**Subject Progression for Science**

| **Year Group** | **Unit** | **Objectives** | **Skills / Knowledge**  Children at the expected standard can… |
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| **3** | **Unit: Animals**  (Building block topic)  *KEY QUESTION:*  *How do animals move?*  *Ligaments – Connect bones in joints.*  *Tendons – Connect muscles to bones.*  *Cartilage – Smooth tissue found at the end of bones, which reduces friction between them.*  *Antagonistic muscle pair – Muscles working in unison to create movement.)* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  All **vertebrates** have internal **skeletons** that protect **vital organs**.  **Invertebrates** have **exoskeletons** that protect **vital organs**.  **Skeletons** support the weight of land animals.  Stronger bones can **support** a greater **mass.**  Bones are **connected** (but can move relative to each other) at **joints**.   Stronger bones can **anchor** stronger muscles.  **Muscles** connect to bones and move them when they **contract**. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Identifying differences, similarities or changes related to simple scientific ideas and processes  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables  Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions  Using straightforward scientific evidence to answer questions or to support their findings  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  Using results to draw simple conclusions, make predictions for new values, suggestimprovements and raise further questions |
| **Unit: Animals (Digestion)**    *KEY QUESTION*  *What is digestion?*    *KEY VOCABULARY:*  *Digestion, nutrients.*  *Carnivore, herbivore, omnivore, predator and prey and food chain.*  *Teeth, incisors, canines, molars, cut, grind and chew.*  *Hygiene, bacteria, acid, cavities.*  *Digestions, absorb, dissolve, blood.*  *Mouth, tongue, chew, oesophagus, stomach, acid, small intestine, large intestine (rectum).*  *Fats, carbohydrates, protein, dairy, vitamins, minerals, fibre.*  *Energy, insulation, growth, repair.* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Animals need a variety of foods to help them grow and survive  The main food groups are:   * **Meat**, **dairy** and pulses provide **protein** for muscles. * **Grains** and **root vegetables** provide **carbohydrates** for energy. * **Fat** for **insulation** and energy. * **Fruit** and **vegetables** for **minerals, vitamins and fibre**.   These are essential to keep our bodies working well and protect us from illnesses.  Different animals require different food to survive.  Humans require a balanced diet to remain healthy but healthy diets vary depending upon the type of activity that humans do.  The **nutrients** in food have to get to every part of the body. The **blood** transports them.  The role of **digestion** is to get the nutrients in food to dissolve in the blood; if it doesn't dissolve it can’t enter the blood and be transported.  Teeth start to break up food  so it is easier to swallow.  Different teeth do different jobs. Canine grab and tear.  The oesophagus squeezes and relaxes to push food down the stomach.  The stomach contains acid that further breaks down and kills microbes that are harmful.  The intestines contain special chemicals that break down food further –so much did it dissolves in water.  Nutrients dissolve into the blood. Anything not broken down and dissolved leaves the body through the anus.  Our diet forms part of a food chain involving other living organisms | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables  Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.  Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.  Using straightforward scientific evidence to answer questions or to support their findings.  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. |
| **Unit: States of Matter/ Materials and their properties**  *KEY QUESTION:*  *What are solids, liquids and gases and can materials change from one of these states to another?*  *KEY VOCABULARY:*  *Solid, liquid, gas, properties.*  *Heating and cooling, evaporation, condensation, melting, freezing, boiling, condensation, freezing and melting temperatures.*  *Rigid, hard, soft, malleable, flow, volume, space, pour etc* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Materials can be divided into solids, liquids and gases.  **Solids** hold their shape unless forced to change.  **Liquids** flow easily but stay in their container because of **gravity**. The more **viscous** a liquid the less runny it is.  **Gases** move everywhere and are not held in containers by **gravity**.  **Heating** causes solids to **melt** into liquids and liquids to **evaporate** to gases.  **Cooling** causes gases to **condense** to liquids and liquids to **freeze** to solids.  The temperature at which a substance **boils** from a liquid to a gas is the same at which it **condenses** from a gas to a liquid.  The water cycle is the process by which water is continuously transferred between the surface of the earth and the atmosphere.  Liquid water evaporates into water vapor, condenses to form clouds, and precipitates back to earth in the form of rain and snow.  Different substances change **state** at different temperatures but the temperatures at which given substances changes state is always the same.  Liquids **evaporate** slowly, even below their boiling temperatures.  The temperature at which a substance **melts** from a solid to a liquid is the same at which it **freezes** from a liquid to a solid.  The temperature at which a substance **boils** from a liquid to a gas is the same at which it **condenses** from a gas to a liquid. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Making systematic and careful observations development of vocabulary to describe materials.  Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions  Setting up simple practical enquiries, comparative and fair  Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables  Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions  Asking relevant questions and using different types of scientific enquiries to answer them  Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions |
| **Unit: Materials and their properties / mixtures and separating them**  *KEY QUESTION:*  *What is a mixture and how can they be separated?*  *KEY VOCABULARY:*  *Mixture, dissolve, separate, sieve.*  *Solution, dissolve, soluble, insoluble filter, evaporate.*  *Reversible, irreversible*  *State, solid, liquid and gas.*  *Temperature, hotter, colder, heating, cooling, evaporation.*  *Bubbles, gas, change, reversible and irreversible.* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  A **substance** is an object with the same properties throughout.  A **mixture** is when more than one substance is present in the same container  When a substance is added to a liquid the substance can disappear- this is called **dissolving.**  A mixture of a substance that has dissolved in a liquid is called a **solution.**  Not every substance can dissolve in water.  Mixtures can be separated if the substances have different properties. This is because the substances in the mixture are still present and are unchanged.  There are different techniques for separating mixtures   |  |  | | --- | --- | | Separating technique | Substance properties required to work | | Filtration and sieving | A substance that does not dissolve in a liquid  Different sized substances | | Magnets | Some magnetic materials some non-magnetic | | Evaporation | A solid substance dissolved in water and the solid has a higher boiling point than water. | | Floating | Some substances float, some substances sink | | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Identifying differences, similarities or changes related to simple scientific ideas and processes  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables  Using straightforward scientific evidence to answer questions or to support their findings  Setting up simple practical enquiries, comparative and fair tests |
| **Unit: Forces – Magnets and their effects**  *KEY QUESTION:*  *Are forces invisible?*  *KEY VOCABULARY:*  *Push, pull, attract, repel, attractive, repulsive,force, non-contact, north pole, south pole, magnet, magnetic, non-magnetic, metal, non-metal, stronger, weaker* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Magnets exert **attractive forces** on some **metals**  Magnetic forces work through other materials including air, so magnets don't need to be touching to **exert** their force. It is called a **non-contact force**.  Each end of a magnet is called a **pole**, opposite poles are called north and south.  Magnets exert **attractive** forces on each other when the poles facing each other are north and south (opposites).  Magnets exert **repulsive** forces on each other when the poles facing each other are the same.  Magnets exert **attractive** forces on each other when the poles facing each other are north and south (opposites).  Magnets exert **repulsive** forces on each other when the poles facing each other are the same.  Magnets exert **attractive** forces on each other when the poles facing each other are north and south (opposites).  Magnets exert **repulsive** forces on each other when the poles facing each other are the same.  The strength of magnetic forces is affected by:   * The strength of the magnet. * The distance between the magnet and the object. * The material the object is made from. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions; careful modelling/scaffolding of how to report findings.  Setting up simple practical enquiries, comparative and fair tests using the Planning Mindmap.  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables - Force arrows.  Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment - continued Focus on measuring accurately.  Asking relevant questions and using different types of scientific enquiries to answer them.  Given a range of resources, deciding for themselves how to gather evidence to answer the question |
| **4** | **Unit: Light**  *KEY QUESTION: How do we see?*  **Multiple contexts**  *KEY VOCABULARY:*  *Light, dark, shadow, light beam, light source.*  *Transparent, translucent, opaque.*  *Shiny, reflective, reflection, absorb, scattering*  *(Refraction – Change in the direction of light going from one material to another.*  *Scattering – When light bounces off an object in all directions.*  *Transparent – A material that allows all light to pass through it.*  *Translucent- A material that allows some light to pass through it.*  *Opaque – A material that allows no light to pass through it.*  *Convex lens – A lens that is thicker in the middle which bends light rays toward each other.*  *Concave lens – A lens that is thinner in the middle which spreads out light rays.)* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  There must be light for us to see.  Light comes from a **source**.  We need light to see things, even **shiny** things.  The closer to the light source an object is, the bigger the shadow will be. This is because the object blocks more of the light.  The further away from the light source an object is, the smaller the shadow will be. This is because the object blocks less of the light.  If an object is **transparent** light will go through it and we will be able to see through it.  If an object is **opaque,** it will block the light and no light will get through. This is what forms shadows.  If the material is **translucent,** it will allow light through, but we won't be able to see through it.  If an object is perfectly **reflective** light will bounce back off it and we will see reflections of objects. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions  Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment including data loggers.  Setting up simple practical enquiries, comparative and fair tests  Gathering, recording, classifying and presenting data in a variety of ways to help in answering questionsrecord classifications e.g., using tables, Venn diagrams, Carroll diagrams.  Setting up simple practical enquiries, comparative and fair tests  Identifying differences, similarities or changes related to simple scientific ideas and processes  Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions  Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables |
| **Unit: Electricity**  **(Circuits / Materials which Conduct Electricity)**  *KEY QUESTION:*  *What is electricity?*  *KEY VOCABULARY:*  *Electricity supply, battery, mains, lead, connection, circuit, switch, wire, device, lamp, motor, buzzer.*  *Complete circuit, incomplete circuit, connection.*  *Metal, non-metal, conductor, insulator*  *Brighter, faster*  *Electricity, energy, heat.*  *Cell, battery, bulb, amp, lead, motor, switch.*  *(Voltage - push*  *Current – flow)*  Building Block | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Lots of **devices** are powered by **electricity.**    Electricity comes from a source.    There are two main sources- **batteries and mains.**  A battery pushes electricity to the device.  To be able to push electricity the battery must be connected to the device using **wires.** This is called a **circuit.**  If there are more batteries added to a circuit this provides a bigger push on the electricity. This will make the device work harder e.g., brighter bulbs, faster spinning motor, louder buzzer.  Some materials will allow electricity to flow through them- **Conductors**  Metals such as silver, gold and copper are good conductors. Water is also a conductor of electricity.  Other materials will not allow electricity to flow through them- **Insulators**  Plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity.   A switch opens and closes a circuit | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Asking relevant questions and using different types of scientific enquiries to answer them  Asking relevant questions and using different types of scientific enquiries to answer them  Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers  Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions  Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions |
| **Unit: Plants**  *KEY QUESTION 1:*  *How do plants reproduce?*  *KEY VOCABULARY:*  Soil, flower, petal, fruit, seed, germination, seed coat, shoot, root.  Reproduction, pollination, fertilization, pollen, egg, embryo, stigma, stamen, anther, ovary, pollen tube, dispersal.  Roots, stem, leaves, branch, twig.  Nutrients, water, carbon dioxide, sunlight, darkness, energy.  ***Building Block*** | **Substantive knowledge**  (Key vocabulary identified in bold)  Flowering plants **reproduce** by the process of **pollination.**  Pollination leads to the formation of a **seed** which can grow into a new plant.  Flowering plants have evolved specific parts to carry out pollination and seed growth.  Those parts are **stamen** where pollen is produced, **stigma** where pollen is collected, and the **ovaries** which contains the eggs that become a seed when the pollen travels down the stigma and meets the egg.  Flowers have **petals** also are a range of colours, patterns, and smells to attract insects  Plants and flowers look different because they pollinate in different ways.  There are two types of pollination: Insect and wind. Insect pollinated flowers are usually bright coloured and strong scents.Wind pollinated flowers have less colourful petals and much less scent.  Plants have evolved many different ways to **disperse** their seeds.  Seed dispersal increases the chances of seeds **germinating** and growing into a mature plant  A seed contains a miniature, undeveloped version of the plant.  They contain a food store for the first stage of growth (until the plant can make its own food).  They are surrounded with a protective coat. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Making systematic and careful observations  Identifying differences, similarities or changes related to simple scientific ideas and processes  Setting up simple practical enquiries, comparative and fair tests |
| **Unit: Living Things (incorporating the Longitudinal Study)**  *KEY QUESTION:*  *What is classification?*  *Longitudinal studies -*  *children should raise and explore questions that* ***demand*** *the**identification and classification of creatures*  *KEY VOCABULARY:*  *Classification keys living and non-living.*  *Animal (names of animals they will observe in their specific local environment)*  *Plant (names of plants they will observe in their specific local environment).*  *Variation.*  *Predator, prey, carnivore, herbivore.*  *Vertebrate invertebrate organism*  *Food chain, food web, nutrients*  *population.*  *Survive, die, migrate, hibernate*  *Seasons (and names of).*  *Rainfall, wet, dry, temperature, warm, cold, daylight hours.*  *Environment, habitat, shelter, food, camouflage.*  *Adapted, unsuited,*  *Dependent, interdependent.* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Living things can be divided into groups based upon their characteristics  **Classification keys** help group, identify and name living things  Animals can be classified as **vertebrates** (having a spine) or **invertebrates** (lacking a spine)  In any habitat there are **food chains** and webs where **nutrients** are passed from one **organism** to another when it is eaten  If the population of one organism in the chain or web is affected, it has a knock-on effect to all the others  Mammals, amphibians, insects and birds have different life cycles  Lifecycles vary in time depending on the species of animal- it can be as short as just a few weeks for insects, to up to 200 years for sea urchins. Larger animals often have longer life cycles but not always.  All animal life cycles begin with growth and development followed by reproduction  **Environmental change** affects different habitats differently  Human activity significantly affects the environment  Different organisms are affected differently by environmental change | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  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  Identifying differences, similarities or changes related to simple scientific ideas and processes  Using straightforward scientific evidence to answer questions or to support their findings  Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers |
| **Unit: Plants continued…**  *KEY QUESTION 2:*  *How do plants make their food?*  ***Big Model***    *KEY VOCABULARY:*  *Producers, absorb, oxygen, carbon dioxide, energy, food* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Plants do not eat food so have to make their own.  This food provides then with energy, and materials to grow  To make the food (sugar) plants need water from the ground, **carbon dioxide** from the air and light from the sun.  The water is taken up through the **roots** from the **soil**  The carbon dioxide is taken in through the **leaves**  As well as food, plants also make **oxygen** which is given out back into the air through the leaves  (This substantive knowledge needs to be taught to all children in addition to the investigations they complete.) | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  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  Setting up simple practical enquiries, comparative and fair tests - Planning Mindmap |
| **5** | **Space and Gravity**  *KEY QUESTION:*  *What goes on in our solar system?*  *KEY VOCABULARY:*  *Sun, star, planet, moon, satellite, phases, universe*  *Diameter, radius, gaseous, rocky*  *Weight, gravity*  *Orbit, spin*  *Galaxy, Milky Way*  *Heat, light*  *NB. Lots of shared vocabulary with Forces and Light.*  ***Building Block*** | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  A **Solar system** is a collection of **planets**, which **orbit** (a curved path) a **star**.  There are huge number of stars in space and therefore a huge number of solar systems.  Our solar system consists of 8 planets, many of those planets have **moons** which orbit around them.  Our solar system can be represented with a model (see diagram), but it isn’t possible to draw it to scale.  The planets and moons are **rotating** (spinning)  The time it takes one planet to rotate is called a **day**. The time it takes a planet to complete one orbit around its star is called a **year**.  The time it takes one planet to rotate is called a **day**. On Earth this is 24 hours  **Asteroids** are lumps of rock that orbit a star (there are millions in between Mars and Jupiter)  **Comets** are objects that are made of Ice, which melts when they get closer to the sun leaving a tail.  **Gravity** is force of attraction between two objects with **mass** (a quantity of matter)  The bigger the mass the bigger force it exerts.  Gravity works over distance but gets weaker as distance increases.  Stars, planets, moons have a very large amount of mass. They exert a gravitational attraction on each other.  Differences in gravity result in smaller mass objects orbiting around lager mass objects, e.g., planets around stars and moons around planets  The solar system is with a massive collection of stars called the **galaxy** (called the Milky way)  The Milky way is one of billions of galaxies in the **Universe**.  Stars are huge balls of gas that produce vast amounts of light and heat. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Identifying scientific evidence that has been used to support or refute ideas or arguments  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate  Recording data and results of increasing complexity using scientific diagrams and line graphs.  Apply substantive knowledge to develop ideas and models of phenomena. |
| **Unit: Electricity**  *KEY QUESTION: How do electrical circuits work?*  ***Building Block***  *KEY VOCABULARY:*  *Electricity, energy, heat.*  *Circuit, current, voltage, resistance.*  *Conductor, insulator.*  *Cell, battery, bulb, amp, lead, motor, switch.* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  **Current** is the flow of electricity around a circuit.  The power supply in a circuit pushes the current round the circuit  The **voltage** of the power supply is a measure of this push  Voltage is measure in **volts**  Batteries have a limited store of energy and when this is gone, they can no longer push the current  Current is the flow of electricity through a conductor  When current passes through a device it makes it work  The larger the flow of current, the harder the device works  All parts of a circuit offer **resistance** to electrical current including the wires.  Resistance is the slowing down of electrical current.  The more devices added into a circuit the greater the resistance. This means less current flows around the circuit | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Reporting and presenting findings from enquiries, in a written form.  Reporting and presenting findings from enquiries in conclusions.  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.  Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. |
| **Unit: Materials**  *KEY QUESTION:*  *How can materials be changed?*  **Multiple context**  *KEY VOCABULARY:*  *Substance*  *Air, gas, oxygen.*  *Weight, mass, heavy, light, balance.*  *Bubbles fizz.*  *Change, reversible and irreversible.*  *Solid, liquid, gas, state,properties.*  *Heating and cooling, boiling*  *Temperature,*  *Insulator and conductor* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible.  If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)  Indicators that something new has been made are the properties of the material are different (colour, state, texture, hardness, smell, temperature)  If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)  All matter, including gas, has **mass**. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Reporting and presenting findings from enquiries  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate |
| **Unit: Light**  *KEY QUESTION:*  *How do we see?*  *KEY VOCABULARY:*  *Transparent, translucent, opaque, reflective, absorbent, angle.*  *Anatomy of eye vocabulary: pupil, retina, lens, iris.*  *Light, dark, shadow, light beam.*  Shiny, reflective, reflection, scatter.  *Nocturnal, adapted.*  ***Building Block*** | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  When light is emitted from a light source, it travels in straight lines until it hits an object.  **Shadows** form when light hits an **opaque** object, the area behind is in darkness because light can only travel in straight lines. **(Activity 3)**  Diagram  Description automatically generated with medium confidenceWhen light hits a **transparent** object, it goes through it in a straight line so we can see a clear image through it.  When light hits a **translucent** material, it goes through it but is scattered, this means light can pass through, but we can’t see an image through it.  When light hits a mirrored surface, it reflects off it in straight lines, so we can see an image in the reflective material.  Sometimes when light hits a material it **reflects** off it in many different directions (it is scattered). In this case light will be reflected but no image will be seen in the material.  Shiny surfaces are better reflectors and rough surfaces scatter light more. Opaque objects don’t allow any light to pass through them.  Animals see objects when light is reflected off the object and enters the eye through the **pupil**.  The pupil changes its size to allow enough, but not too much light into the eye.  Too much light damages the eye and too little results in poor quality images. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary  Recording data and results of increasing complexity using scientific diagrams  Identifying scientific evidence that has been used to support or refute ideas or arguments.  Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.  Reporting and presenting findings from enquiries, in oral and written forms such as displays and other presentations |
| **Unit: Rocks and Soils**  *KEY QUESTION:*  What is the Earth made from?  *KEY VOCABULARY:*  *Rock, mineral, ores, grains, fossils, sedimentary, limestone ,sandstone, crystals, igneous , metamorphic,*  *Granite, slate, porosity, hardness,* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  A **rock** is a solid material made up of **minerals** forming part of the surface of the Earth  Rocks are exposed on the surface at cliffs, hills and mountains but are also under the surface.  Some rocks, called **ores** contain metals  Some rocks are made of **grains** squashed together and can contain the remains of long-dead organisms, called **fossils**. This type of rock is called **sedimentary** rock, an example would be **limestone**, **sandstone** or **mudstone**  Some rocks are made of **crystals** that are locked tightly together. These are called **igneous** and **metamorphic** rocks; an example of igneous rock is **granite,** and an example of metamorphic rock is **slate**  These three types of rocks all have different properties to each other, including **porosity**, **hardness**, reaction to chemicals  The properties of the rock depend on how the rock was formed, e.g. Some igneous rocks form from lava from volcanoes and cool very quickly leading to very small crystals  Soil is made up of small broken-down pieces of rock.  Soil contains a range of different size rock pieces, e.g., sand grains or stones.  Soil also contains humus (rotted plant material)  Soil made of very fine rock is called silt or clay. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Reporting and presenting findings from enquiries, in oral and written forms such as displays and other presentations  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate  Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary |
| **6** | **Unit: Animals**  *KEY QUESTION:*  *How do nutrients and oxygen get to where they are needed in the body?*  ***Big Model***  *KEY VOCABULARY:*  *Digestion, nutrients absorb, dissolve, blood,*  *Teeth, incisors, canines, molars, cut, grind and chew.*  *Mouth, tongue, teeth, chew, oesophagus, stomach, acid, small intestine, large intestine (rectum)*  *Muscles, energy, oxygen, carbon dioxide, carbohydrates, sugar glucose, intestines*  *Blood, heart, circulation, nutrients, dissolve, pulse rate, blood vessels, veins, arteries, capillaries, blood pressure*  *Lungs, breathing, oxygen, dissolve, circulation, respiration* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  All animals need **oxygen** to survive.  Air is breathed into the **lungs** where the oxygen in the air is passed into the blood.  Every part of animals’ bodies need oxygen, especially **muscles**.  Muscles need a supply of oxygen and **sugar (glucose)** to make them work, they are supplied by the blood.  The heart is a vital organ it pumps blood through the blood vessels.  Blood Vessels are the tubes that blood flows through.  The blood **circulates** around the body in a way that ensures all muscles in the body get a supply of oxygen and sugar.  The **heart** pumps blood to every muscle in the body. The circulatory route must allow the blood to collect oxygen from the lungs, sugar from the intestines and visit muscles.  The blood then returns to the heart where it is pumped again.  Exercise helps the heart to work more efficiently.  Exercise helps the heart to work more efficiently.  Eating a healthy diet helps to keep the blood vessels from getting blocked.  Avoiding smoking and alcohol puts less stress on the whole system and keeps it healthier. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.  Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.  Planning different types of scientific enquiries to answer questions, includingrecognising and controlling variables where necessary.  Identifying scientific evidence that has been used to support or refute ideas or arguments.  Using test results to make predictions to set up further comparative and fair tests. |
| **Unit: Variation and Evolution**  *KEY QUESTION:*  *How have living things evolved?*  ***Building block***  *KEY VOCABULARY:*  *Sexual reproduction, asexual reproduction, male, female*  *Variation, similar, different.*  *Offspring, parents, family, siblings, inherit, characteristics, features.*  *Population*  *Reproduction,*  *Survive, extinct, gradual, evolve, evolution, fossils, natural selection, Charles Darwin*  *Environment, adapted*  *Life cycle, fertilisation, embryo, birth, growth, adult, mature, society, learning.*  *Evidence, theory.*  extinct organisms  microorganisms  microscopes. | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  The Earth is very old. Around 4.2 **billion** years. We know this from dating rocks  Life first appeared on Earth around 3.8 billion years ago.  Life was, at first, very simple but over **millions** and millions of years life became more complex through the process of **evolution.**  There are many sources of evidence for evolution.  **Fossils** are one of the main sources of evidence for evolution.  They show when new organisms appear and when they go **extinct**.  Due to the nature of fossil formation and discovery, fossils only provide an incomplete record of evolution.  Scientists use fossils along with other pieces of evidence *(DNA, Embryology, comparative anatomy, artificial selection)* to work out how organisms have evolved.  Fossils form when dead organisms are rapidly buried or leave an imprint and are turned to stone over a long period of time. If they survive in the Earth, they then have to be found by a **palaeontologist** who will study them  **Evolution** is the change of physical form in a population over a long-time span.  **Natural selection** is the process which controls that change.  In any **population** there is **variation** and **competition** for resources (food, water, mates).  Within that variation, organisms that have features which make them better **adapted** at securing food, water, and mates, are more likely to survive and produce **offspring** which have **inherited** those same successful features. Those that are not well adapted will eventually go **extinct.**  Over a long enough timeline all organisms in a population will have those successful features.  Over a long enough timeline all organisms in a population will have those successful features.  This is known as the *Theory of Evolution by Natural Selection* and was developed by **Charles Darwin** in 1859.  Before Darwin, **Lamarck’s** Idea of acquired characteristics was proposed. (Giraffes stretch their necks in life, which made their children have longer necks).  Darwin as a young man travelled around the world on the **HMS Beagle**. On this 5-year voyage he saw lots of things and recorded down lots of evidence which allowed him to work out how organisms change over time by a different mechanism of Natural selection**.**  All living (and **extinct**) **organisms** are classified into groups based upon their physical features.  This includes animals, plants, fungi, and **microorganisms** like **bacteria**.  Within each of these broad groups, organisms are classified into small subgroups. Animals- invertebrates, mammals, birds, amphibians, reptiles and fish, Plants- flowering plants, ferns, conifers, moss.  Bacteria are a group of organisms that are not visible to the naked eye but are very abundant and have distinct physical features we can only see under powerful **microscopes**. | **Disciplinary knowledge**  (Instructed / Undertaken / Revisited)  (Working Scientifically)  Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.  Identifying scientific evidence that has been used to support or refute ideas or arguments.  The method of scientific classification. |
| **Unit: Sound**  *KEY QUESTION:*  *How do we hear?*  *KEY VOCABULARY:*  *Sound, volume (soft and loud), high pitch, low pitch, vibration, frequency, amplify, insulation.*  ***Building Block*** | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  Sounds can be produced in a variety of ways.  Sounds have the properties of **pitch** and **volume.**  When a sound is produced it spreads out from its source in all directions  Sound is caused by **vibration** (objects move rapidly back and forth or up and down)  When objects vibrate it makes the objects in contact with it also vibrate. This includes the air.  The vibration travels through the air and makes other objects it is in contact with vibrate including your **ear drum**.  Pitch and volume are caused by how the material vibrates.  The pitch of a sound is caused by how fast an object vibrates. This is called the **frequency** of vibration. The higher the frequency, the higher the pitch.  Smaller objects or tighter strings tend to vibrate with a higher frequency.  The volume of sound is caused by how big each vibration is. This is called the **amplitude** of vibration. The bigger the amplitude the higher the volume. | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary  Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate  Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs  Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations |
| U**nit: Forces**    *KEY QUESTION:*  *What are forces?*    *KEY VOCABULARY:*  *Force, friction, resistance, grip, movement, slow, oppose, rubbing, rough, surface, interlocking, heat, air resistance, water resistance, density, weight, viscosity, drag, streamlined, air, liquid.*  *Cog, gear, lever, fulcrum, pulley, force multiplier.* | **Substantive knowledge**  (Key vocabulary identified in bold)  To know that:  When objects move through air and water, they have to push it out of the way. The water and air push back with forces called **water resistance** and **air resistance**. The harder it is to push the material out of the way the greater the resistance.  Gases weigh less than liquids and so water resistance is greater than air resistance.  **Friction** is a **force against motion** caused by two surfaces **rubbing** against each other.  It occurs because no surfaces are perfectly smooth; they have bumps and **undulations** that can **interlock** when placed on top of each other.  To move one interlocking surface over another, one of three things must happen:  1. The surfaces must rise slightly  2. The bumps on the surface must bend  3. The bumps on the surface must break  All of these actions require a force, this is what causes friction  Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move.  The use of levers can reduce the force needed to move things. The object you are lifting is called the load, and the force you apply to the arm to make the object move is called the effort.  The use of pulleys can reduce the force needed to move things  (These are particularly complex ideas. It might be better to teach them through a design technology project where children make toys using cogs, pulleys and levers) | **Disciplinary knowledge**  Instructed / Undertaken / Revisited  (Working Scientifically)  **Using test results to make predictions to set up further comparative and fair tests -** when making a generalisation based on the data they have found, using a simple structure for a conclusion which allows children to describe the subtleties and say how sure they are. Language needs modelling. Sentence stems such as the following will help-  *•As x increases/decreases y increases/decreases.*  *• Add detail about the increases e.g., each increase in x causes the same increase in y*  *•The relationship is strong/fairly strong/weak, so we are almost certain/ fairly certain/ not very certain quite confident this is right.*  *•This means Y is almost certainly/certainly/ not affected by*  **Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary -** Planning mindmap- Greater focus on development of ideas for approaches using arrows to show related ideas.  **Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations-** using relevant scientific language and illustrations.  **Recording data and results of increasing complexity using scientific diagrams.**  **Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations**  **Identifying scientific evidence that has been used to support or refute ideas or arguments -** talk about how their scientific ideas change due to new evidence that they have gathered.  **Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate -** children select measuring equipment to give the most precise results e.g., ruler, tape measure or trundle wheel, force meter with a suitable scale. |