ICE POPS

National Curriculum Science KS2 PoS Sc3: 1b; 2c
QCA Science Unit 4C: Keeping warm
Scottish 5–14 Guidelines Materials from Earth – Levels A, B

HOW TO GATHER THE DATA

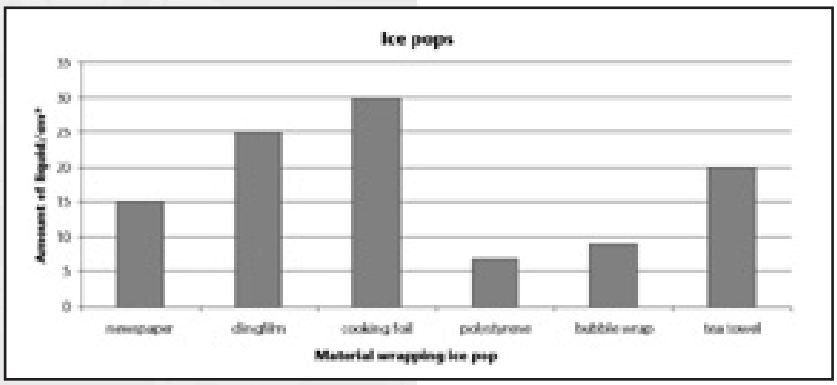
This investigation was suggested and devised by a Year 4 pupil, and shows the benefit of giving children ownership of their work. Ice pops are particularly suitable for this type of investigation, because the plastic wrapper keeps the melted liquid inside until the bottom is cut open. Also, because the liquids tend to be brightly coloured, they are easy to see and compare. If you do not have measuring cylinders that can measure very small amounts of liquid, you can use medicine pots (available from a local pharmacy) to measure the liquid: these are calibrated, plastic and quite easy for children to handle. Resource page 64 can be used to provide a set of blank graph axes.

Answers

1.

Wrapping	Amount of liquid/cm³
newspaper	15
cling film	25
cooking foil	30
polystyrene	7
bubble wrap	9
tea towel	20

2.



3. Cooking foil.
4. Polystyrene.
5. The ice pop wrapped in this material produced the least amount of liquid.
6. Thermal insulator.
7. Thermal conductor.
8. The ice pops should have been at the same initial temperature. They should have been kept in the same place (at the same temperature) during the investigation.
9. Approximately 15cm³.
10. The newspaper gave this amount, and kitchen roll is made from paper.

THE SCIENCE BEHIND THE DATA

Keeping things either hot or cold involves using a thermal insulator to stop heat transfer. Heat is always transferred from a hotter place to a colder one, but 'cold' is not something in itself: it is simply a relative lack of heat. The 'cold' of the ice pop does not escape in this activity: the room is warmer, so heat from the surroundings passes into the ice pop.

When a material is heated, the particles gain energy and move faster. Heat can be transferred from one place to another in three different ways:

1. Conduction – particles vibrate faster and pass on their vibrations to the particles next to them. Metals are good conductors of heat, because their electrons can move easily to transfer energy. Non-metals and liquids are poor conductors. Gases are very poor conductors, and conduction cannot take place through a vacuum.

2. Convection – in liquids and gases, the particles are free to move about. If they are heated, they move faster and spread out more, carrying energy with them. Because the density is less, the warmer liquid or gas will rise.

3. Radiation – all objects give out infra-red (heat) radiation. Very hot objects (such as a light bulb filament) give out visible light as well. This way of transferring heat energy does not require other particles. For example, the Sun's heat energy travels across the near-vacuum of space. Shiny, bright surfaces are the poorest radiators of heat; dark, dull surfaces are the best radiators. The same principle applies to absorbing radiation: dark clothes absorb heat better than light clothes.