



Substantive Knowledge

Plants

EYFS	Lower School	Upper School
<ul style="list-style-type: none"> • Know that there are different types of plants. • Know most plants start growing from a seed or bulb. • Make observations and draw pictures of plants. • Know all plants need water & light to grow and survive. • Know about the key features of the life cycle of a plant. • Know about the need to respect and care for the natural environment and all living things. • Know about the different seasons and the effect they have on 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. 	<ul style="list-style-type: none"> • Know what an oak tree, horse chestnut, holly and sycamore tree look like and what evergreen and deciduous means. • Know what a daffodil, primrose, daisy, dandelion, buttercup, snowdrop and crocus look like. • Know that some plants are wild and others cultivated. • Know these parts of plants – trunk, stem, leaf, bud, flower and root. • Know the functions of roots, stems/trunk, leaves and flowers. • Know that plants need water, light and a suitable temperature to grow and stay healthy. • Know that plants take nutrients from the soil. • Know that water enters a plant through the root and is transported around the plant. • Know the purpose of a flower, the part it plays in the life cycle and that a bee pollinates a flower. • Know about George Washington Carver and his agricultural discoveries. 	<ul style="list-style-type: none"> • Know that plants can be grouped into flowering plants (including grasses) and non-flowering plants (e.g. ferns and mosses). • Know what a plant classification key is, how it works and to be able to use them to identify different plants. • Know about some positive and negative human impacts and changes to the environments in our locality – E.g. Kingsbury Water Park positive, Daw Mill and Coopers' Meadows positive and – negative. • Know the functions and names of the parts of the flower that are to do with reproduction. • Know the difference between sexual and asexual reproduction in plants.
<p>Vocabulary</p>	<p>Plants, leaf, flower, blossom, petal, fruit, berry, root, seed, photosynthesis, pollen, insect/wind, seed trunk, branch, stem, bark, stalk, bud, light, shade, warm, cool, water, grow, healthy, evergreen, deciduous</p>	<p>formation, seed dispersal, wind, water, animal, reproduction, asexual, sexual, stamen, stigma, carpel, fertilisation, dispersal, pollen, nectar, ovule, ovary, anther, filament, classification key, environment, human impact</p>



Animals, including Humans

EYFS	Lower School	Upper School
<ul style="list-style-type: none"> • Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices. • Uses their senses to explore the natural environment and a range of materials. • Knows the names of some animals - pets, farm animals. • Knows about the lifecycle of an animal or insect. • Can talk the life cycle of an animal or insect • Observes some features in the natural world and draws what is seen e.g. animals. • Can say what animals need to survive. 	<ul style="list-style-type: none"> • Know the names of farm animals. • Know what a carnivore, herbivore and omnivore is. • Know the basic similarities & differences between a fish, mammal, bird, reptile and amphibian. • Know human body parts: head, leg, arm, neck, elbow, knees, face, ears, eyes and teeth. • Know the five senses and which body parts are associated. • Know that animals, including humans, have offspring which grow into adults. • Know about Maria Sibylla Merian and her work on the lifecycle of butterflies. • Know the basic needs of animals, including humans, for survival (water, food and air). • Know that healthy eating, hygiene and exercise are important for humans. • Know that humans / animals get nutrition from food. • Know that humans and some other animals have skeletons and muscles. • Know about the work of Marie Curie and Rosalind Franklin. 	<ul style="list-style-type: none"> • Know how human digestive system works and function of mouth, tongue, teeth, oesophagus, stomach and intestine. • Know the different types of teeth in humans and their simple functions. • Know how to care for your teeth. • Know how human teeth compare to those of other animals (herbivores and carnivores). • Know what changes a human goes through from birth to old age. • Know the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Know the impact of exercise on the circulatory system. • Know the ways nutrients and water are transported around the body. • Know that a good diet and exercise are important for healthy lifestyle and on the way that our bodies function. • Know about the work of Marie Daly on the effect of food and diet on the heart. • Know that some drugs can be prescribed to make us better when unwell. • Know about the work of Tu Youyou and Percy Julian. • Know that some substances can be harmful to the human body e.g. tobacco, caffeine and alcohol.
<p>Vocabulary</p>	<p>head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, offspring, reproduction, growth, child, young/old stages e.g., chick/hen, baby/child/adult, caterpillar/butterfly, exercise,</p>	<p>digestive system, digestion, oesophagus, stomach, small intestines, nutrients, large intestine, rectum, anus, mouth, teeth, saliva, incisor, heart, pulse rate, pumps, blood, blood vessels, transported, lungs,</p>



	heartbeat, nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support.	oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle.
Living Things and their Habitats		
EYFS	Lower School	Upper School
<ul style="list-style-type: none"> • Explores the natural environment and begins to identify some similarities and differences. • Observes some features in the natural world and draws what is seen e.g. animals, trees. • Observes some features in the natural world, in a contrasting environment from where they live, and draw what is seen. • Develop some understanding of the effect their behaviour can have on the environment. 	<ul style="list-style-type: none"> • Know the differences between things that are living, dead, and things that have never been alive. • Know what a habitat is. • Know the following habitats and what they are like: micro-habitat in Garden of Reflection, farmland, woodland, rainforest and desert. • Know plants and animals that would live in these habitats and know how/ why they are suited to living there. • Know about the work of Jane Goodall and Rachel Carson. • Know plants and animals depend on each other. • Know what a simple food chain is. • Know about the work of Dame Ann McLaren. 	<ul style="list-style-type: none"> • Know what a habitat is. • Know that vertebrate animals can be grouped into fish, amphibians, reptiles, birds and mammals. • Know that invertebrates can be grouped into snails and slugs, worms, spiders and insects. • Know what a micro-organism is and where it fits in classification of all living things. • Know how a classification key is works. • Know the difference between life cycles of mammals, birds, amphibians and insects (E.g. from UK and other climate zones). • Know that animals reproduce, grow and have young as part of their life cycle. • Know what a producer, consumer, decomposer, predator and prey are. • Know about the work of Charles H. Turner on insects and Carl Linnaeus and his work on classification. • Know who David Attenborough is and his impact on our understanding of the natural world.
Vocabulary	living, dead, never been alive, suited, suitable, basic needs, food, water, food chain, habitat, shelter, move, feed, names of local habitats, names of micro habitats e.g., under logs, in bushes etc.	classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate, life cycle, reproduce, sexual, sperm, fertilisers, egg, live, young, metamorphosis, vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms.



<i>Electricity</i>		
<i>EYFS</i>	<i>Lower School</i>	<i>Upper School</i>
		<ul style="list-style-type: none"> • Know that electricity can be dangerous and what precautions are needed to work safely with it. • Know where electricity comes from. • Know the basic parts of a circuit - cells, wires, bulbs, switches and buzzers. • Know that a circuit needs to be complete in order for it to work. • Know what a conductor and insulator are. • Know how to represent a circuit in a diagram. • Know that a higher voltage will affect brightness / volume. • Know who Michael Faraday was and what he did and about the work of Chi Onwurah on electricity.
Vocabulary		electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, components, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol, circuit diagram, voltage.
<i>Forces</i>		
<i>EYFS</i>	<i>Lower School</i>	<i>Upper School</i>
<ul style="list-style-type: none"> • Begin to explore and talk about different forces they can feel • Explore forces and use new vocabulary to describe them. • Explore floating and sinking. 	<ul style="list-style-type: none"> • Know what a magnet is and how it acts. • Know that a magnet has two poles and that they can attract or repel. • Know a magnet attracts some metal objects e.g. a spoon or paperclip. • Know that some forces need contact between two objects, but magnetic forces can act at a distance. 	<ul style="list-style-type: none"> • Know what gravity is and how it acts between the Earth and the falling object. • Know what air resistance, water resistance and friction are and their effects. • Know that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.



		<ul style="list-style-type: none"> Know about how scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.
Vocabulary	Force, push, pull, twist, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole.	Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears.
Materials/Properties and changing materials		
EYFS	Lower School	Upper School
<ul style="list-style-type: none"> Begin to understand changing states of matter e.g. freezing, melting. Use their senses to explore the natural environment and a range of materials. Talk about the differences between materials and changes that they notice. 	<p>Everyday materials</p> <ul style="list-style-type: none"> Know that objects are made of different materials e.g. metal, plastic, wood, glass, rubber, textile, rock. Know the simple physical properties of a variety of everyday materials e.g. that a wooden desk is hard. Know the types and names of building materials used in our locality. Know who John Dunlop and John McAdam are and what they discovered. <p>Uses of everyday materials</p> <ul style="list-style-type: none"> Know that the material something is made of is dependent on its particular use. Know about the work of Walter Lincoln Hawkins 	<p>Materials and their properties and changes</p> <ul style="list-style-type: none"> Know what is a solid, liquid or gas. Know that some materials change state when heated or cooled. Know that water boils at 100 °C and freezes at 0°C Know what evaporation and condensation is. Know what the water cycle is and how evaporation and condensation are part of this. Know that temperature affects the rate of evaporation / condensation. Know what the following terms mean: transparency, solubility, conductivity (electrical and thermal), magnetism, filtration, sieving and evaporating. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Know that some changes to materials are reversible and others are not.
Vocabulary	Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, shiny, dull, rough, flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bending, stretching.	Solid, liquid, gas, state, change, , freezing, melting point, boiling point, evaporation, temperature, water cycle, condensation thermal, electrical insulator, conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible, non-reversible, irreversible, burning, rusting, new.



<i>Light</i>		
<i>EYFS</i>	<i>Lower School</i>	<i>Upper School</i>
<ul style="list-style-type: none"> Observe the natural process of light casting a shadow. 	<ul style="list-style-type: none"> Know that we need light in order to see things and that dark is the absence of light. Know that light is reflected from surfaces. Know that light from the sun can be dangerous and that there are ways to protect their eyes. Know that shadows are formed when the light from a light source is blocked by an opaque object. 	<ul style="list-style-type: none"> Know that light appears to travel in straight lines and that objects can be seen because they either give out light or reflect light. Know that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Know that shadows have the same shape as the objects that cast them. Know about the work of Patricia Bath on eyes.
Vocabulary	Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous.	Light source, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, straight lines, light rays, reflect, refract, spectrum, shadows.
<i>Sound</i>		
<i>EYFS</i>	<i>Lower School</i>	<i>Upper School</i>
<ul style="list-style-type: none"> Observe and interact with natural processes, such as a sound causing a vibration. 		<ul style="list-style-type: none"> Know that vibrations from sounds travel through a medium to the ear. Know what pitch means and that pitch and volume can be changed in a variety of ways. Know that factors such as distance from source and strength can affect sound.
Vocabulary		Sound, source, vibrate, vibration, travel, pitch (high/low), volume, faint, loud, insulation.
<i>Seasonal Changes</i>		
<i>EYFS</i>	<i>Lower School</i>	<i>Upper School</i>
<ul style="list-style-type: none"> Knows and can talk about some key changes to nature in the autumn, winter, spring and summer. Understand the effect of changing seasons on the natural world. 	<ul style="list-style-type: none"> Know the four seasons in UK and associated weather. Know that the day length changes throughout year. Know that the world's climate may be changing. Who Charles Macintosh was and what he did. 	



Vocabulary	Weather (sunny, rainy, windy, snowy etc.) Seasons (winter, summer, spring, autumn) Sun, sunrise, sunset, day length, climate change, extreme weather, floods, tornadoes hurricanes.	
Earth and Space		
EYFS	Lower School	Upper School
		<ul style="list-style-type: none"> • Know where Earth is in relation to the sun and other planets in Solar System. • Know that the sun is a star. • Know that it is dangerous to look directly at the sun, even while wearing dark glasses. • Know the names of planets in Solar System. • Know what the moon is and it orbits the Earth. • Know why day and night occur. • Know why seasons occur. • Know why the sun appears to travel across the sky. • To know about the race into space and man's mission to the moon. • To know about some current and future plans for space exploration. • Know about the work of Katherine Johnson, Mae Jemison and Dr Maggie Adern-Pocock
Vocabulary		Earth, sun, moon, planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune) spherical, solar system, rotate, star, orbit.
Rocks		
EYFS	Lower School	Upper School
<ul style="list-style-type: none"> • Use their senses to explore the natural environment and a range of materials. 	<ul style="list-style-type: none"> • Know names of rocks e.g. marble, chalk, granite, coal, limestone. • Know that fossils are formed when things that have lived are trapped within rock. 	



	<ul style="list-style-type: none"> • Know that soils are made from rocks and organic matter. • Know about the work of Kusala Rajendran and Mary Anning. 	
Vocabulary	Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, peat, sandy/chalk/clay, permeable, impermeable, sedimentary, metamorphic, igneous.	
Evolution and Inheritance		
EYFS	Lower School	Upper School
		<ul style="list-style-type: none"> • Know that living things have changed over time. • Know what a fossil is and that they provide information about living things that inhabited the Earth millions of years ago. • Know that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Know characteristics are passed from parents to their offspring e.g. in breeds of dog, including modern crossbreeds like the Labradoodle. • Know that animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. • Know who Charles Darwin was and his ideas on evolution. • Know who Mary Anning was and her work on palaeontology.
Vocabulary		Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils, palaeontology.



Working Scientifically

Skills to acquire in each year group

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Planning						
Tell you some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences.	Ask simple questions when prompted. Suggest ways of answering a question.	Ask simple questions. Recognise that questions can be answered in different ways	Ask relevant questions when prompted. With support, set up simple and practical enquiries, comparative and fair tests.	Ask relevant questions Set up simple and practical enquiries, comparative and fair tests.	With prompting, plan different types of scientific enquiries to answer questions With prompting, recognise and control variables where necessary.	Plan different types of scientific enquiries to answer questions Recognise and control variables where necessary.
Conducting Investigations						
As above.	Make relevant observations. Conduct simple tests, with support.	Observe closely, using simple equipment. Perform simple tests.	Make systematic observations, using simple equipment. Use standard units when taking measurements.	Make systematic and careful observations using a range of equipment, including technology e.g. thermometers. Take accurate measurements using standard units, where appropriate.	Select, with prompting, and use appropriate equipment to take readings (including repeated readings). Take precise measurements using standard units.	Take measurements using a range of scientific equipment. Take measurements with increasing accuracy and precision. Take repeat readings when appropriate.
Recording Evidence						
As above.	With prompting, gather and record data to help answer questions.	Gather and record data to help answer questions. Begin to use simple scientific language.	Record findings in various ways using scientific language. Begin to record findings using keys, bar charts and tables. Begin to gather and present data in a variety of ways.	Record findings using simple scientific language, drawings and labelled diagrams. Use keys, bar charts, and tables. Gather, record and present data in a variety of ways.	Begin to record data and results of increasing complexity using scientific diagrams and labels e.g. classification keys, tables, scatter graphs, bar and line graphs.	Record data and results of increasing complexity using scientific diagrams and labels e.g. classification keys, tables, scatter graphs, bar and line graphs.



Reporting Findings.						
As above.	Begin to identify and classify.	Identify and classify.	With support, report on findings from enquires, including oral and written explanations, of results and conclusions. With support, report on findings from investigations.	Report on findings from enquiries, including oral and written explanations, of results and conclusions. Report on findings from enquiries using displays or presentations.	Begin to report and present findings from enquiries, including conclusions and causal relationships. Begin to report and presents findings from enquiries in oral and written forms such as displays and other presentation. Begin to report and present findings, including explanations of, and degree of, trust in results.	Report and present findings from enquiries, including conclusions and causal relationships. Report and presents findings from enquiries in oral and written forms such as displays and other presentation. Report and present findings from enquiries, including explanations of, and degree of, trust in results.
As above.	Begin to use observations to suggest answers to questions.	Use their observations and ideas to suggest answers to questions.	Begin to identify differences, similarities or changes related to simple scientific ideas and processes. Begin to use results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions. Use straightforward scientific evidence to answer questions or to support their findings.	Identify differences, similarities or changes related to simple scientific ideas and processes. Use results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions. Use straightforward scientific evidence to answer questions or to support their findings.	Begin to identify scientific evidence that has been used to support or refute ideas or arguments. Begin to use test results to make predictions to set up further comparative and fair tests.	Identify scientific evidence that has been used to support or refute ideas or arguments. Use test results to make predictions to set up further comparative and fair tests.



**Non-negotiable Investigations
(Must include progression of the Working Scientifically Skills).**

EYFS	Lower School	Upper School
<ul style="list-style-type: none"> -Make observations and draw pictures of animals and plants. -Go on a mini-beast hunt in our school grounds. -Plant seeds or bulbs and observe how they grow. (beans and daffodils) -Plant and care for some different vegetables in our school garden. -Investigate patterns and textures in the natural world. E.g. tree bark, leaf shapes, flower petals, shells and pebbles. -Can everything freeze? E.g. tomato sauce, playdough. -How can the penguin escape from the ice? 	<p>An English Country Garden</p> <ul style="list-style-type: none"> -Identify the deciduous and evergreen trees / plants in our school grounds and church yard and chart on map. -Plant broad beans to observe growth of root and root hairs. -Investigate different type of roots e.g. carrot / grass. -Measure the size of selected trees / hypothesize whether the tallest trees have the biggest leaves. <p>Green Fingers</p> <ul style="list-style-type: none"> -Plant a seed (Y1), bulb (Y2) and rhizome (Y3) look after it and watch it grow (cress / sunflowers / daffodil, hyacinth, potato, ginger). -Investigate what happens in an experiment to show how coloured water is transported through a plant. -Watch a time lapse video of a plant growing as a secondary source. <p>Body Parts!</p> <ul style="list-style-type: none"> -Investigate objects / foodstuff / sounds etc. using senses. -Investigate class heights/ hand spans/ length of feet. -Use x-rays images of skeletons as a secondary source. <p>Healthy Me</p> <ul style="list-style-type: none"> -Keep a food diary / keep an exercise diary. -Collect data on pet diets and present in different ways. -Group and classify foods into food groups (pyramid). -Investigate how much exercise they can do in a minute. <p>Living Things & Their Habitats</p> <ul style="list-style-type: none"> -Identifying / group Y1 farm animals / Y2 common woodland creatures / Y3 garden and woodland birds. -Group and classify given objects that are living, dead or never alive. -Carry out a minibeast hunt in Garden of Reflection. -Visit a farm. <p>Seasonal Change</p>	<p>Living things and their habitats</p> <ul style="list-style-type: none"> -Group and classify, including using and creating keys for various animal and plant groups. -Dissect a flower to identify and name reproductive parts (e.g. tulip, daffodil). -Grow plants from stem or root cuttings (ongoing observations / recordings). <p>Animals, including humans</p> <ul style="list-style-type: none"> -Investigate which drink causes most tooth decay (ongoing observations / recordings). -Group and classify plants and animals in food chains <p>Health and well-being</p> <ul style="list-style-type: none"> -Investigate the effect of exercise on pulse rate. <p>Evolution and inheritance</p> <p>Materials and their properties and changes.</p> <ul style="list-style-type: none"> -Investigate dissolving substances in water -Investigate the effect of temperature on evaporation. -Separate mixtures using filtration and sieving. -Investigate effect of temperature on melting Investigate an irreversible change (e.g. vinegar and bicarbonate of soda). -Investigate thermal conductors and insulators (e.g. lining for a lunch box). -Investigate electrical conductors (e.g. best material in a circuit). <p>Sound and Light</p> <ul style="list-style-type: none"> -Investigate sound travelling through a medium -Investigate pitch of sounds (e.g. elastic bands and stringed instruments). -Investigate increasing volume and insulating sound using different materials (e.g. making earmuffs). -Investigate light travelling in straight lines and shadow using shadow puppets.



-Investigate what happens in an experiment on insulation e.g. best material to keep something warm.
-Take the temperature in different parts of the school and grounds.

-Create a simple weather station and make daily recordings.

-Use secondary sources (pictures / videos) to show change in a landscape over four seasons.

Everyday Materials and Their Uses.

-Identify the materials used in the construction of buildings in our immediate locality in field work.

-Investigate how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

-Group and classify objects that are different materials.

-Use Traction Man to find out what are the best materials for e.g. a waterproof suit, the stretchiest material, best curtains to keep light out.

Can You Feel The Force?

-Investigate strengths of magnets / materials that a magnet attracts / how the two poles work.

-Compare how things move on different surfaces e.g. toy car on tiles / carpet.

Light and Shadow

-Investigate what happens when a torch is shone through different materials & group and classify these materials.

-Form shadow puppets and investigate how to change size of the shadow.

-Go outside to investigate the shape/size of a shadow over a day.

Year three only Rocks and Soils

-Handle and classify rocks.

-Test permeability of rocks.

-Test hardness of rocks.

-Investigate the makeup of different soils.

Electricity

-Make circuits including buzzers, switches, motors and bulbs.

-Test conductivity of materials.

-Make switches from different materials.

-Change the voltage in a circuit to find out what happens.

Earth and Space

-Make a model of the solar system

Forces

-Air resistance investigation e.g. (paper ball compared to sheet of paper etc.)

-Friction experiments – e.g. car on a slope of various surfaces.

-Lever and pulley experiment.

-Water resistance experiment.