Scottish Water
Always serving Scotland

The Water Cycle

Second level

Description of module

This module is all about the water cycle, and follows on from the Water, pure water module. Teachers may wish to do the earlier module first, particularly if the pupils are younger, or need longer to assimilate ideas. There are a number of suggested experiments, and an activity in which pupils add a commentary to a video.

Main experiences and outcomes

Expressive arts

I have experienced the energy and excitement of presenting/performing for audiences and being part of an audience for other people's presentations/performances.
EXA 2-01a

Through observing and recording from my experiences across the curriculum, I can create images and objects which show my awareness and recognition of detail.
EXA 2-04a

Health and wellbeing

I recognise that each individual has a unique blend of abilities and needs. I contribute to making my school community one which values individuals equally and is a welcoming place for all.
HWB 2-10a

Literacy and English

When I engage with others, I can respond in ways appropriate to my role, show that I value the contributions of others and use these to build on thinking.
LIT 2-02a

I can select ideas and relevant information, organise these in an appropriate way for my purpose and use suitable vocabulary for my audience.
LIT 2-06a

I can convey information, describe events, explain processes or combine ideas in different ways.
LIT 2-28a

Sciences

I can apply my knowledge of how water changes state to help me understand the processes involved in the water cycle in nature over time.
SCN 2-05a

Social studies

I can describe the major characteristic features of Scotland's landscape and explain how these were formed.
SOC 2-07a

Technologies

During practical activities and design challenges, I can estimate and measure using appropriate instruments and units.
TCH 2-13a

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Activity 1

Learning intention
- To revise, or introduce, the principles behind the water cycle

Success criterion
- Pupils are able to explain what happened in their recording

Suggestions for teachers

There is an introduction to the water cycle in the Water, pure water module, and it is recommended that you use this if the pupils are new to the concept. The following experiment will reinforce the ideas.

1 On a sunny day...

Follow the directions from resource sheet 1. You do need a good sunny day for this, and a safe place to put the bowl. It works more quickly if you start with water that is not too cold.

2 Development

A development of this is to discuss what is happening, and here the key terms evaporation, condensation and precipitation can be used. The pupils can be led to set up other experiments, with a number of bowls, such as:

- keeping one of the bowls in the shade
- keeping one of the bowls indoors
- putting a handful of ice cubes on the cling film
- starting with freezing water
- starting with warm water

Before the experiments, the pupils could predict what they think might happen. Comparing these predictions with the actual results would lead to greater understanding of the process.

The results could be written up in the form:

- What we used (a labelled diagram)
- What we did
- What I thought would happen
- What really happened
- What I learned from this experiment

3 Indoor experiment

It is possible to do this experiment indoors, which might be necessary if it is not a warm, sunny day. Place bowl near window in the school kitchen (warm environment) and outside in shelter (undercover). Or, follow the instructions on resource sheet 2, and explain that if the experiment were done outside, the sun would have warmed up the water.

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Activity 2

Learning intention
- To explain how the water cycle works

Success criterion
- Pupils are able to explain the water cycle, using appropriate vocabulary in their video commentary

Suggestions for teachers

1 Video clips

Relate what is happening in the bowl in the experiments (on the previous page) to what happens on a global scale. This is quite a step for some children, but there are some good video clips available to help, for example at **https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/z3wpp39**

2 Resource sheet 3

Resource sheet 3 is a good summary, which ties everything together well.

3 Indoor experiment

A formative assessment, and reinforcement activity could be to show the pupils the clip **https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/z3wpp39** and ask them to be a TV presenter; in other words, they need to come up with a commentary to go with the video. This works well in groups: kids' shows often have two or three presenters so that there can be some dialogue between them. Each group would really need access to a computer to play the clip. Just how far you take this is up to you. Some possibilities are:

- having puppets doing the presenting
- allowing some props, such as umbrellas or suitable clothing
- allowing some sound effects
- adding some movement, so the pupils can rush about or jump off PE equipment to demonstrate precipitation
- adding a dance sequence
- adding suitable background music
- doing a finished presentation for other classes.

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Activity 3

Learning intentions
- To show that some water is taken up by plants and then released into the atmosphere
- To explain/recognise the importance of water to plants and animals

Success criterion
- Pupils are able to explain what happened in a series of diagrams

Suggestions for teachers

1 Observe condensing

Put a large transparent polythene bag round a potted plant on a windowsill, securing the bag with string (elastic bands are tricky). The best plants for this are leafy, non-woody and with a single stem at the base, like a scented-leaf geranium. The pupils will observe water condensing inside the bag, and a discussion will probably conclude that the water is coming from the plant. Challenge the pupils on this: how can they be sure that the water doesn't just come out of the air when you leave a plastic bag on the windowsill? How can they be sure that the water isn't coming out of the pot? Does this work with all plants? The pupils should be able to design some experiments to test out their ideas. You may want to introduce the word 'transpiration' to describe what is happening, but this depends on the pupils you have.

2 How does the water move?

To show that the water moves from the damp soil and up the plant, there are a number of well-known experiments involving standing plant material in a water/food dye mixture. Some variations on this are:

- Stand a stick of celery in water mixed with plenty of food dye and watch the progress of the colour as it moves up the stem. Afterwards, cut across the celery stem and notice where the dye is concentrated.
- Then, carefully snap the stem without breaking the 'strings' inside, and pull back; where is the colour?
- Get some white flowers. Carnations are classic for this, but lilies, white daisy-type flowers and many others work well. You can use roses, daffodils and many other flowers, but white shows up best. Place the cut end of the stem in dyed water and watch what happens to the flowers over the day (or days). The edges of the petals are the first to colour, and the effect spreads. Each pupil could have a flower and opt for various colours of food dye, they could even swap the colour half way through to give a two-tone effect.
- More creatively, you could challenge the children to split the stems lengthwise into 2 (or even 3) and put each section in a different colour of dye. The effect is very attractive. (Note that the effect is more rapid if a hair dryer is used, and you could discuss with the pupils why that should be).

3 Diagrams

Recording by means of a sequence of diagrams would be appropriate. Detailed, observational artwork of the dyed flowers would help develop the scientific approach. Alternatively, pupils could photograph the flowers at each stage of the experiment, so they have pictorial evidence that shows the process. These photos could be used in a classroom display; presented in a PowerPoint or in a documentary video.

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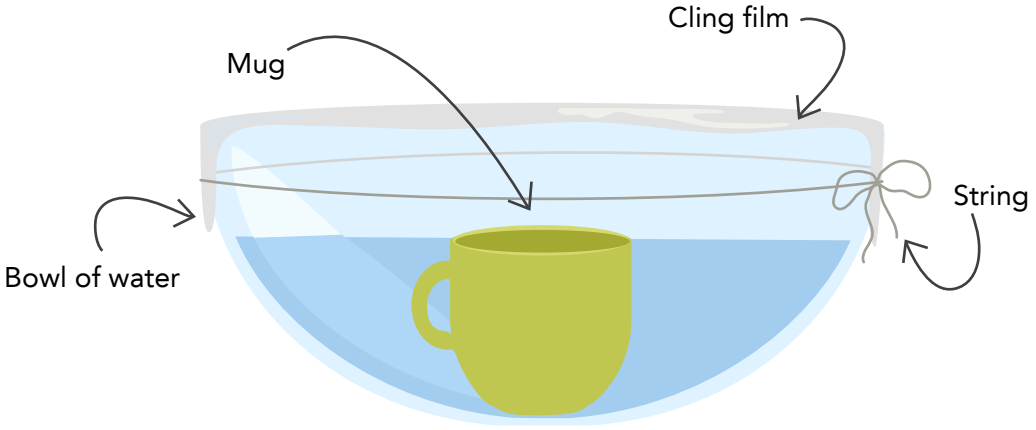
Resource sheet 1

Evaporation experiment

You will need:
- a large metal or plastic bowl
- a sheet of cling film
- a dry ceramic mug (like coffee mug)
- a long piece of string or large rubber band
- water

1. Put the bowl in a sunny place outside.
2. Pour water into the bowl until it is about a quarter full.
3. Place the mug in the centre of the bowl. Be careful not to splash any water in to the mug.
4. Cover the top with the cling film tightly.
5. Tie the string around the bowl to hold the cling film in place.
6. Come back to the bowl every half an hour to see what happens.



The "mist" that forms on the cling film will change into larger drops of water that will begin to drip. (You can speed up the dripping by carefully moving the bowl - don't splash! - into the shade). When this happens, continue watching for a few minutes, then carefully peel back the clingfilm. Is the mug still empty? Water from the "ocean" of water in the bowl evaporated. It condensed to form misty "clouds" on the cling film. When the clouds became saturated it "rained" into the mug!

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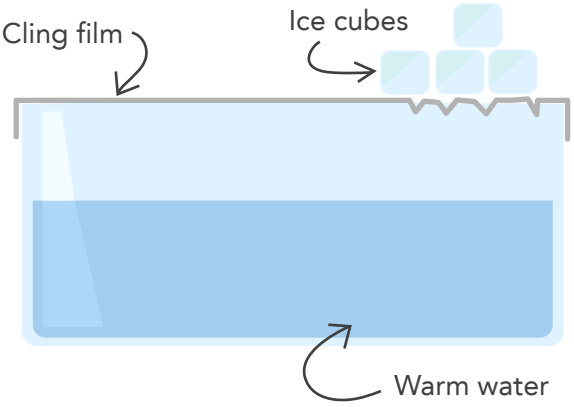
Resource sheet 2

Making rain

You will need:
- plastic fish tank
- some cling film
- some ice cubes



1 Put some warm water in a plastic fish tank.

2 Stretch cling film over the top of the tank.

3 Put 3 or 4 ice cubes in a pile at one end of the cling film.
Pucker the surface of the cling film so that they are kept in the same position.

Watch what happens and write up your experiment below. Write down what you used, what you did and what happened.

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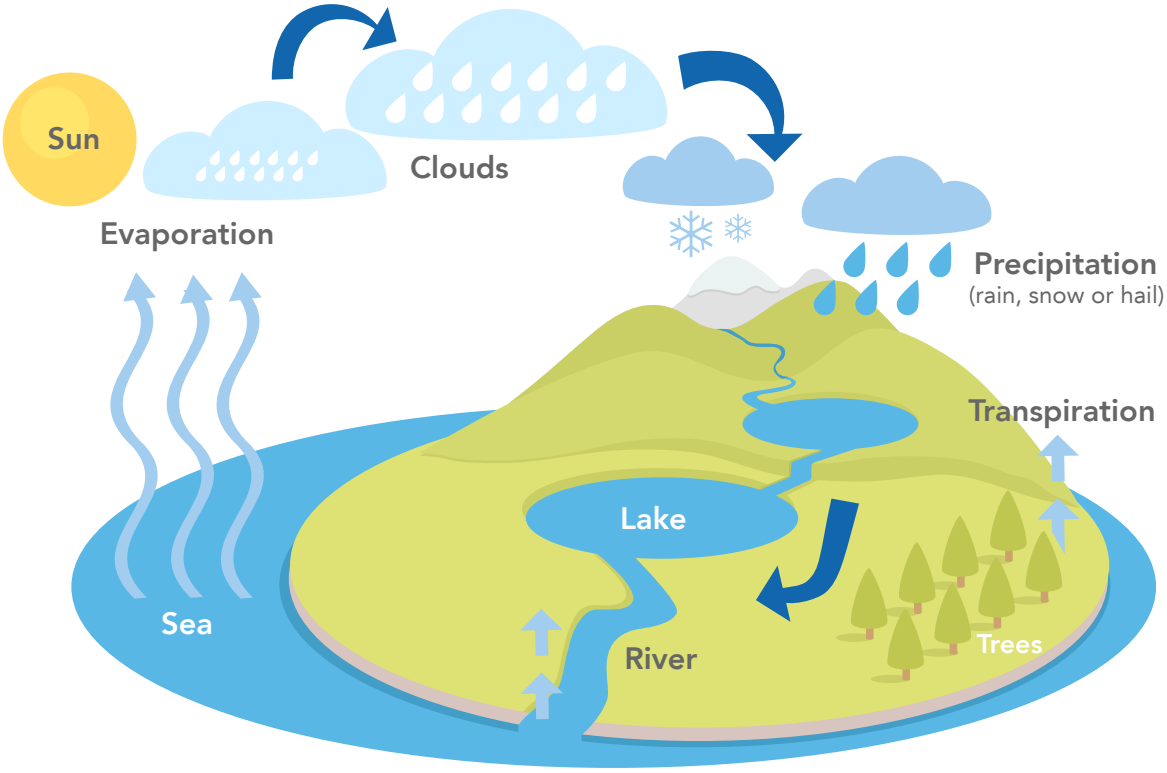
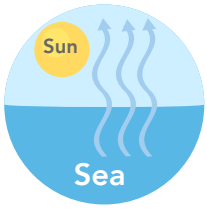
Resource sheet 3

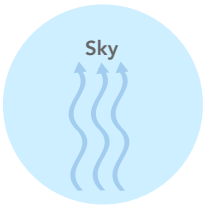




Water **evaporates** from the sea (leaving the salt behind).

Fresh water **evaporates** from rivers.

Trees breath out water vapour through their leaves (this is called **transpiration**).



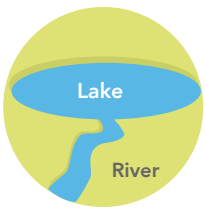
This **water vapour** rises into the sky.

As the water vapour rises it gets colder and **condenses** to form clouds.

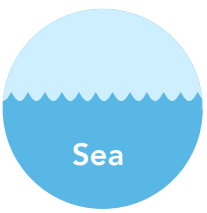
The **water droplets** in the clouds group together to form bigger droplets.

When the water droplets get too big and heavy they fall from the sky as rain, snow or hail.

Some of this water **feeds** plants, trees and animals.



The rest of the water soaks into the ground and flows into rivers.



Eventually, rivers take the water back out into the sea where the cycle starts again.