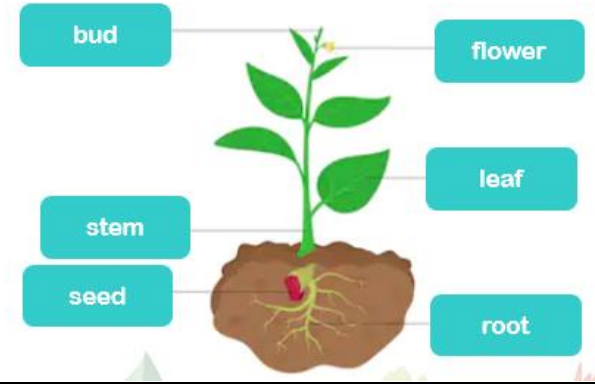
Snarestone CE Primary School

Science

Progression Map Years 1-6

Biology	Plants			
Year 1/2 **Step 1**	**Introduction to plants** • Understand what a plant needs in order to grow well • Know the basic parts of a plant • Understand that some food is grown as a crop on a farm • Know about different arable crops grown by farmers • Understand the difference between an evergreen and deciduous plant • How plants change over time	**Core knowledge** • Farmers can farm both animals and crops. • There are different kinds of farm for different produce i.e. dairy, grain, citrus. • Land used for crop farming is called 'arable.' • Plants need water, light, space and nutrients to grow. • Seeds are moved by insects or the wind. • You can tell how old a tree is by the amount of rings inside it.	**Key diagrams** 	**Vocabulary** seed root flower stem crop leaf fruit grain
Year 1/2 **Step 2**	**Plants – growth and care** • Understand what a plants need in order to thrive • Understand that plants need water, light and a suitable temperature in order to grow well • Understand the difference between a bulb and a seed • Understand that plants make their own food • Know how plants grow from a seed to a plant • Recognise the importance of flowers and seeds	**Core knowledge** • Flowers are brightly coloured to attract insects, like bees, to the pollen • Plants take both nutrients and water from the soil through the roots • Many fruits and veg we eat, like apples and broccoli, actually come from the flower of the plant • Greenhouses can be used to help grow plants, but the best place is out in the open air with real sunlight and rainfall	**Key diagrams** 	**Vocabulary** germinate nutrient produce bulb seed fertilised dormant pollen

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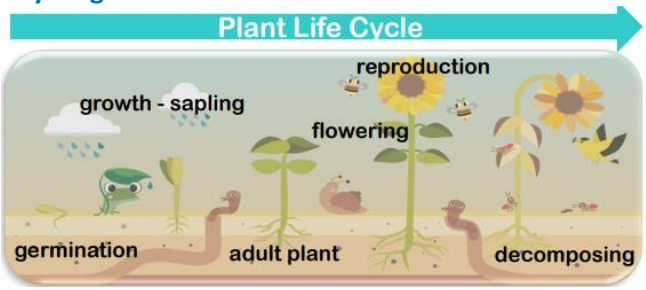
Year 3/4 **Step 3**	**Exploring the world of plants** • Describe how plants soak up water • Describe the life cycle of a plant • Explain how plants make their own food • Name the parts of a flower and describe what they do • Describe the process of pollination • Describe the different ways plants share their seeds	**Core knowledge** • Root hairs are tiny strands on roots which absorb the water and nutrients from the soil • Xylem and phloem are a bit like veins – they go right from the roots, through the stem, to leaves. Xylem transport water, phloem moves the food and nutrients • Transpiration - water escapes from the leaves, which forces the plant to suck more water up via the xylem to replace what it has lost • Parts of a flower - all these parts are vital: The petal is bright and pretty to attract insects; the anther makes pollen and is held up by the filament; the stigma is sticky to stop the pollen dropping, and this sits on a tall style to make sure the insect can find it	**Key diagrams** 	**Vocabulary** transpiration carbon dioxide photosynthesis pollination dispersal xylem phloem glucose
Year 3/4 **Step 4**	**Exploring the world of plants** • Describe the process of germination in seed and bulbs • Explain how water and food moves around a plant • Asexual reproduction in plants • Describe the features of non-vascular plants • Explore extraordinary plants and fungi • Explore the rainforest and its problems	**Core knowledge** • Asexual reproduction occurs in plants such as potatoes and strawberries. A strawberry plant sends out a shoot to find a place to grow a new plant. A potato has an 'eye' which can be replanted to make a new potato plant! Fungi: • Are a type of living organism. The most well-known example is a mushroom. They have a very different life cycle to plants. • They often grow on trees or in damp areas on the ground. • There are many extraordinary fungi. Many of them are poisonous to animals or humans. Insectivorous plants: • Unbelievably, some plants actually eat insects, not the other way around! • A Venus Flytrap is an example. It has tiny hairs inside it which sense the movement of an insect. At this point, it's leaves snap together, trapping the insect inside it. • There are some other plants which even eat small mice!	**Key diagrams** 	**Vocabulary** germination non-vascular asexual reproduction fungi insectivorous deforestation biodiversity fertilisation

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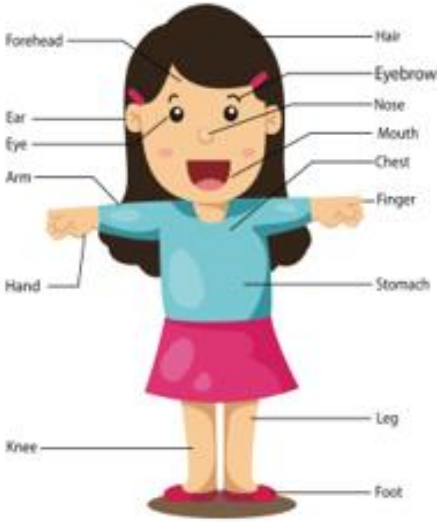
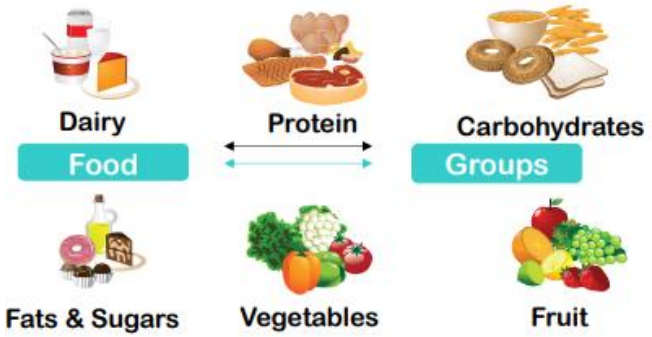
Biology	Animals, including humans			
Year 1/2 Step 1	**About me** • Learn about the senses: sight, taste and touch • Learn about the senses: hearing and smell • Identify, name, draw and label the basic parts of the human body • Learn about changes in your body since you were a baby • Understand the importance of taking care of your body • Show how humans mimic nature	**Core knowledge** • There are 270 bones in the human body • The brain controls our body • Exercise is important because it keeps us healthy • It is important to keep clean by washing our bodies and hair and cleaning our teeth • We need to sleep well because it gives us more energy the next day • Our 5 senses: 	**Key diagrams** 	**Vocabulary** sight smell exercise healthy design baby grow bones
Year 1/2 Step 2	**Diet and health** • Learn the importance of nutrition for humans • Find out about, and describe, the basic needs of animals, including humans, for survival (water, food and air) • Explore what's in your packed lunch • Discuss the importance of exercise, a healthy diet and hygiene • Describe how animals obtain their food from other animals • Know how to keep healthy through daily exercise	**Core knowledge** • It is recommended that we eat five portions of fruit or vegetables a day • Vitamins and minerals are important for your skin, hair and bones • Eating lots of fatty and sugary foods mean we are more likely to get ill • Good exercise or activity is one that gets your heart beating faster than normal	**Key diagrams** 	**Vocabulary** exercise hygiene healthy nutrition portion balanced diet measuring temperature

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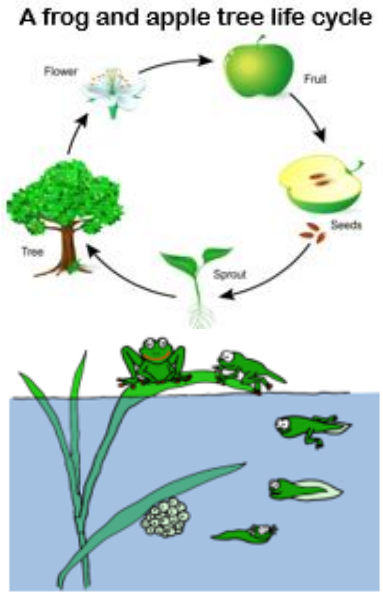
Year 1/2 **Step 3**	**About animals** • Understand what animals need in order to grow • Know where birds live and what they need • Explore how animals need to be cared for differently • Explore how an animal's offspring is the same as its parent • Identify a variety of animals including fish, amphibians, reptiles, birds and mammals • Identify a variety of common animals that are herbivores, carnivores and omnivores	**Core knowledge** • Animals can live in our homes, in the wild, in a farm or in a zoo • Animals eat different things – they are carnivores, herbivores or omnivores • A pet can be lovely to care for and be a friend • Pets need water, food, shelter and lots of care • Animals that live in the wild need a habitat to live in • All animals and plants are part of food chains	**Key diagrams** 	**Vocabulary** pet mammal offspring care bird fish reptile amphibian
Year 1/2 **Step 4**	**Growth** • Learn the lifecycle of birth, growth, reproduction and death • Learn about reproduction and growth in animals • Learn how humans grow by looking at how babies grow into adults • Describe the stages of life from adulthood to old age • Know the lifecycle of a frog • Describe the lifecycle of a butterfly • Compare generations of families to understand how characteristics are inherited	**Core knowledge** • Most animals either give birth directly from the mother or by laying and hatching eggs • A life cycle is called a 'cycle' because it goes round and round and repeats itself • A baby has more bones than an adult because some bones fuse together as you grow • A female frog lays around 1,000 eggs at a time!	**Key diagrams** 	**Vocabulary** birth growth reproduction death life cycle generation child adult

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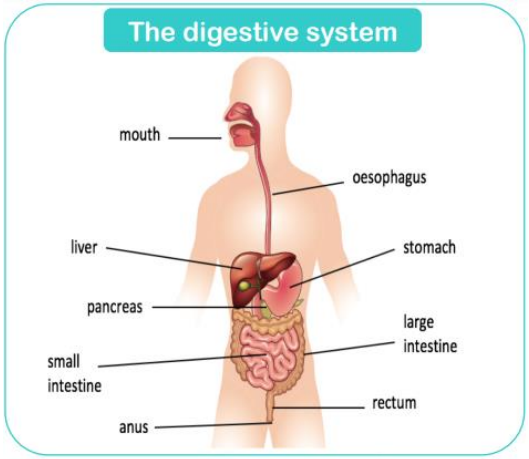
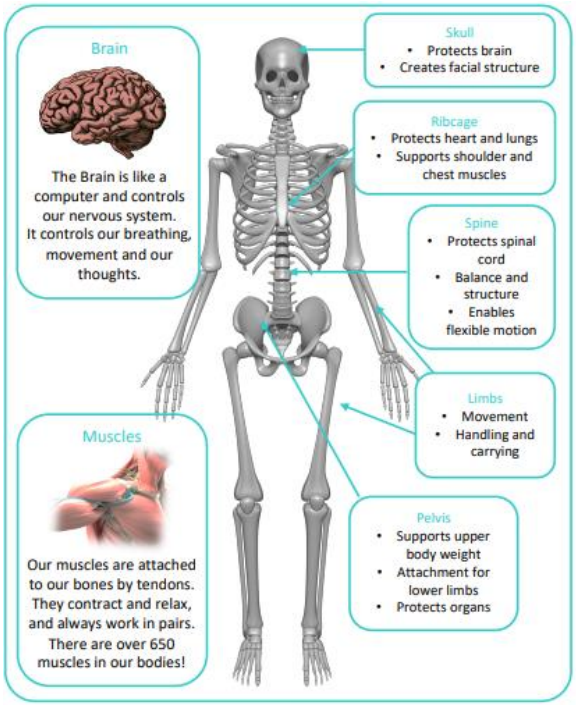
Year 3/4 **Step 5**	**Food and digestion** • Understand salivary glands and taste-buds • Know the different types of teeth • Understand the intestines • Understand the food pyramid and why it is important • Know about vitamins and minerals • Understand the food chain, know how natural cycles work	**Core knowledge** • Most of our protein comes from meat, fish, eggs and nuts • Fruit and vegetables are full of the vitamins we need to be healthy • A food chain is vital for nature to survive • We are 'consumers' as we eat food to make the energy we need • In the UK, 1.9 million tonnes of food is wasted each year! • The food pyramid: 	**Key diagrams** 	**Vocabulary** salivary gland oesophagus intestines food pyramid nutrient vitamin digest decomposer

Year 3/4
 	
Step 6
	What makes us?
	• Know how to keep healthy through diet
	• Design a healthy dinner for Tim Peake in space
	• Learn about voluntary and involuntary muscles
	• Introduction to the skeleton
	• Know about the skeleton tendons and ligaments
	• Explore how skeletons and muscles are used for support, protection and movement
		Core knowledge
		• The different food types:
		  ○ Fruit and vegetables;
		  ○ Bread, rice, potatoes, pasta and other starchy foods
		  ○ Milk and dairy
		  ○ Oils and spreads
		  ○ Meat, fish, eggs, beans and other non-dairy sources of protein.
		• Protein helps your body to grow and repair itself, e.g. red meat, yogurt, beans
		• Carbohydrates give you energy, e.g. bread, potatoes, pasta
		• Fats give you energy, e.g. nuts, oils, avocados
		• Vitamins keep your body healthy, e.g. oranges, carrots and nuts
		• Minerals keep your body healthy, e.g. milk, sweetcorn, spinach
		• Fibre helps you to digest the food that you have eaten, e.g. wholegrain bread, cereals and lentils
		• Water helps to move nutrients in your body and get rid of waste that you don't need. Examples of foods high in water include celery, cucumber, tomatoes.
			Key diagrams
			 
				Vocabulary
				
				skeleton
				tendon
				voluntary muscle
				involuntary muscle

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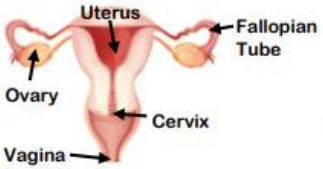
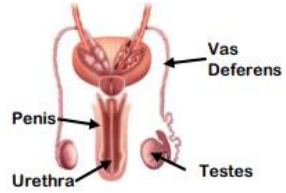
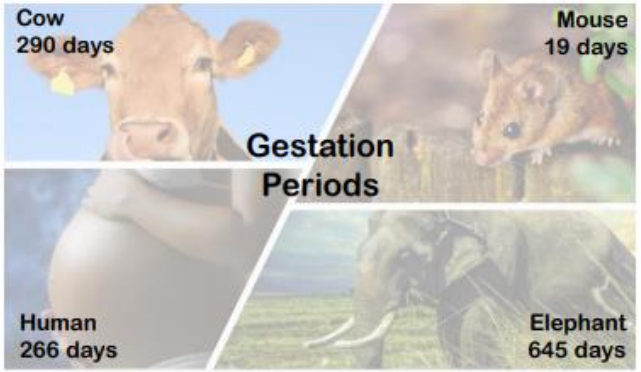
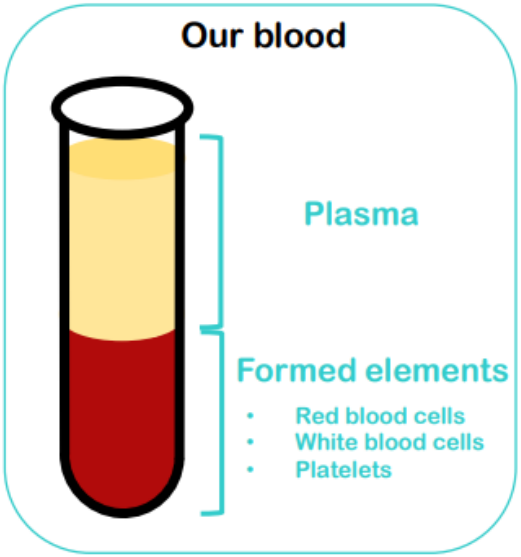
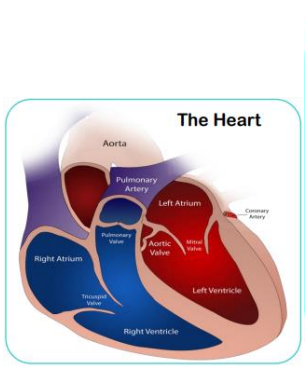
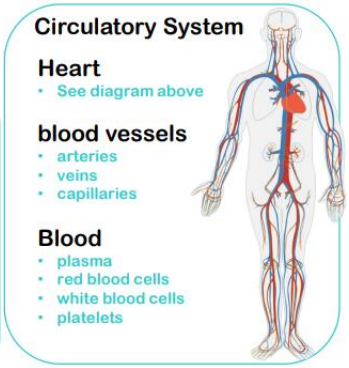
Year 5/6 **Step 7**	**The human life cycle** • Know about life cycles • Know about the human reproductive organs • Exploring gestation periods • Describe the changes which happen in childhood • Understand changes which happen in adolescence • Describe the changes as humans develop to old age	**Core knowledge** • During puberty, we can expect to grow, for hair to grow on our bodies and for genitalia to grow. It can also affect our mood due to hormonal changes. • In old age, we can expect degeneration – for example: eyesight and hearing declines, we may get grey hair and our memories fade. • Female reproductive system - the female reproductive organs are designed to enable fertilisation and birth. Each month, a female releases an egg from her ovary, which travels down the fallopian tube towards the uterus. If it meets a male sperm and fertilises, the baby is grown inside the uterus. The entrance of the vagina is able to widen, which allows the new-born baby to emerge. • Male reproductive system - the male reproductive system works by the testes producing and storing millions of tiny sperm cells. During sexual intercourse, the sperm travels through the vas deferens in a fluid called semen and into the urethra. During ejaculation, millions of sperm cells are released from the penis and one can fertilise a female egg – the start of making a baby. • Fertilisation - this is the point when a sperm cell and an egg cell meet inside the female. When a male ejaculate, millions of sperm swim to meet the egg. Many of these are killed or destroyed, but one may penetrate the egg and fertilise it. The sperm and the egg each contain half the information needed to make a new person; once these cells have fused together, a new person begins to grow.	**Key diagrams**    	**Vocabulary** reproduce puberty adolescence hormone memory childhood gestation fertilisation

Year 5/6 **Step 8**	**Blood and transportation** • Describe the composition of blood • Describe how oxygen is moved around the body • Explain how blood is filtered • Describe what a blood transfusion involves • Describe how diabetes is managed • Describe the roles of bacteria	**Core knowledge** • Blood is composed of a liquid called plasma, red blood cells, white blood cells and platelets. • Blood needs to be filtered to remove damaged red blood cells and to remove substances which could make us ill. • A phlebotomist is the name given to a nurse who takes blood samples to find a diagnosis. • Karl Landsteiner was a scientist who found that there is more than one blood type in humans. • Not all bacteria are bad. The bacteria which lives in our gut helps us stay healthy. • Bacteria can help break down decaying material so nutrients are free to be used by plants. • Diabetes is an illness of the pancreas, where it can't produce enough insulin. It means the amount of sugar in the blood can't easily be controlled. People who suffer from diabetes may have to inject themselves with insulin.	**Key diagrams** 	**Vocabulary** transfusion plasma pancreas diabetes transportation spleen alveoli bacteria
Year 5/6 **Step 9**	**The heart and health** • Describe the function of blood • Describe the function of blood vessels • Describe how your heart moves blood around the body • Describe what affects your heart rate • Describe the consequences of an unhealthy lifestyle • Explore the different food groups and identify ways to eat a balanced diet	**Core knowledge** • Checking your pulse tells us how often your heart contracts to pump blood through your body. • A healthy heart beats between 60 and 100 times a minute. • Regular exercise will help keep your heart healthy. • Human hearts are about the size of our fist. • Arteries transport blood away from the heart and veins transport blood back to the heart. • We need to eat a balanced diet so our bodies receive the range of nutrients which are needed for normal function.	**Key diagrams**  	**Vocabulary** blood vessels circulatory system oxygenated capillary heart rate addiction nutrients balanced diet

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Biology	Living things and their habitats (inc. evolution and inheritance)			
Year 1/2 **Step 1**	**Living things and their habitats 1** • Explore the differences between things that are living, dead, and things that have never been alive • Identify and name a variety of plants and animals in a micro-habitat • Describe how animals obtain their food from plants • Know about different sources of food grown by farmers • Understand the journey food makes from the farm to the supermarket • Learn about the food chain	**Core knowledge** • Thousands of new species of plants and animals are discovered every year • Many animals and plants have changed over time to adapt to their habitat • Farmers are busy all year round preparing the ground and growing crops, as well as looking after animals and breeding animals • A microhabitat is a small area which differs somehow from the surrounding habitat • Some habitats include – desert, rainforest, woodland, mountain, river, ocean	**Key diagrams**  desert rainforest woodland mountain river ocean	**Vocabulary** habitat desert woodland producer root vegetable living excrete microhabitat

Year 1/2

Step 2

Habitats around the world

- Know that living things live in environments to which they are suited
- Appreciate that environments are constantly changing
- Describe life in the ocean
- Appreciate the dangers to ocean life
- Explore the arctic and Antarctic habitat
- Explore the rainforest and its problems
- Understand desert, underground and ocean habitats

Core knowledge

- A habitat is a place where living things, such as animals and plants, can find all of the things they need to survive. This includes food, water, air, space to move and grow and some shelter.
- Some habitats are large, like the ocean, and some are very small, such as under a log.
- Some habitats in our local area include the river and woodlands. Other habitats include the coast and the forest.
- Producers — plants are known as producers. This is because they produce their own food!
- Consumers — animals are consumers, because they can't create their own food. Their food can be both animals or plants!
- Animals and plants depend on each other to survive.

Microhabitats:

- Microhabitats are very small habitats where minibeasts may live. Examples of microhabitats include under stones, in grass, under fallen leaves and in the soil.
- Minibeasts that can be found there include worms, snails, ants, centipedes, millipedes, and butterflies and they help to keep the microhabitat healthy.
- Minibeasts are able to survive in their habitats because they can find the things they need to survive there, such as food and water. For example, caterpillars can survive on leaves as they give them food.

Key diagrams

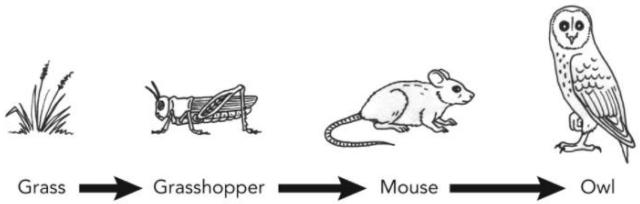
An example of how animals and plants depend on each other to survive:

Worms depend on plants because they feed on dead leaves, but plants depend on worms who make the soil healthy by digging holes and allowing air in.

Birds also need worms because they eat them. Worms are a source of food for birds. This called a food chain.

If there were no worms, there would be less birds as there would be more competition for food. The soil would not be as healthy without worms.

An example of a food chain:



The grass is the producer
The grasshopper, mouse and owl are all consumers

Vocabulary

producer
consumer
microhabitat
food chain
minibeast
Arctic
Antarctic
ocean
desert
rainforest

Year 3/4

Step 3

Classifying living things and their habitats

- Understand habitats
- Know how scientists classify animals
- Understand the difference between vertebrate and invertebrate
- Know about cold-blooded amphibians and reptiles
- Know about warm-blooded birds and mammals
- Understand how fish are different from amphibians and reptiles

Core knowledge

Mammals:
- Can be carnivorous, omnivorous or herbivorous
- Hair and fur; four-chambered hearts; females give milk; have milk; vertebrates
- Warm-blooded

Insects:
- Can be carnivorous or herbivorous
- Made up of a head, thorax and abdomen; six legs; invertebrates
- Cold-blooded

Birds:
- Can be carnivorous, omnivorous or herbivorous
- Feathers; wings; beaks; lays eggs; vertebrates
- Warm-blooded

Fish:
- Mostly carnivorous
- Breathe with gills; scales; fins; can swim; most are vertebrates
- Cold-blooded

Amphibians:
- Can be carnivorous or herbivorous
- Live in water or land; can breathe through gills or lungs; vertebrates
- Cold-blooded

Reptiles:
- Can be carnivorous or omnivorous
- Most lay eggs; has scales; live in water or land, vertebrates
- Cold-blooded

Key diagrams

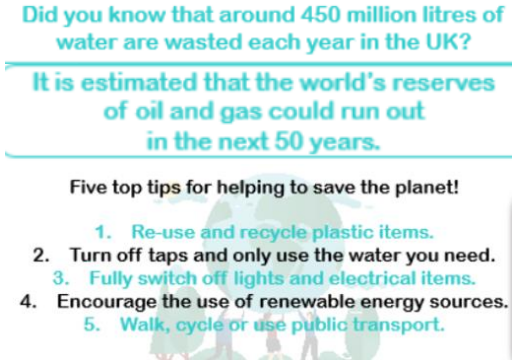
Type	Food	Body	Blood
Mammal 	Can be carnivorous, omnivorous or herbivorous	• Hair and fur • Four-chambered hearts • Females give milk • Have teeth • Vertebrates	Warm-Blooded
Insect 	Can be carnivorous or herbivorous	• Made up of a head, thorax and abdomen • Six legs • Invertebrates	Cold-Blooded
Bird 	Can be carnivorous, omnivorous or herbivorous	• Feathers • Wings • Beaks • Lays eggs • Vertebrates	Warm-Blooded
Fish 	Mostly carnivorous	• Breathe with gills • Scales • Fins • Can swim • Most are vertebrates	Cold-Blooded
Amphibian 	Can be carnivorous or herbivorous	• Live in water or land • Can breathe through gills or lungs • Vertebrates	Cold-Blooded
Reptile 	Can be carnivores or omnivorous	• Most lay eggs • Has scales • Live in water or land • Vertebrates	Cold-Blooded

Vocabulary

classify
vertebrate
invertebrate
cold-blooded
warm-blooded
sample
exoskeleton
creature

<table>
<tr>
<td>Year 3/4

Step 4</td>
<td>Nature and the environment

Know about the balance of nature
Describe ecosystems and how they are affected by changes in the environment
Understand human impact on the environment
Explore air pollution
Understand water pollution
Explore methods that can be used to conserve water
</td>
<td>Core knowledge

</td>
<td>Key diagrams

</td>
<td>Vocabulary

ecology
interdependent
ecosystem
environment
pollute
chemical
habitat
emission</td>
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<tr>
<td>Year 5/6

Step 5</td>
<td>Studying living things

Know about the life and work of Sir David Attenborough
Know about the life and work of Dame Jane Goodall
Learn about sexual reproduction
Describe the life cycles of a mammal, bird and reptile
Describe the life cycle of an insect and amphibian
Learn about asexual reproduction
</td>
<td>Core knowledge

All living things can: move, respire, have senses, grow, reproduce, excrete and take in nutrition.
Most mammals, including humans, go through ‘live birth.’ This means that the mother gives birth to it as a live mammal; it is just a smaller version of an adult. These mammals will grow into adults over time.
Most birds and reptiles are born when the mother lays eggs and incubates them until they are ready to hatch. Once the egg is hatched, the baby is looked after by the mother for a period of time, and then leaves the nest to fend for itself.
Amphibians are a bit different. Many of these are born live or via eggs underwater, but complete a metamorphosis as adults and can live and breathe on land. An example of this is a frog. It starts as frogspawn, changes to a tadpole and then into a frog!
Living things that reproduce asexually include bacteria, mould, algae and fungi. This means they reproduce by themselves!
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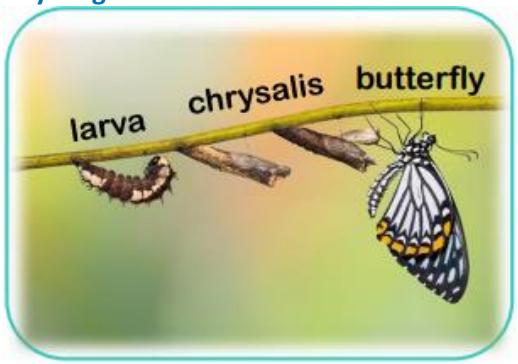
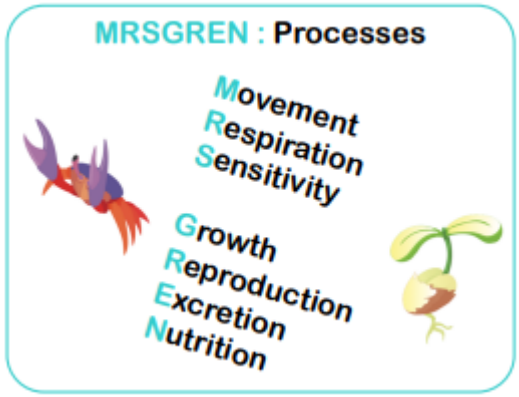
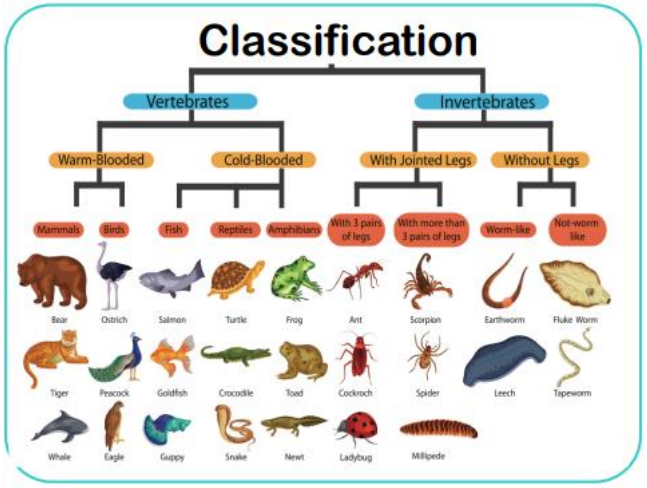
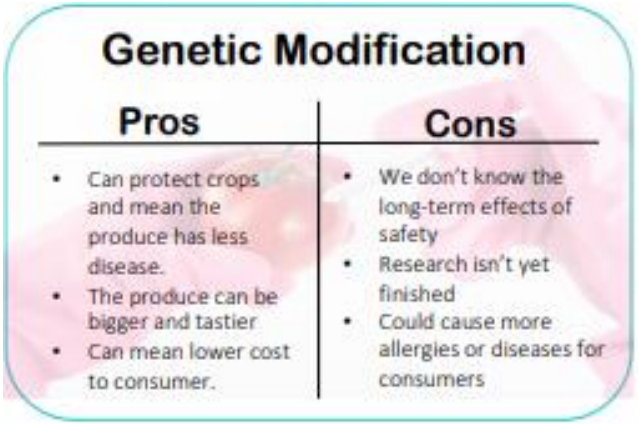
<td>Key diagrams

</td>
<td>Vocabulary

Sir David Attenborough
Jane Goodall
naturalist
metamorphosis
endangered
documentary
asexual reproduction</td>
</tr>
</table>

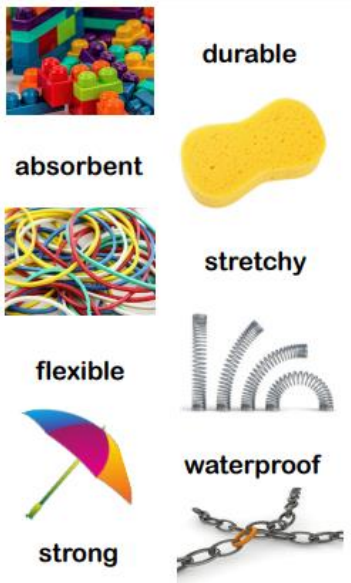
Year 5/6 **Step 6**	**Living things and their habitats 2** • Classify living things • Explore the kingdoms of life • Describe the work of Carl Linnaeus • Identify different classes of vertebrates • Explore soil habitats • Describe different types of fungi	**Core knowledge** • The six living kingdoms are: animals, plants, fungi, bacteria, protists and archaea. • Carl Linnaeus' book called 'Systema Naturae' laid out the classification of living things. • Fungi are their own kingdom as they gain energy from dead plants and animals, not the sun. • An ecosystem is a community of interactive living things which rely on each other to live and grow. • Soil mainly contains micro-organisms, of which there are billions. • Processes of living things: MRS GREN Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion, Nutrition	**Key diagrams**  	**Vocabulary** classify prokaryote species vertebrate invertebrate microorganism fungi kingdom

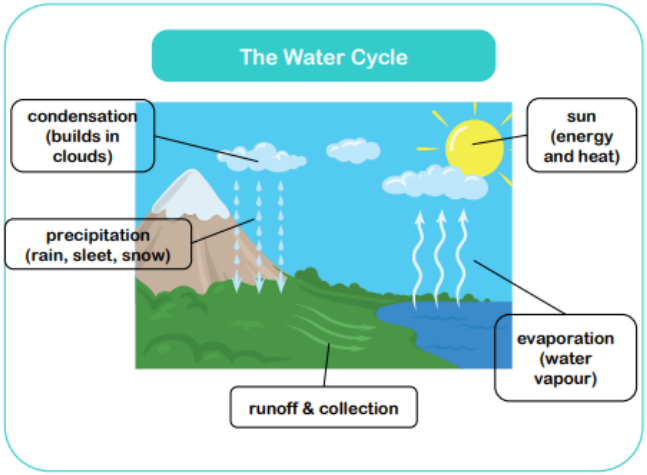
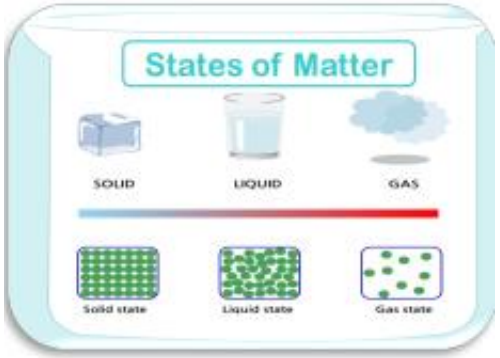
Year 5/6 **Step 7**	**Evolution and inheritance** • Explain how adaptations help animals and plants survive • Explain what fossils can tell us • Describe the process of genetic modification • Explain why animals can look different to their parents • Describe the process of natural selection • Explore the work of palaeontologist Mary Anning	**Core knowledge** Charles Darwin and Natural Selection: • Different species of animal had evolved from one shared ancestor • Animals had adapted to suit the habitats and environments they live in • Those animals that didn't adapt had become extinct. Called the 'Survival of the Fittest.' • Many religious people were angry at his theory to start with • Humans are 99.9% all the same, but the other 0.1% contains enough DNA information to make us all different! • Some animals are bred to make products and others for scientific research. • Animals can also be bred for cultural or ethical reasons, or to be kept as pets. • A GM crop is 'genetically modified' and is one which scientists have altered to protect against disease. • Mary Anning was a famous palaeontologist who discovered lots of fossils • Fossils are the casts of dead organisms who were alive millions of years ago.	**Key diagrams**  	**Vocabulary** evolution inheritance DNA natural selection ancestor husbandry generation fossilisation

<table>
<tr><th>Chemistry</th><th colspan="4">Materials</th></tr>
<tr>
<td>Year 1/2

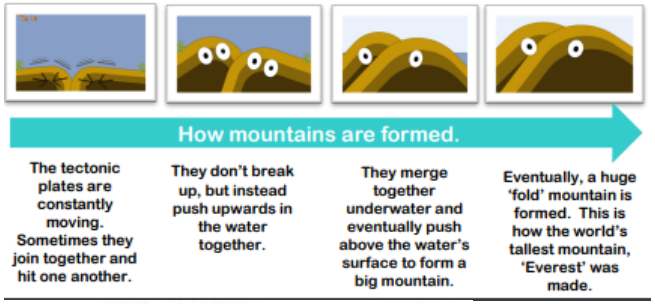
Step 1</td>
<td>Exploring everyday materials
Identify the material objects are made from
Describe some physical properties of materials
Group together materials by their physical properties
Explore everyday materials which are opaque or transparent
Know the story of Wilbur and Orville Wright
Explore everyday materials which are absorbent or non-absorbent</td>
<td>Core knowledge
There are lots of words we can use to describe materials:
transparent/opaque
flexible/rigid
absorbent/waterproof
strong/brittle
light/heavy
It is very important to test for the best materials to make any object. The materials used in cars are tested by crashing the car many times!
Some materials sink and some materials float.
All ceramics are man-made objects.
You can sometimes make something waterproof by covering it in wax or oil.
The Wright Brothers' first test flight lasted only 12 seconds!</td>
<td>Key diagrams
 
</td>
<td>Vocabulary
flight
structure
transparent
opaque
translucent
flexible
rigid
oil</td>
</tr>
<tr>
<td>Year 1/2

Step 2</td>
<td>Uses of everyday materials
Know everyday uses of magnets
Recognise a variety of widely-used materials
Understand why materials are chosen for specific tasks
Understand that magnets only attract certain metals
Understand that magnets have a north and south pole
Know how to test materials for their strength; understand that some materials are natural and some are man-made</td>
<td>Core knowledge
Iron is a magnetic metal, but aluminium is not magnetic.
Glass is made by heating up sand!
You can find hardwoods like oak and softwoods like pine.
Recycling is very important to help our planet.
Most materials we buy can be recycled or re-used.
Gold is sometimes found by miners blowing up holes in the ground!
Materials are tested a lot before being used to make something.
For clothing, cotton is grown on plants and silk starts life being made by a silkworm!</td>
<td>Key diagrams
 
</td>
<td>Vocabulary
magnet
metal
wood
plastic
paper
man-made
natural
recycle</td>
</tr>
</table>

Year 1/2 **Step 3**	**Everyday materials** • Explore the work of Charles MacIntosh; understand how the properties of materials can be changed • Know about John McAdam's invention; recognise that new materials are constantly being invented • Explore the work of John Dunlop; identify and compare the usefulness of certain materials when forces are applied • Explain why we use certain materials • Investigate squashing, bending, twisting and stretching • Compare the uses of everyday materials	**Core knowledge** • To change the shape of an object, you must always apply a force to it. • Tarmac was named after road-builder John Macadam and a raincoat (mac) was named after inventor Charles MacIntosh. • Rubber – used in car tyres, elastic bands and much more, is originally grown on trees in the rainforest. • Most of the materials we use every day can be recycled and made into new items. It is important to recycle.	**Key diagrams** 	**Vocabulary** force absorbent waterproof stretch repel squash properties invention

Year 3/4 **Step 4**	**States of matter** • Compare and group solids, liquids and gases • Investigate the effect temperature has on changing state • Understand diluting and dissolving • Understand evaporation and condensation • Understand the water cycle • Describe freezing and melting	**Core knowledge** • States of matter: solid, liquid, gas • A 'mixture' is something that is physically joined together but can be separated again. • Mixtures can be separated in so many ways – such as evaporation, distillation, filtering and absorption. Dissolving: • The item being dissolved is the solute. • The substance dissolving it is called the solvent. • When the solvent can dissolve no more of the solute, it is called 'saturation'. Diluting: • This process reduces the concentration of a solute in a solution. • Takes place by adding more of the solvent to the solute. • A good example of this is adding more water to orange squash.	**Key diagrams**  	**Vocabulary** water cycle molecule solvent solute evaporation water vapour condensation distillation

"Participate, excel, take pride!"

Year 3/4 **Step 5**	**Rocks** • Describe how mountains are formed • Recognise the differences between igneous, sedimentary and metamorphic rocks • Understand what a fossil is • Describe what soils are made of • Observe rocks, including those used in buildings and gravestones • Classify different types of gravestone weathering	**Core knowledge** • Types of rock: igneous, sedimentary, metamorphic • Types of soil: chalky, sandy, peaty Rocks react to weathering in different ways: • Physical weathering is when rocks can be broken up by ice, which thaws in the rock and makes it crack. • Chemical weathering can be caused by acid rain dissolving the rock over many years. • Biological weathering is when plants and fungi, such as lichens and moss, grow. How mountains are formed: 1. The tectonic plates are constantly moving. Sometimes they join together and hit one another. 2. They don't break up, but instead push upwards in the water together. 3. They merge together underwater and eventually push above the water's surface to form a big mountain. 4. Eventually, a huge 'fold' mountain is formed. This is how the world's tallest mountain, 'Everest' was made.	**Key diagrams**   	**Vocabulary** metamorphic rock igneous rock sedimentary rock soil types weathering acid rain fossil mineral

Year 5/6

Step 6

Properties of materials

- Compare the properties and uses of different materials
- Describe the properties of different materials
- Make the perfect sandcastle
- Explore the work of Spencer Silver and Ruth Benerito
- Explore extracting useful substances from natural resources
- Explore the thermal conductivity of materials to improve energy efficiency in buildings or other systems

Core knowledge

Ways to test materials:

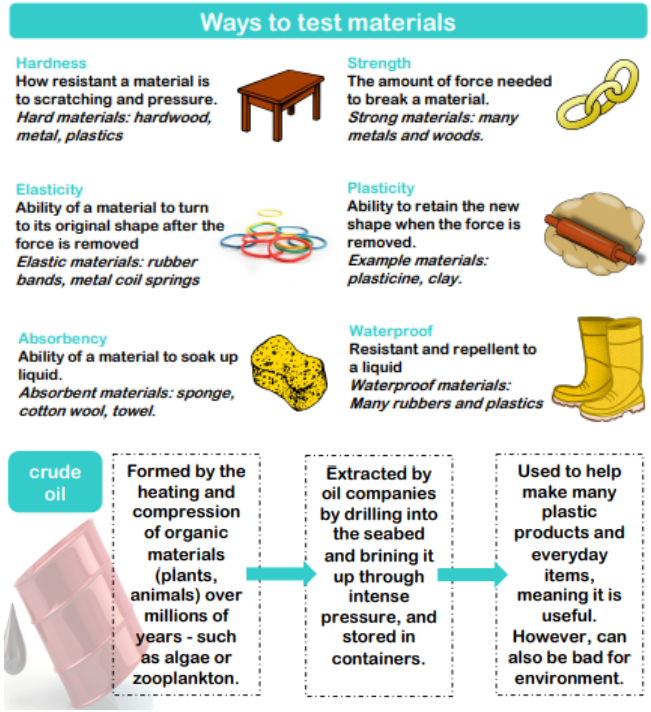
1. Hardness - how resistant a material is to scratching and pressure (e.g. hardwood, metal, plastics)
2. Elasticity - ability of a material to turn to its original shape after the force is removed (e.g. rubber bands, metal coil springs)
3. Absorbency - ability of a material to soak up liquid (e.g. sponge, cotton wool, towel)
4. Strength - the amount of force needed to break a material (e.g. many metals and woods)
5. Plasticity - ability to retain the new shape when the force is removed (e.g. plasticine, clay)
6. Waterproof - resistant and repellent to a liquid (e.g. any rubbers and plastics)

Crude oil:

1. Formed by the heating and compression of organic materials (plants, animals) over millions of years - such as algae or zooplankton.
2. Extracted by oil companies by drilling into the seabed and bringing it up through intense pressure, and stored in containers.
3. Used to help make many plastic products and everyday items, meaning it is useful. However, can also be bad for environment.

- Natural resources which are used in everyday life include: water, air, trees and plants, and cotton.
- Some insulating materials found in our houses include fibre glass loft insulation, cavity wall filler and double-glazed windows.

Key diagrams



Vocabulary

comparative test
elasticity
plasticity
crude oil
perforate
extraction
thermal conductivity
inexhaustible

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Year 5/6

Step 7

Changes of materials

- Understand the actions of filtering, sieving and evaporating
- Be able to explain the words dissolve and solution
- Understand that some changes to materials are not reversible
- Understand that a chemical change alters a molecule permanently
- Know the difference between elements, compounds and mixtures
- Know the difference between physical and chemical change

Core knowledge

- A 'mixture' in a scientific sense, can always be broken down into its component parts.
- Water is an example of a chemical compound - when two or more elements join together to form molecules. Water is 2 Hydrogen (H) atoms + 1 Oxygen (O) atom = H2O

Examples of filtering:

- Brewing coffee
- Cleaning a swimming pool
- Vacuum Cleaning

Examples of evaporating:

- Body sweat
- The water cycle
- Salt / crystal extraction

Examples of sieving:

- Removing impurities during cooking
- Sieving sand during building
- Mining for minerals

Key diagrams

5 ways to compare a physical and chemical change.

Property	Physical Change	Chemical Change
Explanation	Molecules are rearranged but the actual type of molecules stay the same.	The type and make-up of the molecules is changed and a new substance is formed.
Change	A temporary change that is easily reversed, and no new substance is formed.	A permanent change that is irreversible, with a new substance always being formed.
Energy	No energy is produced, and very little or no energy is absorbed.	Energy is produced, in the form of light or heat (for example) and energy is also absorbed.
Effects	Only has an effect on physical properties of a substance or object i.e. shape, size.	Changes both physical and chemical properties of a substance or object.
Examples	Freezing or boiling water, melting wax	Burning wood, eating food, rusting of metal.

Vocabulary

separate
solution
solute
solvent
irreversible
compound
physical change
chemical change

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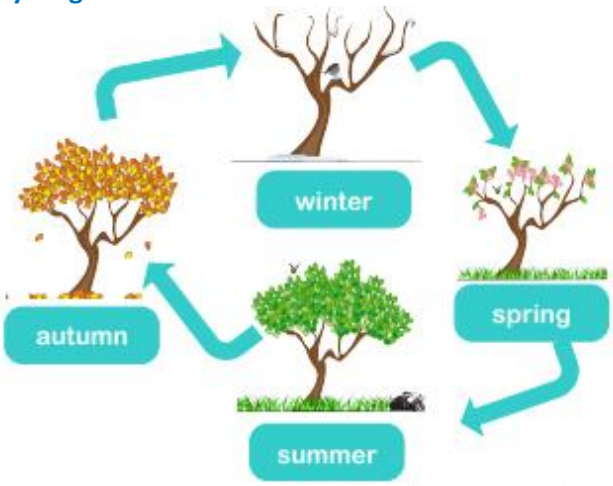
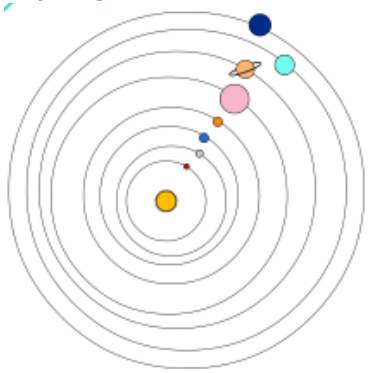
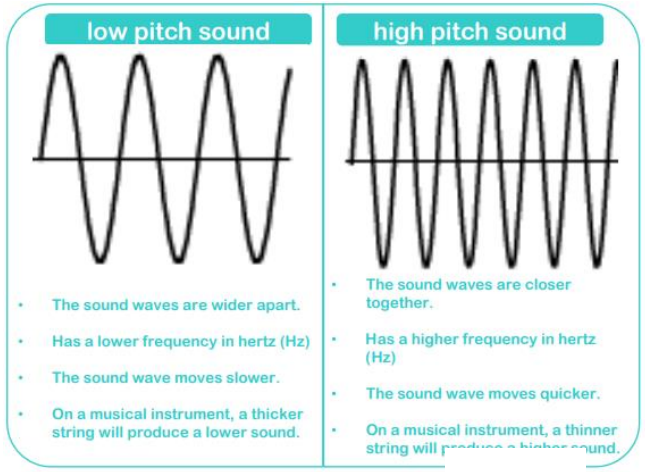
Physics	Seasonal changes / Earth and space			
Year 1/2 **Step 1**	**Seasonal changes** • Recognise different types of weather • Learn about clouds and rainfall • Recognise the different types of cold weather • Explain how to keep safe during thunderstorms • Look at different types of weather and how it affects places on Earth • Identify the four seasons	**Core knowledge** • The seasons are: spring – summer – autumn – winter. • In the winter, the days are short and the nights are long. In the summer, the days are long and the nights are short. • We always need to think about wearing clothes which protect us from the weather. • Thunderstorms and lightning usually happen when it is very hot. Weather and seasons vary around the world: • When it is summer in the UK, it is winter in Australia! • Some countries near the equator have nearly the same weather all year round. • The coldest ever temperature on earth was -89.2C, recorded in Antarctica. • The hottest place on earth is called 'Death Valley' in USA and has reached 56C!	**Key diagrams** 	**Vocabulary** spring summer autumn winter weather temperature thermometer forecast

Year 5/6 **Step 2**	**Earth and space** • Describe Nicholas Copernicus' ideas about planetary motion • Describe the movement of the Earth in space • Describe the characteristics of the planets in our solar system • Describe the Big Bang Theory • Learn about gravitational force • Explore what causes the different phases of the moon	**Core knowledge** • The planets (outwards from the sun): Mercury - Venus - Earth - Mars - Jupiter – Saturn- Uranus - Neptune • The planets each orbit the sun. Copernicus developed the heliocentric theory that the sun was at the centre of the solar system. However, the ellipses-shaped orbit was an idea that was discovered by Johannes Kepler in the 17th century. • It takes the Earth 365.25 days to orbit the sun, which is why every four years we have a leap year of 366 days, to catch up with the orbit! • The Earth takes 24 hours to spin on its axis and complete one rotation, which is why our days are 24 hours long. • We are constantly attracted to the Earth by its gravitational force. The reason the Moon doesn't fall to Earth because of gravity is because it constantly moves around us. Without the Earth's gravity, it would float away into space. • Comets are chunks of ice and rock with tails that orbit a long way around the Sun. Asteroids are chunks of rock and metal that orbit more closely to the Sun. Meteors are fragments of Asteroids that fly into the Earth's atmosphere and catch fire, leaving a bright streak in the sky.	**Key diagrams**  **FROM THE SUN OUTWARDS:** Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune	**Vocabulary** heliocentric geocentric solar system Astronomy Big Bang Theory gravitational force orbit hemisphere

Physics	Light and sound			

Year 3/4
 	
Step 1
	Sound
	• Describe how sound travels
	• Explain what causes sound
	• Compare the speed of sound and the speed of light
	• Compare sounds in solids, liquids and gases
	• Describe different sounds
	• Explain how to protect your ears
		Core knowledge
		• Sound waves can travel through solids, liquids and gases, but will sound differently depending on what they are travelling through.
		• The softer the material, the more sound will be absorbed by it.
		• Low pitch sound:
		  ○ The sound waves are wider apart.
		  ○ Has a lower frequency in hertz (Hz)
		  ○ The sound wave moves slower.
		  ○ On a musical instrument, a thicker string will produce a lower sound.
		• High pitch sound:
		  ○ The sound waves are closer together.
		  ○ Has a higher frequency in hertz (Hz)
		  ○ The sound wave moves quicker.
		  ○ On a musical instrument, a thinner string will produce a higher sound.
		• Protecting your ears:
		  ○ If a sound reaches 85 decibels (dB) or stronger, it can permanently damage your hearing.
		  ○ Your ear drum can get perforated, or burst, if you don't protect your ears.
		  ○ Ear defenders are used by workmen and those who work in noisy environments to protect their ears from the sound.
			Key diagrams
			 
			
				Vocabulary
				
				vibration
				speed of sound
				soundproof
				sound wave
				frequency
				decibel
				ear drum
				pitch

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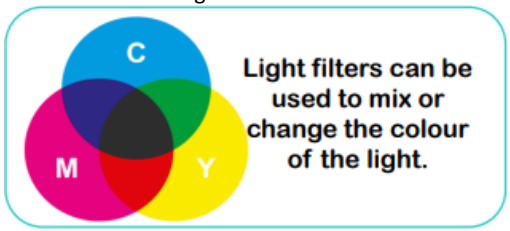
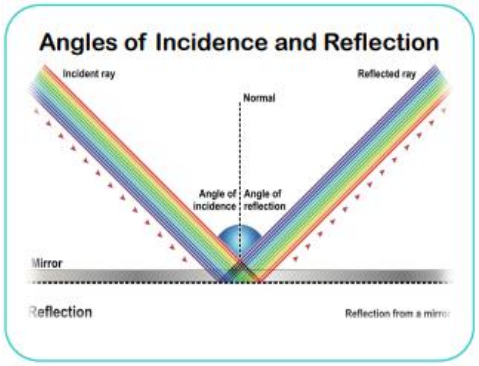
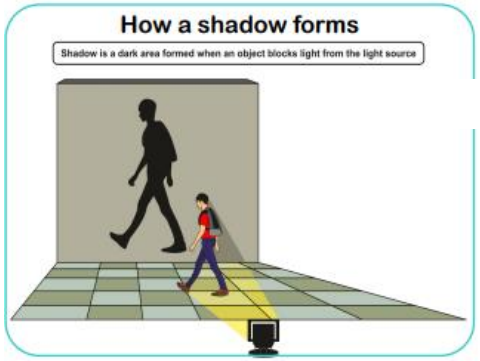
Year 3/4 **Step 2**	**Light 1** • Explain how shadows are formed • Exploring light • Understand different types of mirrors • Know what a periscope is and how it is used • Explain how reflective surfaces help keep us safe • Recognise that light from the sun can be dangerous and that there are ways to protect your eyes	**Core knowledge** • Light travels in straight lines. • Light travels at around 300,000 kilometres per second • Light will travel through transparent objects… …but not opaque ones. • The invisible light waves from the sun are called 'ultraviolet'. • A shadow is formed when an opaque object blocks the light. • A shadow will get smaller the further the object is from the light source • Shadows change angle and length during the day due to the position of the sun in the sky.	**Key diagrams** 	**Vocabulary** transparent opaque reflective Fluorescent UV rays periscope shadow sun protection
Year 5/6 **Step 3**	**Light 2** • Compare materials of different transparencies • Explain how light travels in a straight line and how shadows are formed • Describe how lenses can be used • Show white light is a mixture • Explain how water can bend light • Investigate light colour mixing	**Core knowledge** • Light sources can be both natural and man-made. • Light only travels in straight lines. • A lens is a piece of transparent glass or plastic that bends light as the light rays pass through, so they can change path or direction. • Light is made up of all the colours of the spectrum / rainbow. The colour of the light you see depends on its wavelength. • A telescope has two lenses (one large and one small) which reflect light rather than bending it. • Shadow is a dark area formed when an object blocks light from a light source. • Light filters can be used to mix or change the colour of the light. 	**Key diagrams**  	**Vocabulary** transparent opaque translucent magnify angle of incidence angle of reflection lens refraction

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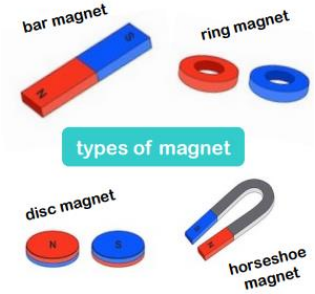
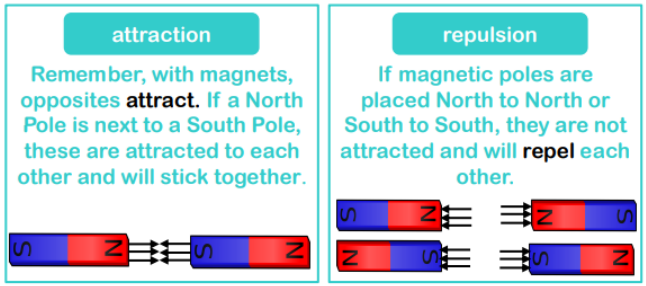
Physics	Forces			
Year 3/4 Step 1	**Forces and magnets** • Understand magnetism • Learn about the different types of magnets • Learn about magnetic fields; learn about the law of magnetic attraction • Know that magnetic needles always point magnetic north • Compare how things move on different surfaces • Explore different forces between two objects	**Core knowledge** • A permanent magnet produces a magnetic field around it that enables it to stick to some types of metal, like iron. • Aluminium and copper are examples of metals which won't stick to a magnet. • Some items can be magnetised by stroking a magnet along them in one direction. This can be useful for things like magnetising a screwdriver. • The Earth is a giant magnet, with a North and South Pole. It is magnetic because of the large amount of iron-rich molten rocks under its surface. • The Earth's magnetic field stretches into space. • A compass works because it's north end is drawn to align with the Earth's magnetic field. A compass has helped people navigate for many years! • Attraction - with magnets, opposites attract. If a North Pole is next to a South Pole, these are attracted to each other and will stick together. • Repulsion - If magnetic poles are placed North to North or South to South, they are not attracted and will repel each other.	**Key diagrams**  	**Vocabulary** lodestone horseshoe magnet bar magnet attract repel compass magnetic needle pendulum

Year 5/6

Step 2

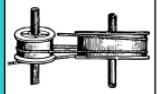
Forces

- Describe the life and work of Sir Isaac Newton
- Explore gravity and air resistance
- Understand water resistance and friction
- Investigate mechanisms – levers and pulleys
- Investigate mechanisms – gears
- Predict if an object will float or sink

Core knowledge

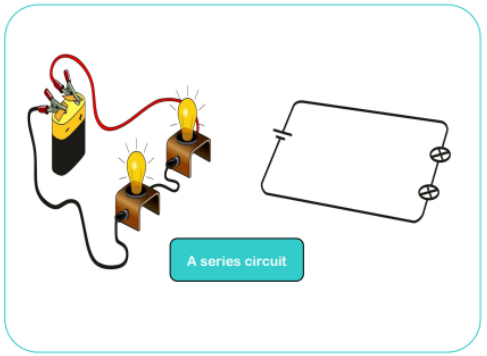
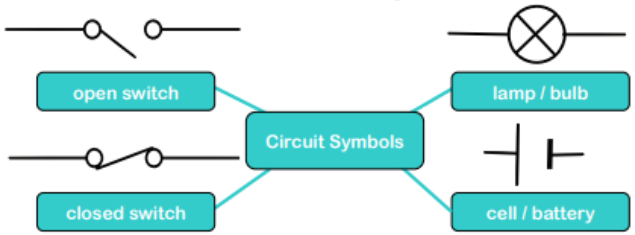
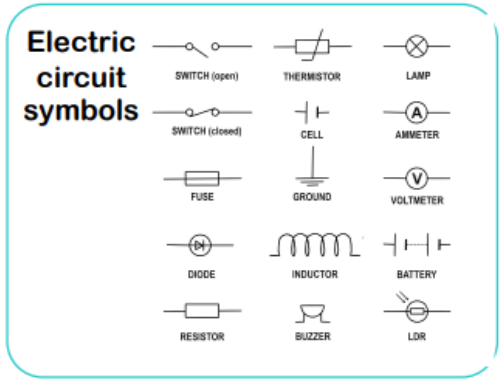
- Sir Isaac Newton (1643-1726):
  - Explained the three laws of motion
  - Explained the theory of gravity, including gravitational pull of the Earth
  - Invented the reflecting telescope
  - His physics book 'Principia' contained many theories of physics
- Air resistance, otherwise known as drag, is the way air opposes the direction an object is travelling in and slows it down. A good example of this is a parachute, the large surface area absorbs the air resistance, and slows down the descent of the parachutist.
- Water resistance is the way water slows down the speed of the item travelling through it. This is why high-speed boats have a narrow front end, so that they can easily glide through it.
- Friction occurs when two surfaces run against each other. The rougher the surface, the more friction is caused. For example, sand and carpet have lots of friction.

Key diagrams

Name	Picture	How it Works	Used For
Lever		Helps to reduce the amount of force needed to move or lift an object, by increasing the distance through which the force acts.	• stapler • door handle • Claw of hammer • tweezers
Pulley		Helps to reverse the direction of the lifting force, therefore multiplying the force your body produces on the object.	• elevator • wells • theatre curtains • bulldozer
Gear		The 'teeth' on the gears turn one another, and in doing so, helps to increase the power of a turning force.	• cars • Bikes • pendulum clock • vacuums

Vocabulary

Sir Isaac Newton
gravity
resistance
lever
gear
pulley
mass
friction

Physics	Electricity			
Year 3/4 **Step 1**	**Electricity 1** • Identify when a lamp will light in a simple series circuit • Explore how electricity is transported • Understand the difference between a series and parallel circuit • Explain how to recognise electrical conductors and insulators • Describe the basic parts of a circuit • Know how to work safely with electricity	**Core knowledge** • A series circuit is a looped circuit where the electricity flows from the positive to negative terminal of the battery. • A parallel circuit has two or more pathways for the current to flow through. • Conductors are materials which allow electricity to flow through them with ease. • Insulators are materials that do not allow electricity to pass through them with ease. • All metals are good conductors of electricity and materials like rubber are good insulators. • A switch is a toggle which is changed by someone as way of controlling an electrical circuit or system. • It is very important to be safe with electricity. Electricians are trained to be safe with electrical circuits and equipment.	**Key diagrams**  	**Vocabulary** series circuit circuit diagram parallel circuit conductor insulator loop switch resistance
Year 5/6 **Step 2**	**Electricity 2** • Explain how objects become charged • Describe the parts of an electric circuit • Explain circuit diagrams and what effects the output of a circuit • Compare electrical conductors and insulators • Build a set of rail crossing signals • Explain how variable resistors can work like a switch	**Core knowledge** • Static electricity is friction on an object which creates an electric charge. • A wind-up torch works through a dynamo which turns mechanical energy to electrical energy through a simple electromagnet. • Insulators are helpful because they prevent electric flow so you don't receive an electric shock! • When a light is switched on, you are sending a flow of electrons around the circuit. • Metals such as copper, aluminium, zinc and gold are good conductors of electricity. • Light bulbs turn electricity into light due to resistance from the filament.	**Key diagrams** 	**Vocabulary** static electricity filament voltage insulator conductor fuse component variable resistor

"Participate, excel, take pride!"

Working scientifically

Year 1/2	Year3/4	Year 5/6
Asking questions and recognising that they can be answered in different ways		
Asking simple questions and recognising that they can be answered in different ways • While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where • appropriate, they answer these questions. • The children answer questions developed with the teacher, often through a scenario. • The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered.	**Asking relevant questions and using different types of scientific enquiries to answer them** • The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary** • Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. • Given a wide range of resources, the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. • They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.
Making observations and taking measurements		
Observing closely, using simple equipment • Children explore the world around them. They make careful observations to support identification, comparison and noticing • change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. • They begin to take measurements, initially by comparisons, then using non-standard units.	**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers** • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. • They use standard units for their measurements.	**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate** • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. • During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value
Engaging in practical enquiry to answer questions		
Performing simple tests • The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. • They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time.	**Setting up simple practical enquiries, comparative and fair tests** • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary** • The children select from a range of practical resources to gather evidence to answer their questions. • They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over

Identifying and classifying • Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing.	**Explanatory note** *A comparative test is performed by changing a variable that is qualitative, e.g. the type of material, shape of the parachute. This leads to a ranked outcome.* *A fair test is performed by changing a variable that is quantitative, e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship*	time and for how long. They look for patterns and relationships using a suitable sample.
Recording and presenting evidence		
Gathering and recording data to help in answering questions • The children record their observations, e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements, e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings.	**Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables** • The children sometimes decide how to record and present evidence. They record their observations, e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements, e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications, e.g. using tables, Venn diagrams, Carroll diagrams. • Children are supported to present the same data in different ways in order to help with answering the question.	**Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs** • The children decide how to record and present evidence. They record observations, e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements, e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications. e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. • Children present the same data in different ways in order to help with answering the question.
Answering questions and concluding		
Using their observations and ideas to suggest answers to questions • Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence, e.g. observations they have made, measurements they have taken or information they have gained from secondary sources.	**Using straightforward scientific evidence to answer questions or to support their findings** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence.	**Identifying scientific evidence that has been used to support or refute ideas or arguments** • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence, e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding.

Using their observations and ideas to suggest answers to questions • The children recognise 'biggest and smallest', 'best and worst' etc. from their data.	**Identifying differences, similarities or changes related to simple scientific ideas and processes** • Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships.	**Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations** • In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.
	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • They draw conclusions based on their evidence and current subject knowledge.	
Evaluating and raising further questions and predictions		
	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.	**Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations** • They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used. • They identify any limitations that reduce the trust they have in their data.
	Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • Children use their evidence to suggest values for different items tested using the same method, e.g. the distance travelled by a car on an additional surface. • Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.	**Using test results to make predictions to set up further comparative and fair tests** • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

British Science Week 2023: w/b 10th - 19th March

Theme: Connections

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