Unit 4C Keeping warm

ABOUT THE UNIT

Through this unit children build on their ideas about temperature as a measure of how hot or cold objects are and learn about thermal insulators as materials which can help to keep things warm or cool.

Experimental and investigative work focuses on:

- turning ideas into a form that can be investigated
- using thermometers to make careful measurements of temperature
- identifying and suggesting explanations for patterns and trends in results and using results to draw conclusions.

Children also have opportunities to use IT (see IT Units 3C and 4D) to collect, retrieve and present information and to use their understanding of science to explain everyday phenomena about keeping warm and cooling down.

This unit takes approximately 10 hours.

WHERE THE UNIT FITS IN

Builds on Unit 2D 'Grouping and changing materials', Unit 3C 'Characteristics of materials' and Unit 4F 'Circuits and conductors'

Children need:

- to know that metals are good electrical conductors
- to be able to identify materials
- to be able to measure some quantities *eg length* in standard measures.

Links with Units 3F, 4A, 4D, 5C, 5D, 6A and geography.

VOCABULARY

In this unit children have opportunities to use:

- words and phrases related to warmth and cold eg temperature, thermometer, degrees Celsius, thermal conductor, thermal insulator
- related nouns and verbs eg conductor/conduct, insulator/insulate
- phrases with specific scientific meaning *eg room temperature*
- words which have a different meaning in other contexts eg conductor.

RESOURCES

- thermometers
- containers for water eg beakers, metal cans
- IT temperature sensor (if available)
- access to a source of ice
- a variety of materials eg bubble wrap, sponge sheeting, aluminium foil, woollen (or other) blanket, cotton, paper, polystyrene wrap, polythene
- wooden, plastic and metal spoons
- metal saucepan with wooden or plastic handle

EXPECTATIONS

at the end of this unit

most children will:

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

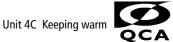
some children will have progressed further and will also:

recognise that temperature is a measure of how hot or cold objects are; identify some materials that are good thermal insulators and some everyday uses of these; recognise that the same materials keep cold objects cold as keep warm objects warm; use thermometers to measure temperatures; suggest how to investigate a question; construct tables for their results and offer simple explanations for results

recognise that temperature is a measure of how hot or cold objects are; identify some everyday uses of thermal insulators; use thermometers to measure temperature and present results in tables prepared for them

recognise that objects cool or warm to the temperature of their surroundings when they are left; recognise that metals are both good thermal and good electrical conductors





LEARNING OBJECTIVES POSSIBLE TEACHING ACTIVITIES LEARNING OUTCOMES POINTS TO NOTE CHILDREN SHOULD LEARN CHILDREN **SAFETY** – Children should not touch ice immediately after it is removed from a freezer. Water should not be uncomfortably • identify touch as a method of telling whether things are hot or cold • that the sense of touch is not an Present children with an ice cube, bowls of water at room temperature and warm water and ask accurate way of judging temperature them to judge how hot they are. Ask them whether it is always easy to tell using their sense of and suggest it is not very accurate, particularly when differences are touch and how they could make a better judgement. hot, just warm. • to use a thermometer to make careful ◆ Ask children to explore how thermometer readings change eg when they hold it in their hand, • use a thermometer correctly to make readings of temperature Children will need to have access to thermometers which can be read measurements of temperature using blow on it, put it under a cold running tap. Demonstrate to children, using a container of water at • given the temperature of a room, correctly predict the final standard measures room temperature, how to use a thermometer safely and to an appropriate degree of accuracy. temperature of an initially cooler or warmer container of water SAFETY – Mercury thermometers are not suitable for use in primary schools because of the problems of clearing up toxic • that temperature is a measure of how Provide children with containers of water at a range of temperatures (including below room • read correctly the temperature indicated on models or drawings of hot or cold things are and that temperature) and ask them to find the temperature of each. Ask children to take the thermometers mercury if they are broken. temperatures of the bowls of water after about an hour. Record the results, and compare with the something hot will cool down and SAFETY – Care is needed with hot water. If hot water is poured into containers made of some plastics they may soften, spilling something cold will warm up until it is original readings and ask children to suggest what has happened. While children are waiting the same temperature as its practise reading thermometer scales from models or drawings. the water. Keep children well back if water is more than hand hot. surroundinas • to explain temperature and temperature changes using scientific knowledge and understanding ◆ Ask children to draw a plan or map of the classroom showing which areas they think are hot and to use IT (see IT Unit 6C 'Control and • explain why they think some parts of the classroom will be warmer Children sometimes use the word 'heat' and 'temperature' monitoring – What happens when ...?') which are cold. Ask them to explain their suggestions and to guess the temperature of their than others and recognise that the temperature of the classroom is interchangeably. These are two distinct concepts and it is important for classroom. Use children's suggestions to choose two or three suitable places in the classroom and to collect, store and retrieve usually around 20°C teachers to use the words correctly. temperatures and to explain trends and use the temperature sensor or thermometer to record the temperature in these places over a • identify differences in the recorded temperatures and, with help, A sensor linked to a computer can be used to display the temperatures explain these in terms of day and night and the characteristics of patterns in results in terms of scientific period of 24 hours. Ask children to compare the results obtained with their suggestions and to at regular time intervals as water cools. This provides an opportunity for suggest reasons for any differences. knowledge and understanding children to begin to interpret a line graph. If schools do not have access to temperature sensors these activities could be carried out using thermometers and records of temperature made at regular intervals during the day. • to turn an idea about how to keep • Ask children to suggest ways things are kept cool eg cold drinks as part of a packed lunch, or • with help children suggest a way of testing how to keep cold things Children will sometimes suggest that the material will keep the cold in things cold into a form that can be taking frozen food home. Ask them to think about how they could find out in school about how cold and what observations they are going to make rather than prevent the surroundings warming up the ice. It is important to avoid implying that this is so. It is also important to try to to keep something cold eq using an ice cube as a cold object and trying out different wrappings • record results clearly in a suitable table using drawing or writing investigated • to decide what evidence to collect (bubble wrap, sponge sheeting, aluminium foil, polythene), what they would do and what • identify which materials are effective in preventing the ice cube avoid implying that 'heat' is like water or air. • to make a table and to record results apparatus they would use eg leave all the wrapped ice cubes for half an hour, look at them every melting and some common features of these eg all the materials that fifteen minutes. Help children to think about what they will record and ask them to make a table stopped the ice cube melting were thick **SAFETY** – Check children's plans carefully for safety eq use of in it A SAFETY – hot water. for their results. Ask children to make a record of what they did in drawing and writing. to draw conclusions from their results to turn an idea about how to keep ◆ Ask children to think about the sort of materials they use to keep themselves warm in winter and • carry out a fair test eg using the same sort of container with the how they could investigate which materials help keep things warm. Ask how they will judge out a whole investigation. It may be helpful to concentrate on the things warm into a form that can be same volume of water in it whether something is keeping warm or not. Help children to plan an investigation to find out • make careful measurements of the temperature of liquid in aspects of investigation highlighted in the learning objectives. investigated • to plan a fair test deciding what to containers at regular time intervals and present results in a suitable what materials will keep eq a container of water warm for the longest time. Ask children to Some children may be ready to interpret results from this activity change, what to keep the same and suggest how the test will be kept fair and how often to take the temperature. Suggest different presented as line graphs. groups of children use different materials. Help children to record their results in tables and to • interpret their results to make comparisons of how well different what to measure to make careful measurements of interpret what they show.

temperature at regular time intervals • to record results in a table and to use these to draw conclusions • that some materials are good thermal

insulators

- materials kept the water warm
- identify some materials as good thermal insulators

This activity, and the previous one, offer children opportunities to carry

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LEARNING OBJECTIVES

POSSIBLE TEACHING ACTIVITIES

of material are good electrical conductors.

CHILDREN SHOULD LEARN

- that good thermal insulators keep cold objects cold and warm objects warm
- ice cubes from melting and liquids from cooling. Remind them about using flasks for hot and cold drinks.

◆ Place long handled spoons made of metal, plastic, wood in a container of hot water and ask

children to feel how warm the handles are after five to ten minutes. Discuss the results and ask

children to suggest why saucepans often have wooden or plastic handles. Record explanations in

drawing and writing. Remind children of work on electrical conductors and ask them which types

◆ Prepare a class presentation about keeping things warm or keeping things cool eg by making a

display of packaging, wrapping, pictures, clothing with explanations of their purposes.

- that metals are not good thermal insulators but that wood and plastics are
- that materials such as metals which are good electrical conductors are often good thermal conductors
- to recognise a range of uses of thermal insulators

• Discuss with children whether their investigations showed that similar sorts of material kept

LEARNING OUTCOMES

CHILDREN

• compare the results of the two investigations and identify a material that kept the ice cube from melting and prevented water cooling

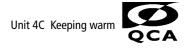
POINTS TO NOTE

Children may find it difficult to accept that the same types of material help keep cold objects cold and warm objects warm. Concept cartoons could be used to introduce ideas about keeping things cool or warm and to stimulate suggestions.

- state that the metal spoon feels hotter than the plastic and wooden
- explain that the wooden and plastic spoons are insulators but the metal spoon is a conductor saying eg the metal spoon lets heat travel along it so it feels hot at the end
- generalise that metals are both good electrical and good thermal conductors

SAFETY – Care is needed with hot water. If hot water is poured into containers made of some plastics they may soften causing water to spill. Keep children well back if water is more than hand hot.

• identify a range of everyday ways in which eg food, drinks, people, animals are kept, or keep, cold or warm



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