

Properties of materials: irreversible changes



Expected prior learning

- Understand the basic three states of matter.
- Understand that matter can change states for different reasons, such as temperature change, chemical reaction or physical manipulation.



Overview of progression

By the end of this chapter children should have learned:

- the states of matter, in particular with reference to separating mixtures in different ways
- to appreciate irreversible changes that do not need heat
- to understand and investigate the role of heat in changing foodstuffs
- to investigate the effects of burning on different materials
- to investigate vinegar and bicarbonate of soda, in particular the creation and collection of carbon dioxide
- to understand iron and the causes and effects of rust
- to understand plastics – their manufacture, properties and history.



Creative context

- Several experiments in this chapter introduce children to interesting phenomena: substances that are hard when hit but slimy when handled gently; plaster of Paris; invisible inks; making 'plastic milk' and slime. All of these present creative opportunities, particularly art, DT and literacy.
- With advanced planning there are opportunities for secret messages, hidden artefacts (in plaster of Paris); jewellery and statues; and original breads and biscuits, with the option of creating stalls to sell goods to raise funds for chosen charities.



Background knowledge

The three states of matter are defined by how active molecules are, which is easiest to envisage with ice/water/steam. Although some other materials also freeze, melt and evaporate, many do not: when they change their state it is not reversible. This is not always a bad thing – much of the modern world is based on the creation of new materials such as plastic. As such, controlling the way substances change state is the work of many scientists.

Understanding burning is critical for health and safety – we need to know the properties of solids, liquids and gasses to know how dangerous they are, and whether they can be useful in fighting fire. Although oxygen is essential to life, it is highly flammable and helps things to burn. It can also cause some materials to disintegrate, such as rusting iron, a process known as oxidisation.



Speaking scientifically

- Children will need to know the vocabulary associated with melting, dissolving, and evaporating. As the chapter progresses, words associated with irreversible change become more important, such as reaction and oxidisation.



Preparation

You will need to provide: Equipment and materials are listed for every lesson. Children will need to work alone, in pairs and in groups so you will need to have sufficient numbers of much of the equipment. Children will also need access to the internet and reference books.

On the CD-ROM you will find: photocopiable pages 'Irreversible changes that involve heat', 'Irreversible changes that do not require heat'; interactive activities 'Burning: before and after slideshow', 'Melt, boil, cool, freeze', 'Collecting carbon dioxide', 'Fizz, bang, sizzle'; media resources 'Firefighters in action', 'A volcano', 'Rusted objects'