Science

Y6

- Living things and their habitats: classification of living things and reasons
- Electricty: identify and name parts of a circuit, varying components (D+T)
- Light: how light travels, reflection
- Animals including humans: human circulatory system, diet, exercise and drugs, water transportation
- Evolution and Inheritance: adaptation and evolution, parent offspring

Y5

- Properties and changing of materials: properties and classifying
- Forces: gravity, air resistance, friction, pulleys and gears
- Space: movement of the Earth and Moon, day and night (Geog link)
- Animals including humans: life cycles of humans,
- Living things and their habitats: life cycles of amphibian, bird, insect and mammal; process of reproduction

Y4

- Living things and their habitats: classification with keys, habitats, changing environments
- Animals including humans: teeth and digestive system, food chains.
- Electricity: simple circuits, switches, lamps, conductors, inductors (D+T)
- Sound: sources, how sound is made, pitch, volume
- States of Matter: grouping, heating and cooling, evaporation and condensation, The Water Cycle (Geog link)

Y3

- Light: sources of light, reflections and shadows
- Forces and magnets: how magnets attract and repel, objects and movement
- Rocks: physical properties and classification, fossils and soil
- Animals including humans: skeleton, nutrition and diet
- Plants: structure, life-cycle, water travelling and role of flowers

Y2

- Animals including Humans: basic needs, offspring, exercise and hygiene
- Plants: growth and needs
- Everyday materials and their uses: identify and compare how objects change
- Living things and their habitats: living, non-living things, habitats, food chains

Y1

- Animals including Humans: parts of the body, senses and classification
- Everyday materials: recognising, describing and classifying
- Plants: naming and identifying plants
- Seasonal Changes: seasons and the weather (Geog link)

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- The Natural World
- Physical Development
- PSED

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- PSED
- Physical Development
- The Natural World

Subject Rationale: Science

At Harpfield Primary Academy, we aim for the pupils to develop an enthusiasm for and enjoyment of science. We strive to develop their knowledge and understanding of important scientific ideas, processes and skills and encourage them to relate these to their everyday experiences (therefore developing cultural capital). Through teaching science as part of a broad and balanced curriculum, we aim to provide our pupils with the foundations to understand the world around them. They should be encouraged to be curious and ask questions about what they notice and observe and should be helped to develop their understanding of different types of scientific enquiry. In each unit of work, pupils will be given opportunities to work scientifically- questioning, fair testing, measuring, gathering and presenting data, recording, reporting and concluding. In addition, threaded throughout the curriculum, are scientific concepts such as: hypothesising, researching, analysing, connecting, comparing and curiosity. Investigation is an important aspect of the subject therefore the teaching and learning of science should be done through the use of first hand practical experiences where ever possible. Progression in science learning is clearly planned so that skills, knowledge and vocabulary develop sequentially throughout the school. The essential skills builder framework is woven into the existing Science curriculum to promote and develop life skills.

In the EYFS science is taught through the Early Years curriculum and therefore is a key part of Knowledge and Understanding of the World. It is also integral to many areas of daily exploration, learning and play. Alongside specific scientific knowledge and vocabulary, pupils will develop the concept of 'working scientifically' appropriate to their developmental stage.

Year 6	Living things and their habitats	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; know that broad groupings, such as micro-organisms, plants and animals can be subdivided; should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals); find out about significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.
	Animals inc. Humans	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; explore questions to understand how the circulatory system enables the body to function; learn how to keep their bodies healthy and how their bodies might be damaged - including how some drugs and other substances can be harmful to the human body; explore the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.
	Light	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; work scientifically by: deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works; look at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).
	Electricity	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; construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors; learn how to represent a simple circuit in a diagram using recognised symbols.
	Evolution and Inheritance	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; be introduced to the idea that characteristics are passed from parents to their offspring, i.e. different breeds of dogs, and what happens when, for example, labradors are crossed with poodles; appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer; find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.
	UKS2 Working Scientifically	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary; taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate; recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs; 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 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; explore and talk about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically; recognise that scientific ideas change and develop over time; draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings; pupils should read, spell and pronounce scientific vocabulary correctly**
Year 5	Living things and their 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; raise questions about their local environment throughout the year; find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall; find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.
	Animals inc.Humans	Describe the changes as humans develop to old age; draw a timeline to indicate stages in the growth and development of humans.
	Properties and 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; explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes; explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda.
	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; explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall; explore the effects of friction on movement and find out how it slows or stops moving objects; find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.
	Earth and Space	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; learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006); understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).
Year 4	Living things and their habitats	Recognise that living things (including those in the locality) 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.
	Animals inc. Humans	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
	States of Matter	Explore a variety of everyday materials and develop simple descriptions of the 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.
	Sound	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.
	Electricity	Identify common appliances that run on electricity; construct a simple series circuit, identifying/naming its basic parts, including cell, wire, bulb, switch and buzzer; use their circuits to create simple devices; draw the circuit as a pictorial representation (not necessarily using conventional circuit symbols; about precautions for working safely with electricity; identify whether or not a lamp will light in a simple series circuit; 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.
	LKS2 Working Scientifically	**Making decisions, 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 using notes and simple tables; 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,; using relevant scientific language, 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; patterns, similarities or changes related to simple scientific ideas and processes; using straightforward scientific evidence to answer questions or to support their findings; begin to look for naturally occurring patterns and relationships; recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations.**

Year 3	Plants	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; know that plants make their own food.
	Animals inc. Humans	Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; identify that humans and some animals have skeletons and muscles for support, protection and movement.
	Rocks	Compare and group together different kinds of rocks (including those in the locality) on the basis of 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.
	Light	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.
	Forces and Magnets	Compare how things move on different surfaces; notice that some forces need contact between two objects, but magnetic forces can act at a distance ; observe how magnets attract or repel each other and attract some materials and not others; compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials; describe magnets as having two poles; predict whether two magnets will attract or repel each other, depending on which poles are facing.
Year 2	Living things and their habitats	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; 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 ; understand a simple food chain, and identify and name different sources of food.
	Plants	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.
	Animals inc. Humans	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.
	Everyday materials and their uses	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.
	KS1 Working Scientifically	**Asking simple questions and recognising that they can be answered in different ways; observing closely, using simple equipment and measurement ; performing simple tests; identifying and classifying; using their observations and ideas to suggest answers to questions; gathering, recording and communicating data and findings to help in answering questions; use scientific language and read and spell age-appropriate scientific vocabulary; begin to notice patterns and relationships.**
Year 1	Plants	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.
	Animals inc.Humans	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.
	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.
	Seasonal Changes	Observe changes across the four seasons; observe and describe weather associated with the seasons and how day length varies.
Reception		**Reception: Understanding the World - The Natural World** Explore the natural world around them. (Forest, seasons/ weather, minibeasts. Names of trees; oak and acorn, conker and chestnuts linked to autumn) Describe what they see, hear and feel whilst outside. (Forest, senses) Recognise some environments that are different to the one in which they live. (Three Little Pigs) Understand the effect of changing seasons on the natural world around them. (Seasons, senses) **Reception: PSED Physical Development Managing Self** Know and talk about the different factors that support their overall health and wellbeing:- regular physical activity- healthy eating- toothbrushing- sensible amounts of 'screen time'- having a good sleep routine- being a safe pedestrian (food tasting; porridge, toast, chocolate) **ELG Understanding the World- The Natural World** Explore the natural world around them, making observations and drawing pictures of animals and plants. (beans; Jack and the Beanstalk, minibeasts) 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. (pets; vets roleplay, beach; Punch and Judy, farm; Little Red Hen) Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. (Seasons. Life cycle of a frog) **ELC: Personal, social and Emotional Development Managing Self** Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices. (ongoing)
Nursery		**Birth to 3 years: Understanding the World- The Natural World** Explore materials with different properties. (Big/small, soft/ hard, hot/cold- Goldilocks) Explore natural materials, indoors and outside. (Forest) Explore and respond to different natural phenomena in their setting and on trips. (Weather) **3-4 years: Understanding the World The Natural World** Use all their senses in hands-on exploration of natural materials. (Forest/ tuff spot activities) Explore collections of materials with similar and/or different properties. (Goldilocks. Metal-shiny/dull- Space, Three Little Pigs; wood/ straw/ bricks) Talk about what they see, using a wide vocabulary. (ongoing) Plant seeds and care for growing plants. (Sunflowers, potatoes) Understand the key features of the life cycle of a plant and an animal. (Life cycle of caterpillar- The Very Hungry Caterpillar. Life cycle of sunflower) Begin to understand the need to respect and care for the natural environment and all living things. (planter in outdoor area/ forest) Explore and talk about different forces they can feel. (magnets, capacity. Going on a Bear Hunt) Talk about the differences between materials and changes they notice. (melting, cooking- porridge for Goldilocks, bread for Little Red Hen alongside other baking over the year. Three Little Pigs- building) **3-4 years: Personal, social and Emotional Development Managing Self** Manage their own needs. (ongoing)

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 6	Evolution and Inheritance	1.To understand how living things have changed over time and how we know. 2.To know how life has evolved over time. 3.To know what DNA is and what it does. 4.To understand whether all offspring are identical to their parents. 5.Darwin and Wallace - what evidence did they share to argue the case for evolution? 6.Survival of the fittest - To know how animals have adapted and evolved to suit their environment.	1.Can they use evidence such as fossils to recognise how living things have changed over time? (observing, hypothesising). 2.Can they create a history of life on Earth? Can they investigate the evolution of plants by using the question 'Where did the first seed come from?'. (generating curiosity, research) 3.Can they write a short talk to explain what DNA is, how it can be used to alter plants and the advantages / disadvantages for this? (explaining, applying) 4.Can they give reasons why living things produce offspring of the same kind? Can they give reasons why offspring are not identical with each other or with their parents? (proving, applying) 5.Can they talk about the life of Charles Darwin and Alfred Wallace and use their evidence to prove the theory of evolution? (justifying, presenting, researching) 6.Can they recognise and question how animals are suited to their environment and how they might have evolved. (questioning, comparing).	Prior knowledge: vary, variation, reproduce, reproduction, descend, descendant, diverse, diversity, diversify. Tier 2: characteristic, adaptation, acquire, theory, modify, generation. Tier 3: evolve, survival, species, colne, inherit, fossil.
	Electricity (D+T link)	1a.To know electricity is and how it works. 1b.To know how to build and represent a series circuit. 2a.To know the components in a series circuit. 2b.To know how the number of cells and voltage affects components in a circuit. (Test it). 3.To know the effects and consequences of changing circuit components and batteries.	1.Can they identify and name the basic parts of a simple electric series circuit? (researching, justifying) 2.Can they compare and give reasons for variation in how components function eg number of batteries compared to bulb brightness or buzzer volume? (connecting, recording) 3.Can they explain how to make changes in a circuit? Can they explain the impact of changes in a circuit? Can they explain the effect of changing the voltage of a battery? (investigating, predicting, reasoning) Can they recognise the achievements of Thomas Edison, Nikola Tesla, Alessandro Volta?	Prior knowledge: circuit, circuitous, current, conduct, conductor, insulate, insulator, insulation. Tier 2: component, consequence, systematic, represent, source, generate. Tier 3: proton, neutron, electron, terminal, series, voltage.
	Animals inc. Humans 2	1.Remember: circulation (Y6) and digestion (Y4). To know how these two systems are connected. 2.To know where the kidneys are and what they do. 3.To know how the kidneys keep us healthy.	1.Can they identify and explain the function of the organs of the human circulatory system? (explaining) Can they identify and explain the function of the organs of the human digestive system? (connecting) 2.Can they recognise and explain the function of their kidneys. (generating curiosity, reasoning, identifying, applying) 3.Can they recognise how hydration and dehydration effect the human body? (handling data)	Prior knowledge: skeleton, muscles, digestion, nutrition, oxygen. Tier 2: cell, chamber, system, circulation, vessel, clot, Tier 3: plasma, platelet, artery, capillary, vein, ventricle.
	Animals inc. Humans 1	1.To know what blood is made of and why we need it. 2.To know why our bodies need nutrients and how they are transported. 3.To know what the circulatory system is. 4.To know what our heart is like inside and how it works. 5.To know who influenced what we know about our circulatory system. 6.To know how we can keep healthy: effect of exercise, drugs and lifestyle. (Test it)	1.Can they find out what bone marrow is, explain it's function and produce an annotated diagram? (researching, annotating, predicting). 3.Can they identify and explain the function of the organs of the human circulatory system? Heart, lungs, arteries, veins, capillaries. (proving, describing) 4a.Can they explain what the left and right side of the heart does? (explaining, reasoning). 4b.Can they recognise what happens to the pulse rate during and after exercise? (predicting, comparing). 5.Can they understand how the work of what Galen and William Harvey helped our understanding of the circulatory system and the heart today? (comparing) 6a.Can they recognise important factors in how to stay healthy? (interpreting, reasoning) 6b.Can they plan an investigation to terst the hypothesis 'Fruit juices have less sugar than fizzy (hypothesising, connecting, predicting).	Prior knowledge: skeleton, muscles, digestion, nutrition, oxygen. Tier 2: cell, chamber, system, circulation, vessel, clot. Tier 3: plasma, platelet, artery, capillary, vein, ventricle.

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 6	Evolution and Inheritance	1.To understand how living things have changed over time and how we know. 2.To know how life has evolved over time. 3.To know what DNA is and what it does. 4.To understand whether all offspring are identical to their parents. 5.Darwin and Wallace - what evidence did they share to argue the case for evolution? 6.Survival of the fittest - To know how animals have adapted and evolved to suit their environment.	1.Can they use evidence such as fossils to recognise how living things have changed over time? (observing, hypothesising). 2.Can they create a history of life on Earth? Can they investigate the evolution of plants by using the question 'Where did the first seed come from?'. (generating curiosity, research) 3.Can they write a short talk to explain what DNA is, how it can be used to alter plants and the advantages / disadvantages for this? (explaining, applying) 4.Can they give reasons why living things produce offspring of the same kind? Can they give reasons why offspring are not identical with each other or with their parents? (proving, applying) 5.Can they talk about the life of Charles Darwin and Alfred Wallace and use their evidence to prove the theory of evolution? (justifying, presenting, researching) 6.Can they recognise and question how animals are suited to their environment and how they might have evolved. (questioning, comparing).	Prior knowledge: vary, variation, reproduce, reproduction, descend, descendant, diverse, diversity, diversify. Tier 2: characteristic, adaptation, acquire, theory, modify, generation. Tier 3: evolve, survival, species, colne, inherit, fossil.
	Light	1.To know how light travels. 2.To know what colour light is made of. (Test it) 3.To understand reflection - how does light help us to see objects? (Test it) 4.To know which surfaces make the best reflectors. (Test it) 5.To understand why we see objects as a particular colour. 6.To understand what happens to the appearance of objects when placed in water?	1.Can they explain how light travels? (research, applying) 2.Can they explain how different colours of light can be created? (generating curiosity, research) 3.Can they explain what a reflection is and how the human eye sees objects? (proving) 4.Can they set up an experiment that has controlled variables and an independent variable? (predicting) 5.Can they explain what happens when they mix coloured filters? (research, investigate) 6.Can they explain how light creates an effect when an object is put in water? (observing, explaining, reasoning). Challenge- Can they use and explain how simple optical instruments work? (periscope, telescope, binoculars, mirror, magnifying glass, Newton's first reflecting telescope)	Prior knowledge: reflect, absence, presence, transparent, translucent, opaque, visible. Tier 2: impurity, emit, absorb, constituent, emit, artificial. Tier 3: refraction, incidence, spectrum, prism, lux, pigment.
	Living thing and their Habitats	1.To know who the scientist Carl Linnaeus was and what he did. 2.To know how we classify vertebrates. 3.To know how we classify invertebrates we know. 4.To know how we classify invertebrates we don't know. 5.To be able to classify animals and know what animals and plants exist in the local environment.	1.Can they understand of the work of Carl Linnaeus? 2.Can they recognise and group animals into vertebrates? (categorise, describe, sort, classify) 3.Can they group animals into and invertebrates? (categorise, describe, sort, classify) 4.Can they use a matrix to ask questions and organise decisions? (questions, classify) 5.Can they explain the classification of living things from the local environment into broad groups based on common observable characteristics? Challenge - Can they sub divide their original groupings and explain their divisions?	Prior knowledge: environment, vertebrate, invertebrate, interdependence, eco-system. Tier 2: characteristic, interdependence, specific, categorise, primitive, hierarchy. Tier 3: fungus, arthropod, taxonomy, kingdom, phylum, genus.

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 5	Properties of Materials	1.To know what properties materials have and understand how we use them. 2a.To know what a solution is. 2b.To know what a mixture is, 3.To know how we can separate materials from a mixture. (Test it) 4.To know how can we separate materials from a solution. (Test it) 5.To know what changes are reversible. 6.To what changes are irreversible.	1.Can they show what they know about the properties of different materials? Can they give reasons for the uses of everyday materials based on scientific evidence? (comparing) Can they test and group materials based on scientific evidence? hardness, solubility, transparency, conductivity, insulation, magnetism. (data handling) 2a.Can they explain the process of dissolving? Can they explain what a solution is? 2b.Can they explain what a mixture is? Can they describe changes using scientific words? (eg evaporation, condensation) 3.Can they decide how a mixture would best be separated? filtering, sieving, evaporating (investigating, recording and presenting) 4.Can they recover a substance from a solution? (investigating, data handling) 5.Can they use the term 'reversible'? Can they describe what it means to reverse a change? Can they describe which changes can be reversed? (justifying, applying) 6. Can they use the term 'irreversible'? Can they describe which changes cannot be reversed? (applying, generating curiosity)	Prior knowledge: solids, liquids, gases, transparent, transparency, translucent, thermal, magnetism. Tier 2: property, particle, separate, combine, recover, comparative. Tier 3: atom, molecule, chemical (changes), physical (changes), reversible, reaction.
	Earth and Space (Geog link)	1.To know the names of the planets in our solar system. 2 + 3.To know how our view of the moon changes in a lunar month. 4.To know why the rotation of the Earth results in night and day. (Test it) 5.To know why the Earth's tilt (axis) is responsible for the seasons. 6.To know how to retrieve, explain and present information. To know the work of some space pioneers (Galileo, Copernicus, Neil Armstrong)	1.Can they name the planets in our solar system? Can they identify and explain the movement of the Earth relative to the sun? 2.Can they identify and explain the movement of the Moon relative to the Earth? (creating) 3.Can they explain the size, shape and position of moon? (observing, researching,) 4.Can they explain how night and day are created and use diagrams to show this? (interpreting) Can they create shadow clocks? 5.Can they explain how seasons and the associated weather is created? (researching) 6.Can they present their findings from their research of NASA data? (analysing data). Can they explore the work of some space pioneers? (Galileo, Copernicus, Neil Armstrong)	Prior knowledge: clockwise, anticlockwise, hemisphere, equinox. Tier 2: luminous, phenomenon, attraction, approximately, relative, apparent. Tier 3: orbit, axis, crescent, gravitational, waxing, waning.
	Forces	To know what gravity is. To know about the work of Isaac Newton. 1.To understand what friction is and when it is helpful and when it is not. (Test it) 2.To know the effects of air resistance. (Test it) 3.To know the effects to water resistance. (Test it) 4.To know what a lever is and how they help us, 5.To know what pulleys and gears are and how they help us. 6.To know who Galileo Galilei is.	Can they explain what gravity is and its impact on our lives? (Isaac Newton) 1.Can they explain the impact of friction on a moving object? 2.Can they investigate the effect of air resistance? (interpreting) 3.Can they work out how water can cause resistance to moving and floating objects? (investigating, reasoning) 4 + 5.Can they explain how force and motion can be transferred through gears, pulleys, levers and springs? (predicting, measuring, describing, researching) 6.Can they present information about Galileo Galilei? (creating)	Prior knowledge: force, magnetism, attract, repel, friction, resistance. Tier 2: opposite, reaction, advantage, displace, weight, mass. Tier 3: pulley, gear, pivot, fulcrum, lever, upthrust.
	Animals inc. Humans	1.To know the human timeline. 2.To know how we change into adults. 3.To know how human and animal lifespans compare.	1.Can they create a timeline to indicate stages of growth in humans? (observing, comparing) 2.Can they recogniser the changes from childhood into adulthood? (grouping, applying) 3.Can they research human and animal lifespans? (generating curiosity, concluding)	Prior knowledge: chronology, chronological, multiply. Tier 2: development, diverse, unique, generation, mature, equipped. Tier 3: adolescence, puberty, gestation, embryo, foetus, womb.

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 5	Living things and their habitats	1.To know the difference between a mammal and amphibian. (life cycles) 2.To know the difference between an insect and a bird. (life cycles) 3.To know the difference between the life cycles of a mammal, amphibian, bird and insect. 4.To know who Maria Merion was and what she did. 5.To know how living things reproduce. 6.To know the process of reproduction in plants and animals. To know about the work of well known naturalists - David Attenborough and Jane Goodall.	1.Can they explain the difference between a mammal and a bird? (compare, contrast) 2.Can they explain the difference between an insect and a bird? (compare, contrast) 3.Can they describe and compare the life cycles of a range of animals, including humans, amphibians, insects and birds? (categorise, compare, contrast) 4.Can they talk about the work of Maria Merion? (researching, presenting) 5.Can they describe the life cycles of common plants? (explaining) 6.Can they observe their local environment and draw conclusions about lifecycles? For example, the vegetable garden or plants in a shrubbery. (observing, recording) Can they compare the life cycles of plants and animals in their local environment with the life cycles of those around the world, e.g. rainforests? (applying, generating curiosity) Can they explore the work of well know naturalists, David Attenborough and Jane Goodall? (generating curiosity)	Prior knowledge: pupa, larva, reproduction, pollinate, pollination. Tier 2: deduce, process, re-form, transform, adolescence, contrast. Tier 3:embryo, sexual, metamorphosis, incubate, biochemical, fertilisation.

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 4	Living things and their habitats	1.To know the characteristics of living things. 2.To know which animals are vertebrates. 3.To know which animals are invertebrates. 4.To know the groups that plants are classified in. 5.To understand what classification is and how to use a key. 6.To know what happens if the environment in a habitat changes.	1.Can they use a classify a variety of living things? (observing) 2.Can they recognise which animal are vertebrates? (categorise and compare) 3.Can they say why some animals are classified as invertebrates? (categorising and proving) 4.Can they classify and compare flowering and non-flowering plants? (questioning and applying) 5.Can they use a classification key? (deciding and evaluating) 6.Do they recognise that environments can change and this can sometimes pose a danger to living things? (generating curiosity, describing, reasoning).	Prior knowledge: habitat, micro-habitat, depend, organism, reproduction. Tier 2: classification, environment, interdependence, interact, beneficial, hierarchy. Tier 3: vertebrate, invertebrate, biotic, ecosystem, species, niche.
	Electricity (D+T link)	1.To know what appliances use electricity. To know what sort of power makes them work. To know how we can be safe with electricity. 2.To know the components in a simple series circuit. To know and explain what a switch does. 3.To know the effects of changing circuit components and batteries. (Test it)	1.Can they explain how electricity is useful to us? Can they recognise the safety points concerning electricity? (creating and applying) 2.Can they construct a simple circuit? (recording) Can they explain what a conductor is and test materials for conductivity? (hypothesising) Can they construct a circuit with a switch? (applying) 3.Can they investigate the effect of adding more or fewer batteries in a circuit? Can they investigate the effect of adding more or fewer bulbs / motors in a circuit? Can they recognise the independent variable and the dependent variable? (hypothesising, deciding, evaluating)	Prior knowledge: perimeter, complete, completion, recharge. Tier 2: associate, identify, portable, effect, appliance, series. Tier 3: component, electrical insulator, electrical conductor, circuit, hypothesis, variable.
	Animals including Humans	1.To know the different types of teeth humans have. 2.To know how the mouth and teeth help with digestion. 3.To know if teeth can tell us what animals eat. 4.To know the parts of the digestive system. 5.To know how the digestive system works. 6.To know what a food chain is. To be able to construct a food chain. To know how teeth, digestion and food chains are connected.	1.Can they identify the simple function of different types of human teeth? (identifying) 2.Can they recognise the role of the mouth and teeth as part of the digestive system? (explaining) 3.Can they recognise the function of different teeth of herbivores and carnivores? (comparing, reasoning, researching) 4.Can they identify and name the basic parts of the human digestive system? (researching, presenting) 5.Can they describe the function of the organs of the human digestive system? (explaining) 6.Can they create and explain what a simple food chain shows? Can they recognise the effect on the chain if one aspect is altered? (hypothesising and applying)	Prior knowledge: skull, skeleton, carbohydrate, vitamins, proteins, absorbs. Tier 2: expel, compact, digestion, acid, stomach, intestines. Tier 3: incisor, canine, molar, enzyme, saliva, peristalsis (squeezing action of intestines).
	Sound	1.To know what sound is. 2.To know how sound travels. 3.To know what pitch and loudness of a sound is. (Test it)	1.Can they compare sources of sound and explain how the sounds are made? (explain and applying) 2.Can they describe and explain how a sound travels from a source to our ears? (research and presenting) Can they explain what happens to sound as it travels away from its source? (applying) 3.Can they explain how you could change the pitch of a sound? (hypothesising and presenting) Can they investigate how different materials can affect the pitch and volume of sounds? Soundproofing.	Prior knowledge: particle, matter, solid, liquid, gas, energy. Tier 2: produce, property, source, frequent, regular, affect. Tier 3: vibrate, pitch, volume, medium, vacuum, sound wave.
	States of matter (Geog link)	1.To know what 'matter' is. To know what 'state' means. 2.To know what solids, liquids and gases are. 3.To know how materials change state: (Test it) a) melting b) evaporating c) condensing. 4.To have a clear understanding of how materials change their state of matter.	1.Can they explain the terms 'matter' and 'state'? (explaining and research) 2.Can they compare and group materials based on their states of matter, ie, liquid, solid or gas? (categorising) 3.Can they explain what happens to materials when they are heated or cooled? (explaining) Can they measure the temperature at which different materials change state? (measuring and handling data) Can they use measurements to explain changes to the state of water? (measuring) Can they explain the part that evaporation and condensation has in the water cycle? (applying) 4.Can they explain what happens over time to materials such as puddles on the playground or washing hanging on a line? (explaining and applying)	Prior knowledge: heat, cool, temperature, change, freeze, compare, materials, properties. Tier 2: permanent, particle, liquid, solid, liquid, gas, vapour. Tier 3: evaporate, condense, melt, matter, state, volume.

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 3	Light	1.To know if we need light to see things. 2.To know how shadows are formed. 3.To know what happens to the size of a shadow when the object moves closer to, or away from, the light source. (Test it)	1.Can they test a hypothesis about light card reflecting more light than dark card? (investigating) 2.Can they investigate how a shadow changes size during a day? (estimating and measuring) 3.Can they describe where the light source should be positioned? (deducing)	Prior knowledge: light, materials, opaque, shiny. Tier 2: absence, cast (shadow), impenetrable, reflect, shadow, source. Tier 3: constant, dependent, independent, illuminate, translucent, variable.
	Forces and Magnets	1.To know what a contact force is. 2.To know how surfaces affect the motion of an object. 3.To know how friction affects moving objects. (Test it) 4.To know what a non-contact force is and how this is different to a contact force. 5.To know how magnets attract and repel. 6. To know which materials are magnetic. (Test it)	1.Can they categorise and say the effect a contact force can have on a ball? (sorting and observing) 2.Can they show how surfaces affect the resistance of an object's movement? Friction. (predicting, handling data, connecting) 3.Can they use a newton metre in an investigation? (suggesting) 4.Can they explain what a non-contact force is? Can they ask questions based on a graph? (handling data). 5.Can they say how magnets attract and repel objects? Can they say how magnets are used in the world today? (research and applying) 6.Can they investigate which materials are magnetic and whether magnetic force can travel through water? (presenting and generating curiosity)	Prior knowledge: materials, properties, physical, metal. Tier 2: consequence, contact, force, attract, north, south. Tier 3: magnet, resistance, friction, repel. pole, magnetic field.
	Animals including humans	1.To know the effects of what we eat on our bodies. 2.To know where the skeleton is and what it does. 3.To know where muscles are and what they do.	1.Can they explain the effect of eating different types of food on the human body? (research) 2.Can they recognise where the skeleton is and what it does? (comparing and generating curiosity) Can they design a structure to protect an object (eg an egg shell) if it were dropped? How does this compare to the role that the rib cage has? 3.Can they explain where muscles are and what they do? (exploring and questioning) Can they explain how to safely exercise muscles eg arm curl and they effect that this will have? (explaining)	Prior knowledge: vertebrates, invertebrates, flexible, muscle, heart, absorb. Tier 2: minerals, skeleton, skull, voluntary, involuntary, nerves. Tier 3: biceps, triceps, vertebrae, vitamins, proteins, carbohydrates.
	Plants	1.To know the parts of a flowering plant and their purpose. 2.To know whether all plants need the same thing to thrive and grow. 3.To know how leaves make food for the plant. 4.To know how water moves through a plant. (Test it) 5.To know what flowers do. 6.To know what pollination is.	1.Can they recognise the parts of a flowering plant? What do they do? (identifying) 2.Can they explain if all plants need the same conditions to thrive and grow? (comparing and deciding) 3.Can they explain how leaves make food for the plant? (explaining) 4.Can they show how water moves through a plant? (comparing and deducing) 5.What do flowers do? Can they investigate a pattern in sunflower petals? (connecting) 6.What is pollination? Can they find out why the number of bees is in decline? (research)	Prior Knowledge: thrive, absorb, stem, nutrients, perennial, germination. Tier 2: adapt, essential, glucose, transport, variety, vital. Tier 3: transpiration, stoma, pollination, stamen, pistil, photosynthesis.
	Rocks	1.To know how rocks are formed. (Test it) 2.To know different types of rocks. 3.To know if rocks can change. 4.To be able to test a rock to see if it is limestone or chalk. (Test it) 5.To know what soil is and what makes soil. 6.To know how fossils are formed. To find out about Mary Anning's discoveries.	1.Can they define how rocks are formed? (explaining) Can they test the hardness of rocks? 2.Can they recognise different types or rock? (categorising and grouping) 3.Can they explain if rocks can change? (describing) 4.To recognise the controlled variable, independent variable, dependent variable? (investigating) 5.Can they sieve and separate soil? (observing and analysing) 6.Can they observe and draw fossils? (applying)	Prior knowledge: materials, properties, physical. Tier 2: cemented, compacted, decay, prehistoric, soil, transform. Tier 3: fossil, igneous, magma, metamorphic, minerals, sedimentary, palaeontologist, Mary Anning

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 2	Animals inc. Humans	1.To be able to define an animal. (MRS GREN) 2.To know how animals change as they mature. 3To know how humans change as we mature. (Test it) 4.To know what all animals need to stay alive. 5.To know why we need exercise. 6.To know why we eat different types of food.	1.Can they describe what animals are and group them into vertebrates and invertebrate? (classifying) 2.Can they say how an animal changes as it grows older? life cycle of some living things e.g. chicken, butterfly. Can they find a place that would be good for a butterfly to lays it's eggs? (explaining) 3.Can they recognise how humans change as we mature? Are the tallest pupils in the class the oldest? (investigating) 4.Can they say that all animals need water, food and air to stay alive? (justifying, explaining) 5.Can they describe why exercise is important for humans? (predicting) 6.Can they plan a meal and explain why it is healthy? (explaining)	Prior knowledge: mammal, amphibian, reptile, carnivore, herbivore, omnivore. Tier 2: healthy, survive, exercise, heart, lungs, muscles. Tier 3; hygiene, lava, pupa, vertebrates, invertebrates, metamorphosis.
	Plants	1.To know how seeds germinate and what happens. (Test it) 2.To know what happens when bulb sprout. 3.To know what plants need to thrive and be healthy. 4.To know what can happen if plants don't get the things that they need. 5.Are the plants around school healthy or unhealthy? 6.How do seeds and bulbs grow? Show what you know.	1.Can they observe and draw seeds germinating over time? (generating curiosity, observing, recording) 2.Can they show what happens when a bulb sprouts? (suggesting, observing, concluding) 3.Can they recognise what plants need to grow, stay healthy and survive? (justifying) 4.Can they say what the effect on a plant is if it doesn't' get the things it needs to grow healthily? (annotating, comparing, applying) 5.Can they explore the school grounds to healthy and unhealthy plants? (exploring, suggesting, deciding) 6.Can they draw the cycle of a plant? (explaining)	Prior knowledge: bud, bunch, stem, branch, bark, seed, nutrients, respiration, reproduction, excretion, deciduous, evergreen. Tier 2: wither, dormant, mature, bulb, anchor, sustain. Tier 3: germination, perennial, carbon-dioxide, glucose, clone.
	Everyday materials and their uses	1.To know what materials are used for: 2a.To be able to categorise and compare wood, metal, plastic and glass. 2b.To be able to categorise and compare ceramics, rock, paper, card and fabric. 3.To know what happens when we squash, bend, twist or stretch a material. (Test it) 4.To know what's the right material for the job. 5.To know what's the most absorbent material. (Test it) 6.To know what 'waterproof' means. To know who invented waterproofing (Charles Macintosh).	1.Can they recognise the what different materials are used for? (identifying) 2.Can they show that the properties of materials are important for what they are used to make? (handling data) 3.Can they recognise how a material might change if it is squashed, bent, twisted or stretched? (comparing, observing) 4.Can they explain why an object is made from that materials? (identifying) 5.Can they show which material is the most absorbant?(observing, investigating) 6.Can they explain the term 'waterproof'? (investigating, researching)	Prior knowledge: materials, physical properties, flexible, transparent, waterproof, opaque, absorb. Tier 2: artificial, brittle, extracted, fabric, manufactured, natural. Tier 3: ceramic, durable, inflexible, reflective, rigid, translucent.
	Living things and their habitats	1.To know what is alive and what is not. 2.To understand what all living things have in common. (MRS GREN) 3.To know where plants and animals live. 4.To know what plants and animals live on our local environment. (Test it) 5.To know food chains are and how they are connected. 6.To know why plants and animals need each other.	1.Can they recognise the features of living things? (matching) Can they explain the differences between living and non living things? 2.Can they describe some of the life processes common to plants and animals, including humans? (answering questions) 3.Can they describe how plants and animals are suited to their habitat? (observations) 4.Can they ask questions and investigate the school environment for plants and animals? (questioning) 5.Can they explain what a food chain shows? Can something that has never been alive be in a food chain? (applying, questioning) 6.Can they use the correct vocabulary to describe a habitat where plants and animals live? (observing, an-	Prior knowledge: habitat, animal, plant, living. Tier 2: thrive depend, producer, consume, prey, predator. Tier 3: oxygen, nutrition, respiration, sensitivity, reproduction, excretion.

		Substantive knowledge (understanding)	Disciplinary knowledge (working scientifically)	Vocabulary
Year 1	Seasonal changes (Geog link)	1.To know what the four season are. 2.To know what the weather is like in Autumn, Winter, Spring and Summer. (Test it) 3.To know why day becomes night.	1.Can they name the four seasons? (questioning) 2.Can they collect and record data to make tables and charts about the weather in autumn, winter, spring and summer? (observing and investigating) 3.Can they make displays about what happens when day becomes night? (observations)	Prior knowledge: sun, rain, snow, cloud, day, night. Tier 2: dawn, dusk, mild, rotate, soaked, weather. Tier 3: month, season, spring, summer, autumn, winter.
	Everyday materials	1.To know what materials are. (MRS GREN) 2.To be able to identify what things are made of in school. 3.To be able to describe materials. 4.To know which materials are waterproof and which are not. (Test it) 5.To know which materials are transparent, and which are opaque. 6.To know which material is best for the job and why.	1.Can they recognise that a material is different to an object? (deciding, identifying) 2.Can they say what the objects around them are made of? (matching, classifying, handling data) 3.Can they used the correct vocabulary to describe materials? (deciding, classifying, grouping) 4.Can they recognise which materials are waterproof? (connecting, observing) 5.Can they use the terms 'transparent' and 'opaque' to describe materials? (grouping, observing) 6.Can they explain why a material might be useful for a specific job? (applying)	Prior knowledge: hard, soft, stretch, bend. Tier 2: absorb, rough, smooth, waterproof, metal, plastic. Tier 3: metals, properties, flexible, transparent, opaque, physical.
	Plants	1.To know the parts of a plant. 2.To know what wild plants are and where you find them. 3.To know what garden plants are and where you find them. 4.To know what makes a tree. 5.To be know that there are different types of tree. 6.To know the difference between trees (evergreen / deciduous).	1.Can they name the petals, stem leaf and root of a plant? (applying) 2.Can they name some wild plants and explain where to find them? (applying) 3.Can they recognise some common plants that could be found in a garden? (observing and predicting) Can they say whether a bulb or seed will grow into the tallest plant? (predicting) 4.Can they name the different parts of a tree? (general curiosity, connecting, observing applying). 5 Can they identify and name a range trees? (comparing, observing) 6.Can they say how an evergreen tree is different to a deciduous tree? (suggesting, applying)	Prior knowledge: plant, tree, fruit, flower, roots, leaf, garden, living, grow. Tier 2: bud, truck, branch, bark, seed, wild. Tier 3: nutrients, stem, deciduous, evergreen.
	Animals including humans	1.To know what an animal is. 2.To know what types of animals there are (mammal, bird) 3.To know what types of animals there are (amphibian, reptile, fish). 4.To know what is similar and different about the types of animals. 5.To understand what food tells us about an animal. 6.To know what makes humans an animal. To know what senses humans have. (Test it)	1.Can they point out some of the characteristics of an animal? (justifying) 2.Can they recognise and classify common animals? a) birds and mammals. (justifying) 3.Can they recognise and classify common animals? b) amphibians, reptiles, fish. (grouping, identifying, justifying) 4.Can they recognise similarities and differences between different animals? (matching, observation) 5.Can they show how they know an animal eats meat or plants? (observing, concluding) 6. Can they say why humans are animals? (explaining) Can they name the senses that humans have? (investigating)	Prior Knowledge: animal, human, living, plant. Tier 2: blood, senses, young, feathers, fur, scales. Tier 3: mammal, amphibian, reptile, herbivore, carnivore, omnivore.