Greenside Primary School
Science Progression Framework

Curriculum Intent

Community	Resilience	Creativity	Aspiration	Diversity

The science curriculum at Greenside aims for children to develop:

- The ability to think independently and raise questions about working scientifically and the knowledge and skills that it brings.
- Confidence and competence in the full range of practical skills, taking the initiative in, for example, planning and carrying out scientific investigations.
- Excellent scientific knowledge and understanding which is demonstrated in written and verbal explanations, solving challenging problems and reporting scientific findings.
- High levels of originality, imagination or innovation in the application of skills.
- The ability to undertake practical work in a variety of contexts, including fieldwork.
- A passion for science and its application in past, present and future technologies.

Implementation

The science curriculum at Greenside Primary School has been carefully considered to ensure coverage of all the national curriculum objectives. As a one and a half form entry school, we have carefully devised a 2-year cycle to ensure coverage of key substantive knowledge. The aim is that over the 2 years, pupils will gain a deeper knowledge and application of the disciplinary 'working scientifically' skills they need as scientists.

All science units have a corresponding medium-term plan, which maps substantive knowledge, disciplinary skills and vocabulary on a lesson-by-lesson basis to ensure progression throughout each unit. Each unit has clear end points mapped and which knowledge we want children to be able to recall and retain.

Each lesson within the sequence will focus on a particular piece of substantive knowledge. The sequence of lessons builds up the children's substantive knowledge to answer an overarching assessment question by the end of the unit.

In order for children to know more and remember more in each area of science studied, the lesson sequence is structured so that prior learning is always considered and opportunities for revision and retrieval of key facts are built into lessons through the 'Fab 5' activities. The Fab 5 is a 5-minute retrieval task that takes place at the start of every lesson that often revisit the key substantive knowledge from previous learning in the sequence, year or from another phase completely. This all allows for revision to become part of good practice and ultimately helps build a depth to children's scientific knowledge and understanding. Through revisiting and consolidating skills, our lessons and resources help children build on prior knowledge alongside introducing new skills as well as opportunities for deeper thinking. Revision and introduction of key vocabulary is built into each lesson. This vocabulary is then included in display materials and additional resources to ensure that children are allowed opportunities to repeat and revise this knowledge.

Through these lessons, we intend to inspire pupils and practitioners to develop a love of science and see how it has shaped the world they live in. It is important for children to understand that scientific discoveries influence past, present and future technologies. We want to encourage children to learn that what we learn in science gives us the knowledge to help shape a better future.

Each unit has a designated 'end point' and summaries of the children's learning will be evident from the work they have produced throughout the unit, which is revisited regularly. These form the basis of our assessment.

The essential knowledge, highlighted in yellow, has been identified for each unit learning and forms the focus of teacher assessment.

The Science Curriculum and Provision for Pupils with SEND

At Greenside Primary School, we believe all pupils should have the opportunity to learn to the best of their capabilities through a broad and balanced, inclusive curriculum. For our pupils with a Special Educational Need, we scaffold their learning to provide them with the strongest opportunities for success in our school. We believe firmly in the SEND Code of Practice's statement that 'every teacher is a teacher of SEN' and that our pupils with SEN should be provided with the same opportunities as their peers in our school. This means that, with their learning being personalised to meet their areas of need, they feel included in the classroom and make progress year on year. Reasonable adjustments are made in all lessons to enable this.

The Science curriculum can be adapted to meet the needs of children with SEND in the following ways:

Universal Support across school for all subjects
Word Banks for pre-learning and to support during topics and themes
Cutting and Sticking Key Words on to work as prompts
Print out portions of work and learning objectives to minimise writing
Coloured Paper or recycled paper to minimise visual stress & background colours of the whiteboard is considered for pupils with dyslexia.
Breaking down lessons into short, manageable chunks
Mixed ability groups – using peers as support and role models
Adult assistance nearby/ Using another student as a reader/support
Now/Next or Visual Timetables – class and individual/ My Turn/Your Turn
Knowledge map/Mind Maps
Printing work larger and in smaller chunks
Cloze passages/activities to check learning
Draw answers or explanations / Actions – telling the story of a lesson
Fidget toys available/ Cushions for seats – wobble and wedge cushions – access to standing desks
Pupils with hearing impairments/visual impairments are positioned close to the whiteboard to be able to access.
Word lists of key vocabulary for pre-learning and as prompts
A safe/quiet space in or Cloud Room
Keeping instructions short and one at a time

Universal Support specific to subject
Use systems such as racks so that science equipment can be found and put back easily.
Specialist advice on equipment for pupils with particular SEN or disabilities, e.g. tactile ridges on measuring glassware for pupils with a visual impairment.
Plan the demonstration area so that it is clearly laid out, uncluttered and gives all pupils a clear view.
Ensuring pupils do not come into contact with any substances or materials that they are allergic to.
Simple audio recorders can be used instead of written notes during investigations.
Build on pupils' preferred learning styles when explaining concepts, by using different media – e.g. diagrams, stories, acting out processes, computer simulations, concept mapping, etc.
Considered risk points in the lesson, e.g. for pupils with noise or smell sensitivity
Talking postcards / talk to text / use of laptop to type rather than write science investigation or work

When planning for Science, class teachers should adapt their lessons where necessary using ideas taken from this list, however, it is important to remember this list is not exhaustive and other adaptations may be needed for children with specific needs.

We also have 'Continuum of Provision Maps' for each area of SEND need (e.g. Autism, Cognitive, SEMH, Visual impairment etc).

Breadth of Study

Key Concepts	EYFS	KS1	LKS2	UKS2
Working Scientifically This concept involves learning the methodologies of the discipline of science.	❖ Make comments about what they have heard and ask questions to clarify their understanding. ❖ Explore the natural world around them, making observations and drawing pictures of animals and plants.	❖ Asking simple questions and recognising that they can be answered in different ways. ❖ Observing closely, using simple equipment. ❖ Performing simple tests. ❖ Identifying and classifying. ❖ Using their observations and ideas to suggest answers to questions. ❖ Gathering and recording data to help in answering questions.	❖ Asking relevant questions and using different types of scientific enquiries to answer them. ❖ Setting up simple practical enquiries, comparative and fair tests. ❖ Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. ❖ Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. ❖ Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. ❖ Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. ❖ Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. ❖ Identifying differences, similarities or changes related to simple scientific ideas and processes. ❖ Using straightforward scientific evidence to answer questions or to support their findings.	❖ 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. ❖ Using test results to make predictions to set up further comparative and fair tests. ❖ Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a 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.
Biology - Understand Plants This concept involves becoming familiar with different types of plants, their structure and reproduction.	❖ Explore the natural world around them, making observations and drawing pictures of animals and plants. ❖ Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what have been read in class.	**YEAR 1** ❖ identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. ❖ identify and describe the basic structure of a variety of common flowering plants, including trees. **YEAR 2** ❖ 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.	**YEAR 3** ❖ 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.	
Biology -Understand Animals and Humans This concept involves becoming familiar with different types of animals, humans and the life processes they share.	❖ Explore the natural world around them, making observations and drawing pictures of animals and plants. ❖ Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.	**YEAR 1** ❖ identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. ❖ identify and name a variety of common animals that are carnivores, herbivores and omnivores. ❖ describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets). ❖ identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. **YEAR 2** ❖ notice that animals, including humans, have offspring which grow into adults. ❖ find out about and describe the basic needs of animals, including humans, for survival (water, food and air).	**YEAR 3** ❖ 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. **YEAR 4** ❖ 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.	**YEAR 5** ❖ describe the changes as humans develop to old age. **YEAR 6** ❖ 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 importance for humans of exercise, eating the right amounts of different types of food, and hygiene.		
Biology - Investigate Living Things & their Habitats This concept involves becoming familiar with a wider range of living things, including insects and understanding life processes.	❖ Explore the natural world around them, making observations and drawing pictures of animals and plants. ❖ Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what have been read in class.	**YEAR 2** ❖ explore and compare the differences between things that are living, dead, and things that have never been alive. ❖ identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. ❖ identify and name a variety of plants and animals in their habitats, including microhabitats. ❖ describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	**YEAR 4** ❖ 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. ❖ recognise that environments can change and that this can sometimes pose dangers to living things.	**YEAR 5** ❖ 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. **YEAR 6** ❖ describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. ❖ give reasons for classifying plants and animals based on specific characteristics.
Biology - Understand Evolution & Inheritance This concept involves understanding that organisms come into existence, adapt, change and evolve and become extinct.				**YEAR 6** ❖ 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 - Investigate Materials This concept involves becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.	❖ Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**YEAR 1 Everyday Materials** ❖ 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. **YEAR 2 Uses of 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. ❖ find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	**YEAR 3 Rocks** ❖ 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. **YEAR 4 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 or research the temperature at which this happens in degrees Celsius (°C). ❖ identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	**YEAR 5 Properties & Changes of Materials** ❖ compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. ❖ know that 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 and the action of acid on bicarbonate of soda.
Physics - Understand Seasonal Change	❖ Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**YEAR 1** ❖ observe changes across the seasons. ❖ observe and describe weather associated with the seasons and how day length varies.		
Physics - Understand Earth & Space This concept involves understanding what causes seasonal changes, day and night.				**YEAR 5** ❖ 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.
Physics - Investigate Light & Seeing This concept involves understanding how light and reflection affect sight.			**YEAR 3** ❖ 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.	**YEAR 6** ❖ 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 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.
Physics -Understand Movement, Forces & Magnets This concept involves understanding what causes motion.			**YEAR 3 Forces & Magnets** ❖ compare how things move on different surfaces. ❖ notice that some forces need contact between 2 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 2 poles. ❖ predict whether 2 magnets will attract or repel each other, depending on which poles are facing.	**YEAR 5 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 effects of air resistance, water resistance and friction, that act between moving surfaces. ❖ recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.
Physics - Investigate Sound & Hearing This concept involves understanding how sound is produced, how it travels and how it is heard.			**YEAR 4** ❖ 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 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.	
Physics - Understand Electricity This concept involves understanding circuits and their role in electrical applications.			**YEAR 4** ❖ 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.	**YEAR 6** ❖ 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.

Long Term Plans

EYFS		KS1	LKS2	UKS2
Seasonal change – Autumn, Winter, Spring, Summer Living things and their habitats – exploring a range of animal habitats around the world Materials – investigating floating and sinking / investigating properties of ice. Living things and their habitats – minibeasts and life cycles. Plants and their lifecycles. Animals inc humans – human body, health, hygiene & wellbeing	**Cycle A**	Autumn 1: **Y1 Animals, including humans (BIOLOGY)** ➢ Identify and name common animals including fish, amphibians, reptiles, birds and mammals. ➢ identify and name a variety of common animals that are carnivores, herbivores and omnivores. ➢ describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). Autumn 2: **Y1 Seasonal Changes Autumn to Winter (PHYSICS)** ➢ observe changes across the four seasons. ➢ observe and describe weather associated with the seasons and how day length varies. Spring 2: **Y1 Animals, including humans (BIOLOGY)** ➢ identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Summer 1: **Y2 Living Things and Their Habitats (BIOLOGY)** ➢ explore and compare the differences between things that are living, dead, and things that have never been alive. ➢ identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. ➢ identify and name a variety of plants and animals in their habitats, including microhabitats. ➢ describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. Summer 2: **Y1 Plants (BIOLOGY)** ➢ identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. ➢ identify and describe the basic structure of a variety of common flowering plants, including trees.	Autum 1: **Working Scientifically** Autumn 2: **Y3 Animals including humans (BIOLOGY)** ➢ 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. Spring 1: **Y4 Sound (PHYSICS)** ➢ 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 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. Spring 2: **Y4 Electricity (PHYSICS)** ➢ 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. Summer 1: **Y4 Living Things and Their Habitats (BIOLOGY)** ➢ 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. ➢ recognise that environments can change and that this can sometimes pose dangers to living things. Summer 2: **Y3 Light (PHYSICS)** ➢ 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.	Autumn 1: **Y6 Light (PHYSICS)** ➢ 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 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. Autumn 2: **Y6 Evolution and Inheritance (BIOLOGY)** ➢ 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. Spring 1: **Y6 Animals and Humans (Circulatory System) (BIOLOGY)** ➢ 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. Spring 2: **Y6 Living Things and Their Habitats (Plants and Animals) (BIOLOGY)** ➢ 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. Summer 1: **Working Scientifically** Summer 2: **Y6 Electricity (PHYSICS)** ➢ 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.

	Cycle B	Autumn 1: **Y2 Animals including humans (BIOLOGY)** ➢ notice that animals, including humans, have offspring which grow into adults. ➢ 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. Autumn 2: **Y2 Plants (BIOLOGY)** ➢ 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. Spring: **Y1 Seasonal Changes - Spring to Summer (PHYSICS)** ➢ observe changes across the four seasons. ➢ observe and describe weather associated with the seasons and how day length varies. Autumn 1: **Y1 Everyday Materials (CHEMISTRY)** ➢ 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. Autumn 2: **Y2 Uses of everyday materials (CHEMISTRY)** ➢ identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. ➢ find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	Autumn 1: **Y3 Forces and Magnets (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. Autumn 2: **Y3 Rocks and Soils (CHEMISTRY)** ➢ 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. Spring 1: **Y4 Animals including humans (BIOLOGY)** ➢ 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. Spring 2: **Y3 Plants (BIOLOGY)** ➢ 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. Summer 1: **Y4 States of Matter (CHEMISTRY)** ➢ 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 (°C). ➢ identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. Summer 2: **Working Scientifically**	Autumn 1: **Y5 Properties and Changes of Materials (CHEMISTRY)** ➢ compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. ➢ know that 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 and the action of acid on bicarbonate of soda. Autumn 2: **Y5 Living Things and Their Habitats (BIOLOGY)** ➢ 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. Spring 1: **Y5 Earth and Space (PHYSICS)** ➢ 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. Spring 2: **Y5 Forces (PHYSICS)** ➢ explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. ➢ identify the effects of air resistance, water resistance and friction, that act between moving surfaces. ➢ recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. Summer 2: **Y5 Animals and Humans (BIOLOGY)** ➢ describe the changes as humans develop to old age.

Progression of Scientific Knowledge & Vocabulary

Key: Essential Knowledge identified for each unit of learning.

EYFS Knowledge and Vocab Summary								
	Autumn 1 **Great at Greenside** **Seasonal Change (Autumn)**	**Spring 1** **Our World** **Living Things & Their Habitats (Habitats)**	**Spring 1** **Our World** **Materials (floating & sinking)**	**Spring 1** **Our World** **Seasonal Change (Winter)** **Materials (Ice)**	**Spring 2** **Life Around Us** **Living Things & Their Habitats (mini beast life cycles)**	**Spring 2** **Life Around Us** **Plants**	**Spring 2** **Life Around Us** **Seasonal Change (Spring)**	**Summer 2** **Wonderful Me** **Animals Including Humans (Human body & human life cycle)**
ELG	• Understand some important processes and changes in the natural world around them, including the seasons.	• Explore the natural world around them, making observations and drawing pictures of animals and plants. • Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.	• Understand the important processes and changes in the natural world around them, including the seasons and changing states of matter.	• Understand some important processes and changes in the natural world around them, including the seasons. • Understand the important processes and changes in the natural world around them, including the seasons and changing states of matter.	• Explore the natural world around them, making observations and drawing pictures of animals and plants. • Understand some important processes and changes in the natural world around them, including the seasons.	• Explore the natural world around them, making observations and drawing pictures of plants. • Know similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.	• Understand some important processes and changes in the natural world around them, including the seasons.	• Explore the natural world around them, making observations and drawing pictures of (animals) humans. • Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food and choices.
Assessment	How do I know its Autumn?	Are all animal habitats the same?	Do all objects sink?	How do I know its Winter? How does ice melt?	Where do frogs and butterflies come from?	What does a plant need to grow?	How do I know its Spring?	How do I keep my body healthy?
Substantive Knowledge	• Understand the leaves change colour and fall from some (deciduous) trees in the autumn. • Understand that some animals hibernate as the season changes to winter. • Understand some animals store food to eat through the winter when trees, plants, fruits and vegetables are not growing.	• Match animals to their habitats. • Understand that different animals live in different habitats. • Know that a habitat is a place where an animal chooses to live.	• Identify objects that float. • Identify objects that sink. • Understand that big objects can float. • Understand that small objects can sink.	• The temperature gets colder in the winter. • Understand we often have snow and ice due to the colder temperature. • Understand that ice is a solid. • Identify ways to make ice melt such as hot water, salt, leaving in a warm place near a radiator or in the sun.	• Understand that all living things (animals / insects) have a life cycle. • Understand and sequence the life cycle of a butterfly. • Understand and sequence the life cycle of a frog.	• Understand that seeds and bulbs start to grow in the spring. • Know that all plants grow from seeds or bulbs. • Understand that all living things (plants) have a life cycle.	• Understand that new plants start to grow in the spring. • Understand the leaves and blossom start to grow on trees in the spring. • Understand that baby animals are born in the spring (eg. lambs).	• Understand that all living things (humans) have a life cycle. • Understand how humans are born as babies and grow into toddlers, children, teenagers, adults, older people. • Identify and name body parts of the human body. • Understand what the human body needs to stay fit and healthy including a balanced diet, exercise, sleep and good hygiene.
Disciplinary Knowledge (Skills)	• Observing seasonal changes over time. • Spotting patterns between trees, plants, wildlife and the seasons.	• Researching different habitats around the world and the animals that inhabit them. • Observing and investigating habitats in our school grounds – playground, woodland, field, outdoor classroom / forest school area.	• Investigating floating and sinking using a selection of large and small items, heavy and light items.	• Observing seasonal changes over time. • Spotting patterns between trees, plants, wildlife and the seasons.	• Sequencing life cycles e.g. frog and butterfly	• Planting seeds and investigation conditions needed for growth – water, sun, air. • Observing plant growth over time. • Sequencing plant life cycles e.g. sunflower	• Observing seasonal changes over time. • Spotting patterns between trees, plants, wildlife and the seasons.	• Use a balloon and inflate / deflate to demonstrate how lungs work. • Use a bag and mash up food to demonstrate how digestion works. • Physical activities to investigate what happens to heart rate, we get hot, sweaty and short of breath

Vocabulary	Autumn, trees, plants, dying, red / orange / brown / yellow leaves, vegetables (pumpkins), colder weather, rain, names of types of weather, animals who hibernate (Hedgehog, bat, dormouse), Squirrels store food for the winter	Habitat – beach, woodland, sea, ocean, polar, rain forest, desert, live on land, live in water, North Pole, South Pole, hot, cold, wet, dry, animal names from each habitat.	Float, sink, water, big, small, heavy, light	Winter, cold, ice, frost, snow, names of types of weather, colder, freezing	Minibeast names, life-cycle, living things,	tree, bush, herb, plant, flower, fruit, vegetable, weed, seed, names of plants and trees they see at home and in our outdoor areas.	Spring / Summer, trees, plants, blossom, green leaves, fruits, vegetables, warmer weather, names of types of weather	Healthy, unhealthy, exercise, hygiene, clean, balanced diet, clean teeth, names of body parts, skeleton, muscles, hair colour and length (long, short, straight, curly), eye colour, skin (e.g. black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman
Scientist	Keeley Donovan / Paul Hudson – Look North news meteorologists	David Attenborough - Naturalist	Maddie Moate - Scientist	Keeley Donovan / Paul Hudson – Look North news meteorologists	David Attenborough - Naturalist	Beatrix Potter – Author & Botanist Alan Titchmarsh - Botanist	Keeley Donovan / Paul Hudson – Look North news meteorologists	Dr Ranj – Dr and TV Presenter
Outdoor	Autumn walk in the outdoor areas	Outdoor areas including field, playground, woodland to investigate habitats of animals in our local area	Floating and sinking investigation in the water tray	Winter walk in the outdoor areas Investigating ice in the outdoors	Trip to Tropical World or Nell Bank Mini beast hunting using reference sheets and resources in investigation shed	Planting seeds both indoors in pots and outdoors in our raised beds and tyres Walk to explore plants and trees in our playground, woodland and school field	Spring walk in the outdoor areas	Harvesting and eating the fruits and vegetables we have grown in our garden

KS1 Knowledge and Vocab Summary – Cycle A					
	Animals inc Humans (Y1) **(Identify and name common animals)**	**Seasonal Change (Y1)** **(Autumn to winter)**	**Animals inc Humans (Y1)** **(Body parts and senses)**	**Plants (Y1)**	**Living things and their habitats (Y2)**
NC	• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • Identify and name a variety of common animals that are carnivores, herbivores and omnivores describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets)	• Observe changes across the 4 seasons • Observe and describe weather associated with the seasons and how day length varies	• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. • Identify and describe the basic structure of a variety of common flowering plants, including trees	• explore and compare the differences between things that are living, dead, and things that have never been alive • identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • identify and name a variety of plants and animals in their habitats, including microhabitats. • describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food
Assessment	Are all animals the same?	How do I know the season has changed?	What are the different parts of my body and how do I use these?	Are all trees and plants the same?	How can living things survive in different habitats?
Substantive Knowledge	• Know there are 5 different types of animals: birds, fish, amphibians, reptiles, birds and mammals. • Be able to name some animals in each group e.g. a dog is a mammal. • Know that fish have gills and scales and can breathe underwater. • Know that reptiles have dry, scaly skin. • Know that amphibians have moist skin and can live on both land and water. • Know that birds have feathers. • Know that humans are a type of mammal. • Understand that mammals give birth to live young. • Be able to spot similarities and differences between animals in the same group. • Know that carnivores eat meat. • Know that herbivores eat plants. • Know that omnivores eat both plants and meat.	• Know that there are four seasons: autumn, winter, spring and summer. • Know that days (how many hours of sunlight) are shorter in winter. • Know that days (how many hours of sunlight) are longer in summer. • Know that in autumn, leaves (from deciduous trees) change from green to brown/yellow/orange and fall to the ground. • Know that in winter, the temperature is generally much colder (in the UK). There is sometimes snow & ice. • In winter, some animals hibernate e.g. hedgehog. • Understand that our choices of clothes are dictated by the weather.	• Understand that there are 5 senses: smell, taste, touch, hear, see. • Know which parts of the body are associated with each sense e.g. ears & hearing. • Name and label parts of the human body e.g. eyes/wrist. (see vocabulary list below).	• There are different varieties of plants. • Know that evergreen trees do not lose their leaves e.g. conifer & holly • Know that deciduous trees lose their leaves in winter e.g. sycamore & oak • Name some varieties of common wild plants e.g. daisy/poppy/buttercup/foxglove. • Name some varieties of common garden plants e.g. rose/sunflower/tulip/daffodil. • Understand that trees and plants are structured differently. • Know that trees have roots, trunk, branches/twigs and leaves. • Know that some trees may also have flowers or fruit e.g. apple. • Understand that all plants have roots, a stem and leaves. • Some plants have flowers and others do not.	• Understand that some things are alive, dead or have never been alive. • Understand that plants and animals are living things. • Know that dead things include dead animals and plants (or part of them). • An object made of wood would be classed as dead. • Know that objects made from metal, rock or plastic have never been alive. • Know that a habitat is where a plant/animal chooses to live. • Understand that a habitat meets the basic needs of a plant/animal e.g. shelter, food, water. • Understand that there are microhabitats within habitats e.g. on the bark of a tree or on fallen leaves. • Be able to explain that microhabitats can have totally different conditions. • The way that plants/animals obtain food is part of a food chain.

Disciplinary Knowledge (Skills)	• Grouping and classifying. *Sorting animals - amphibians, mammals, fish, birds, reptiles *Sorting animals with different features – i.e. four legs, 2 legs etc. *Sorting the farm/zoo animals *Classify animals they have seen/have first-hand experience of, choosing their own criteria to do so. *Classify animals based on physical structure. *Classify animals they have first-hand experience of based on what they eat (plants, other animals, both). (Complete this after the research.) • Secondary research. *Compare the animals in Britain to a warmer country *What do different animals eat? *Find facts out about an animal of interest *Use secondary sources to name animals seen in the local environment that they may not currently be able to name (e.g. birds: magpie, blackbird). *Research what animals they have first-hand experience of eat. • Spotting patterns. *Do all animals with …… have ……? • Observation over time. *Observe animals in the local environment throughout the year.	• Grouping and classifying. *Sorting summer/autumn images *Sorting autumn/winter clothing (repeatable for the other seasons) *Collection of different leaves – sorting the leaves into different shapes • Secondary research. *Read books about the seasons *Google search *Weather forecast – newsround • Spotting patterns. *Which is the coldest month? – look at the temperature for the first week of every month – observe this then over time. *At the end of the year, look for patterns in evidence e.g. Does it rain more in spring? Do we have more sunny days in the summer? Which was the coldest month? • Observation over time. *Observe the temperature and weather for a week in the different seasons to make comparisons. *Observe the changes in the environment – take a picture in the same place at different times in the school year. What is different/similar? *Observe a tree in the playground – how does it change throughout the year? *Record/Photograph what children are wearing (jumper, coat, hats, scarves, etc.) *Make observations of daylight hours e.g. send a diary and toy bear home with one child each day and ask the child to record their activities, but the bear needs to go to bed when it gets dark and the children must record the time this happens. (This gathers evidence, over time, that day length changes and so do activities.)	• Grouping and classifying. *Which parts of my body are involved with my senses? Which sense do I use for ____? • Simple comparative tests. *If I am older, does it mean I am taller? *Can I taste the difference between different flavoured crisps/skittles/smarties? • Secondary research. What do I use my_____ for? • Spotting patterns. *The tallest person will have the biggest feet *The taller the person the bigger they jump *Children generate questions for investigation such as: Do people with longer arms have longer legs? Can more people identify prawn cocktail crisps than cheese and onion? • Observation over time. *Observe the changes in their height over the school year.	• Grouping and classifying. *What is the name of the parts of the plant? *Can you sort the parts of the plant into the different groups? *Children to classify leaves, flowers, and seeds, choosing their own criteria. • Simple comparative tests. *Growing the seeds in different composts. *Growing seeds in different materials • Secondary research. *Find out about plants that grow at different times of the year *Use secondary sources to name plants (including trees) based on observations of leaves, seeds, flowers, buds, and bark (Leafsnap UK on Apple App Store, SEEK INaturalist on google play and Apple App Store, textbooks, Woodland Trust resources). • Spotting patterns. *Plants growing at different times of the year – are they the same? *Does the biggest bean make the biggest beanstalk/sunflower? *Based on observations, encourage children to identify patterns e.g. after comparing the size of leaves on different plants, children may suggest "bigger plants have bigger leaves." • Observation over time. *Observe how a bean grows in different materials – identifying the different parts *Observe a tree through the year. *Observe a trail/patch to identify how plants change through the year.	• Grouping and classifying. *Sorting living, dead, never living items in the indoors and outdoors. *Answer questions including 'is a flame alive?', 'is a deciduous tree dead in winter?'. Discuss and find ways to answer these questions. *Identify and name different plants and animals – match to their habitats. *Animal food chains – that include humans e.g. grass, cow, human. • Secondary research. *Researching habitats for different animals / plants around the world. *What do living things need to survive? *Could a penguin live in the desert? *Could a camel live in the North Pole? • Observation over time. *Observing different habitats and micro-habitats (under logs, on stony paths, under bushes). Observe how the conditions affect the number and type(s) of plants and animals that live there.
Vocabulary	Mammal, bird, fish, reptile, amphibian, carnivore, herbivore, omnivore. Gills, feathers, scales, wing, beak, fin	Spring, summer, winter, autumn, seasons, weather, temperature, daylight/sunlight, hibernation	Body, shoulders, knees, elbows, chest, toes, skin, ankle, wrist, heel, forehead. eyes, ears, nose, mouth, teeth, lips, tongue, cheeks. Touch/feel, hear, see, smell, taste. *RSE policy states there can be reference to penis/vagina if it arises*	leaf, flower, fruit, berry, root, seed, trunk, branch, twig, stem, oak, sycamore, conifer, holly, daisy, poppy, buttercup, weeds, foxglove, rose, sunflower, daffodil, tulip	Habitat, micro-habitat, basic needs, food chain, shelter, survive, woodland, *Add names of plants/animals studied during the unit*
Scientists	Chris Packham - Animal Conservationist Joan Beauchamp Procter – Herpetologist and curator of reptiles at London Zoo Tanesha Allen – Zoologist who studies badgers	Dr Steve Lyons - Extreme Weather Holly Green -Meteorologist Jim Cantore – Meteorologist and storm tracker	Leonardo Di Vinci – Anatomical drawing Miller Hutchinson – Engineer who invented the first electric hearing aid Patricia Bath – ophthalmologist and inventor of using lasers in cataract operations.	Beatrix Potter - Author & Botanist Maria Sibylla Merian – German Artists, scientific illustrator and naturalist	Rachel Carson - Marine Pollution Liz Bonnin – Conservationist William Kirby – Father of modern entomology, the study of insects Prem Singh Gill – Polar scientist Dawood Qureshi – Marine biologist who studies wildlife in the ocean.
Outdoor	Yorkshire wildlife park	Local walk Playground – taking temperature daily Take photographs of the children in the same place each week/month – observe the changes	Eureka Setting up an obstacle course – timings for each station – observe heart rate	School field, Reception woodland area, Outdoor classroom Local walks – Gibb, Pudsey Park, Queens Park Planters in the school grounds Pudsey Park Greenhouse	Askham Bryan / Tropical World School field, Reception woodland area, Outdoor classroom Local walk – The Gibb Pudsey Park – educational centre Bug hunt Pond dipping – could use Primrose Hill / Lowtown / Southroyd Orchard and field – Primrose Hill Make bird boxes/bird feeders

KS1 Knowledge and Vocab Summary – Cycle B					
	Animals including humans (Y2)	**Everyday Materials (Y1)**	**Uses of Everyday Materials (Y2)**	**Seasonal Changes – Spring to Summer (Y1)**	**Plants (Y2)**
NC	• notice that animals, including humans, have offspring which grow into adults. • 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	• 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.	• identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	• observe changes across the 4 seasons • observe and describe weather associated with the seasons and how day length varies	• 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
Assessment	What do animals need in order to survive? How do offspring grow and develop from birth?	How do I know what an object is made from?	Why are objects made from different materials?	How do the seasons change from Spring to summer?	Do all plants need the same conditions to grow and thrive?
Substantive Knowledge	• All animals (including humans) grow into adults throughout their life cycle. • Understand that an animal's offspring is their child. • All animals can produce offspring and have 'babies' via reproduction – this is not just a term used for humans. • All animals have a life cycle. • Some animal's life cycle differs to others. • Mammals' life cycles start with live young (humans are a type of mammal). • Other animals such as birds, amphibians' reptiles and some fish start as eggs. • All animals need to have exposure to water, food and air to survive. • Understand that humans require a balanced diet (different types of food) to achieve healthy lifestyle. • Understand that different types of food provide different nutrition. • Recognise the importance of staying hydrated. • Understand that humans require regular exercise to achieve a healthy lifestyle (change 4 life NHS) • Understand that humans require hygiene routines to prevent illness and infection. • Be able to identify hygiene routines e.g., washing hands regularly (after using the toilet), brushing teeth and washing our bodies regularly.	• Be able to identify what everyday objects might be made from. • All objects are made from one or more materials. • All materials can be described by their properties e.g. shiny, stretchy, rough. • Name common everyday materials e.g. metal, plastic, wood, glass, water, rock. • Know that metal is generally strong but flexible. • Know that plastic is a common material that comes in many forms. • Understand that wood is generally strong but rigid. • Understand the difference between natural and man-made materials. • Understand that glass can be shaped in different ways and can be strong or fragile. • Know that the strength of glass depends on the thickness.	• Be able to identify what everyday objects might be made from. (Y1 Unit) • All objects are made from one or more materials. (Y1 Unit) • Know that objects are made from materials chosen specifically because they have suitable properties for the task. E.g. water bottle is made from plastic because it is transparent and waterproof. • Identify the suitability of different material for a specific purpose e.g. a teapot, a raincoat. • The shape of objects can be changed depending upon the properties of the materials they are made from e.g. by bending, stretching, squashing, twisting. • Identify how a specific material has been changed to meet their purpose.	• Know that there are four seasons: autumn, winter, spring and summer. • Know that days (how many hours of sunlight) are longer in spring/summer • In spring, some animals come out of hibernation e.g. hedgehog. • Know that in spring, flowers start to reappear, and leaves begin to grow back on deciduous trees. • Understand that in Spring the weather can be changeable but is generally warmer in comparison. • Understand that in summer, the temperature is generally dryer and warmer. • Understand that our choices of clothes are dictated by the weather. • Recognise that in summer, the sun can be harmful to our eyes and skin. • Be able to name some simple ways to keep safe in the sun e.g., sunscreen, hats, sunglasses.	• Know that all plants begin as seeds or bulbs. • Plants have a life cycle and grow from seeds into mature plants. • Understand that seeds are dispersed in a variety of ways (animals, wind, water, explosion, falling). • Germination is what happens to a seed when it begins to grow (usually underground). • Seeds and bulbs do not require light to grow. • Seeds and bulbs have a store of food within them. • All plants (including seed and bulbs) need water to grow and survive. • All plants require specific conditions for them to be able to grow and stay healthy – this isn't the same for all plants. • All plants germinate and grow at different rates. • Different plants like to be planted at different times of the year. • Some plants grow to develop flowers, berries or fruit.

Disciplinary Knowledge (Skills)	• Grouping and classifying. *Which foods are healthy and unhealthy? *Which drinks are unhealthy for our teeth? *Life cycle of a human / other animals *Identify, match and name animals and their offspring • Simple comparative tests. *Which drinks are unhealthy for our teeth? *Do children get faster at ____ as they grow older? • Secondary research. *Which foods are healthy and unhealthy? *How do I / humans keep healthy? *What do living things need to survive? *Could I survive without _____? *Could a _____ live on the moon? *Could a penguin live in the desert? *Could a camel live in the North Pole? • Spotting patterns. *Which foods are healthy and unhealthy? *Do children get faster at ____ as they grow older? • Observation over time. *Which drinks are unhealthy for our teeth? *Observe through video or first-hand observations and measurements, how different animals grow.	• Grouping and classifying *Sorting the materials into the different properties *What objects can float and not float? *Sorting recyclable and non-recyclable materials *How can we sort these items? *Classify objects made from the same material (e.g. lots of things made from plastic). *Classify one object made from different materials (e.g. cups made of different materials). *Classify different fabrics based on texture (e.g. to make a feely-book for a child). *Classify paper/plastics/fabrics.. • Simple comparative tests. *Which material is the most absorbent? *Which material is the most flexible? *Which material would be the best for an umbrella/coat? *Which material would be best for a chair? *Test objects made of different materials to see how effective they are e.g. umbrellas/hats/coats for waterproofness, cloths/nappies for absorbency, socks for elasticity, bounciness of balls, sunglasses for protection from the sun, picnic plates for stiffness, door mats for wiping your feet, different papers for writing on/painting etc. • Secondary research. *How can materials be reused? *What can be recycled? • Observation over time. *Observing the changes to ice during the day • *Observing foam soap – what changes happen to it?	• Grouping and classifying. *Compare the uses of everyday materials in and around school. *Identify materials found in different places e.g. at home, the journey to school, on visits, in stories / rhymes / songs. *Identify and classify the uses of different materials. *What materials have been used to build our school? *How can we group materials by the changes that can be made? • Simple comparative tests. *What are the best materials to build a castle? *Waterproofing materials. *Are bricks absorbent? *Which ball is the bounciest? *Which material is the scratchiest? *Which is the strongest paper? *Paper bridges – make and test. *Testing rigidity • Spotting patterns. *How can you change the shape of these materials? *What materials can you bend and twist? • Observation over time. *Observing closely the uses of different materials. *Recording observations	• Grouping and classifying. *Sorting summer/autumn images *Sorting autumn/winter clothing (repeatable for the other seasons) *Collection of different leaves – sorting the leaves into different shapes • Secondary research. *Read books about the seasons *Google search *Weather forecast – Newsround • Spotting patterns. *Which is the coldest month? – look at the temperature for the first week of every month – observe this then over time. *At the end of the year, look for patterns in evidence e.g. Does it rain more in spring? Do we have more sunny days in the summer? Which was the coldest month? • Observation over time. *Observe the temperature and weather for a week in the different seasons to make comparisons. *Observe the changes in the environment – take a picture in the same place at different times in the school year. What is different/similar? *Observe a tree in the playground – how does it change throughout the year? *Record/Photograph what children are wearing (jumper, coat, hats, scarves, etc.) *Make observations of daylight hours e.g. send a diary and toy bear home with one child each day and ask the child to record their activities, but the bear needs to go to bed when it gets dark and the children must record the time this happens. (This gathers evidence, over time, that day length changes and so do activities.)	• Simple comparative tests. *What conditions are needed for a plant to grow and stay healthy? • Secondary research. • Spotting patterns. *How tall does a plant grow each month? • Observation over time. *How long does it take for a plant to grow? (measuring growth over time from a seed or a bulb or observing similar plants at different stages of growth.
Vocabulary	Offspring, young, balanced diet, lifestyle, thrive, hygiene, hydrated, nutrition, life cycle, disease/infection, reproduction, baby, toddler, teenager, child, adult. *Specific vocabulary to be added for life cycles covered*	object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, fragile, rough, smooth, shiny, dull, opaque, transparent, translucent.	Purpose, function, suitability, opaque, translucent, transparent, hard, soft, stretchy, stiff, bendy, floppy, fragile, rough, smooth, shiny, dull.	Spring, summer, winter, autumn, seasons, weather, temperature, daylight/sunlight, hibernation, sunrise, sunset	Seeds, bulbs, seed dispersal, germination, temperature. *Specific vocabulary to be added for specific plants taught* e.g. poppies, sunflowers, cress, broad bean.
Scientists	Florence Nightingale - Pioneer of modern nursing in GB Elizabeth Garrett Anderson - First British female physician and surgeon Steve Irwin -Wildlife expert Robert Winston - Human Scientist Dr Kelly Blacklock – Veterinary Surgeon Daniella Dos Santos – Veterinary Surgeon	William Addis -Toothbrush Inventor Charles Mackintosh - Waterproof material John MacAdam – Tarmac / roads Chester Greenwood -Earmuffs Becky Schroeder – Inventor of Glo-sheets which she patented as a 12 year old	Charles Macintosh -Waterproof material John MacAdam - Tarmac / roads Victoria Callaghan – Develops sustainable packaging for BASF plc Dr Pearl Agyakwa – Materials scientist	Dr Steve Lyons - Extreme Weather Holly Green -Meteorologist Jim Cantore – Meteorologist and storm tracker	Captain Cook – Botanists Joseph Banks – Naturalist on Captain Cook's voyage Daniel Solander – Botanist who worked with Joseph Banks on Captain Cook's voyage. Thomas Wyatt Turner – Botanist who studied plant disease. Agnes Arber- Botanist Alan Titchmarsh - Botanist & Gardener Poppy Okotcha – Horticulturist Dr Ben Woodcock – Ecological Entomologist Angie Burnett – Plant biologist
Outdoor	Yorkshire wildlife park Eureka	Local walk – materials hunt Make boats and test in water outside Test suitable materials out – identify properties	Local walk – materials hunt Make boats and test in water outside Test suitable materials out – identify properties	Local walk Playground – taking temperature daily Take photographs of the children in the same place each week/month – observe the changes	School field, Reception woodland area, Outdoor classroom Local walks – Gibb, Pudsey Park, Queens Park Planters in the school grounds Set up grow bags for potatoes, tomatoes etc. Pudsey Park Greenhouse

Lower KS2 Knowledge and Vocab Summary – Cycle A					
	Animals inc Humans (Y3) **(Nutrition and skeletons)**	**Sound (Y4)**	**Electricity (Y4)**	**Living things and their habitats (Y4)**	**Light (Y3)**
NC	• 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.	• 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 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.	• 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.	• 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. • recognise that environments can change and that this can sometimes pose dangers to living things.	• 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.
Assessment	How do animals ensure a balanced and nutritious diet? How does the skeleton and muscles support movement?	Why are all sounds different and how do we hear them?	How does electricity flow through electrical appliances? Do all materials allow the flow of electricity?	How can we classify different plants and animals within our local area and beyond?	What is a light source and how are shadows created?
Substantive Knowledge	• Know that animals' bodies cannot make their own food. • Understand that nutrition is taking in food and converting it to energy. • Understand that all animals have to eat/drink to survive (take in nutrients). • Know that animals' bodies cannot make their own food. • Know that a healthy diet is made up of a variety of different food types. • Understand that there are a range of different food types: fruit & vegetables, carbohydrates, dairy, protein, sugars & fats. • Understand the importance of animals taking on enough fluid (water). • Know how to identify nutritional information from food packaging. • Be able to discuss some food alternatives (e.g. soya, quorn). • All humans and some animals have a skeleton. • The function of a skeleton is to protect the main organs of the body and allow movement. • Muscles are attached to the skeleton and you need both to create movement. • Understand that there are 3 different types of skeleton (exoskeleton, endoskeleton & hydrostatic skeleton). • Know the names of some key parts of the skeleton e.g. skull, fibula, pelvis, humerus. • Identify some common muscles (biceps, triceps, calf) and that they work by expanding and contracting.	• Know that all sounds originate from a source. • Understand that all sounds originate from vibrations. • Understand that different sounds can travel through solids, liquids and gases – these can be called a 'medium.' • All sounds travel as a wave. • Humans hear sounds as the vibrations travel into the ear. • Know that the louder the vibration, the louder the sound and be able to investigate this. • Know that pitch is described as high or low. • Know that pitch can be changed on a string instrument by tightening the string. • Know that pitch can be changed on a woodwind instrument by closing more holes. • Know that pitch can be changed on a percussion instrument by tightening the skin. • Amplitude is how loud or quiet a sound is. • Sounds became fainter as the distance from the source increases. • Understand ways of reducing the impact of sound e.g. soundproofing. • Explain different ways sounds can be absorbed.	• Recognise the dangers associated with electricity. • Be able to name a range of common appliances that run on electricity e.g. fridge, tv, oven. • Understand that electricity is generated from an electric current. • An electrical current is the flow of electric charge through a material. • Know that much of our electricity comes through mains electricity. • Batteries also provide temporary electrical current. Some batteries are rechargeable. • Know that all circuits require a source of electricity to work (e.g. a battery). • Understand that both sides of a battery need to be part of a circuit to allow the flow of electricity. • Understand how to construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Be able to identify when a circuit is complete or incomplete and the implication e.g. lamp won't light. • Recognise that a switch opens and closes a circuit. • Know that a conductor is a substance or material that allows the flow of electricity through it. • Understand that an insulator is a substance or material that does not allow the flow of electricity through it. • Understand how to test whether a material is a conductor or insulator.	• Know that living things can be referred to as organisms. • All living things follow life processes (MRS GREN). • Be able to identify the difference between living and non-living things using MRS GREN. • Understand that classification is the process of grouping things based on similarities and differences. • Know that animals can be classified into 2 main groups: vertebrates and invertebrates. • Remember that there are 5 sub-groups of vertebrates (KS1) • Understand that there are different types of invertebrates. • Recognise that there are flowering (e.g. tulip) and non-flowering plants (ferns and mosses). • Classify a range of animals and plants using a simple key. • Know how to classify some animals and plants in the local area via fieldwork. • Be able to identify threats to animal habitats within the local environment e.g. building work and pollution.	• Understand that darkness is a result of there being no light. • Be able to identify some simple light sources e.g. sun, bulb, fire. • Understand that without light, humans are unable to see things unaided. • Know that light can be reflected from surfaces. • Understand that reflection occurs when a material does not absorb the light. • Understand that some materials purposely reflect light e.g. cats eyes, high visibility jackets, sunglasses. • Be able to test different materials to investigate reflective properties. • Know that the light from the sun can be dangerous and explain ways to protect eyes from it e.g. sunglasses and skin e.g. suncream/hats. • Know that a shadow is created when a light source is blocked by an opaque object. • An opaque object does not let light pass through it e.g. wooden table. • Be able to explain whether objects are transparent, translucent or opaque. • A shadow changes when the distance between the light source and the opaque object changes. • Understand that the size of the shadow created depends on the proximity of the light source.

Disciplinary Knowledge (SkillsP	• Grouping and classifying. Based on the children's own criteria: *classify food items (leading to sorting by nutrients) *classify animals (leading to sorting by whether or not they have skeletons). *classify bones based on the type of joints *How do the skeletons of different animals compare? • Simple comparative tests. *How does the skull circumference of a girl compare with that of a boy? • Secondary research. *Look at food packaging to identify the amount of nutrients in different food items *Research which types of food contain which nutrients. *Generate questions to research about the human skeleton. *Research types of joints • Spotting patterns. *Children generate questions for investigation into objective 1 such as: - Do 'healthy' drinks have less sugar? *Children generate questions for investigation into objective 2 such as: - Do people with long arms throw further? - Can people with short legs jump higher?	• Grouping and classifying. *Based on the children's own criteria, sort musical instruments. *How would you group these instruments based on the sound they make? *How would you group these instruments based on how they change pitch or volume? • Simple comparative tests. *Measure volumes from different instruments *Measure how volume changes away from a source. *Investigate string telephones. *Explore pitch e.g. through a carousel of activities using milk bottles, straw pipes, rulers, elastic band guitars. *Make earmuffs out of different materials to investigate the best sound insulator. • Secondary research. *Research, make and play their own instruments based on what they learned about pitch and volume. • Spotting patterns. *Finding patterns in sounds made by different objects. *Is there a link between how loud school is at different times of the day?	• Grouping and classifying. *Based on the children's own criteria, classify household appliances and/or toys (leading to electrical/not electrical, batteries/mains) *Test materials to classify into insulators and conductors. • Simple comparative tests. *Explore which materials can be used instead of wires to make a circuit *Which metal is the best conductor of electricity? *How does the thickness of a conducting material affect how bright a bulb is? • Spotting patterns. *Observing patterns within the circuit, such as the brightness of a bulb and the number of cells.	• Grouping and classifying. Based on the children's own criteria: *Classify a number of living things in their local environment (plants and animals) *Classify a number of living things in their wider environment (plants and animals) after completing research. *Introduce branching databases/dichotomous keys. *Begin to group creatures based on type (e.g. mammal) • Simple comparative tests. *How does the average temperature of the pond water change in each season? *Does the amount of light affect how many woodlice move around? • Secondary research. *Research and be able to name plants and animals in the wider environment e.g. polar, desert, jungle etc. *Explore examples of human impact on the environment (positive and negative) *Use fieldwork to explore human impact on the local environment e.g. litter, tree planting *Use classification keys to name unknown living things *Use secondary sources to find out about how environments may naturally change • Spotting patterns. *Do animals with…have….? *Do plants with…have….? • Observation over time. *Observe living things in their local environment at different times of year. *Use the local environment to identify how habitats change throughout the year	• Grouping and classifying. Based on the children's own criteria: *classify light sources (leading to man-made/natural) *classify materials (leading to reflective/non-reflective, transparent/translucent/opaque). • Simple comparative tests. *Test materials for reflectiveness. *Test materials for transparency. *Investigate shadows (size of shadows, shape of shadows). *Which pair of sunglasses will be best at protecting our eyes? • Secondary research. *Research inventors – Thomas Eddison and Joseph Swan *How does the Sun make light? • Spotting patterns. *Are you more likely to have bad eye sight and to wear glasses if you are older? • Observation over time. (NB Do not look at how shadows in the playground change throughout the day.) *Is the sun the same brightness all day? *When is our classroom darkest?
Vocabulary	nutrition, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, skeleton, muscles, joints, support, protect, skull, ribs, spine	source, vibrate, pitch (high, low), volume, faint, insulation, absorb, amplitude.	Appliance, mains electricity, electrical circuit, component, cell, crocodile clip, conductor, insulator, generator	classification, characteristics, vertebrate, invertebrate, MRS GREN, *Add names of plants/animals studied during the unit*	light source, reflect, transparent, translucent, opaque, ultraviolet light.
Scientists	Marie Curie - Radiation Wilhelm Rontgen - X rays Adelle Davis -Nutritionist Michelle Williams - Radiologist	Alexander Graham Bell -Invented the telephone Aristotle - Sound Waves Isaac Newton – Mathematician and Physicist who measured the speed of sound Gailileo Galilei - Frequency and Pitch of Sound Waves	Michael Faraday - Discovered relationship between magnets and electricity Thomas Edison - Lightbulb Joseph Swan - Incandescent Light Bulb Lewis Howard Latimer – Electronic engineer who improved the design of Eddison's lightbulb and brought street lighting to the world Ronit Kanwar – Sustainable solar-powered lights to poor rural India. William Kamkwamba – Inventor who used wind turbines to being electrivity to a village in Malawi Zubera Iqbal – Chemist – sustainable ways to recycle electric vehicle batteries	Jacques Cousteau -Marine Biology Cindy Looy -Environmental Change and Extinction Joean Beauchamp - Procter Zoologist Rachel Carson – Aquatic biologist who wrote about environmental pollution Wangari Maathai – Biologist Kelsey Archer Barnhill – Deep sea ecologist Liz Bonnin – Wildlife conservationist	Justus Von Liebig - Mirrors James Clerk Maxwell - Visible and Invisible Waves of Light Percy Shaw – Inventor of cat's eye
Outdoor	Zoo Farm Fake fossil hunt outside Dinosaur bones in school grounds	Make sound and measure Sound waves over distance Make own drum Echoes	National media museum	Nell Bank Pond Dipping – Primrose Hill, Southroyd, Lowtown Rodley Nature Reserve	Talking pictures in their garden to show the differences in the light/dark Reflective clothing Pin hole camera – make own Drawing shadows on the playground

Lower KS2 Knowledge and Vocab Summary – Cycle B					
	Animals inc Humans (Y4) (Teeth & Digestion)	**Rocks & Soils (Y3)**	**States of Matter (Y4)**	**Plants (Y3)**	**Magnets & Forces (Y3)**
NC	• 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	• 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	• 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 (°C) • identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	• 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	• compare how things move on different surfaces. • notice that some forces need contact between 2 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 2 poles. • predict whether 2 magnets will attract or repel each other, depending on which poles are facing
Assessment	How many different types of teeth do we have and what is their function? How do humans digest the food we eat? What is a food chain and why are they important?	Are all rocks the same? How are fossils formed?	Are all solids hard and opaque? Does evaporation make water vanish?	Do plants eat food? How do plants reproduce?	Are all metals magnetic? Are bigger magnets stronger?

Substantive Knowledge	• 'Digest' means breaking down food into small parts (like nutrients) so the body can use it. • The digestive system is a set of organs that help take nutrients from food and allow waste to pass out of the body. • Food enters the body through the mouth. • Digestion starts with the mouth when teeth start to break the 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 further by being churned around 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 passes into the large intestine. • Here the water is removed for use elsewhere in the body. What is left is stored in the rectum until it leaves the body through the anus when you go to the toilet. • Other organs, such as the liver and gall bladder helps process food during digestion by producing liquids such as bile. ---------- • Humans have 5 types of teeth: Incisors for cutting, canines for tearing and molars and premolars for grinding (chewing), and wisdom teeth. • Humans grow 2 set of teeth in their lives – baby/milk teeth and adult teeth. • Adults usually have 8 incisors – these are used for biting and cutting food. • Adults have 4 canines – these are pointy and used for ripping/tearing. • Adults have 8 pre-molars located next to the canines. The are small and flat and used for holding and crushing food. • Adults have 8 molars in the back corners. These are large and flat and used for grinding food. • Some adults get wisdom teeth. These are effectively a third type of molar but no longer serve a function – scientists believe they were used when humans used to grind down leaves as part of their diet. • Teeth will naturally decay unless cleaned routinely. Some food types cause more decay (like sugar). Food chains are made up of producers, prey and predators. ---------- • Living things can be classified as producers, predators and prey according to their place in the food chain.	• Geology is the study of rocks • Rocks are a naturally occurring material. • Rocks are made from minerals and there are many different types. • There are different types of rocks e.g. sandstone, limestone, slate etc. which have different properties. • Rocks can be hard and rigid or soft and brittle. • Rocks have different sizes of grain or crystal. • Rocks may absorb water. • Some rocks are porous (let water pass through) and others are not. • Rocks can be different shapes and sizes (stones, pebbles, boulders). • Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). • The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. • Sandstone is made up from ancient stream or beach deposits. • The properties of rocks have a huge impact on the shape of local environments and what they can be used for. • Some rocks contain fossils. • Fossils are formed millions of years ago. • When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water. This is called fossilisation and is how we know so much about dinosaurs.	• 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 liquid can be poured and keeps 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. • Each individual grain demonstrates the properties of a solid. ---------- - • Melting is a state change from solid to liquid. • Freezing is a state change from liquid to solid. • The freezing point of water is 0°C. • Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. • Water boils when it is heated to 100°C. • 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 a change back from a gas to liquid caused by cooling. ---------- - • Water at the surface of the seas, rivers etc, evaporates into water vapour (a gas). • This rises, cools and condenses back into a liquid forming clouds. • When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	• Many plants, but not all, have roots, stems / trunk, 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 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, which is produced by the male part of the flower, 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. • Different plants require different conditions for germination and growth.	• A force is a push or a pull. • When an object moves on a surface, the texture of the surface ad the object affect how it moves. • It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes. • A magnet attracts magnetic material. • Iron and nickel and other materials 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. • For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. • Some forces act at a distance e.g. magnetism. The magnet does not touch the object that it attracts.

Disciplinary Knowledge (Skills)	• Grouping and classifying. *Compare and contrast different types of teeth (with links to simple functions) *Compare the teeth of carnivores and herbivores, suggesting reasons for differences *Classify jaw bones/teeth to aid with making food chains e.g. recognise what eats plants and what eats animals by looking at their teeth. *Explore eating different types of food, to identify which teeth are being used for cutting, tearing and grinding (chewing) • Simple comparative tests. *In our class, are omnivores taller than vegetarians? *Make own toothpaste and compare against other brands – which toothpaste will remove the sharpie marker stain from a ceramic tile? Toothpaste ingredients – Bicarbonate of soda, cornflour, peppermint essence, glycerine & water. – Chd decide how much of each ingredient will be needed in the mixture. • Secondary research. *Researching the different parts of the digestive system. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT etc.) *Research what different animals eat within a specific environment, e.g. coral, polar, African grasslands, in order to construct food chains. *Find out what damages teeth and how to look after them. *Draw and discuss their ideas about the digestive system and compare them with models or images. *Create a model of the digestive system using household objects • Spotting patterns. *Are food that are high in energy always high in sugar?	• Grouping and classifying. *Based on the children's own criteria, classify rocks. Appearance then physical features. *Look at different soils and discuss how they are similar/different. *Can you use the identification key to find out the name of each of the rocks in your collection? • Simple comparative tests. *Test the hardness of different rocks. (scratch test) *Test what happens when rocks are put in water *Test how quickly water runs through different types of soil. *Which soil absorbs the most water *Which surface is best to stop you slipping? • Secondary research. *Research how fossils are formed. *Who was Mary Anning and what did she discover? • Spotting patterns. *Is there a pattern in where we find volcanos on planet Earth? • Observation over time. *Observe how soil separates into different layers in water *How does tumbling change a rock over time? *What happens when water keeps dripping on a sandcastle?	• Grouping and classifying. Based on the children's own criteria: *Classify solids (including grains, crystals, powders: physical properties) *Classify liquids *Group materials into solids, liquids and gases • Simple comparative tests. *What affects the melting rate of chocolate (size of pieces, temperature of water, type of chocolate)? *What affects the rate an 'ice pole' melts? *What affects the rate of evaporation? *Test the 'runniness' of different liquids. *Investigating melting point of different materials e.g. ice, margarine, butter and chocolate *Explore the freezing point of different liquids e.g. tomato ketchup, oil, shampoo • Secondary research. *Researching the melting point of metals. *Research the water cycle. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT etc.) *Research the temperature at which materials change state. • Spotting patterns. *Is there a pattern in how long it takes different sized ice lollies to melt? • Observation over time. *Watch ice melt (ice hands) *Watch frozen liquids melt. *Watch hand prints dry e.g. water handprints on coloured paper towel. *Observe and record evaporation and condensation over a period of time. Investigate the effect of temperature on washing drying or a snowman melting. *Observe the changes when making rocky road cakes or ice-cream.	• Grouping and classifying. *Classify flowers based on the children's own criteria. *How many different ways can you group our seed collection? • Simple comparative tests. *Which conditions help seeds germinate faster? • Secondary research. *Research the functions of the parts of flowering plants. *Research the different methods of seed dispersal. *Research different methods of pollination. • Spotting patterns. *Investigate what happens when conditions are changed e.g. more/less light/water, change in temperature, nutrients *What colour flowers do pollinating insects prefer? • Observation over time. *Observe celery in coloured water. *Observe white carnations in coloured water. *Gather seeds and photographic evidence of blossoms/flowers and berries on a particular trail throughout the year *What happens to celery when it is left in a glass of coloured water? *How do flowers in a vase change over time?	• Grouping and classifying. Based on the children's own criteria: *sort materials (leading towards metal/non-metal and magnetic/not magnetic) sort toys (leading to what makes them move e.g. push/pull) • Simple comparative tests. *Test how objects move on different surfaces e.g. cars, spinning tops, wind-up/clockwork toys. *Test the strength of different magnets. *Test how cars move faster on ramps due to the pull of gravity *Which magnet is strongest? • Secondary research. *Find out how magnets are used in everyday life. *How have our ideas about forces changed over time? *How does a compass work? • Spotting patterns. *Does the size and shape of a magnet affect how strong it is? • Observation over time. *If we magnetise a pin, how long does it stay magnetised for?
Vocabulary	digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain	rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, soil, types of soil (e.g. peaty, sandy, chalk, clay)	solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport	Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole
Scientists	Ivan Pavlov - Digestive System Mechanisms Washington & Lucius Sheffield - Toothpaste in a tube William Beaumont – Surgeon who studied human digestion Paul Sharpe – Bioengineer who studies how to regrow damaged teeth.	Mary Anning - Fossil hunter Dr Anjana Khatwa - Geologist William Smith - Fossils strata Inge Lehrmasn - Earth's Mantle Katia Krafft - Geologist and Volcanologist James Hutton – Scientists who studied rocks and the effects of natural process on them. Florence Bascom – Geologist Brianna Green - Biochemist	Joseph Priestly – Discovered oxygen Carl Wilhelm Scheele – Chemist discovered oxygen about the same time as Priestly Lord Kelvin - Absolute zero (temperature) Anders Celsius -Temperature Scale Daniel Fahrenheit - Temperature Scale / Invention of the Thermometer George Washington Carver – chemist John Boyd Dunlop – Inventor of pneumatic trye	Joseph Banks- Botanist Ahmed Mumin Warfa – Botanist Jan Ingenhousz – Dr and Scientist who discovered the process of photosynthesis Charles Henry Turner – Zoologist Jagadish Chandra Bose – Biophysicist George Washington Carver – Agricultural scientist Dr Kelsey Byers - Biologist	Andre Marie Ampere -Electro-magnetism The Wright Brothers - Airplanes Henry Ford – Cars William Gilbert – Dr who developed the theory of magnetism. Leonardo Da Vinci – first person to plan and carry out tests on friction. Eric Laithwaite – Electrical engineer
Outdoor		Rock hunt and classify – Gibb/local walk Make compost	Naturally occurring matter Matter hunt Use thermometers to measure temperature of cooling indoors and outdoors Condensation – make a filtration system	Dissect a plant Look at plants Scavenger hunt Plant seeds outdoors Pudsey Allotment visitor	Rolling down a hill Metal hunt around school Compass – orienteering

Upper KS2 Knowledge and Vocab Summary – Cycle A

	Light (Y6)	Evolution & Inheritance (Y6)	Animals inc Humans (Y6) (Circulatory system)	Electricity (Y6)	Living Things & Habitats (Y6)
NC	• 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 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	• 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	• 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	• 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 how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. • give reasons for classifying plants and animals based on specific characteristics
Assessment	How does light travel and how does this help humans to see?	How and why have organisms evolved over time?	How does the circulatory system transport nutrients around animals?	How do different components affect the flow of electricity?	How do we classify living things?
Substantive Knowledge	• Light travels in straight lines. • Understand that we see objects when light reflects from an object into our eyes. • Label a scientific diagram depicting how humans see things. • Understand that light enters our eye through the cornea and the lens. • Understand and name a variety of light sources. • Know that dark surfaces absorb more light. • Know that light surfaces reflect more light. • Explain that shadows retain the same shape as the objects that cast them. • Understand that light is reflected at the same angle it hits an object. • Discuss adaptations of humans to protect eyes (e.g. eyelids, eyelashes) • Identify some simple optical instruments such as the periscope • Know that Isaac Newton discovered the theory of colour • White light is a combination of all colours on the visible spectrum	• Know that a parent's genes are passed onto its offspring. • Understand that offspring characteristics can vary greatly. • Offspring are not identical to their parents. • Inherited characteristics refer to both physical characteristics and abilities e.g. sense of smell. • Many living organisms are created by sexual reproduction. • Offspring inherit characteristics from both parents. • How genes combine to make our DNA makes all animals unique. • Name simple variations in humans e.g., eye colour, nose shape. • Understand that animals have adapted to suit their environment. • Understand that animals have evolved over millions of years to increase their chances of survival. • Explain simple adaptations of animals such as a giraffe, polar bear, camel and penguin. • Understand that evolution can be as a result of environmental changes (e.g., lack of/change of food source). • Explain that bird beaks have adapted to suit their food/environment. • Explain that Charles Darwin came up with the Theory of Evolution • Understand that natural selection is when successful animals pass on the genes most needed to survive in a particular environment.	• Know that the heart and lungs are at the centre of the circulatory system. • Understand that the heart is a muscle and pumps blood to the lungs to pick up oxygen. • The heart pumps oxygenated blood around the body. • The heart is made up of atriums and ventricles. • Arteries carry oxygenated blood away from the heart. • Veins carry deoxygenated blood back to the lungs via the heart. • Capillaries allow for oxygen to pass from arteries to the body. • Understand that a balanced diet and exercise helps keep our heart healthy. • When arteries become clogged with fatty residue, this increases the risk of heart attacks (blockage in the circulatory system) in later life. • Nutrients and water are carried within the blood and deposited around the body. Statements needed on blood vessels/blood functions	• Draw a circuit diagram using the correct symbols. • Identify the correct scientific symbols for lamp, cell, motor, wire and buzzer. • Understand that the more cells, the stronger the stronger the electrical current. • A higher voltage in a cell also increases the amount of electrical current (so a blub will be brighter or a buzzer will be louder). • An electrical current is the flow of electric charge through a material. • Understand that both sides of a battery need to be part of a circuit to allow the flow of electricity. • Know that switches are used to open or close a circuit. • Only closed circuits allow the passing of electrical current through. • The more components in a circuit, the weaker the electrical current.	• Understand that all vertebrates can be separated by their characteristics. • Know that mammals generally give birth to live young and feed offspring on milk. • Understand that amphibians have moist skin whilst reptiles have dry skin. • Know that invertebrates do not have a spine (backbone). • Know that invertebrates are divided into 7 main groups. • Understand how to use knowledge of features and a key to classify invertebrates. • Know that Carl Linnaeus was a scientist who devised a classification system. • Understand that Linnaeus classification system was revolutionary. • Know that Linnaeus researched the basis of the 5 kingdoms: plants, fungi, animals, protists and bacteria. • Understand why animals that are similar are separated by their species (e.g. lions and tigers). • Know that all living things can be classified into one of the 5 kingdoms: plants, fungi, animals, protists and bacteria. • Know that animals are first separated by vertebrates and invertebrates. • Understand that physical features and characteristics of animals help us classify them further (e.g. penguin and Macaw). • Know that micro-organisms are microscopic living things. • Know that bacteria are single-celled micro-organism. • Understand that there are good and bad bacteria. • Understand how to investigate and harvest bacteria.

Disciplinary Knowledge (Skills)	• Simple comparative tests. *Decide where to place rear view mirrors on a car. *Design and make a periscope, and explain how it works using the idea that light travels in a straight line. *Look at a range of phenomena such as rainbows, colours on soap bubbles and objects looking bent in water and coloured filters. *Investigate the shape of shadows and link this to light travelling in straight lines. • Secondary research. *Research famous scientists in relation to light. • Spotting patterns. *Look for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.	• Grouping and classifying. *Design a new plant or animal to live in a particular habitat. *Identify features in animals and plants that are passed on to offspring. *Make observations of fossils to identify living things that lived on Earth millions of years ago. *Consider the artificial breeding of animals or plants e.g. dogs. *Children compare woolly mammoth to elephants thinking about its characteristics to recognise the changes that have happened over time and how animals are suited to their environments. *Show variation in a species: classify a species of animal e.g. cats, dogs. Classify a species of plant e.g. daffodils, tulips, lilies. • Secondary research. *Research the work of Mary Anning and how this provided evidence of evolution. *Compare the ideas of Charles Darwin and Alfred Wallace on evolution. *Use secondary sources to find out about how the population of peppered moths changes during the Industrial Revolution. *Use models to demonstrate evolution e.g. Darwin's finches bird beak activity. *Research different types of a species and their characteristics making them suitable for different habitats e.g. penguins. • Spotting patterns. *Children use different pieces of equipment e.g. chopsticks, toothpick, cutlery to look for patterns linking the suitability of bird beaks for the available food e.g. rice, grapes, raisins.	• Simple comparative tests. *Complete different activities to compare the impact on their own heart rate. • Secondary research. *Learn about the impact of exercise, diet, drugs and lifestyle on the body. *Create a role play model for the circulatory system. *Generate questions to research about the human circulatory system. • Spotting patterns. *Children generate questions for investigation such as: do older people have lower pulse rates? Do boys have higher pulse rates? • Observation over time. *How long does it take children's pulse rate to return to their resting pulse rate (recovery rate)?	• Grouping and classifying. *Classify animals according to Carl Linnaeus' system. *Classify plants into flowering, mosses, ferns and conifers, based on specific characteristics. *Create a branching database to classify a set of living things. • Secondary research. *Research the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification. *Research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system. *Research the characteristics of a vertebrate/invertebrate group. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT, etc.) *Research the characteristics of flowering plants, mosses, ferns and conifers. *Research the difference between bacteria, virus and fungi to give reasons why these are not plants or animals. *Research how micro-organisms can be helpful or harmful. *Research unusual animals e.g. axolotl, platypus, kangaroos etc.	• Simple comparative tests. *Systematically identify the effect of changing one component at a time in a circuit, answering questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors, representing simple circuits in a diagram using recognised symbols. *Design and make a set of traffic lights, a burglar alarm etc. • Secondary research. *Research famous scientists in relation to electricity, for example explain how Steve Jobs used electronics to design computers. • Spotting patterns. *Observe and explain the effects of differing volts in a circuit. *Conduct an investigation, presenting and reporting findings on the effect of wire length on the brightness of bulbs or the loudness of buzzers.
Vocabulary	Artificial, cast, retina, refraction, absorb, reflect, intensity, transmission, hypothesis, optical, periscope, illusion, spectrum	variation, sexual reproduction, characteristics, adapted, inherited, species, evolution, genes	Atrium ventricle, oxygenated, deoxygenated, vein, artery, capillary, pulse	circuit diagram, circuit symbol, voltage, components	Bacteria, Fungi, Protists, Exoskeleton, Arachnid., Crustacean, Cnidarian, Mollusc, Worms, Echinoderm, specie
Scientists	Thomas Edison - Invented electric light bulb Patricia Bath (BP website) - saving sight Thomas Young - Wave Theory of Light Ibn al-Haytham -Light and our Eyes Percy Shaw - The Cats Eye Euclid – Mathematician who predicted light travels in straight lines. Colin Webb – Professor of laser physics	Hippocrates -The Father of Medicine Charles Darwin - Evolution Alfred Russell Wallace – naturalist Rosalind Franklin – DNA Nettie Stevens – Geneticist Professor Alice Roberts - Evolutionary biologist Mary Anning – Fossils / dinosaurs Emma Dunne – Palaeobiologist Thelma Laurentino – Evolutionary biologist	Leonardo Da Vinci - anatomy Santorio Santorio -Anatomist Dr. Katherine Dibb – Expert in Cardiovascular Sciences Justus von Liebig - Theories of Nutrition and Metabolism Sir Richard Doll - Linking Smoking and Health Problems William Harvey – blood circulation and function of heart as a pump Ruth Ella Moore – Bacteriologist James Miranda Steuart Barry – Transgender Dr born Margaret Bulkley	Nikola Telsa - AC electric system Alessandro Volta- Electrical battery Nicola Tesla - Alternating currents Edith Clarke - Electrical engineer Mildred S Dresselhaus – Materials scientist	Carl Linneus - Classification Libby Hyman – Classification of invertebrates Agnes Arber – Botanist Hu Xiansu – Botantist Beatrix Potter - Mycologist
Outdoor	Try and make shadows on the ground – draw around them	Visit – look at variation in animals	Acting out circulatory system Exercise and measuring heartbeat		Outdoor areas Pond dipping

Upper KS2 Knowledge and Vocab Summary – Cycle B

	Properties & changes of materials (Y5)	Living things and their habitats (Y5)	Earth & Space (Y5)	Forces (Y5)	Animals including humans (Y5)
NC	• compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • know that 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 and the action of acid on bicarbonate of soda.	• 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 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	• explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • identify the effects of air resistance, water resistance and friction, that act between moving surfaces. • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	• describe the changes as humans develop to old age.
Assessment	Are all changes of state reversible changes? How do we identify which materials are fit for purpose?	What are the different ways plants and animals reproduce? How do the life cycles of animals differ?	What is the relationship between the Sun, Earth and Moon? How does the movement of the Sun, Earth and Moon affect us?	What are the different forces and how do they impact everyday lives? How have humans found ways to manipulate forces?	How do humans develop throughout their life cycle?
Substantive Knowledge	• Know that all materials can be classified according to a variety of properties (e.g. hardness, solubility, transparency, conductivity and response to magnets). • Understand how to carry out comparative tests about an object's properties. • Know that permeability refers to how an object allows liquids or gases to pass through it. • Know that different materials have different thermal properties (insulator/conductor). • Be able to name some simple thermal conductors e.g., metal objects. • Be able to name some simple thermal insulators e.g., fabrics, wood & plastics. • Explain that some materials are better electrical conductors/insulators e.g. metal/rubber. • Explain why certain objects are made from specific materials referencing their properties. • Know the difference between melting and dissolving. • Identify some factors that affect the rate of dissolving/melting e.g. liquid to solid ratio. • Name different methods to separate solution and identify when to use which process e.g. sieving, filtering and evaporating. • Know that most changes of state are reversible changes e.g. melting, dissolving. • Know that some chemical changes are irreversible and create new materials. • Understand that burning causes irreversible changes and creates new material e.g. ash • Know the impact of acid (e.g. vinegar) on bicarbonate of soda (baking powder).	• Know the functions of the reproductive parts of a plant e.g. • Know that sexual reproduction in some plants and animals occur when the male and female gametes join. • Understand that when male and female gametes join, fertilisation can occur. • Some plants are pollinated by insects and others the wind. • Some plants need pollen to fuse with the ovule to make a seed (sexual reproduction). • Asexual reproduction only requires one parent plant – there is no mixing of genetic information which creates identical offspring. • Mammals produce offspring through sexual reproduction. • Know that most mammals begin as an embryo and grow inside the mother before being born alive. • Describe the life cycle of a rabbit (mammal) - embryo, baby, adolescent, adult. • Describe the life cycle of a caterpillar (insect) egg, larvae, chrysalis, butterfly. • Describe the life cycle of an amphibian (frog) – egg, tadpole, froglet, frog. • Describe the life cycle of a chicken (bird) – egg, chick, chicken. • Know some key difference between the life cycles of a rabbit, frog, chicken and butterfly.	• The sun is at the centre of the solar system. All planets orbit the sun. • The sun is a stationary body which all other planets orbit. • Some planets have moons (like Earth). Moons orbit individual planets. • The Earth, sun and moon are approximately spherical bodies. • The sun is the largest body in the solar system. • Our solar system is within the Milky way and is made up of the sun and 8 planets (not including Pluto, a dwarf planet). • Copernicus, Galileo and Newton followed the heliocentric theory. • Ancient Greek scientist Aristotle believed in the geocentric theory. • Heliocentric theory believed the sun was at the centre of the solar system. • Geocentric theory believed that Earth was at the centre of the solar system. • Earth is constantly rotating on its axis. • The rotation of the Earth causes the change from night to day. This takes 24 hours. • Part of the Earth is in darkness as it moves away from the light/heat of the sun. This impacts time zones. • Different seasons occur due to the proximity of Earth to the sun. • It takes 365 days for the Earth to fully orbit the sun.	• Gravity is a pulling force that pulls objects towards the Earth's core. • Isaac Newton discovered the force of gravity. • Gravity is measured in Newtons (N) • Be able to carry out simple investigations using a newton meter. • Air resistance is a pushing force which counteracts gravity. • Air resistance slows down objects moving through the air. • Galileo carried out experiments to test gravity and air resistance. • Friction is a pushing force that acts between 2 touching surfaces. • Understand how to keep variables the same to carry out a fair test on forces. • Water resistance is a pushing force that pushes against objects in liquids. • The density of the liquid depends on the amount of water resistance. • There are ways to design objects to counteract the effects of water resistance, air resistance and friction e.g. streamline shapes, surface area. • Simple machines can be used to transmit greater force. • A lever is rigid bar that transmits force and motion e.g. seesaw • A gear is a toothed wheel that fits into another to transmit motion e.g. bike gears. • A pulley is a mounted rotating wheel with a grooved rim over which a string can move to change direction of a pulling force e.g. crane.	• Humans change as they age. • There are 7 stages of human development: prenatal, infancy, childhood, adolescence, early adulthood, middle adulthood, and late adulthood. • Prenatal means before birth humans grow in the womb for 9 months (the gestation period). • Infants learn to eat, crawl, walk, laugh, make sounds, talk and grow teeth. • During childhood, we are heavily supported by adult guidance. • Puberty occurs in adolescence; these changes allow reproduction in early adulthood. • Women experience the menopause in middle adulthood. There can be physical changes to appearance in middle adulthood (such as hair colour). • The end of the human life cycle is typically in late adulthood. • Different animals have different gestation periods. • Be able to investigate the gestation periods of different animals.

Disciplinary Knowledge (Skills)	• Grouping and classifying. *Compare the properties of a broad range of materials (including relating these to what the chn learnt about in Yr 3 magnetism and Yr4 electricity). *To group materials based on the chn's knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. *Based on the children's own criteria after observing what happens when solids are added to liquids, classify materials based on the outcomes. • Simple comparative tests. *Observe some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. EG *Which materials would be the most effective…at making a warm jacket? For wrapping ice cream to stop it melting? *For making black out curtains? *Which material would be good for a tent? *Which material would be good to make a tea bag from? *Which materials keep things warm/cold? *Which material would be good for a bag for different purposes? *Test solids for solubility. Compare rates of solubility. *Burn different materials (not plastic or toxic substances). • Secondary research. *Find out about how chemists create new materials e.g. Spencer Silver who invented the glue for sticky notes. *Research how chemical changes have an impact on our lives e.g. cooking. • Spotting patterns. *Explore reversible changes including evaporating, filtering, sieving, melting and dissolving. *Recognising that melting and dissolving are different processes. *Observe changes that occur when burning different materials or baking bread or cake. • Observation over time *Observe changes that are difficult to reverse e.g. burning, rusting and other reactions e.g. vinegar with bicarbonate of soda. *Investigate that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution – observing the solution absorbed into the string over a period of time.	• Grouping and classifying. *Comparing different life cycles – using a classifying diagram. • Simple comparative tests. *Grow new plants from different parts of the parents plant e.g. seeds, stem and root cuttings, tubers, bulbs. • Secondary research. *Research life cycles. Dissect a flower – using a secondary source label the dissected flower using post-its or label the flower parts on sketch. *Research work of naturalists and animal behaviourists e.g. Jane Goodall and David Attenborough. *Generate questions to research the life cycle of a chosen animal: mammal, amphibian, insect, bird e.g. dragon fly, cuckoo, salmon, worm, owl. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT, etc.) *Research how gardeners asexually reproduce plants. • Spotting patterns. *Sorting plants reflecting their type of reproduction – air cross etc. *Sorting plants – asexually and sexually reproduce. *Children generate questions such as: - Do larger mammals have longer gestation periods? - Do larger animals live longer? - Do smaller animals lay more eggs? • Observation over time *Cuttings of plants – how they establish themselves over time – whether they grow roots/stems/leaf/flower *Observe life cycle changes e.g. plants and animals in the local environment. *Grow from, and harvest, bulbs through the year. (Can be done in conjunction with Year 2.) *Observe strawberry/spider plants through the year.	• Secondary research. *Research shape and appearance of Earth, Sun and Moon to make scale drawings/playground activity. *Practical movement of bodies in relation to each other. *Generate questions to research about the Earth and space. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT, etc.) • Spotting patterns. *Comparing the time of the day at different places on the Earth through internet links and direct communication (e.g. Skype). • Observation over time *Creating and monitoring sun-dials (through measuring shadows throughout the day) calibrated to show midday and the start and end of the school day.	• Grouping and classifying. *Sorting different actions under the heading of different forces. • Simple comparative tests. *Drop a bouncy ball from different heights or of different materials – use of gravity. *Compare friction - how it stops or slows a moving object e.g. trainers or weighted match box pulled with force meter, balloon rockets, CD hovercraft, balloon cars, observe the effect of a brake on a bicycle wheel. *Compare water resistance e.g. boats in a gutter of water, plasticine in a cylinder of liquid (easier with a more viscous liquid e.g. bubble bath). *Compare air resistance e.g. spinners, parachutes, sailing boats, straw rockets. • Secondary research. *Leavers, pulleys, gears – how and why are they used? *How Galileo Galilei and Isaac Newton helped to develop the theory of gravitation. *Research Heath Robinson and Rube Goldberg machines. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT, etc. This could be cross-curricular with D&T and English biography writing.) • Spotting patterns. *Pulleys on toys (the larger the pulley, the slower the turn etc). *Experience forces that make things begin to move, get faster or slow down.	• Secondary research. *Research 6 stages of human development (timeline) *Develop questions to ask an expert e.g. a health visitor, doctor or nurse. (Questions will need to be filtered by the teacher.) • Observation over time *Old Age True or False cards – to produce a fact page about 'Old Age' including 'Myth Busters'.
Vocabulary	Substance, malleable, filtering, sieving, solution, permeable, dissolve, soluble, acid, bicarbonate of soda, thermal	offspring, sexual reproduction, asexual reproduction, embryo, gamete, chrysalis, fertilisation, pollinated, clone, metamorphosis	Asteroid, sphere, orbit, Milky Way, galaxy, solar system, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, Geocentric, Heliocentric, axis.	Gravity, Newtons, core, Newtonmeter, density, lever, gear, pulley, fulcrum, air resistance, water resistance, friction	Prenatal, fertilisation, womb, gestation period, infancy, adolescence, puberty, menopause

Scientists	Sir Humphrey Davy - Separating gases Jamie Garcia (BP website) - Invention of a new plastic Becky Schroeder - fluorescence material Spencer Silver, Arthur Fry and Alan Amron - Post-It Notes Ruth Benerito - Wrinkle-Free Cotton Andre Geim & Konstantin Novoselov – Physicist who discovered graphene Raquel Prado – Chemist developed a sustainable fabric looks like leather	Jane Goodall – naturalist, wildlife researcher, conservationist Sylvia Earle - Marine biologist Dr. Paula Kahumbu -wildlife conservationist Mangala Mani – Antarctic scientist Sir David Attenborough - Animal Behaviourist & Naturalist Roger Arliner Young – Zoologist Ernest Everett Just - Zoologist	Margaret Hamilton - Computer scientist (Moon Landings) Stephen Hawking - Black Holes Mae Jemison – Astronaut Claudius Ptolemy and Nicolaus Copernicus - Heliocentric vs Geocentric Universe Neil Armstrong - First man on the Moon Helen Sharman- GB astronaut Caroline Herschel - First to find a comet Valentina Tereshkova -Cosmonaut Dr Claudia Alexander – Physicist – NASA Gallileo Mission to Jupiter Maggie Aderin-Pocock – Space Scientist Tim Peake – GB Astronaut	Isaac Newton- Gravity Albert Einstein- The Theory Of relativity Galileo Galilei - Gravity and Acceleration Archimedes of Syracuse – Levers George Cayley – Aeronautical engineer Brahmagupta – Mathematician and astronomer	Alexander Fleming - Penicillin Louis Pasteur - Vaccination Eva Crane - Reproduction in Bees Virginia Apgar – obstetrical anaesthesiologist Robert Winston – Professor of science & society, Professor of fertility
Outdoor	Material hunt around school/outside Why are certain materials used? Can we find better alternatives? Investigate puddles and evaporation during the day.	Pond dipping – find different stages of animals in their life cycles	Space camp – Fulneck School		

Progression of Skills

	EYFS (Milestone 1)	KS1 (Milestone 2)	LKS2 (Milestone 3)	UKS2 (Milestone 4)
Working Scientifically	• Learn new vocabulary. • Ask questions to find out more. • Describe events in some detail. • Observe and describe what they see, hear and feel while they are outside. • Use talk to work out problems and organise thinking and activities. • Explain how things work. • Explain why things might happen. • Use new vocabulary in different contexts.	• Ask simple questions. • Observe closely, using simple equipment. • Perform simple tests. • Identify and classify. • Use observations and ideas to suggest answers to questions. • Gather and record data to help in answering questions.	• 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. • 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.	• Plan enquiries, including recognising and controlling variables where necessary. • Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work. • 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.
Biology - Understand Plants	• Identify and distinguish between different plants and trees. • Identify the basic parts of a plant / tree, including roots, stem, trunk, leaves and flowers.	• Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen. • Identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers. • 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.	• 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 dispersal.	• *Relate knowledge of plants to studies of evolution and inheritance.* • *Relate knowledge of plants to studies of all living things.*
Biology -Understand Animals and Humans	• Identify parts of the human body including head, neck, shoulders, arms, tummy, back, chest, legs, hands, feet, fingers, toes, face, eyes, ears, nose, mouth. • Know and talk about different factors that support their overall health and wellbeing including: ▪ Regular physical activity ▪ Healthy eating ▪ Toothbrushing ▪ Sensible amounts of 'screen time' ▪ Having a good sleep routine ▪ Being a safe pedestrian	• Identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates. • 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 (birds, fish, amphibians, reptiles, mammals and invertebrates, including pets). • Identify name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. • Notice that animals, including humans, have offspring which grow into adults. • Investigate 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.	• 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.	• 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 importance of diet, exercise, drugs and lifestyle on the way the human body functions. • Describe the ways in which nutrients and water are transported within animals, including humans.

Biology - Investigate Living Things & their Habitats	• Explore the natural world around them. • Recognise some environments that are different from their own.	• Explore and compare the differences between things that are living, that are dead and that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including micro-habitats. • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.	• Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys. • Recognise that environments can change and that this can sometimes pose dangers to specific habitats.	• 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. • Give reasons for classifying plants and animals based on specific characteristics.
Biology - Understand Evolution & Inheritance	• Distinguish between and identify a baby, a child and an adult.	• *Identify how humans resemble their parents in many features.*	• *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.*	• 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 - Investigate Materials	• Identify some common everyday materials. • Identify simple properties of materials e.g. hard, soft, bendy. • Identify how some materials can change states e.g. ice melting, water freezing. • Identify and distinguish between liquids and solids.	• 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. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock, and paper/cardboard for particular uses.	**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. • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	• 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, oxidisation and the action of acid on bicarbonate of soda.
Physics - Understand Seasonal Change	• Understand the effect of the changing seasons on the natural world around them.	• *Observe the apparent movement of the Sun during the day.* • Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies.	• *Describe the movement of the Earth relative to the Sun in the solar system.* • *Describe the movement of the Moon relative to the Earth.*	• 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.

Physics - Investigate Light & Seeing	• Distinguish between night and day.	• *Observe and name a variety of sources of light, including electric lights, flames and the Sun, explaining that we see things because light travels from them to our eyes.*	• 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.	• 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.
Physics - Understand Movement, Forces & Magnets	• Explore what objects / materials 'stick' to magnets and which don't. • Identify how objects need to be pushed or pulled to move them.	• *Notice and describe how things move, using simple comparisons such as faster and slower.* • *Compare how different things move.*	• 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.	**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.
Physics - Investigate Sound & Hearing	• Identify different sounds. • Explore making different sounds using body, voice and instruments / objects.	• *Observe and name a variety of sources of sound, noticing that we hear with our ears.*	• 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 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.
Physics - Understand Electricity	• Identify how some toys and appliances need batteries or to be plugged in to make them work.	• *Identify common appliances that run on electricity.* • *Construct a simple series electrical circuit.*	• 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.	• 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.