

Science Curriculum

Year 1 – Year 6



Overview of Science Content

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Reception	Animals (spiders) and Seasons (Autumn)	Seasons: Autumn	Seasons: Winter Wooded areas.	Seasons: Spring	Seasons: Summer Dinosaurs	Seasons: Summer Animals: farm and sea.
Year 1	Animals, including humans	Seasons: Autumn	Seasons: Winter and Spring	Revision of previous units	Everyday Materials	Plants Seasons: Summer
Year 2	Properties and uses of different materials	Revision of previous units		Animals, including humans	Plants	Living things and their habitats
Year 3	Classifying animals of the sea and rivers.	Animals, including humans: nutrition, skeleton and muscle development.	Light	Rocks and Fossils	Plants	Forces and Magnets
Year 4	Animal and plant classifications Using a key Habitats	Electricity	Revision of previous units	Sound	Properties of materials	Animals, including humans: human digestion, teeth and food chains.
Year 5	Animals and Plants in the rainforest Adaptation Life Cycles	Properties and changes of materials: Solids, Liquids, gases Dissolving	Revision of previous units	Changes as humans develop to old age	Forces	
Year 6		Light	Earth and Space	Humans: Circulatory system and health	Electricity	Classification Evolution and Inheritance

The Aims of the National Curriculum for Science

The national curriculum for art aims to ensure that all pupils:

- develop **scientific knowledge and conceptual understanding** through the specific disciplines of biology, chemistry and physics
- develop understanding of the **nature, processes and methods of science** through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the **uses and implications** of science, today and for the future.

Year 1

Websites, videos and blogs BBC revise: Animals - KS1 Science Youtube: Science KS1 Animal life cycles BBC Teach National Oak Academy: Unit - Oak National Academy	
Term: Y1 T1	Focus of Study: Animals, including humans
NC Objectives	Key Knowledge and Vocabulary
Pupils will be taught to: identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals identify and name a variety of common animals that are carnivores, herbivores and omnivores describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets)	Y1 Context for study: This unit is the first of eight science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms . From Reception, pupils can name common animals and their babies. Pupils also know that animals that live in particular habitats and know some common features of mini beasts. In Year 1, pupils further develop their knowledge of animals as they are introduced to the concept of 'families' and how animals are grouped according to their shared properties including fish, amphibians, reptiles, birds and mammals. Pupils learn the key features of each animal family and group them into their correct families. New learning includes identifying and naming a variety of common animals that are carnivores, herbivores and omnivores. Pupils identify, name, draw and label the basic parts of the human body. Pupils also learn about the senses.

identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

This unit is the precursor to work studied in Year 2 where pupils learn about how animals, and humans, grow and change. Pupils study life cycles of humans and animals such as butterflies, chickens and frogs.

Knowledge Content

The study of animals, including **humans** is part of the discipline of **biology** - the study of living **organisms**.

Pupils will know that animals are **grouped** together in **'families'** based on shared **properties**. They will name the groups **fish, amphibians, reptiles, birds** and **mammals**.

Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone.

Understand the difference between a pet and a wild animal.

Mammals	Fish	Bird	Reptile	Amphibian
<u>Animals in Oldham</u>	<u>Animals in Oldham</u>	<u>Animals in Oldham</u>	<u>Animals in Oldham</u>	<u>Animals in Oldham</u>
Mouse Fox Badger Squirrel Hedgehog	Carp Stickleback	House Sparrow Blackbird Magpie Starling Robin	Common lizard Adder Grass snake	Common toad Common frog Smooth newts
<u>Wider World</u>	<u>Wider World</u>	<u>Wider World</u>	<u>Wider World</u>	<u>Wider World</u>
Elephant Tiger Gorilla Lion Orangutan	Cod Tuna Salmon	Flamingo Penguin Macaw Pelican Emu	Iguana Chameleon Crocodile Alligator	Poison dart frog

Zebra		Ostrich		
Sea Lion				
Giraffe				
Meerkat				
Kangaroo				
Camel				

Know the features of a fish - **gills, scales, fins**, water dwelling,
 Know the features of mammals - hair or fur, babies drink mother's milk, live on land or water
 Know the features of amphibians - live on land or water when adults, soft skin, lay eggs in water, live in water when young
 Know the features of reptiles - dry **scaly** skin, lay eggs on land,
 Know the features of birds - wings, feathers, **beak/bill, hatch** from eggs, most can fly but some can't (e.g., **ostrich, penguin, kiwi**)

WORKING SCIENTIFICALLY

Sorting animals into the correct classification

Know that objects can be identified or sorted into groups based on their observable properties

Know that we can write down numbers and words or draw pictures to record what we find

Know that herbivorous animals eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants

Know that a cat is an example of a carnivore; that a rabbit is an example of a herbivore; know that many humans are examples of omnivores (though not vegetarians)

Know the **magpie** rhyme by heart -

'One for sorrow,
 Two for joy,
 Three for a girl,
 Four for a boy,

Five for silver,
Six for gold,
Seven for a secret,
Never to be told.
Eight for a wish,
Nine for a kiss,
Ten for a bird,
You must not miss.'

Parts of the human body

Know that we have five senses - smell, taste, touch, sight, hearing
Know that the following body parts are linked to the senses

Sense	Part of the body
sight	eyes
smell	nose
touch	hands, feet, arms, legs etc
hearing	ears
taste	tongue

Know the following parts of the body -
Image removed

Know why we need the following body parts - ears, mouth, eyes, nose, tongue.
Know that the brain controls the body and is where you think and remember things. Know the location of the brain.
Know the rhyme 'Heads, Shoulders Knees and Toes'



Know that this painting (Gérard de Lairesse - Allegory of the Five Senses) contains a depiction of the five senses. Know which characters represent which senses.

Term: Y1 T2 (revisited throughout the year)	Focus of Study: Seasonal Changes
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils will be taught to:</p> <p>observe changes across the 4 seasons</p> <p>observe and describe weather associated with the seasons and how day length varies.</p>	<p>Context for study:</p> <p>This unit follows on from work in Reception where pupils study the names of the 4 seasons and look at changes to trees and plants during this time as each season occurs. In year 1 they begin to learn more about the 4 seasons, including the months that fall into each season and the weather patterns they follow. They will learn about the changes to the earth’s light patterns through the seasons and how the seasons affect animals and plants. This unit comes before work studied in year 2 about what plants need to grow well and when plants grow best. They review work studied in year 1 about common plants and how seasons affect deciduous and evergreen plants.</p> <p><u>Knowledge Content</u></p> <p>Know that there are 4 seasons - Autumn, Winter, Spring and Summer. Know that the seasons occur in a cycle and that they consist of the following months -</p>

Image removed

Know how the **environment** changes in each season.

Autumn - Leaves change colour and fall from **deciduous** trees, **harvest** time, some birds **migrate** (e.g. swallows)

Winter - Some animals including **hedgehogs** and **tortoises hibernate** throughout Winter (identify these animals) water freezes to ice. Many plants stop growing.

Spring - Flowers begin to grow, associated with rebirth and growth, some baby animals are born (e.g. lambing season),

Summer - Flowers and trees are in **bloom**.

(Time-lapse video of seasons - <https://vimeo.com/2639782>)

Know that the length of **daylight** varies with Winter having the shortest daylight hours and Summer having the longest. Know that in the UK the longest day is June 21st (the **Summer Solstice**) and the shortest day is December 21st (the **Winter Solstice**). Know that there is equal daylight and night time at the **Spring Equinox** (around March 20th) and the **Autumn Equinox** (around 22nd September).

Know that the Earth orbits the Sun with one orbit constituting a year of 365/366 days

(Note: The Sun and the Earth are capitalized when being discussed in an astronomical context.)

Know the weather patterns associated with each season -

Autumn - Temperatures start to drop from Summer, **overcast**

Winter - Coldest time of year, snow, **frosty** in the morning, **sleet, blizzard, hail**

Spring - Temperatures start to warm up

Summer - Hottest time of the year, sunshine, generally dry weather but may be thunderstorms

Know the differences between types of precipitation - hail, rain, snow, sleet.

WORKING SCIENTIFICALLY

	<p>Know how to gather information on wind speed, rainfall and temperature at each season. Know that a thermometer is used to measure temperature. Know how to read a thermometer to find out the temperature outside.</p> <p>Know that we measure temperature in degrees Celsius which is abbreviated to °C. Know that when the temperature falls below 0°C then water turns to ice.</p> <p>Know that looking directly at the sun is not safe even when wearing sunglasses. Know that the temperature on earth is affected by the sun.</p> <p>Know how to understand a weather forecast. Know that a forecast is a prediction about future weather.</p>
Term: Y1 T3	Focus of Study:
NC Objectives	Key Knowledge and Vocabulary
	See Yr 1 T2 planning for revision
Term: Y1 T4	Focus of Study:
NC Objectives	Key Knowledge and Vocabulary
	See Yr 1 T2 Planning for revision
Term: Y1 T5	Focus of Study: Everyday Materials
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils will be taught to:</p> <p>distinguish between an object and the material from which it is made</p> <p>identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock</p> <p>describe the simple physical properties of a variety of everyday materials</p>	<p>Y1 Context for study: This unit is the first of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from.</p> <p>In this Year 1 unit, pupils identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Pupils distinguish between an object and the material from which it is made including if it is 'man-made' or 'natural'. New learning includes describing the simple physical properties of a variety of everyday materials. The knowledge acquired will help pupils at the end of the unit as they compare and group together a variety of everyday materials on the basis of their simple physical properties. Pupils study the work of John Dunlop and 'the pneumatic tyre.'</p>

compare and group together a variety of everyday materials on the basis of their simple physical properties

This unit is the precursor to work in Year 2 as pupils compare the suitability of objects and compare how things move on different surfaces.

Knowledge Content

The study of **materials** is part of the discipline of **Chemistry** - the identification of the properties that a substance is made from.

Know that matter (stuff) is made from tiny building blocks. This comes in three forms - **solids, liquids** and **gases**. Solids include glass, plastic and stone. Liquids include water, blood, milk. Gas includes air that we breathe.

Know that many materials are **solid** and have different **properties**. Water is a **liquid** and is different because it can change its shape. Know that some materials are **natural** and others are **man-made**. Natural materials come from materials found in nature and man-made materials are those which humans make.

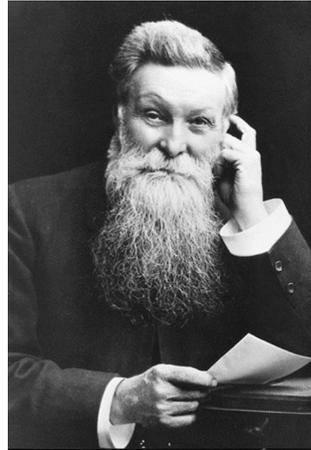
Natural materials: **iron, gold, silver, silk, cotton, leather, wood, water and rock**. (know that iron, gold, silver are collectively known as metals)

Man-made materials: plastic, glass (know that glass is heated sand), brick, paper, concrete, rubber and some metals like steel.

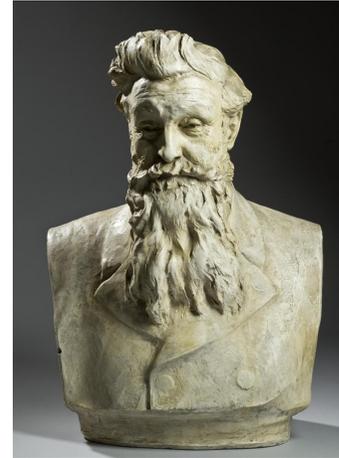
Identify different items and name what material or materials they are made from.
e.g. Canoe: wood or plastic. Car: metal and rubber tyres.

Know that **John Dunlop** was the inventor of the **inflatable (pneumatic)** tyre in 1887. Know that he was born in Scotland. He watched his son riding a bicycle over **cobbles** with solid tyres and noticed how uncomfortable the bike was to ride. John Dunlop was a vet and he used **rubber** sheets to protect his tables when performing surgery on animals. He used these rubber sheets to make an **airtight** tube which he stitched together by hand. He then attached this to the bike wheel and wrapped **canvas** material around it and sealed it with **liquid rubber**. He then pumped the tube with air and invented the first **inflatable** (or pneumatic) tyre. The air meant that the bumps in the road did not shake the bike as much as solid wheels and it was much more comfortable to ride. These tyres are now used all over the world on all sorts of vehicles including cars, planes and bikes. The first tyre invented by John Dunlop is now in the **Museum of Scotland** for people to look at. Know that a museum is a building

where a large number of interesting and valuable objects are kept, studied, and displayed to the public.



Photograph of John Dunlop



Bust of John Dunlop



Dunlop's first tyre

Know that Dunlop is now a multinational company that makes and sells tyres around the world.

(Watch video clip - https://www.youtube.com/watch?v=T_EZ3QuYYXU)

Describe materials using key property vocabulary: **hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent.**

WORKING SCIENTIFICALLY

Test a range of materials and identify which properties they have.
Group materials based on similar properties.

Term: Y1 T6

Focus of Study: Plants

NC Objectives

Key Knowledge and Vocabulary

Pupils will be taught to:
identify and name a variety of common wild and garden plants, including deciduous and evergreen trees

Context for study:
This unit follows on from learning in Reception about the seasons and changes that happen to the plants during those seasons. They have also recognised some fruits and vegetables and named the basic parts of a plant (petals, stem, flower, roots). In year 1 the pupils learn about

identify and describe the basic structure of a variety of common flowering plants, including trees

the names of common plants and trees and learn to identify them by their leaves. They learn about the terms 'evergreen' and 'deciduous' and how deciduous plants fit into the change of the seasons. This unit is the precursor to work studied in year 2 where pupils will recap common plants and trees studied in year 1 before moving onto how plants grow (including germinations and pollination), what they need to grow healthily and differences between bulbs and seeds.

Knowledge Content

The study of plants is part of the discipline of **biology** - the study of living **organisms**.

Know the names of the following common plants - **daisy, white clover, poppy, nettle, ivy, bramble** and locate some in the local environment. (also **dandelion** and **grass**)

Daisy	<i>Image removed</i>
White Clover	<i>Image removed</i>
Nettle	<i>Image removed</i>
Ivy	<i>Image removed</i>
Bramble	<i>Image removed</i>

(For further plant identification info see https://www.npms.org.uk/sites/default/files/PDF/NPMS%20ID%20GUIDE_WEB_0.pdf)

Know the names of the following common trees - **oak, elm, maple, silver birch, sycamore, horse chestnut, crack willow**

Know how to identify them from their leaves, fruit and shape using this table

Oak	<i>Image removed</i>
Elm	<i>Image removed</i>
Maple	<i>Image removed</i>
Horse Chestnut	<i>Image removed</i>
Sycamore	<i>Image removed</i>
Silver Birch	<i>Image removed</i>
Crack Willow	<i>Image removed</i>

(Further tree ID info available here - <https://www.countrylife.co.uk/gardens/a-simple-guide-to-identifying-british-trees-85493>)

Know how to identify some of the trees in the grounds of Stanley Road (use this powerpoint to support this teaching

<https://www.dropbox.com/s/tntfzh1whbhqg0/Stanley%20Road%20Trees.pptx?dl=0>)

Know the term **deciduous** - a tree that sheds its leaves **annually** - this means every year the tree loses its leaves. The leaves of deciduous trees are often large and thin.

Know the term **Evergreen** - a tree that has green leaves all year. These leaves are usually, waxy, thick, narrow and small.

Know that oak, birch and sycamore are deciduous
Know that holly and pine are evergreen.

Know the names of the basic parts of a plant and their function - **leaves, flower, stem, roots, petals**

part	function
leaves	collect energy from the sun to help the plant grow
flower	creates seeds
stem	holds the flower and leaves up high and transports water
root	collects nutrients and water from the soil to help the plant grow
petals	the coloured part of a flower that attracts insects

Image removed

Know how to draw a **diagram** showing the parts of a plant

Know the names and function of parts of a tree - **roots, trunk, branches, leaves.**

Know that a tree trunk is a type of stem.

Know that flowers on a tree are often called **blossom.**

Know that fruit often grows on trees including - **apples, oranges, cherries, lemons, bananas, mangoes, pears and plums.**

Know that the **fleshy** part of the fruit generally protects the seeds within. Recognise examples of seeds and **pips** found in apples, oranges, peaches and cherries.

Know that seeds are buried in the ground (or planted) and grow into new plants.

Know that **bulbs** are short stems with leaves built up around it. They are planted in the ground and new plants can grow. Know that **onions** are an example of a bulb that we can eat.

Know how to observe a **hyacinth** bulb growing in a transparent glass vase. Know how to record **observations** about the roots and stem growing.

Image removed

Hyacinth growing in a vase

Know how to use a **magnifying glass** to study flowers and plants closely and know how to record information about these flowers.

Year 2

Term: Y2 T1	Focus of Study: Uses of Everyday Materials
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> ● identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses (recap of material properties) ● compare how things move on different surfaces. ● find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching <p>--</p>	<p>Y2 Context for study: This unit is the second of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it.</p> <p>Pupils have a secure knowledge of the properties of a variety of everyday materials. Pupils can identify, name and describe an object in terms of the material it is made from including if it is ‘man-made’ or ‘natural’. Previous learning includes comparing and grouping together everyday materials on the basis of their simple physical properties. Pupils have studied the work of John Dunlop and ‘the pneumatic tyre.’</p> <p>This year 2 unit builds on pupils’ knowledge of materials of properties as pupils identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses.</p> <p>New learning includes comparing how things move on different surfaces. This unit will help pupils understand how squashing, bending, twisting and stretching can change the shapes of some solid objects.</p> <p>This is the precursor to work studied in Year 3 rocks and soils. The knowledge acquired will help pupils in Year 4 as pupils study materials in terms of solid, liquid and gases. Year 5 pupils learn about dissolving, mixing and changes of state, and reversible and irreversible changes. Pupils also build on previous knowledge of magnetic and non-magnetic metals.</p> <p><u>Knowledge Content</u></p> <p>The study of forces is part of the discipline of physics - the study of the processes that shape our world and how we use it. It is also part of the discipline of Chemistry - the identification of the properties a substance is made from.</p> <p>Know that matter (stuff) is made from tiny building blocks.</p> <p>Know the following properties of materials - flexible, stiff, rigid, stretchy, hard, soft, brittle, strong, weak, absorbent, heavy, light, solid, runny (viscosity - mentioned in making every science lesson count) smooth, rough, opaque, transparent and translucent. Know which</p>

materials have these properties (include plastic, wood, aluminium foil, copper, steel, iron, ceramic, glass, wool, cotton, silk, rubber).

Know the following definitions

flexible	An object or material that can be bent easily without breaking.
stiff	Something that is stiff is firm or does not bend easily
rigid	A rigid substance or object is stiff and does not bend, stretch, or twist easily.
opaque	If an object or substance is opaque , you cannot see through it.
transparent	If an object or substance is transparent , you can see through it.
translucent	If a material is translucent , some light can pass through it.
brittle	An object or substance that is brittle is hard but easily broken.

Use properties to compare what different materials would be used for and why.

Know that a chair can be made of wood because wood is **strong and rigid**. Plastic would also be good for a chair because it is **strong, flexible and smooth**. Glass is a good material for a window because it is **transparent and rigid**. Fabric would be a good material for a jumper because it is **flexible, soft and strong**. Know why some materials are not appropriate e.g. Why is glass not appropriate for a chair? Why is wood not appropriate for a window?

Know how to use a Venn diagram to sort a set of materials (e.g., one circle labelled 'flexible' and the other circle labelled 'opaque')

Know that **resistance** is 'a force which slows down a moving object'.

Know that when objects move across a surface there is **friction** when they rub against each other and that sometimes this friction is larger or smaller.

	<p>To know that the smoother the surface of the material, the less resistance it has and will travel further. Know that the rougher the surface, the more resistance it has and the less it will travel.</p> <p>Know that materials can change shape when properties are flexible and soft but they can't change shape when the properties are rigid, hard and stiff.</p> <p>WORKING SCIENTIFICALLY Make predictions and test how an item moves on different surfaces - sandpaper, carpet, paper, plastic and bubble wrap.</p> <p>Make predictions and test items made from different materials against 4 forces - squashing, bending, twisting and stretching. Know that applying forces to objects can change their shape. Record the results to see which can be changed or not by each force.</p>
Term: Y2 T2	Focus of Study: Uses of Everyday Materials (continued)
NC Objectives	Key Knowledge and Vocabulary
<ul style="list-style-type: none"> identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses (recap of material properties) 	<p>Revision block - materials (see above)</p> <p>Pupils will learn about John McAdam. John McAdam (1756-1836) was a scottish engineer and road-builder. He was the inventor of "macadamisation", an effective and economical method of constructing roads, shortened to macadam. This process means that large stones were placed at the bottom and small stones and gravel were crushed on the top to create the surface and structure. The roads were also curved, so that rainwater ran off the surface. <i>Image removed</i></p> <p>Tar was later added to macadam roads to stabilise them. This became known as tarmacadam, which is now commonly known as tarmac.</p>
Term: Y2 T3	
NC Objectives	
	SEE T4

Term: Y2 T4	Focus of Study: Animals, including humans & Healthy Eating						
NC Objectives	Key Knowledge and Vocabulary						
<p>Pupils should be taught to:</p> <p>notice that animals, including humans, have offspring which grow into adults</p> <p>find out about and describe the basic needs of animals, including humans, for survival (water, food and air)</p> <p>describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene</p> <p>describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene</p>	<p>Y2 Context for study: This unit is the second of eight science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. Pupils have a secure knowledge of common animals, their babies and their habitats. Pupils can identify and name a variety of common animals that are carnivores, herbivores and omnivores. Pupils can identify, name, draw and label the basic parts of the human body. In Year 2, pupils study life cycles and learn that animals, including humans, have offspring which grow into adults. New learning includes the basic needs of animals, including humans, for survival and the importance of exercise, eating the right amounts of different types of food, and hygiene.</p> <p>This unit is the precursor to work studied in lower key stage 2 where pupils learn to classify and group animals and learn about skeletons, vital organs and the digestive system. In Upper key stage 2 pupils continue their learning looking in more depth at food chains, life cycles, vital organs and the circulatory systems.</p> <p><u>Knowledge Content</u> The study of animals, including humans is part of the discipline of biology - the study of living organisms.</p> <p><u>Life Cycles</u> Know the following animals and their babies and identify them in photos -</p> <table border="1" data-bbox="824 994 2040 1182"> <tr> <td data-bbox="824 994 1229 1182"> dog, puppy cat, kitten horse, foal bear, cub </td> <td data-bbox="1229 994 1635 1182"> bird, chick cow, calf pig, piglet goat, kid </td> <td data-bbox="1635 994 2040 1182"> duck, duckling lion, cub sheep, lamb snake, hatchling </td> </tr> </table> <p>Know that animals grow and change over their lifetime. Know that animals grow in a womb, and are born or hatch. Know the following animals that hatch from eggs and those that have live young - (Watch video clip - https://www.bbc.com/bitesize/clips/zdw9wmn)</p> <table border="1" data-bbox="824 1417 2040 1479"> <tr> <td data-bbox="824 1417 1433 1479">Hatch from an egg</td> <td data-bbox="1433 1417 2040 1479">Live young</td> </tr> </table>		dog, puppy cat, kitten horse, foal bear, cub	bird, chick cow, calf pig, piglet goat, kid	duck, duckling lion, cub sheep, lamb snake, hatchling	Hatch from an egg	Live young
dog, puppy cat, kitten horse, foal bear, cub	bird, chick cow, calf pig, piglet goat, kid	duck, duckling lion, cub sheep, lamb snake, hatchling					
Hatch from an egg	Live young						

crocodile
swift
mosquitos
frogs
toads
crabs
moth
spiders

horses
cats
dogs
pigs
cow
lion
sheep

Know that most snakes lay eggs but some produce live young.

Know that some animals need milk and care from their mothers (including lambs, calves, piglets, goat kids) and some fend for themselves (including ducks and geese).

Know the life cycle of a human using the following language -

Stage
Baby
Toddler
Child
Teenager
Adult
Elderly

Know the **life cycle** of a butterfly - **egg, caterpillar, pupa, butterfly** (know that the term **metamorphosis** describes the change from a caterpillar to butterfly. Frogs also demonstrate metamorphosis when changing from tadpole to adult frog). Know that caterpillars **moult** to remove their old layer of skin. Know that a butterfly **pupa** is often known as a **cocoon** or **chrysalis**.

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Watch video clip - <https://www.youtube.com/watch?v=3kZD6rISLUw>

Know how to identify the following species of UK butterfly -

<i>Image removed</i> Gatekeeper	<i>Image removed</i> Common Blue (Females are brown)
<i>Image removed</i> Large White	<i>Image removed</i> Peacock
<i>Image removed</i> Red Admiral	<i>Image removed</i> Swallowtail

Know the life cycle of a chicken - **egg, chick, chicken**

Image removed

Know the life cycle of a frog - **frogspawn, tadpole, frog.**

Image removed

Know that frogs have four legs - two front legs and two back legs. (address the misconception that frogs have arms)

CORE READING

The Very Hungry Caterpillar by Eric Carle

Tadpole's Promise by Jeanne Willis

Health

Know that animals and humans need **water, food** and **air** to survive (relate to looking after pets)

Know that humans need **exercise** to stay **fit** and **healthy** (exercise can include, running, swimming, playing sport etc.)
Know the following terms - **muscles, flexible, strength, circulation** to describe the effects of exercise on the body and the benefits to health and wellbeing.
Know that the **heart** pumps blood around the body through the veins and that **lungs** are used for breathing. The heart and lungs are called **organs**.
Know that when we breathe in we take **oxygen** from the air.
Know why we need a heart and why we need lungs.

Diet

Know that a **balanced diet** consists of the five **food groups** below. Know examples from each and the health benefit of each food group

- **Carbohydrates** give us energy (e.g. bread, pasta, rice)
- **Protein** helps the body to grow and repair itself (e.g. meat, fish, eggs)
- **Dairy products** keep bones and teeth healthy (e.g. milk, yoghurt, cheese)
- **Fruit and Vegetables** keep your **digestive** system healthy. (e.g. apple, orange, pear, strawberry, melon)
- **Fats and Sugars** give us energy but should not be eaten too often (e.g. butter, cooking oil, cream, chocolate, sweets, jam, cakes, biscuits)

Know the phrase '*An apple a day keeps the doctor away.*'

Know that we need to drink water to be **hydrated** and stay healthy.

Know that water is good to drink as it does not contain **calories** and is not harmful to teeth.

Know that **calories** are 'a measure of the amount of energy in food'.

Unhealthy food and drink

Know that sugary soft drinks can damage teeth and contain sugar which can be harmful to the body and cause weight gain.

Know that sports and energy drinks are not suitable for children to drink. (Use this guide to help support teaching -

[https://www.nutrition.org.uk/attachments/article/588/Childrens%20Hydration%20Guide_No v16.pdf](https://www.nutrition.org.uk/attachments/article/588/Childrens%20Hydration%20Guide_No%20v16.pdf))

Hygiene

	<p>Know that a germ is ‘a very small living thing that causes disease’. Know that they are only visible through a microscope.</p> <p>Know the following basic hygiene rules to prevent the spread of germs</p> <ul style="list-style-type: none"> ● Wash hands regularly especially before eating and after using the toilet ● Cover your mouth when sneezing or coughing ● Have a bath or shower regularly ● Wash your hair at least twice a week ● Wear clean clothes ● Brush teeth twice a day <p>WORKING SCIENTIFICALLY</p> <p>Pupils will model the spread of germs using biodegradable glitter and record results in a table.</p>
Term: Y2 T5	Focus of Study: Plants
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> ● observe and describe how seeds and bulbs grow into mature plants ● find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. 	<p>Context for study: This unit follows on from learning in Reception about the seasons and changes that happen to the plants during those seasons. They have also recognised some fruits and vegetables and named the basic parts of a plant. In year 1 the pupils learned about the names of common plants and trees and how to identify them by their leaves. They learn about the terms ‘evergreen’ and ‘deciduous’. In year 2 pupils will recap common plants and trees studied in year 1 before moving onto how plants grow (including germination and pollination), what they need to grow healthily and differences between bulbs and seeds. This unit includes an investigation about growing healthy plants. This is the precursor to work studied in Year looking more at what plants need to grow healthily. They will also study water transportation and the process of the life cycle of the plant including pollination, seed formation and seed dispersal. In Year 6, pupils continue to study plants by studying plant classification for flowering and not flowering plants.</p> <p><u>Knowledge Content</u></p> <p>The study of plants is part of the discipline of biology - the study of living organisms.</p> <p>Know the names of common trees and plants from Y1 curriculum (see below) Plants - daisy, white clover, poppy, nettle, ivy, bramble, dandelion and grass and introduce new species daffodils, roses, thistle and shamrock (all UK national flowers)</p>

Know that roses are England's **national flower**, that thistles are Scotland's national flower, daffodils are Wales' national flower and shamrocks are Northern Ireland's national flower (Know that Shamrock's are closely related to clover).



Shamrock (Northern Ireland)



Daffodil (Wales)



Thistle (Scotland)



Rose (England)

Know how to use the term **species** to describe different plants.

Trees - **oak, elm, maple, silver birch, sycamore, horse chestnut, crack willow**

Know the parts of a plant as **roots, stem, flower, leaves** (revision from Y1)

Know that roots support the plant in the ground and **absorb** water and **nutrients** needed for growth. Know that nutrients are **substances** that help plants and animals to grow.

Know that the stem holds the flower and leaves up to the sunlight and carries water and nutrients to the leaves.

Know that leaves are made to catch sunlight and change the sun's energy into energy for the plant to use to grow. They are the only living things that can do this.

Know that the flower is where seeds are made. Know that bees and insects help this process by carrying **pollen** from one flower to another. This is called **pollination**.

Know that plants grow from **seeds** or **bulbs**. Identify pictures of seeds and bulbs. Know that seeds are **sown** and bulbs are **planted**.

Know that when a seed **germinates** it starts to grow. This process is called **germination**.

As a plant grows it becomes a **seedling** before becoming an adult plant.

Know that a **shoot** is a new part of a plant that grows

Know that seeds and bulbs have a **store** of food inside them

Image removed

Plant Life Cycle Diagram - Understand why a circle diagram is used to understand the life cycle of a plant.

Know that seeds need the following to germinate -

- **Water**
- **Oxygen**
- **Warmth**

Know that plants need the following to grow and be healthy -

- **Water**
- **Air**
- **Warmth**
- **Light**
- **Nutrients** ('food' absorbed by the roots)

Know that healthy plants are green and strong unhealthy plants are often pale, yellowy and weak.

WORKING SCIENTIFICALLY

Carry out a demonstration with changed variables. Know that **variables** are the elements of an experiment that can be changed. Know how to conduct an experiment to demonstrate the effects of water and light on plant growth. (Note this task is not used to learn the effects of water and light but to prove what they have already been taught is true)

1. Seed A should have water and access to light (this is called the **Control**)
2. Seed B should have access to light but no water.
3. Seed C should have no water and access to light.
4. Seed D should have no water and no light.

Pupils use what they know about what plants need to grow to **predict** what will happen for each container.

Know that the experiment must have other variables the same e.g. **temperature**.

Know that they must check the size of the plants regularly and over a long period of time.

Know that scientists record results accurately to compare different **conditions**.

Know how to use a ruler to measure height of a plant in cm.

Know how to describe the health of the plant through careful **observation** of colouring and stem strength.

Know the following phrases linked to flowers and plants

Phrase	Meaning
as fresh as a daisy	feeling full of energy
oops a daisy	said when someone has an accident
bark up the wrong tree	to misunderstand something
to have green fingers	to have good gardening skills

Term: Y2 T6	Focus of Study: Living Things and their habitats
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> ● explore and compare the differences between things that are living, dead, and things that have never been alive ● identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other ● identify and name a variety of plants and animals in their habitats, including microhabitats ● describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. 	<p>Context for study: Prior to this unit pupils will have already started to study habitats by looking at minibeasts in Reception. In year 2 pupils will learn about the food chains of animals in varying habitats and will look at microhabitats and the animals that live there. They will also learn how to determine if something is alive, was once alive or never lived, using the acronym MRS NERG. This unit comes before work in Year 3 studying the animals native to sea, river and canals and the features that help them to live there. In year 4 pupils will continue learning about habitats by grouping animals into categories, such as vertebrates/invertebrates, before moving onto work in year 5, studying adaptation and eco-systems.</p> <p><u>Knowledge Content</u> The study of animals, including humans is part of the discipline of biology - the study of living organisms.</p> <p>To know which items, including those made from a variety of materials, fit into each category and place them in a table under the headings living (tree, person, animal, fish, grass) dead (paper, bunch of flowers, cotton shirt, wooden table), and things that have never been alive (plastic chair, pen, window, stone, metal). Understand that a flame is not alive and that a deciduous tree is not dead in Winter.</p> <p>Know that living things move, grow, consume nutrients and reproduce; that dead things used to do these things but no longer do; and that things that never lived have never done these things.</p> <p>Know the acronym MRS NERG (Movement, Respiratory, Sensitivity, Nutrition, Excretion, Reproduction and Growth) to teach about how to organise objects into each category.</p> <p>Know the meaning of these terms from this table -</p>

M	Movement	All living things move, even plants.
R	Respiration	Getting energy from food.
S	Sensitivity	Detecting changes in the surroundings.
G	Growth	All living things grow.
R	Reproduction	Making more living things
E	Excretion	Getting rid of waste.
N	Nutrition	Taking in and using food.

Know that a species of animal or plant that is **extinct** no longer has any living members in the world. e.g. dinosaurs, dodo.

Know that all creatures need **air, food, shelter** and **water** to **survive**

1. Sea/underwater - A fish breathes through gills, has fins to swim, swim bladders for buoyancy, eat water insects and other sea creatures (shrimp)

2. Woodland - A fox/badger, breathes through lungs, has fur for warmth, lives in a den underground, eats creatures found in the habitat (frogs, worms, berries, mice)

3. Birds - breathe through lungs, have wings to fly to warmer places (migrate) or out of danger, eat worms and slugs found on the ground

Know that animals and plants survive in a habitat because of each other and that different plants and animals live in different places because of their needs.

Link to food chains for how they depend on each other to survive.

Know the terms **omnivore, carnivore** and **herbivore** to describe the eating habits of animals in the food chain.

Know that the arrows on a food chain show the direction that the energy travels.

Recognise and name these larger habitats - **ocean, tropical rainforest, desert, woodland, tundra** and **polar ice**. Know the names of plants in these habitats such as **cactus, tumbleweed (desert), orchid, coffee plant (rainforest) dandelion, moss, clover, grass, shrub, conifer (woodland/grassland)**.

	<p>Know the names of the following minibeasts - caterpillar, spider, woodlouse, beetle, worm, slug, water boatman, pond skater and observe where they live. Know that an insect has 6 legs. Know that a spider has 8 legs and is an arachnid. Know that a worm and a slug are not insects.</p> <p>Understand the term microhabitat (a small habitat specific to minibeasts within larger habitats)</p> <p>WORKING SCIENTIFICALLY</p> <p>Use questions to sort different animals based on their characteristics and habitat. Use the word key to describe the system of sorting.</p> <p>A woodland has many microhabitats - under a log or rock, a leaf pile or under a bush. Know that a pond is a microhabitat. Pupils should look at some habitats and microhabitats in the local area and record their findings.</p> <p>Use the terms Solar Energy, Producer, Consumer, Prey, Predator to describe a food chain and use the terminology to organise and create food chains. Know the following food chains -</p> <ol style="list-style-type: none"> 1. Sunlight, Clover, Snail, Songbird and Falcon 2. Sunlight, Ash Tree, Greenfly, Frog, Snake 3. Sunlight, Lettuce, Slug, Frog, Fox
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Year 3

Term: Y3 T1	Focus of Study: Living Things and Their Habitats - The Blue Planet
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>recognise that living things can be grouped in a variety of ways</p> <p>explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment</p>	<p>Y3 Context for study: This unit is the third of eight science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. Pupils have a secure knowledge of life cycles and what animals, including humans, need to survive and the importance of a healthy lifestyle. Pupils can identify and name a variety of common animals that are carnivores, herbivores and omnivores.</p> <p>This Year 3 unit builds on pupils' knowledge of grouping living things in a variety of ways. Pupils learn the names of animals native to the sea, rivers and canals and the features that help them to live there. Pupils undertake an extended study of the Blue Whale. New learning includes using classification keys to help group, identify and name a variety of living things in their local and wider environment.</p>

This unit is the precursor to work in year 4 as pupils learn about habitats by grouping animals into categories, such as vertebrates/invertebrates, before moving onto work in year 5 studying adaptation and eco-systems.

Knowledge Content

The study of living organisms is part of the discipline of **biology**.

Know the names and features of the following animals found in or near the sea.

Mammals	Blue Whale, Bottlenose Dolphin, Killer Whale (Orca), Humpback Whale, Narwhal
Crustaceans	Shore Crab, barnacle, Common lobster, shrimp, common prawn, krill, Japanese Spider Crab
Fish	Mackerel, Cod, Great White Shark, Hammerhead Shark, Whale Shark, stingray, manta ray, clownfish, spiny seahorse
Cephalopod	Octopus, Squid, Cuttlefish
Birds	Cormorants, Puffin, Gannet, Arctic Tern, Herring Gull, Black Headed Gull, eider duck.

Know that **jellyfish** and **starfish** are not fish. Identify photographs of these.

Know that birds that live near rivers, canals etc are aquatic birds. They have webbed feet to mimic the use of the fin in fish.

Know the names and features of the following animals found in or near rivers and canals

Mammals	Water vole, otter, mink, shrew, dormouse
Fish	Carp, perch, brown trout, rainbow trout, eel
Birds	Mallard, Mute Swan, Kingfisher, Canada Geese, Coots, Moorhens, Grey Heron, Greylag Goose.

Insects	Pond skaters, damselflies, dragonflies, water boatman
Amphibian	Common frogs, common toads, smooth newts

Know the following definitions -

mammals	animals such as humans, dogs, lions, and whales. In general, female mammals give birth to babies rather than laying eggs, and feed their young with milk.
crustaceans	an animal with a hard shell and several pairs of legs, which usually lives in water. Crabs, lobsters, and shrimps are crustaceans.
fish	a creature that lives in water and has a tail and fins. There are many different kinds of fish.
cephalopod	a marine animal with a well-developed head and, often large eyes and a ring of tentacles with suckers. The group includes the octopuses and squids.
birds	a creature with a beak/bill, feathers and wings. Female birds lay eggs. Most birds can fly.
insects	a small animal that has six legs. Most insects have wings.
amphibian	are animals such as frogs and toads that can live both on land and in water.
reptile	a group of cold-blooded animals which have skins covered with small hard plates called scales and lay eggs. Snakes, lizards, and crocodiles are reptiles.

Extended study of the Blue Whale

Know that the Blue Whale is the largest animal that has ever lived (including dinosaurs).

	<p>Know that it is a mammal because it is warm blooded and gives birth to live young which feed on the mother's milk.</p> <p>Know that it is an endangered species.</p> <p>Know that the average lifespan is 80-90 years. They weigh over 130,000kg and can be 30m long (show this by demonstrating on the playground)</p> <p>Know that a blue whale is a carnivore as it eats other animals including crustaceans such as krill.</p> <p>Know that its habitat is the ocean and can be found in all oceans except the Arctic.</p> <p>Know that they have a long, streamlined body, a wide head, huge flippers, a powerful tail and a small dorsal fin.</p> <p>Know that the blue whale is a species of baleen whale - instead of teeth they have fibrous material to filter their food.</p> <p>Know that blue whales communicate with calls that travel through water (listen to these). Know that their calls can be heard for hundreds of miles.</p> <p>Know that blue whales have a seasonal migration pattern - during the feeding season they eat krill in cold polar regions and then travel to warm water to mate and give birth.</p> <p>https://www.natgeokids.com/uk/discover/animals/sea-life/10-blue-whale-facts/ https://www.nationalgeographic.com/animals/mammals/b/blue-whale/</p> <p>Know the story of Jonah and the Whale</p> <p>WORKING SCIENTIFICALLY</p> <p>Know that we can ask questions and answer them by setting up scientific enquiry. Research how humans have polluted the oceans with plastic waste through wider reading and what is being done to improve the situation e.g. http://www.bbc.co.uk/newsbeat/article/42030979/blue-planet-2-how-plastic-is-slowly-killing-our-sea-creatures-fish-and-birds</p>
Term: Y3 T2	Focus of Study: Animals, including Humans
NC Objectives	Key Knowledge and Vocabulary

Pupils should be taught to:

identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.

identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Y3 Context for study: This unit is the fourth of eight science units where pupils study animals, including humans, as part of the discipline of **biology** - the study of living **organisms**. Pupils have a secure knowledge of life cycles and what animals, including humans, need to survive and the importance of a healthy lifestyle. Pupils can identify and name a variety of animals. Pupils know the names of animals native to the sea, rivers and canals and the features that help them to live there. Pupils can use classification keys to help group, identify and name a variety of living things in their local and wider environment.

In this Year 3 unit, pupils learn that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Pupils further develop their knowledge of what humans need to thrive by learning about a balanced diet, including how sugar can cause tooth decay and obesity, the food groups and their role in human development. New learning includes how humans and some other animals have skeletons and muscles for support, protection and movement.

This unit is the precursor to work in year 4 as pupils learn about the digestive system, teeth and food chains. The knowledge acquired in this unit will help pupils in Year 5 as they learn about puberty and gestation periods of animals before studying the circulatory system and dental structures in year 6.

Knowledge Content

The study of animals, including **humans** regarding **nutrition**, **skeletons** and **muscles** is part of the discipline of **biology** - the study of living **organisms**.

Animals, including humans, need food, water and air to survive.

The arrows on a food chain show the direction that the energy travels.

Know that all animals are **consumers** (they eat food but cannot create it themselves) and rely on a **balanced diet** to maintain their health. Consumers eat plants and some also eat other **consumers**. Know that plants are the only organisms that can make food for themselves using the sun's energy. The food that animals eat gives them **nutrients** for body health and maintenance. Know that nutrients are **substances** that help plants and animals to grow.

Know that different food types provide different **benefits** for humans. **Fruit and vegetables** provide **fibre**, **vitamins** and **minerals** to keep body parts working properly and maintain health. Know that **fibre** consists of the parts of plants or seeds that your body cannot **digest**. Fibre is useful because it makes food pass quickly through your body.

Know that vitamins are substances that you need in order to remain healthy which are found in foods. Know that vitamins are known by letters and know the following information about vitamins

Vitamin	Food	Main Role
A	Milk, Cheese, butter	Healthy vision and skin
C	Orange, Lemon, tomatoes	Prevent infection
D	Milk, Cheese, Fish	Helps bone development

Meat, fish and eggs provide **protein**, which is needed for healthy **muscle development** and **maintenance**. **Milk, cheese and yoghurt** provide **calcium**, necessary for good **bone and tooth development**. Know that fibre/vitamin rich food should be 50% of each meal, protein around 30% and calcium around 20%.

Know that high fat and sugary food does not provide any nutritional value, and can be harmful to health.

Know for example, that a lack of vitamin D leads to a disease called **Rickets**.

Know that tooth **decay** is caused by an **excess** of sugar.

Know that excess fat from fatty foods such as butter and cheese - and created in the body from excess calories - builds up in the body and can cause **obesity**.

NB: some food groups are difficult to afford for some families so sensitivity is required when teaching this area.

Know what a human skeleton looks like. Name key parts: **skull/cranium, rib cage, spine, pelvis, collar bone, spine, vertebra, patella/knee cap, cartilage**

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Know that **mammals** have skeletons and that a human is a type of **mammal**.

Know that **birds, fish, amphibians** and **reptiles** also have skeletons, and that skeletons are designed to keep bodies the correct shape and help movement, as well as offer **protection** of

organs, such as the **skull** protects the **brain** and the **rib cage** protects the **heart** in humans. Bird bones are hollow, making them lighter, enabling birds to fly.

Know that humans have muscles. Know the name and location of the following **skeletal** muscles in the body - **abdominal, pectoral, bicep, tricep, hamstrings, calves**.

Know that the heart is a special type of muscle called **cardiac** muscle.

Know that **muscles** are attached to the bones, and are **responsible** for **movement**. Know that when muscles **contract** and **relaxing**, that this is what causes **movement**.

Know that joints occur where two bones meet and are able to move together e.g. knee, elbow

Know that sitting up straight is good for your **posture**

WORKING SCIENTIFICALLY

Compare human skeletons with the skeletons of fish (tuna and shark), birds (owl and pigeon) and other mammals (blue whale, tiger, kangaroo)

Know the following phrases related to bones and skeletons

Phrase	Meaning
dry as a bone	extremely dry
a bone to pick	a complaint
bone idle	lazy
chill to the bone	to be very scared
soaked to the bone	extremely wet
work your fingers to the bone	working very hard
like a dog with a bone	not giving up or letting go of something

	skeleton in the closet	an embarrassing secret
Term: Y3 T3	Focus of Study: Light	
NC Objectives	Key Knowledge and Vocabulary	
<p>Pupils should be taught to:</p> <p>recognise that they need light in order to see things and that dark is the absence of light</p> <p>notice that light is reflected from surfaces</p> <p>recognise that light from the sun can be dangerous and that there are ways to protect their eyes</p> <p>recognise that shadows are formed when the light from a light source is blocked by an opaque object</p> <p>find patterns in the way that the size of shadows change.</p>	<p>Y3 Context for study: This unit is the first of two science units where pupils learn about light as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the terms opaque, transparent and translucent. They know what plants need, including light, to grow well and how energy from light is the start of a food chain.</p> <p>This unit builds upon pupils' prior knowledge of materials as they recognise that shadows are formed when an opaque object blocks the light from a light source. Pupils find patterns in the way that the size of shadows changes. In Year 3, pupils learn we need light in order to see things and that dark is the absence of light. New learning includes that light is reflected from surfaces and it can be separated into a prism of colours. Pupils learn that light from the sun can be dangerous and that there are ways to protect their eyes.</p> <p>This is the precursor to work studied in Year 6 as pupils learn how shadows are formed. The knowledge acquired in this unit will help pupils to understand how light travels in straight lines and how the amount of light entering the eye is controlled by the pupil.</p> <p><u>Knowledge Content</u></p> <p>The study of light is part of the discipline of physics - the study of the processes that shape our world and how we use it.</p> <p>Know that light is a form of energy</p> <p>Know that energy is needed to make things happen. Every movement or change, no matter how small, requires energy.</p> <p>Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another.</p>	

Know that we need light to see things and that darkness is the **absence of light**

Know that light travels in straight lines

Pupils should know that we require **light** to see and that **darkness** is the **absence** of light. Know that light is **reflected** from **surfaces** (smooth, shiny surfaces reflect light more efficiently), and is not the producer of the light source itself. **Reflection** of light is when we can see the light on another surface. Other sources of light are all **man made**. Know that light reflects off objects and enters our eyes. This is how we see. Know that natural sources of light include - sun, stars, fire, lightning and **bioluminescence** in animals (such as fireflies) Know that there are man-made sources of light such as light bulbs, televisions, neon signs.

Know that many light sources give off light and heat.

Know that the Sun gives off light and heat

Know that **filaments** in traditional bulbs heat up until they glow, giving off light and heat

Know that **fluorescent** bulbs glow when electricity adds energy to a **gas** within the bulb

Know that looking directly at the sun is dangerous, as the light is too strong. Understand that **Ultraviolet (UV)** light causes **blindness or other long term vision problems** and that eyes should be protected by covering with either a wide brimmed hat / cap and sunglasses.

Know that a rainbow occurs when it is sunny and raining. Through teacher demonstration know that light can be **separated** with a **prism** into different colours. Know that white light consists of many different colours. These are - Red, Orange, Yellow, Green, Blue, **Indigo, Violet**. This is known as the **spectrum of colours**. This can be recalled with the **mnemonic** 'Richard of York Gave Battle In Vain' or ROY G BIV. Know that in a rainbow drops of rain act like a prism to create a rainbow. Know that sometimes double rainbows can occur. Rainbows occur when the sun is low in the sky.

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Understand that shadows are formed when an **opaque** object blocks light from passing through. This means it **blocks** out the light. **Transparent** and **translucent** objects let light through, creating no clear shadows.

Term	Definition	Example of material
Opaque	You cannot see through it	Wood, stone, metal
Translucent	Some light can pass through it but you cannot see clearly through it	some glass, some plastic, tissue paper
Transparent	You can see through it clearly	glass, plastic, cling film

Know the meaning of the following phrases

Phrase	Meaning
see the light at the end of the tunnel	to see that something which has been difficult or confusing is nearly at an end.
shine a light on	to focus on something
go out like a light	to fall asleep very quickly
shed light on something	to uncover something that is hidden
feel lightheaded	to feel dizzy
many hands make light work	If everyone helps with a task it will get done more quickly
let there be light	The phrase spoken by God in The Bible when light was created.

WORKING SCIENTIFICALLY

Take part in an experiment to see how the distance of the light source away from an opaque object changes the length of the shadow. Use a man-made light source to create the light for the shadow. Know that the further away the light source the smaller the shadow as less light

	<p>is blocked. Know that the nearer the light source the larger the shadow as more light is blocked.</p> <p>Know that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same.</p> <p>Know that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts (e.g. effect of changing sunlight on a plant – does this work with other plants / different types of light / etc).</p> <p>Know that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry.</p>
Term: Y3 T4	Focus of Study: Rocks and Soils
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</p> <p>describe in simple terms how fossils are formed when things that have lived are trapped within rock</p> <p>recognise that soils are made from rocks and organic matter</p>	<p>Y3 Context for study: This unit is the third of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it.</p> <p>Pupils have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses. Previous learning includes comparing how things move on different surfaces. Pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects. Pupils have studied the work of John Dunlop and John MacAdam.</p> <p>This year 3 unit builds on pupils’ knowledge of properties of materials as pupils learn about rocks and soils. New learning includes comparing and grouping together different kinds of rocks on the basis of their appearance and simple physical properties. Pupils describe how fossils are formed when things that have lived are trapped within rock and recognise that soils are made from rocks and organic matter. The knowledge acquired of rocks and soils during this unit will help pupils understand the significance of the life and works of palaeontologist Mary Anning. Later in the year, during a separate Year 3 forces unit, pupils further develop their knowledge as they compare and group together a variety of everyday</p>

materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.

This unit is the precursor to work studied in Year 4 as pupils study materials in terms of solids, liquids and gases. Year 5 pupils learn about dissolving, mixing and changes of state, and reversible and irreversible changes. Pupils also build on previous knowledge of magnetic and non-magnetic metals.

Knowledge content

The study of rocks, fossils and soils is part of the discipline of **physics** - the study of the processes that shape our world and how we use it. It is also part of the discipline of **Chemistry** - the identification of the properties a substance is made from.

Know the three natural types of rocks: **igneous**, **sedimentary** and **metamorphic**.

Know that the Earth has a solid **crust** made up of **tectonic plates** with **molten rock** beneath.

Igneous rocks are formed from the heat of **lava** or **magma**. They have large crystals. e.g.

Granite and **basalt**

Sedimentary rocks are formed from **sediment** (small pieces of rock and earth that settle at the bottom of a liquid i.e. water) being **compressed** by the weight of the liquid above and **cementing** over time. They are made of small grains. e.g. **Limestone (chalk)**, **coal** and **sandstone**.

Metamorphic rocks are formerly igneous or sedimentary rocks that have been **changed** at a chemical level due to intense heat from magma. e.g. **Marble** and **slate**.

Know how to use a **magnifying glass** to identify features of the rock types. Identify if the rocks have **grains** or **crystals**.

WORKING SCIENTIFICALLY

Know how to test a range of rocks for **density** (use comparative weight of similar sized rocks), **permeability/impermeability** (waterproof - pour a small amount of water and observe it is absorbed or runs off) and **strength** (hard or soft - use a coin or similar object to scratch the rock and observe whether particles are easily dislodged). They will then decide which rock group the rock belongs to based on the properties.

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Teacher note - do not test durability but teach that igneous rocks are very durable, sedimentary rocks are not durable and metamorphic rocks are durable)

Know that scientific enquiries are limited by the accuracy of the measurements (and measuring equipment) and by the extent to which conditions can vary even, and that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry. Understand that using comparative weight (holding a similar sized object in either hand and deciding which is heavier) is not a scientifically accurate measure and that this could be improved by taking rocks of the same size and weighing using digital scales.

FOSSILS

Know that a fossil is the hard **remains** of a **prehistoric** animal or plant that are found inside a rock

Know that fossils are comprised of **body fossils** (animal **bones**) and **chemical** fossils (that contain **carbon** and prove life once existed such as imprints in the ground and leave **trace** fossils behind) and understand how fossils are formed.

Know that fossils are only found in **sedimentary** rock and go through the same process of **compression** and **cementation** in the ground over long periods of time.

Know that it is very rare for living things to become fossilised. Usually after most animals die their bodies just rot away and nothing is left behind. However, under certain special conditions, a fossil can form.

Know the sequence of fossil formation as -

1. Animal dies and is buried by sediment
2. Soft parts of the animal **decay** or **decompose**
3. More sediment builds up around the animal and is compressed to form rock
4. Bones start to be dissolved by water underground
5. Minerals in the water then turn to rock

Know that **Mary Anning** is famous for finding many important fossils.

Know that she was born in 1799 in Lyme Regis, **Dorset** which is near the coast.
Know that 200 million years ago Dorset was beneath the sea.
Know that her fossils helped us to understand more about **prehistoric** animals.
Know the term **palaeontology** means 'a person who studies fossils' and
Know the term dinosaur comes from the Greek word deinos (terrible) and sauros (lizard) which, put together, makes 'terrible lizard.'
Know that dinosaurs are actually **reptiles** not lizards.
Learn about the discovery of the **ichthyosaur** skull and a complete **plesiosaur** and how this changed the view of the **prehistoric** (pre-written history) natural world.
Know that previously people did not believe in dinosaurs as real, as there was no evidence. It also helped people realise the world was much older than previously thought.
Video clips - <https://www.bbc.com/ideas/videos/the-girl-who-helped-discover-dinosaurs/p06bfr1s>

<https://www.bbc.co.uk/programmes/p015gn89>

SOIL

Know that soil is a **mixture** of air, water, broken down rock **matter** and other **organic** material (dead or living animal **tissue**)
Know the names of common soil types: sand, clay and silt.
Know that sandy soil is dry and gritty, and does not hold onto water.
Silty soil is richer in nutrients and smoother to the touch. It has smaller **particles** (a tiny piece of **matter**) and it can retain water for longer but will eventually start to lose this.
Clay soil has the smallest **particles** and so absorbs more water. It is **silky** when wet but smooth and solid when dry. It contains the most nutrients as they cannot escape in water.

Know that topsoil is dark in color and high in **organic** matter
Know that **subsoil** usually appears to be lighter in colour and has a sticky texture
Know that **bedrock** is the solid rock in the ground which supports all the soil above it.

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Know the following phrases linked to the word rock

	Phrase	Definition
	solid as a rock	very strong and stable
	on the rocks	something which is broken and in ruins
	rock the boat	to cause a problem
	rock bottom	at such a low level that it can't go any lower
Term: Y3 T5	Focus of Study: Plants	
NC Objectives	Key Knowledge and Vocabulary	
<p>Pupils should be taught to:</p> <p>identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers</p> <p>explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant</p> <p>investigate the way in which water is transported within plants</p> <p>explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</p>	<p>Y3 Context for study: This unit is the third of six science units where pupils learn about plants as part of the discipline of biology - the study of living organisms. Pupils are able to identify and name a variety of common wild and garden plants including deciduous and evergreen trees. Pupils are also able to identify and describe the basic structure of a variety of common flowering plants, including trees.</p> <p>During this unit, pupils revise a significant amount of knowledge from Year 2: the parts of a plant/tree; the function of each part of a plant; what seeds and plants need to grow and be healthy. This unit also reviews and builds upon pupils' knowledge of germination, pollination and life cycle diagrams. New learning includes seed formation and the four methods of seed dispersal. Pupils investigate the way in which water is transported within plants.</p> <p>The knowledge acquired in this unit will help pupils to group and classify living things in Year 4. This is the precursor to work studied in Year 5 when pupils construct food chains and in Year 6 when pupils study Linnaean classification, adaptations and sexual reproduction in plants.</p> <p><u>Knowledge Content</u></p> <p>The study of plants is part of the discipline of biology - the study of living organisms. Living things move, grow, consume nutrients and reproduce; that dead things used to do these things, but no longer do; and that things that never lived have never done these things.</p> <p>This is the process of pollination, seed formation and dispersal.</p> <p>Know that different parts of plants have one or more functions (jobs)</p>	

Evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn (revision from Year 1 unit)

Know the following parts of a plant/tree (revision from Y2 unit) roots, **stem, trunk, leaves** and **flower**.

Know that flowering plants are any plant that produces a flower head or fruit.

Know the function of each part of a plant (revision from Year 2). **Roots** keep the plant secured within the ground and also collect water and **nutrients** from the soil. The stem keeps the plant upright and transports water to the leaves and flower head. The leaves collect energy from the sun to make into food. Plants are **producers**, as they make their food.

What Seeds and Plants need to grow (revision from Y2)

Know that seeds need the following to germinate -

- **Water**
- **Oxygen**
- **Warmth**

Know that plants need the following to grow and be healthy (revision from Year 2) -

- **Water**
- **Air**
- **Warmth**
- **Light**
- **Nutrients**

Pollination, Seed formation and seed dispersal

The flower is used to form seeds and attract animals for **pollination**. Insects such as bees travel from flower-to-flower drinking **nectar** for energy. Know that nectar is a sweet liquid produced by flowers, which bees and other insects collect.

They collect pollen from one flower which sticks to their bodies. The grains of pollen from one plant stick to another plant and this begins the process of seed making. This is called pollination.

(Know that some people are **allergic** to pollen and this is known as **hayfever** which causes the nose and eyes to run)

After pollination over a number of days seeds begin to form in the flower head. When the seeds are developed, they are scattered away from the **parent plant** through a process called **seed dispersal**. Know the importance of **brightly coloured petals** and flower heads as these colours can be seen by **insects** as '**advertisements**' for food

Know the four methods of seed dispersal -

Method	Description	Examples of seeds
Wind Dispersal	seeds are blown to a new location	sycamore, dandelion
Water Dispersal	seeds float on water to a new location	coconut
Animal Dispersal	animals carry seeds either on their skin or in their stomachs after eating to a new location	blackberry, cherry, burdock
Explosion	dry seed pods crack open and the seeds fly out to a new location	poppy, laburnum

Study photographs or real-life examples of the following seeds - sycamore, dandelion, coconut, blackberry, cherry, burdock, poppy, laburnum.

Identify a **cactus**, **tulip** and **venus fly trap** in photographs
 Know how a **cactus** plant is different from a tulip. Cactuses have thicker stems as they live in **arid** (dry) conditions whereas tulip's grow in **damp** conditions where access to water is much easier. Cactus plants do not rely on insects for **reproduction**, whereas tulips have bright leaves to **attract** insects. Compare with a **venus fly trap**, which gets most of its **nutrition** from insects above the ground, instead of **nutrients** in the soil like the cactus and tulip. (Perhaps watch the following clip although it may be a bit gruesome - please use professional judgement! <https://www.youtube.com/watch?v=O7eQKSf0LmY>)

Know the life cycle of a plant as follows -
 Germination > Growth > Pollination > Seed Formation > Seed Dispersal > Germination...

Know the following idiom related to seeds

Phrase	Meaning
plant/sow the seeds of doubt	to cause someone to have doubts or worries about something

WORKING SCIENTIFICALLY

Know that water travels through the stem of the plant.

Use celery and coloured water to demonstrate the early stages of **transpiration** (water travelling through the plant.) Celery plants are mostly stems (as this is what we eat.) Set up the celery 72 hours prior to the session. Trim the root off the pieces, and place in dyed water. Red food colouring works better. Leave to allow the plant to soak up the dye. Cut open the celery and show a cross section of the plant. Draw the **cross section** of the celery. Know that a cross section is what you see if you cut through an object.

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(see website for further information - <https://www.fizzicseducation.com.au/150-science-experiments/botany-experiments/celery-transpiration/>)

Term: Y3 T6

Focus of Study: Forces and Magnets

NC Objectives

Key Knowledge and Vocabulary

Pupils should be taught to:

compare how things move on different surfaces

Y3 Context for study: This unit is the first of three science units where pupils study **forces** as part of the discipline of **physics** - the study of the processes that shape our world and how we use it. There are also many links to the discipline of **Chemistry** - the identification of the properties a substance is made from.

Pupils have a secure knowledge of resistance and friction, are able to compare how things move on different surfaces and know that applying forces to objects can change their shape.

notice that some forces need contact between two objects, but magnetic forces can act at a distance

observe how magnets attract or repel each other and attract some materials and not others

compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials

describe magnets as having two poles

predict whether two magnets will attract or repel each other, depending on which poles are facing.

Previous learning includes studying the work of scientist John MacAdam and his invention of the tarmac road.

This Year 3 unit builds on pupils' knowledge of how things move on different surfaces with a focus on the force friction. New learning is based on magnetism as pupils notice that some forces need contact between two objects, but magnetic forces can act at a distance. Pupils describe magnets as having two poles and observe how magnets attract or repel each other. Pupils further develop their knowledge of everyday materials as they compare and group according to whether they are attracted to a magnet, and identify some magnetic materials. The knowledge acquired in this unit will help pupils as they learn more about materials and their properties. This unit is the precursor to work in year 5 as pupils revise magnetism and learn about thermal and electrical conductivity.

Knowledge Content

The study of **forces** and **magnetism** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that a force can be thought of as a push or a pull.

Know that there are three types of **contact** force: **impact** forces (when two surfaces **collide**), **frictional** forces (when two surfaces are already in contact) and **strain** forces (when an elastic material is stretched or squashed).

FRICTION

Know that the **texture** of a **surface** will affect how another object moves along that surface.

Know that **smooth** surfaces allow things to move **quickly** but **rougher** surfaces create a **pull** that keeps the object **stuck** there longer.

Know that the term **motion** means 'moving from one place to another'

Know that the force between two surfaces rubbing together is called **friction**.

Know that a **balanced force** is when two forces are **equal** and there is no motion.

Know that **accelerate** means to get faster.

Know that **decelerate** means to slow down.

Know that there are also non-contact forces that can act between objects without them touching and that magnetism is an example of a non-contact force.

Magnetism

Know that a magnet is a piece of iron or other material which **attracts** some metals towards it

Know that a magnet has two **poles** - **North** and **South**

Know that the word **attract** means one object pulling another object towards it

Know that **repel** means one object pushing another object away from it

Know that magnets have a **magnetic field** around them and that this is the area around a magnet where the magnetic forces work

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Understand that **magnetic** forces can work at a **distance** and do not need to have contact.

Know that when materials are drawn to magnets this is called **attraction**.

Know that when materials are not drawn to magnets this is called **repulsion**.

Know that magnets can come in different forms: horseshoe, ring, button, bar.

Know the benefits of magnetic materials: sorting through different types of metals, keeping fridge doors sealed, attaching items to whiteboards without damaging them.

Know the following information -

Magnetic Materials	Non-Magnetic Material
1. Iron	1. Aluminium
2. Steel	2. Copper
3. Nickel	3. Gold
	4. Silver

Know the information in this diagram (red = North and blue = South)

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Know what a compass looks like e.g.

Image removed

1. A compass is used to find which direction you are facing.
 2. They were invented over 2000 years ago
 3. It was often used by sailors and explorers in the past to help find their way
 4. The thin metal pin inside is **suspended** so it can spin freely
 5. The pin always points North
 6. Now people often use Global Positioning Systems (GPS) rather than a compass
- (Recap the 8 points of the compass from Year 2)

WORKING SCIENTIFICALLY

Plan an experiment comparing different materials, to see which are magnetic (they attract) and which are not (do not attract). Use wood, plastic, rubber, steel, iron, aluminum, glass and rock. Record results in a table. (Note - this experiment is not to be used to teach the magnetic and non-magnetic materials but to prove what they have been taught already)

Know the following phrases

Phrase	Meaning
force of nature	someone with a lot of energy that is unstoppable
a force to be reckoned with	be strong and powerful
brute force	using a lot of strength to achieve something
force of habit	doing something in a certain way because it is a habit

Year 4

Term: Y4 T1	Focus of Study: Living things and their habitats
NC Objectives	Key Knowledge and Vocabulary
Pupils should be taught to: recognise that living things can be grouped in a variety of ways	Y4 Context for Study: This unit is the fourth of six science units where pupils learn about plants and animals as part of the discipline of biology- the study of living organisms. Pupils have a secure knowledge of the functions of the different parts of flowering plants and the requirements of plants for life and growth. They know how water is transported within plants

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.

and the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

This Year 4 unit builds upon pupils' prior knowledge of plants as they identify and name a variety of living things in their local and wider environment. Pupils group living things and begin to use classification keys for flowers (flowering and nonflowering). Animals are classified into warm blooded and cold-blooded, vertebrates and invertebrates. New learning includes knowing the names of common woodland species, which builds on knowledge from the Blue Planet topic in Year 3. Pupils learn that environments can change and that this can sometimes pose dangers to living things. The knowledge of plants acquired in this unit will help pupils at the end of Year 4 to construct and interpret a variety of food chains, identifying producers, predators and prey. This is the precursor to work studied in Year 5 as pupils identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. They will also describe the life process of reproduction in some plants and animals. This links to work studied in Year 6 when pupils study Linnaean classification, adaptations and sexual reproduction in plants.

Knowledge Content

Grouping plants and animals

Know that animals and plants can be put into different groups this is called **classification**.

Warm Blooded vs Cold Blooded

Know that animals can be divided into warm and cold blooded

Type	Definition	Example
Warm Blooded	Animals that can make their own body heat even when it is cold outside	Humans, mammals, birds
Cold Blooded	Animals that cannot make their own heat. They need the sun's warmth to heat their bodies.	reptiles, amphibians, fish

Vertebrates and Invertebrates

Know that animals can be classified into **vertebrates** and **invertebrates**.

Know that vertebrates are animals with a backbone and that invertebrates have no backbone and can be hard bodied or soft bodied.

Know that vertebrates will include **fish, amphibians, reptiles, birds** and **mammals**.

Invertebrates into **molluscs, worms, arachnids** and **insects**.

Mammals are warm blooded, have fur or hair, usually give birth to live young and typically feed their young milk.

Fish are cold blooded, breathe using gills, lay eggs and have fins.

Reptiles are cold blooded, have dry scaly skin and lay their eggs on land.

Birds are warm blooded, have feathers and lay eggs.

Amphibians are cold blooded, breathe air but lay eggs underwater as their young use gills to breathe.

Molluscs have soft, **unsegmented** bodies but use shells for protection. They live in damp, wet habitats.

Worms are long, slender unsegmented animals that burrow underground and have no additional **limbs**.

(Know that limb is a word used to mean arms and legs)

Arachnids usually have **segmented** body parts and eight legs.

Insects have six legs, 3 **segmented** body parts and generally have one or two sets of wings.

Know that insects have 3 parts to their body structure head, thorax and abdomen

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Know how to identify these in a range of different insects (real and from pictures)

Know the names of these common UK Woodland animals, the classification groups they are members of and identify pictures of them -

Mammals: **Weasel, badger, rabbit, bat, deer, fox, mole**

Fish: **Salmon, brown trout**

Birds: **Barn owls, blackbird, kestrel, cuckoo, great spotted woodpecker, kingfisher**

Reptiles: **Adder, Grass Snake, Common lizard**

Amphibians: **Common frog, Common toad, Smooth newt**

Molluscs: **Slug, Garden Snail,**

	<p>Arachnids: Harvestman, Garden Spider Worms: Common earthworm Insect: Peacock Butterfly, wood ant, wasp. bee, cricket, centipede, millipede, woodlouse, grasshopper</p> <p><u>Classifying Flowers</u> Know that plants can be classified into flowering and non-flowering plants. Flowering plants such as grasses and non-flowering plants such as ferns, mosses. Discuss the key features of each plant group. Know how to identify grass and moss in the local environment</p> <p>Flowering plants will have a flower head or fruit. Non flowering plants do not produce flowers or fruit.</p> <p>Flowering plants: dandelion, buttercup, daisy, bluebell Non-flowering plants: fern and moss</p> <p>WORKING SCIENTIFICALLY Know how to use a classification key to sort animals into groups Know how to create a classification key to sort the UK woodland animals studied above focusing on mammals, birds, amphibians and reptiles.</p> <p><u>Changing Environments</u> Know that humans can impact positively and negatively on the environment. Know that negative impacts include cutting down trees (deforestation), building roads/houses, growing population, littering, plastic in oceans. Know that positive impacts include building nature reserves, protecting land, introducing different species e.g reintroduction of Beavers. Conservation groups such as the Royal Society for the Protection of Birds (RSPB), Tiggywinkles and Bumblebee conservation trust.</p>
Term: Y4 T2	Focus of Study: Electricity
NC Objectives	Key Knowledge and Vocabulary

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.

Y4 Context for study: This unit is the first of two science units where pupils learn about electricity as part of the discipline of **physics** - the study of the processes that shape our world and how we use it. Children will have limited prior knowledge before studying this unit. During this Year 4 unit, pupils identify common appliances that run on electricity and construct a simple series electrical circuit, identifying and naming its basic parts. Pupils investigate 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. Pupils recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They recognise some common conductors and insulators, and associate metals with being good conductors.

The knowledge acquired in this unit will help pupils to compare and group together everyday materials on the basis of their properties, in terms of conductivity, in Year 5. This is the precursor to work studied in Year 6 when pupils use recognised symbols when representing a simple circuit in a diagram. Pupils investigate the brightness of lamps or the volume of buzzers with the number and voltage of cells used in the circuit. Pupils compare and give reasons for variations in how components function.

Knowledge Content

The study of electricity is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

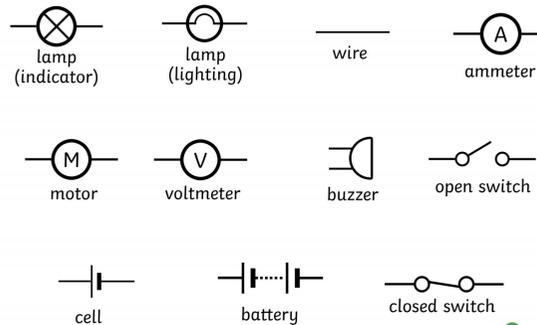
Know that electricity is **dangerous**, and know how to be **safe** using it.

know how **electricity** travels through a **circuit**, and the various **components** that create a circuit (**Battery, cell, open and closed switches, buzzer, lamp, motor, wire and voltmeter.**)

Note: all batteries are cells, but not all cells are batteries. A cell is a power source, a battery is a power source that uses chemical reactions to **generate power**.

Know the correct **symbols** to use when drawing circuits.

Electrical Circuit Symbols



Know **appliances** that run on electricity in school and at home and those that do not. Identify the **hazards** that might be faced in the home.

1. **Overloaded** plug extension **sockets**,
2. **Exposed** wires,
3. Damaged **sockets**,
4. Wires left along the carpet for people to trip over,
5. Electrical **appliances and wires** near water,
6. Placing metal into electrical appliances or open sockets,

Know how to prevent these hazards and know not to touch anything they feel is unsafe.

Know how to create simple circuits using a battery, a bulb and a switch.

Know that an open switch will not complete the circuit and that a closed switch will complete the circuit.

Know that electricity must be able to flow around the circuit for components to work

Know the difference between mains electricity and battery powered electricity.

Know that the word **current** describes the flow of electricity in a circuit

Know that Thomas Edison invented the **incandescent** electric light bulb in 1879 in New Jersey, USA. (Video Clip - <https://www.youtube.com/watch?v=0wkjISZt0ko>)

Know that Thomas Edison was born in 1847 and died in 1931.

He lived in the state of New Jersey in The United States of America (USA)

He is known as one of the greatest inventors in history.
He invented the light bulb, the **phonograph** (which could record and play sound) and an early video camera called the **Kinetograph**. The films were then watched on a **Kinetoscope** which he also invented.

Know that **static electricity** can be created by rubbing a balloon on material or through brushing hair

Know if the following circuits work or not. 1. A complete circuit without switches. 2. A circuit with wires not connected to the cell on one side. 3. A complete circuit with an open switch. 4. A complete circuit with a closed switch. 5. A circuit where the wire is not connected to the bulb / buzzer / motor.

WORKING SCIENTIFICALLY

Know that **conductors** allow electricity to pass through them and that **insulators** prevent the passage of electricity. Know that metals such as copper, iron and steel make good conductors. Know that wood, plastic, paper and rubber are insulators.

Identify materials that are conductors and insulators. (Children should know which materials are insulators and conductors prior to the investigation. The purpose of the demonstration is to prove what they know - not to discover for themselves)

Plan an investigation to check the **conductive properties** of materials, with pupils predicting that metals will allow a circuit to be complete, but that other materials will not. Test the predictions and record in a table.

Material tested	Conductor	Insulator
Copper		
Wood		
Rubber		

	Iron		
	Steel		
	Plastic		
	Paper		
Term: Y4 T3	Focus of Study:		
NC Objectives	Key Knowledge and Vocabulary		
	Revision block. No new science.		
Term: Y4 T4	Focus of Study: Sound		
NC Objectives	Key Knowledge and Vocabulary		
<p>Pupils should be taught to:</p> <p>identify how sounds are made, associating some of them with something vibrating</p> <p>recognise that vibrations from sounds travel through a medium to the ear</p> <p>find patterns between the pitch of a sound and features of the object that produced it</p> <p>find patterns between the volume of a sound and the strength of the vibrations that produced it</p> <p>recognise that sounds get fainter as the distance from the sound source increases.</p>	<p><u>Y4 Context for study:</u> This is a stand-alone unit where pupils learn about sound as part of the discipline of physics - the study of the processes that shape our world and how we use it. It is important to assume that all pupils have very little prior knowledge in this unit. During teaching, extra attention must be given to explicitly teaching the precise meaning of subject specific vocabulary as pupils may be unfamiliar with this. This unit does not link directly with any future science teaching so it is important that knowledge is secured during the unit. In Year 4, pupils identify how sounds are made and recognise that vibrations from sounds travel through a medium to the ear. Learning includes the anatomy of the ear and how whales communicate via Whale Song. The knowledge of sound acquired in this unit will help pupils find patterns between the pitch of a sound and features of the object that produced it. It also helps pupils find patterns between the volume of a sound and the strength of the vibrations that produced it. Pupils will know that sounds get fainter as the distance from the sound source increases.</p> <p><u>Knowledge Content</u> The study of sound is part of the discipline of physics - the study of the processes that shape our world and how we use it.</p> <p><u>Sound and Vibrations</u> Know sounds are made when something vibrates. Know that vibrate means to shake with repeated small quick movements.</p>		

Metal vibrates when it is struck, **vocal chords** inside our throat vibrate when we speak. This causes the air around the source of the sound to vibrate. The vibration travels through the air to our ear in a **wave**. Sound waves can travel through **solids** (such as metal, stone and wood), **liquids** (such as water) and **gases** (such as air).

Know that sound travels in longitudinal waves as each particle pushes the particles next to it. Know that where there is no gas, there is no sound. Sound cannot travel through space as there is no air. This is called a **vacuum**.

Whale Song

Know that whales can communicate over many miles underwater.

They communicate through a combination of clicks, whistles and pulsing sounds.

This is often called Whale Song.

Know that sound travels four times faster underwater than through air.

Some whale song can be heard over 100 miles away from the **source**.

Know that **ambient noise** created by humans such as boats, machines in the water can cause difficulties for whales trying to communicate.

Listen to <https://www.youtube.com/watch?v=WabT1L-nN-E>

Read the Whales' Song by Dyan Sheldon.

Further information - <http://www.whalefacts.org/how-do-whales-communicate/>

WORKING SCIENTIFICALLY

Demonstrate that sound can travel through gas and liquid. Scratch a desk and listen to the sound through the air and then place your ear on the desk and listen again. Know that the sound is louder when it travels through the desk.

Anatomy of the ear

Know the **structure**/ anatomy of the human ear.

Know that the ear consists of the **outer ear** and **inner ear**.

Know that the **eardrum** is a thin piece of stretched skin inside the ear which vibrates.

These vibrations then travel through a sequence of small bones (the smallest bones in the human body).

These bones connect to the **cochlea**.

The cochlea looks like a snail shell (the word 'cochlea' means snail in Ancient Greek).

Small hairs in the cochlea convert the vibrations into nerve impulses which send information to the brain for processing.

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Pitch

Know that **pitch** is how high or low a sound is.

Know that the following words would be used to describe low and high pitch sounds

Low Pitch	squeak, squeal,
High Pitch	rumble, grunt, boom

Know that pitch and **volume** are different - volume is how loud or quiet a sound is.

Know that there are **high pitches** and **low pitches**.

A short string gives a higher-pitched sound than a long string when they are plucked.

A tight drum skin gives a higher-pitched sound than a loose drum skin.

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WORKING SCIENTIFICALLY

Observe what happens when you tighten the string of a guitar. The tighter the string (the shorter the length) the higher the pitch.

Alternatively, cut straws. The shorter the straw, the higher the pitch.

Volume

Know that the **volume** of a sound is how loud or quiet a sound is.

Know that the stronger the vibrations the louder the sound.

The weaker the vibrations the quieter the sound.

Know that as sounds travel the vibrations become weaker, because they run out of energy.

This means that the volume of the sound will decrease the further away a sound is from an ear to hear it.

WORKING SCIENTIFICALLY

	<p>Tap a drum using different amounts of pressure. The more force exerted, the louder the sound.</p> <p>Know the following phrases linked to sound -</p> <table border="1" data-bbox="824 284 2040 667"> <thead> <tr> <th data-bbox="824 284 1205 352">Phrase</th> <th data-bbox="1205 284 2040 352">Meaning</th> </tr> </thead> <tbody> <tr> <td data-bbox="824 352 1205 421">sound asleep</td> <td data-bbox="1205 352 2040 421">sleeping peacefully</td> </tr> <tr> <td data-bbox="824 421 1205 489">safe and sound</td> <td data-bbox="1205 421 2040 489">being safe</td> </tr> <tr> <td data-bbox="824 489 1205 558">music to my ears</td> <td data-bbox="1205 489 2040 558">When you hear exactly what you want to hear.</td> </tr> <tr> <td data-bbox="824 558 1205 667">face the music</td> <td data-bbox="1205 558 2040 667">accept the negative consequences of something that has happened.</td> </tr> </tbody> </table>	Phrase	Meaning	sound asleep	sleeping peacefully	safe and sound	being safe	music to my ears	When you hear exactly what you want to hear.	face the music	accept the negative consequences of something that has happened.
Phrase	Meaning										
sound asleep	sleeping peacefully										
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music to my ears	When you hear exactly what you want to hear.										
face the music	accept the negative consequences of something that has happened.										
Term: Y4 T5	Focus of Study: States of Matter										
NC Objectives	Key Knowledge and Vocabulary										
<p>Pupils should be taught to: compare and group materials together, according to whether they are solids, liquids or gases</p> <p>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)</p> <p>identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</p>	<p>Y4 Context for study: This unit is the fourth of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it.</p> <p>Pupils have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials. Previous learning includes comparing how things move on different surfaces and pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects. Pupils have studied the work of John Dunlop, John MacAdam and Mary Anning. Pupils can compare and group different kinds of rocks on the basis of their appearance and simple physical properties. Pupils know how fossils are formed and recognise that soils are made from rocks and organic matter.</p> <p>This year 4 unit builds on pupils’ knowledge of properties of materials as pupils learn about states of matter. Pupils compare and group materials together, according to whether they are solids, liquids or gases. New learning includes 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). Pupils. The knowledge acquired during this unit will help pupils</p>										

understand the water cycle in geography: the part played by evaporation and associate the rate of evaporation with temperature.

This unit is the precursor to work studied in Year 5 pupils learn about dissolving, mixing and changes of state, and reversible and irreversible changes. Pupils also build on previous knowledge of magnetic and non-magnetic metals.

Knowledge Content

The study of **changes of materials** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it. It is also part of the discipline of **Chemistry** - the identification of the properties a substance is made from.

Know that everything is made up of tiny **particles**. The properties of a **substance** depend on what its particles are like, how they move, and how they are arranged.

Most substances can exist in three **states: solid, liquid and gas**. The particles of a substance are the same in each state, but their **arrangement** and movement change. This explains the different behaviour of a substance in its three states.

In a solid state the **vibrating** particles form a regular pattern. This explains the fixed shape of a solid and why it can't be compressed or poured.

In a **liquid** the particles still touch their neighbours but they move around, sliding over each other. This is why you can pour, but not **compress** (squash), a liquid.

In the **gas** state, widely-spaced particles move around **randomly**. This explains why you can compress gases and why they flow.

Know the information in this diagram and be able to recreate it -

Image removed

Identify the following solids, liquids and gases at **room temperature**. Know that room temperature means neither heated or cooled. Watch video clip at <http://www.bbc.co.uk/guides/zqp7p3#zh4fy4j>

Solid (at room temperature)	Liquid (at room temperature)	Gas (at room temperature)
Wood Iron Copper Plastic	water milk blood oil	oxygen carbon dioxide nitrogen steam

Know that air is a collection of gases (not a single gas) and it contains - 78% **nitrogen**, 21% **oxygen** and a small amount of other gases including **carbon dioxide**.

Know that steam and **smoke** are not the same thing. Know that steam is water in gas form and that smoke comes from burning solid material.

Know that when atoms are **heated**, the bonds between them break, allowing for solids to become liquids, and liquids to become gases.

Know that when materials are **cooled**, bonds are created in air to form liquids, and bonds are strengthened and become rigid, creating solids from liquids.

Know that water can exist in all three states.

Know the information in the following diagram and be able to recreate it (use the word **water vapour** alongside steam)

Image removed

Water Cycle (links with geography curriculum)

The study of the water cycle is part of the discipline of **physics**, (the hydrologic cycle) - the study of the processes that shape our world and how we use it.

Image removed

Know the term for each part of the water cycle: **evaporation, condensation, precipitation, runoff**

Know that **evaporation** is when water changes from a **liquid** to **vapour (gas)** as a result of becoming hotter. Understand that water becomes vapour at **100 °C** as it is the **boiling point** of water.

Image removed

Know that we measure temperature using degrees Celsius (**°C**)

Know that in many countries they use a Fahrenheit scale.

Compare the two scales shown in the diagram above.

Know that **condensation** is the name of the process when water vapour changes into liquid through **cooling**. Know that condensation also refers to the liquid as it appears on windows on a cold day.

Know that as water condenses clouds form in the sky. When it is cool enough, and a vast amount of water has formed, it falls in the form of rain and is called **precipitation**.

Understand that water will change from a liquid to a **solid** when cooled to 0°C and that this is the **freezing process**. When ice melts, it becomes liquid which becomes part of the water cycle again.

Know that about 70% of the earth's surface is water.

Know that about 96% of earth's water is stored in the oceans. Know that the remaining 4% is stored in rivers, lakes, ice caps, glaciers, water vapour in the air, in the soil and even in animals.

WORKING SCIENTIFICALLY

Demonstration of different foods melting. Observe and record how long butter, chocolate and whipped cream take to melt.

Measure the temperatures as the solids are heated using a thermometer (adult demonstration)

Know the following phrases linked to changes

Phrase	Meaning
change of scene	a significant change in your life
a leopard can't change its spots	people do not really change the way they are even if they appear to change.
change your mind change your tune change of heart	to change the way you are thinking about something
chop and change	to make lots of changes one after the other

Term: Y4 T6

Focus of Study: Animals, including humans - Digestive system

NC Objectives

Key Knowledge and Vocabulary

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.

Y4 Context for study: This unit is the sixth of eight science units where pupils study animals, including humans, as part of the discipline of **biology** - the study of living **organisms**. Pupils have a secure knowledge of life cycles and what animals, including humans, need to survive. Pupils know the importance of a healthy lifestyle, including a balanced diet and the effects of sugar, the food groups and their role in human development. Pupils can identify and name a variety of animals, including the names of animals native to the sea, rivers and canals and the features that help them to live there. Pupils can use classification keys to help group, identify and name a variety of living things in their local and wider environment. Pupils know that humans and some other animals have skeletons and muscles for support, protection and movement.

In this Year 4 unit, pupils learn about the simple functions of the basic parts of the digestive system in humans. New learning includes identifying the different types of teeth in humans

and their simple functions. Pupils construct and interpret a variety of food chains, identifying producers, predators and prey.

This unit is the precursor to work in year 5 as pupils learn about puberty and gestation periods of animals. The knowledge acquired in this unit will help pupils in Year 6 to learn about the circulatory system and dental structures.

Knowledge Content

The study of animals, including **humans** regarding **nutrition, skeletons and muscles** is part of the discipline of **biology** - the study of living **organisms**.

The digestive system

Know that **digestion** is the breaking down of food **mechanically** in the mouth before **chemically** in the stomach.

Know that the **mouth, tongue, teeth, oesophagus** (sometimes spelled **esophagus**), **stomach, small and large intestine** make up the human digestive system. Know where each part is within the human body. Know the function of each part -

1. Mouth: food enters the digestive system and is mixed with **saliva** to make it softer
2. Tongue: moves food around to be broken down.
3. Teeth: break down the food so it can travel through the esophagus.
4. Oesophagus: moves food from the mouth to the stomach.
5. Stomach: uses chemicals to break down the food into small parts before passing on to the small intestine.
6. Small intestine: digested food here is passed into the **bloodstream** where it can be taken to the body parts that require it.
7. Large intestine: any food leftover is unwanted, and is passed along the large intestine to the **rectum**.

Know that, without digestion, we could not **absorb** nutrients from food into our bodies and use them. Know that, in humans, the small intestine is about 6 metres long and the large intestine is about 1.5 metres long.

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Teeth

Know that there are different teeth for different purposes.

Incisors: the front teeth help bite off chunks of food to be broken down.

Canines: pointed teeth designed to rip and tear meat and fish.

(Premolars and) Molars: flatter, thicker teeth at the back of the mouth designed to crush and grind food.

Know that you get two sets of teeth during your lifetime - the first set is often called the milk or baby teeth.

Know that a child has 20 teeth and an adult has 32.

Know that adults have **wisdom teeth** which grow at the end of each row of teeth. These are often removed in adults because they can affect the growth of the teeth nearby and can be painful.

Know that it is important to look after teeth by brushing at least twice a day for two minutes at a time. It is important to use toothpaste which contains **flouride** as this protects teeth from tooth decay. (Watch video clip to understand the most effective way to brush teeth - <https://www.youtube.com/watch?v=xm9c5HAUBpY>)

Know that you can also use mouthwash and dental floss to help look after your teeth.

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WORKING SCIENTIFICALLY

Compare the teeth of humans with **carnivores** and **herbivores**.

Know that carnivores eat only meat. Their teeth have more canines as they will rip and tear food more. e.g. Lion's teeth.

Know that herbivores eat only plant life. Their teeth have more molars as they **grind** and break down **vegetation** more. e.g. Zebra's teeth.

Know that humans are **omnivores** and have a more balanced diet of plants and animals.

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Food Chains

Know that a **food chain** is a series of living things which are linked to each other because each thing feeds on the one next to it in the series.

Know that plants are **producers**, and create their own food through a process called **photosynthesis** (which they will find out about in secondary school)
 Know that all animals are **consumers**, they eat food (either plants or other animals) rather than produce their own (as plants are able to)
 Know that **prey** are animals that are consumed by other animals and **predators** are animals that consume other animals. Understand that some animals can be both predator and prey (e.g. a baboon eats grasshoppers but is eaten by a leopard)

Know the following food chains:

Plant Roots (producer) -> Zebra (prey) -> Lion (predator)

Green shoots (producer) -> antelope (prey) -> crocodile (predator)

Grass (producer) -> grasshopper (prey) -> Baboon (predator + prey) -> Leopard (predator).

Grass (producer) -> cow (prey) -> human (predator).

Know the following phrases linked to teeth

Phrase	Meaning
fed up to the back teeth	Really annoyed about something
by the skin of your teeth	something that was barely achieved.
get your teeth into something	to get involved in something with a lot of enthusiasm
grit your teeth	to be determined to do something
lie through your teeth	to openly lie about something
like pulling teeth	when something is very slow and difficult to do

Year 5

Term: Y5 T1	Focus of Study: All living things and their habitats - Rainforest animals and adaptations
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</p> <p>describe the life process of reproduction in some plants and animals.</p> <p>identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</p> <p>construct and interpret a variety of food chains, identifying producers, predators and prey (Y4)</p>	<p>Y5 Context for Study: This unit is the fifth of six science units where pupils learn about plants and animals as part of the discipline of biology- the study of living organisms. Pupils have a secure knowledge of the functions of the different parts of flowering plants and the requirements of plants for life and growth. They know how water is transported within plants and the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. Pupils can identify and name a variety of living things in their local and wider environment and use classification keys to help group plants and animals. In Year 5, pupils revise their prior knowledge of food chains, identifying producers, predators and prey.</p> <p>This unit builds on pupils’ understanding of how environments can change and that this can sometimes pose dangers to living things. Pupils identify how animals and plants of the Amazon rainforest are adapted to suit their environment in different ways and that adaptation may lead to evolution. New learning includes knowing particular species of animals and plants of the Amazon rainforest and describing the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Pupils further develop their knowledge of the seven life processes. The knowledge acquired in this unit will help pupils understand the life process of reproduction in some plants and animals. This is the precursor to work studied in Year 6 when pupils study Linnaean classification, adaptations and sexual reproduction in plants and animals.</p> <p><u>Knowledge Content</u></p> <p>The study of life in the rainforest is part of the discipline of biology - the study of living organisms. Know that an ecosystem is ‘all the plants and animals that live in a particular area together and the relationship between them and the environment’. Know that a tropical rainforest is an ecosystem consisting of ‘wet, warm forest all year round’. Understand the term biodiversity as ‘the variety of animals and plant life in a particular ecosystem’. Know that rainforests are home to approximately 50% of all living things on earth.</p> <p>Know the names of the following species of animals which live in the Amazon rainforest, identify pictures of these and whether they are herbivores, carnivores or omnivores - giant anteater, green iguana, tapir, anaconda, poison dart frog, sloth, macaw, jaguar, armadillo, howler monkey, piranha, hummingbird, leaf cutter ants, porcupine, tarantula and toucan.</p>

Know the names of the following **species** of plants which live in the Amazon rainforest and identify images of these - **rubber tree, orchid, cacao, giant water lilies and banana tree**.

Know the following **food chain** - orchid (**producer**), butterfly (**consumer**), toucan (**consumer**), jaguar (**consumer**). Use the terms **predator** and **prey** to describe the relationships in the food chain. Know that all food chains begin with **Solar Energy**.

Know that a number of different species each year become **extinct** as a result of **deforestation**. Know that extinct means 'no longer in existence'. e.g. dodo

Adaptations

In biology, an adaptation is defined as 'the process of change by which an organism or species becomes better suited to its environment.'

Know that **piranhas** have adapted to live and hunt in schools, they have sharp teeth, they have interlocking jaws, they have an **acute** sense of hearing to detect prey. Understand the term **evolution** as 'the process by which different kinds of living organisms are believed to have developed from earlier forms during the history of the earth'. Know that **adaptations** can lead to evolution of species. (Explain that they will learn more about this in Year 6)

Life processes and life cycles

Revise the seven life processes (from Y2) are **Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion and Nutrition**. Use the acronym **MRS GREN** to recall these.

M	Movement	All living things move, even plants.
R	Respiration	Getting energy from food.
S	Sensitivity	Detecting changes in the surroundings.
G	Growth	All living things grow.
R	Reproduction	Making more living things
E	Excretion	Getting rid of waste.
N	Nutrition	Taking in and using food.

Life Cycles

Jaguar (**mammal**)

Live young > kitten > adult

Females have between one and four kittens in each **litter**. She will give birth in a cave den or a **thicket**. The kittens are born with their eyes closed. At birth they have fuzzy spotted fur. The kittens begin to hunt when they are six months old. They will stay with their mother for about two years. The jaguar has a **lifespan** of 15-20 years.

Poison dart frog (**amphibian**),

frog spawn > tadpole > froglet > adult frog

<https://nationalaquarium.wordpress.com/2013/07/16/the-life-cycle-of-poison-dart-frogs-explained/>

Leaf cutter ant (**insect**)

Know that the life cycle of the ant consists of four stages: egg, larva, pupa, and adult.

Fertilized eggs produce female ants (queens, workers, or soldiers); unfertilized eggs produce male ants.

- **Egg:** Ant eggs are oval shaped and tiny (they are about 1 mm long)
- **Larva:** The worm-like larvae have no eyes and no legs. The larvae **molt** (shed their skin) many times as they increase in size.

	<ul style="list-style-type: none"> ● Pupa: After reaching a certain size, the larva spins a silk-like cocoon around itself (against a solid object) and pupates. During this time the body metamorphoses (changes) into its adult form. ● Adult: The pupa emerges as an adult. The entire life cycle usually lasts from 6 to 10 weeks. <p>http://www.enchantedlearning.com/subjects/insects/ant/leafcutter.shtml</p> <p>Hummingbird (bird). Egg > Young > Adult https://sciencing.com/life-cycle-hummingbird-5417886.html</p> <p>WORKING SCIENTIFICALLY Identify differences between the life cycles.</p>
Term: Y5 T2	Focus of Study: Properties and changes of materials
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets</p> <p>know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</p> <p>use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</p>	<p>Y5 Context for study: This unit is the fifth of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it.</p> <p>Pupils have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials. Pupils know how things move on different surfaces and pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects. Pupils have studied the work of John Dunlop, John MacAdam and Mary Anning. Previous learning includes knowing different kinds of rocks on the basis of their appearance and simple physical properties. Pupils know how fossils are formed and recognise that soils are made from rocks and organic matter.</p> <p>In this year 5 unit, pupils further develop their knowledge as they compare and group together everyday materials on the basis of their properties, including hardness (using Moh’s Hardness Scale) solubility, transparency, electrical and thermal conductivity. Pupils revise their prior knowledge of magnetic and non-magnetic metals from Year 3. New learning includes knowing that some materials will dissolve in liquid to form a solution, and knowing how to recover a substance from a solution. This unit also builds on pupils’ previous knowledge of states of matter. Pupils know that some materials change state when they are heated or cooled (e.g. evaporation and condensation in the water cycle) and associate the</p>

give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic

demonstrate that dissolving, mixing and changes of state are reversible changes

explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

rate of evaporation with temperature. Pupils use their knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. The knowledge acquired during this unit will help pupils understand that dissolving, mixing and changes of state are reversible changes. By the end of the unit, pupils will be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

This unit is the precursor to work studied in KS3 as pupils continue to learn about states of matter.

Knowledge Content

The study of **properties and changes of materials, including dissolving** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it. It is also part of the discipline of **Chemistry** - the identification of the properties a substance is made from.

Know how to compare materials based on the properties of **hardness, solubility** (how easily dissolvable it is), **transparency, magnetism, conductivity of thermal** (heat) and **electricity**.
Know that different materials will have different purposes, based on their properties.

Hardness

Know that hardness can be measured by observing if one material can scratch another.

Know that a common scale for doing this is Moh's Hardness Scale developed in 1812

Know how to conduct a scratch test.

1. If **Specimen A** can scratch Specimen B, then Specimen A is harder than Specimen B.
2. If Specimen A does not scratch Specimen B, then Specimen B is harder than Specimen A.
3. If the two specimens are equal in hardness then they will be relatively ineffective at scratching one another. Small scratches might be produced, or it might be difficult to determine if a scratch was produced.
4. If Specimen A can be scratched by Specimen B but it cannot be scratched by Specimen C, then the hardness of Specimen A is between the hardness of Specimen B and Specimen C.

Know that Diamond scores the highest, 10, on the Moh's scale (therefore is the hardest mineral)

Know that talc scores the lowest, 1, on the Moh's scale (therefore is the softest mineral)

Know the following sequence of materials ordered by hardness

Fingernail > glass > knife blade

WORKING SCIENTIFICALLY

Know how to conduct a simple scratch test on familiar items

Solubility

Know that solubility is the ability of a substance to **dissolve**

Know that **dissolving** is when a solid material mixes with a liquid and is no longer **visible**.

Know that materials dissolved into liquid will create a **solution**: salt water, sugar water.

Know that there is a limit to how much material can be dissolved in a given liquid. This is called **saturation point**. After this no more material will be dissolved it will be visible.

Know that the hotter the solution the faster the dissolving process occurs.

Know that stirring a solution can speed up the dissolving process.

WORKING SCIENTIFICALLY

Know that to get the salt or sugar back (**the substance**), the solution can be heated to evaporate the water from the substance. (Using a cold surface above the heat will catch the vapour and return it to liquid water) Observe the process and record findings.

Transparency

Revise vocab from previous year - **transparent, translucent, opaque**

Magnetism (Revision from Y3 unit)

Revise vocab from Y3 unit - north and south pole, magnetic field, attract, repel.

Magnetic Materials	Non-Magnetic Material
<ol style="list-style-type: none"> 1. Iron 2. Steel 3. Nickel 	<ol style="list-style-type: none"> 1. Aluminium 2. Copper 3. Gold 4. Silver

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Know how to use a magnet to test for magnetism.

Thermal Conductivity

Know that the term **thermal** refers to heat

Know that a **thermal conductor** is a material that allows heat to be **transferred** easily

Know that a thermal insulator does not conduct heat well.

Know that a metal spoon heats up more quickly than a plastic one in a hot drink.

Know that metal (such as aluminium and steel) conducts heat well so it is used to make saucepans so is known as a good thermal conductor.

Know that wood does not conduct heat well so is often used for handles of saucepans.

Know that plastic does not conduct heat well so is a thermal insulator.

Electrical Conductivity

Know that an electrical conductor allows electricity to flow through it.

Know that an electrical insulator does not.

Know that rubber is used for coating copper wires, as it is a poor conductor of electricity.

Know that iron is used in circuits as it will conduct electricity.

Know that silver, copper, gold and aluminium are the most effective electrical conductors.

	<p><u>Separating Solids and Liquids</u> Know that solids, liquids and gases can be separated using filtering, sieving and evaporation.</p> <p>Know the following terms Filtering: separates an insoluble solid from a liquid. Sieving: separates solids of different sizes. Evaporation: separating dissolved substances from liquids.</p> <p><u>Reversible and Irreversible Changes</u> Know that reversible changes are changes that are not permanent. Dissolving, mixing and altering states are reversible changes. Water can be altered from solid to liquid, to gas and back. Butter can be melted then will solidify. Know that solidify means ‘to become a solid’</p> <p>Know that some changes result in the making of a new material, and that this is irreversible. Bread, wood, paper that is burnt cannot be returned to its original state. Know that cooking an egg is an example of an irreversible change.</p> <p>Know that adding acid to bicarbonate of soda results in the bicarbonate breaking down into salt, water and gas. The resulting product cannot be transformed back into its original form. Know what this looks like through teacher demonstration.</p>
Term: Y5 T3	Focus of Study:
NC Objectives	Key Knowledge and Vocabulary
	Revision block. No new science.
Term: Y5 T4	Focus of Study: Animals, including humans - Human and Animal Development
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>describe the changes as humans develop to old age.</p>	<p><u>Y5 Context for study:</u> This unit is the seventh of eight science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. Pupils have a secure knowledge of life cycles and what animals, including humans, need to survive. Pupils can use classification keys and interpret food chains: identifying producers, predators and prey. Pupils know that humans and some other animals have skeletons and muscles for support, protection and movement. Previous learning includes the importance of a healthy lifestyle, including a balanced diet and the effects of sugar, the food groups and</p>

their role in human development. Pupils know the functions of the basic parts of the digestive system and the functions of different types of teeth in humans.

In this Year 5 unit, pupils learn about the changes a human goes through as they develop across their lifetime. Pupils describe the changes as humans mature to old age and draw a timeline to indicate stages in the growth and development. Pupils learn what older people need to stay healthy and the difficulties they may face, including memory loss and a weakened immune system, as a result of old age. In SRE sessions, pupils learn how babies grow and develop, and about puberty.

New learning includes the gestation period and life expectancy of different species of animals. Pupils also undertake an extended study of the Mayfly.

This unit is the precursor to work in Year 6 as pupils learn about the circulatory system and dental structures.

Knowledge Content

The study of animals, including **humans** regarding the changes a human goes through as they develop across their lifetime is part of the discipline of **biology** - the study of living **organisms**.

To know that all humans grow and develop from the time they are born until old age.

To know the terms **baby, toddler, child, teenager, adolescent, adult and pensioner** and the periods with which they roughly refer.

Baby: 0 - 1 year

Toddler: 1 - 3 years

Child: 3 - 12 years

Teenager/ adolescent: 12 - 18 years

Adult: 18+ years

Pensioner (old age): 65+ years

To know that **puberty** is when changes occur in the body during **adolescence**. It is the end of the development of the body.

Draw a **timeline** to indicate stages in the growth and development of humans.

Know that an **embryo** develops into a **foetus** in the mother's **womb** and that over time the foetus develops typical human features including arms and legs.

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Know how to read a table showing the length and **mass** of a baby in the womb as it develops.
Image removed

Gestation Periods

Know that nearly all mammals are **viviparous** - they give birth to live young rather than laying eggs.

Know that the **gestation** is the development of an **embryo** up to the point of birth.

Know that an embryo is an unborn animal at the very early stages of development.

Know that the gestation period refers to the time an embryo spends in development in the womb.

Know that an embryo develops into a **foetus** (in humans this is after 8 weeks)

Know the following gestation periods -

Animal	Average Gestation Period in days	Average Gestation Period in Months
Rat	21 days	Less than a month
Rabbit	31 day	1 month
Cat/Dog	63 days	2 months
Human	275 days	9 months
Horse	336 days	11 months
Killer Whale	465 days	15 months
Elephant	624 days	20 months

Know that the general rule is '**the bigger the animal, the longer the gestation period**'

Know that these gestation periods are averages and that sometimes this period is longer and shorter.

How babies grow and develop

Puberty

(see Christopher Winter SRE scheme plans)

Old Age

Know that there are a number of changes as adults move into old age.

Know that older people need a different diet to stay healthy, they may keep their teeth throughout old age, they need to exercise, they can learn new information.

Know that some older people suffer from **severe memory loss** (become **senile**)

Know that some older people have difficulty in moving around and may use a walking stick or frame.

Know that the **immune system** becomes weaker in old age and it is more difficult for the body to fight off illness. Know that the immune system defends people against germs and microorganisms every day. In most cases, the immune system does a great job of keeping people healthy and preventing infections. But sometimes problems with the immune system can lead to illness and infection.

Life Expectancy

Know that life expectancy is the length of time that a particular species of animal is expected to live.

Know the following animals and their life expectancies -

Species	Life Expectancy
Mayfly	1 day
Rat	1 year
Salmon	3 years
Human	68 years
Killer Whale	70 years

Blue Whale	100 years
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Identify pictures of the following animals - mayfly, rat, salmon, Killer Whale, Blue Whale (refer back to previous unit of work in Y3 on Blue Whales)
 Know that the general rule is '**the longer the gestation period the longer the life expectancy**'.

Mayfly study

Know that Mayfly are famous for having a very short life span/expectancy
 Know that all animals also have **Latin** names and that a mayfly is known as **Ephemeroptera**.
 Know that the word '**ephemeral**' is used to describe something which lasts for a very short time.
 Know that mayfly begin life in an egg which hatches into the **nymph phase** for one year before they become adult flies.
 Know that a nymph is the **larva** or young of an insect
 Know that larva is the form a young insect takes before it **metamorphoses** into an adult.
 Know that, in Greek and Roman **mythology**, nymphs were spirits of nature who appeared as young women.
 Know that adult mayfly only live to **reproduce** they do not eat and do not even have **functioning** mouth parts.
 Know that often mayflies in a given population **hatch** at the same time.
 Know that the adult females of some species live for less than five minutes.
 Know that females typically lay between four hundred and three thousand eggs. The eggs are often dropped onto the surface of the water; sometimes the female deposits them by dipping the tip of her **abdomen** into the water during flight.

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(See this video for further information <https://vimeo.com/70579714>)

Term: Y5 T5	Focus of Study: Forces - Gravity and Mechanisms
NC Objectives	Key Knowledge and Vocabulary

Pupils should be taught to:

explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object

identify the effects of air resistance, water resistance and friction, that act between moving surfaces

recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Y5 Context for study: This unit is the second of three science units where pupils study **forces** as part of the discipline of **physics** - the study of the processes that shape our world and how we use it. There are also many links to the discipline of **chemistry** - the identification of the properties a substance is made from.

Pupils have a secure knowledge of resistance and friction, are able to compare how things move on different surfaces and know that applying forces to objects can change their shape. Previous learning includes studying the work of scientist John MacAdam and his invention of the tarmac road.

In Year 5, pupils revise and build upon previous learning on magnetism. They know some forces need contact between two objects, but magnetic forces can act at a distance. Pupils know magnets have two poles and that they attract or repel each other. Pupils further develop their knowledge of magnetic and non- magnetic materials with thermal and electrical conductivity. New learning in this unit includes knowing that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Pupils study the effects of air resistance, water resistance and friction, that act between moving surfaces. By the end of the unit, pupils will know that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

The knowledge acquired in this unit will help pupils as they learn more about materials and their properties. This unit is the precursor to work in year 6 as pupils study the movement of the Earth in space.

Knowledge Content

The study of **forces** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that the **force** that pulls things to the ground on Earth (and other planets) is called **gravity**.

Know that gravity acts as a pull force making **unsupported** objects fall towards Earth. Know that gravity pulls towards earth wherever you are on Earth. If any of the people in the diagram below drop an object it will fall to the ground.

Image removed

Know that gravity holds Earth and the other planets in their **orbits** around the Sun.

Know that the force of gravity also exists on the Moon but it is not as strong as it is on Earth. This is because the Moon is much smaller than our planet. Know that objects appear to float in space because of the lack of gravity. Astronauts experience **weightlessness** in space. (see clip for example) <https://www.youtube.com/watch?v=KFPvdNbftOY>

Know that objects with greater **mass** have a stronger force of gravity. As the earth is bigger than the Moon the force of gravity is stronger. Understand the difference between mass and weight. Know that mass is constant (never changes regardless of whether you are, for example, on Earth or in space). Know that weight is the force of gravity on an object and therefore changes depending on where you are. Your weight on the moon is about $\frac{1}{6}$ of your weight on earth although your mass does not change.

Know that this means astronauts move differently when walking on the moon.

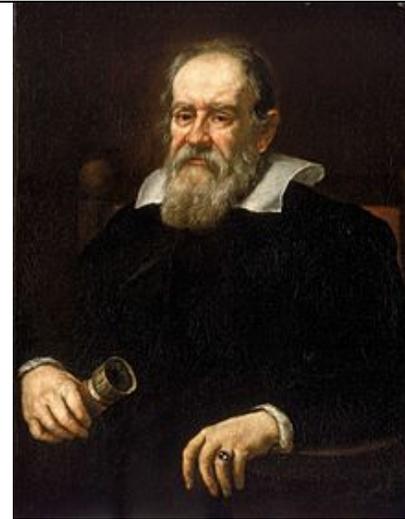
Galileo Galilei

Know that **Galileo Galilei** (1564 - 1642) was a scientist from Italy. He discovered that when you drop two objects of similar shape and size but of different mass they will fall at the same rate. This went against the common sense idea at the time from Aristotle who believed that heavier objects fell faster.

He is said to have dropped objects from the **Leaning Tower of Pisa** to demonstrate this. Most scientists and historians believe this was a '**thought experiment**' and did not actually happen. A thought experiment is when you imagine the outcome of an experiment rather than carry it out directly.



Leaning Tower of Pisa



Galileo Galilei

WORKING SCIENTIFICALLY

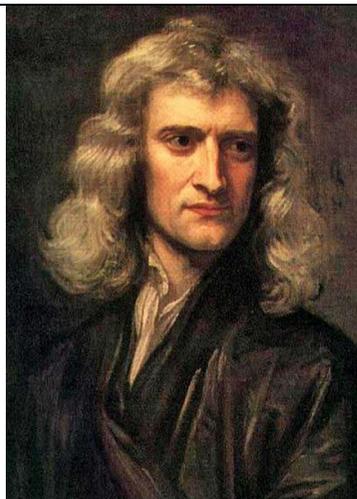
Teacher demonstration of dropping a cricket ball and ball of scrunched up paper of the same size. Students should **predict** what will happen based on Galileo's rule and then be shown that the balls fall at the same rate. Understand the rule that objects of the same size and shape fall at the same speed regardless of their mass.

Isaac Newton

To know that **Sir Isaac Newton** (1642 - 1726) was an English mathematician and scientist. He is known as one of the most **influential** scientists of all time. He developed Newton's law of **universal gravitation**. Know that he is said to have 'discovered' the concept of gravity when sitting under a tree and an apple fell to the ground near him. There is a common myth that the apple landed on his head which is generally considered to be untrue.

Newton also discovered that white light was made from a range of colours (review previous work on rainbows and the colour spectrum).

Know that he is buried in Westminster Abbey with other famous people Charles Dickens, Charles Darwin, Queen Elizabeth I and most recently Professor Stephen Hawking. Many Kings and Queens are also buried in Westminster Abbey. Know that this is the location of many royal weddings including that of the Duke and Duchess of Cambridge in 2011.



Sir Isaac Newton

Friction, Air Resistance and Water Resistance

Know that **friction** occurs when objects move through water or air. **Air resistance** is a type of friction between air and another material (this is sometimes called **drag**). Know that **air resistance** is the frictional force air **exerts** against a moving object. As an object moves, air resistance slows it down. The faster the object's motion, the greater the air resistance exerted against it. Air resistance affects all moving objects. For example, when an aeroplane flies through the air, air particles hit the aeroplane making it more difficult for it to move through the air.

It's the same for an object moving through water. If you go swimming, there is friction between your skin and the water particles. This is known as **water resistance**.

When something is in water, there are two forces acting on it. Its weight and the force of the water pushing up, the **upthrust**.

If the weight is equal to or less than the upthrust, it floats. Things that float are '**buoyant**'. Know that '**buoyancy**' is the ability of an object to float in liquid or the air. Know that a **buoy**

is a floating object that is used to show ships and boats where they can go and to warn them of danger.

Image removed

Picture of a Buoy

Know that if the weight of an object is greater than the upthrust, it sinks.

Know how to use arrows on diagrams to show the forces at work in given situations e.g. submarine in water, parachute falling, car moving on the road.

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WORKING SCIENTIFICALLY

Observe the fall of **sycamore** seeds. Demonstrate how a paper helicopter can act as a model of a sycamore seed. Know how air pushes the blades of the paper helicopter as it falls and causes it to rotate.

Conduct an experiment to test paper helicopters and measure resistance with designs that are weighted and unweighted. Paper clips and blue tack can be used to act as comparative amounts of mass acting on the object (helicopter). Use graphs to map the results.

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Levers, Pulleys and Gears

Know that **levers, pulleys and gears** are mechanisms that allow a small force to have a greater effect.

Levers

Know that a lever is a simple **mechanism** used to move or lift objects.

Know how to label a diagram showing a lever, **load, effort** and a **fulcrum** or **pivot**.

Image removed

Know that the nearer the fulcrum/pivot to the load then the less effort is needed. Know that a seesaw works because the fulcrum is in the middle. Consider what would happen if a seesaw had the fulcrum closer to one end.

Gears

Know that **gears** are toothed wheels that lock together and turn each other.

Know that gears are often different sizes.

A number of gears connected together are called a **gear train**

Small gears rotate faster than large ones and need less effort to move.

Know that gears on a bike enable us to go faster than we could normally move without using up a lot of energy.

Know and understand the following diagram -

Image removed

For further information - <https://www.dkfindout.com/uk/science/simple-machines/gears/>

Watch examples of gears - https://www.youtube.com/watch?v=D_i3PJlYtuY

Pulley

Know that a **pulley** is a device consisting of a wheel over which a rope or chain is pulled in order to lift heavy objects. Know that when someone raises a flag up a flagpole a pulley system is used.

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Term: Y5 T6

Focus of Study:

NC Objectives

Key Knowledge and Vocabulary

No Science

Year 6

Term: Y6 T1	Focus of Study:
NC Objectives	Key Knowledge and Vocabulary
	No Science
Term: Y6 T2	Focus of Study: Light
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>recognise that light appears to travel in straight lines</p> <p>use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye</p> <p>explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes</p> <p>use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</p>	<p>Y6 Context for study: This unit is the second of two science units where pupils learn about light as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the terms opaque, transparent and translucent; what plants need, including light, to grow well and how energy from light is the start of a food chain. Previous learning includes knowing that light from the sun can be dangerous and that there are ways to protect their eyes. Pupils also know we need light in order to see things and that dark is the absence of light.</p> <p>This unit builds upon pupils' prior knowledge that shadows form when the light from a light source is blocked by an opaque object. Pupils already know that light is reflected from surfaces and it can be separated into a prism of colours. New learning includes knowing how light appears to travel in straight lines. Pupils learn that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. This new knowledge acquired in Year 6 is used to explain why shadows have the same shape as the objects that cast them and that those objects are seen because they give out or reflect light into the eye.</p> <p>This is the precursor to work studied in KS3 as pupils continue to learn about how light can be reflected, refracted and dispersed as part of the discipline of physics.</p> <p><u>Knowledge Content</u></p> <p>The study of light is part of the discipline of physics - the study of the processes that shape our world and how we use it.</p> <p>Know that light travels in straight lines from its source. Know that some light sources are natural (stars, sun, fire, lightning, bioluminescence) and some are man-made (torch, light bulb, digital screen, laser pointer)</p>

Know that light either travels in a straight line **directly** from the source or by **reflecting** off a **surface** into our eye.

Know how to draw arrows to show light entering the eye from a light source or reflection.

Know that **reflection** is when light bounces off a surface, changing the direction of a **ray** of light.

Know that all objects reflect light; smooth and shiny surfaces reflect all the rays of light at the same angle, rather than **scattering** the rays of light like rough or dull surfaces.

Know that when rays of light reflect, they obey the law of reflection: The angle of **incidence** always equals the angle of **reflection**. Demonstrate with a laser pointer and mirror. Predict where the laser will point given a change in angle.

Shadows

Know that a shadow is formed when light is blocked by an **opaque** object. Know that opaque means light cannot pass through, **translucent** means some light can pass through but it is difficult to see through and that **transparent** means light can pass easily through and it is easy to see through.

Understand that as light travels in straight lines shadows have the same shape as the objects that cast them. Understand that if something **casts** a light or shadow somewhere, it causes it to appear there.

Know that the further the light source from the opaque object the bigger the shadow.

Know that the nearer the light source from the opaque object the smaller the shadow.

Know that the shadow of an object can be moved by moving the light source.

Know that a silhouette is different from a shadow because a silhouette is the solid dark shape that you see when someone or something has a bright light or pale background behind them.

Silhouette of a lizard

Shadow of people

The Eye

Know that the amount of light entering the eye is controlled by the **pupil**, which is surrounded by the **iris** – the coloured part of the eye. Know that the pupil **dilates** when it is darker to let more light into the eye. The pupil **constricts** when it is bright to reduce the amount light entering the eye.

WORKING SCIENTIFICALLY

Use sticks and mirrors to create simple **periscopes** that allow people to see what is happening behind or above them. Create labelled diagrams that show the path that the light took to reach the eye.

Know the following phrases linked to eyes

Phrase	Meaning
can't believe your eyes	when you can't believe something is real
eyes bigger than stomach	when you eat more than you should
birds eye view	to look down from above on something
able to do with eyes closed	able to do something very easily
eagle eyes	very good eyesight
pull the wool over my eyes	deceive someone
see eye to eye	to agree with someone
eye of the storm	the centre of a tornado which is very calm

	<table border="1"> <tr> <td data-bbox="824 140 1048 247">turn a blind eye</td> <td data-bbox="1048 140 2022 247">to deliberately ignore something that is happening</td> </tr> </table>	turn a blind eye	to deliberately ignore something that is happening
turn a blind eye	to deliberately ignore something that is happening		
Term: Y6 T3	Focus of Study: Earth and Space		
NC Objectives	Key Knowledge and Vocabulary		
<p>Pupils should be taught to:</p> <p>describe the movement of the Earth, and other planets, relative to the Sun in the solar system</p> <p>describe the movement of the Moon relative to the Earth</p> <p>describe the Sun, Earth and Moon as approximately spherical bodies</p> <p>use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.</p>	<p><u>Y6 Context for study:</u> This unit is the last of three science units where pupils study forces as part of the discipline of physics - the study of the processes that shape our world and how we use it. There are also many links to the discipline of chemistry - the identification of the properties a substance is made from.</p> <p>Pupils have a secure knowledge of the effects of air resistance, water resistance and friction, that act between moving surfaces. Pupils know that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</p> <p>Previous learning includes how some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. Pupils know about magnetic and non- magnetic materials, and thermal and electrical conductivity. They know some forces need contact between two objects, but magnetic forces can act at a distance. Pupils know magnets have two poles and that they attract or repel each other.</p> <p>In this Year 6 unit, pupils describe the Sun, Earth and Moon as approximately spherical bodies. New learning includes knowing about the movement of the Earth, and other planets, relative to the Sun in the solar system. Pupils learn the movement of the Moon relative to the Earth. By the end of the unit, pupils use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.</p> <p>This unit is the precursor to work studied in KS3 when pupils continue to study forces as part of the discipline of physics. The knowledge acquired in this unit will help pupils as they learn more about forces and movement, including measuring forces.</p> <p><u>Knowledge Content</u></p> <p>The study of Earth and Space is part of the discipline of physics - the study of the processes that shape our world and how we use it.</p>		

Sun, Moon, Earth

Know that the Earth, sun and moon are approximately **spherical bodies** in space.

Know that the sun is a **star** and the moon is a **satellite**, not planets.

Know that the Earth **rotates** once every 24 hours.

Know that this creates **day and night** as the Earth takes 24 hours to complete one spin on its **axis**.

Know that the Earth orbits around the sun once every 365 and a quarter days (one year).

Know that the sun is the ball of gas in the sky that the Earth goes round, and that gives us heat and light.

Know that it is not safe to look directly at the Sun, even when wearing dark glasses

Know that the orbit is the curved path in space that is followed by an object going round and round a planet, moon, or star

Know that every 4 years the Earth year is 366 days long due to the 4 quarter days equalling an extra day. We refer to this as a **leap year**. Know that the extra day occurs on Feb 29th.

Know that the Earth **spins** on an imagined **axis, tilted** at approximately 23°

Explain how this also alters how we see the sun in different **positions** in the sky throughout the day, and this makes the sun look as if it is moving when it is in fact Earth.

Know that the sun appears to rise in the east and sets in the west.

Moon

Know that the moon is not a **light source** it reflects the light from the sun.

Know that the moon orbits our Earth every 28 days, and this is called the **lunar cycle**.

Know that Earth has one moon; Jupiter has four large moons and numerous smaller ones.

Know that in **folklore** a full moon is when werewolves are supposed to transform from humans into werewolves. Know that a full moon is regarded as a spooky symbol.

(no requirement to teach the names of the phases of the moon)

Know that over 28 days the moon goes from a full moon to a sequence of shrinking crescent moons to a new moon (not visible) a sequence of increasing crescent moons to a full moon over 28 days.

Solar System

Know the names of the planets in our solar system in order from the sun - **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, (Pluto)**. Know that recently Pluto has been designated as a **dwarf planet** and is no longer included as a planet in the solar system.

Know the mnemonic - My Very Easy Method Just Speeds Up Naming Planets

Know that there is an **asteroid belt** between Mars and Jupiter

Know the **approximate relative size** of planets from this diagram.

Know that planets have their own moons

Know that only Earth is **habitable**.

The gas giants are: Jupiter, Saturn, Uranus and Neptune.

The others are **terrestrial** planets: **terra** meaning land.

Solar System Models

Know the way that ideas about the solar system have developed,

Know how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

Planets

Know that the planet names are derived from **Roman** and **Greek** mythology, except for the Earth which is Germanic and Old English in **origin**.

Mercury: named after the Roman messenger god who was known for his ability to travel quickly with wings on his feet.

Venus: named after the goddess of love and beauty. The planet Venus is the brightest object in our sky after the sun and the moon.

Earth: the name comes from the German word 'erde' which means ground. This is the odd one out as it is not based on Roman or Greek Mythology.

Mars: the Roman god of war. Red is the colour of blood and war and Mars is the Red Planet. The colour is due to a type of rust in the soil.

Jupiter: the **supreme** god of the ancient Romans. The planet Jupiter, the largest planet in our solar system, is named after the king of the gods,

Saturn: the king of the **Titans** who ruled the world before Jupiter. Saturn has over 30 moons in orbit

Uranus: the Roman sky god.

Neptune: named after the Roman god of the sea. For many years, Neptune was thought to lie on the edge of the Solar System, watching over the vast oceans of space.

Pluto: Pluto was the brother of Jupiter and Neptune and the god of the **underworld**. The underworld was supposed to be dark and cold just like the planet Pluto.

Space Exploration

Know that the first animal in space was a dog named Laika

Know that the first man in space was **Yuri Gagarin** on VOSTOCK 1 in 1961

Know that the first moon landing was **Apollo 11** in **1969**

Know that **Alan Shepherd** was the first American in space in 1961

Know that **Valentina Tereshkova** was the first woman in space in 1963

Know that there was a '**space race**' to be the first country to put a person on the moon between Russia and USA

Know that **Richard Nixon** was president of the USA at this time.

Know that **Neil Armstrong** was the first person on the moon in 1969

Know that **Edwin 'Buzz' Aldrin** was the second person on the moon after Neil Armstrong in 1969.

Know that **Michael Collins** was on the same mission as Buzz Aldrin and Neil Armstrong but had to stay in the **command module** and did not set foot on the moon.

Know that this moon landing was a key cultural event watched by **approximately** 600 million people.

Know that **Tim Peake** was the most recent Briton to go into space in 2015

Know the following quote "**The eagle has landed**" which was said when the Apollo 11 ship first touched down on the moon

Know the following quote "**That's one small step for man, one giant leap for mankind**" which was said when Neil Armstrong first stepped off the ladder of the **lunar lander** onto the moon. Know that this phrase has passed into popular culture.

Know that Edwin 'Buzz' Aldrin and Neil Armstrong spent about 20 hours on the moon's surface collecting rock samples to find out more about the moon.

Know that **NASA** stands for **National Aeronautics and Space Administration** and they are the government operated agency that carries out scientific investigation into space.

Core Reading - <https://www.scientificamerican.com/article/the-eagle-has-landed/>

Time Zones

Know that there are different time zones across the world because of the rotation of the earth. Know that as you move eastwards from the UK you add time on. Know that as you move westwards you subtract time.

Know that to find the time in Sydney, Australia you add 9 hours on (this is true during the study of this unit but will change when the clocks change in October).

Know the following terminology to discuss space

Orbit	The path of a celestial body
Rotation	To turn or spin
Solar System	A star and everything that travels around it

	Planet	A celestial body that revolves around the sun
	Cosmic	Related to space
	Galaxy	A collection of star systems
	Sun	The star at the centre of a solar system
	Nebula	A cloud of gas and dust in space
	Universe	Everything that exists anywhere
	Spherical	Shaped like a sphere
	ISS	The International Space Station
	Celestial Body	An object in space
	Atmosphere	The gases surrounding a planet
	Meteor	A small rock that hits the earth's atmosphere
	Satellite	Any celestial body orbiting around a planet or star
	Lunar	Relating to the moon
	Star	A glowing celestial body of burning gases

	CORE READING: Destination: Space by Christoph Englert
Term: Y6 T4	Focus of Study: Circulatory System
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</p> <p>recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</p> <p>describe the ways in which nutrients and water are transported within animals, including humans.</p>	<p>Y6 Context for study: This is the final unit of eight science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. Pupils have a secure knowledge of life cycles and what animals, including humans, need to survive. Pupils know that humans and some other animals have skeletons and muscles for support, protection and movement. Pupils know the functions of the basic parts of the digestive system and the functions of different types of teeth in humans. Previous learning includes the changes a human goes through as they develop across their lifetime. In SRE sessions, pupils learned how babies grow and develop, and about puberty. Pupils know what older people need to stay healthy and the difficulties they may face as a result of old age.</p> <p>This Year 6 unit builds on pupils' knowledge of the importance of a healthy lifestyle, including a balanced diet and the effects of sugar, the different food groups and their role in human development. New learning includes recognising the impact of diet, exercise, drugs and lifestyle on the way their bodies function. In Year 6, pupils identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Pupils also describe the ways in which nutrients and water are transported within animals, including humans.</p> <p>This is the precursor to work studied in KS3 when pupils continue to study the human body as part of the discipline of biology.</p> <p><u>Knowledge Content</u></p> <p>The study of animals, including humans regarding the human circulatory system is part of the discipline of biology - the study of living organisms.</p> <p>Know the circulatory system is the system that circulates blood through the body.</p> <p>Know that this consists of the heart, blood vessels, blood, veins, arteries, capillaries, oxygen, lungs and ribcage.</p>

Know the following definitions -

heart	the organ in your chest that pumps the blood around your body.
blood vessels	the general name for the narrow tubes through which your blood flows includes the arteries, veins and capillaries
blood	a red fluid that is pumped by the heart through the arteries and veins, supplies tissues with nutrients and oxygen .
veins	blood vessels that carry blood to the heart.
arteries	blood vessels that carry blood away from the heart.
capillaries	microscopic blood vessels found in the muscles and lungs
oxygen	a colourless gas that exists in large quantities in the air. All animals need oxygen in order to live.
lungs	the two spongy organs inside your chest which fill with air when you breathe in. They remove carbon dioxide from blood and add oxygen .

ribcage	the bony structure consisting of the ribs and their connective tissue that encloses and protects the lungs, heart
carbon dioxide	a gas produced by animals and people breathing out

Know the location of the lungs and heart
 Know how to label the following diagram

Know that the heart is a hollow muscular organ that pumps the blood through the circulatory system by regular **contractions**. There are four **chambers** with two **atria** and two **ventricles**.
 Know the following sequence that explains the function of the heart -

1. **Deoxygenated** blood flows into the heart from the body through the veins
2. This blood is pumped out to the lungs through the **pulmonary artery**
3. Blood is then **oxygenated** in the lungs
4. Blood returns to the heart through the **pulmonary vein**
5. The oxygenated blood is then pumped out of the heart through the **aorta**
6. The blood travels around the body delivering oxygen and nutrients to the organs.

Know that **oxygenated** means 'to be enriched with oxygen'
 Know that **deoxygenated** means 'to be depleted of oxygen'

Know that blood is red when **oxygenated** and deep purple or blue looking through skin when not.

Diet, exercise, drugs and lifestyle

Know that diet can impact on lifestyle as fatty rich foods can **clog** arteries and veins, preventing blood from delivering what is needed.

Know that exercise can improve the health of a person by removing **fatty deposits** from the body.

Know that some exercises are called **cardiovascular**, and are designed to improve the fitness of the overall circulatory system by **strengthening** the organs and **pulse rate**.

Know the impact of having little exercise and poor diet will have, and know that taking certain drugs such as cocaine can cause permanent damage to the circulatory system (link to PSHE drugs curriculum)

WORKING SCIENTIFICALLY

Take measurements of pulse rate before and after a range of exercises. Make predictions as to what will happen if measurements are taken at regular intervals. Repeat over time and record results in a line graph.

Developing language through phrases about 'blood'

Know the following phrases and their meanings

bad blood	If you say that there is bad blood between people, you mean that they have argued about something and dislike each other
bay for blood	If you say that people are baying for blood , you mean that they are demanding that someone should be hurt or punished.
blue blood	If you say that someone has blue blood , you mean that they are from a family that has a high social rank.

	<table border="1"> <tr> <td>make blood boil</td> <td>If you say that something makes your blood boil, you are emphasizing that it makes you very angry.</td> </tr> <tr> <td>blood out of a stone</td> <td>If you say that doing something such as getting information or persuading someone to talk to you is like getting blood out of a stone or getting blood from a stone, you are emphasizing that it is very difficult and that people are not being very helpful.</td> </tr> <tr> <td>Blood, sweat and tears</td> <td>If you refer to something as involving blood, sweat, and tears, you mean that it is a very hard thing to do and requires a lot of effort.</td> </tr> <tr> <td>blood is thicker than water</td> <td>People say 'blood is thicker than water' when they mean that their loyalty to their family is greater than their loyalty to anyone else.</td> </tr> <tr> <td>own flesh and blood</td> <td>If you say that someone is your own flesh and blood, you are emphasizing that they are a member of your family.</td> </tr> </table>	make blood boil	If you say that something makes your blood boil , you are emphasizing that it makes you very angry.	blood out of a stone	If you say that doing something such as getting information or persuading someone to talk to you is like getting blood out of a stone or getting blood from a stone , you are emphasizing that it is very difficult and that people are not being very helpful.	Blood, sweat and tears	If you refer to something as involving blood, sweat, and tears , you mean that it is a very hard thing to do and requires a lot of effort.	blood is thicker than water	People say ' blood is thicker than water ' when they mean that their loyalty to their family is greater than their loyalty to anyone else.	own flesh and blood	If you say that someone is your own flesh and blood , you are emphasizing that they are a member of your family.
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Term: Y6 T5	Focus of Study: Electricity										
NC Objectives	Key Knowledge and Vocabulary										

<p>Pupils should be taught to:</p> <p>associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.</p>	<p>Y6 Context for study: This unit is the second of only two science units where pupils learn about electricity as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils are able to identify common appliances that run on electricity. Pupils have a secure knowledge of simple series electrical circuits including that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a</p>
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compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.

use recognised symbols when representing a simple circuit in a diagram.

simple series circuit. They know some common conductors and insulators, and associate metals with being good conductors.

In Year 6, pupils learn about the scientists Benjamin Franklin and Thomas Edison and the key role they each played in the discovery of electricity. During this unit, pupils revise and build upon their previous knowledge of electrical circuits as they use recognised symbols when representing a simple circuit in a diagram. New learning includes associating the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Pupils compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.

Knowledge Content

The study of **electricity** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that electricity is created by **generators** which can be powered by **gas, coal, oil, wind or solar**.

Know that the electrical energy can be **converted** into other types of energy such as light, heat, movement or sound. Electricity is dangerous, so be careful when using electrical appliances.

Discovery of electricity

Know that American scientist **Benjamin Franklin** carried out important experiments relating to electricity in the 1700s. He conducted an experiment to show that lightning was electricity. He flew a kite in a thunderstorm and tied a metal key to the string to conduct the electricity. Lightning hit the kite and Franklin received an electric shock. It was lucky he was not seriously injured but it showed that **lightning was electrical**.



Benjamin West's c. 1816 painting *Benjamin Franklin Drawing Electricity from the Sky*

Know that it took until 1879 for people to find a way to turn electrical power into light - American inventor **Thomas Edison** invented the electric light bulb in this year.

Conductors and Insulators Revision from Y4

Know that some materials let electricity pass through them easily. These materials are known as **electrical conductors**.

Know that many metals, such as **copper, iron and steel**, are good electrical conductors. That is why the parts of electrical objects that need to let electricity pass through are always made of metal.

Know that metal is used in plugs to allow electricity to transfer from the wall socket, through the plug, and into a device such as a radio or TV.

Know that some materials do not allow electricity to pass through them. These materials are known as **electrical insulators**.

Know that plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity.

Know that the plastic covering that surrounds wires is an electrical insulator. It stops you from getting an **electrical shock**.

Circuits

Know that electricity can **flow** through the **components** in a complete electrical **circuit**.

Know that a circuit always needs a power source, such as a battery, with wires connected to both the **positive** (+) and **negative** (-) ends. A battery is made from a collection of cells connected together.

Know that a circuit can also contain other electrical components, such as **bulbs**, **buzzers** or **motors**, which allow electricity to pass through.

Know that electricity will only travel around a circuit that is **complete**. That means it has no gaps. You can use a **switch** in a circuit to create a gap in a circuit. This can be used to switch it on and off.

Know that when a switch is open (off), there is a gap in the circuit. Electricity cannot travel around the circuit. When a switch is closed (on), it makes the circuit complete. Electricity can travel around the circuit.

Know that a circuit always has a battery (cell) but it can also contain other electrical components, such as bulbs, buzzers and motors.

Know that when drawing **circuit diagrams**, rather than drawing detailed components, we use simple **symbols** to represent the different components.

Know that electricity **flows** through a **circuit**, with the **volt** being the **push** that moves **electrons** along the wires.

(Additional information can be found here -

<https://www.bbc.com/bitesize/topics/zq99q6f/resources/1>)

Know which symbols to use when drawing a circuit (Revision from previous unit)

Image removed

Know that the more volts there are in a circuit, the more power there is travelling through it. Understand that the higher the volts, the brighter a lamp and the louder a buzzer.

Know the following terminology -

Term	Definition
Circuit	An electrical circuit is a complete route which an electric current can flow around.
voltage	The voltage of an electrical current is its force measured in volts.
volt	A volt is a unit used to measure the force of an electric current.
battery	Batteries are small devices that provide the power for electrical items such as torches and children's toys.
components	the individual parts of an electrical circuit
current	the flow of electricity through a wire or circuit
series circuit	Components that are connected one after another on the same loop of the circuit are connected in series. The current that flows across each component connected in series is the same.

WORKING SCIENTIFICALLY

(Note - ensure children are confident with their understanding of how circuits work before designing circuits. Practical work then supports what they already know and is not used to teach knowledge)

Draw and design circuits using the correct symbols then build them. Systematically identify the effect of changing one component at a time. Predict and test outcomes.

Term: Y6 T6	Focus of Study: Evolution, Inheritance and Classification
NC Objectives	Key Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals</p> <p>give reasons for classifying plants and animals based on specific characteristics.</p> <p>describe the life process of reproduction in some plants.</p> <p>recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago</p> <p>recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</p> <p>identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</p>	<p>Y6 Context for Study: This unit is the final of six science units where pupils learn about plants and animals as part of the discipline of biology- the study of living organisms. This unit comes after pupils have studied a variety of living things in their local and wider environment. Pupils know species of animals and plants from the Amazon rainforest, how they are adapted to suit their environment and that adaptation may lead to evolution. Pupils can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Pupils have secure knowledge of the seven life processes, the requirements of plants for life and growth and food chains.</p> <p>In this unit, pupils revise and further develop their knowledge of the functions of the different parts of flowering plants related to reproduction. In Year 6, pupils learn that sexual reproduction in plants happens in a cycle-like pattern: germination, pollination, fertilization and seed dispersal (Year 3 revision).</p> <p>This unit builds on pupils' previous knowledge of the classification of living things. In Year 6, pupils describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. Pupils learn about plant taxonomy- the science that finds, identifies, describes, classifies, and names plants. Pupils learn about the modern classification system created by Carl Linnaeus and that each species is given a name using Latin words which links to the Year 5/6 Latin curriculum. Pupils are introduced to the taxonomic hierarchy in relation to the red fox which is the precursor to work pupils will study in KS3. During this unit, pupils also learn about the important role bees play in pollination in our ecosystem, understand why the global bee population is in decline and the need for conservation to maintain bee populations for the future.</p> <p><u>Knowledge Content</u> <u>Classification</u></p> <p>The study of plants is part of the discipline of biology - the study of living organisms.</p> <p>Know that plant taxonomy is the science that finds, identifies, describes, classifies, and names plants.</p>

Classifying organisms

Know that there are millions of species of living things on our planet. Know that it would be difficult to describe and name each one individually. Know that while species can be very different from each other, many of them have similar features that allow us to put them into groups.

Know that grouping things helps scientists identify gaps in their research and they get an idea of what to investigate next.

Modern classification system

Know that, in 1735 (in the eighteenth century), **Carl Linnaeus** started the modern system of organising species of organisms into certain groups and giving them scientific names.

Carl Linnaeus (1707 - 1778)

Each species is given a name using **Latin** words, so that the same name can be used all over the world.

Know that Latin is the language which the ancient Romans used to speak and is used frequently in science for classifying animals (relate to Latin content in the UKS2 Languages curriculum)

Know that the scientific name for modern human beings is '**homo sapiens**'. Know that homo means 'man' and sapiens means 'wise'. Know that homo is the **genus** name and sapiens is the **species** name. Putting different species into different groups according to their features is called **classification**.

Know that a genus is a class of similar things, especially a group of animals or plants that includes several closely related species.

Use the diagram below to introduce the taxonomic hierarchy in relation to the red fox. They will learn more about this in KS3.

Know that a **species** is a class of plants or animals whose members have the same main characteristics and are able to breed with each other.

Know that plants can be classified into two groups - flowering and non-flowering.

Know that non-flowering plants can be divided into two groups -

1. those that reproduce with dust-like particles called **spores**

2. those that use seeds to reproduce

Know the following plants by their appearance –

Flowering Plants	Non-flowering Plants
bluebell poppy rose dandelion daisy honeysuckle ivy snowdrop	ferns pine moss

Know that mushrooms and fungi are not plants - they belong to a separate classification of living things called fungi.

Revise the parts of a plant and their function - **roots, stem, leaves, flower**. (see Y2 T6)

Life cycle of a plant

Know that sexual reproduction in plants happens in a cycle-like pattern. Flowers come from seeds, and they create seeds too. All flowering plants go through the following life cycle -

1. **Germination** is the process by which a plant begins to grow from a seed. Roots form under the soil. The stem, leaves and flower emerge above the soil.
2. **Pollen** produced by a flower is carried by insects or blown by the wind to another flower. This process is called **pollination**.
3. When the pollen reaches another flower, it travels to the **ovary** where it **fertilises** the **ovules (egg cells)** to make seeds. This process is called **fertilisation**.
4. These seeds are scattered by animals or the wind. This process is called **dispersal**. Some of the seeds will grow into new plants.

Know the parts of a flower related to reproduction - **stamen** (male) consists of the **anther** and **filament**. The **carpel** (female) consists of the **stigma, style, ovule** and **ovary**. Know how to label these on a diagram of a flower.

Seed dispersal

<https://www.bbc.com/education/clips/znvfb9q>

(Revision from Y3 T4)

Importance of bees (<http://www.bbc.co.uk/guides/zg4dwmn>)

Know that bees play an important role in pollination.

Know that the **global bee population** is in **decline because of pesticides, parasites, disease** and **habitat loss**

Know that without bees our **ecosystem** would struggle because fewer plants would be pollinated and therefore fewer plants would grow.

Know that bee **conservation** is important to maintain bee **populations** for the future.

Know that conservation is 'saving and protecting the environment'

Know different ways to encourage bees into gardens.

Know that a hive is a structure in which bees are kept, which is designed so that the beekeeper can collect the honey that they produce.

Know that there are many species of bees recorded in the UK. Recognise the difference between bumblebees and honey bees

Know that bees can sting and many die after stinging as the sting is **barbed** and sticks in the skin. This means a large part of the bee is left behind after it has stung causing its death. The sting contains **venom** that can cause itchiness and an uncomfortable feeling for a few days.

Common Phrases involving bees/hives

Know the following common phrases and their meanings -

Phrase	Meaning
busy bee	a person who has lots to do - bees are famous for being hard working
spelling bee	a spelling competition
bee in your bonnet	being enthusiastic or worried about something so that you keep mentioning it
bee's knees	something which is particularly good.
beeline	the most direct route between two places
hive of activity	a location where things are very busy
swarm around something	to gather closely around something like a swarm of bees might.

The study of **evolution** and **inheritance** is part of the study of **biology** - the study of living **organisms**.

Know that **characteristics** are passed from parents to their **offspring**. Use the example of different **breeds** of dog (including what happens when **Labradors** are crossed with **poodles**). Know that **variation** in **offspring** over time can make animals more or less able to survive in particular environments e.g. the development of **insulating** fur on the **arctic fox**.

Charles Darwin

Know that Darwin lived from 1809 - 1882 and is known for his theory of **evolution**.

Know that Darwin studied animals and plants (a biologist) and developed the idea of **natural selection** to explain how different species had evolved over time.

Know that he explained his **theory** in his most famous book '**On The Origin of Species**'

Know that his theory was formulated whilst studying animals on the **HMS Beagle** voyage between 1831 and 1836 including the **Galapagos islands**.

Know that Darwin said 'A man who dares to waste one hour of time has not discovered the value of life'

Know that the theory of evolution states that evolution happens by **natural selection** through the following process

The Process of Evolution

1. More organisms are born than can survive.
2. These individuals all have slight **variations** between them.
3. Some of these variations are helpful and improve an organism's chance of **survival**
4. Those that survive pass their **characteristics** onto their **offspring**.
5. Over time these helpful variations are passed on to the next **generation**.
6. This process takes thousands of years and can't be seen from one generation to the next.

Know the term **inheritance** as 'the passing on of characteristics from parent to offspring' (<http://www.bbc.co.uk/timelines/zq8gcdn>)

WORKING SCIENTIFICALLY

Know the story of Darwin's finches and how the shape of their beaks helped Darwin to develop his theories. Know that in biology, an **adaptation** is defined as '*the process of change by which an organism or species becomes better suited to its environment.*'

Know the case study of the **peppered moths** as described in Moth: An Evolution Story.

Peppered Moths Case Study

1. Light-coloured moths were common

2. During the Industrial Revolution (1760 – 1840) coal burning covered the moth's habitats in black soot
3. This gave the dark coloured moths a greater chance of survival because they had better camouflage than the light moths
4. Many light-coloured moths died as they were easily spotted by their prey
5. Dark coloured moths became more common
6. As pollution has reduced over time the light-coloured moths have now become more common again

CORE READING - Moth: An Evolution Story by Isabel Thomas

Understand the case study of Darwin's Finches as a further example of evolution and natural selection in action - <https://www.youtube.com/watch?v=s64Y8sVYfFY&vl=en-GB>

Fossilisation

Know that **fossilisation** is the process that forms fossils. Know that a fossil is 'the remains or impression of a prehistoric plant or animal **embedded** in rock and preserved in **petrified** form'

Know that **prehistoric** means 'before written history'. Know that **preserved** means 'to keep something as it is'. Know that **petrified** means 'change into stone'

Know that an **ammonite (a-muh-nite)** is a **mollusc** that lived in the sea over 65 million years ago. Know what an ammonite fossil looks like and identify them from images of fossils.

Know these dinosaur names and identify from images -

Tyrannosaurus Rex, Brachiosaurus, diplodocus, stegosaurus, triceratops, iguanodon, velociraptor.

Know the term dinosaur comes from the Greek word deinos (terrible) and sauros (lizard) which, put together, makes 'terrible lizard.'

Know that dinosaurs are actually **reptiles** not lizards.

Know that a **pterodactyl** is not regarded as a dinosaur although lived at the same time.