Science Scheme of Work

Perranporth C P School

Year 4 Autumn Term

	AUTUMN 1st Half	Autumn 2nd Half
Theme	**I am Warrior (Romans)**	**Misty Mountain Winding River**
British Key Question	How has modern Britain been shaped by other cultures?	How does water shape our world?
Enhancements	Visit to Penlee Gallery and Museum - Life in Cornwall Celts and Romans Celts vs Romans Battle Roman Banquet	River visit Talk from Matthew Jones Dad – rock climbing
Books	Running Wild – Michael Morpurgo Ashley Booth – Romans (Non-Fiction) Boudicca (Folk Song) Romulus and Remus (Roman myths)	Running Wild – Michael Morpurgo The River – Valerie Bloom (poem) Diary Explanation texts
Addressing Stereotypes	Role of Women – Boudicca Role of women in the home	Climbing is too dangerous for everyone to do it https://www.theguardian.com/world/2019/oct/31/mount-everest-lhakpa-sherpa-climbed-nine-times-world-record
British Values	Democracy – Were there equal rights for all? Upper class (Patricians) Lower Class (Plebians) Rule of Law – Were slaves covered by the same laws as everyone else? Individual Liberty – Did Boudicca make the right choices? Mutual Respect & Tolerance – What if a boy doesn't want to fight?	Democracy – Should you pay to fish in the sea/river? Rule of Law – Should we limit the number of people who visit a beach? (National Trust) Individual Liberty – Can water be stolen? Mutual Respect & Tolerance – Can you harm a river?
Science (All NC subject content covered)	**States of Matter** **Pupils should be taught to:** • compare and group materials together, according to whether they are solids, liquids or gases • observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) • identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature **Working Scientifically (WS):** During years 4, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative, and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes	**Electricity** **Pupils should be taught to:** • identify common appliances that run on electricity • construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • recognise some common conductors and insulators, and associate metals with being good conductors **Working Scientifically (WS):** During years 4, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative, and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

<table>
<tr><td></td><td colspan="5"></td><td colspan="6">reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions
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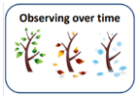
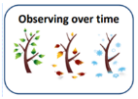
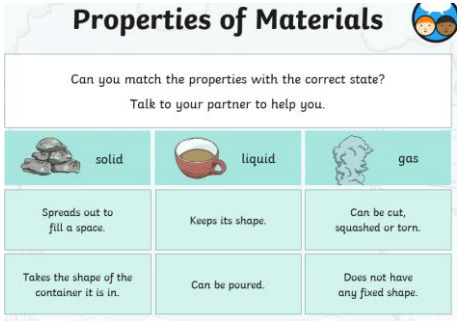
<tr><td>WS opportunities</td><td> 
What happens to ice when it is heated?
What happens to chocolate when it is heated?
What happens to a puddle on a hot day?</td><td> 
I can sort materials according to their state of matter.</td><td>  </td><td> 
Do gases have weight?
Can state changes be reversed?</td><td>  </td><td> 
How much longer will an extra cell make a component work? i.e. one battery vs two batteries v three batteries?</td><td>  </td><td> 
Are all magnetic objects good electrical conductors?</td><td> 
How can we make the lightbulb brighter?
How can we make the component work better/worse?</td><td> 
How do we get electricity in our homes?</td></tr>
<tr><td>Key questions / knowledge and understanding to be explained
Key Knowledge and facts to be recalled</td><td colspan="5">KWL/Mind map activity – what do we know already?
I can sort and describe materials according to whether they are solid, liquid or gas.
A material may be in one of three states: solid, liquid or gas.
Solids
Materials in a solid state keep their shape unless a force is applied to them. Solids can be cut, squashed or twisted. They will not change shape on their own. Solid materials always take up the same amount of space. They do not spread out or flow. Solids do not have to be hard. They can be squashy or soft.
Liquids
Materials in a liquid state take the shape of the container they are in. Although liquids can change shape, they do not change their volume. This means they still take up the same amount of space. Liquids are pulled down to the bottom of a container by gravity. Liquids can flow or be poured.
Gases
Materials in a gaseous state can spread out to completely fill the container or room they are in. Gases have weight. Gases can be squashed. Gases do not keep their shape.
 
Particles</td><td colspan="6">KWL/Mind map activity – what do we know already?
Children encouraged to think about: Where electricity comes from; How switches work; Which materials allow electricity to flow through them and items that use electricity to work.
 
<ol start="2">
I can explain ways that electricity is generated.  </td></tr>
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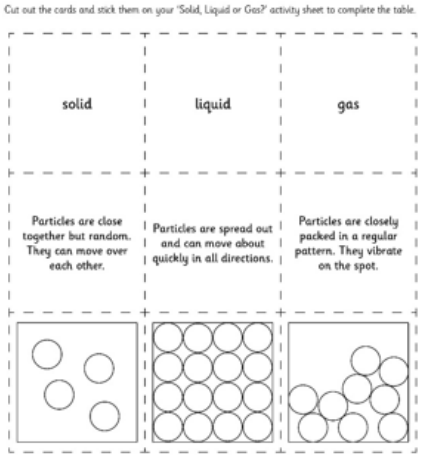
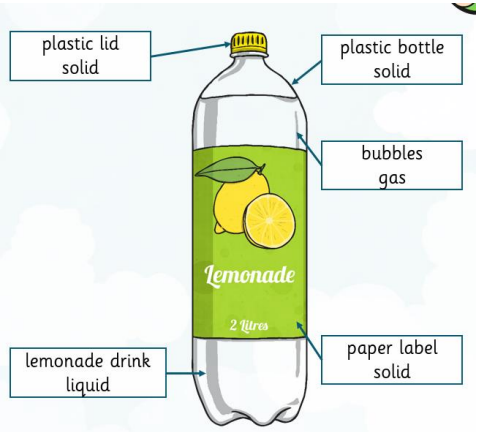
We can explain the differences between solids, liquids and gases by knowing what they are made of. Scientists have found out that all materials are made of very tiny particles. These particles are so small that we cannot see them with our eyes, or even with a microscope! The position and behaviour of the particles is different in solids, liquids and gases.

Children use drama and images to articulate the relationship of the particles in solids, liquids, and gases:



3. I can investigate gases and explain their properties

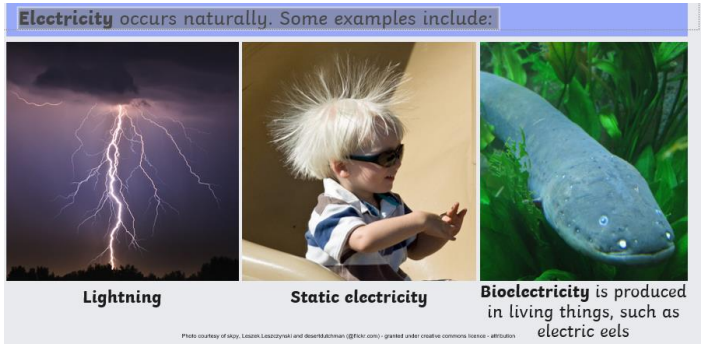
Children begin by articulating what property of materials they can see in a bottle of fizzy drink:



Bubbles in fizzy drinks are made from a gas called **carbon dioxide**. Carbon dioxide is a gas that is all around us. It makes up only about 0.04% of the Earth's atmosphere.
Fizzy drinks are made by adding carbon dioxide to liquid under huge pressure. The carbon dioxide dissolves in the liquid and settles in the space above the liquid in the bottle or can. When the container is opened, the pressure decreases and the gas escapes quickly, making a hissing sound. The bubbles appear as the carbon dioxide turns into gas.

Children to have a selection of images or real-life electrical appliances (safety) and discuss the similarities and differences between them – they could group them on this discussion.

Define electricity: When we refer to electricity, what we usually mean is electric current, which is the flow of electric charge.

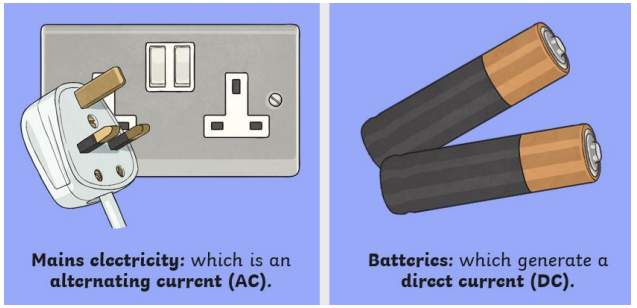


Electricity powers many of the things we use every day - televisions, phones, computers, lights and microwaves. Electricity occurs naturally, such as in lightning, or even in your body to send messages from your brain to your organs!

Over time, scientists worked out how to use electricity to make things work. They also discovered ways to generate, or make, electricity. This meant that electricity was more readily available, and things could be powered more easily. This sort of electricity is known as **current electricity.**

Current electricity is a flow of electrical charge through a material. Often it flows through wires to travel from a power source to an appliance.

There are two types of electrical current that we use to power appliances:



Where does electricity come from? An energy source is a way of powering something. Electricity is a secondary energy source. This means it is made from primary sources of energy.

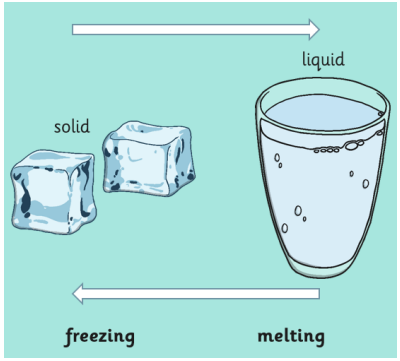
Carbon dioxide can be very useful. Some fire extinguishers use carbon dioxide to cool flames and to stop oxygen getting to the fire. Carbon dioxide freezes at -78°C, and it becomes a solid called dry ice. It is used to transport food that needs to be kept cool and fresh, such as on aeroplanes and trains.

WS: Do Gases Weigh Anything?

Children carry out a comparative test answering the question, which drink is fizziest or do gases weigh anything?

4. I can investigate materials as they change state

What Makes Materials Change State?



Solid to liquid

When a solid turns into a liquid it is called melting. The temperature at which a solid material melts is called its melting point. Different materials have different melting points If a solid material is heated to its melting point, it will start to melt and will change state from a solid to a liquid. In a solid, the particles are closely packed together and are vibrating on the spot. When a solid is heated, the particles start to move faster and faster. If enough heat is applied, the particles will have enough energy to move about. They are still close together but can move over and around each other. At this point, the solid has melted to form a liquid.

Some primary sources of energy include:

- Coal
- Oil
- Natural gas
- Wind power
- Solar power

Since electricity is a secondary source of energy, it needs to be generated, or made, from a primary source of energy.

Fossil Fuels	Hydro and Wind
Coal, oil and natural gas are fossil fuels. Burning them produces heat, which generates electricity.	Water is used in dams, and wind is used to turn windmills. These both generate electricity.
Nuclear	**Solar**
This is the energy that is created when atoms are either combined or split, creating heat. This can be converted into electricity.	The sun's rays shine on special panels, which convert its energy into electricity.
	Geothermal
	Geothermal energy is heat from the Earth, which can be converted into electricity.

There are several different ways of generating electricity for us to use to power our appliances. Some of these methods of generating electricity are renewable. This means they will never run out, so we can use them to generate electricity for ever. However, some methods are non-renewable. This means that they will run out, and when they do, we will not be able to use them to generate electricity.

Renewable sources: Solar, Geothermal, Hydro, Wind

Non-renewable: Fossil fuels

3. WS: I can identify electrical appliances and the types of electricity they use.

What is an appliance? An appliance is a device, piece of equipment or an instrument designed to perform a task.

A washing machine is an appliance which performs the task of washing clothes.

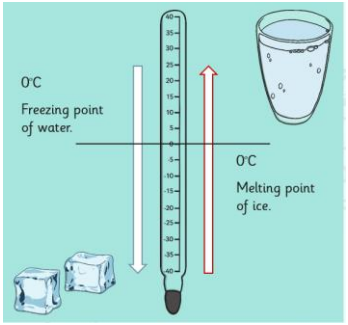
A thermometer is an appliance that performs the task of checking temperature.

Liquid to solid

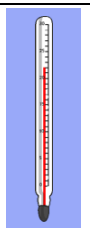
When a liquid turns into a solid it is called freezing. The temperature at which a liquid material freezes is called its freezing point. Different materials have different freezing points. It is important to remember that some materials have freezing points above 0°C. For example, the freezing point of iron is around 1550°C! Interestingly, this means its melting point is also its freezing point, just in reverse! Above this temperature, it will be liquid iron. Below this temperature, it will be solid iron. If a liquid material is cooled to its freezing point, it will turn from a liquid to a solid. The particles in a liquid are close together but can move quite quickly around and over each other. As it is cooled, the particles start to slow down. Eventually, they slow down so much that they only move gently on the spot, and a solid structure is formed. The material has frozen.

Melting and Freezing Points

For most materials, their melting and freezing points are the same. Although it sounds strange, think of the melting and freezing point as a barrier. If the material is heated to a temperature higher than this, it will melt. If the material is cooled to a temperature lower than this, it will freeze.

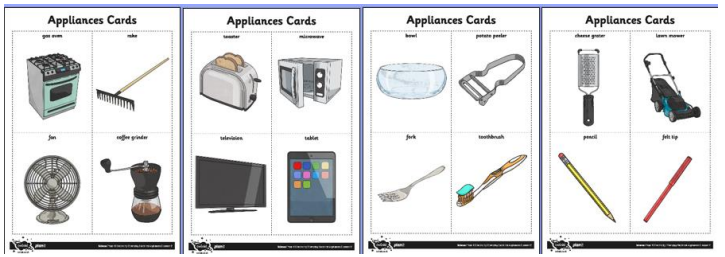


WS: Teacher led investigation/small group opportunity on melting point of chocolate

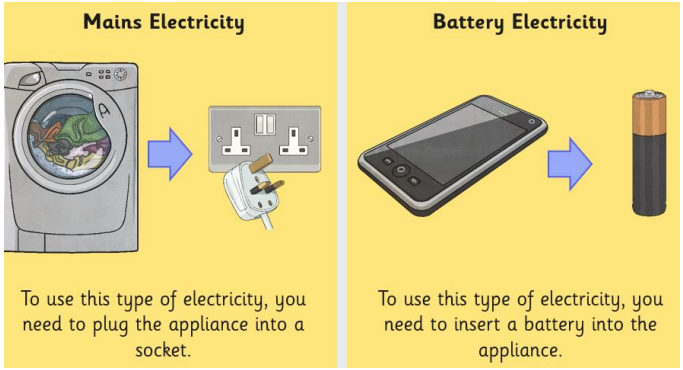


Children are given a range of appliances or photographs of appliances and are asked to sort them into electrical and non-electrical.

Example appliance ideas:

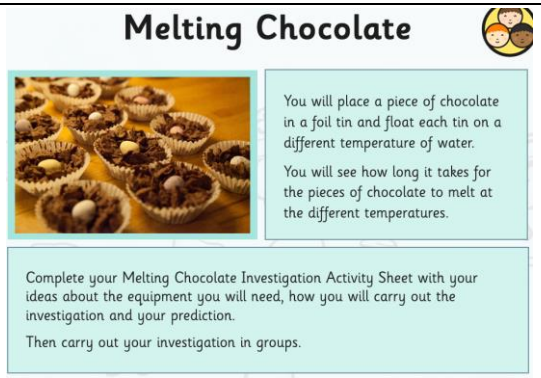


After this activity, focus on the electrical appliances and split them further into the type of electricity they use: mains or battery.



In the UK, mains electricity is produced mainly by gas, coal or nuclear power stations. Wind turbines, hydroelectric and solar panel power stations are also used to generate electricity, but to a lesser extent. A small number of homes have solar panels attached to their roofs to provide mains electricity.

Mains electricity can be dangerous, causing anything from a minor electric shock, to serious burns and even death!



5. I can explore how water changes state

Evaporation

Evaporation is when water turns into water vapour (a liquid turning to a gas). Evaporation happens very easily when water reaches its boiling point of 100˚C. However, evaporation can happen more slowly at much lower temperatures. For example, when water in a puddle warms up, water from the surface of the puddle slowly changes to water vapour.

Condensation

Condensation is when water vapour is cooled down and turns to water (a gas turning to a liquid). You can see that condensation has happened when you see droplets of water on a window or mirror in a warm room. The water vapour in the air has been cooled by touching the cold surface and this causes it to change to water.

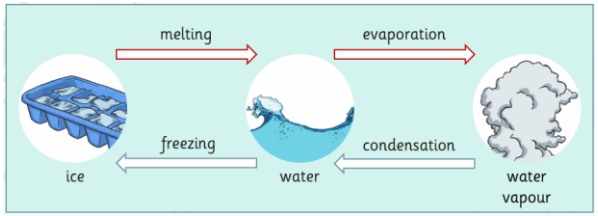
Freezing

Freezing occurs when water is made very cold. When water reaches 0˚C it turns to ice. (Freezing is a liquid turning to a solid.)

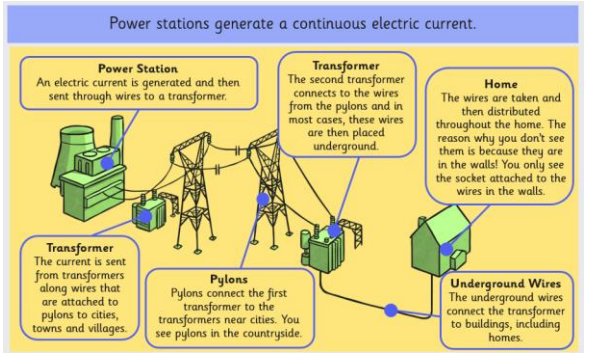
Melting

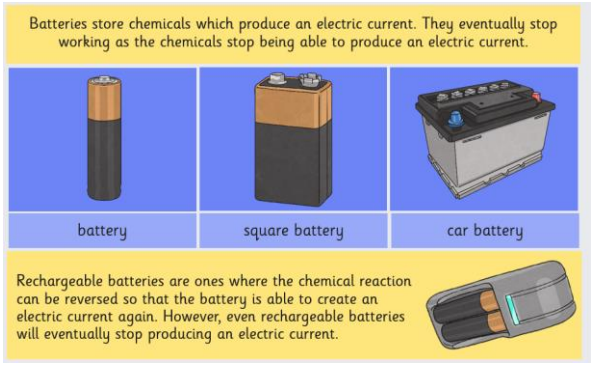
Melting occurs when ice warms up and changes to water (a solid changing to a liquid). At temperatures above 0˚C, ice will melt.

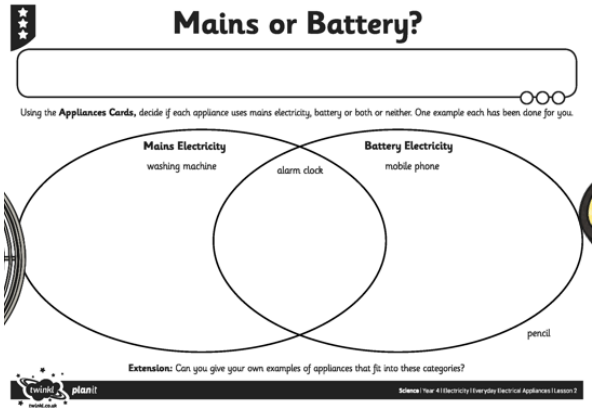
Water changes state as a result of these processes.



WS opportunities:

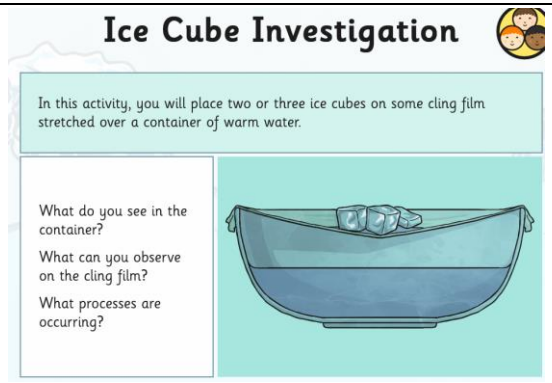


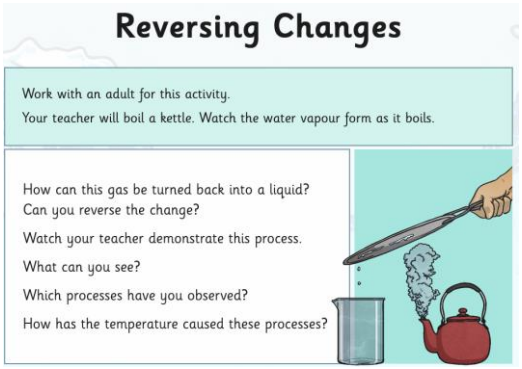


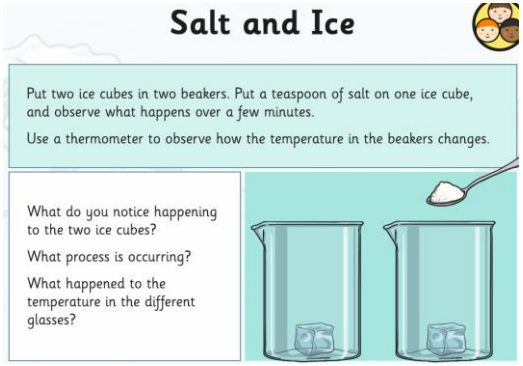


4. WS: I can identify complete and incomplete circuits.

An electrical circuit can be complete or incomplete.



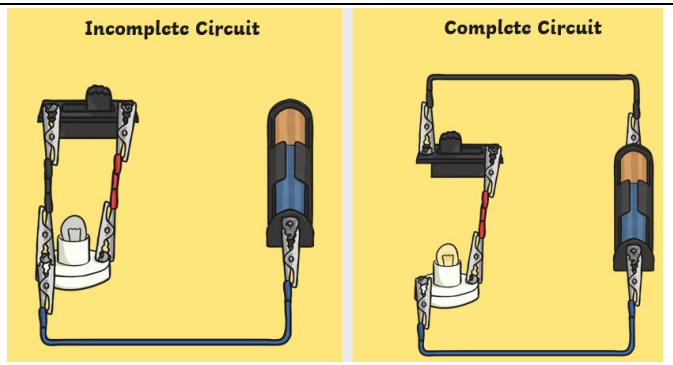




6. I can investigate how water evaporates

Evaporation is the process of a liquid changing into a gas. When clothes dry on the washing line, it is evaporation that causes the liquid on the wet clothes to turn into gas, leaving the clothes dry.

When clothes are hung on a washing line to dry, they are exposed to heat. They are not boiling, but there is some heat. The particles in the liquid water are moving around and over each other, and some particles move faster than others. These particles move so fast that they change state, turning into water vapour. The particles of water vapour move away from the clothes, spreading out into the air. The particles don't turn into air! Eventually, if the clothes are left on the washing line for long enough, all the



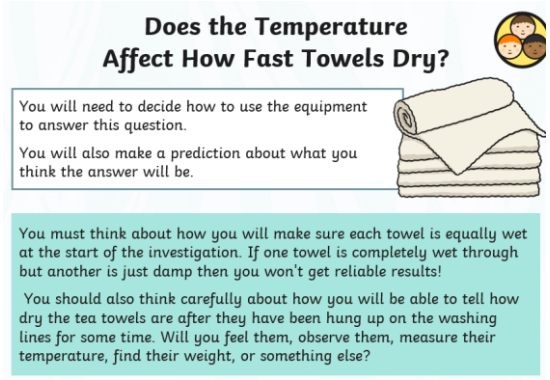
Current electricity is the flow of electrical charge though materials.
Every complete circuit must have a power supply. The power supply could be the mains, or it could be a battery. For a circuit to be complete, there must be wires connected to both the positive and negative ends of the power supply. **Electricity can only flow around a complete circuit that has no gaps.**
Children then predict and test a range of circuits using equipment provided (check cells and components prior to session).

5. WS: I can identify and sort materials into electrical conductors or insulators.

Children given a range of components to make a complete ecectrical circuit. Create and test that these work:

particles of liquid water will change state into gaseous water vapour. The water will have evaporated and the clothes will be dry.

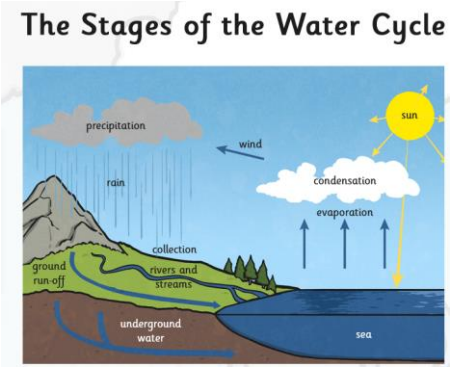
WS opportunity: tea towel drying investigation



7. **Links to real world: I can identify and describe the different stages of the water cycle and complete the L section of my KWL grid/add to my initial mind-map**

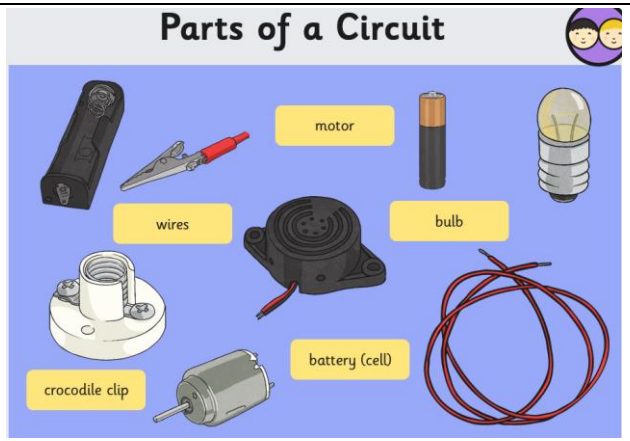
The importance of water!

More than three quarters of the Earth's surface is water. Some of this water evaporates in the heat of the Sun. When the water has evaporated, it is in the form of water vapour. Clouds are made from water vapour that has condensed to form tiny water droplets. When the water droplets get too big, they fall from the clouds. The water droplets can fall as rain, hail or snow. Three hundred millions litres of water falls on dry land each day.



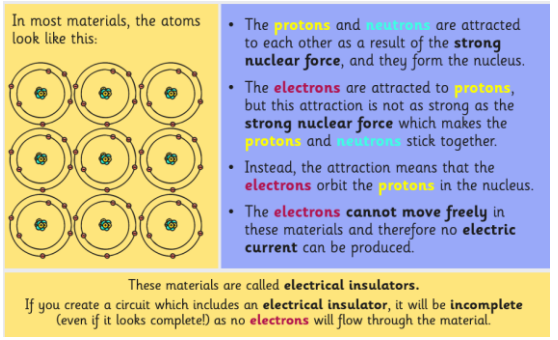
Evaporation

Heat from the Sun causes water to evaporate from seas, lakes, rivers and streams. Water also evaporates from puddles and ponds. This evaporation happens even on cloudy or cold days. The liquid water turns into water vapour when it has evaporated.



Children then shown a range of materials and asked to name them:

Insulators and Conductors explained:



Condensation

The water vapour in the air rises, and as it does so, it cools down. Eventually, it cools enough for the water vapour to condense and form small droplets of water. The droplets of water clump together to form clouds.

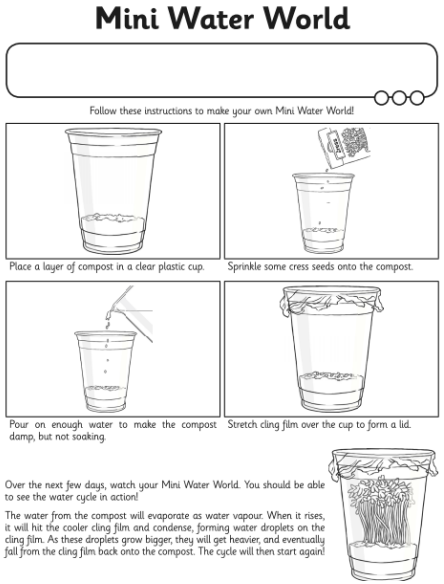
Precipitation

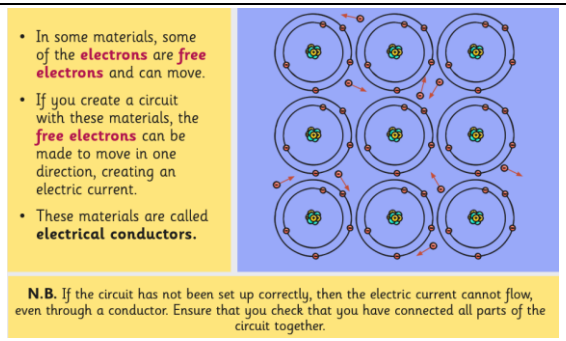
As more water vapour condenses, more water droplets are formed in the clouds. Eventually, the water droplets are large enough and heavy enough to fall back to the surface of the Earth. These droplets of water fall from the clouds in the form of rain, sleet, hail or snow.

Collection

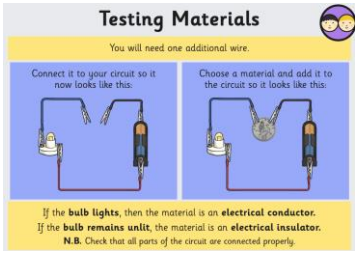
When water falls back to Earth as precipitation, the water may fall on oceans, lakes, rivers or on the ground. Water that falls on the ground is either absorbed into the soil, and is used as drinking water for animals and plants, or it runs over the ground and collects in the oceans, lakes and rivers. This water is then evaporated and the cycle starts all over again!

WS: Mini water cycle opportunity





Children use the knowledge above to predict which materials will conduct and which will insulate against electrical current. **NB: Teacher will need a complete, working circuit to share if children's circuits malfunction.**



Record results in simple table of insulators/conductors.

6. WS: I can explain how a switch works and why they are needed.

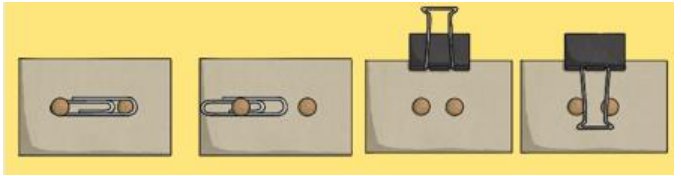
A switch 'breaks' a complete circuit on purpose to stop the flow of electrons when it is off. When the switch is on, the circuit is complete and so the electrons are able to flow around the circuit. A circuit with a switch is not the same as an incomplete circuit. In an incomplete circuit, the electrons are unable to flow at all whether the switch is on or off.

There are a wide variety of switches that can be used including: slide switches, push button switches, pull switches, dimmer switches, paddle switches, selector switches, key switches and toggle switches.

Children then draw and create a range of simple circuits with switches and explain which worked or did not work and why.

7. WS: I can record and report on an investigation into different switches.

Children work collaboratively to create their own home-made switches as per the images below:



They then use the switches and test how long it takes to break and reconnect a range of circuits with them.

8. **Refer to initial KWL/Mind map and identify real world/life context of learning.** A world without electricity? A world without switches?

Vocabulary

States
Solid liquid
Gas

Processes
Melt freeze
Evaporate
Condense
Heat heated
Cool cooled
Evaporation
Condensation
Melting
Warm cool
Solidify

Water Cycle
Changing state
Container (shape)
Thermometer
Degrees Celsius (°C)
Measurement

Appliances
Mains powered
Battery powered
Electricity
Electrical circuit
Electrical safety
Danger
Signs

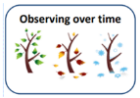
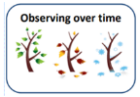
Components
Cell
Wire
Bulb
Buzzer

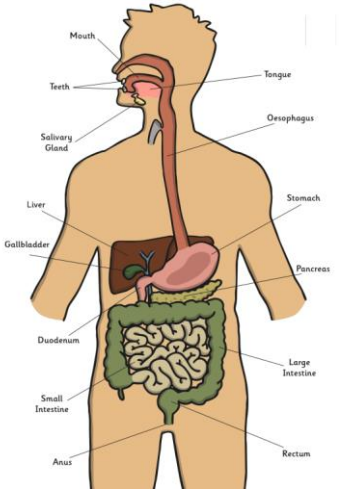
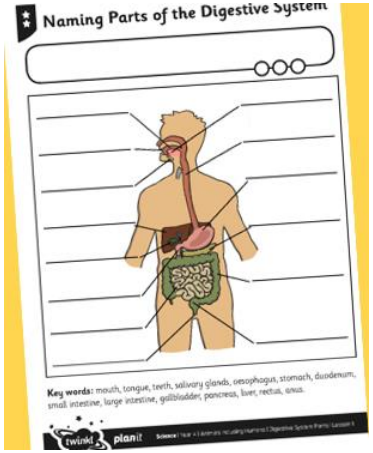
Switches
Open closed

Insulators
Wood rubber
Plastic glass

		Conductors Metal Water
Outdoor Learning	Roman banquet in our amphitheatre	River visit Create a labelled 3D model explain the journey of a river

Year 4 Spring Term

	Spring 1st Half	Spring 2nd Half
Theme	**Burps, Bottoms, Bile**	**Cornwall or Corfu?**
British Key Question	Are you what you eat?	Where would you go?
Enhancements	Visit from dentist/nutritionist	Visit form Travel Agent/Tourist Board http://www.perranporthinfo.co.uk/ Perranporth beach and town survey
Books	The Devil and his Boy – Anthony Horowitz Demon Dentist – David Walliams	The Devil and his Boy – Anthony Horowitz Mousehole Cat Myths and Legends – Giant Bolster/Theseus and the Minotaur
Addressing Stereotypes	Boys don't wash their hands!	My Dad makes the tastiest pasty! A Corfu/London pasty is as tasty as a Cornish pasty!
British Values	Democracy – Teeth care should be free for all, like the NHS Rule of Law – Teeth care should be free for all, like the NHS Individual Liberty – Everyone should alter their eating habits to save the planet Mutual Respect & Tolerance – Meat vs Vegetarian vs Vegan Which is preferable?	Democracy – How could we choose which is the best place for a Summer holiday? Rule of Law – Why don't be abolish passports? Individual Liberty – Freedom to travel where we wish – passports Second homes are an asset Mutual Respect & Tolerance – Should we speech the language of the country we visit?
Science (All NC subject content covered)	**Animals including Humans** **Pupils should be taught to:** • describe the simple functions of the basic parts of the digestive system in humans • identify the different types of teeth in humans and their simple functions • construct and interpret a variety of food chains, identifying producers, predators, and prey **Working Scientifically (WS):** During years 4, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative, and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes	**Living Things and their Habitats** **Pupils should be taught to:** • recognise that living things can be grouped in a variety of ways • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment • recognise that environments can change and that this can sometimes pose dangers to living things **Working Scientifically (WS):** During years 4, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative, and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes
WS opportunities	   How are humans and animals similar/different?  What effect do different  .I can create my own foo chains  How do habitats  Is it a living thing or not?  Do taler plants grow from larger seeds?   How can humans help

				liquids have on tooth enamel?	through research.	change over the seasons?		How many living things can I find in…?	What does a plant need to grow? What does a seed need to germinate? Are they the same?	protect habitats?
Key questions / knowledge and understanding to be explained Key Knowledge and facts to be recalled	1. **KWL/Mind map activity – what do we know already?** 2. **I can identify and name parts of the human digestive system.** Humans digest food. They have a digestive system that allows them to do this. Children draw and label what they think the human digestive system looks like and how it works before using the image below to correct and/or relabel a blank diagram:   Elicit that a lot happens, and their food travels a long way from the point they put it in their mouth. This will be explored in the next session. 3. **I can explain the functions of the digestive system.** **Glands** Glands are organs that release fluids to be used in the body. **Enzymes** Enzymes are special molecules in the body (molecules make up cells, which make up tissue, glands, organs, etc). They act to create a chemical reaction. In the digestive system the reaction they produce breaks down food. There are lots of different types of enzymes as a type of enzyme can only do one thing – so enzymes that break down protein cannot also break down carbohydrates. You need different enzyme for that! They are often thought of as a lock – only the right key will fit! **Digestion step by step:** **Salivary Glands**		1. KWL/Mind map activity – what do we know already? 2. I know the key life processes and can group living things in a range of ways. Have a selection of living on board or printed for children to discuss – what do they have in common? What differences? Can you group them? How? Why?  Establish that they are all *'living things'*. Sometimes we call them **'organisms'.** Even though they might be very different from each other, all of these organisms share certain characteristics. All living things do certain things to stay alive. These are called **life processes.** All animals, including humans, do these things. Plants do too, although they do them in different ways. One way of remembering life processes is the acronym MRS GREN: **Movement** **All living things move**. Animals move around to get from place to place. Plants grow and turn towards the light. For example, a hare runs to escape from danger and a sunflower will move so that it faces the sun. **Respiration** **All living things respire.** Plants and animals both use oxygen gas from the air to turn their food into energy. This is called respiration. Land animals breathe oxygen through their mouths or noses. Sea creatures breathe oxygen dissolved in the water through their gills. Both types of creature then use this oxygen in their body for respiration. Plants both respire and photosynthesise. While photosynthesis happens when the plant is in light, plants respire by taking in oxygen and giving out carbon dioxide during darkness.				

First part of the digestion process starts without you even eating! The smell of food triggers the salivary glands to produce saliva (some call it your mouth watering). The amount of saliva increases as you taste the food. Saliva is mostly made of water, and it helps you to chew, taste and swallow food. Saliva contains enzymes which start to break down the food we eat.

Mouth
Entry point for food. Where saliva mixes with food. Location of tongue and teeth. Top part of the mouth (soft palate) helps move food along to the oesophagus.

Teeth
Tear, cut and grind food into smaller pieces.

Tongue
Helps mix the food and saliva.

Oesophagus
A muscular tube which forms the path from the mouth to the stomach. Muscles contract and relax to move food down the oesophagus to the stomach.

Stomach
Glands line the stomach produce acid and **enzymes** which breaks the food down further. Muscles in the stomach mix the food.

Liver
Produces bile which helps to absorb fats. Bile is sent to the gallbladder to be stored.

Gallbladder
Releases bile into the duodenum when needed.

Pancreas
Produces enzymes to break down fats, proteins and carbohydrates. Releases them into the duodenum.

Duodenum
First part of the small intestine. Food is broken down by bile from the gallbladder and enzymes from the pancreas.

Small Intestine
The other parts of the small intestine – (jejunum and ileum) absorb nutrients from the food. Pass any leftover broken down food to the large intestine.

Large Intestine
Connects the small intestine to the rectum. Absorbs water from waste food. Forms stool from waste food.

Rectum
Stores stool passed to it from the large intestine. Makes brain aware of need to go to the toilet.

Anus
Releases the stool. End of the digestive process.

4. I can identify the types and functions of teeth.

Incisors
Humans have 8 incisors altogether: 4 in the upper jaw and 4 in the lower jaw. Incisors are shovel-shaped and are used for biting and cutting food.

Canines

Sensitivity

All living things are sensitive. Every living thing can detect changes in their surroundings. Animals use their senses to see, hear, taste, touch and smell the world around them. Plants can also detect changes in the environment. This mimosa plant curls up when you touch it!

Growth

All living things grow. Animals grow from babies to adults. Seeds grow into plants.

This ocean mola started life as an egg not much bigger than a full stop. It will grow to weigh about 1000 kg - this is the same size as a large bull!

Bamboo can grow up to 3cm every hour!

Reproduce

All living things reproduce. Animals have young. Plants produce seeds from which more plants grow. Animals lay eggs or give birth to live young. Most plants reproduce by forming seeds.

Excretion

All living things excrete to get rid of waste. Waste products are removed from the body. Both plants and animals have to get rid of excess gas and water. Animals excrete waste through urine and faeces. Leftover gases and water leave plants from their leaves.

Nutrition

All living things require the correct food or nutrition. Food is eaten to provide energy to live. Green plants make their own food using sunlight. Animals may be carnivores, herbivores or omnivores. Green plants make their own food using the energy from the sun – this is known as **photosynthesis**.

Sorting living things content to be added here.

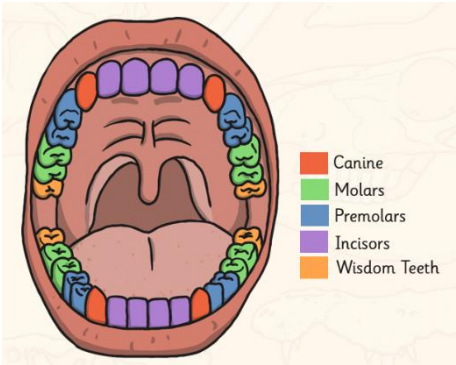
3. (a) I can identify vertebrates by observing their similarities and differences.

Classification:

Scientists think that there are 7.77 million species of animals in the world, living on the land, in the sky and in the sea. We have discovered and named about 1.4 million of these…which means that over 6 million species of animal are yet to be discovered!

We have already discovered:

Humans have 4 canine teeth, one in each quarter of the mouth, on either side of the incisors. Canines are pointy and are used for tearing and ripping food.



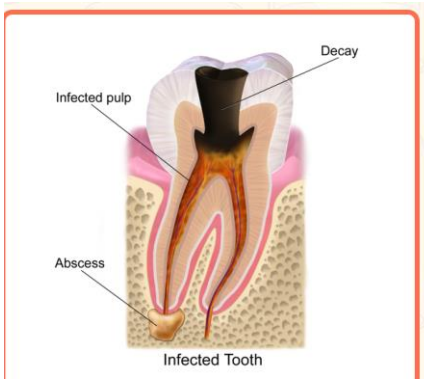
Premolars
Humans have 8 premolars, two in each quarter of the mouth. They are between the canine tooth and the molars. Premolars are flat and small are used to hold and crush food.

Molars
Humans have 8 molars, two in each quarter of the mouth. They are at the back of the mouth behind the premolars. They are large and flat and are used for grinding food.

Wisdom Teeth
Humans can have up to 4 wisdom teeth, although not everyone has them. There is 1 in each quarter of the mouth behind the molars. They are large and flat (they are just a third molar). Wisdom teeth do not have a function in modern humans. Some scientists think that human ancestors needed a third molar to help grind down plant tissue from thicker leaves when humans still ate them. Since the diet of humans has changed, we don't need them. As the human diet changed our mouths have become smaller. This is the reason why many people have their wisdom teeth extracted – taken out – as there is no real room for a wisdom tooth so it tends to grow inward and can become a problem.

Children are taught that animals have different teeth to humans based on their evolution and diet. For example, predators like Lions and Tigers have larger and more prominent canines and incisors to catch, hold and tear their prey.

5. I can create an enquiry or test into tooth decay.



Discuss the following questions with your talk partner:

- What is tooth decay?
- What causes tooth decay?
- How do you know?

5500 species of mammal

10 400 species of bird

10 000 species of reptile

7300 species of amphibian

33 000 species of fish

1 305 000 kinds of invertebrate

When scientists discover a new animal, they give it a name and record everything they know about it.

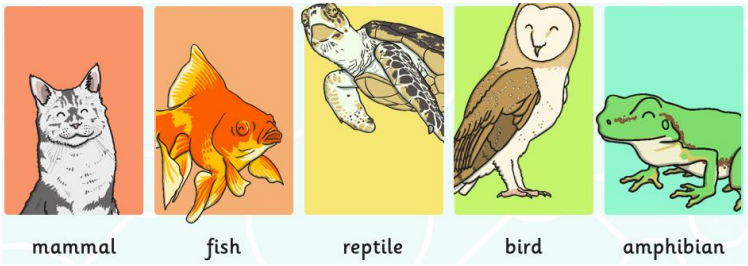
We organise living things into groups based on their similarities and differences, so that we can learn more about what makes each species unique. The differences between living things is sometimes called variation.

It is easy to sort most of the living things we can see in the world into two groups: plants and animals.
Plants and animals share life processes, but they do them very differently.

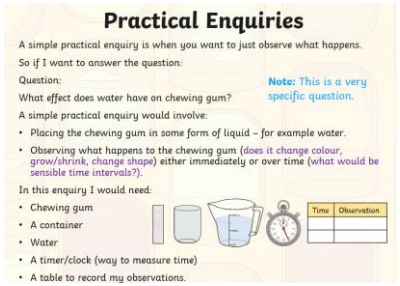
Animal Groups
Vertebrates are animals with a backbone. They have a hard skeleton made of bone. It holds their body up and gives them shape.

Invertebrates do not have a backbone, or a skeleton made of bones. Many have a hard shell outside their bodies to protect them. Others have soft, flexible bodies.

Vertebrates can be separated into five broad groups:



Articulate that we will be asking a scientific question on tooth decay over the next two sessions. Remind pupils that a scientific question needs to be clear and measurable – how will we know what we have found out? Scientists need to choose their equipment and question carefully. Follow the example hypothesis on effect of water on chewing gum in the presentation as below:



In the practical enquiry we are interested in the observation and what happens as we are not sure what the results will be. When we conduct comparative or fair tests we want to test the particular effect of something. You might ask - Question:
Do different liquids affect the colour of chewing gum?

The variable you are testing is the thing you change every time you carry out the test. In the comparative and fair test we will look at, this will be the liquids. **I want to change the liquids to see if different types of liquids have a particular effect on the chewing gum.**

When you are carrying out a fair test, you need to change only one thing. All other variables should be kept the same so that they don't affect your results. In my tests I want to know if liquids change the colour of chewing gum but if I use different containers to put the liquid in or put the containers in different parts of the room then it could be the material of the containers that has the effect or the place in the room, not the liquid. These differences would mean I was testing lots of types of variables when I just want to test one type - liquid. That's why we must keep some things the same throughout so that we know what is having the effect.

In my tests I would want the following things to be the same:

- Containers
- Where I place the containers
- The amount of liquid in each container
- The time between each observation
- The type of chewing gum
- The amount of chewing gum in each container.

Mammals have warm blood and have hair or fur on their bodies. Mammal babies are born alive. The mothers feed their babies milk.

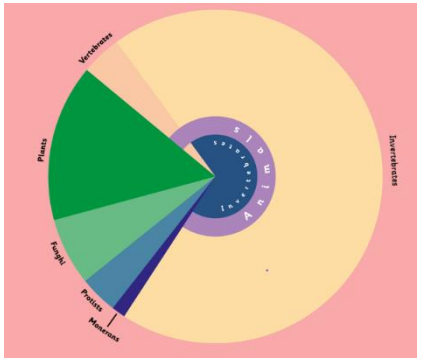
Fish live in water. They have fins instead of legs and gills instead of lungs. They lay their eggs in water. They have cold blood and scaly skin.

Some **reptiles** live on land, and some in water. They have lungs that breathe air. They have scales and are cold-blooded. They lay their eggs on land.

Birds have a beak, wings, feathers and 2 legs. They lay eggs on land. They have warm blood.

Amphibians live on land and in water. They are cold-blooded. They have gills when they are young. They have smooth skin. They lay their eggs in water.

3. (b) I can use a key and evidence to identify invertebrates.



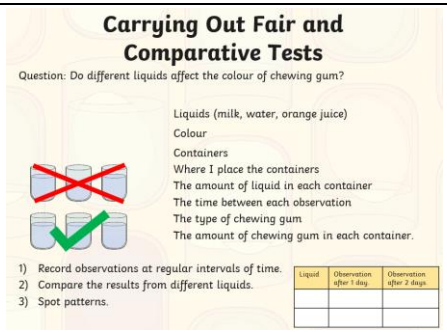
More than 80% of living things on the planet, and 98% of animals, are invertebrates.

Insects: There are over 800 000 different types of insects.
They have an exoskeleton covering their body.
The body consists of 3 parts: the head, thorax and abdomen.
They must shed their exoskeleton in order to grow.
They have a pair of antennae on their head.

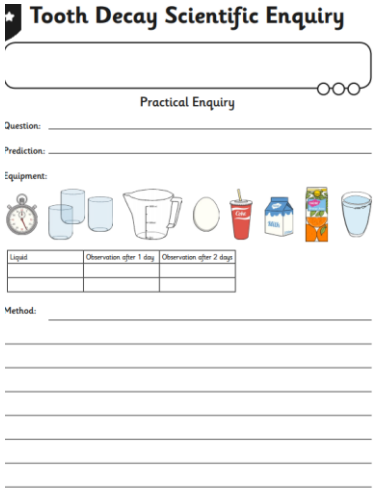
Annelids: They have existed for over 120 million years.
There are over 9,000 species, including worms and leeches.
They have bodies divided into segments.
They don't have any limbs.
Some have long bristles; others have shorter bristles and seem smooth.

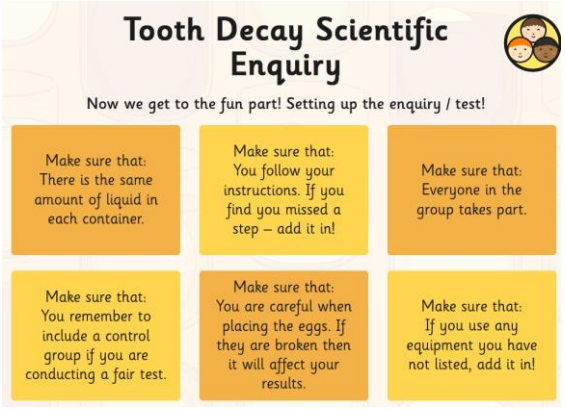
Protozoa: They eat tiny algae and bacteria.
They can only be seen under a microscope.
They are simple, single-celled animals.
They are a source of food for fish and other animals.
They reproduce by splitting in half.

Crustaceans: Most common crustaceans are the crab, lobster and barnacle. Woodlice are also crustaceans.
They have a hard, external shell which protects their body.
They live mostly in the ocean or other waters.
They have a head and abdomen.
Many have claws that help with crawling and eating.



Children then plan and undertake their own tooth decay investigation after being shown the different liquids they can use to test with, including a possible control solution – water.



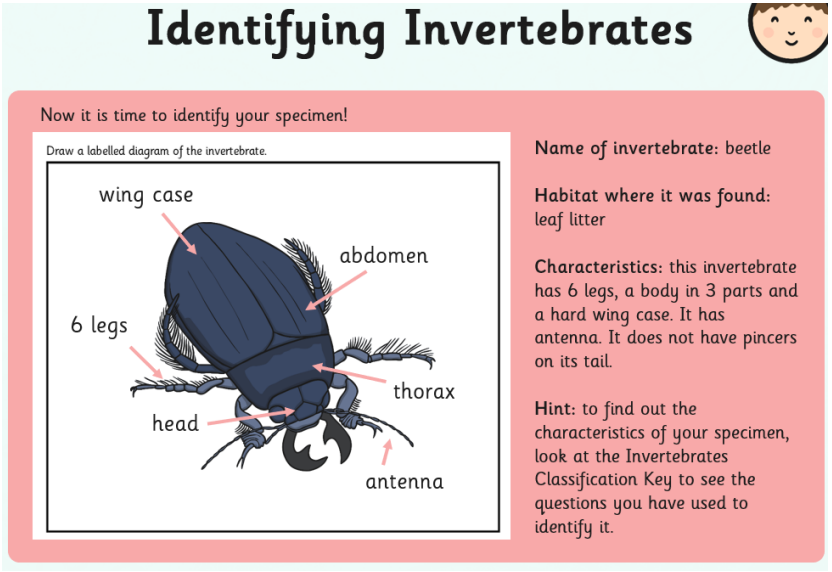


Molluscs: They were among the first inhabitants of the Earth.
They live on land or in water.
Most have a soft, skin-like organ covered with a hard outside shell.
Land molluscs move slowly on a flat sole called a foot.
Ocean molluscs attach themselves to rocks or other surfaces, and can't move.

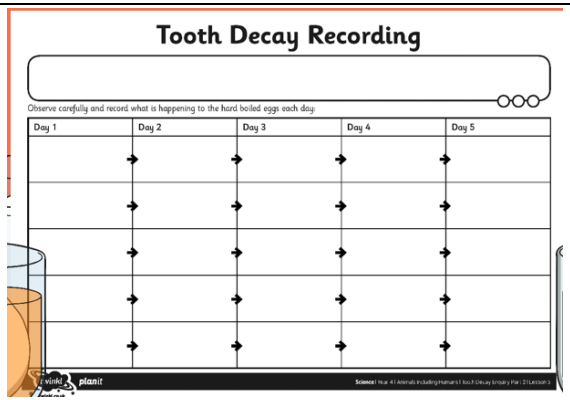
Arachnids: Most arachnids have 4 pairs of legs.
The first pair of legs may be used for holding their prey and feeding.
Common arachnids are spiders, scorpions, ticks and mites.
They have a hard exoskeleton and jointed legs for walking.
Arachnids do not have antennae.

Echinoderms: They are marine animals that live in the ocean.
Common echinoderms include the sea star, sea urchin, sand dollar and sea cucumber.
They have arms or spines that radiate from the centre of their body.
The central body contains their organs, and their mouth for feeding.
The mouth is underneath, to eat other sea life.

Children complete a local invertebrate 'hunt' in the school grounds (or beyond if possible).



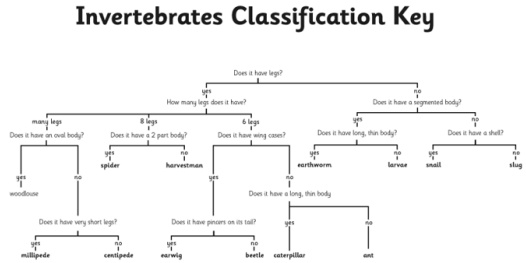
They then use the invertebrates key to identify their specimen(s).



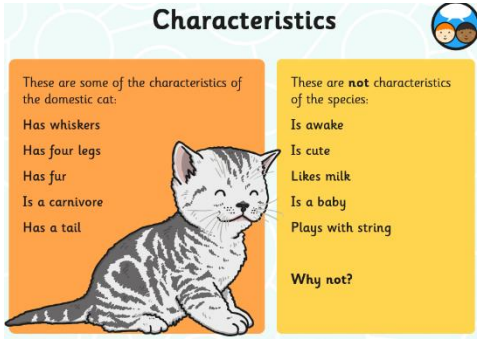
6. I can construct and interpret food chains.

Watch the video link below as a refresher from the children's learning in Year 3 and KS1:

Food chains - KS1 Science - BBC Bitesize

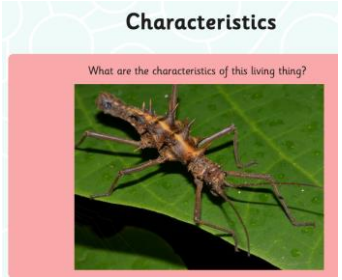


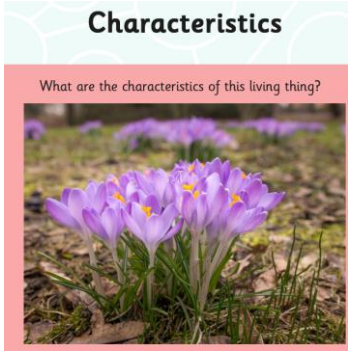
4. I can create a classification key and use it to show the characteristics of living things.



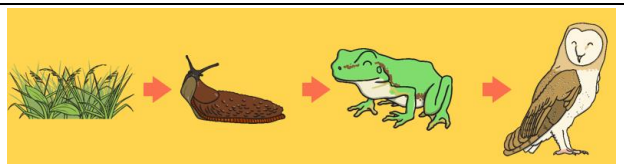
The characteristics of a living thing are what make it similar or different to other living things. All species of living thing have a unique set of characteristics. Species with similar characteristics are put into groups. This is how we classify living things.

Discuss the characteristics of a range of living things, such as those shown below.





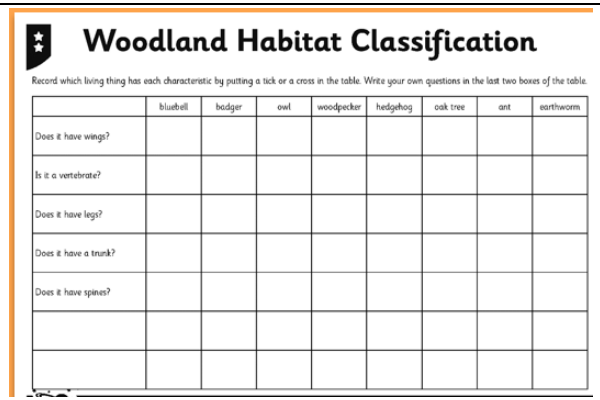
Children then complete a table of charactersitics for a humbe rof different living things, as shown below:



How is this food chain constructed? What do the arrows represent? How should we label the different parts of the food chain?

Children define the key vocabulary below:

Herbivores	An animal that eats plants.
Carnivores	An animal that eats other animals.
Omnivores	An animal that eats plants and animals.
Detritivores	An animal that eats decomposing plants and animals.
Producers/Autotrophs	Plants that produced their own food.
Consumers	Animals that eat plant or other animals.
Primary Consumer	An animal that eats plants.
Secondary Consumer	An animal that eats the primary consumer.
Tertiary Consumer	An animal that eats the secondary consumer.
Prey	An animal that is hunted for food.
Scavenger	An animal that eats dead animals.
Predators	An animal that kills for food.
Decomposer	An organism or bacteria that breaks down dead plants and animals into liquid for food.



Woodland Habitat Classification

Record which living thing has each characteristic by putting a tick or a cross in the table. Write your own questions in the last two boxes of the table.

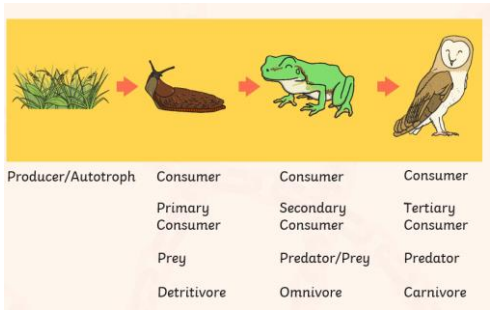
	bluebell	badger	owl	woodpecker	hedgehog	oak tree	ant	earthworm
Does it have wings?								
Is it a vertebrate?								
Does it have legs?								
Does it have a trunk?								
Does it have spines?								

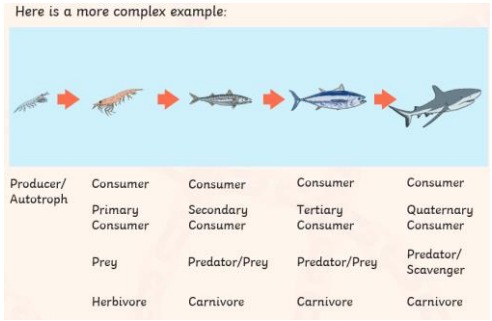
Children use this data to begin to create classification keys to sort the living things.

5. I can conduct a local habitat survey and recognise positive and negative changes to the local environment.

Children to conduct a local habitat survey for a location of their choice – this could be in the school grounds, or an area nearby school; Perranporth Beach would be a great one to use and compare if time allows.

Children then identify the vocabulary on food chains and create versions of their own for selected habitats.





7. **Refer to initial mind-map/KWL activity and real-world context.**

Plants and animals are not able to make big changes to their habitats to make them more suitable, like we are. They rely on their environment to give them everything they need.

This means that when habitats change it can be very dangerous to the plants and animals that live there.

Litter can cause injury to animals. Animals can cut themselves or get tangled or trapped in rubbish.

Animals might eat litter, this could poison or injure them.

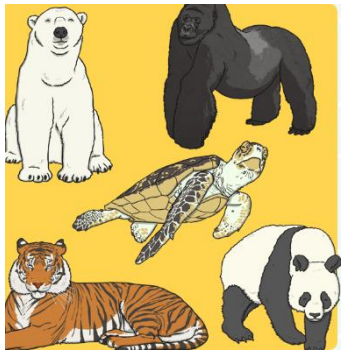
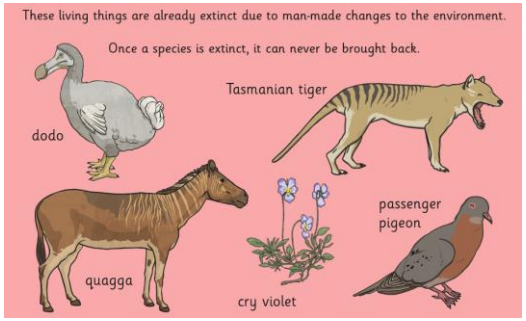
Fire caused by humans can kill animals and plants.

Chemicals in or near water can kill water plants, fish and insects and pollute the water source for birds and animals who live nearby.

Roads are dangerous for animals, who are often hit by cars.

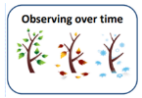
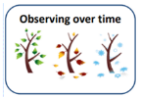
Cutting down trees and building new structures can destroy plants and animal homes.

Walls and fences can get in the way of pathways used by animals to reach food and water.

		Tall grass and flowers are an important habitat. Plants and animals lose their habitat when it is cut down. **6. I can research and describe environmental dangers to endangered species.** Many living things are endangered because humans have destroyed much of their habitat. When a living thing is endangered it means that there are not many of that plant or animal left and scientists are concerned that the species may become extinct.  Here are some endangered species. There are many more species of plants and animals threatened by the destruction of their habitats. If these species cannot be protected from the changes in their environment, some of them may become extinct.  Children research and prepare a presentation on endangered animals of their choosing.  **7. What have a I learnt in this topic? Refer back to initial ideas from lesson 1.**
Vocabulary	Human Digestive System Digestion mouth Tongue - mixes moistens Saliva Oesophagus transports	Organisms – plants, animals. life processes respiration sensitivity reproduction excretion

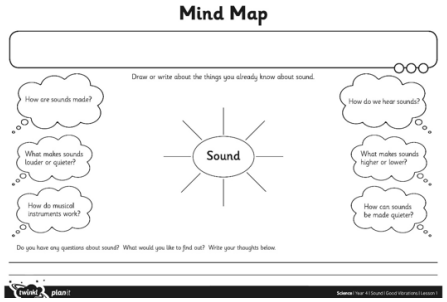
	Stomach acid Enzymes Small intestine absorbs water Vitamins Large intestine compacts Colon **Teeth** Incisors cutting slicing Canines ripping tearing Molars grinding chewing Flossbrush **Food Chain** Sun Primary secondary Producers decomposer Consumers tertiary Prey Predators Carnivore Herbivore Omnivore	nutrition habitat environment endangered species extinct Life Processes – MRS GREN – Movement, respiration, sensitivity, growth, reproduction, excretion, nutrition. Classification Vertebrates Invertebrates Specimen Characteristics
Outdoor Learning		Walk around town and beach

Year 4 Summer Term

	Summer 1st Half	Summer 2nd Half
Theme	**Traders & Raiders**	**Blue Abyss**
British Key Question	How did the Anglo-Saxon era end and what was their impact on life in Britain? How did the Vikings influence life in Britain?	Can you/Britain save the oceans?
Enhancements	Build a boat challenge	Falmouth Maritime Museum/National Marine Aquarium (Visit/Virtual)
Books	Street Child – Berlie Doherty Legend of King Arthur (myth/legend) How to Train Your Dragon	Street Child – Berlie Doherty The Sea – James Reeves (poem)
Addressing Stereotypes	You have to be loud and scary to win a battle! Women should stay in the village while the men fight	Where are the female natural scientists to rival Steve Backshall and David Attenborough?
British Values	Democracy – The strong rule - Discussion is preferable to force Rule of Law – Let's trade! Could we survive without money? Individual Liberty – We should be able to choose our leaders Mutual Respect & Tolerance – The strong rule - Discussion is preferable to force	Democracy – What needs our support the most? (endangered species) Rule of Law – The fish we catch belong to everyone (over fishing) Individual Liberty – I can go to an aquarium if I wish! Sea creatures belong in the sea not in tanks Mutual Respect & Tolerance – Sea creatures belong in the sea not in tanks
Science (All NC subject content covered)	**Sound** **Pupils should be taught to:** • identify how sounds are made, associating some of them with something vibrating • recognise that vibrations from sounds travel through a medium to the ear • find patterns between the pitch of a sound and features of the object that produced it • find patterns between the volume of a sound and the strength of the vibrations that produced it • recognise that sounds get fainter as the distance from the sound source increases **Working Scientifically (WS):** During years 4, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative, and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes	Researching real life Scientists **Working Scientifically (WS):** During years 4, pupils should be taught to use the following practical scientific methods, processes, and skills through the teaching of the programme of study content: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative, and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes
WS opportunities	   Do bigger musical instruments   .	     How and where can I

		How can I sort different sounds?	always make deeper sounds? How can the pitch of a sound be altered?	Why can't I hear a sound when I'm too far away? How can I improve my ability to hear a sound?						find out about this real life scientist?

Key questions / knowledge and understanding to be explained
Key Knowledge and facts to be recalled



1. I can describe and explain sound sources

Start the session by watching the clip below and discussing the different ways musical instruments can create sound.

https://www.bbc.co.uk/education/clips/zqtxpv4

All the instruments are played in different ways, but they all have something in common. They all create sounds by vibrating. The strings of the guitar and the gopichand vibrate when they are plucked. The pan pipes and horn are filled with air, which vibrates when they are blown. The balafon and the bongos make sounds when they are hit or banged, causing the blocks or the skin to vibrate.

We can see and feel vibrations whenever sounds are made. Gently place your hand on your throat. Say 'Ah!' Can you feel the vibrations from your vocal cords?

Place a few grains of rice on a drum skin and gently bang the drum.
What do you observe? The grains of rice bounce on the drum skin when it is hit. This is because the drum skin vibrates, and the vibrations pass to the grains of rice, which also vibrate.

Children watch tuning fork video to demonstrate the sound vibrations having an affect like a ripple in water:

https://youtu.be/iRYWmo3Tuq4

School Sound Survey

1. Initial thoughts – present children with a photograph of each scientist. Children to make notes on who they think the people are and what they may do. Elicit that each is a scientist and explain their links to our science learning.

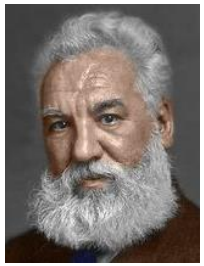
2. (a) Scientist 1 – Gerald Durrell – conservationist

Gerald Durrell was born in India in 1925, and was an English conservationist. He worked hard to conserve the endangered species of Madagascar. Gerald Durrell founded the Durrell Wildlife Trust and the Jersey Zoo, which is now called the Durrell Wildlife Park. He set up his own zoo in 1959 especially to look after endangered animals from around the world.

He made several expeditions all over the world to find endangered animals and bring them back to his Wildlife Park in Jersey, where he cared for them and set up breeding programmes so that these species could successfully have young.

2. (b) Scientist 2 – Alexander Graham Bell

Alexander Graham Bell was a Scottish scientist and inventor. His most famous invention was the first telephone. Alexander Bell was born in March 1847 in Edinburgh, Scotland. He had two brothers, Melville James Bell and Edward Charles Bell. Bell's father, Alexander Melville Bell, was a phonetician, which is a scientist who studies speech sounds and how they are made and transmitted. His mother was Eliza Grace Bell, and she was an accomplished pianist. Bell was home-schooled by his mother,
who tried to give him a sense of curiosity about the world around him. To his close friends and family, Alexander Bell was known by the nickname Aleck. In 1870, Alexander Bell moved to Canada with his parents. Soon after, he moved again to the United States.



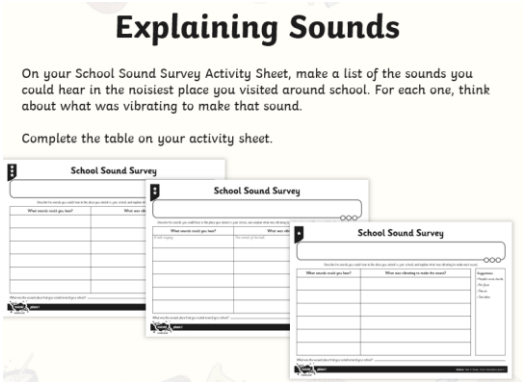
Alexander Bell's work with Deaf people – please check this content and adapt for your cohort as required.

Alexander's father worked with deaf people and developed a system known as 'Visible Speech' to show how different speech sounds are made. At that time, Visible Speech was thought of as an excellent way to help deaf people learn and develop their speech, although its use gradually stopped after about twelve years. Following on from his father's work, Alexander helped demonstrate how Visible Speech could be used and supported his father in teaching it to deaf people.

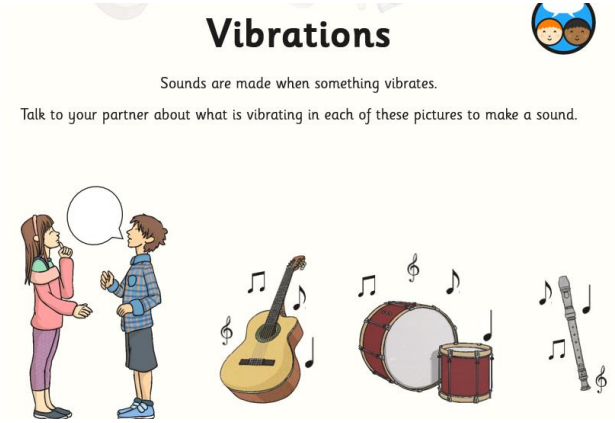
Alexander went on to open his own school too, where deaf children could learn to communicate using the Visible Speech methods. His most famous pupil was Helen Keller.

Although some of Bell's work on helping deaf people to communicate with hearing people did have some positive impacts, some of his ideas were unacceptable. He tried to discourage people from using

Around school there are lots of different sounds. Some places will be noisy, whereas some places will be quiet. The loudness of the different places will even change throughout the day! Children carry out a sound survey of school to find which places are noisy and which are quiet at different times of day. Children rate each place out of 5, with 5 being very noisy and 0 being totally silent. Children predict the noisiest/quietest place before the survey and then compare their results to these predictions. Would the results be the same at another time of day?



2. I can explain how different sounds travel.



Place some rice on the skin of a drum. Bang the drum three times: gentle, medium and hard. Observe the way the rice vibrates each time. Is there a link between the loudness of the sound and the size of the vibrations?

sign language and, even worse, he tried to keep deaf people away from one another. He argued that deaf people should be prevented from getting married and having children together.

Deaf people think of being deaf as making them who they are and it was very offensive to them that Alexander Bell spread the idea that being deaf was something bad that needed to be prevented.

2. (c) Scientist 3 – Maria Telkes – Solar Power

Maria Telkes is a famous scientist who made lots of discoveries around solar power. She was born in Hungary in 1900. She is best known for creating the first house built with a heating system that ran completely on solar energy – The Dover Sun House – with the architect Eleanor Raymond. Her other inventions include a solar-powered **desalination machine** (which uses solar energy to remove salt from water at sea). This saved the lives of many people stranded at sea. There are many schools named after her today, especially in the USA where she worked for many years. Her work in solar energy is so well known that she is sometimes called the Sun Queen.

2. (d) Scientist 4 – Garrett Morgan

Garrett Morgan was an American inventor and entrepreneur. He thought of himself first as a businessman and second as an inventor. Garrett Morgan's achievements are especially impressive because he only went to school up until sixth grade. In America, sixth grade is for children ages 11 and 12. It was also difficult for Garrett Morgan to achieve his many successes due to the racism he experienced during the time he lived.

Garrett was born in 1877 in Kentucky and grew up on his family's farm. His father had been enslaved (freed in 1863) but it is not clear if his mother had also been enslaved earlier in her life. When Garrett was a teenager, he left Kentucky to look for opportunities in Ohio.

At first, he got a job working for a rich landowner, maintaining his property and then working in a sewing machine factory. Garrett was determined to further his education so he used the money he earned to pay a tutor. He also taught himself, and through his job, one of the things he learnt was how to repair sewing machinery.

He invented an improved version of the sewing machine and, in 1907, he opened a shop selling sewing equipment that also did repairs.

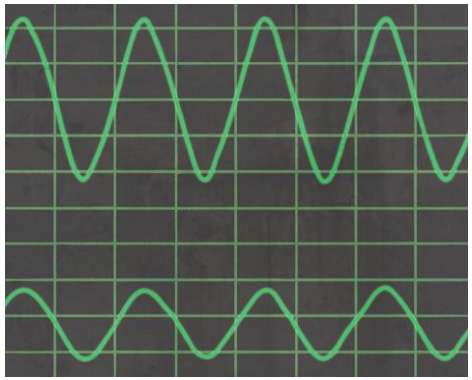
The repair shop was successful and a couple of years later, Garrett Morgan also opened a clothes making business employing 32 people.

In 1914, Garrett Morgan secured a **patent** for a safety hood he had invented. This invention was the first version of the modern gas mask.

The Morgan Safety Hood was popular and received many orders. Sadly, due to racial discrimination, Garrett used White actors to present his ideas at invention

Loud and Quiet

The louder the sound, the bigger the vibration. Children should have noticed that the rice grains vibrated more when they hit the drum harder, creating a louder sound.



The size of the vibration is called the amplitude. Quieter sounds have a smaller amplitude, and louder sounds have a bigger amplitude.

Play the clip to explore and discuss how sound travels:

Understanding sound - KS2 Science - BBC Bitesize

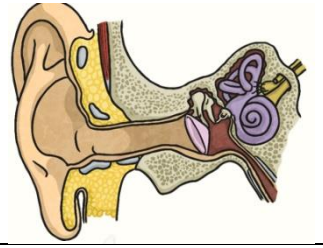
Sound can travel through solids, liquids and gases.

Sound travels as a wave, vibrating the particles in the medium it is travelling in.

So in our example, when you hit the drum, the drum skin vibrated. This made the air particles closest to the drum start to vibrate as well. The vibrations then passed to the next air particle, then the next, then the next. This carried on until the air particles closest to your ear vibrated, passing the vibrations into your ear.

Hearing Sounds

Once in your ear, the vibrations travel into the ear canal until they reach the eardrum. The eardrum passes the vibrations through the middle ear bones (the hammer, the anvil and the stirrup) into the inner ear. The inner ear is shaped like a snail and is called the cochlea. Inside the cochlea, there are thousands of tiny hair cells. Hair cells change the vibrations into electrical signals that are sent



events and on advertisements for his hood because he knew that, at this time, many people did not want to buy a product from a Black inventor.

In 1916, Garrett Morgan, his brother and some other volunteers put on the safety hoods to rescue some workers from an underground tunnel. The men had become trapped when there had been an explosion.

As a result of Garrett's heroic actions, he was featured in the national newspapers. Although the publicity led to an increase in orders generally, when some companies realised the Morgan Safety Hood was made by a Black inventor, they cancelled their orders.

These events show the racism that Garrett Morgan experienced as he worked to become a successful inventor and a businessman.

Another of Garrett Morgan's most famous inventions was the first three-signal traffic light.

He was inspired to invent this after witnessing an accident between a horse-drawn carriage and a car.

There had been two-way traffic lights before Morgan's invention but his three-signal traffic lights provided a safer option for road users.

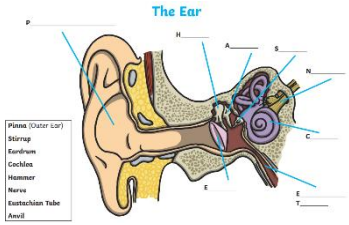
Garrett got the patent for this invention in 1923 and then went on to sell the patent to the General Electric Company.

3. (a) Preparing to present - what have we found out? What surprised you? Each pair of children given one of the five scientists to develop their knowledge into an oral presentation.

3. (b) Presenting our findings – children present their research to another pair of children in class.

4. What have we learnt about each scientist? How is their research linked? What do we know now that we didn't know in lesson 1?

to the brain through the hearing nerve. The brain tells you that you are hearing a sound and what that sound is.



Children complete a simple ear diagram and short explanation of how sound reaches them to hear. They can also use the clip below to support this understanding.

https://youtu.be/HMXoHKwWmU8

3. I can explore ways to change the pitch of a sound.

Sounds can be loud or quiet. Bigger vibrations make louder sounds, and smaller vibrations make quieter sounds.

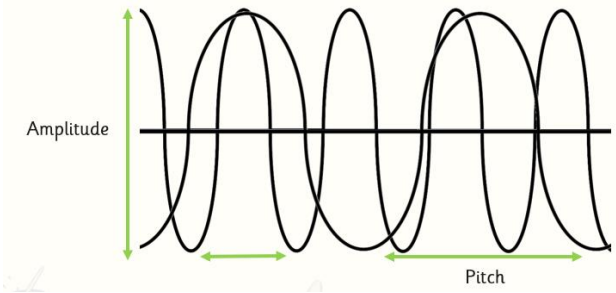
There are other ways sounds can be different.

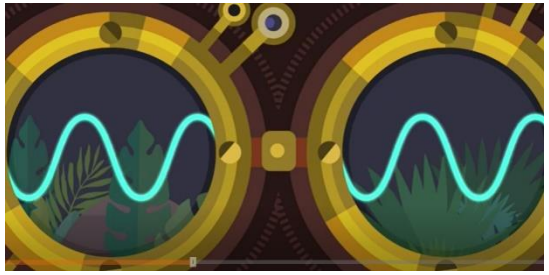
Can you make a high sound? How about a low sound? Children to investigate how they can change the pitch from high to low and vice versa.

High and low are words to describe the pitch of a sound.

The pitch of a sound is different to the amplitude.

Amplitude is a measure of how loud or quiet a sound is, and pitch is a measure of how high or low a sound is. High sounds can be quiet or loud, and low sounds can be quiet or loud too!



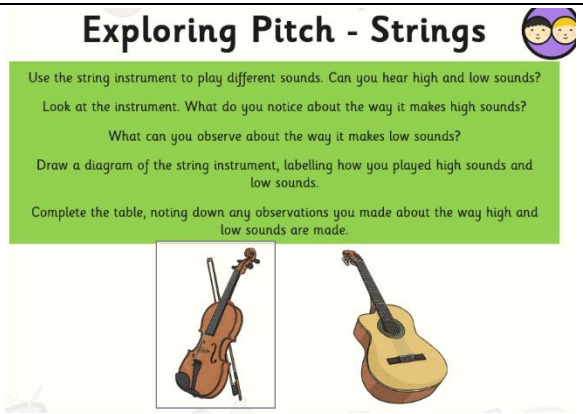


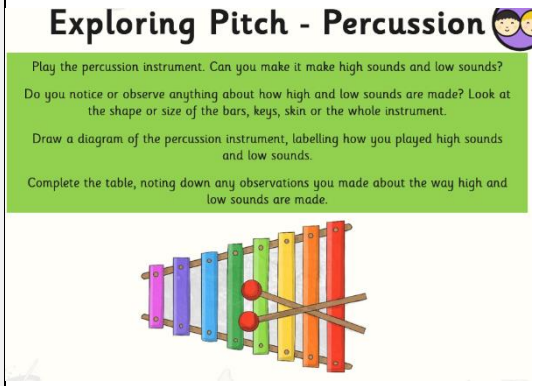
Share this video with the children (or fin other alternatives). How do instruments make sound? How are the sounds changed within the same and different instruments?

What is pitch? - BBC Bitesize

Children then investigation pitch using three different instrument types:

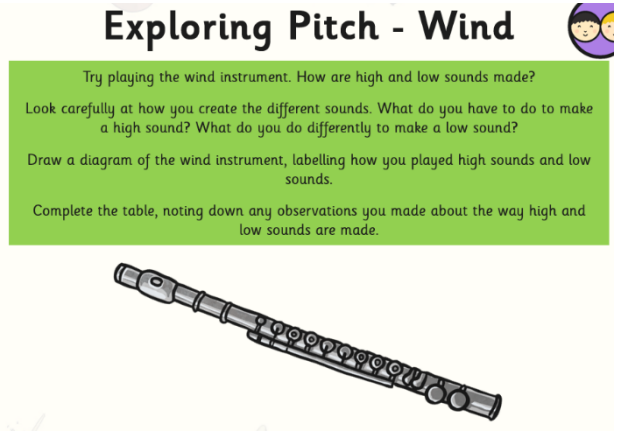
Exploring Pitch – strings





Exploring pitch – percussion

Exploring pitch – wind



Changing Pitch

Share the video below with the children:

[Making sounds with different pitches - KS2 Science - BBC Bitesize]

Changing pitch on a string instrument

On a string instrument, there are several ways to change the pitch.

The tighter, thinner or shorter the string is, the higher pitched the sound will be and the looser, thicker or longer the string is, the lower the sound will be.

Faster vibrations will make a sound higher, and slower vibrations will make a sound lower.

The ways of changing the strings all change the vibrations, which in turn change the pitch of the sound.

Changing pitch on a wind instrument

On a wind instrument, the column of air inside the instrument is what vibrates to cause the sound.

Shortening the column of air will create a higher sound, and lengthening the column of air will create a lower sound.

This can be done with a sliding mechanism, such as in a trombone.

The length of the column of air can be changed by opening or closing holes in the side of the tube, such as in a recorder.

Changing pitch on a percussion instrument

In a percussion instrument, the surface or object that is struck is the thing that vibrates to create the sound.

The pitch of a percussion instrument can be changed in different ways.

There may be a series of different length bars or keys, such as in a xylophone. The shorter the bar or key, the higher the pitch will be.

There may be different instruments of different sizes. For example, when playing hand bells the musician will have a set of bells to play. The smaller the bell, the higher the pitch. The larger the bell, the lower the pitch.

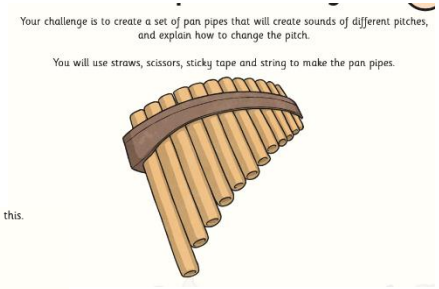
In a drum, the tighter the skin, the higher the pitch will be.

A thinner skin will make a higher pitched sound and a thicker skin will make a lower pitched sound.

Common points when changing pitch:

Generally, the shorter, tighter or thinner the object is, the higher the pitch of the sound will be. This is because the vibrations will be **faster.** The longer, looser or thicker the object is, the lower the pitch of the sound will be. This is because the vibrations will be **slower.**

Children **could** then be challenged to make a set of windpipes using straws tape – can they make the highest/lowest sound in class with theirs? How?



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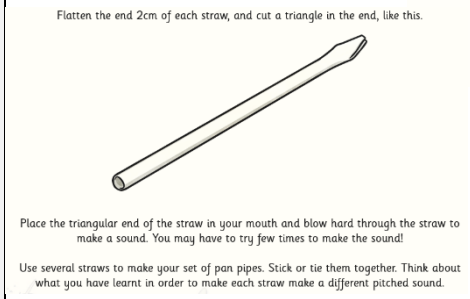


4. I can explore how sounds change over distance.

Travelling Sounds

Sounds get quieter as the distance between the sound source and your ear increases.

Sounds travel as vibrations. As the sound waves travel, the particles of whatever they are travelling through vibrate, or move quickly on the spot. The further the vibrations travel, the more they spread out. As they spread out through more and more particles, the vibrations become smaller and smaller. This causes the sound to get quieter and quieter.

Think of dropping a leaf into a pond. The very first ripples directly around the leaf will be very large, but as the ripples spread out across the pond, they will get smaller and smaller until eventually they disappear.

Therefore, sounds get quieter and quieter as you move further away from the source, until you eventually can't hear the sound at all.

You can see the ripples getting smaller as they spread out across the pond, until they eventually disappear. This is like the way the vibrations of sound get smaller as they spread out over distance, getting quieter and quieter.

Sounds also get quieter over distance because some of the vibrations are absorbed by obstacles they meet.

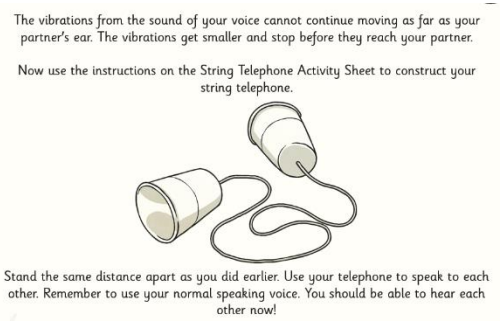
If the ripples in the pond hit an obstacle such as a stick or rock, they would not travel as far. This can help you understand why sounds get quieter as you move

further away.

Telephone Transmission of Sound

Telephones are used to transmit the sound of people's voices over long distances.

When you speak into a telephone, the sound energy in your voice is turned into electrical energy, which is transported down a wire to the other person's telephone.



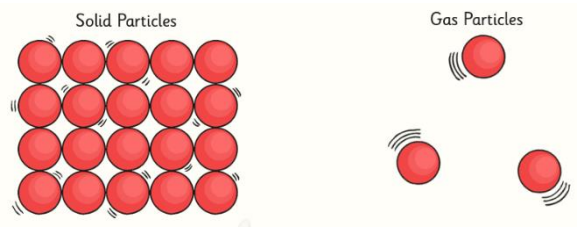
The electrical energy is converted back into sound energy, and they can hear what

you are saying!

Children are then challenged to make a string telephone and test it out to see if they can hear speech through the telephone that they cannot hear from the same distance without.

How does your telephone work?

The string and the cups are solid, so the particles are much closer together than the particles in the air, which is a gas.



The sound energy can travel from particle to particle far easier in the solid string telephone, so the sound of your voice is louder over the same distance than it was in the air.

5. I can investigate ways to absorb sound.

You have learnt about how sound travels, and that sounds get quieter as they travel further away.

You created a string telephone to make sounds louder so that they can travel further.

But sometimes people need to absorb sound, not make it louder!

Can you think of reasons why people may want to absorb sound?

If you lived near a noisy building site, or a busy nightclub, you would not want to hear the sounds of the machines or music! You would need to find a way to absorb the sounds so your house remained quiet and peaceful. This is called soundproofing.

Maybe your neighbour plays the drums, or has their television too loud. You don't want to hear the sounds from their house! You may choose to soundproof your house, or ask them to soundproof their house.

Many people have noisy jobs and need to absorb sound. Tree surgeons wear ear defenders to absorb the sound of the chainsaws they use to chop down trees.

WS Challenge:
Children are challenged to identify the best material(s) for soundproofing using the scenario below as a starting point:

Soundproofed Studio

This band practise and record their songs in a special room called a studio.

Unfortunately, they have had complaints from people who live near their studio, because their music is too loud. They would like to soundproof their studio so that the sound of the music is absorbed. They want you to investigate the best material to use to soundproof their studio. They want to use the material that absorbs the sound the most.

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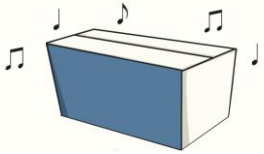
You will play some music and place the music player in a box. The box is like the studio! Record how loud the sound is when the music is playing in the studio with no soundproofing. Then you need to try the different materials.

Choose a material and wrap the box in a single layer of the material. Measure the volume of the music now. Continue testing all the materials and measuring or listening to how loud the sound is with each one.



Absorbing Sound:

Generally, soft, pliable materials that have air pockets in, like a sponge or bubble wrap, will be the best at absorbing sound.

6. **Refer to initial mind-map/KWL activity and real-world context.**

Children could also complete Sound Q and A quiz as shown below.

Sound Q and A

Move around the classroom finding people to fill in the boxes. Use your knowledge and understanding of sound to help others complete the boxes on their sheets!

Q. When playing a guitar, the shorter the string, the _____ the sound is.	Q. Sound is caused by _____.	Q. Louder sounds are created by _____ vibrations.	Q. Sound travels as a _____.
A.	A.	A.	A.
Q. Sounds travel from a sound source through each _____ to our ears.	Q. _____ is a measure of how high or low a sound is.	Q. If you hit a drum softly, it will make a _____ sound.	Q. A sound will seem quieter as you move _____ away from its source.
A.	A.	A.	A.
Q. Sound travels faster through a _____ than it does through water or air.	Q. In order to stop sounds getting in or out of a room, you should _____ the room.	Q. On a set of pan pipes, the longest pipe will make the _____ sound.	Q. We hear sounds with our _____.
A.	A.	A.	A.

Vocabulary	Vibrate vibration vibrating Air (or other medium) pitch wave amplify particle Travel distance volume pitch Ear hear sound Insulate conduct Faint fainter loud louder Solid Soundproof ears Instruments String percussion woodwind Brass	Gerald Durrell, conservationist, endangered species, Madagascar. Durrell Wildlife Trust, expeditions. Alexander Graham Bell, telephone, phonetician, 'Visible Speech', communicate Maria Telkes solar power, solar energy, The Dover Sun House, solar-powered desalination machine (which uses solar energy to remove salt from water at sea). Garrett Morgan, inventor, slavery, racism, gas mask, three-signal traffic light.
Outdoor Learning		What's in our pond?