

Lesson 1 - The Water Cycle



Before you start this session, please:

- Print Session Information sheets
- Print Activity sheets 1:2, 1:3 and 1:4
- Make sure you have access to the internet so that you can watch video clips on YouTube.
- Collect together the following items to help you complete the experiment and activities in this lesson.
 - **For the experiment:** a clear, sealable plastic bag, marker pens, half a cup of water (with food colouring if possible), sticky tape.
 - **For Activity 1:3:** various different sized containers to collect water, a ruler or lollypop sticks.
 - **For Activity 1:4:** kitchen roll, felt tip pens, two small bowls, a paper cup, some thread.

The water cycle

Let's get started

Water is vital to all life on earth, 70% of the earth's surface is covered in water.

However, not all of that water is the same - some is salty and some is not.

Water that is not salty is known as fresh water.

Some of the fresh water is in the form of ice and snow.



Watch the video clip Water on our planet in the Education Playlist <https://www.youtube.com/playlist?list=PLyJiBXEcAN5ZMtas4S68rp24yOs5N-SMQ> to find out how the water on the earth is distributed.

If you can't access the video, please take a look at the supporting information sheet 'How much water do we have available to us?'

Did you know?



- **97%** of the world's water is found in our oceans and seas. Why is this not useable? (Salty)
- Another **2%** is locked up in ice and snow. Why is this not useable? (Because most of that is found in the Arctic and Antarctic or on top of mountains)
- What form does the last **1%** take? (Rivers and Wetlands, lakes, ground water, etc)

Water is continually moving around planet Earth from the sea to the sky, from the sky to the land and then from the land back to the sea again.

It is also changing state from a liquid to a gas and a solid all the time. This never-ending movement of natural water is called the water cycle.

Water can exist in different states - a solid (ice), a liquid or as a gas (water vapour/steam).



Watch the video The Water Cycle in the Education playlist <https://www.youtube.com/playlist?list=PLyJiBXEcAN5ZMtas4S68rp24yOs5N-SMQ> to find out a little more about the water cycle or read the explanation below.

The water cycle



The sun heats the water on the surface of the earth, causing the water to turn from a liquid into a gas called water vapour. This process is called evaporation.



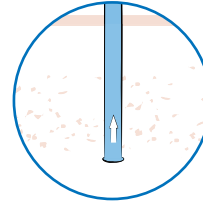
Hot air rises, so the water vapour is carried up high into the sky.



As the water vapour rises, it cools. The water vapour turns back into tiny droplets of water again, forming clouds. This process is called condensation.



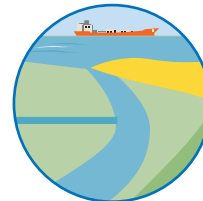
As the clouds cool even more, larger droplets of moisture form which are heavy enough to fall from the air as rain. If the air is really cold, the water might freeze, become solid and fall as snow or hail. This is known as precipitation.



Some of the rain soaks into the ground and makes its way through the rocks slowly until it reaches a river or seeps out of the ground forming a spring.



In some places the surface of the ground is impermeable. Surfaces that are impermeable don't let water pass through them, so the water runs off these surfaces into lakes, streams and rivers. Some of this water evaporates, forming water vapour.



Water collects in rivers and lakes and flows downhill to the sea to complete the water cycle.



The water cycle

Let's do an experiment:

Water cycle in a bag

Mark on the clear plastic bag each stage of the water cycle - use the diagram you have just completed to help you - ensuring you have the key stages of evaporation, condensation and precipitation marked on there. If you want to add houses, trees etc you can.

Next, fill a cup with regular tap water. Then add a couple of drops of blue food colouring to it to make it stand out. Swirl the cup of water a few times to mix the colouring until it's a nice, solid blue.

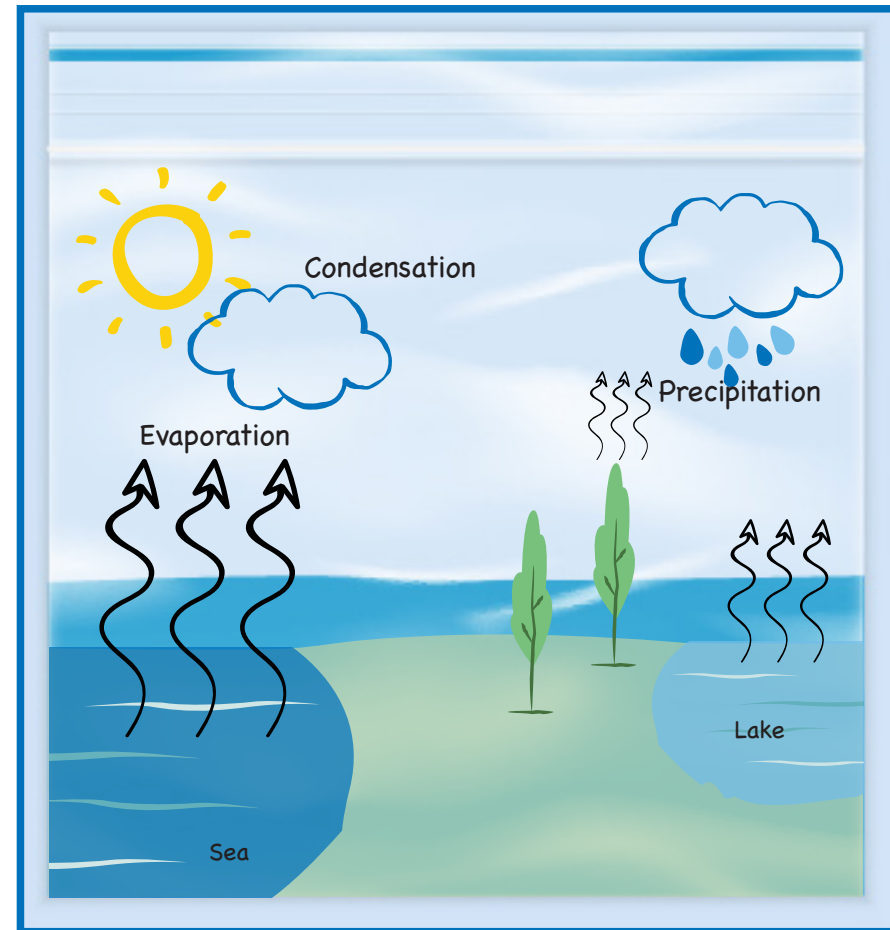
Now, carefully pour the water into the plastic bag and zip it closed. Make sure it's nice and tight! You don't want any water to be able to escape.

Once your water has been added to the bag and it's sealed up, it's time to hang it up on a window! Pick a window that gets a lot of sunshine for best results.

Cut two long pieces of tape and stick them to the corners of your bag. Then, press the tape tightly to the window - you don't want your bag to fall down!

Wait a couple of hours and check on your experiment. You should see a change in your bag between two hours and 1 day (depending on the amount of sun and the time of day you started).

Eventually, you will begin to see droplets of water sticking to the side of the bag. Some of these will be up high (in the clouds) while other droplets will be on their way back down (like rain).



Why is this happening?

It's because the water in the bag is being heated up against the sunny window. That water turns into a gas through a process called evaporation. In nature, evaporated water vapour goes into the atmosphere, but in our bag, it has nowhere to go, so it ends up sticking to the side of the bag, turning back into a liquid as condensation. That condensed water then slides back into the pool of water below as 'rain'.

The water cycle

So, what have you learned?



Water exists in many forms on the earth - some is salty and some fresh. It can be a solid, liquid or gas. The water cycle explains how water changes state and form on the earth.

There are some top water facts at

<https://www.youtube.com/playlist?list=PLYJiBXEcAN5ZMtas4S68rp24yOs5N-SMQ>, watch the video Top Water Facts on the Education playlist, to find some fascinating facts about water.

Challenges:
Now have a
go at some
of these:

1. Make your own rain gauge - what the weather brings Activity sheet 1.3.
2. Write your own rap to explain the water cycle.
3. Grow your own rainbow - take a look at Activity sheet 1:4.

The water cycle

All the water on the planet is constantly being recycled in the water cycle. This is important to get the water we need.

Can you write the names of the process on the diagram? The words you need are in the boxes.

Condensation	Sea	Reservoir
Collection	Water vapour	Evaporation
Precipitation	Clouds	Sun



Where does the water come from?

We collect the water from the water cycle to clean and pump to your taps. We get the water from these places:

50% from reservoirs

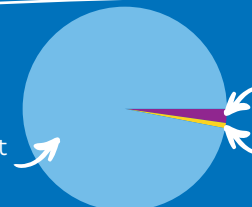
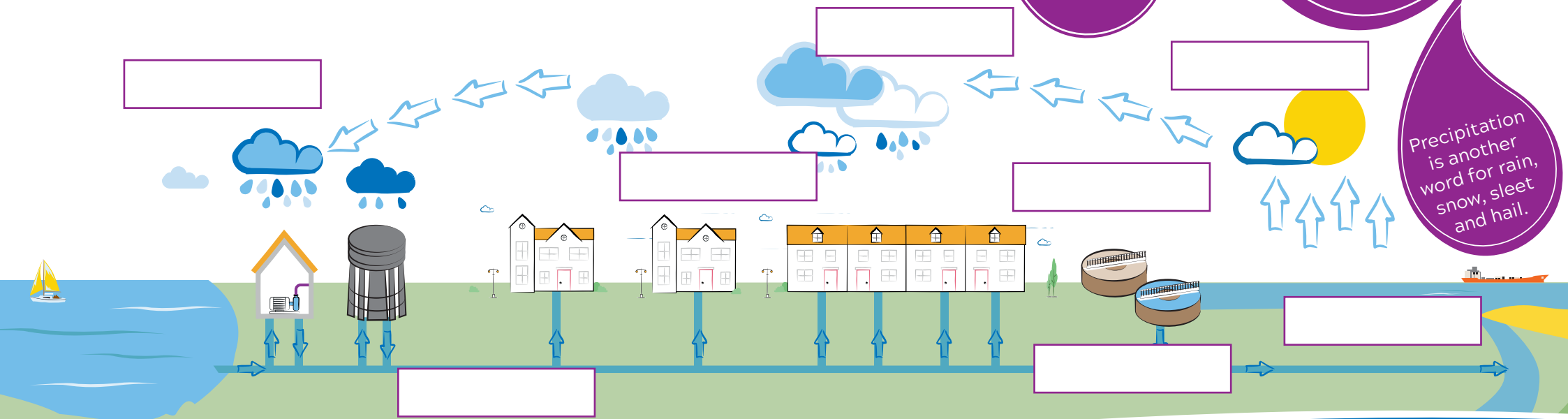
45% from underground

5% from rivers

Water you drink could have had dinosaurs swimming in it!

Reservoirs are man-made lakes to store rain water in. They are also homes to lots of animals and plants, and are great places to visit!

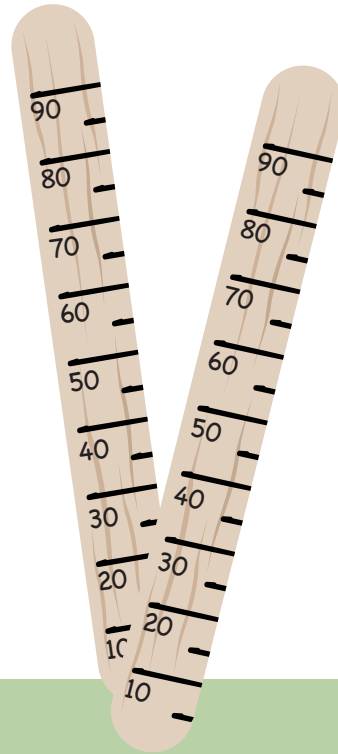
Precipitation is another word for rain, snow, sleet and hail.



The water cycle

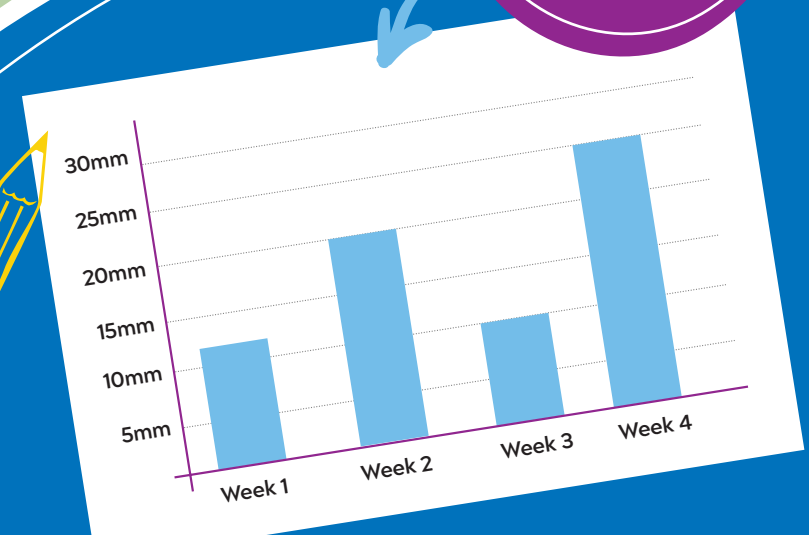
What the weather brings

How much water do we get when it rains?
This will affect the amount of water you
will need to water your plants.



- Position different containers with straight sides around your garden to collect the rainfall.
- Measure the depth of water in each container. (This can be done using measuring sticks made from lollipop sticks or a ruler).
- This will show how much rainfall different areas of the garden get.
- Collect rainwater weekly for a month to help you calculate how much water your garden is receiving.

Create a table to record the rainfall each day. Use this information later to create a rainfall graph.



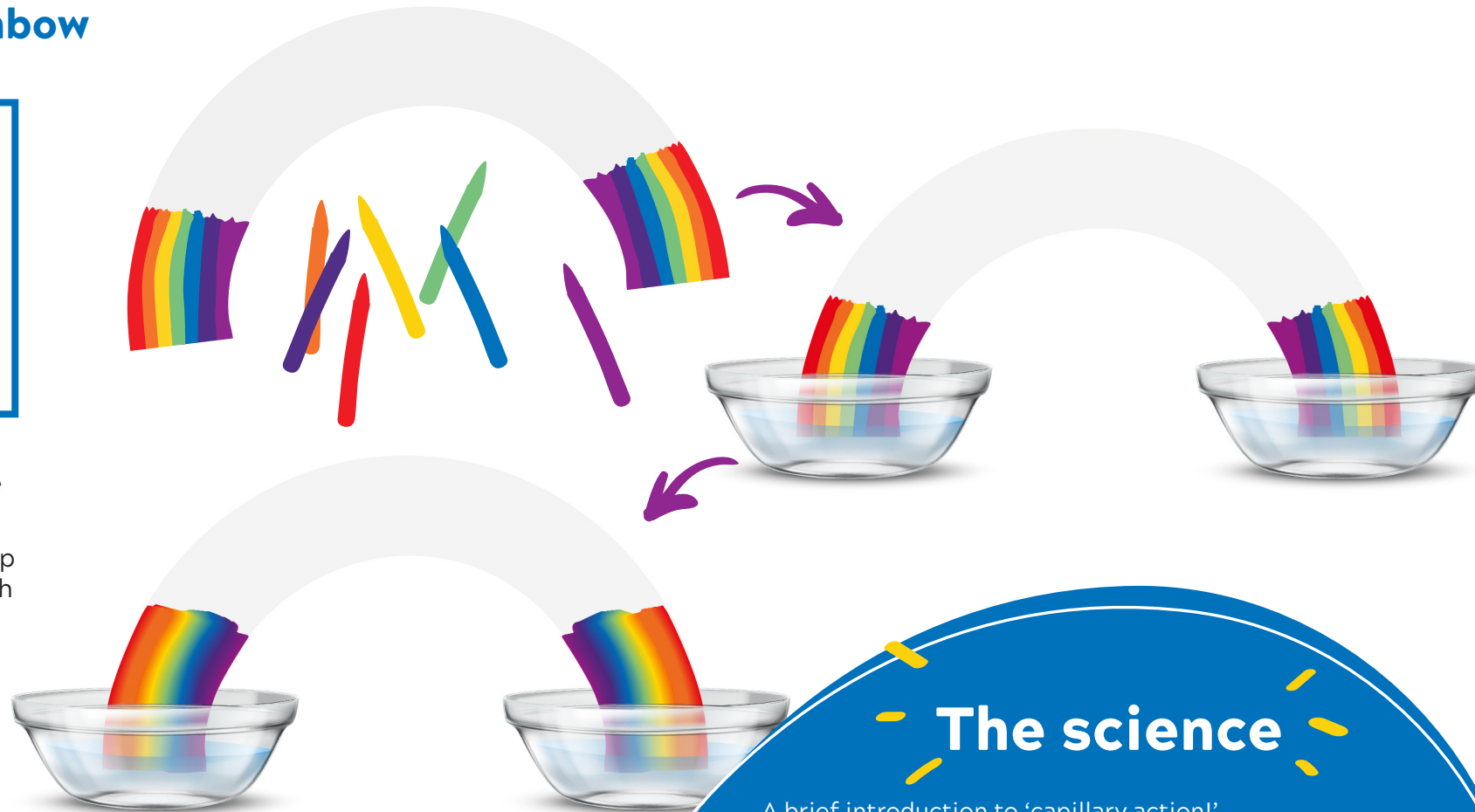
The water cycle

How to grow a rainbow

You will need:

- Kitchen roll/paper towel
- Felt tip pens
- Two small bowls of water
- A paper clip
- Thread

- Cut your kitchen roll into the shape of a rainbow.
- Colour both sides with felt tip pens about 2cm up from each end of the rainbow on both sides.
- Attach a thread to the paperclip and put the paper clip at the midpoint of the rainbow, so you can hold it.
- Fill each small bowl with water.
- Put each end of the rainbow in the bowls and see what happens.
- Is your rainbow growing?



The science

A brief introduction to 'capillary action!'

Water molecules like to stick to things - including themselves. Sticking to things is called adhesion and sticking to itself is called cohesion.

Between the fibres in the kitchen roll are lots of little holes. water is 'sucked' through the holes because of adhesion (sticking to other things). and cohesion (sticking to itself).

The water pressure will eventually slow down and the pressure of gravity will mean it stops moving.

The water cycle



There is no 'new' water available

It is vitally important that we look after what we have, making sure we use it as efficiently as possible.

The water we have in the world is the same water which dinosaurs drank over 200 million years ago.

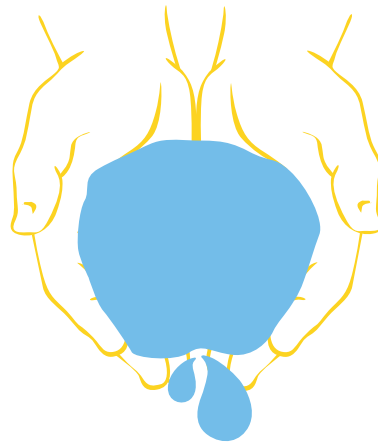
How much water do we have available to us?

We might like to think that we have plenty, but try this practical demonstration.



Step 1

Take a bucket and fill it up to three quarters full of water. This represents all the water in the world.



Step 2

Now cup your hands together, scoop them in the bucket so that they are full. This represents all the fresh (not salty) water in the world.



Step 3

Now let this water drop back into the bucket. All the water left on your hands (which is not very much!) represents the water available to the world's human population for everything they need clean water for.

This demonstration is attributed to Henry Nicholls, University of East Anglia.



97% of the water has got salt in it (sea water)

2% is fresh water that is locked in glaciers and ice

1% of is for all our needs (plants, animals and people)