Plants – knowledge progression

Year Group	Key knowledge
1	• Growing locally, there will be a vast array of plants which all have specific names. • These can be identified by looking at the key characteristics of the plant. • Plants have common parts, but they vary between the different types of plants. • Some trees keep their leaves all year while other trees drop their leaves during autumn and grow them again during spring.
2	• Plants may grow from either seeds or bulbs. • These then germinate and grow into seedlings which then continue to grow into mature plants. • These mature plants may have flowers which then develop into seeds, berries, fruits etc. • Seeds and bulbs need to be planted outside at particular times of year and they will germinate and grow at different rates. • Some plants are better suited to growing in full sun and some grow better in partial or full shade. • Plants also need different amounts of water and space to grow well and stay healthy.
3	• Many plants (but not all) have roots, stems/trucks, leaves and flowers/blossom. • Leaves use sunlight and water to produce the plant's food. • Some plants produce flowers, which enable the plant to reproduce. • The roots absorb water and nutrients from the soil and anchor the plant in place. • The stem transports water and nutrients/minerals and supports the plant. • Plants need certain conditions to grow well: air, light, water, nutrients from soil and room to grow. • The life cycle of flowering plants includes germination, pollination, seed formation and seed dispersal.
4 (Living things and their habitats)	• Living things can be classified in different ways according to their features. • Classification keys can be used to identify and name living things. • A habitat provides animals, plants and other living things with food and shelter. • Each habitat has different conditions: amount of light, temperature and amount of moisture. • Environments can change with seasons and living things may change their behaviour in different seasons. • Humans can cause environments to change in a positive and negative way.
5 (Living things and their habitats)	• Plants reproduce both sexually and asexually (only one parent involved). • Sexual plant reproduction occurs through pollination – pollen is transferred from the stamen to the stigma. • Seeds are formed during sexual plant reproduction and dispersed by animals and the wind.
6 (Living things and their habitats)	• Living things can be classified into broad groups according to their characteristics – plants, animals and microorganisms. • Plants can make their own food whereas animals cannot. • Plants can be divided broadly into two main groups: flowering plants and non-flowering plants.
KS3	• Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms

Living things and their habitats – knowledge progression

Year Group	Key knowledge
1 (Plants & Animals, including humans)	• Growing locally, there will be a vast array of plants which all have specific names. • These can be identified by looking at the key characteristics of the plant. • Plants have common parts, but they vary between the different types of plants. • Some trees keep their leaves all year while other trees drop their leaves during autumn and grow them again during spring. • Key features (such as wings, scales etc.) help us to identify animals.
2 (Animals, including humans)	• Living things are plants (including seeds) and animals. • Dead things include dead animals/plants and parts of plants/animals that are no longer attached. • Objects made of rock, metal and plastic have never been alive. • Animals and plants live in a habitat to which they are suited. • The habitat provides the basic needs of the animals and plants – shelter, food and water. • Within a habitat there are different micro-habitats which have different conditions and affect which plants and animals live there. • The plants and animals in a habitat depend on each other for food and shelter etc. • The way that animals obtain their food from plants and other animals can be shown in a food chain. • Animals, including humans, have offspring which grow into adults.
3 (Plants)	• The life cycle of flowering plants includes germination, pollination, seed formation and seed dispersal.
4 (Animals, including humans)	• Living things can be classified in different ways according to their features. • Classification keys can be used to identify and name living things. • A habitat provides animals, plants and other living things with food and shelter. • Each habitat has different conditions: amount of light, temperature and amount of moisture. • Environments can change with seasons and living things may change their behaviour in different seasons. • Humans can cause environments to change in a positive and negative way. • Living things can be classified as producers, predators and prey according to their place in the food chain.
5	• Plants reproduce both sexually and asexually (only one parent involved). • Sexual plant reproduction occurs through pollination – pollen is transferred from the stamen to the stigma. • Seeds are formed during sexual plant reproduction and dispersed by animals and the wind. • Most animals reproduce sexually - the sperm from the male fertilises the female egg. • Some young undergo metamorphosis before becoming adults. • Most mammals give birth to live young but most amphibians, insects and birds lay eggs that hatch to young.
6 (Evolution and inheritance)	• Living things can be classified into broad groups according to their characteristics – plants, animals and microorganisms. • Plants can make their own food whereas animals cannot. • Plants can be divided broadly into two main groups: flowering plants and non-flowering plants.

	• Animals can be divided into two main groups: vertebrates and invertebrates. • Vertebrates can be divided into five small groups: fish, amphibians, reptiles, birds and mammals and each group has common characteristics. • Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. • All living things have offspring of the same kind, as they inherit features from their parents. • Due to sexual reproduction, offspring are not identical to their parents and vary from each other. • Plants and animals have characteristics that make them suited to their environment. • Changes in the environment can affect the survival of some variations of species. • Over time, characteristics may become so different that a new species is created – evolution.
KS3	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. • Differences between species.

Animals, including humans – knowledge progression

Year Group	Key knowledge
1	• Key features (such as wings, scales etc.) help us to identify animals. • Animals eat certain things - some eat other animals, some eat plants, some eat both plants and animals. • Humans have key parts in common, but these vary from person to person. • Humans (and other animals) find out about the world using their senses. • Humans have five senses – sight, touch, taste, hearing and smelling. • The senses are linked to particular parts of the body.
2 (Living things and their habitats)	• Animals, including humans, have offspring which grow into adults. • All animals, including humans, have the basic needs of feeding, drinking and breathing that must be satisfied in order to survive. • To grow into healthy adults, they also need the right amounts and types of food and exercise. • Good hygiene is also important in preventing infections and illnesses. • The way that animals obtain their food from plants and other animals can be shown in a food chain.
3	• Animals unlike plants, which can make their own food, need to eat in order to get the nutrients they need. • Food contains a range of different nutrients that are needed by the body to stay healthy – carbohydrates including sugars, protein, vitamins, minerals, fibre, fat, sugars and water. • A piece of food will often provide a range of nutrients. • Humans and some other animals have skeletons and muscles, which help them move and provide protection and support.
4	• Digestion starts when the teeth start to break the food down. • Saliva and the tongue help to roll the food into a ball so it can be swallowed. • The oesophagus transports the food to the stomach, where churning & chemicals break it down further. • The small intestine removes nutrients from the food to be used elsewhere in the body. • The large intestine removes water from the food to be used elsewhere in the body. • The rectum stores the food that is left until it leaves the body through the anus. • Humans have four types of teeth - incisors for cutting, canines for tearing, molars and premolars for grinding (chewing). • Living things can be classified as producers, predators and prey according to their place in the food chain.
5 (Living things and their habitats)	• There are 6 stages in the human life cycle: foetus, baby, childhood, adolescence, adulthood and old age. • It takes 40 weeks for a foetus to develop in the womb and it is completely dependent on the mother. • The height and weight of a baby changes rapidly. • As children progress through childhood, they learn new skills which make them less dependent on their parents. • Adolescents go through many new changes to their bodies, and these changes are known as puberty.

	• As people get older, their immune system and bones become weaker, their hearing and eyesight decline and their hair and skin ages. • Plants reproduce both sexually and asexually (only one parent involved). • Sexual plant reproduction occurs through pollination – pollen is transferred from the stamen to the stigma. • Seeds are formed during sexual plant reproduction and dispersed by animals and the wind. • Most animals reproduce sexually - the sperm from the male fertilises the female egg. • Some young undergo metamorphosis before becoming adults. • Most mammals give birth to live young but most amphibians, insects and birds lay eggs that hatch to young.
6 (Living things and their habitats)	• The three main parts of the circulatory system are the heart, blood vessels and blood. • The heart is a strong muscle which contracts and relaxes to pump blood around the body. • Arteries, veins and capillaries are blood vessels which carry blood around the body. • Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body. • Red blood cells transport oxygen, white blood cells protect against disease, platelets help the blood clot to form scabs and plasma carries the cells and nutrients around the body. • Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. • Living things can be classified into broad groups according to their characteristics – plants, animals and microorganisms. • Animals can be divided into two main groups: vertebrates and invertebrates. • Vertebrates can be divided into five small groups: fish, amphibians, reptiles, birds and mammals and each group has common characteristics. • Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms.
KS3	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. • The structure and functions of the gas exchange system in humans, including adaptations to function. • The mechanism of breathing to move air in and out of the lungs. • The impact of exercise, asthma and smoking on the human gas exchange system.

Evolution and inheritance – knowledge progression

Year Group	Key knowledge
1	N/A
2 (Living things and their habitats & Animals, including humans)	• Animals and plants live in a habitat to which they are suited. • The habitat provides the basic needs of the animals and plants – shelter, food and water. • Within a habitat there are different micro-habitats which have different conditions and affect which plants and animals live there. • The plants and animals in a habitat depend on each other for food and shelter etc. • Animals, including humans, have offspring which grow into adults.
3 (Rocks & Plants)	• Fossils are compressed layers of sedimentary rock, formed when plants or animals die. • The life cycle of flowering plants includes germination, pollination, seed formation and seed dispersal.
4 (Living things and their habitats)	• Environments can change with seasons and living things may change their behaviour in different seasons. • Humans can cause environments to change in a positive and negative way.
5 (Living things and their habitats)	• Plants reproduce both sexually and asexually (only one parent involved). • Sexual plant reproduction occurs through pollination – pollen is transferred from the stamen to the stigma. • Seeds are formed during sexual plant reproduction and dispersed by animals and the wind. • Most animals reproduce sexually - the sperm from the male fertilises the female egg.
6	• All living things have offspring of the same kind, as they inherit features from their parents. • Due to sexual reproduction, offspring are not identical to their parents and vary from each other. • Plants and animals have characteristics that make them suited to their environment. • Changes in the environment can affect the survival of some variations of species. • Over time, characteristics may become so different that a new species is created – evolution. • Fossils give evidence of what lived on the Earth millions of years ago and support the theory of evolution. • Darwin and Wallace observed how species adapt to different environments to become distinct varieties with their own characteristics.
KS3	• Heredity as the process by which genetic information is transmitted from one generation to the next. • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction.

Materials – knowledge progression

Year Group	Key knowledge
1	• All objects are made of one or more materials. • Some objects can be made from different materials: wood, plastic, glass, metal or rock. • Materials can be described by their properties e.g. shiny, stretchy, rough etc.
2	• All objects are made of one or more materials. • A material can be suitable for different purposes and an object can be made of different materials. • Objects made of some materials can be changed in shape by bending, stretching, squashing and twisting.
3 **(Rocks & Forces and magnets)**	• Rocks are a natural material that can be different shapes and sizes. • Rocks can be hard or soft, have different sizes of grain/crystal and may absorb water. • There are different types of rock, which have different properties. • Fossils are compressed layers of sedimentary rock, formed when plants or animals die. • A magnet attracts the magnetic materials iron and nickel and other materials containing these e.g. stainless steel.
4	• A solid keeps its shape and has a fixed volume. • A liquid can be poured, has a fixed volume but changes in shape. • A gas fills all available space so has no fixed shape or volume. • Melting is a state change from solid to liquid. • Freezing is a state change from liquid to solid and water freezes at 0^{o}C. • Boiling is a change of state from liquid to gas and water boils when heated to 100^{o}C. • Evaporation is a state change from liquid to gas caused by heating. • Condensation is the change back from a gas to a liquid caused by cooling. • Water cycle - water evaporates into the air, water vapour condenses into clouds, water falls as precipitation and water returns to the sea. • The rate of evaporation increases as the temperature rises.
5	• Materials have different properties: hardness, transparency, electrical and thermal conductivity and attraction to magnets. • Thermal insulators do not allow heat to pass through them easily. • Some materials dissolve in liquid and form a solution; others do not dissolve and form a sediment. • Some materials can be separated from a liquid by sieving or filtering others can only be separated by evaporation. • Melting, freezing, boiling, evaporating and condensing are all changes of state that are reversible. • When new materials are formed, the change is usually irreversible e.g. burning and acid on bicarbonate of soda.
6	N/A
KS3	• Chemical reactions as the rearrangement of atoms. • Representing chemical reactions using formulae and using equations. • Combustion, thermal decomposition, oxidation and displacement reactions. • Defining acids and alkalis in terms of neutralisation reactions. • The pH scale for measuring acidity/alkalinity; and indicators

Rocks – knowledge progression

Year Group	Key knowledge
1 (Materials)	• All objects are made of one or more materials. • Some objects can be made from different materials: wood, plastic, glass, metal or rock. • Materials can be described by their properties e.g. shiny, stretchy, rough etc.
2 (Materials)	• All objects are made of one or more materials. • A material can be suitable for different purposes and an object can be made of different materials.
3	• Rocks are a natural material that can be different shapes and sizes. • Rocks can be hard or soft, have different sizes of grain/crystal and may absorb water. • There are different types of rock, which have different properties. • Soils are made from rock and organic matter. • The type of rock, size of rock and the amount of organic matter affect the soil. • Fossils are compressed layers of sedimentary rock, formed when plants or animals die.
4	N/A
5	N/A
6 (Evolution & inheritance)	• Over time, characteristics may become so different that a new species is created – evolution. • Fossils give evidence of what lived on the Earth millions of years ago and support the theory of evolution.
KS3	• The composition of the Earth. • The structure of the Earth. • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks.

Light – knowledge progression

Year Group	Key knowledge
1 (Animals, including humans & Materials)	• Humans have five senses – sight, touch, taste, hearing and smelling. • The senses are linked to particular parts of the body. • Materials can be described by their properties e.g. shiny, stretchy, rough etc.
2	N/A
3	• We need light to be able to see things. Darkness is caused by the absence of light. • When light hits an object, it is reflected. If the reflected light hits your eyes, you can see the object. • Some surfaces and materials reflect light better than others. The surfaces that reflect light best are smooth, shiny and flat. • The pupils control the amount of light entering the eyes. If too much light enters, then it can damage the retina. • Shadow is larger when an object is closer to the light source. This is because it blocks more of the light. • Shadows form when the light from a light source is blocked by an opaque object.
4	N/A
5 (Properties and changes of materials)	• Materials have different properties: hardness, transparency, electrical and thermal conductivity and attraction to magnets.
6	• Light appears to travel in straight lines and we see objects when light from them goes into our eyes. • The light may come directly from light sources but for other objects some light must be reflected from the object into our eyes for the object to be seen. • Objects that block light (are not fully transparent) will cause shadows. • Because light travels in straight lines, the shape of the shadow will be the same as the outline shape of the object. • The size of the shadow is larger when the light source and object move closer to each other as more of the light is blocked.
KS3	• The similarities and differences between light waves and waves in matter. • Light waves travelling through a vacuum; speed of light. • The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. • Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. • Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

Forces – knowledge progression

Year Group	Key knowledge
1	N/A
2 (Materials)	• Objects made of some materials can be changed in shape by bending, stretching, squashing and twisting.
3	• A force is a push or a pull. • When an object moves on a surface, the texture of the surface and the object affect how it moves. • A magnet attracts the magnetic materials iron and nickel and other materials containing these e.g. stainless steel. • The strongest parts of a magnet are the two poles which are called the North Pole and South Pole. • If two like poles are brought together, they will push away from each other – repel. • If two unlike poles are brought together, they will pull together – attract. • For some forces to act there must be contact e.g. a hand opening a door. • Some forces can act at a distance e.g. magnetism.
4	N/A
5	• A force causes an object to start moving, stop moving, speed up, slow down or change direction. • Everything is pulled to the Earth by gravity, which causes unsupported objects to fall. • Friction slows a moving object down by acting in the opposite direction. • Air resistance is a force that slows an object down as it moves through the air. • Water resistance is a force that slows down objects moving through water. • Pulleys, levers and gears are mechanisms that allow a small force to have a greater effect.
6	N/A
KS3	• Magnetic fields by plotting with compass, representation by field lines. • Earth's magnetism, compass and navigation. • Forces as pushes or pulls, arising from the interaction between two objects. • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. • Moment as the turning effect of a force. • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. • Forces measured in Newtons, measurements of stretch or compression as force is changed.

Sound – knowledge progression

Year Group	Key knowledge
1 (Animals, including humans)	• Humans have five senses – sight, touch, taste, hearing and smelling. • The senses are linked to particular parts of the body.
2	N/A
3	N/A
4	• A sound source vibrates to produce sound waves which travel through a medium from the source to our ears. • Sound waves cause parts of our body inside our ears to vibrate, allowing us to hear the sound. • Different mediums can carry sound but sound cannot travel through a vacuum. • Smaller objects usually produce higher pitched sounds. • Bigger vibrations cause louder sounds. • Sound gets fainter as the distance from the sound source is increased.
5	N/A
6	N/A
KS3	• Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. • Sound needs a medium to travel, the speed of sound in air, in water, in solids. • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • Auditory range of humans and animals. • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. • Waves transferring information for conversion to electrical signals by microphone.

Electricity – knowledge progression

Year Group	Key knowledge
1	N/A
2	N/A
3	N/A
4	• Many household devices and appliances run on electricity. • Some devices and appliances plug in to the mains and others run on batteries. • An electrical circuit consists of a cell or battery connected to a component using wires. • If there is a break in the circuit, a loose connection or a short circuit, the component will not work. • A switch can be added to the circuit to turn the component on and off. • Metals are good conductors so they can be used as wires in a circuit. • Non-metallic solids are insulators except for graphite (pencil lead). • Water, if not completely pure, also conducts electricity.
5	N/A
6	• Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer louder. • Using a battery with a higher voltage can also make a bulb brighter, a motor spin faster or a buzzer louder. • Adding more bulbs to a circuit will make each bulb less bright. • Using more motors makes each motor spin slower and using more buzzers makes each buzzer quieter. • Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. • The circuit symbols for a lamp, motor, buzzer, switch (opened and closed), cell, battery and wires.
KS3	• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. • Differences in resistance between conducting and insulating components (quantitative) • Static electricity.

Earth & space – knowledge progression

Year Group	Key knowledge
1 (Seasonal changes)	• The weather changes with the seasons. • In the UK, it is usually colder and rainier in winter, and hotter and dryer in the summer. • In the UK, the day length is longest at mid-summer and gets shorter each day until mid-winter before getting longer again.
2	N/A
3	N/A
4	N/A
5	• The sun is a star and it is at the centre of our solar system. • There are 8 planets – Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. • The planets travel around the sun in fixed orbits. • Earth takes 365 ¼ days to complete its orbit around the sun. • The earth rotates (spins) on its axis. • As it rotates, half faces the sun (here it is day) and half is facing away from the sun (night). • As the earth rotates, the sun appears to move across the sky. • The moon orbits the earth and it takes about 28 days to complete its orbit. • The sun, earth and moon are approximately spherical.
6	N/A
KS3	• Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). • Our Sun as a star, other stars in our galaxy, other galaxies. • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. • The light year as a unit of astronomical distance.