical reactions (e.g. bicarbonate of soda and vinegar) are all examples of this. Here, the particles are combined into different substances. Clues that a chemical reaction has taken place might be:

- A colour change (this can happen with physical changes too).
- The production of gas.
- The production of light or heat, or a change of temperature.

A common misconception held by children is that when a chemical reaction takes place, especially one in which invisible gases are produced, the chemicals are 'used up' and the matter no longer exists. It is important to remind children that matter does not disappear in a reaction; it just changes form. Even if it is no longer visible, the matter is still present somewhere.

### Bicarbonate of soda and vinegar

The baking soda (sodium bicarbonate) is a base while the vinegar (acetic acid) is an acid. When they are mixed together they react together and form a gas carbon dioxide, this is a new material, so it is a chemical change and it is irreversible. It is the gas that fizzes as it escapes the solution. Changing the

amount of baking soda and vinegar changes this reaction, either increasing or decreasing the reaction and amount of gas produced.

### Milk and vinegar

When vinegar is mixed with hot milk a protein called casein is extracted from the milk due to a reaction between the milk and vinegar. The casein sticks together and forms clumps or curds similar to plastic, and can be moulded and changed in shape.

### Rust

Rust is produced in a chemical reaction between iron, oxygen (dissolved in water) and is an example of oxidation, here it leads to corrosion. If rust is left

it eats into the iron causing holes and gradually weakening the iron. Iron is often painted over not just for cosmetic purposes but to protect it, however, if the paintwork is scratched water can get to the metal surface causing a chemical reaction between the iron, water and oxygen resulting in rust. Rust is an irreversible change.

### Burning

Burning is a chemical reaction, a chemical change, a new material is formed and burning is not reversible. For burning to take place there must be three things: fuel, oxygen and a high enough temperature. This is called the 'fire triangle'.



## CHILDREN'S MISCONCEPTIONS

### Children might think...

- That burning and melting are similar.
- That burning and heating are the same.
- That smoke and steam are the same thing.
- When something burns it disappears for ever, it no longer exists.
- That rusting is a physical change; in fact it is a chemical reaction of iron with air and water: rust does not conduct electricity.

### Children already know...

- That some materials change state (Year 4).
- That some materials can be dissolved (Year 5).



## SCIENTIFIC VOCABULARY

You can download a Word mat of essential vocabulary from *My Rising Stars*.

**burning:** a specific type of chemical change, particularly in fuels

**irreversible / chemical change:** one that cannot be undone

**reversible / physical change:** one that can be undone

**rust:** a reddish- or yellowish-brown flaking coating that forms on the surface of iron when exposed to air and moisture