

# SCIENCE

## SKILLS AND KNOWLEDGE PROGRESSION



*"The scientist is not person who gives the right answers, he's one who asks the right questions." – Claude Levi-Strauss*

## Science Curriculum

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

The national curriculum for science 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

### Science in EYFS

Science in Reception is broadly covered through the 'understanding the world' area of the EYFS Curriculum. It is introduced indirectly through activities that encourage children to explore, problem solve, observe, predict, think, make decisions and talk about the world around them. Children in Reception will physically explore the natural world around them, identify and sort a range of living things, observe the changes in our environment throughout the year and experience a range of materials using their senses. They will learn to represent scientific observations by mark making, drawing or creating simple charts and tables and begin to offer explanations for why things happen, making use of new vocabulary introduced to them.

# Year 1

## Context

Science is taught as a discrete subject in year 1, as well as within topic lessons to encourage cross curricular links. Teachers will elicit the prior knowledge of children and make links to their learning in reception to introduce the children to plants, animals, the four seasons and everyday materials. Children will continue to explore, problem solve, observe, predict, think, make decisions and talk about the world around them but be guided to explain and test their observations. They will also continue to build upon their understanding of habitats from EYFS.

## Key Skills

### WORKING SCIENTIFICALLY

Sc1/1.1 ask simple questions and recognising that they can be answered in different ways

Sc1/1.2 observe closely, using simple equipment

Sc1/1.3 perform simple tests

Sc1/1.4 identify and classify

Sc1/1.5 use observations and ideas to suggest answers to questions

Sc1/1.6 gather and record data to help in answering questions.

### Enchanted Woodland: Plants 1A

Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.

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

Identify, compare, group and sort a variety of common wild and garden plants, including deciduous and evergreen trees, based on observable features.

Observe objects, materials, living things and changes over time, sorting and grouping them based on their features.

Observe the local environment throughout the year and ask and answer questions about living things and seasonal change.

Describe how to care for plants and animals, including pets.

### Childhood: Everyday materials 1B

Identify natural and man-made materials in the environment.

Compare and group materials in a variety of ways, such as based on their physical properties; being natural or man-made and being recyclable or non-recyclable.

Observe objects, materials, living things and changes over time, sorting and grouping them based on their features.

Identify and name what an object is made from, including wood, plastic, glass, metal, water and rock.

Investigate and describe the simple physical properties of some everyday materials, such as hard or soft; stretchy or stiff; rough or smooth; opaque or transparent; bendy or rigid and waterproof or not waterproof.

**Superheroes: Animals including humans – human focus 2A**

Identify and name basic parts of the human body.

Draw and label basic body parts of the human body.

Identify and name the 5 senses.

Identify and name the body part associated with each sense.

**Paws, claws and whiskers: Animals including humans – animals focus 2B**

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).

**Splendid Skies: Seasonal Changes 3B**

Observe and describe different types of weather.

Investigate weather using toys, models or simple equipment.

Observe changes across the four seasons

Observe objects, materials, living things and changes over time, sorting and grouping them based on their features.

Observe the local environment throughout the year and ask and answer questions about living things and seasonal change.

Talk about what they might do or what might happen in a simple experiment.

Follow instructions to perform simple tests Use simple equipment to measure and make observations.

Gather and record simple data in a range of ways (data tables, diagrams, Venn diagrams).

Explain in simple terms how shadows are formed

Compare shadows made by different objects and materials.

**Key Knowledge**

**Enchanted Woodland: Plants 1A**

To know that the local environment is a habitat for living things and can change during the seasons.

To know that a habitat is the natural home of an animal or plant.

To know that a woodland habitat is land covered with trees forming open habitats with plenty of sunlight and limited shade.

To know that plants are living things.

To know that common plants include the daisy, daffodil and grass.  
To know that trees are large, woody plants and are either evergreen or deciduous.  
To know that trees that lose their leaves in the autumn and bud new leaves in the spring are called deciduous trees.  
To know that examples of deciduous trees include oak, beech and rowan.  
To know that trees that shed old leaves and grow new leaves all year round are called evergreen trees.  
To know that examples of evergreen trees include holly and pine.  
To know that the basic plant parts include root, stem, leaf, flower, petal, fruit, seed and bulb.  
To know that the root brings water and nutrients to the plant from the soil.  
To know that the stem holds the plant up and carries water and nutrients around the plant.  
To know that the leaf produces food for the plant using sunlight.  
To know that the flower produces pollen and attracts insects.  
To know that the seed or bulb is where the plant grows from.  
To know that trees have a woody stem called a trunk.  
To know that objects and living things can be looked at and compared as living, dead or never been alive.  
To know that living things need to be cared for in order for them to survive.  
To know that living things need water, food, warmth and shelter in order to survive.

### **Childhood: Everyday Materials 1B**

To know that an object is an item you can see, touch or hold.  
To know that a material is what an object is made from.  
To know that a material is something used to build or make something else.  
To know that everyday materials include wood, plastic, glass, metal, water, rock, brick, paper and fabric.  
To know that everyday materials can be classified as natural or man-made materials.  
To know that natural materials are dug out of the ground, grown or taken from a living thing.  
To know that man-made materials are often made from natural materials but have been changed to have different properties.  
To know that materials have different properties, such as hard or soft; stretchy or stiff; rough or smooth; opaque or transparent; bendy or rigid; waterproof or not waterproof.  
To know that materials can be grouped according to their properties.  
To know that the properties of a material make them suitable for different jobs.  
To know that objects, materials and living things can be looked at and compared.

### **Superheroes: Animals including humans – human focus 2A**

To know that humans are mammals.

To know that the human body is made up of different parts.

To know that some of the basic human body parts include the head, arms, legs, hands, feet, stomach, neck, shoulders, knees, elbows, eyes, ears, mouth and nose.

To know that humans have 5 senses.

To know that the 5 senses are sight, smell, hearing, touch and taste.

To know that each sense is associated with a different body part.

To know that the eyes are associated with sense of sight.

To know that the nose is associated with sense of smell.

To know that the ears are associated with sense of hearing.

To know that the skin is associated with sense of touch.

To know that the tongue is associated with sense of taste.

### **Paws, claws and whiskers: Animals including humans – animals focus 2B**

To know that there are many species of animals in the world.

To know that species are a group of similar individuals.

To know that animals can be classified as a mammal, bird, fish, amphibian or reptile.

To know that mammals have hair or fur, give birth to live young and are warm-blooded.

To know that birds are warm blooded, lay eggs and have feathers and wings.

To know that fish are cold-blooded, have scales and fins and use gills to breathe under water.

To know that reptiles have scaly, dry skin, lay eggs and are cold-blooded.

To know that amphibians live on both land and water, lay eggs, are cold-blooded and have moist skin and webbed feet.

To know that webbed feet is the name given to toes connected by a piece of skin.

To know that animals can be classified as carnivores, herbivores or omnivores.

To know that carnivores have a diet consisting of solely meat.

To know that herbivores have a diet consisting of solely plants.

To know that omnivores have a mixed diet consisting of meat, plants and animal products.

To know that domestic animals have been bred to live alongside humans.

To know that wild animals live on their own without help from people.

To know that some domestic animals are kept by humans for companionship or pleasure and are known as pets.

To know that prey are animals that are hunted and killed by other animals.

To know that predators are animals that gather food by hunting and killing other animals.

To know that an adaptation is a physical feature or behaviour that helps an animal to survive in its habitat.

To know that camouflage is a specific adaptation that allows animals to blend in with their environment.

### **Splendid Skies: Seasonal change 3B**

- To know that the UK has 4 seasons.
- To know that the 4 seasons are Spring, Summer, Autumn and Winter.
- To know that each season has a typical weather pattern.
- To know that types of weather include sun, rain, wind, snow, fog, hail and sleet
- To know that the weather can change daily
- To know that in the UK the weather can usually be very warm and sunny in Summer.
- To know that in the UK the weather can usually be very cold and snow in Winter.
- To know that in the UK there can be lots of rain all year round.
- To know that in the UK the length of the day can vary depending on the season.
- To know that in Autumn the days start to become shorter
- To know that in Winter the days are at their shortest.
- To know that in the Spring the days start to become longer.
- To know that in Summer the days are at their longest.
- To know that the environment changes with each season.
- To know that in Spring, green leaves and buds appear on the trees and plants begin to grow.
- To know that in Autumn leaves on deciduous trees change colour and fall off
- To know that all light travels in straight lines
- To know that transparent materials are materials we can see through.
- To know that light can travel through transparent materials.
- To know that opaque materials are materials we cannot see through
- To know that light cannot travel through opaque materials
- To know that a shadow is formed when light from a light source is blocked by an opaque object
- To know that shadows are usually the same shape as the object which cast them
- To know that shadows cast when the Sun is the light source change during the day
- To know that shadows change as the Sun's position in the sky changes
  
- To know that weather can be measured using simple equipment
- To know that a thermometer is used to measure the temperature of a location
- To know that a rain gauge is used to measure the rainfall in a location
- To know that an anemometer is used to measure wind speed at a location
- To know that a weather vane is used to measure wind direction

To know that objects, materials and living things can be looked at and compared.  
To know that simple tests can be carried out by following a set of instructions.  
To know that The results are information that has been found out from an investigation.  
To know that data can be recorded and displayed in different ways, including tables, pictograms and drawings.

## Year 2

### Context

Science in Year 2 builds upon knowledge and understanding from EYFS and Year 1. The children will continue to develop their knowledge on parts of a plant by explaining the importance of each part in the survival of a plant. They will continue to build upon their knowledge of living things from Y1 and habitats from EYFS: looking at survival needs, world habitats and food chains. The children will also build their knowledge on materials by comparing properties and choosing the most suitable material for a product and sort products according to their properties. They will continue to experience different enquiry skills by making predications, observing over time and interpreting results.

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### Key Skills

#### WORKING SCIENTIFICALLY:

- Sc1/1.1 ask simple questions and recognising that they can be answered in different ways
- Sc1/1.2 observe closely, using simple equipment
- Sc1/1.3 perform simple tests
- Sc1/1.4 identify and classify
- Sc1/1.5 use observations and ideas to suggest answers to questions
- Sc1/1.6 gather and record data to help in answering questions.

#### Plants

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.

#### Materials

Make predictions and test how an item moves on different surfaces - sandpaper, carpet, paper, plastic and bubble wrap. 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

## **Key Knowledge**

### **Street detectives – Plants**

Know that the study of plants is part of the discipline of biology - the study of living organisms

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)

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)

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

To know the 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.

### **Coastline – Habitats**

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

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.

Recognise and name the larger habitats - ocean, tropical rainforest, desert, woodland, tundra and polar ice.

Know the names of plants in these habitats such as: coral, seaweed (ocean), cactus, tumbleweed (desert), orchid, coffee plant (rainforest) dandelion, moss, clover, grass, shrub, conifer (woodland/grassland).

Understand the term microhabitat (a small habitat specific to minibeasts within larger habitats)

#### Links to Coastline

Know that an ocean habitat refers to any seas or oceans

Know that coastal habitats include: shallow sea water, to dunes and beaches, to rock pools and coves

Know that beach habitats are home to mammals (seal, otter, porpoise), birds (sea gulls, puffin, oyster catcher), minibeasts (prawns, starfish, hermit crabs) and plants (sea weed, marram, sea holly)

Know that rock pool habitats are a harsh habitat to live in due to a wide variation in temperature, oxygen levels and salinity and the turbulent tides that pound rocks and carry in fresh cargoes of predators

Know some wildlife that live in rock pools such as: long spined sea scorpion, shanny, prawn, shore crab and hermit crab

Know that the ocean habitat is the largest on earth (70%) of the Earth's surface

Know that the ocean habitat contains the greatest diversity of life on Earth

Know that the ocean is a marine habitat which means it is incredibly salty

Know that there are 2 types of ocean habitat tropical (warmer temperatures) and polar (colder temperatures)

Know and compare living things that live in tropical (turtles, coral reef, barracuda) and polar oceans (whales, squid, arctic cod) and how they have adapted to their environment

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  
Know and understand some basic food chains for living things in an ocean habitat

### **Magnificent monarchs - Animals inc. humans (human focus)**

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

To know and understand the terms 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).

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.

Know the acronym MRS NERG (Movement, Respiratory, Sensitivity, Nutrition, Excretion, Reproduction and Growth) to teach about how to organise objects into each category.

Know the life cycle of a human using the following language: baby, toddler, child, teenager, adult and elderly

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.

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 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'

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

Know that a germ is 'a very small living thing that causes disease'.

Know that they are only visible through a microscope.

Know the following basic hygiene rules to prevent the spread of germs ● 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

### **Wriggle and crawl - Habitats & Animals inc. humans (animal focus)**

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

(Repeated for recap) To know and understand the terms 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).

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.

Know the acronym MRS NERG (Movement, Respiratory, Sensitivity, Nutrition, Excretion, Reproduction and Growth) to teach about how to organise objects into each category.

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

Know and understand some basic food chains for living things

Know the following animals and their babies and identify them in photos - dog, puppy cat, kitten horse, foal bear, cub bird, chick cow, calf pig, piglet goat, kid duck, duckling lion, cub sheep, lamb snake, hatchling

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: crocodile swift mosquitos frogs toads crabs moth spiders

Know the following animals have live young: horses cats dogs pigs cow lion sheep

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 lifecycle of a chick: Egg Fertilization, Egg Embryo, Chick, Pullet (Teenager), Hen (Adult)

Know that a chick emerges from an egg after 21 days

Know that female chicks are brown and male chicks are yellow

Know that the term metamorphosis means the stages in a butterflies development

Know the life cycle of a butterfly: the egg, the larva (caterpillar), the pupa (chrysalis), and the adult butterfly

Know that the metamorphosis of a butterfly can take approximately 30 days

### **Great fire of London - Everyday materials**

Know that 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.

Know that matter (stuff) is made from tiny building blocks.

Know the following properties of materials - flexible, stiff, rigid, stretchy, hard, soft, brittle, strong, weak, absorbent, heavy, light, solid, runny, smooth, rough, opaque, transparent and translucent.

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

Know the following vocabulary and their definitions: flexible, stiff, rigid, opaque, transparent, translucent, brittle

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

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.

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.

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.

## Year 3

### Context

Science in year 3 develops enquiry skills further as children are encouraged to offer oral and written explanations to their scientific findings. They will recap their KS1 learning of plants and gain an understanding of pollination. Children will build their knowledge of a healthy diet by learning about the different food groups and developing their own healthy meals. They will research and develop their knowledge of rocks and fossils and how they are formed, which they will later consolidate further in their year 6 evolution lessons. The children will be introduced to light and magnets and will be able to explain their uses in everyday life.

### Key Skills

#### WORKING SCIENTIFICALLY

Asking relevant questions and using different types of scientific enquiries to answer them

Setting up simple practical enquiries, comparative and fair tests

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

Identifying differences, similarities or changes related to simple scientific ideas and processes

Using straightforward scientific evidence to answer questions or to support their findings.

## **Key Knowledge**

### **Scrumdiddlyumptious – Animals including humans - food groups**

To know humans have to get nutrition from what they eat, they cannot make it.

To know that it is important to have a balanced diet made up of the main food groups, including proteins, carbohydrates, fruit and vegetables, dairy products, and fats and oils.

To know that carbohydrates give you energy

To know that protein helps to repair muscles

To know that dairy helps to maintain strong bones

To know that fruit and vegetables help maintain a healthy gut and digestive system

To know that fats and oils provide essential calories

To know that Humans need to stay hydrated by drinking water.

### **Through the Ages –plants**

To know that pollination is the process where pollen grains are transferred from the stamen of one flower to the carpel of another of the same type.

To know that after pollination, seeds form in the carpel's ovary.

To know that a pollinator is an animal that pollinates flowering plants such as bees

To know that some plants are pollinated by the wind.

To know the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow)

To know that the plant's roots anchor the plant in the ground

To know that a plant's roots transport water and minerals from the ground to the plant.

To know that the stem (or trunk) supports the plant above the ground.

To know that the leaves collect energy from the Sun and make food for the plant.

To know that flowers make seeds to produce new plants.

To know that petals are bright colours and smell nice to attract bees

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

To know that water is transported in plants from the roots, through the stem and to the leaves, through tiny tubes called xylem.

To know the names and functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

To know that once a flower is pollinated its seeds produce fruit

### **One Planet - Magnets**

To know that a force can make something move away – a kick, a shove, a push – or bring it back – a pull

To know that all forces are either a push or a pull

To know that a magnet has a south and north pole

To know that magnets attract each other when facing north to south

To know that magnets repel each other when facing the same pole

To know that magnets can be moved without touching

To know that a magnet's can still work through a solid object

To know that a magnet will attract some metal objects

To know that not all metals are magnetic, the ones which are- iron, nickel and steel

To know that plastic, paper and food are not magnetic

To know that some old coins are made from a non-magnetic material so they are not magnetic

To know that the circular feeling between two of the same poles is called a magnetic field

To know that repel means to push away from each other

To know that attract means to be pulled together

### **Rocks relics and rumbles – rocks**

To know that fossils are formed when things that have lived are trapped within rock

To know that fossils are formed when a creature dies, its bones are washed away by water, the gap is filled by minerals from the water, more soil compresses the mould over the years and eventually the natural mould rises to be discovered

To know rocks can be classified into 3 groups, metamorphic, igneous and sedimentary

To know that sedimentary rocks are made up of dead sea creatures which have been compressed over millions of years

To know that fossils are found in sedimentary rock

To know that rocks have different qualities and features

To know that common rocks can be classified into 3 groups – chalk - sedimentary, slate - metamorphic, sandstone - sedimentary, granite - igneous, limestone - sedimentary, marble - igneous

To know that crystals are found in igneous rock

To know that layers are found in metamorphic rock  
To know that metamorphic and sedimentary rock can be scratched  
To know that sedimentary rock can be dusty  
To know that sedimentary rock will fizz if acid is dropped onto it  
To know that permeable means to let in water  
To know that impermeable means to not let in water  
To know that metamorphic is a permeable rock, to know that sedimentary is a permeable rock and that igneous is an impermeable rock  
To know that igneous rock is made by cooled lava  
To know that metamorphic rock is made inside a volcano by altering the sedimentary or igneous rock by heat

### **Emperors and Empires – Light**

To know that opaque means no light can get through  
To know that translucent means some light can get through  
To know that transparent all light can get through  
To know that a material being opaque, transparent, translucent will affect it's shadow and how it will look  
To know that a natural light source is the sun and fire  
To know that an artificial light source is anything man made which creates light  
To know that a light source is something which emits light  
To know that a shadow is created when light is blocked  
To know that darkness is the absence of light  
To know that we cannot see without light  
To know that some colours can be seen with a little bit of light – white, yellow  
To know that a shadow can be made bigger or smaller depending on how close the object is to the light source  
To know that looking directly at the sun will damage our eyes  
To know that reflective surfaces bounce light from them  
To know that a reflective surface can be a mirror, glass or the surface of water  
To know that a reflection can be affected by whether the surface is smooth or not  
To know that light travels in straight lines  
To know that light is made up of 7 colours called the colour spectrum  
To know that rainbows are made by light being bent through water  
To know that rainbows can only be made by light and water  
To know that if the 7 colours are spun together you would make white



### **Animals including humans – muscles and skeletons**

To know that humans need skeletons to protect their organs

To know that humans need skeletons to hold up their body

To know the name for bones in the body – femur, ribcage, skull, pelvis

To know that there are 206 bones in the body

To know that creatures with a backbone are called vertebrates – humans, bears, tigers

To know that creatures without a backbone are called invertebrates e.g. jellyfish, slug, lobster

To know that some creatures have a protective skeleton on the outside like lobsters and crabs – these are called exoskeletons

To know that muscles work in pairs to allow movement and maintain posture

To know that the more you use a muscle the stronger it will get

To know that your bicep and tricep work together to move your arm

To know that the abdominal muscles are where the tummy is

To know that the glute muscles are the bottom

## **Year 4**

### **Context**

In year 4, children will continue to build on their knowledge of living things and their habitats to describe the importance of food chains and adaptation. They will also develop their understanding of the human body by examining the digestive system, how teeth are formed and how to maintain good oral health. They will construct simple circuits and be able to draw diagrams to represent these in their electricity unit before studying how sound travels through vibrations into the ear and the mechanics behind this. The children will develop their understanding of materials through learning about gas, liquids and solids and the Water Cycle.

### **Key Skills**

WORKING SCIENTIFICALLY

Asking relevant questions and using different types of scientific enquiries to answer them

Setting up simple practical enquiries, comparative and fair tests

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

Identifying differences, similarities or changes related to simple scientific ideas and processes

Using straightforward scientific evidence to answer questions or to support their findings.

## **Key Knowledge**

### **Blue Abyss: Living things and their habitats 1A**

Know that classification keys are scientific tools that aid the identification of living things. (Ocean)

Know that animals can be divided into warm (whales, dolphins, seals) and cold blooded (fish, porpoise, sharks)

Know that animals can be classified into vertebrates and invertebrates.

Know that vertebrates are animals with a backbone (sharks, seals, whales, turtles, fish)

Know that invertebrates have no backbone and can be hard bodied or soft bodied (crabs, shrimps, jellies, coral, sea anemones)

Know that vertebrates will include fish, amphibians, reptiles, birds and mammals. Invertebrates into molluscs, worms, arachnids and insects.

Know that scientists classify living things according to shared characteristics.

Know that animals can be divided into six main groups: mammals, reptiles, amphibians, birds, fish and invertebrates. These groups can be further subdivided.

Know that food chains show what animals eat within a habitat and how energy is passed on over time (Ocean)

Know that all food chains start with a producer, which is typically a green plant.

Know the producer is eaten by a primary consumer (prey), which is eaten by a secondary consumer (prey), which is eaten by a tertiary consumer.

Know that all food chains end with a top or apex predator.

Know that changes within a food chain, such as an abundance or lack of one food type, have an impact on the entire food chain.

Know that an adaptation helps an animal or plant survive in its habitat (gills, blowholes, fins, streamlined bodies etc.)

Know that whales are the largest animals on earth

Know that if living things are unable to adapt to changes within their habitat, they are at risk of becoming extinct.

Know some marine life that are close to extinction (Galapagos penguin, Hawaiian monk seal, Hawksbill sea turtle)

Know that habitats change over time, either due to natural or human influences. Natural influences include extreme or unseasonable weather. Human influences include habitat destruction or pollution. These changes can pose a risk to animals and plants that live in the habitat. (Ocean)

### **Burps, bottoms and bile: Animals including humans 1B**

To know humans have four types of teeth: incisor, canine, pre molar and molar (Wisdom teeth are a type of molar)

To know carnivores typically have incisors in front, followed by large, pointed canines, premolars and molars in the rear

To know herbivores typically have chisel-like incisors and large, flat premolars and molars

To know omnivores typically have chisel-like, narrow incisors, small canines and broad, flat premolars and molars

To know humans and animals have teeth to be able to bite food into smaller pieces in order to swallow it

To know humans and animals produce saliva to help swallow and digest food

To know saliva contains enzymes which help digest food

To know in humans, after the mouth food travels down the oesophagus and pushes food down to the stomach with strong muscles

To know in the stomach, food is churned with saliva, enzymes, bile and stomach acid in order to be digested

To know the liver produces bile and stores this in the gallbladder

To know the pancreas produces enzymes to help break food down

To know this mixture of digestive juices and partly digested food is called chyme

To know after the stomach, the chyme goes into the small intestine where nutrients are absorbed and sent around the body

To know after the small intestine is the large intestine, which absorbs excess water and salt

To know the remains is called stool and reaches the rectum

To know stool exits through the anus

To know the importance of oral hygiene in reducing bacteria in the mouth

To know plaque is hardened bacteria in the mouth

To know brushing teeth must be done twice a day, in circular motions, with fluouride toothpaste for 2 minutes at a time

To know brushing teeth reduces a build-up of plaque

### **Road trip USA: Electricity 2A**

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).

Know the correct symbols to use when drawing circuits

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.

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

### **Invasions: Sound 2B**

Know that the study of sound is part of the discipline of physics  
Know sounds are made when something vibrates.  
Know that vibrate means to shake with repeated small quick movements.  
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.  
Know that sound travels four times faster underwater than through air.  
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 (hammer, anvil, stirrup) 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 through the acoustic nerve.  
Know that pitch is how high or low a sound is.  
Know the Eustachian tube helps balance pressure in the middle ear (felt as ears popping) to protect your eardrum bursting  
Know that the following words would be used to describe low and high pitch sounds  
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.  
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.

### **Misty mountain, winding river: States of matter 3A**

Know that the study of changes of materials is part of the discipline of physics

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.

Know that most substances can exist in three states: solid, liquid and gas.

Know that in a solid state the vibrating particles form a regular pattern.

Know that in a liquid the particles still touch their neighbours but they move around, sliding over each other.

Know that in the gas state, widely-spaced particles move around randomly.

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 that the study of the water cycle is part of the discipline of physics,

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.

Know that water becomes vapour at 100 °C as it is the boiling point of water.

Know that we measure temperature using degrees Celsius (°C) but many countries use a Fahrenheit scale

Know that condensation is the name of the process when water vapour changes into liquid through cooling

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.

Know that water will change from a liquid to a solid when cooled to 0°C and that this is the freezing process

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.

## **Context**

Children in year 5 develop their independent enquiry skills through conducting tests which allow them to develop conclusions and follow their own further lines of enquiry. They will build upon their understanding of states of matter from year 4 to test the properties of everyday materials as well as learning about reversible and irreversible change. They will recap their learning of life processes from year 2 to compare the life cycles of different species such as amphibians and mammals as well as research different farming methods; they will also develop their understanding of the human body by learning about how we age over time. The children will be introduced to Space and know key facts about our solar system; they will make links and references to this is their forces unit where they learn how forces shape our world and how we use it.

## **Key Skills**

### WORKING SCIENTIFICALLY

Asking relevant questions and using different types of scientific enquiries to answer them

Setting up simple practical enquiries, comparative and fair tests

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

Identifying differences, similarities or changes related to simple scientific ideas and processes

Using straightforward scientific evidence to answer questions or to support their findings.

Identify differences between the life cycles

Know how to conduct a simple scratch test on familiar items

## **Key Knowledge**

**Investigating our world – Castleton: Properties and changes of materials 1a (separate science)**

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.

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.

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

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.

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.

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.

Know that solids, liquids and gases can be separated using filtering, sieving and evaporation.

Know the following terms Filtering: separates an insoluble solid from a liquid. Sieving: separates solids of different sizes. Evaporation: separating dissolved substances from liquids.

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'

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. (teacher model)

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. (teacher model)

### **Star gazers: Space 1b**

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.

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 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

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 that there is an asteroid belt between Mars and Jupiter

Know the approximate relative size of planets from a diagram.

Know that planets have their own moons

Know that only Earth is habitable.

Know that the gas giants are: Jupiter, Saturn, Uranus and Neptune. The others are terrestrial planets: terra meaning land.

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



Know the Italian physicist and mathematician Galileo Galilei (1564–1642) was the first person to observe sunspots moving across the Sun's surface, through a telescope which he constructed in 1609.

Know that his work confirmed and advanced the Sun centred system that Copernicus had first postulated in the mid 1500s.

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.

### **Pharaohs: Animals including humans 2a (separate science)**

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

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

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

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.

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: rat, dog, horse, human, whale, elephant

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.

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.

### **Pharaohs: Forces 2b (separate science)**

Know 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.

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.

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.

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 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.

Know that Sir Isaac Newton (1642 - 1726) was an English mathematician and scientist.

Know that 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.

Know that friction occurs when objects move through water or air.

Know that air resistance is the frictional force air exerts against a moving object (drag)

Know that water resistance (movement in water) is the same force as air resistance but in the water

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

Know that if the weight is equal to or less than the upthrust, it floats. Things that float are 'buoyant'.

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

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

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.

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

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

Know that gears are often different sizes (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 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.

### **Sow, grow and farm: Living things 3b (separate science first few lessons)**

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

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

Know the life cycles of a Jaguar (mammal), Poison dart frog (amphibian), Leaf cutter ant (insect), Hummingbird (bird)

Know that farming in the UK can be divided into three main types: arable (growing crops), pastoral (raising livestock), mixed (arable and pastoral).  
Know that intensive farming in the past has resulted in the loss of habitats.  
Know that modern farming methods, such as excessive tillage, monoculture, removal of hedgerows, use of synthetic fertilisers and chemical pesticides, irrigation technologies and autumn planting, all impact on wildlife and the natural environment.

## Year 6

### Context

Science in year 6 is designed to build on and solidify the enquiry skills which have been developed across the school. They will be challenged to think about the reliability of their data and to make references to known scientific facts when writing conclusions and developing a hypothesis. They will build on their knowledge of light from year 3 and make links to their learning of living things and their habitats from EYFS, KS1 and KS2. The children will learn about the evolution and adaptation through making observations and researching Darwin's Theory of Evolution. They will be introduced to the circulatory system and build upon prior learning of the importance of a healthy diet and lifestyle. They will also use their understanding of electricity in year 4 to build circuits and draw diagrams.

### Key Skills

#### 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.

Identify how animals and plants are adapted to suit their environment, such as giraffes having long necks for feeding, and that adaptations may lead to evolution

A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make.

A variable is something that can be changed during a fair test.

A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.

To record and display data in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.

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.

### Key Knowledge

Hola Mexico: Light 1a

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)

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.

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.

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.

### **Frozen Kingdom: Living things and their habitats 1b**

Know that an adaptation is a physical or behavioural trait that allows a living thing to survive and fill an ecological niche

Know that adaptations evolve by natural selection

Know that living things are classified into groups, according to common observable characteristics and based on similarities and differences

Know that favourable traits help an organism survive and pass on their genes to subsequent generations

Know that a network of many food chains is called a food web

Know the adaptations of a polar bear and a penguin

### **Darwin's Delights: Evolution 2a**

Know that living things have changed over time

Know that most scientists believe that animals evolve due to having the characteristics that make them best suited to their environment and that this is known as 'natural selection' or 'survival of the fittest'

Know Darwin visited the Galapagos Isles where he made detailed observations about Finches and tortoises

Know that fossils provide information about things that inhabited Earth millions of years ago

Know that species pass on characteristics to their offspring but offspring vary and are not identical to their parents

Know that animals and plants can be bred to produce offspring with specific and desired characteristics. This is called selective breeding

Know that fossils are the preserved remains or traces of ancient plants and animals

Know Darwin was an expert in the natural history world

Know that finches adapted through varied beaks to suit the specific environment of the different Galapagos islands

Know Darwin pioneered the 'theory of evolution'

Know that a cactus has adapted to survive in the desert through its thick waxy skin to reflect heat; large stems to store water; deep roots to access water far below surface; long roots to spread over a wide area

### **Blood Heart: circulatory system 3b**

Know the circulatory system is the system that circulates blood through the body

Know that this consists of the heart, blood vessels, blood, veins, arteries, capillaries, oxygen, lungs and ribcage.

Know the heart is the organ in your chest that pumps the blood around your body

Know blood vessels are the general name for the narrow tubes through which your blood flows includes the arteries, veins and capillaries

Know blood is a red fluid that is pumped by the heart through the arteries and veins, supplies tissues with nutrients and oxygen.

Know veins are blood vessels that carry blood to the heart.

Know arteries are blood vessels that carry blood away from the heart.

Know capillaries are microscopic blood vessels found in the muscles and lungs

Know lungs are the two spongy organs inside your chest which fill with air when you breathe in. They remove carbon dioxide from blood and add oxygen.

Know the location of the lungs and heart

Know that the heart is a hollow muscular organ that pumps the blood through the circulatory system by regular contractions.

Know there are four chambers with two atria and two ventricles.

Know Deoxygenated blood flows into the heart from the body through the veins

Know This blood is pumped out to the lungs through the pulmonary artery

Know Blood is then oxygenated in the lungs

Know Blood returns to the heart through the pulmonary vein

Know The oxygenated blood is then pumped out of the heart through the aorta

Know 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.

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)

Know Lifestyle choices can have a positive (exercise and eating healthily) or negative (drugs, smoking and alcohol) impact on the body.

### **Electricity:**

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

Know that electricity is dangerous, so be careful when using electrical appliances

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.

Know that 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