MNSP Science KS1 Progression

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.

Within the disciplines of science we have identified the 'big ideas' (or threshold concepts) which are schemata which give the learning coherence . These big ideas are:

Biology	Chemistry	Physics
Plant Life **Animals and Humans** **Living things and their environments** **Evolution and Inheritance**	**Substances and their properties**	**Movement, forces and magnets** **Light and seeing** **Sound and hearing** **Electricity** **Earth in space**

We teach pupils to know about the unique processes of enquiry in science. Our' Big Ideas' for Working Scientifically (disciplinary content) are :

Observing over Time 
Observing, Classifying and Grouping 
 **Comparative and Fair Testing**
Pattern Seeking 
Research Using Secondary Sources 

Year 3

TERM	1	2	3	4	5	6
Topic title and NC link **Threshold Concepts** **NC Ref**	**The Power of Forces (Movement, Forces and Magnets)** • Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or		**Animals and humans and all living things (Animals and Humans, Living things and their environments)** • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food – they get nutrition from what they eat. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	**Rock Detectives (Substances and properties)** Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. • Recognise that soils are made from rocks and organic matter	**How does your garden grow? (Plant Life)** Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. Investigate the way in which water is transported within plants. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	**Physics - Light (Light and Seeing)** Recognise that they need light in order to see things, and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. • Find patterns in the way that the size of shadows change

	repel each other, depending on which poles are facing.				
Prior knowledge	The shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (y2)	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). • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2)	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses (y2)	Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy (y2)	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Describe the simple physical properties of a variety of everyday materials, transparent and opaque .
Sticky knowledge	A force is a **push or a pull.** When an object moves on a surface, the texture of the surface and the object affect how it moves. Forces act in **opposite directions** to each other. When an object moves across a surface, **friction** acts as an **opposite force**. A magnet attracts magnetic material. Iron and nickel and other materials	Animals, unlike plants which can make their own food, need to eat in order to get the **nutrients** they need. Food contains a range of different nutrients – **carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water – and fibre** that are needed by the body to stay healthy. A piece of food will often provide a range of nutrients. Humans, and	There are three types of rocks that are formed naturally. **Igneous: Sedimentary and Metamorphic**: Some rocks can absorb water .Some rocks contain fossils. **Fossils** were formed millions of years ago. When plants and animals	Many plants, but not all, have **roots, stems/trunks,** leaves and **flowers/blossom.** The roots absorb water and **nutrients** from the soil and **anchor** the plant in place. The stem transports water and **nutrients/minerals** around the plant and holds the leaves and flowers up	We see objects because our eyes can sense **light. Dark** is the **absence of light**. We cannot see anything in complete darkness. Some objects are sources of light. Objects are easier to see if there is more light. Some surfaces **reflect l**ight. Objects are easier to see when there is less light if they are

	containing these, e.g. stainless steel, are **magnetic.** The strongest parts of a magnet are the **poles.** Magnets have two poles – a **north pole and a south pole**. If two like poles, e.g. two north poles, are brought together they will push away from each other – **repel.** If two unlike poles, e.g. a north and south, are brought together they will pull together – **attract.** The distance around a magnet which attracts magnetic materials is called its **magnetic field.**	some other animals, have **skeletons and muscles** which help them move and provide protection and support. There are 5 types of **vertebrate** (animals with backbone: **mammals ,fish, reptiles, amphibians, bird**s)	died, they fell to the seabed. They became covered and squashed by other material. **Soils** are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter).	in the air to enhance **photosynthesis, pollination and seed dispersal.** The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to **reproduce.** Pollen is transferred to the **female** part of other flowers **(pollination)**. This forms seeds, sometimes contained in **berries or fruits** which are then dispersed in different ways.	**reflective.** The light from the sun can damage our eyes and therefore we should not look directly at the sun. **Shadows** are formed on a surface when an **opaque** or **translucent** object is between a **light source** and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface. Define: **transparent, translucent and opaque**
Working scientifically	**Identify, classify and group** Identify magnetic and non-magnetic materials **Pattern Seeking** Explore the way that magnets behave in relation to each other. **Comparative and fair testing**	**Identify classify and group** Compare, contrast and classify skeletons of different animals. Classify food according to food group and nutrients. Identify the impact of a lack of nutrients on human health Identify which bones are used for support, protection and movement. Identify how	**Identify Classify and group** Classify rocks according to simple physical properties , create a key Identify types of fossils **Observing change over time**	**Identify Classify and group** Identify common features of flowers, name and label them Identify pollen in flowers observe pollination by insects in flowers in school grounds **Observing change over time**	**Identify Classify and group** Classify materials according to how reflective they are **Pattern Seeking** Explore how shadows vary as the distance between a light source and an object or surface is changed. Explore shadows in the playground at different times

	Carry out investigations to explore how objects move on different surfaces e.g., rolling balls/cars. Devise an investigation to test the size of a magnetic field.	muscles expand and contract for movement.	Observe and describe the effects of weathering on different rocks **Comparative and fair testing** Devise a test to find out if all rocks are waterproof Investigate and test different kinds of soils to see how quickly water drains through	Observe the effect of putting cut white carnations or celery in coloured water. **Comparative and fair testing** Investigate how removal of leaves/ light/ soil/ roots affects a growing plant. Devise a fair test. **Secondary sources:** Research different types of seed dispersal	of day- explain why they are different **Comparative and fair testing** Investigate best materials to make shadow puppets **Secondary sources:** Research how sunglasses filter UV light from the sun
End of unit task	**Investigate movement, forces and magnets** Is a bigger magnet stronger? Investigate and conclude.	**Animals and humans:** Identify and describe the main nutritional benefits of carbohydrates, fibres, fats, proteins Explain the impact of diet on human health and some of the effects of a poor diet and malnutrition	**Investigate fossils.** Explain how a given fossil was formed -storyboard and explain the journey	**Investigate important changes in our environment** Research why bees are important and what we need to do to save them. Write an explanation of pollination and its importance.	**Understand light and seeing** Explain investigation findings about how and why the size of shadows changes.

Year 4

TERM	1	2	3	4	5	6
Science focus **and threshold concepts**	**Physics – Electricity**	**Physics – Sound (sound and hearing)**	**Chemistry – States of Matter (Substances and properties)**		**Biology – Living things and their habitats (Evolution and Inheritance, Organisms and their environments)**	**Biology – Animals, including humans** (**Evolution and inheritance, Organisms and their environments**)
NC Ref	Identify common appliances that run on electricity. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors.	Identify how sounds are made, associating some of them with something vibrating. Recognise that vibrations from sounds travel through a medium to the ear. Find patterns between the pitch of a sound and features of the object that produces it. Find patterns between the volume of a sound and the strength of the vibrations that produced it. Recognise that sounds get fainter as the distance from the sounds source increases.	Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius. Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.		Recognise that living things can be groups in a variety of ways. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose dangers to living things.	Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey.

Prior learning	Not covered before	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)	Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock .Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	Describe and compare the structure of a variety of common animals (Y1 – Animals, including humans) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)	Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)
	An **electrical circuit** consists of a **cell or battery** connected to a **component** using wires. If there is a break in the circuit, a	A **sound** produces **vibrations** which travel through a medium from the source to our ears.	A **solid** keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A	Living things can be grouped **(classified)** in different ways according to their features.	Food enters the body through the mouth. **Digestion** starts when the teeth start to break the

	loose **connection** or a **short circuit,** the component will not work. A **switch** can be added to the circuit to turn the **component** on and off. Metals are good **conductors** so they can be used as wires in a circuit. **Non-metallic** solids are **insulators** except for graphite (pencil lead).	Sound cannot travel through a **vacuum.** The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The **loudness** (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. A sound **insulator** is a material which blocks sound effectively. **Pitch** is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce **higher pitched sounds.**	**liquid** can be poured and keeps a level, horizontal surface. A **gas** fills all available space; it has no fixed shape or volume. Granular and **powdery** solids like sand can be confused with liquids because they can be **poured**, but when poured they form a heap and they do not keep a level surface when tipped. **Melting and freezing** are changes of state. The freezing point of water is 0oC. **Boiling** is a change of state from liquid to gas. Water boils when it is heated to 100oC. **Evaporation** is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. **Condensation** is the change back from a gas to a liquid caused by cooling. Pupils need to explain the **water cycle** with reference to changes of state.	**Classification** keys can be used to identify and name living things. Living things live in a **habitat** which provides an environment to which they are suited (Year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the **environment** to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the **seasons;** different living things can be found in a habitat at different times of the year.There are 5 types of **vertebrate (animals with backbone: mammals ,fish, reptiles, amphibians, birds)**	food down. **Saliva** is added and the tongue rolls the food into a ball. The food is swallowed and passes down the **oesophagus** to the stomach. Here the food is broken down and other chemicals are added. The food passes into the **small intestine.** Here **nutrients** are removed from the food and leave the **digestive system** to be used elsewhere in the body. The rest of the food then passes into the **large intestine.** Here the water is removed for use elsewhere in the body. What is left is then stored in the **rectum** until it leaves the body through the **anus.** Humans have four types of teeth: **incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing)** Living things can be classified as **producers, predators and prey**

					according to their place in the food chain.
Working scientifically	**Identify Classify and group** Classify materials as conductors and insulators **Pattern Seeking** Investigate how different types of switches operate **Comparative and fair testing** Compare different materials to replace wires in a circuit.	**Identify Classify and group** Classify materials according to sound insulation **Pattern Seeking** Find patterns between volume and strength of vibration causing it Find patterns between pitch of a sound and features of the instrument producing it. **Comparative and fair testing** Investigate how size of sound changes as distance from source increases	**Identify Classify and group** Group materials as solid, liquid or gas. **Observing over time** Observe how states of matter change over time, observe ice melting and evaporation. Observe the boiling of water, what happens at boiling point and change of state. **Pattern Seeking** Describe the water cycle. Identify examples condensation and where they come from **Comparative and fair testing** Investigate the best places to dry washing	**Identify Classify and group** Use fieldwork to investigate types of human impact in the local area Use classification keys to identify unknown living things **Observing over time** Observe local wildlife habitats **Secondary sources** Find out about how environments may naturally change. Find out about human impact, both positive and negative, on environments.	**Identify Classify and group** Classify types of teeth and their functions Classify animals as predators and prey, create food chains and webs Identify the organs and processes in the human digestive system **Pattern Seeking** Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing). Identify patterns of energy in food chains

End of unit task	**WALT investigate electrical circuits** Make, draw and describe the components of an electric quiz board.	**WALT investigate sound and hearing** Suggest a way to prove the relationship between size of instrument and pitch. True or false? Smaller instruments create higher pitched sounds	**WALT investigate states of matter** Summarise, using scientific terminology, the relationship between temperature and states of matter. Explain the water cycle using the appropriate terminology	**WALT classify living things** Summarise the key similarities and differences of animals in different groups. Adapt a classification key to include different criteria.	**WALT explain food chains** Demonstrate and explain how food chains begin with sunlight Explain how water is essential in a food chain

Year 5

TERM	**1**	**2**	**3**	**4**	**5**	**6**
Topic title and threshold concepts	**Physics – Forces and magnets (Movement, Forces and Magnets)**	**Physics – Earth and Space (Earth in Space)**	**Everyday Materials and Marvellous mixtures (Substances and properties)**		**The Circle of Life and reproduction of plants and animals (Plant Life, Evolution and Inheritance, Animals and Humans)**	**Animals including humans** **(Evolution and Inheritance, Organisms and their environments)**
Essential knowledge	Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object Identify the effects of air resistance, water resistance	Describe the movement of the Earth, and other planets, relative to the Sun in the solar system Describe the movement of the Moon relative to the Earth	Compare and group together everyday materials on the basis of their properties, know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution		Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals.	Describe the changes as humans develop to old age.

	and friction, that act between moving surfaces Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	Describe the Sun, Earth and Moon as approximately spherical bodies Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating Demonstrate that dissolving, mixing and changes of state are reversible changes		
Prior learning	Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract or repel each other and attract some materials and not others. Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet. (Y3 - Forces and magnets)	Observe changes across the four seasons. (Y1 - Seasonal changes) • Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)	Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)	Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)	Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)
Sticky Knowledge	A **force** causes an object to start moving, stop moving, speed up, slow down or change direction. **Gravity** is a	The Sun is a star. It is at the centre of our **solar system**. There are 8 planets (can choose to	Substances have different uses depending on their **properties** and **state** (liquid, solid, gas). Properties include **hardness,**	Most animals **reproduce** sexually. This involves two parents where the sperm from the male fertilises the	When **babies** are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn

	force that acts at a distance. Everything is pulled to the Earth by gravity. **Air resistance, water resistance and friction** are contact forces that act between moving surfaces. A **mechanism** is a device that allows a small force to be increased to a larger force. The payback is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. **Pulleys, levers and gears** are all mechanisms, also known as simple **machines**.	name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its **orbit** around the Sun. The Earth **rotates** (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon **orbits** the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately **spherical.**	**transparency, electrical and thermal conductivity** and attraction to magnets. Some substances will **dissolve** in a liquid and form a **solution** while others are **insoluble** and form **sediment. Mixtures** can be separated by **filtering, sieving and evaporation.** Some changes to materials such as dissolving, **mixing** and **changes of state** are **reversible**, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new substances and these are **not reversible.**	female egg. Animals, including humans, have **offspring** which grow into adults. In humans and some animals, these offspring will be born alive and then grow into adults. In other animals, such as chickens or snakes, there may be **eggs** laid that **hatch** to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a **metamorphosis**. Plants reproduce both **sexually and asexually**. Bulbs, tubers, runners and plantlets are examples of **asexual plant reproduction** which involves only one parent. **Sexual reproduction** occurs through **pollination**, usually involving wind or insects.	many skills. A**t puberty,** a child's body changes and develops **primary and secondary sexual characteristics**. This enables the adult to **reproduce.** This needs to be taught alongside PSHE.
Working Scientifically	**Identify Classify and group** Identify and classify gears, levers and pulleys	**Pattern Seeking** Investigate how the planet's temperatures	**Identify Classify and Group** Classify materials according to their properties	**Identify Classify and Group** Classify vertebrates and identify their life cycles	Taught through direct instruction and in conjunction with PHSE according to RSE policy.

	Comparative and fair testing Investigate the effects of friction, air and water resistance on objects and speed	change according to their distance from the sun Explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model **Secondary Sources** Research each planet and find out how far away from the sun. Present in scaled way	Classify ways of separating materials Classify which solids dissolve in water Classify reversible and non-reversible changes **Pattern Seeking** Observe and describe reversible and non- reversible changes **Comparative and fair testing** Investigate variables which affect how fast sugar dissolves.	Classify flowers according to male and female parts Identify the ways plants reproduce and the reproductive parts of flowers which differ from plant to plant . **Pattern Seeking** Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. Look for patterns between the size of an animal and its expected life span.	**Pattern Seeking** Look for patterns in the main changes occurring from birth to old age
End of unit task	**Understand movement, forces and magnets** How does the height and surface of a ramp affect how the car travels along it?	**Describe movement of the Earth in relation to the sun** Explain and demonstrate how a sundial, used to tell the time, works.	**Understand how mixtures can be separated** Investigate how to extract pure salt from rock salt. Explain findings	**Describe life process of reproduction in plants and animals** Explain the similarities and differences between the process of reproduction in plants and animals, including	**Investigate living things** Graph changes in average heights of males and females at different ages. Summarise findings.

				amphibians, insects and birds as well as mammals.	

Year 6

TERM	1	2	3	4	5	6
Topic title	Biology - Animals and humans **Body Pump and Body Health** **Organisms and their environments, Animals and Humans**		Biology – **Evolution and heritance**		**Physics – Light** **(Light and Seeing)**	**Physics – Electricity**
NC Ref.	Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function Describe the ways in which nutrients and water are transported within animals, including humans.		A) Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals Give reasons for classifying plants and animals based on specific characteristics. B) Recognise that living things have changed over time and that fossils provide information about		Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Explain that we see things because light	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of

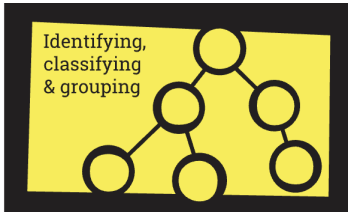
		living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	travels from light sources to our eyes or from light sources to objects and then to our eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	buzzers and the on/off position of switches Use recognised symbols when representing a simple circuit in a diagram.
Prior learning	Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans) • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)	Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) Describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. (Y2 - Living things and their habitats) • Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)	Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. • Find patterns in the way that the size of shadows change. (Y3 - Light) • Compare and group together everyday materials on the basis of	Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common

		Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats)	their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)	conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)
Sticky knowledge	The heart pumps blood in the **blood vessels** around to the lungs. Oxygen goes into the blood and **carbon dioxide** is removed. The blood goes back to the heart and is then **pumped** around the body. **Nutrients, water and oxygen** are transported in the blood to the **muscles** and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the **human circulatory system.** **Diet, exercise, drugs and lifestyle** have an impact on the way our bodies function. They can affect how well our heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some	Living things can be formally grouped according to **characteristics.** Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. **micro-organisms** such as **bacteria and yeast,** and **toadstools and mushrooms.** Plants can make their own food. Animals can be divided into two main groups: **vertebrates and invertebrates.** Vertebrates can be divided into five small groups: **fish; amphibians; reptiles; birds; and mammal**s. Each group has common characteristics. Invertebrates can be divided into a number of groups, including **insects and spiders**. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants. All living things have **offspring** of the same kind. Due to **sexual reproduction,** the offspring are not **identical** to their parents and **vary** from each other. Plants and animals have characteristics that make them **suited (adapted)** to thei**r environment.** If the	Light appears to travel in **straight lines,** and we see objects when light from them goes into our eyes. The light may come directly from **light sources**, but for other objects some light must be **reflected** from the object into our eyes for the object to be seen. Objects that block light (are not fully **transparent**) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object. Light can change direction in a process called **refraction**	Adding more **cells** to a complete **circuit** will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a **battery** with a higher **voltage,** the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a **switch** off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, **motors or buzzer**s will then turn off as well. You can use recognised circuit symbols

	conditions are caused by **deficiencies** in our diet e.g. lack of vitamins. This content is also included in PSHE	environment changes rapidly, some **variations** of a **species** may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited will survive to reproduce and pass their characteristics on to their young. Over a longer period of time, these characteristics may be so different to how they were originally that a new species is created. This is **evolution.**		to draw simple circuit diagrams.
Working scientifically	**Identify classify and describe** Classify and describe the roles of veins, capillaries and arteries in the circulatory system Classify healthy and unhealthy foods, describe the importance of exercise, the impact of illegal drugs on the body. **Pattern Seeking** Investigate how exercise affects heart rate, before, just after and minutes after exercise. Investigate recovery period. Identify mean for class/ group and compare with average for age group. **Comparative and fair testing**	**Identify classify and describe** Classify animals, plants, fungi, bacteria and Protista according to the Carl Linnaeus system. Create classification charts for vertebrates and invertebrates Create a classification system for some of the living things in the school ground Identify features in animals and plants that are passed onto offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs **Observations over time** Investigate conditions needed for bread to go mouldy and microorganisms to thrive **Pattern Seeking**	**Identify classify and describe** Identify ways that light can change direction, including through refraction **Pattern Seeking** Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in the card.	**Identify classify and describe** Make circuits then represent them in circuit diagrams and applying component symbols appropriately. **Pattern Seeking** Experiment with, explain and demonstrate the pattern between the voltage of cells and the brightness of a bulb. **Comparative and fair testing**

	Investigate variables affecting heart rate in exercise, design a fair test. **Secondary Sources** Use secondary sources to research the negative impact of drugs such as tobacco	Compare how humans and other mammals have evolved over time **Comparative and fair testing** Which bird 'beak' has adapted best for which type of bird 'food' (models Galapagos finches)	Note patterns in how mirrors change the direction of light travelling **Comparative and fair testing** Investigate the best reflective material for a periscope Investigate variables which affect the size of a shadow	Compare and explain, using correct scientific language, what happens to lamps, buzzers and motors when a resistor changes the flow of electricity in a circuit.
End of unit task	**WALT understand animals and humans** Write a booklet explaining how the heart and circulatory systems work and the importance of looking after them	**WALT understand evolution and inheritance** Explain and give examples of the idea of adaptation and evolution	**Understand how light travels** Experiment with making or using a periscope to demonstrate how objects may be seen. Explain what is happening to the light.	**WALT understand electrical circuits** Devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test Using correct scientific language, describe how changing the number and types of components in a circuit affects how they operate, such as increasing number of motors, buzzers

Progression in Working Scientifically in Years 3-6

Concept	**What pupils should know and be able to do Lower KS2**	**Key vocabulary Lower KS2**	**What pupils should know and be able to do Upper KS2**	**Key vocabulary Upper KS2**
	Identifying means to recognise something. Pupils learn that living and nonliving things can be sorted according to their differences (classifying) They can then group things according to similarities and differences. These are called criteria**.** Pupils record classifications using Venn and Caroll diagrams and tables.	differences, similarities, classify, diagram, chart, key, Carroll Diagram, Venn Diagram, behaviour, properties, criteria,	Identifying means to recognise something. Pupils learn that living and nonliving things can be sorted according to their differences (classifying) They can then group things according to similarities and differences. These are called criteria**.** Pupils record classifications using Venn and Caroll diagrams and tables. Pupils use classification keys to group according to criteria.	differences, similarities, classify, diagram, chart, key, Carroll Diagram, Venn Diagram, behaviour, properties, criteria, classification key
	A systematic observation is a way scientists observe repeatedly with a clear purpose. Pupils need to know that they can use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements , using a range of equipment, including thermometers and data loggers. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if	systematic, notice, patterns, observations, careful, accurate, evidence, increase, decrease, predict, conclude, relationships, appearance, unit measurements	Pupils must know how to 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);	systematic, notice, patterns, observations, careful, accurate, evidence, increase, decrease, predict, conclude, relationships, appearance, unit measurements (force, mm, cm, mins, seconds)

	required, to which they can add headings)		or check further secondary sources (researching); in order to get accurate data (closer to the true value)	
	In a scientific test, scientists make predictions and hypotheses. A prediction is what they think the outcomes might be, and a hypothesis is an explanation of phenomena. In simple comparative tests children compare one event with another and identify different outcomes. A variable is something that can change. In order to demonstrate a causal relationship between two variables children carry out a fair test. For a fair test, they identify a variable that can be changed and measured while keeping the other variables the same. In investigations, **conclusions** summarize how your results support or contradict your original prediction and help to form a hypothesis.	cause, effect, enquiry, fair test, comparative test, variable factor, record, measure, prediction,conclusion, evidence, hypothesis, phenomena.	The children show they know how to 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 assimilate other scientific processes into their learning. 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). They evaluate their findings, suggest improvements to their methods and form hypotheses.	Control, relationships, reliability, accuracy, interpret, justify, prove, Question/Enquiry , Method , Variables , Prediction , Results , Conclusion , Evaluation

	Pupils learn to recognise when a simple fair test is necessary and help to decide how to set it up. They learn to think of more than one variable factor. They recognise when a simple comparative test is necessary and help to decide how to set it up.			
	Children begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. With help, children can look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. Children can say what they found out, linking cause and effect.	patterns, relationships, cause, effect, data, changes, similarities, differences, predict, question, observations, conclude,	Pupils learn how to identify causal relationships and patterns in the natural world from their evidence; make simple conclusions, make predictions for new values, suggest improvements and raise further questions. They draw conclusions based on their evidence and current subject knowledge. They identify results that do not fit the overall pattern; and explain their findings using their subject knowledge (anomalies)	causal, interpret, data, graphs and charts, anomaly, atypical, typical, impact
	Begin to recognise when and how secondary sources might help to answer questions that cannot be answered through practical investigations	secondary source, reliability, fact, interpretation	Begin to recognise when and how secondary sources might help to answer questions that cannot be answered through practical investigations	secondary source, reliability, fact, interpretation

End points:

Milestone 2- End of Year 4	Milestone 3 - End of Year 6
Biology: • Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers. • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. • Investigate the way in which water is transported within plants. • Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. • Identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition from what they eat. • Construct and interpret a variety of food chains, identifying producers, predators and prey. • Identify that humans and some animals have skeletons and muscles for support, protection and movement. • Describe the simple functions of the basic parts of the digestive system in humans. • Identify the different types of teeth in humans and their simple functions. • Recognise that living things can be grouped in a variety of ways.	**Biology:** • Relate knowledge of plants to studies of evolution and inheritance. • Relate knowledge of plants to studies of all living things. • Describe the changes as humans develop to old age. • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. • Describe the ways in which nutrients and water are transported within animals, including humans. • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. • Describe the life process of reproduction in some plants and animals. • Describe how living things are classified into broad groups according to common, observable characteristics and based on similarities and differences, including microorganisms, plants and animals.

• Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. • Recognise that environments can change and that this can sometimes pose dangers to living things. Identify how plants and animals, including humans, resemble their parents in many features. • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Identify how animals and plants are suited to and adapt to their environment in different ways. **Chemistry:** Rocks and Soils • Compare and group together different kinds of rocks on the basis of their simple, physical properties. • Relate the simple physical properties of some rocks to their formation (igneous or sedimentary). • Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock. • Recognise that soils are made from rocks and organic matter. States of Matter • Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure the temperature at which this happens in degrees Celsius (°C), building on their teaching in mathematics.	• Give reasons for classifying plants and animals based on specific characteristics. • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. **Chemistry:** • Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets. • Understand how some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning, oxidation and the action of acid on bicarbonate of soda. **Physics:**

• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. **Physics:** • Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing. • Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the Sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by a solid object. • Find patterns in the way that the size of shadows change. • Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Identify common appliances that run on electricity.	Magnets • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing. **Forces** • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • Identify the effect of drag forces, such as air resistance, water resistance and friction, that act between moving surfaces. • Describe, in terms of drag forces, why moving objects that are not driven tend to slow down. • Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs. • Understand that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. • Understand that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.

• Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common conductors and insulators, and associate metals with being good conductors. • Describe the movement of the Earth relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth.	• Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases. • Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram. • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. • Describe the movement of the Moon relative to the Earth. • Describe the Sun, Earth and Moon as approximately spherical bodies. • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
To work scientifically: • Ask relevant questions. • Set up simple, practical enquiries and comparative and fair tests. • Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers.	**To work scientifically:** • Plan enquiries, including recognising and controlling variables where necessary. • Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work.

• Gather, record, classify and present data in a variety of ways to help in answering questions. • Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables. • Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests. • Identify differences, similarities or changes related to simple, scientific ideas and processes. • Use straightforward, scientific evidence to answer questions or to support their findings.	• Take measurements, using a range of scientific equipment, with increasing accuracy and precision. • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models. • Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions. • Present findings in written form, displays and other presentations. • Use test results to make predictions to set up further comparative and fair tests. • Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.