

PUDDLES

National Curriculum Science KS2 PoS Sc3: 2b, d

QCA Science Unit 5D: Changing state

Scottish 5–14 Guidelines Changing materials – Levels C, D

HOW TO GATHER THE DATA

The children can decide whether they want to measure across the puddle or round the circumference (using a piece of string or a trundle wheel). The activity can also be 'modelled' on a board by making a circle shape with a wet (but not dripping) cloth. Some surfaces (such as cloth-type boards) work well; but with other surfaces or in warm classrooms, the evaporation can be very rapid and uneven. The children can either measure the puddle or draw round its perimeter and measure later.

THE SCIENCE BEHIND THE DATA

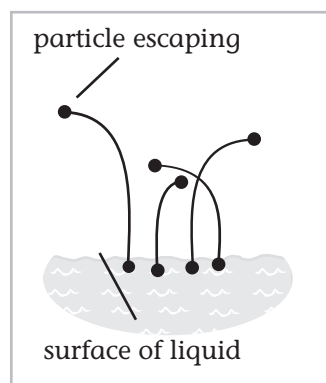
Materials are held together by forces of attraction between particles. Solids are held together by strong forces: the particles are held in a close, regular pattern. Liquids have weaker forces between the particles, which can move from one position to another. If the particles are moving rapidly and are near the surface of a liquid, they can escape from it (evaporation). The particles are now in a gas: they are moving very rapidly and are far apart.

Particles vibrate more, move faster and move further apart if energy (for example, heat) is supplied to them. As a liquid evaporates, the particles with the most energy escape from it – so the temperature of the liquid drops. A liquid will evaporate faster if the

air around it is warmer, because more energy is available to make the particles move – so liquids evaporate faster in summer, when the air is warmer. However, puddles in winter will eventually dry out. If a material is in a liquid state it can evaporate, no matter what its temperature is.

In this activity, you may have to deal with some children's ideas that the water from puddles only disappears because it soaks into the ground. You can use open and closed containers in the classroom to demonstrate that water disappears from an open container when it will not disappear from a similar closed container – so the water is escaping into the air.

The lines on the graph are both curves because the rate of evaporation depends on the surface area of the puddle, which is proportional to the width squared. This means that the slope of the graph decreases with time.



Answers

- Using a (waterproof) tape measure or a metre rule – or a trundle wheel for the circumference. Centimetres.
- The size of both puddles decreased.
- The summer puddle dried up faster. The child may answer that the summer puddle became smaller – this is a limited answer, because eventually the winter puddle would have reached the same size. However, this answer may be the limit of some children's ability to express their ideas. Comparing evaporation rates is difficult.
- In summer the weather is warmer, so the temperature is higher and water will evaporate faster.
- Evaporation is a slow process at ordinary outdoor temperatures.
- To make the test fair.
- Winter 60–65cm (actual result 62cm); summer 15–19cm (actual result 17cm).
- Into the air. The child may answer that it has evaporated – so ask further: *Where is the water now?* Answers such as 'It has soaked into the ground' and 'The Sun has sucked it up' are not uncommon. If these answers are given, some further investigative activities will be needed.