World of Water

Join Precious on a journey of discovery into the world's most essential resource

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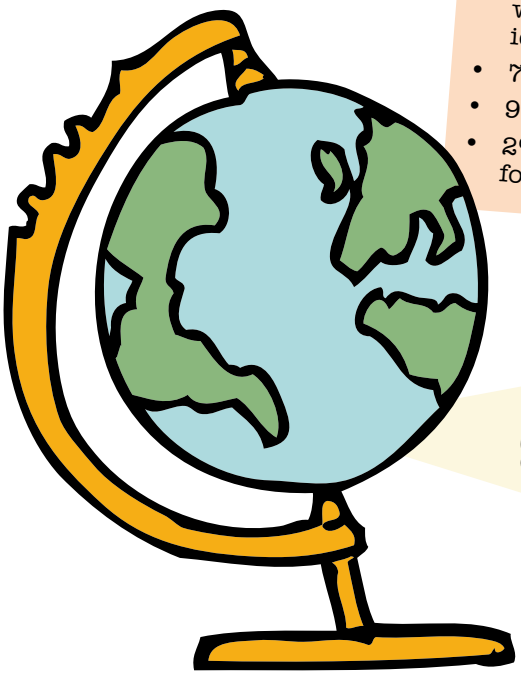
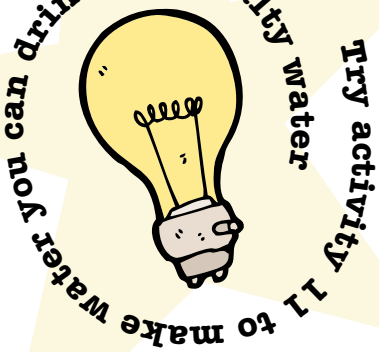
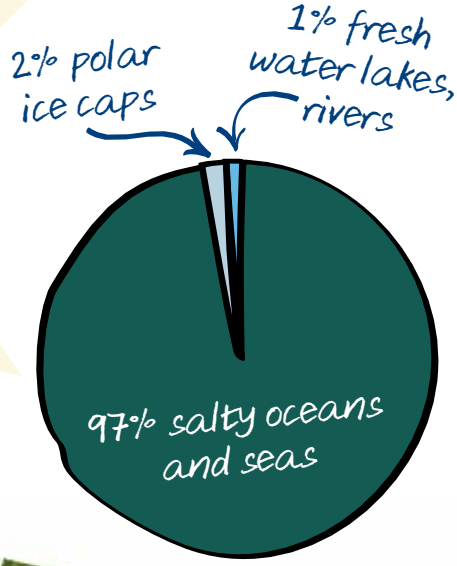
planet water...

INFORMATION SHEET 1

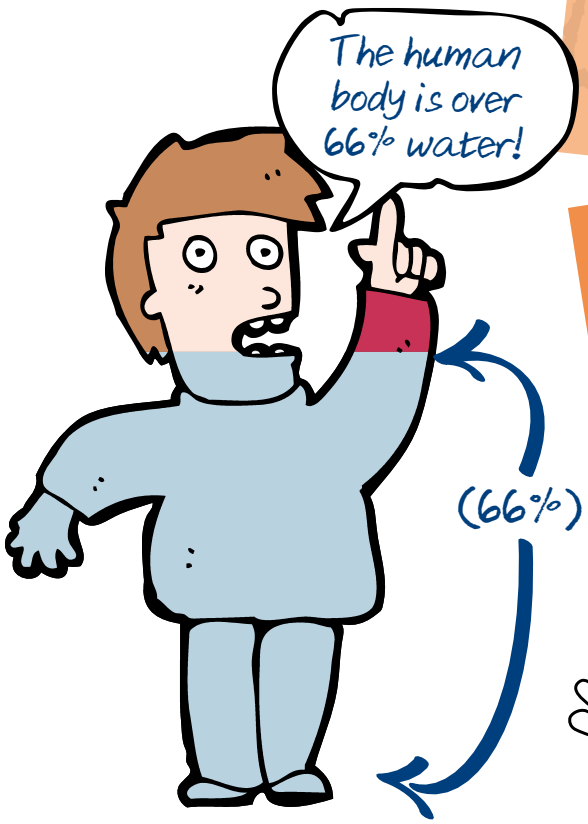


- Water can be a solid, a liquid or a gas. Think of all the examples of water – oceans, seas, lakes, rivers, streams, ponds, puddles, snow, ice, rain and the steam coming out of a kettle spout to name a few!
- 70% of the earth's surface is covered in water.
- 97% of that water is salty and is found in the oceans and seas.
- 2% is frozen in the polar ice caps and only 1% is fresh water, found in lakes and rivers, in the ground and in the atmosphere.



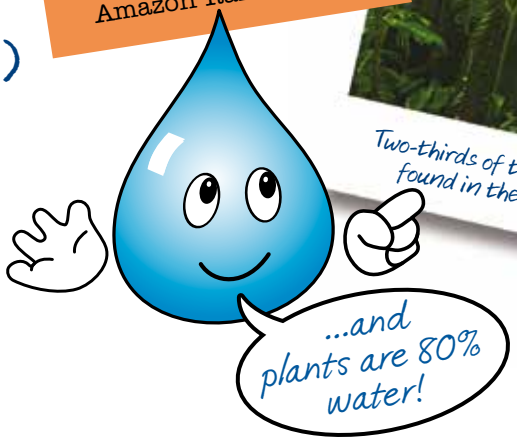


- Water is one of the world's most important resources. All life depends on water to survive. Without water humans would die within 3 to 5 days.



Did you know?

- The human body is 66% water
- Plants are 80% water
- Two-thirds of the world's fresh water is found in the Amazon Rainforest



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Nature's water cycle

INFORMATION SHEET 2

Evaporation and transpiration

- The water cycle has no beginning or end. It is an ongoing process. It is nature's way of providing a continuous supply of water, recycling it over and over. This process has been going on for millions of years.
- The sun shines on the water in oceans, rivers and lakes, heating it. As the water warms it evaporates and becomes a vapour (gas). These vapours rise into the air.

Try activity 1 to measure the water vapour in the air

Run-off

Condensation

- High in the atmosphere the temperature is cooler. This vapour condenses (become a liquid) into floating droplets of water, becoming clouds. This process is called **Condensation**.

Try activity 2 to learn more about clouds

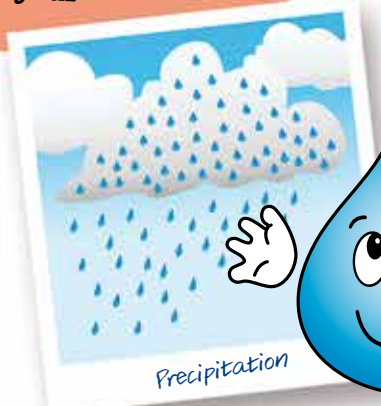
- When these droplets become too big they fall back to earth in a number of forms, such as rain, snow, sleet and hail. This is how the water is returned back to earth. We call this **Precipitation**.
- The water falls back into the oceans and rivers and seeps into the ground on land by a process called **Infiltration**.

Try activity 3 to measure rainfall

- Some of this water is then warmed and evaporates into the air again as water vapour and the cycle continues.

Try activity 4 to make your own water cycle

Infiltration



Precipitation

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weather

INFORMATION SHEET 3

watch : clouds

- We can use the clouds to help us to predict what the weather will be like in the next few hours.
- Clouds are made up of billions of water droplets that have formed from condensed water vapour in the atmosphere.
- There are different types of cloud and meteorologists (people who study the weather) use clouds to help them to predict the weather. Here are some of the clouds you will see:


Small cumulus signal dry weather


High up, these are cirrus clouds


Nimbus - dark grey rain clouds


Stratocumulus - these become cumulus clouds

Cumulus
Cauliflower-shaped at the top and flat at the bottom. When small in size they signal dry weather but when they become towering in size it means rain is likely.

Cirrus
High clouds, made up of ice crystals.

Stratus
Low flat clouds, thick and grey to look at. They can produce drizzle but never heavy rain. Fog comes from Stratus clouds.

Nimbus
Dark, grey clouds that cause rain. They are always seen with cumulus or stratus clouds.

Cumulonimbus
Storm clouds and can mean that lightning; thunder and heavy rain are coming. They are tall clouds.

Stratocumulus
Low, round clouds that become cumulus clouds, greyish-white in colour.

Altocumulus
Flat, thick, grey middle clouds that are wavy. Sometimes nicknamed 'sheep'.


Cumulonimbus clouds


Altocumulus clouds, or "sheep"


Stratus clouds mean fog or drizzle

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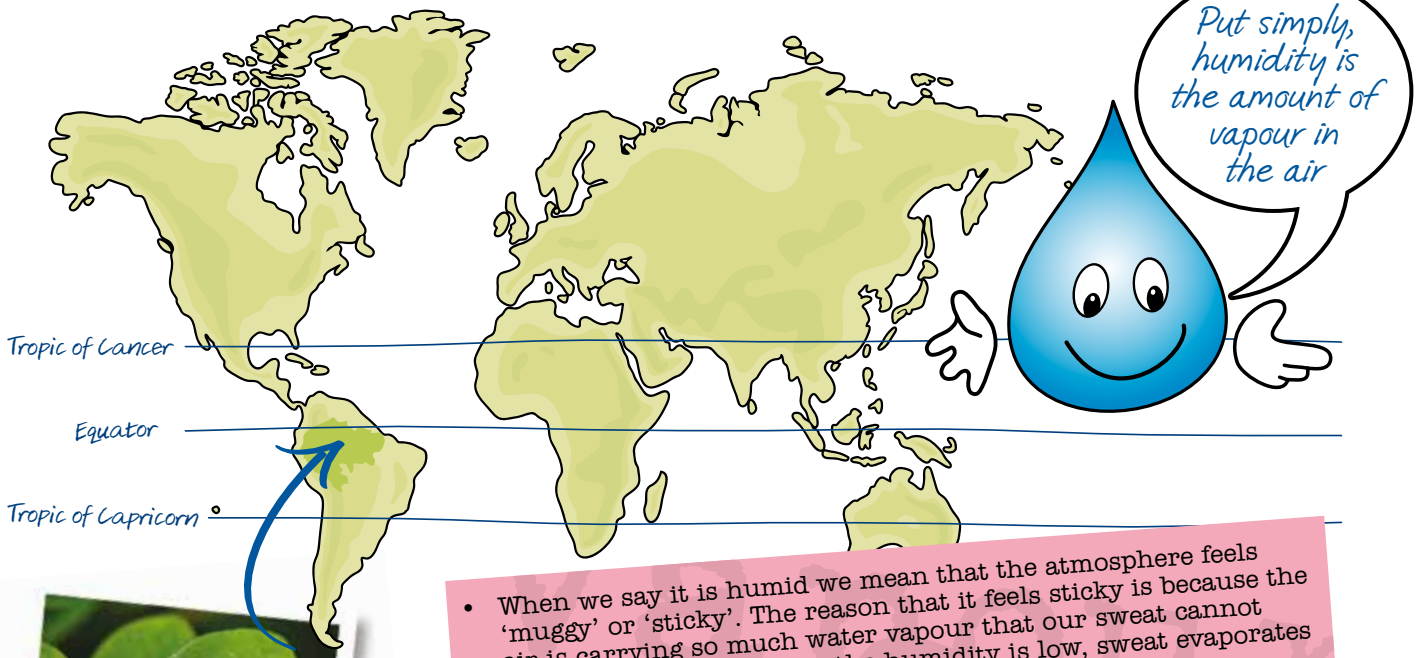
weather

INFORMATION SHEET 4

watch : humidity



- When we say it is humid we mean that the atmosphere feels 'muggy' or 'sticky'. The reason that it feels sticky is because the air is carrying so much water vapour that our sweat cannot evaporate so easily. When the humidity is low, sweat evaporates quickly from the body, making our skin feel dry.
- The air around us always contains water vapour, which is the gas form of water. As a gas, it is invisible. When the vapour turns to water (condenses) it can be seen as small droplets of water. These droplets are seen as clouds, mist and fog. When the droplets get too big they become rain.

The Amazon rainforest is the world's largest rainforest

- The tropics are located in the area of the world between the Tropic of Cancer and the Tropic of Capricorn, north and south of the Equator.
- This area of the world is hot all year round and does not experience seasons like we do in Britain. It also rains quite a lot in these areas. The combination of high temperatures and a high level of rainfall makes the atmosphere very humid.

Travel to the tropics at Staunton's tropical house!

- Tropical rainforests are found between the Tropics of Cancer and Capricorn. The Amazon Rainforest in Brazil is the largest rainforest in the world and also one of the wettest areas of the world, with two-thirds of the Earth's fresh water to be found there.
- We have our very own rainforest in the Stove House where you will discover many tropical plants growing. Although the plants in the Stove House are under glass and do not get rained on, they are watered every day which means that a mini water cycle is happening in there everyday!
- The plants take in the water through their root systems. This water then moves through the plant, leaving through the leaves as water vapour, returning to the air. It then condenses on the glass becoming vapour again.

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Weather Glossary

INFORMATION SHEET 5

Anemometer
Used to measure wind speed

Barometer
Used to measure atmospheric pressure

Blizzard
Severe weather with snow and wind

Cloud
Clouds are made up of billions of water droplets that have ormed from condensed water vapour in the atmosphere

Condensation
Process where water vapour (gas) changes into a liquid

Dew
Moisture that condenses on objects close to the ground

Drizzle
Very light rain, small, slow-falling droplets

Evaporation
The process in which the sun heats water in oceans, rivers and lakes and the heated water becomes a vapour

Fog
Droplets of water suspended in the air

Frost
A covering of ice that is formed on a surface whose temperature has fallen below freezing

Hail
Falling ice pellets

Humidity
A measure of how much condensed water there is in the air.

Hygrometer
Used to measure water vapour content of the atmosphere

Infiltration
The process where water falls back into the oceans and rivers and seeps into the ground on land

Meteorologist
Somebody who studies the weather, records temperature, humidity, air pressure, rainfall levels and wind speed

Mist
Thin fog close to the ground

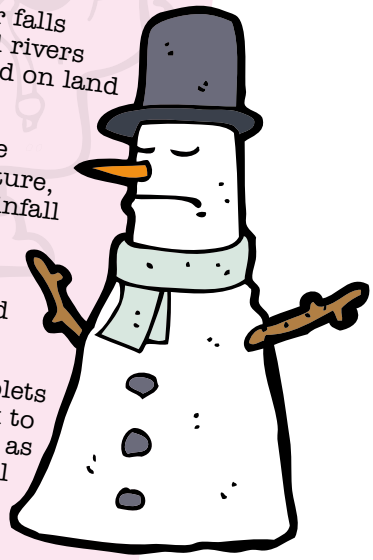
Precipitation
When condensed water droplets become too big they fall back to earth in various forms, such as rain, snow, sleet and hail - all forms of precipitation

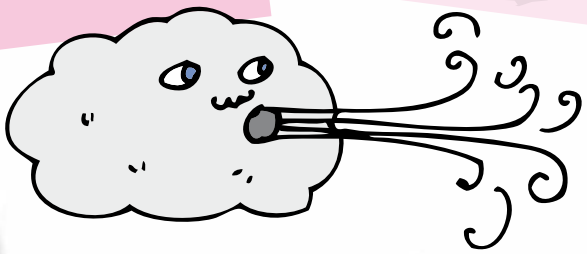
Rain
Drops of water falling from the clouds

Runoff
The process by which water runs off the land and into rivers, which take it back to the sea

Sleet
A mixture of rain and snow

Snow
Ice crystals falling from the clouds





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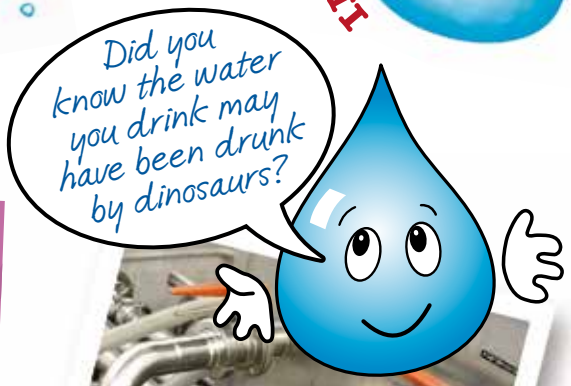
Your water supply

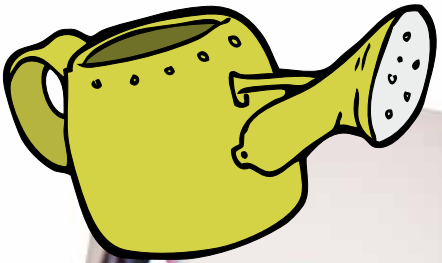
INFORMATION SHEET 6a



Making sure it is safe to drink and getting the water to your tap is a complex process. The first step of the process is to collect raw water by abstraction of "groundwater" from wells, boreholes, springs and "surface water" from rivers, lakes and large storage reservoirs.

Groundwater is usually of good quality as it has been naturally filtered during its journey through the soil and rocks. To make the water safe a small dose of chlorine is often the only treatment required to kill any bacteria that might be present. At some sites, where quality is not quite as good, there can be a need for filtration to remove small particles and micro-organisms.

Surface water by comparison is much dirtier with vast quantities of small particles, chemicals and debris. Treatment is usually a two step process; during the first stage chemicals are added to bind small particles together and these are removed by clarification (filtering and settling of debris and particles) or dissolved air flotation (dissolving air into the water, which then forms tiny bubbles which stick to the small particles and rise to the surface, where they can be skimmed off). Bacteria and other micro-organisms are then removed in the second filtration stage. After treatment chlorine is added to ensure a safe and wholesome water supply.



Treated drinking water is usually pumped to covered service reservoirs and water towers which can hold a couple of days supply. From here it is delivered to households and businesses through a distribution system consisting of a network of large and small underground pipes.

Throughout the treatment and distribution process monitoring takes place to ensure that your water supply is safe to drink.

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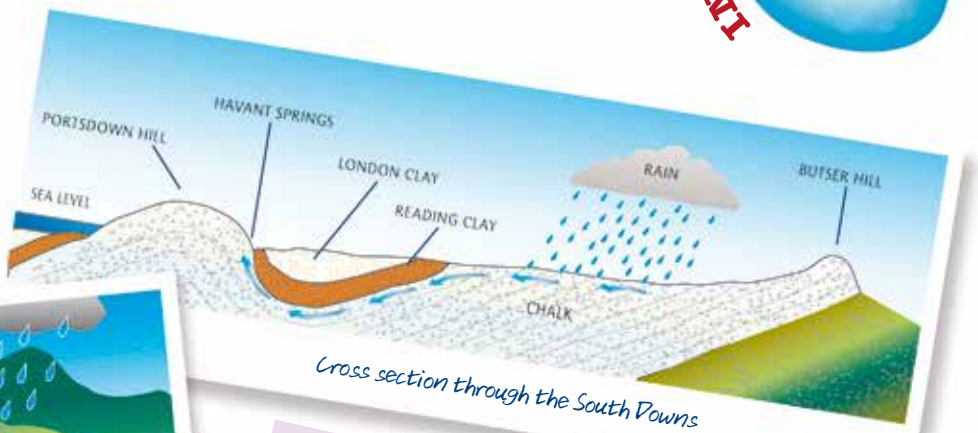
Sources of water

INFORMATION SHEET 6b

In this area we are fortunate to have the South Downs. Formed of chalk, the porous nature of the Downs allows rainwater to soak into the chalk and run towards the sea.

The springs at Havant and Bedhampton, get their water from the chalk of the South Downs.



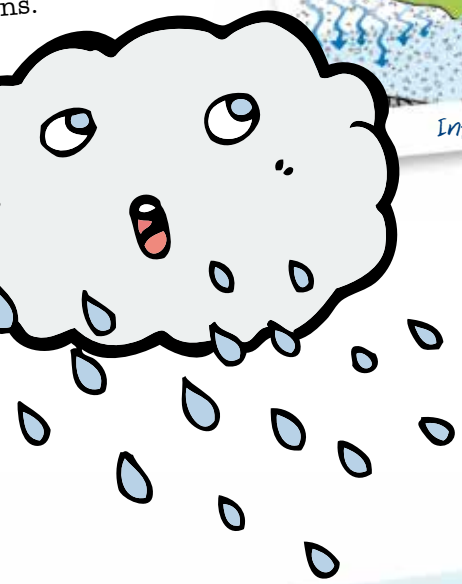
Cross section through the South Downs


Infiltration

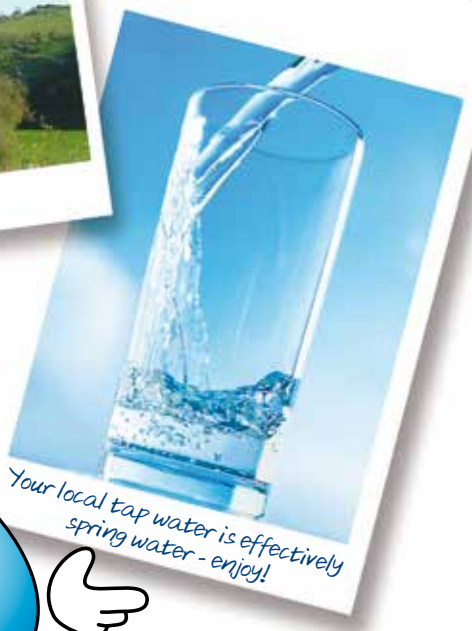
The cross-section diagram above demonstrates how rain falling on the South Downs seeps into the chalk through cracks and fissures whilst flowing underground by gravity towards the sea. After dipping under the clays of the Hampshire Basin around Waterlooville, Cowplain and Rowlands Castle, the chalk comes close to ground level at Havant and Bedhampton where a unique set of natural springs appears.

These springs are believed to be the largest group used for public water supplies in Europe and can produce anything between 53 and 170 million litres of water every day. The spring water is treated at the Company's Farlington Filtration Works before supplying Portsmouth, Havant and Hayling Island.

When you drink a glass of water from your tap you are likely to be drinking spring water!




South Downs, Hampshire


Your local tap water is effectively spring water - enjoy!

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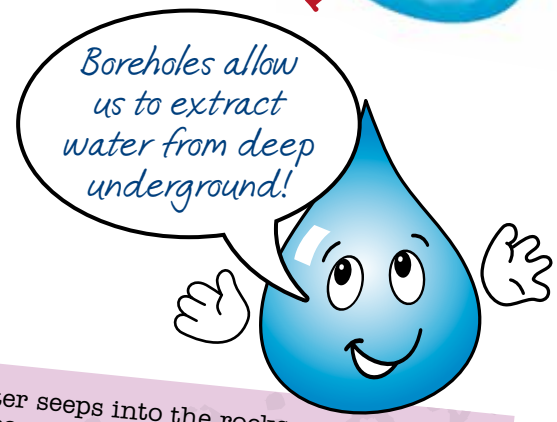
Sources

INFORMATION SHEET 6c

# of water - how a borehole works

A borehole under construction



When the water seeps into the rocks as part of the infiltration process it can be pumped out by using boreholes.

These are holes that are drilled down through porous rock, such as chalk, to the water-retaining part known as aquifers.

Pumps and pipes are lowered into the boreholes and the water is then pumped back up to the surface.

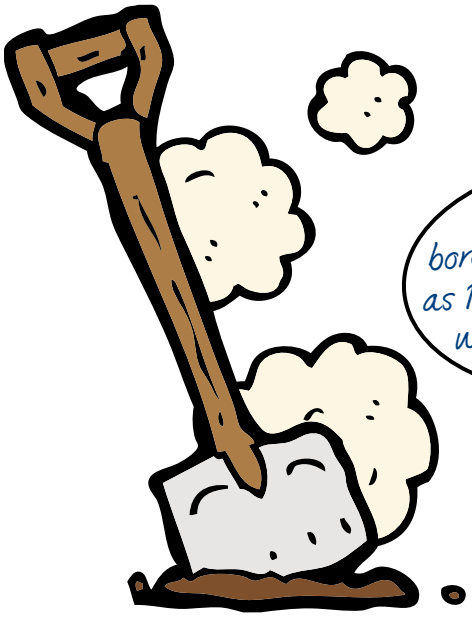
Q: What is an aquifer?

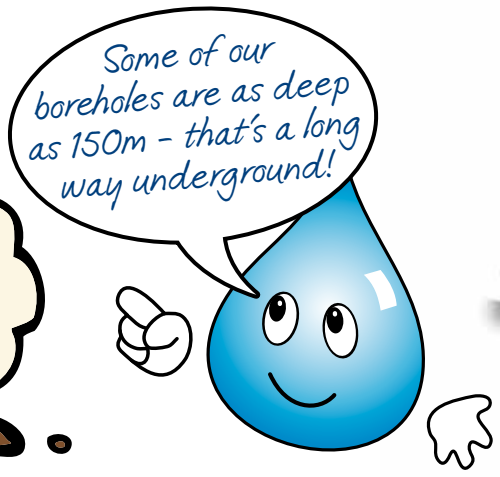
A: A type of rock that can hold water like a sponge.

Rainwater percolates down from the ground and fills the aquifer from the bottom upwards. Underneath the aquifer is impermeable rock which has no spaces for water to get into.

The water is pumped up from the rocks and fed to a treatment plant where chlorine is added to remove any harmful bacteria.

The treated water is then ready to be used by the community.





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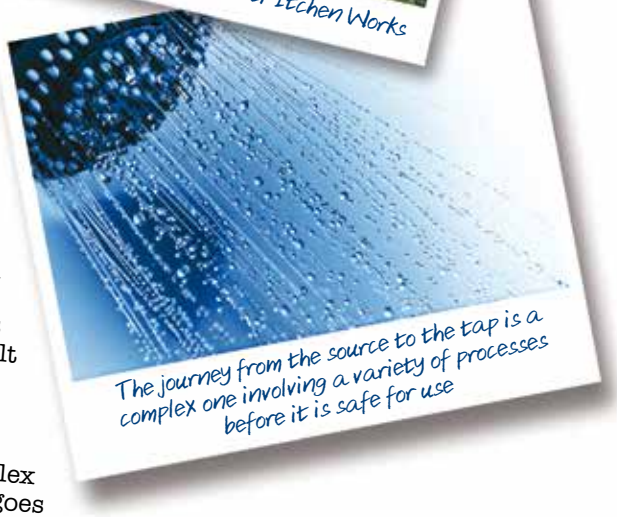
Water Treatment

INFORMATION SHEET 7

Apart from boreholes where the water is treated at source by chlorine and sometimes filtration, water from springs and rivers is transferred to large water treatment works.
The treatment works is where more complex processes are used to clean the water – often by either using sand, carbon filters or, more recently, membrane. Chemicals, acting as a disinfectant, are added to ensure all the bacteria are killed.

Abstraction at the River Itchen Works



The journey from the source to the tap is a complex one involving a variety of processes before it is safe for use

Water comes from different sources – some are cleaner than others – for example river water is exposed to all types of pollutants such as pesticides as well as being home to a large variety of wildlife. Therefore river water needs more 'cleaning' than spring water which for the majority of its life is underground and often receives natural filtration. As a result different sources need different treatment processes.

The processes are very complex and **Information Sheet 8** goes into detail of what is required to make the water clean and safe to drink from a spring source. It is a very technical process.

The journey from the source to the tap is a complex one involving a variety of processes before it is safe for use. Read Information Sheet 8 and find out what is done to your water before it appears from your tap.

Distribution pumps at Farlington Works

Treatment is only part of the process – read information sheet 9 and find out how the water is stored and eventually gets to your tap.

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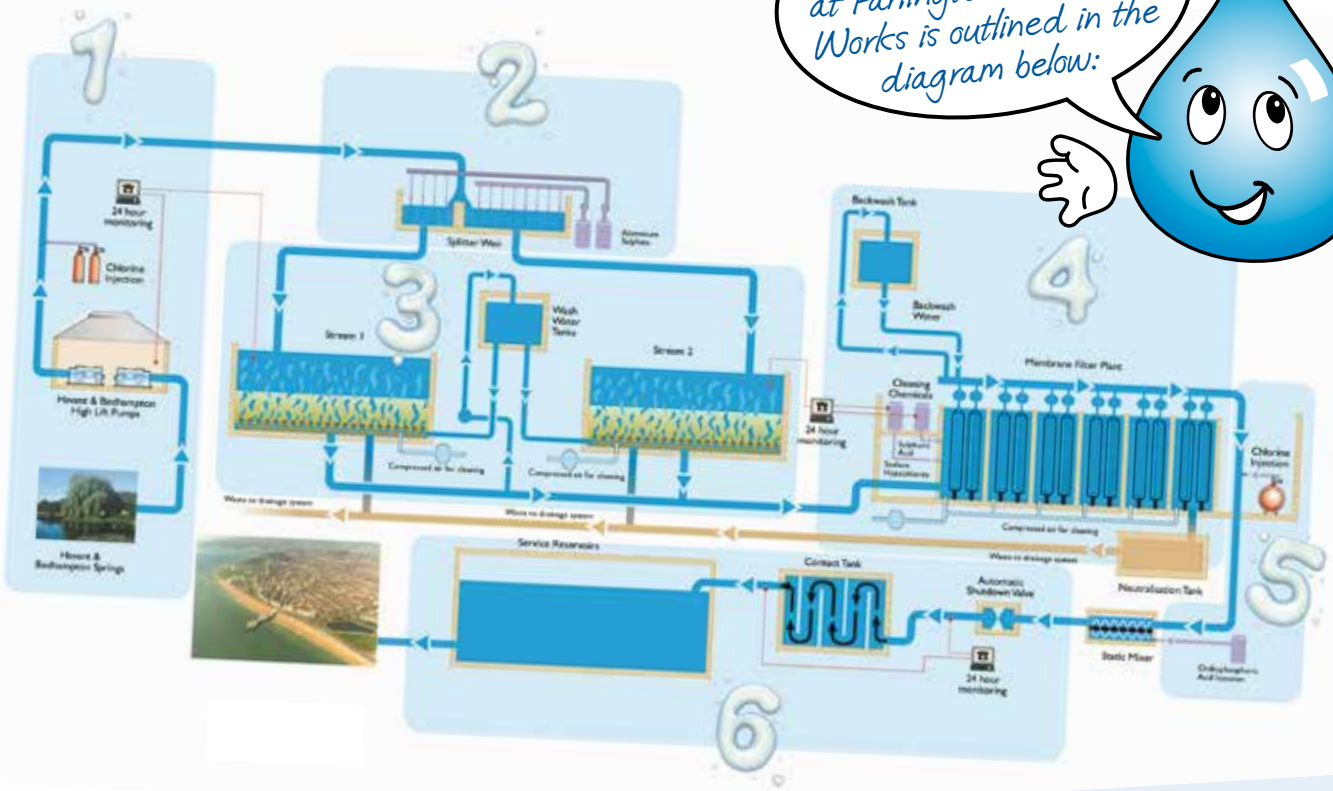
Spring water treatment at Farlington treatment works

INFORMATION SHEET 8

The treatment process at Farlington Treatment Works is outlined in the diagram below:



Stage 1

Spring water is collected at Havant and Bedhampton, chlorine is added to begin the disinfection process and pumped by High Lift Pumps to Farlington Treatment Works.

Stage 2

Partially treated water enters a Splitter Weir Chamber where alum, a coagulation aid (to make particles move closer together in larger clumps), is added to help the filtration process. This starts to bind together the small particles which cause turbidity (cloudiness). Here the flow is split with one third of the flow going to Stream 1 and two thirds to Stream 2.

Stage 3

The coagulated water is then divided equally between five Rapid Gravity Filters in Stream 1 and eight Filters in Stream 2. Here the water is filtered through a graded sand and gravel bed, approximately one metre deep, to remove more impurities before being discharged to the filtered water channel below.

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Spring water treatment at Farlington treatment works

INFORMATION SHEET 8

(...continued)

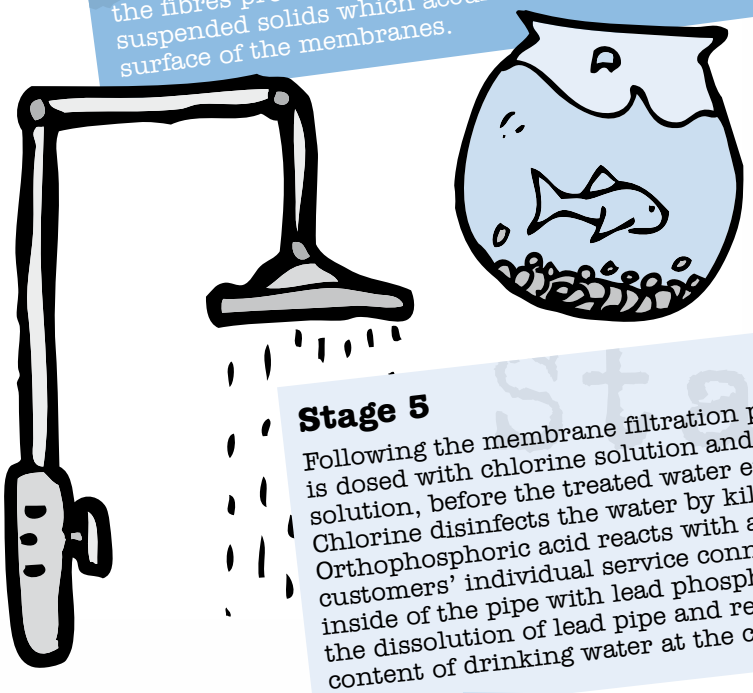
Stage 4

To provide an effective barrier against cryptosporidium (a water-borne parasite which can cause diarrhoea and stomach ache) the filtered water is then passed through a membrane filtration system.

The membrane system consists of submerged microfiltration modules which allow water to pass through the walls of the hollow fibres to the centre of the fibres producing a filtrate virtually free of suspended solids which accumulate on the outer surface of the membranes.

The Membrane Filter Building

Chlorine & orthophosphoric acid dosing



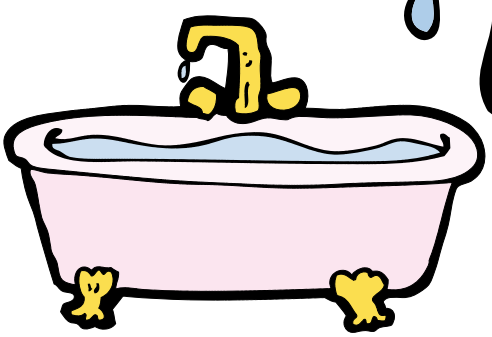
Stage 5

Following the membrane filtration process, the filtered water is dosed with chlorine solution and orthophosphoric acid solution, before the treated water enters the Contact Tank. Chlorine disinfects the water by killing bacteria and viruses. Orthophosphoric acid reacts with any lead pipes in customers' individual service connections and coats the inside of the pipe with lead phosphate. This inhibits the dissolution of lead pipe and reduces the lead content of drinking water at the customer's tap.

Stage 6

A number of monitoring checks are then conducted for Water Quality purposes before the treated water is transferred from the Treatment Works to the nearby underground service reservoirs.

Inside the Farlington reservoirs



...by the time it reaches your tap, water has gone through loads of complex processes to make it safe to drink.

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Storage and distribution

INFORMATION SHEET 9

The water has been treated and is ready for use – but how does it get to your tap?

Connecting new supply

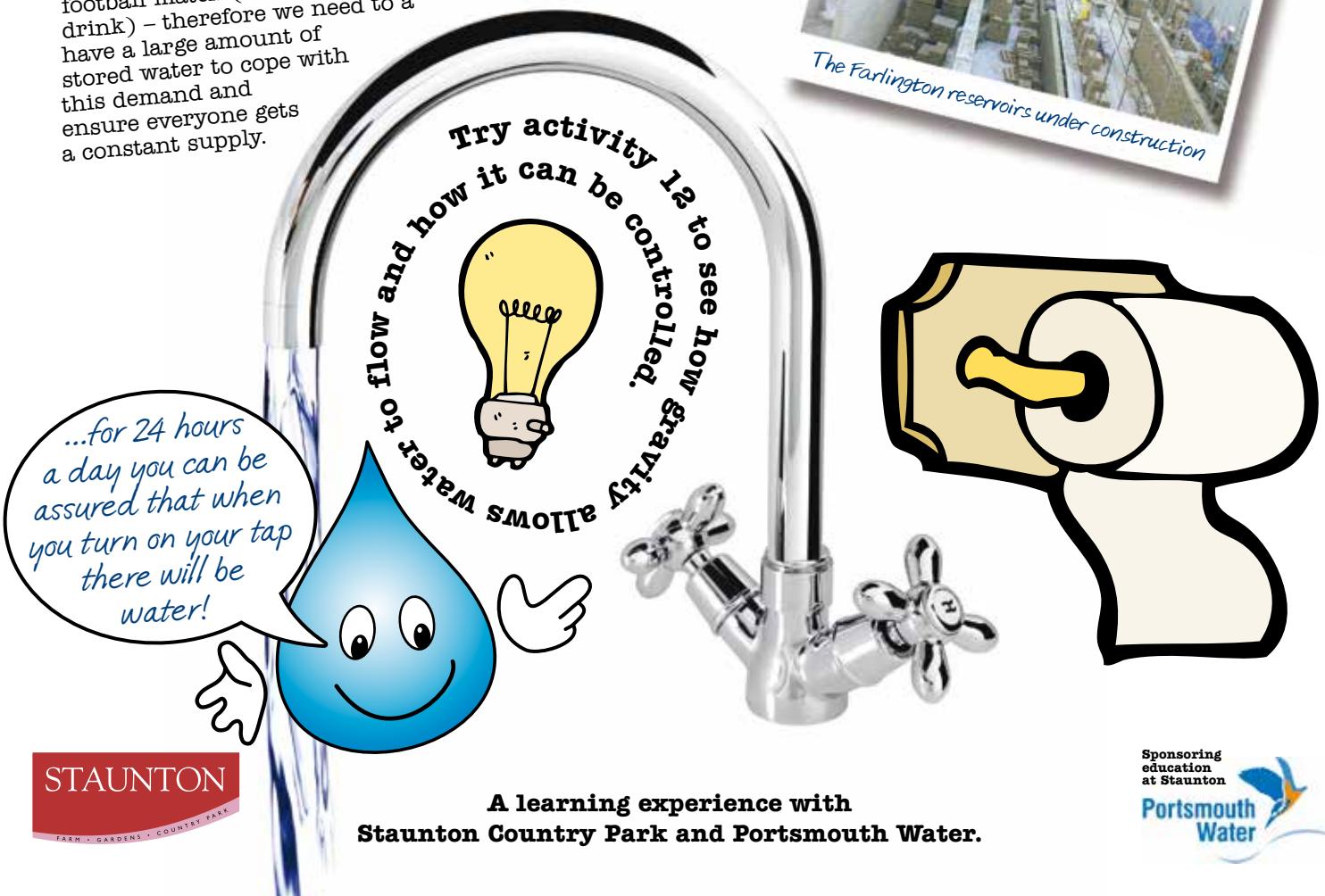
Once water has been purified and chlorinated at the water treatment works, it needs to continue its journey to your home which may be many kilometres away. The clean water is either pumped or flows naturally by use of natural gravity straight into the distribution system - a network of large and small underground pipes - but most homes get their water from service reservoirs which are large stores of fresh, clean drinking water that are covered to keep the water clean. They are usually on high ground which allows water to flow by gravity into the distribution network and out of your tap.

Why do we use service reservoirs?

It may appear to be easier to put all the treated water into the distribution network but water companies must make sure everyone has a constant supply. So for 24 hours a day you can be assured that when you turn on your tap there will be water!

Sometimes everyone wants their water at the same time – for example in the morning when people get up or at halftime in a football match (everyone either goes to the toilet or makes a drink) – therefore we need to a have a large amount of stored water to cope with this demand and ensure everyone gets a constant supply.

The Farlington reservoirs under construction



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Storage and distribution

*continued!

INFORMATION SHEET 9

Laying a new main

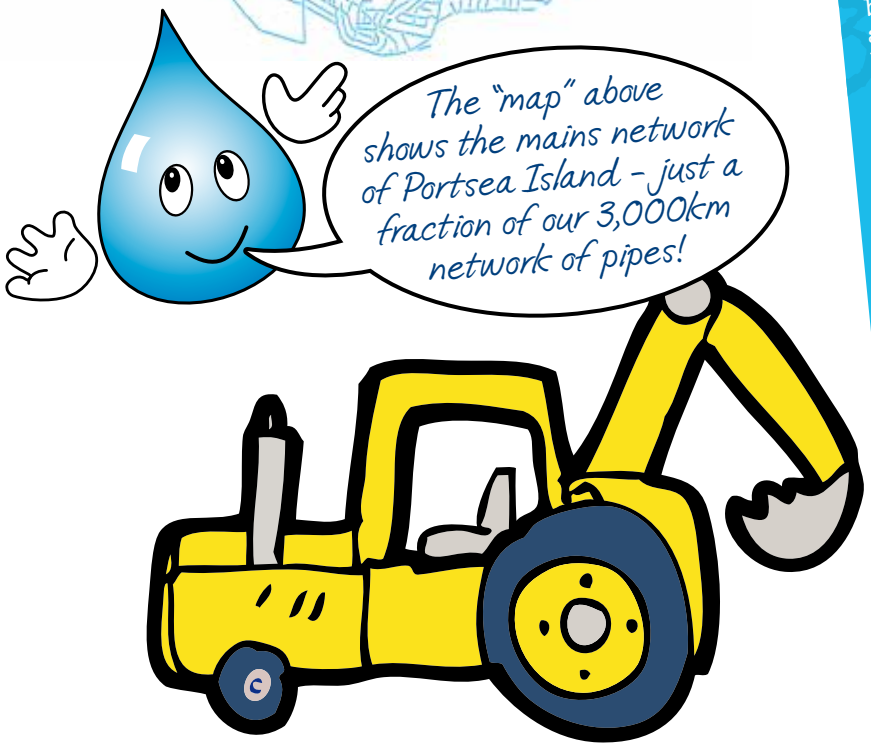
Distribution Network

The distribution network pipes must be capable of transferring the required flow, be capable of withstanding internal pressure created by pumping and when laid under roads be capable of withstanding the crushing loadings imparted by vehicle traffic.

Laying a new main

They must also be suitable to withstand accidental damage caused by mechanical and manual digging, a common problem in urban areas. Metal pipes must be protected against corrosive action of groundwater and soils. In the Portsmouth Water area the distribution network comprises approximately 3,000 kilometres of pipe ranging in size from 50mm to 1200mm, enough pipes to stretch to Kuwait. Imagine how much pipe is in the ground throughout the whole country!

Don't forget the other utilities, Gas, Electric along with Cable and BT – they also have their own distribution network



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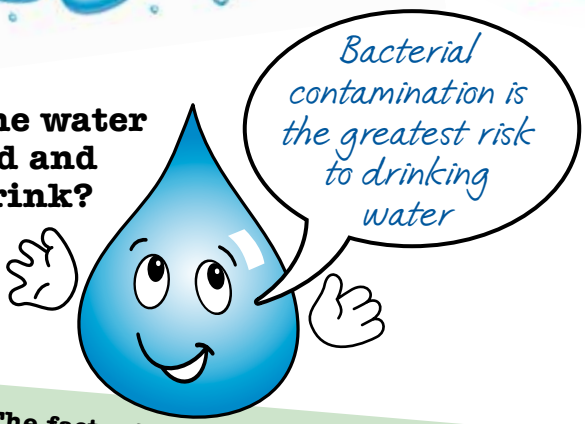
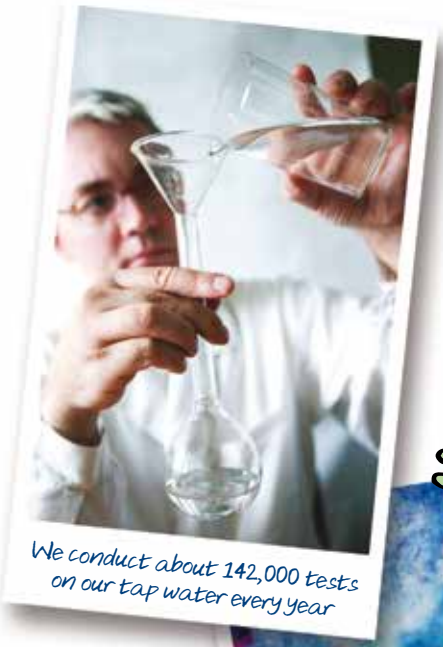
Water Quality

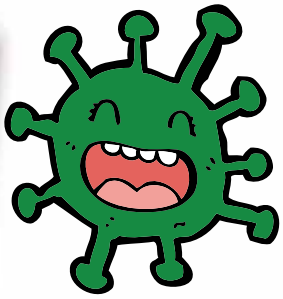
INFORMATION SHEET 10a

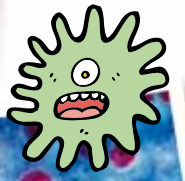
How do we know that the water after it has been treated and distributed is safe to drink?



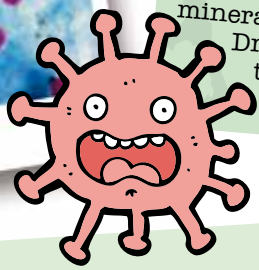


We conduct about 142,000 tests on our tap water every year





Cryptosporidium parasite



The facts about drinking water quality

The Water Companies have a long record of providing safe drinking water to England and Wales. The safety of the drinking water supply will always remain one of the principal objectives.

The greatest health risk associated with drinking water still arises from bacterial contamination. In the UK, only 150 years ago, contaminated water caused many outbreaks of waterborne disease such as typhoid, cholera and dysentry. In the western world these diseases have been virtually eliminated with modern treatment methods and in particular the introduction of chlorine as a disinfection agent. In the Third World unsafe drinking water remains one of the major causes of disease.

All drinking water contains some naturally occurring chemicals. The concept of PURE WATER would imply the absence of everything except H2O. If you drank a glass of pure water you would find it very flat and uninteresting. It's the natural minerals that give drinking water its taste. Drinking water taken from different parts of the UK can taste very different because of the varying natural chemicals in each supply.

Water quality in your area

Most of Portsmouth's supplies originate from the chalk of the South Downs and these naturally contain the hardness salts of calcium and magnesium and traces of other minerals. Hardness salts fur up your kettle but many people consider that they also make the water more palatable. There are some substances - nitrates for example - which would cause concern if present in large amounts. So we carefully monitor levels and strictly follow the advice of the Government's Drinking Water Inspectorate who regularly audit our work.

The company has its own fully equipped laboratory and regularly monitors all its water for both microbiological and chemical quality.

Microbiological and chemical samples are taken regularly from all our treatment works, reservoirs and customers' taps. In all we conduct about 142,000 tests from around 13,000 samples which we take each year.

Microscopic, but bacteria can't hide

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Water Quality

INFORMATION SHEET 10b

Taste and Smell in Water

Deciding whether water has an unusual taste or smell can vary from person to person. Some palates are more sensitive than others.

Chlorine is added in very small quantities to your water supply – the average chlorine dose is 0.3 milligrams per litre which is equivalent to about 1 part in 3 million. In most cases this tiny dose should be undetectable to the human palate.

However, this trace of chlorine can react with fittings like tap washers and kettle seals and can create a medicinal taste that is often described as a TCP like taste.

There has been an increase in bottled water sales. None of the bottled water is better in quality than normal tap water, and in some cases it can be inferior especially if it has been stored in warm conditions.

Can you tell the difference between bottled and tap water?

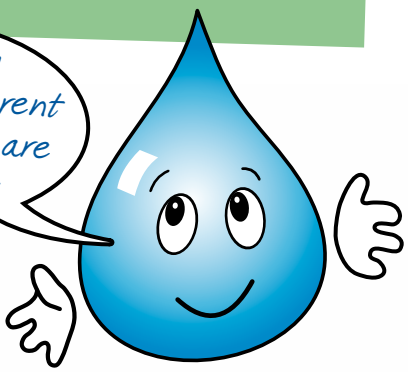
Which do you prefer?

Hard or Soft Water

Most of the water in this area comes from the heart of the South Downs. It is of excellent quality from the health point of view but is what is known as 'hard' water.

This is because the water originates from the chalk of the South Downs and therefore contains naturally the hard salts of calcium and magnesium. These are the chemicals that produce fur in your kettle.

The high levels of calcium in the water are good for bone development so 'hard' water is 'good' for health.



Try activity 9 to see if different types of water taste or smell the same

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Play your part, be

water smart

INFORMATION SHEET 11

- Take a short shower, 5 minutes or less is best
- Turn off the tap when you are cleaning your teeth
- Use the plug in the basin when washing your hands – not running water

Get the grown-ups to join in too...

Get them to:

- Use a bucket not a hosepipe when washing the car
- Use a watering can not a sprinkler for the garden
- Use a water butt to store rainwater and recycle household water on the garden
- Always use full loads in the washing machine

Try activity 5 and see if you are Water Wise or do you need to save more water?

Try activity 5 again after you have followed some ideas for water saving in the home and see the amount of water that you use fall.

Save water today so we have enough for tomorrow!

Visit **www.portsmouthwater.co.uk** and take the Saving Water Challenge

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Water for Health

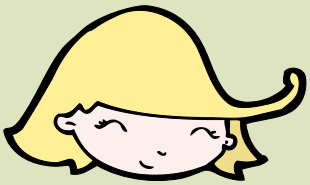
INFORMATION SHEET 12

How much water should we drink per day?

On average everyone carries around 40 litres of water in their body; even your blood, muscles and bones are mainly water! Water plays a very important part in our body.

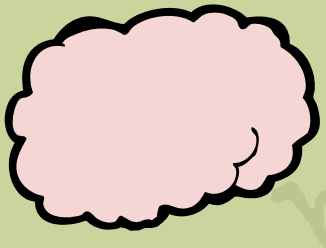
Health professionals throughout the country regularly tell us that we need to drink two litres of water each day in addition to tea, coffee and fizzy drinks. The main reason is to prevent dehydration. Dehydration is where the body becomes deprived of water and therefore cannot work as well.


Water is essential to us all



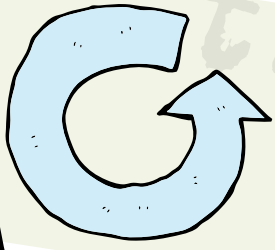
...looks after your complexion

Your skin suffers first if you are dehydrated as water is re-directed to other essential organs. Dehydration causes your skin to look dry and flaky.



...activates your brain

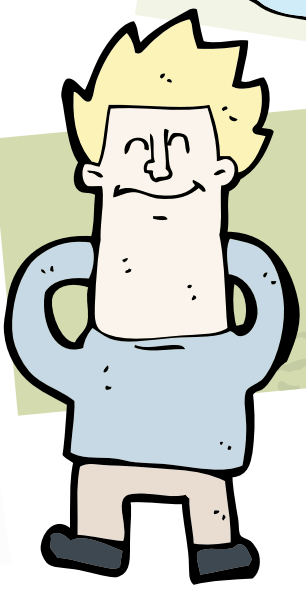
The brain is 75% water. If you become even mildly de-hydrated your thoughts and feelings can become distorted.



...spring cleans your system

Water acts as the waste disposal service of your body, helping to flush out the toxins it takes in and produces


Did you know - even your blood, muscles and bones are mainly water!



...helps beat stress

As you become dehydrated the level of salt in your blood increases and you start to feel lethargic and irritable.

Water also helps your digestion and regulates your temperature, stopping you from overheating.

How much water do you drink?

Be healthy - drink water!

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Water in the World

INFORMATION SHEET 13

In the UK it's easy to take water for granted... other countries are not so lucky...

Water may need to be carried up to four miles

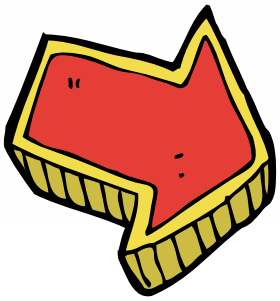
In many countries girls as young as 10 collect the family's water

Impact on Children

Children throughout the world suffer and die each day because they don't have access to safe water and sanitation. Their health, education and family relationships are affected.

In many countries children, particularly girls, are responsible for the collection of water. Girls as young as 10 years old may take the main responsibility for drawing and carrying the family's water.

The size of the water container may vary with the size of the child, but each litre of water carried weighs 1kg and may need to be carried up to three or four miles. Carrying such heavy weights is damaging in the long term for adult women, and for girls there are even more serious implications given their physical immaturity. In particular, there can be damage to the head, neck and spine. In extreme cases deformity of the spine can lead to problems in pregnancy and childbirth.



Effect on Education

Collecting water is not only physically stressful but extremely time consuming. One of the most serious effects is that girls are often not able to attend school. Many children who do manage to go to school have very low attendance figures and often drop out. Both boys and girls are needed by poor families to help with either farming or in doing domestic tasks at home. They have little time to play.

With every litre of water weighing 1kg, carrying water can be damaging to long term health

For more information visit
www.wateraid.org.uk

WaterAid

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Water in the world

(...continued)

INFORMATION SHEET 13

Sanitation in schools

The lack of adequate sanitation facilities in schools also prevents girls from attending school, particularly when they are menstruating. Of the 113 million children currently not enrolled in school worldwide, 60% are girls. Girls' attendance at school is increased through improved sanitation. For example, in Bangladesh, a school sanitation programme has increased the enrolment of girls by 11% every year since it began in 1990.

Providing children with clean and accessible water and toilet facilities changes their lives. Their health improves, they have more time with their families and more regular and varied meals. They have time to go to school and gain an education, sometimes they have time to simply play.

Time spent collecting water can prevent parents from earning

A lack of water means children cannot wash often enough and can suffer from diseases as a result.

Health matters

Children are most vulnerable to the diseases that result from a lack of water, dirty water and poor sanitation. In developing countries each child has an average of ten attacks of diarrhoea before the age of five.

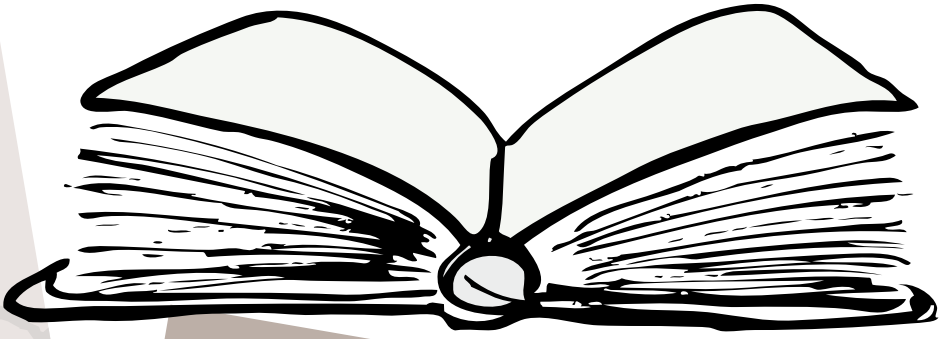
Malnourished children are more vulnerable to disease, and prone to diarrhoea, pneumonia, measles and malaria. These four diseases, plus malnutrition, account for seven out of ten childhood deaths in developing countries. For example in Zambia, one in five children dies before their fifth birthday. In contrast in the UK less than one in 100 of children die before they reach the age of five. Diarrhoea is the second most serious killer of children under five worldwide (after pneumonia) but in most cases it can be prevented or treated.

Children's ill health places an increased burden of care on the women and girls who look after them, adding to their already heavy workload. This and the time spent collecting water can prevent women from earning money which can in turn mean they are unable to afford to send their children to school.

A lack of water also means that children cannot wash often enough and suffer from diseases as a result. These include skin diseases like scabies and eye infections such as trachoma, the largest cause of preventable blindness in the developing world.

Glossary of terms

INFORMATION SHEET 14



Abstraction
The removal of raw water from rivers, springs and boreholes

Aquifer
A type of rock that can hold water like a sponge

Boreholes
A pump that removes the water from the Aquifers

Chlorine
A chemical used as a disinfectant to kill bacteria

Clarification
Removal of particles from the water

Coagulation
A chemical used to bind small particles together so they do not pass through the filters

Cryptosporidium
A nasty parasite that is found in many of our raw water sources

Evaporate
The heating process that turns water into vapour

Filtration
The process where the water is cleaned and particles are removed

Infiltrate
The water seeping into the ground and rocks

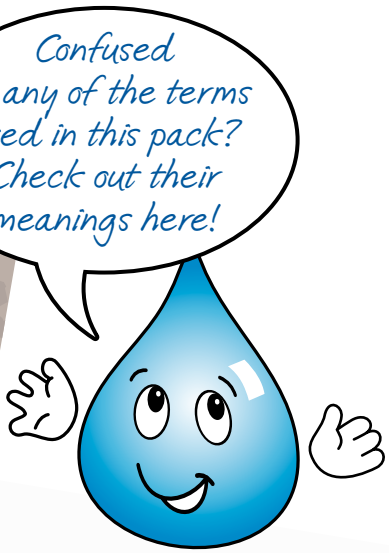
Membrane
A very fine filter that removes organisms such as Cryptosporidium

Ml/d
Mega litres per day

Porous
The ability to absorb water such as chalk

Service Reservoirs
A large container holding treated water ready for use

Turbidity
Where the water is mixed with many small particles



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Measuring Humidity levels

ACTIVITY SHEET 1

Humidity level is measured by a hygrometer.

How to make your own hygrometer

You will need:

2 thermometers, elastic band, beaker, water and muslin cloth

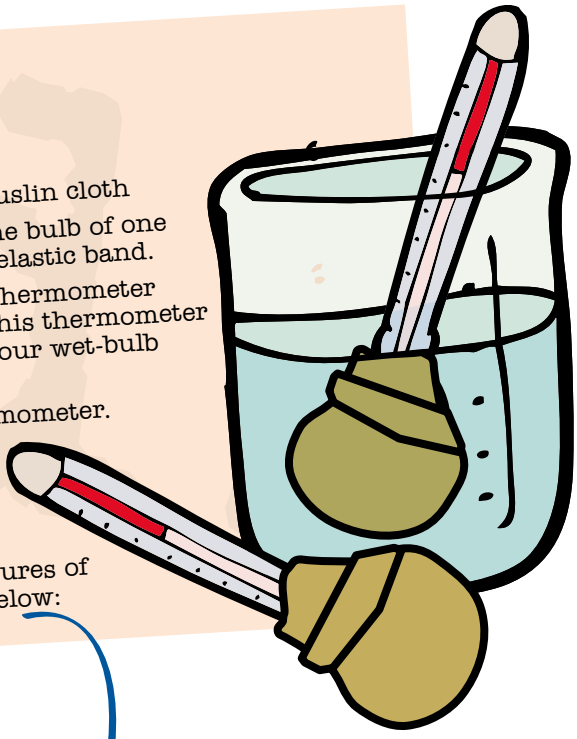
1 Carefully wrap a piece of muslin cloth around the bulb of one of the thermometers. Secure it in place with an elastic band.

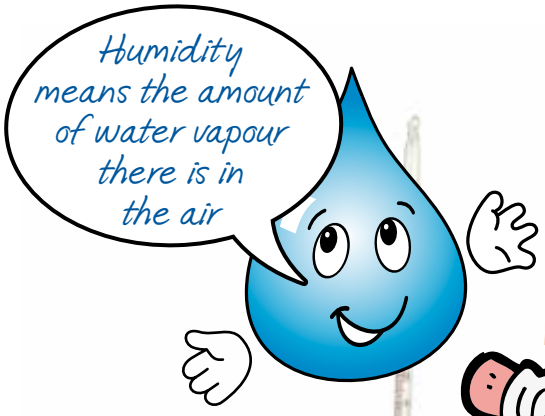
2 Fill your beaker with water and then place the thermometer with muslin wrapped around into the beaker. This thermometer is your wet-bulb thermometer. You must keep your wet-bulb thermometer damp at all times.

3 Your thermometer is known as a dry-bulb thermometer. Together they are known as a hygrometer.

4 Carefully take your hygrometer into the Stove House, making sure the wet-bulb thermometer is kept moist at all times.

Wait 10 minutes before reading the temperatures of each thermometer. Record your findings below:





	Stove House	Walled Garden
Wet bulb temperature		
Dry bulb temperature		
Difference		
Humidity level		

Subtract the wet-bulb reading from the dry bulb reading. Write the difference in the table.

Use the Thermometer Hygrometer chart to find out the humidity level of the Stove House.

Now take your hygrometer into the Walled Garden and repeat the process.

The area that showed less difference between the wet and dry bulbs has the more humid atmosphere.

Safety!

Be careful not to break the thermometer

This activity should be carried out with adult supervision

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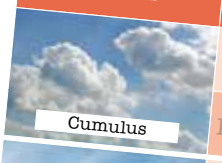
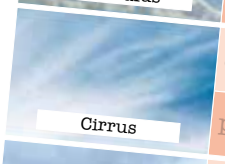
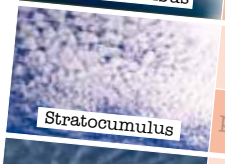
Cloud watch

ACTIVITY SHEET 2

Take a good look at the clouds in the sky today. Which type of cloud can you see?

Use the table below to record cloud shapes for the whole week.

Put a ✓ next to the type of cloud you see each day.

Cloud	Monday	Tuesday	Wednesday	Thursday	Friday
 Cumulus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.
 Cirrus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.
 Stratus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.
 Nimbus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.
 Cumulonimbus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.
 Stratocumulus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.
 Altocumulus	a.m.	a.m.	a.m.	a.m.	a.m.
	p.m.	p.m.	p.m.	p.m.	p.m.

Use this table to make notes, describing the weather each day. Look at the glossary for useful weather words to use.

Day of the week	Morning (a.m.)	Afternoon (p.m.)
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		

Now compare your descriptions of the weather with the type of cloud seen on one of the days.

Do you think you can predict the weather by looking at the shape of the clouds?

Meteorologists make a number of observations to predict the weather: temperature, humidity, air pressure, rainfall and wind speed.

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Make a Rain gauge

ACTIVITY SHEET 3

Rainfall is measured in millimetres or inches

You can record rainfall by making a simple rain gauge

You will need:

A transparent plastic bottle, permanent marker pen, scissors and a ruler

1 Draw a line around the middle of the bottle. Carefully cut along this line so that the top and the bottom of the bottle are separated. Ask an adult to help you with this task.

2 Take the bottom end of the bottle and stand it upright with the opening at the top. Use the ruler to measure 5 millimetres (mm) up from the bottom, mark a line and label as 5mm. Measure 5mm from your first mark and label it as 10mm. Continue this process until you have measured up to 50mm.

3 Now take the top part of the bottle and turn it upside down so that the neck of the bottle is pointing down. Place this inside the bottom part of the bottle. This will act as a funnel encouraging the water to remain in your gauge.

4 Place your rain gauge in an open area that is not sheltered from the rain.

5 Measure the amount of rain collected each day at the same time. When you have measured it remove the rain from the gauge so that you only measure new rainfall each day.

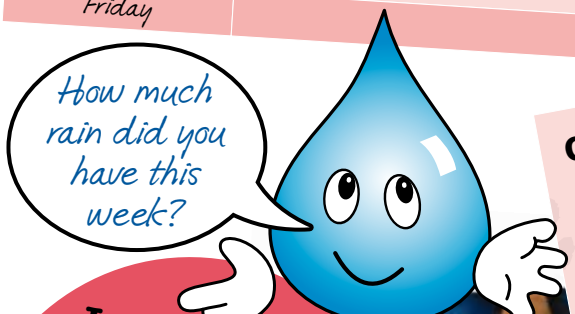
Safety!

Be careful when cutting the plastic bottle - the edges may be sharp

Ask an adult to help

Use this chart to record rainfall over a week.

Day of the week	Amount of rainfall
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	



Consider...

- Designing a fair test
- Where you will locate your rain gauges
- How you will compare the differences
- A way of recording your findings

Explain your findings

Investigation:

Does the position of a rain gauge affect the amount of rain collected? Plan an investigation to find out the answer to this question. Maybe you could carry it out with your friends so that you could use a number of rain gauges.

March has the lowest average UK rainfall (34.5mm) and October the highest (70.8mm)

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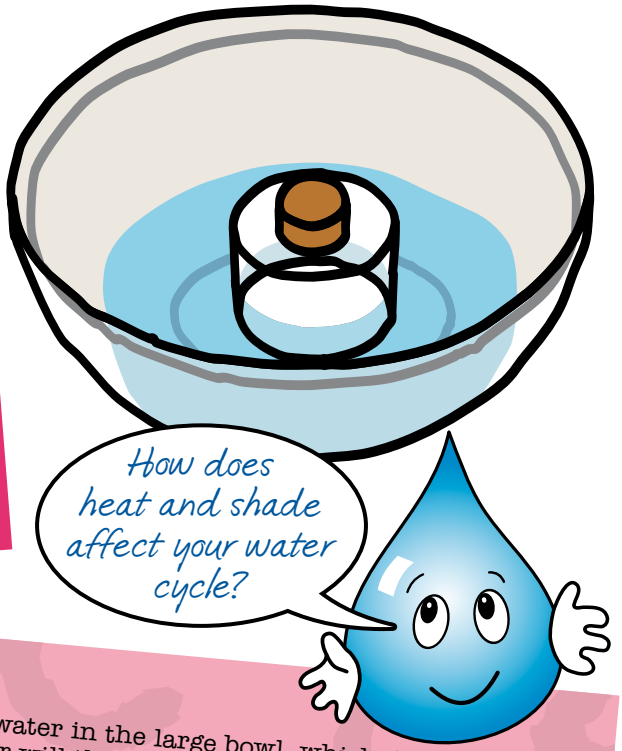
Make your own water Cycle

ACTIVITY SHEET 4

You will need:

A large plastic bowl, cling film, a weight, a smaller container (yoghurt pot), large elastic band, jug, lamp and clock.

1. Put the smaller container into the large bowl in the centre.
2. Put a little water into the large bowl, below the height of the smaller container.
3. Cover the bowl with the cling film and keep it in place with an elastic band.
4. Carefully put the weight into the centre of the cling film to weigh it down slightly.
5. Leave the bowl in the sun or under a desk lamp for a while.



What will happen?

The heat of the sun or lamp evaporates the water in the large bowl, which then rises and condenses on the cool cling film. This vapour will then fall into the smaller container. It will then evaporate, to then condense, just like Nature's Water Cycle!

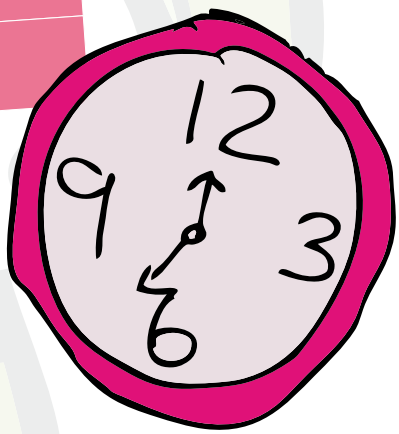
Use a clock to measure how long it took for water to appear in the smaller container.

Now place your water cycle in a shady area away from direct heat.

Does this affect the time it takes for water to appear in the small container?

Conditions	Time at beginning of investigation	Time water appeared in small pot	How long did it take for water to appear?
Investigation 1: Water cycle in a warm area			
Investigation 2: Water cycle in a shady area			

Record your results here:



Are you water wise?

ACTIVITY SHEET 5

Water calculator

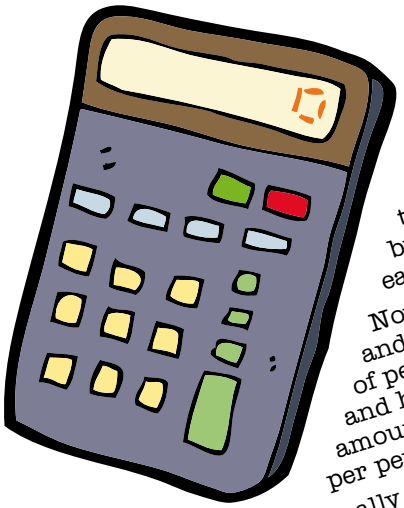
Water is a valuable resource and it is very important that we do not waste it.

Below is your own water calculator which enables you to work out how much water your household uses every day and whether you are water wise.

Houshold activities	Amount of water	Number of times per day		Total litres
Taking a bath	80 litres	x		=
Taking a shower	35 litres	x		=
Flushing a toilet	9 litres	x		=
Washing your face	9 litres	x		=
Having a drink	1 litre	x		=
Brushing your teeth	1 litre	x		=
Washing machine	65 litres	x		=
Dishwasher	25 litres	x		=
Garden sprinkler	17 litres per min	x	min	=
Hosepipe	10 litres per min	x	min	=
			Total use per household	
			Divide above figure by the number of people in your household	
			= water used in litres per person per day	
			Check with the chart to see if you are water wise	

To try out Portsmouth Water's online Interactive Water Calculator, visit www.portsmouthwater.co.uk/environment/WaterCalculator.aspx?id=360

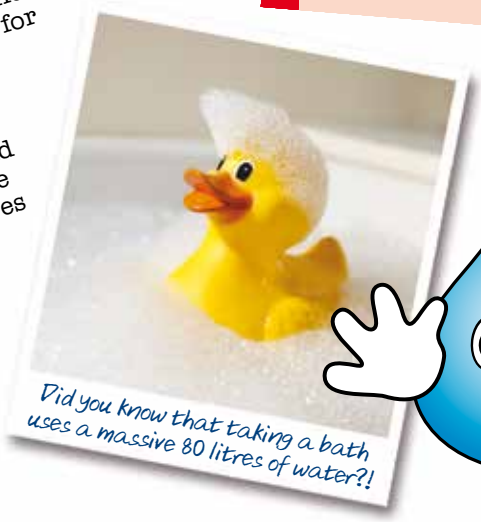
Very good	100–110	**Congratulations!** You're really water wise
Good	120–130	**Well done** You're using water carefully
Average	140–160	**Average** You're an average water user - but could you use less?
Poor	170–190	**Not so good** You're using a lot of water - can you cut it down?
Very poor	200–220	**Oh no!** You're definitely not Water Wise! Try and make a real effort to use less.



To calculate the amount of water used on a typical day, simply enter the number of times each activity takes place in your household during the day. You will then need to multiply by the amount of water for each activity.

Now add up all the totals and divide by the number of people in your household and hey presto you have the amount of water used in litres per person per day.

Finally all you have to do is complete this with the Water Use Chart to see if you are Water Wise!



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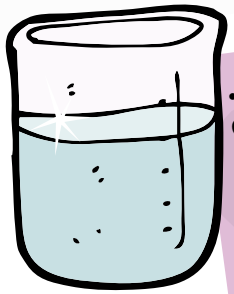
Make a Filter

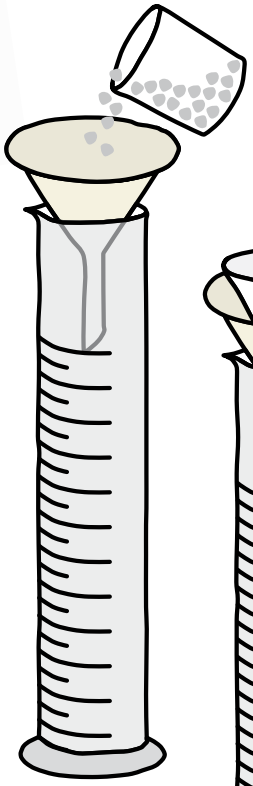
ACTIVITY SHEET 6



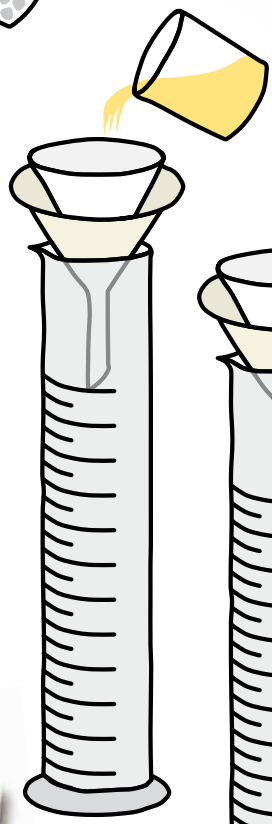
...to find a way of cleaning dirty water

Materials you will require:

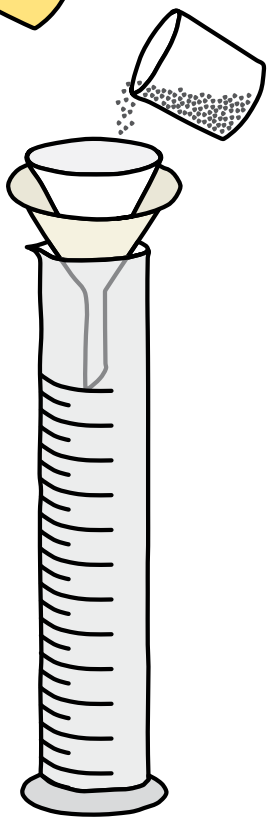
- 2 filters
- Sand
- Gravel
- Activated carbon
- Food colouring
- 3 funnels
- 3 graduated cylinders
- 1 pipette
- 1 stirrer
- 1 beaker
- Earth (collect a small potful from school grounds)



Step 2

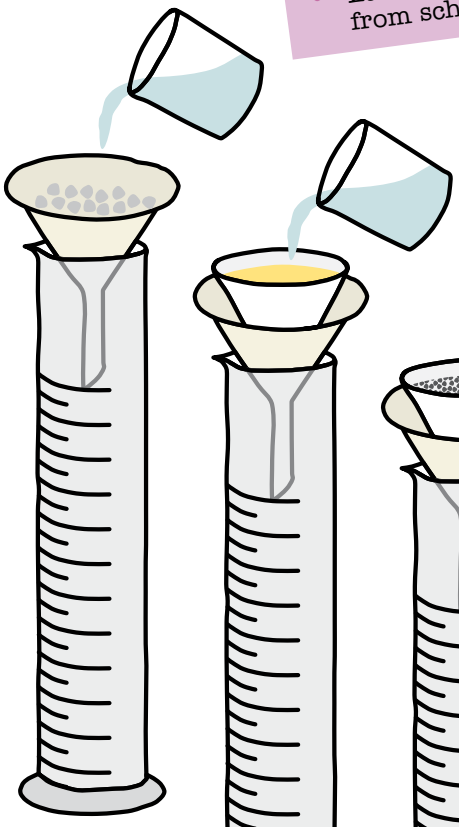


Step 5



Step 5

Filters clean dirty water



Step 6

Step 6

Step 6

We all need clean water - filtering is the answer

Step by step:

1. Place a funnel in each of the three graduated cylinders.
2. Fill the first funnel three-quarters full with gravel (no filter).
3. Prepare two filters (following the instructions from the assembly card).
4. Put a filter in two of the funnels.
5. Fill these two funnels three-quarters full: sand in the first, activated carbon in the second.
6. Slowly pour 60ml of water in each funnel to clean the gravel, sand and activated carbon.
7. Leave the cylinders to stand until the water stops dripping from the funnels, then throw the water away.

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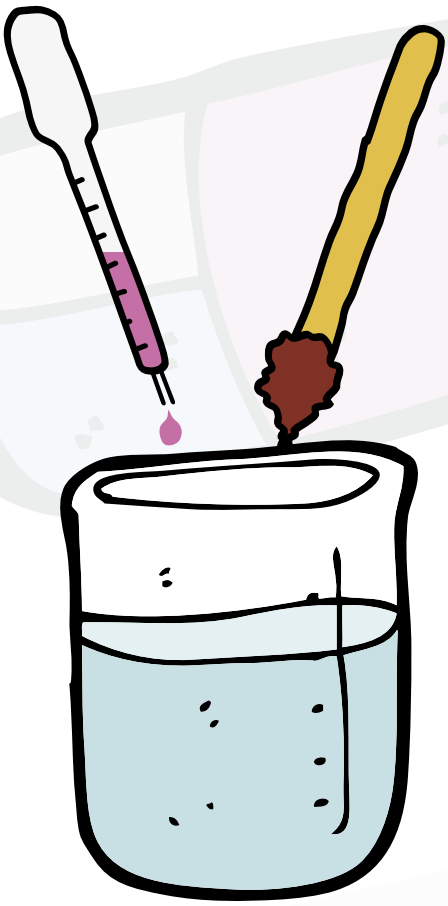
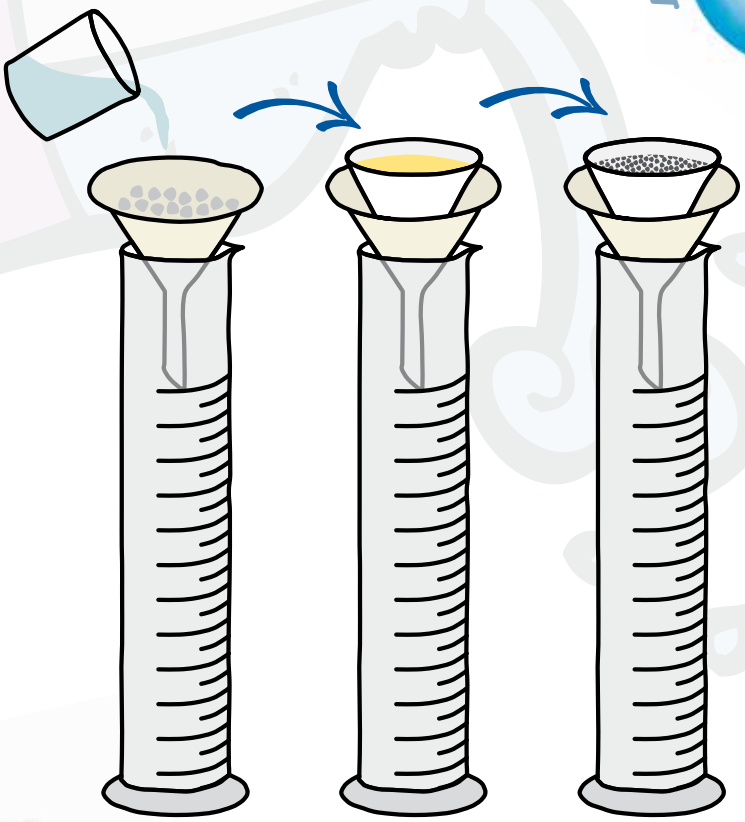
ACTIVITY SHEET 6



Step 8



Step 9 Step 10 Step 11

Water filtration plants work on the same basic principle as your home made filter

Step by step (continued)

8 Pour 60ml of water into the beaker. Using a stirrer, add two measures (about two teaspoons) of earth.

With the pipette, add only one drop of food colouring. Using a stirrer, mix the liquid and earth together.

9 Pour the beaker of water and earth over the gravel and leave it to stand. What can you see happening?

10 Pour the mixture, which has just been filtered, over the sand filter and leave it to stand. When the entire mixture has been filtered by the sand, examine it closely. What has happened?

11 Pour the mixture which has been filtered through the sand over the the activated carbon filter. Leave it. When the mixture has been filtered examine it. What has happened?

12 Clean the gravel, sand and activated carbon as you did in step 6 so that everything is ready to put away.

13 Now wash your hands thoroughly.

Make sure all equipment is clean before returning it to the box.

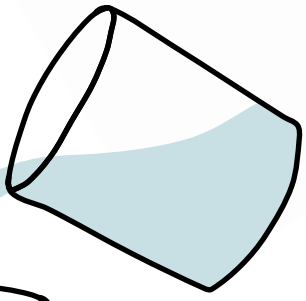
Is the water soft or hard?

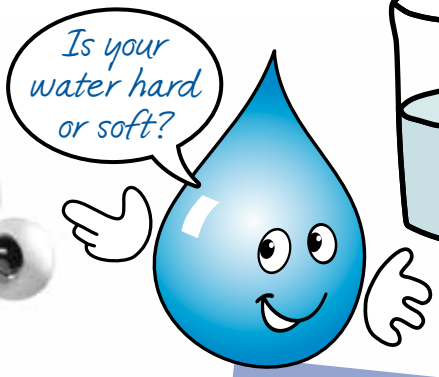
ACTIVITY SHEET 7

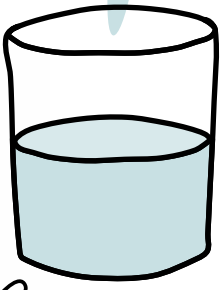
Finding out about water "hardness"

Materials you will require:

- 4 pots
- Calcium acetate
- 2 pipettes
- 1 beaker
- Water hardness strips
- 1 felt pen
- Rain water or distilled water (from classroom resources)
- Tap water
- 6 aluminium dishes
- Liquid soap







Steps 1-4

Steps 5-6

Step by step:

1. Pour 100 ml of rain water or distilled water into one of the pots.
2. Label the pot: rain water or distilled water.
3. Pour 100 ml of tap water into the second pot.
4. Label the pot: tap water.
5. Put a water hardness strip into each pot for one or two seconds.
6. Put each strip in a different aluminium dish and leave for one minute before continuing.
7. Carefully compare each strip with the chart (back page). Which numbers do the strips match? The higher the number the harder the water.
8. Which water was the hardest? Which water was the softest?

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ACTIVITY SHEET 7

Step by step (continued)

9 Using a pipette, add 1 ml of liquid soap to the pot containing rain water.

10 Using a pipette, add 1 ml of liquid soap to the pot containing tap water.

11 Close both pots and shake them.

12 What happens? Does it make any difference to the hardness?

13 Repeat steps 1 to 4.

14 Using a clean pipette, add 3 ml of calcium acetate to a fresh pot of rain water.

15 Close the pot and shake it.

16 Measure the hardness. What do you notice now?

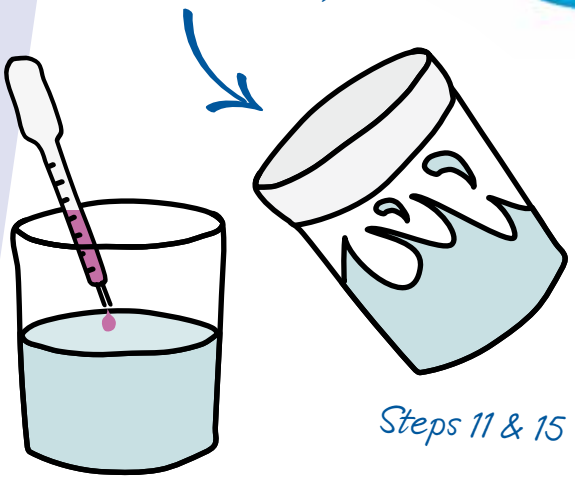
17 Using a clean pipette, add 3 ml of calcium acetate to a fresh pot of tap water.

18 Measure the hardness. What do you notice now?

19 Does calcium acetate do anything to soft water?

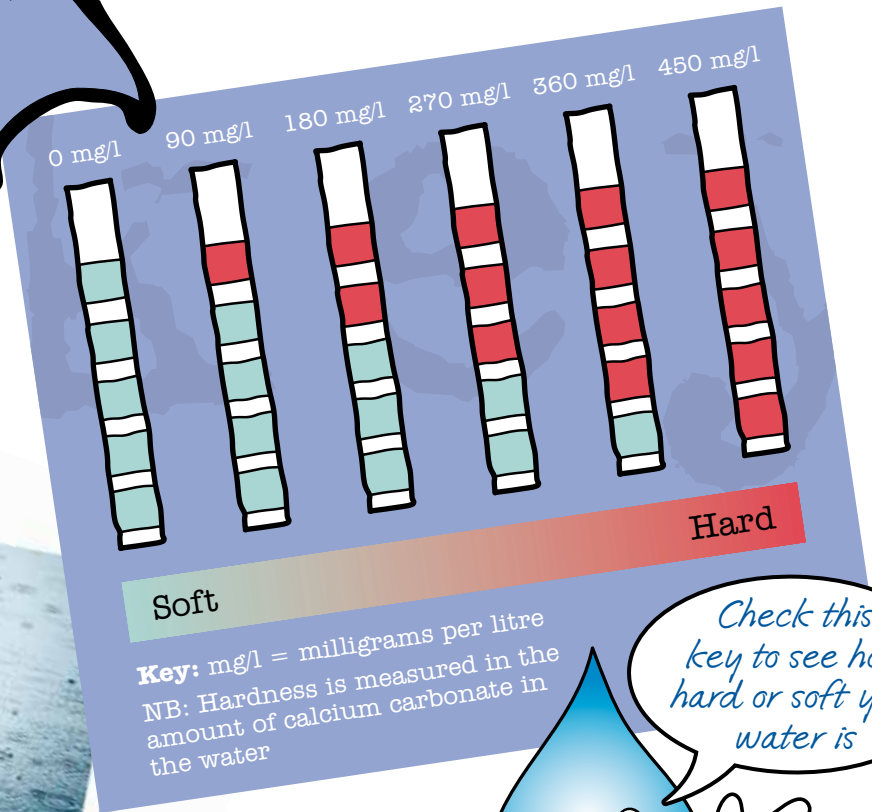
Make sure all equipment is clean before returning it to the box.

(Remember the lid when you shake!)

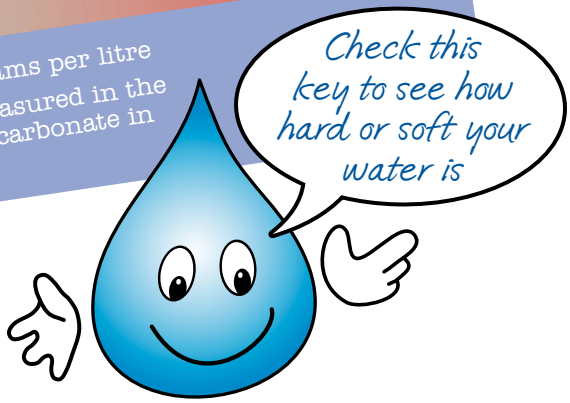


Steps 9-10

Steps 11 & 15



Rainwater is naturally soft, but it picks up minerals as it infiltrates the ground



How far can you Carry water?

ACTIVITY SHEET 8

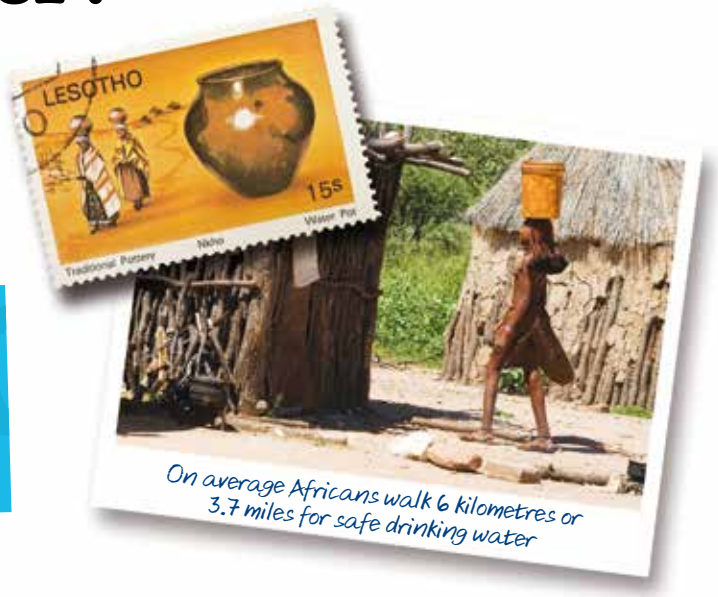
Do you remember how far children on other parts of the world have to carry water?

Some as young as 10 years have to carry water weighing 20 kgs up to 3 to 4 miles.

Can you do this?

You will need:

1. Two buckets with handles filled with water
2. A towel
3. A clear space to walk up and down (5 metres minimum, if possible)



On average Africans walk 6 kilometres or 3.7 miles for safe drinking water

Step by step:

1. Stand with the bucket either side of you
2. Bend your knees and grab the bucket handles
3. Gently lift both buckets and walk up and down

Safety – Put the buckets down if they become too heavy

How many times can you do this – can you do it **over 600 times?** That's how far some **10 years old** have to carry their water! Just think what would happen if you got tired and spilt the water? The family would have no water to cook or clean so you'd have to go back and get some more.

4. When you have finished put the bucket down and let someone else have a go

Aren't we lucky that we don't have travel 3 to 4 miles to get some water? How far do you go to get some water?

When you have finished this activity do not waste the water. Put it on some plants or in the garden.

...how far do you have to go to get some water?

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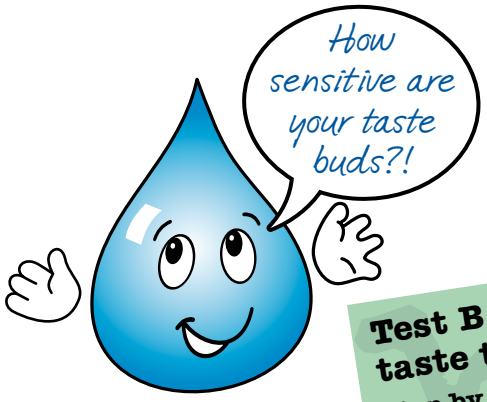
Is all water the Same?

ACTIVITY SHEET 9

Are there any differences between different types of water?

Materials you will require:

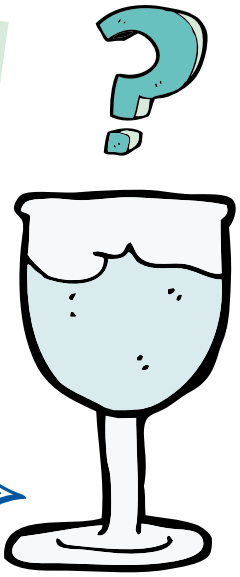
- Clear glasses for observing water (from classroom resources)
- Water brought from home (in a container labelled with your name for identification)
- Bottled water from different locations (from classroom resources)



Test A - Taste test

Step by step

1. Pour a small amount of each type of water provided into separate glasses and label them to show where each type of water has come from.
2. Do they look the same?
3. Do they smell the same?
4. Do they taste the same?
5. Which do you prefer?

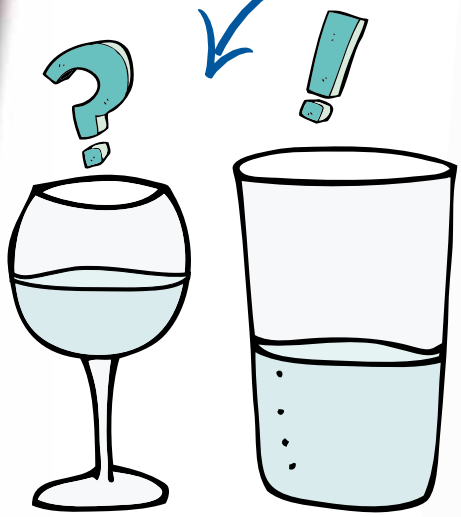


Test B - Blind taste test

Step by step

1. Cover your eyes with a scarf?
2. Drink from each glass once again?
3. Can you recognise them?

Do you think you can tell the difference between bottled water and tap water?




Water... can you taste the difference?

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Reservoirs and water pressure

ACTIVITY SHEET 10

To find out what happens when water flows from one container to another.

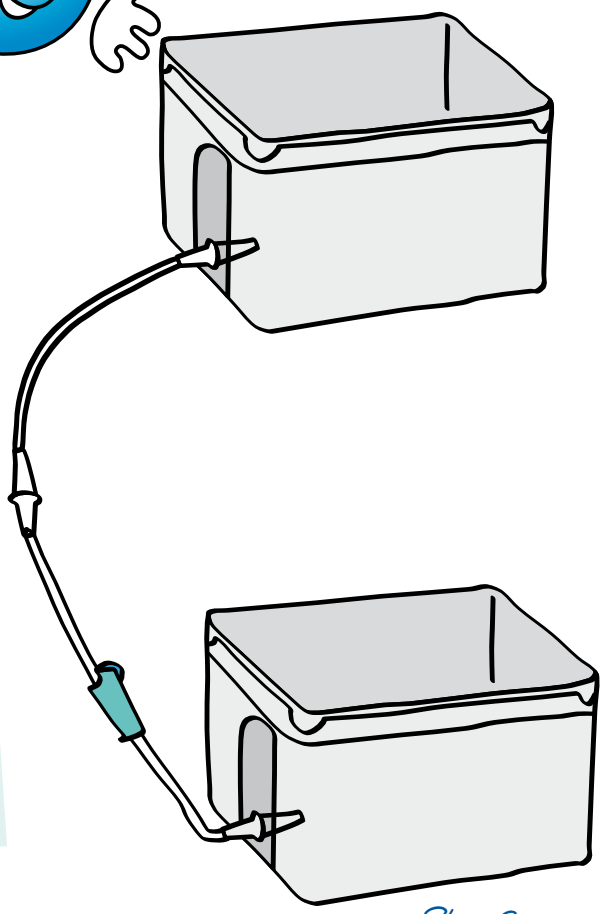
Materials you will require:

- The storage locker
- 2 boxes with holes and with tubing connected (see assembly instructions if not already connected)
- 1 extra tube connector
- Plastic film
- Large strong elastic band (from classroom resources)
- Watch with second hand (from classroom resources)

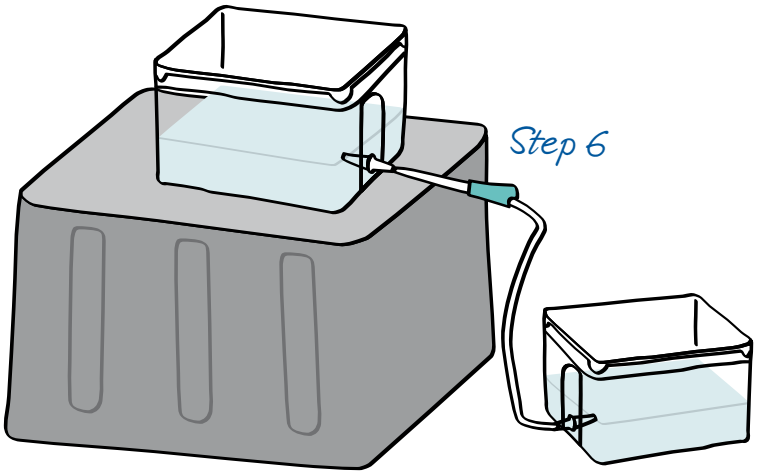
Step by step:

1. Join the two boxes using the tube connector to connect the two tubes.
2. Close the tube clamp.
3. Place the first box on top of the upturned storage locker.
4. Fill this box three-quarters full with water.
5. Open the clamp and begin timing. Stop timing as soon as the water stops flowing. How long was the water flowing?
6. Pour out the water from the boxes and cover the lower box with plastic film allowing the film to sag slightly into the box. Fix a strong elastic band round the rim of the box to make an airtight seal.
7. Repeat the steps 4 and 5
8. How long did it take? What has happened to the plastic film and why?

Make sure all equipment is clean before returning it to the box

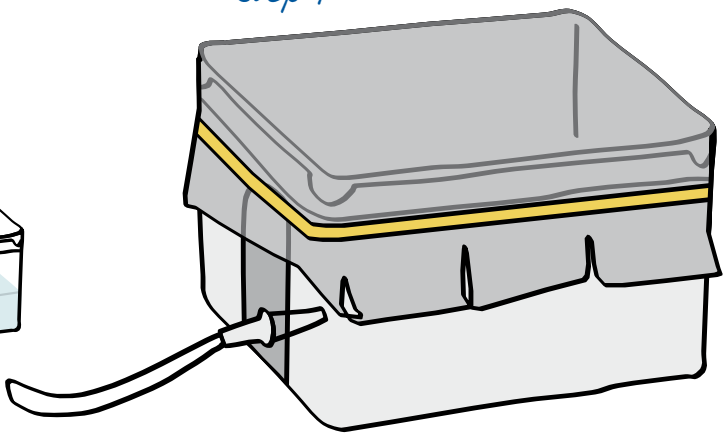


Step 2



Step 6

Step 9



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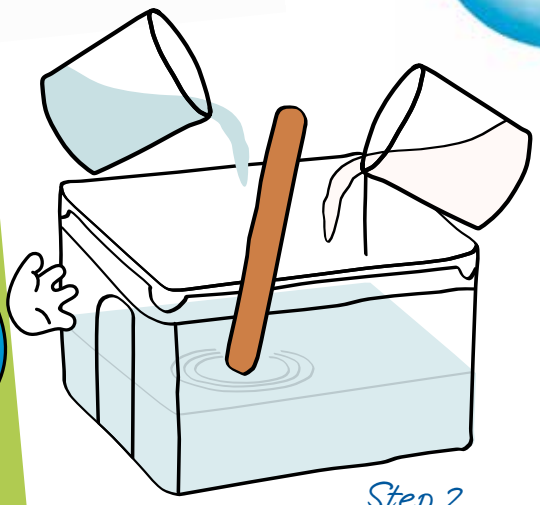
Fresh water

ACTIVITY SHEET 11

How to get water you can drink from salty water.

Materials you will require:

- Salt
- 1 stirrer
- 1 box without holes
- 2 beakers
- 1 glass that can withstand hot water (from classroom resources). The glass needs to be higher than the water level but not touching the film
- Plastic film
- Ice cubes (from classroom resources)
- Hot water (from classroom resources)
- Strong rubber band to go around box (from classroom resources)

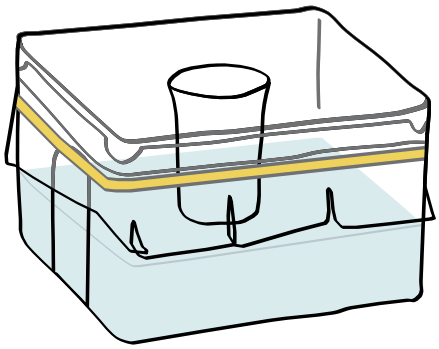


Step 2

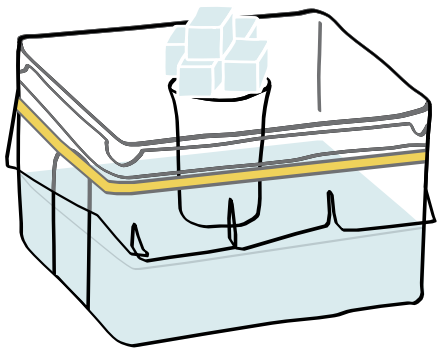
Step by step:

1. Fill the box halfway with hot water.
2. Pour 20 ml of salt into the box, mix with the stirrer.
3. Stand the glass right side up in the centre of the box.
4. Cover the box with two layers of plastic film. Make certain that all the edges are well sealed. Use a strong rubber band to hold the plastic film in place.
5. Put the ice cubes on top of the film directly above the glass.
6. Place the box in a safe place where it will not be disturbed.
7. When the ice cubes have melted, taste the water in the glass. What do you notice? Can you explain what has happened?

Make sure all equipment is clean before returning it to the box



Steps 3-4



Step 5

Desalination plants enable us to transform salty water into drinking water

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