

### 3. In the melting pot

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Children are introduced to the word 'evaporation' by considering how objects are dried at home. They then set up an investigation using different methods to evaporate salt from salty water. They then plan an investigation into the effect of the size and shape of the container on the speed of evaporation.

#### OBJECTIVES

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- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.

#### RESOURCES

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Copies of Activity sheet S8-9, salt, desk lamp, radiator, hair-dryer, tea- cup, saucer, egg-cup, plastic plate, yogurt pot. Other resources, depending on the children's planned investigations.

To introduce the concept of evaporation, the children are given Activity sheet S8 and asked what all the pictures have in common. The pictures show wet clothes on a washing-line, a hair-dryer being used to dry wet hair, paintings being left to dry, a draining rack of wet dishes and a towel on a radiator.

Once children have established that each picture shows something drying, they are asked what happens to make wet things dry and where the water goes. The children should be introduced to the word 'evaporation', if it is not suggested as a reason for the water 'disappearing'.

The children are asked to put the examples in order, starting with the one where evaporation (drying) takes the longest. Children may want to introduce factors such as the quantity of water in/on the wet object, the size of the wet object, whether water is trapped inside the object or on the surface, etc. The teacher should avoid introducing these factors, as they can lead to confusion if a child is not ready for them.

#### Safety note

All mains appliances used in schools must be checked annually. If a desk lamp or hair-dryer is brought from home, it must go through a standard safety check. Children should be told not to try this activity at home.

The children are given Activity sheet S9, which asks them to obtain salt from salty water in three different ways. Groups of children should decide on appropriate quantities of salt and water, estimate and measure evaporation times, and give reasons for their findings. Teachers can guide children in their decision-making, asking questions such as how long the test will take.

## HANDY HINTS

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1. The smaller the quantity of water used, the quicker it will evaporate. One tablespoon of water in a saucer takes the following approximate times to evaporate:

With hot air from a hair-dryer blown across the surface.	30 mins
On a hot radiator.	60-90 mins
Under a desk lamp with a low wattage bulb.	8+ hours
On a sunny window sill in summer.	8+ hours

2. The slower the evaporation, the larger the size of the salt crystals. This is demonstrated by using a variety of evaporation methods.
3. Using dark-coloured saucers, etc. aids the observation of the salt crystals.
4. When using a hair-dryer, the air should initially be directed across the surface of the water, to avoid blowing water out of the saucer. As the water evaporates, hot air can be blown directly at and closer to the solution. Children can take turns to hold the hair-dryer or it could be supported in some way.

## WATER HOLDER INVESTIGATION

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The children then plan an investigation into the effect of the container on the speed of evaporation. They use a tea-cup, saucer, egg-cup and plate and choose additional resources and variables to be controlled and measured. Ideally, they should control the quantity of salt and water and the method of evaporating the water (under a lamp, etc.)

N.B. *This experiment will take 2-3 weeks if the water is left to evaporate at room temperature with no added heat source. However, slow evaporation will demonstrate the larger crystal size.*

The children should find that the larger the surface area of the exposed solution, the faster the evaporation.

## TEACHER INFORMATION

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During evaporation the water changes from a liquid to a gas. Most gases cannot be seen (like air) and so the water seems to have disappeared. The warmer the temperature, the faster the evaporation.

Water evaporates very slowly at temperatures below boiling point. Water molecules (particles) at the surface of the water slowly 'escape' from the water as a gas. Therefore, the greater the surface area, the greater the number of water molecules that escape.

## EXTENSION ACTIVITIES

Challenge children to make coloured salt. Salt is dissolved in water with food colouring and then the water is evaporated.

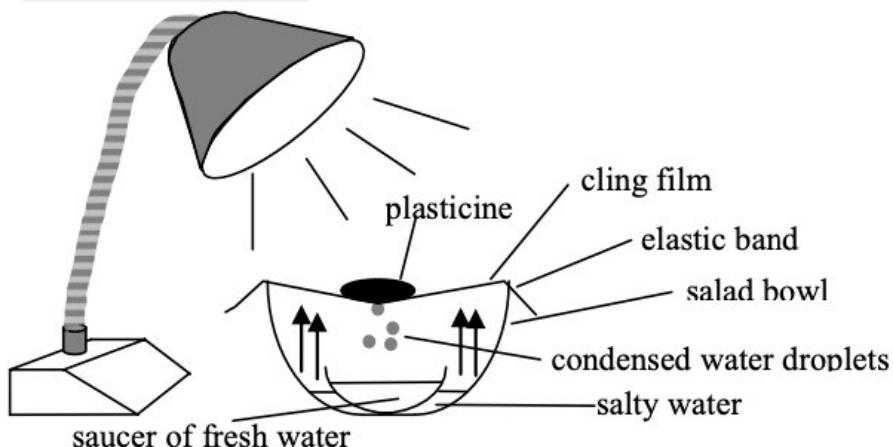
Children can investigate the possibilities of retrieving other solids from solution, e.g. coffee or sugar.

In some hot countries drinking water is obtained by evaporating water from salt water (see geography, page 117). The water is condensed and collected. The teacher can demonstrate condensation by holding a pan lid over a pan of boiling water.

*N.B. The teacher should wear an oven glove when holding the lid.*

The children will observe water condensing on the lid and dripping back in to the pan.

The children can devise an investigation to obtain fresh water from salty water using a desk lamp to represent the Sun and their knowledge of evaporation and condensation. Alternatively, the teacher or a group of children can set up a simple model of this process in the classroom:



The cling film must be secured firmly to the bowl with an elastic band. The desk lamp (angled directly over the bowl if possible) heats the salty water through the cling film. The water evaporates and the resulting condensation on the surface of the cling film can be seen after a couple of hours. When heavy enough drops of water have formed they drop into the saucer.

*N.B. This takes more than 24 hours using a 60 watt bulb, and about 12 hours using a 100 watt bulb.*