

Unit 6D Reversible and irreversible changes (short unit)

ABOUT THE UNIT

This unit brings together and consolidates work that children have done before on reversible changes *eg melting, freezing, evaporating, dissolving, condensing*, introduces burning as a change that cannot be reversed and, like other irreversible changes, produces new materials.

Experimental and investigative work focuses on:

- making careful observations
- suggesting explanations for observations, using scientific knowledge and understanding.

Work in this unit also offers opportunities for using scientific knowledge and understanding to explain and interpret a range of everyday changes.

This unit takes approximately 6 hours.

WHERE THE UNIT FITS IN

Builds on Unit 2D 'Grouping and changing materials', Unit 5D 'Changing state' and Unit 6C 'More about dissolving'

Children need:

- to know about dissolving, evaporating, condensing, melting and freezing as changes which can be reversed.

Links with Units 4D, 5C and design and technology (food).

VOCABULARY

In this unit children will have opportunities to:

- use terms *eg reversible, irreversible* to describe changes
- give explanations *eg for the way in which they classify changes*.

RESOURCES

- a range of solids which dissolve and which do not dissolve in water *eg sand, salt, talc, flour, chalk, bath salts, baking powder*
- a range of solids which react with water, lemon juice or vinegar *eg washing soda, plaster of Paris, cement, bicarbonate of soda*
- real items, or pictures of items, which change when they are heated *eg egg, cake mixture, ice, dough, water, chocolate*
- materials which burn *eg wax, twigs, paper, charcoal*
- fire hazard warning labels from furniture

EXPECTATIONS

at the end of this unit

most children will:

use careful observation to describe a number of changes; classify some changes *eg dissolving* as reversible and others *eg burning* as irreversible; recognise that irreversible changes often make new and useful materials and recognise the hazards of burning materials

some children will not have made so much progress and will:

use careful observation to describe a number of changes and identify whether some changes are reversible or not

some children will have

progressed further and will also:

explain that in some cases the new materials made are gases and identify some evidence *eg vigorous bubbling* for the production of gases

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- that mixing materials can cause them to change
- to make careful observations, record and explain these using scientific knowledge and understanding

POSSIBLE TEACHING ACTIVITIES

- ◆ Present children with a range of materials *eg sand, flour, baking powder, powder paint, salt, plaster of Paris, Andrews salts*, ask them to mix each with water, describe and try to explain what has happened. Ask children to group materials into categories *eg those which dissolve in water, those which don't dissolve and those where there appears to be a different sort of change*. Talk with children about their groupings and introduce the idea of changes which are different from dissolving.

- that insoluble materials can be separated by filtering and solids which have dissolved can be recovered by evaporating the liquid from the solution

- ◆ Ask children to explain what they would do to separate *eg sand from water* and to recover *eg salt* from the water. Introduce the word 'reversible' to describe the changes that took place when these solids were added to water.

- that some changes that occur when materials are mixed cannot easily be reversed
- to make careful observations, record these and explain what happened using scientific knowledge and understanding

- ◆ Remind children of the changes that took place when *eg plaster of Paris and water, Andrews salts and water were mixed* and demonstrate some similar changes *eg vinegar and bicarbonate of soda, lemon juice and washing soda, cement and water*. Ask children to observe and describe what happens and suggest whether these changes could be reversed or not. Ask them if they think a new material has been made and their evidence for this *eg bubbles of gas from vinegar and bicarbonate of soda, a hard solid from cement and water*.

- that heating some materials can cause them to change
- that cooling some materials can cause them to change

- ◆ Present children with a series of pictures or objects/materials *eg ice, cake mixture, a raw egg, dough, unfired clay, water, chocolate* and ask them to describe what happens when they are heated and to classify changes as easily reversible or not. Talk with children about their ideas and ask them to suggest materials that are changed by cooling and to decide whether these changes are mostly reversible or irreversible.

- that when materials are burned, new materials are formed

- ◆ Demonstrate (or show pictures or a video of) what happens when a range of materials *eg paper, wax, twigs, tiny pieces of fabric* burn. Discuss what is made *eg ash* and ask children if they think other materials are made which they cannot see. Talk about how they would know if a gas were made when they can't see it. Discuss everyday examples of burning *eg natural gas in cookers and fires, bonfires, flares, barbecues*.

- that the changes that occur when most materials are burned are not reversible
- to recognise and assess hazards and risks in burning materials

- ◆ Discuss safety in relation to burning, and point out that new materials are made which may be harmful. Show hazard labels from *eg fabrics/furniture* and discuss these in relation to safety at home. Ask children to make a poster illustrating some of the hazards of burning things.

Review work on reversible and irreversible changes by asking children to construct a concept map using terms *eg heating, cooling, dissolving, melting, freezing, solids, evaporating, condensing, burning, change, reversible, irreversible, salt, water, clay, wood, wax, gas, new materials, steam, ice, air*. Discuss outcomes with children.

LEARNING OUTCOMES

CHILDREN

- use observations of what happens when solids are added to water to group them and justify their groupings

- describe how a solid which does not dissolve and one which does can be recovered from water
- explain in terms of the size of the particle why different methods have to be used
- recognise that these changes are reversible

- recognise that when there is vigorous bubbling a gas is being released
- identify some changes as irreversible and explain reasons for doing so

- describe what happens to some materials when they are cooled *eg water, steam* and say whether these changes are easily reversed

- describe what is seen when common materials *eg wax, wood, natural gas* are burned
- recognise that in each case new materials are made *eg ash, gases that cannot be seen*
- classify burning as an irreversible change

- identify hazards associated with burning materials

POINTS TO NOTE

Plaster of Paris and cement react chemically with water to make new substances: plaster and concrete. When vinegar is added to bicarbonate of soda, lemon juice to washing soda, and Andrews salts to water, the bubbles of gas produced are carbon dioxide.

 **SAFETY** – Children should only use low hazard materials to avoid the need for eye protection for them. Teachers could demonstrate cement. For more information see 'Be Safe' section 7.

 **SAFETY** – Lemon juice should be provided in a bottle not in a 'squeazy lemon'.

This activity re-visits work done in earlier units. Teachers may wish to use it to consolidate some children's understanding.

It is not possible to demonstrate directly that these changes cannot be reversed. However, children will recognise that it is not easy to reverse them as it was with the changes in the earlier activity.

Emphasise to children that heating something is causing its temperature to rise. It is not setting it alight. Avoid using bread in this activity as charring occurs when bread is heated.

Many of the changes that occur when materials *eg vegetables, fruit* are frozen result from water in the materials freezing. This damages the tissues, or material, but does not cause changes in the structure of the materials themselves.

It is helpful at this stage to distinguish between burning and heating by saying that when something burns a flame can be seen. (Charcoal has a nearly invisible flame as it burns.)

 **SAFETY** – Burn materials using a small candle or night light standing in a metal tray *eg a baking tray containing dry sand*. Do not use more than a piece the size of a small postage stamp because plastics and synthetic fabrics often give off poisonous gases when they are burned. Avoid the use of PVC. Any LEA/school guidelines must be observed.

A concept map shows the connections between different ideas in a particular topic and is a useful source of information about children's understanding. If children have not previously made a concept map they will need to be taught how to do so. If teachers are not sure that children's understanding is secure it is helpful to use a limited number of terms initially and to extend this after discussion with the children.



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