Southbroom St James Academy

Southbroom St James Academy - Science Intent

What is Science? The intent.

Our science curriculum is designed to provide children with the ability to think independently and raise questions about working scientifically and the knowledge and skills that it brings. Our children will gain a confidence and competence in the full range of practical skills, taking the initiative in, for example, planning and carrying out scientific investigations. In turn showcasing their passion understanding and explaining the natural world. When investigating, their thinking is developed by a number of **big organising ideas and generalisations known as concepts**. These concepts form a unique framework of enquiry and shape the questions that Scientists investigate. There are three disciplines in Science, Biology, Chemistry and Physics and alongside these five second order concepts have been identified.

How will the curriculum be delivered? The implementation.

As per our teaching and learning policy, the approach taken with all subjects is to ensure that memory is strengthened at all opportunities. As Kirschner, Sweller and Clarke (2006) stated: "Learning is a change in the long-term memory. If nothing has been changed in the long-term memory, then nothing has been learned."In science, lessons and teaching follows a mastery approach as shown below. We work on the principle that all learners, with effort and excellent teaching, will meet expectations. Where possible and appropriate, links are made between scientific learning and our wider curriculum themes and Christian values, encouraging deeper thinking and reflection. Our drivers – resilience, creativity, independence and curiosity – are woven through this approach.

The exact knowledge to be learnt is set out for staff in detailed medium-term plans and for children via a knowledge organiser. Throughout their learning journey, children assess their own learning security through cumulative quizzing. This gives children a platform from which to orally rehearse prior learning and link to new knowledge. It also serves as means of self- and peer-quizzing to help ensure knowledge becomes embedded in long-term memory.

Curriculum Review (Impact):

To complement our pupil led knowledge organisers children will answer a 'BIG' question often in an essay-style response. To answer this question, knowledge from each lesson will need to be thought about. During assessment weeks, children will also complete a quiz. Scores from this are tracked throughout the year and used by teachers and leaders to focus future teaching and retrieval. Select questions from each historical unit studied throughout the year form part of a larger, end of year summative quiz. Because our curriculum serves as the progression model, the level of success in these quizzes shows the degree of impact. This will also be judged following pupil discussions by subject and curriculum leaders.

Concepts in Science

Scientists use four key concepts and these help to focus their understanding of their experience, a system of categorisation, and how they learn and uses these. Children are then able to build a schema of knowledge about key themes. Key concepts shape the overarching enquiry for the spine of learning.

Teaching Enquiries

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Years 3/4 A	**Physics** Forces Magnets	**Biology** Nutrition & Diet Food Waste	**Biology** Digestive System	**Biology** Food Chains Habitats Deforestation	**Physics** Electricity	**Chemistry** Rocks Soils Fossils
Year 3/4 B	**Chemistry** States of Matter	**Biology** Skeletons Movement	**Physics** Light	**Biology** Plants	**Biology** Group & Classify Living Things	**Physics** Sound
Year 5/6 A	**Biology** Animals Including Humans	**Biology** Circulatory System	**Biology** Diet, Drugs and Lifestyle Global Warming Plastic Pollution	**Physics** Properties of Materials	**Physics** Reversible and Irreversible Changes	**Biology** Life Cycles Reproduction
Year 5/6 B	**Physics** Forces	**Physics** Space	**Biology** Living Thing and Their Habitats	**Biology** Variations Adaptation	**Physics** Light Light Pollution	**Physics** Electricity Renewable Energy
← **Working Scientifically** →						

Key Concepts

Key concepts identify the content or focus areas of study.

	Biology	Chemistry	Physics	Working Scientifically
Content	Alive (Structure & Function) Thrive & Survive (Nutrition & Growth) Reproduction Diversity	Properties of Materials Changes Materials	Forces (Contact & non-contact) Energy	All areas

Second Order Concepts – shape the enquiry

Second order concepts define the questions that drive the investigations Scientists carry out. They can all be applied across the entire subject, and everyone is interconnected. The second order concepts used to share our enquiries are:

← Working Scientifically →			
Cause and Effect When something becomes different from its original form and the scientific reason behind it.	**Analysing** When anything repeats itself in a predictable way.	**Communication** When things are connected and have an effect on one another.	**Application** The way in which things can be similar or different.

Sequenced and Progressive

Through the careful consideration of the sequencing of the curriculum, ensuring that knowledge build on and grows from previous knowledge, the curriculum has become the progression model. The sequences of knowledge are exposed in the pathways for single and mixed age below. The rationale for these is summarised in the flow charts that follow. There had been careful consideration to the cohesion between the science and the maths curriculum to ensure that children are applying previously maths knowledge to the disciplinary skills.

Progression Tables – Substantive Knowledge

Biology Key Concept: Alive (structure) Organisms are organised on a cellular basis and have a finite life span	
• All organisms comprise one or more cells. • Multi-cellular organisms have cells that are differentiated according to their function.	• All the basic functions of life are the result of what happens inside the cells that make up an organism. • Growth is the result of multiple cell divisions.

National Curriculum	Plants Knowledge Progression	Animals Knowledge Progression	Plants and Animals Knowledge Progression	Essential Vocabulary	
Year 3 NC • identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • identify that humans and some other animals have skeletons and muscles for support, protection and movement	• Know that a stem/trunk provides support and transport water • Know that the leaf captures energy from the sun. • Know that flowers attract insects. •	• Know that humans and animals have skeletons to: ○ protect their vital organs ○ support the structure of their body ○ allow movement • Know that humans and animals have muscles which work in pairs to allow movement		• Transport • Support • Function • Energy • Store • Capture • Attract • Insects	• Skeleton • Protect • Organs • Structure • Muscles • Joint • Bones • Human
Year 4 NC					

National Curriculum	Plants Knowledge Progression	Animals Knowledge Progression	Plants and Animals Knowledge Progression	Essential Vocabulary	
Year 5 NC • describe the changes as humans develop to old age	•	• Know that babies are dependent upon an adult • Know that a toddler can move around their world. • Know that children grow rapidly • Know that adolescents experience puberty which enables them to reproduce • Know that adults are fully grown human • Know as humans age, their bodies begin to change		• Dependence • Toddler • Adolescent • Puberty • Ageing • Rapid	
Year 6 NC • identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • describe the ways in which nutrients and water are transported within animals, including humans. • 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 the function of the heart is to pump blood around the body. • Know that the function of the lungs is to bring oxygen into the body and excrete carbon dioxide • Know that carbon dioxide is waste product • Know that blood vessels transport the blood to all areas of the body. • Know that blood carries oxygen, CO2, water and nutrients. •	• Know the difference between a plant, micro-organisms and an animal • Know that a microorganism is a bacteria or a virus that can be helpful or harmful • Know the difference between flowering plants and non-flowering plants • Know the difference between vertebrates and invertebrates • Know the 5 classifications of vertebrates: mammals, bids, fish, amphibians and reptiles. • Know that invertebrates can be worms, insects and spiders • 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.	• Heart • Blood • Blood vessels • Arteries • Veins • Pump • Lungs • Oxygen • Carbon dioxide • Toxic / waste product • Nutrients • (Respiration)	• Micro-organism • Bacteria • Virus • Vertebrate • Invertebrate • Classification • Characteristics

Biology Key Concept: Survive and Thrive Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms	
• Food provides materials and energy for organisms to carry out the basic functions of life and to grow. • Green plants and some bacteria are able to use energy from the sun to generate complex food molecules.	• Animals obtain energy by breaking down complex food molecules and ultimately depend on green plants as their source of energy source. • In any ecosystem there is competition among species for the energy resources and materials they need to live and reproduce.

National Curriculum	Plants Knowledge Progression	Animals Knowledge Progression	Plants and Animals Knowledge Progression	Essential Vocabulary	
Year 3 NC • 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 • 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	• Know that plants need nutrients from the soil and room to grow • Know that different plants need different conditions • Know that water is transported in plants from the roots to the stem and excreted through the leaves.	• Know the role of carbohydrate, protein, fats and vegetables in maintaining a balanced of diet. • Know that nutrition provides the body with energy.		• Soil • Nutrients • Conditions • Transportation •	• Fats and oils • energy
Year 4 NC • describe the simple functions of the basic parts of the digestive system in humans • identify the different types of teeth in humans and their simple functions • recognise that environments can change and that this can sometimes pose dangers to living things • construct and interpret a variety of food chains, identifying producers, predators and prey	•	• Know that teeth break down food into small swallowable pieces. • Know the function of the molars is to grind food. • Know the function of the canines is to rip food • Know the function of the incisors is to cut food. • Know the oesophagus transports chewed food and liquid to the stomach • Know that the stomach breaks down the chewed food into a liquid • Know that the small intestine allows nutrients to be absorbed into the body. • Know that the function of the large intestine is to absorb water. • Know that the anus allows the body to store and excrete waste	• Know that a food chain starts with a producer • Know that a food chain includes predators who feed on prey. • Construct a food chains containing producers predators and prey • Know that environmental change can endanger living things in a habitat	• Molar • Grind • Canines • Rip • Incisors • Chew • Small intestine • Absorbed • Large intestine • anus	• producer • predator • pre • endanger • environment threat
Year 5 NC					
Year 6 NC • recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	•	• Know that an unbalanced diet leads to poor health • Know that exercise leads to greater well-being both physically and mentally • Know that some drugs can be harmful to the human body,		• Well being • Physical health • Emotional health • Drugs • Medicines	

Biology Key Concept: Reproduction Genetic information is passed down from one generation of organisms to another	
• Genetic information in a cell is held in the chemical DNA. • Genes determine the development and structure of organisms.	• In asexual reproduction all the genes in the offspring come from one parent. • In sexual reproduction half of the genes come from each parent.

National Curriculum	**Plants Knowledge Progression**	**Animals Knowledge Progression**	**Plants and Animals Knowledge Progression**	**Essential Vocabulary**	
Year 3 NC • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	• Know that plants mature and create flowers and seeds • Know that the flower attracts pollinators. • Know that pollinators carry pollen from one plant to another causing pollination to occur. • Know that a seed forms as a result of pollination • Know that seeds disperse by wind, explosion, animals and water. • Know that seeds disperse to find room to grow new plants. •			• Mature • Pollinators • Attract • Pollen	• Pollination • Disperse • Explosion • reproduce
Year 4 NC					
Year 5 NC • describe the life process of reproduction in some plants • 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 animals	• Know that plants that reproduce sexually need pollen from a male and female plant. • Know that asexual plants do not require male and female pollen and therefore do not have flowers. • Know that seeds germinate and grow into mature plants	• Know the life cycle of a mammal (human) • Know that mammals require sperm from a male to fertilise an ovary from a female. • Know that a fertilised egg grows in the female's uterus until the offspring is ready to be born. • Know that a bird's embryo is grown outside of the female within a protective egg, until it is ready to be hatched. • Know that an amphibian's embryo is laid as soft spawn in water until they are ready to hatch. • Know that amphibian offspring undergo metamorphosis into a mature adult. • Know that insects have four stages within their life cycles – egg lava, pupa and adult.		• Fertilisation • Fertilise • Male • Female • Germinate • Sperm • Ovary • gestation	• Uterus • Born • Fertilised • Embryo • Metamorphosis • Lava • pupa • Asexual reproduction • Sexual reproduction
Year 6 NC					

Biology Key Concept: Diversity

The diversity of organisms, living and extinct, is the result of evolution

- All life is directly descended from a universal common ancestor that was a simple one-celled organism.
- Over countless generations changes resulting from natural diversity within a species led to the selection of individuals best suited to survive under certain conditions
- Species not able to respond sufficiently to changes in their environment become extinct.

National Curriculum	Plants Knowledge Progression	Animals Knowledge Progression	Plants and Animals Knowledge Progression	Essential Vocabulary	
Year 3 NC					
Year 4 NC • recognise that living things can be grouped in a variety of ways • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment	• Classify plants in flowering and non-flowering plants	• Classify vertebrates into fish, amphibians, birds, fish and mammals • Classify non-vertebrates into insects, arachnids, molluscs. • Know invertebrates are animals which do not have a backbone, vertebrates do.	• Know that a classification key is a tool for identifying and grouping based on differences	• Classification • Classification key • Classify • Identify • vertebrates	• non-vertebrates • arachnids • molluscs • insects
Year 5 NC					
Year 6 NC • 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.		• Know that animal offspring are similar to, but not identical to their parents.	• Know that fossils are evidence of the plants and animals alive millions of years ago. • Know that characteristics are passed to offspring from their mother and father. • Know that animals and plants have characteristics that are suited to the habitat in which they live. • Know that overtime, animals and plants adapt to suit their environment. • Know that adaptations can be passed from offspring to offspring over many years. • Know that adaptations passed through many offspring result in permanent change which is called evolution.	• Fossils • Evidence • Characteristics • Adaption • Evolution • Inheritance • Breed • variation	

Chemistry Key Concept: Properties of Materials AND Changing Materials All matter in the Universe is made of very small particles.	
• Atoms are the building blocks of all matter, living and non-living. • The behaviour and arrangement of atoms explains the properties of different materials. •	• In chemical reactions atoms are rearranged to form new substances. • Each atom has a nucleus containing neutrons and protons, surrounded by electrons. • The opposite electric charges of protons and electrons attract each other, keeping atoms together and accounting for the formation of some compounds.

National Curriculum	Properties of Materials Knowledge Progression	Changing Materials Knowledge Progression	Essential New Vocabulary	
Year 3 NC • compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • describe in simple terms how fossils are formed when things that have lived are trapped within rock • recognise that soils are made from rocks and organic matter	• Know that rocks can be grouped based on what they look like and how they feel. • Know that different rocks have different properties. • Know that fossils are found in sedimentary rocks • Know that sedimentary rocks are formed of layers.	• Know that a fossil is the imprint of something that was once living (plants/animals) • Know that the fossil is the imprint of the hardest material in the living thing • Know that fossils are formed when things that have lived are trapped in layers of rock • Know that organic matter is the remains of something that was once living • When organic matter is squashed it forms a soil	• Rocks • Soils • Sedimentary • Layers • Fossils • Imprint • Organic matter	• Grains • Crystals
Year 4 NC • 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	• Know that materials are made from matter. • Matter is the building blocks of everything. • Know that the three states of matter are solids, liquid and gas. • Know that a solid is a substance that holds its shape. • Know that liquids form a pool not a pile. • Know that gas escape from an unsealed container.	• Know that temperature is a measure of the amount of heat (Celsius) • Know that some materials change state when they are heated or cooled • Know that melting is when a solid changes to a liquid and that freezing is when a liquid changes to a solid • Know that materials all have a melting and freezing point • Know that water freezes at 0 degrees and evaporates at 100 • Know that evaporation is when a liquid changes to a gas and that condensation is when a gas changes to a liquid • Know that the sun's thermal energy evaporates water from the earth's surface. • Know that the water held in clouds cools and condensates back to earth as rain / snow.	• Matter • States of matter • Solid • Liquid • Gas • Temperature • Celsius • Degrees • Melting / melt • Freezing /freeze	• Evaporating / evaporate • Thermal energy • Thermal • Condensation • Water-cycle

National Curriculum	Properties of Materials Knowledge Progression	Changing Materials Knowledge Progression	Essential New Vocabulary	
Year 5 NC • compare and group materials together, according to whether they are solids, liquids or gases • 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.	• Know that materials that do not easily change when forces are applied are hard. • Know that materials that allow heat in the form of thermal energy or electrical energy to flow through are conductors. • Know that materials that restrict the flow of energy are called insulators. • To know that some materials are magnetic. • To know that the greater the transparency of the material the more light it lets through. •	• Know that soluble materials (substance) are able to be dissolved in a liquid. • Know that a solution contains a liquid and a soluble material. • Know that you can recover a substance from a solution by evaporating off the liquid • Know that some changes are reversible • Know that some changes are irreversible as a new material is formed. • Know that burning a substance is an irreversible change • Know that mixtures can be separated in different ways, including filtering, sieving, and evaporating • Know that chemical changes which involve acids are irreversible	• Conductors • Insulators • Electrical • Thermal • Magnetic • Transparency • Soluble • Dissolve • Solution • Soluble • substance	• revisable • irreversible • burning • mixtures • sieving • filtering • acid • chemical change
Year 6 NC				

Physics Key Concept: Non-Contact Forces Objects can affect other objects at a distance	Physics Key Concept: Contact Forces Changing the movement of an object requires a net force to be acting on it
• All objects have an effect on other objects without being in contact with them. • In some cases the effect travels from the source to the receiver in the form of radiation (e.g. visible light). • In other cases, action at a distance is explained in terms of the existence of a field of influence between objects, such as a magnetic, electric or gravitational field. • Gravity is a universal force of attraction between all objects, however large or small. It keeps the planets in orbit around the sun and causes terrestrial objects to fall towards the centre of the earth.	• A force acting on an object is not seen directly but is detected by its effect on the object's motion or shape. • If an object is not moving, the forces acting on it are equal in size and opposite in direction, balancing each other. • Since gravity affects all objects on earth there is always another force opposing gravity when an object is at rest. • Unbalanced forces cause a change in movement in the direction of the net force. • When opposing forces acting on an object are not in the same line they cause the object to turn or twist. This effect is used in some simple machines

National Curriculum	Non- contact forces Knowledge Progression	Contact Forces Knowledge Progression	Essential New Vocabulary	
Year 3 NC • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having 2 poles • predict whether 2 magnets will attract or repel each other, depending on which poles are facing • notice that some forces need contact between 2 objects • compare how things move on different surfaces	• Know a force is active power • Know that magnetic forces can act at a distance • Know that magnets can attract and repel each other and that these are forces. • Know that some materials are attracted to magnets • Know that metals (except aluminium) are magnetic. • Know that magnets have a north and south pole. • Know that like poles repel and opposite poles attract.	• To know that things move further on smoother surfaces.	• Power • Force • Magnetic • Magnet • Attract • Repel •	• North / south poles
Year 4 NC				
Year 5 NC • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. • describe the 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.	• Know that gravity is an attractive force which causes unsupported objects fall to earth. • Know that sun is the centre of our solar system. • Know that the sun's gravitational force cause the planets to orbit it. • Know that the moon orbits the earth. • Know that the moon appears differently in the night sky at different points in its orbit. • Know that the time between two full moons is an orbit cycle. • Know that sun is a star. • Name the eight planets in the solar system. • Know that the sun, earth and moon are approximately spheres. • Know that earth spins on its axis. • Know that one spin is 24 hours • Know that this causes the surface of the earth to face towards the sun in the day time and away from the sun at night. • Know that the Earth rotation makes it appear as if the sun is moving across the sky.	• To know that friction is a force acting between two surfaces • To know that friction tries to slow things down or halt them. • To know that the same object will move differently on different surfaces. • To know that water resistance is the force acting between an object and body of water. • To know that air-resistance is the force acting between an object and a body of air.	• Gravity • Solar system • Orbit • Orbit cycle • Star • Axis • Rotation • Friction • Resistance • Accelerate • Decelerate •	
Year 6 NC				

Physics Key Concept: Energy

The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event

- Many processes or events involve changes and require an energy source to make them happen.
- Energy can be transferred from one body or group of bodies to another in various ways. In these processes some energy becomes less easy to use.
- Energy cannot be created or destroyed. Once energy has been released by burning a fossil fuel with oxygen, some of it is no longer available in a form that is as convenient to use.

National Curriculum	Energy Knowledge Progression		Essential New Vocabulary	
Year 3 NC • recognise that they need light in order to see things and that dark is the absence of light • notice that light is reflected from surfaces • recognise that light from the sun can be dangerous and that there are ways to protect their eyes • recognise that shadows are formed when the light from a light source is blocked by an opaque object • find patterns in the way that the size of shadows change	**Light** • Know that light is needed to see things • Know that dark is the absence of light. • Know that light reflected from surfaces. • Know that looking directly at the sun is dangerous. • Know that an opaque object blocks light. • Know that shadows are forms when light is blocked. • Know that translucent materials allow light through. • Know that the close an object to the light source the larger the shadow.		• Light • Dark • Reflection • Opaque • Shadow • Translucent • Absence	
Year 4 NC • identify how sounds are made, associating some of them with something vibrating • recognise that vibrations from sounds travel through a medium to the ear • find patterns between the pitch of a sound and features of the object that produced it • find patterns between the volume of a sound and the strength of the vibrations that produced it • recognise that sounds get fainter as the distance from the sound source increases • identify common appliances that run on electricity • construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • recognise some common conductors and insulators, and associate metals with being good conductors	**Sound** • To know that sound is a form of energy. • To know that sound occurs due to an object vibrating. • To know that the vibrations of sound travel through solids, liquids and gases to the ear. • To know that the speed of the vibrations changed the pitch. A high-speed vibration causes a higher pitch. • To know that strength of a vibrations causes a louder volume. • To know that a sound gets fainter as the distance from the sound source increases. •	**Electricity** • To know some common appliances that run on electricity. • To know the basic parts of a circuit: bulb, cells, switch wire buzzer. • To Know that a complete circuit is needed to power a component. • To know the impact of a complete and open circuit • To know that a switch completes and opens a circuit. • To know that electrical insulators do not allow electricity to flow through them. • To know that electrical conductors do allow electricity to flow through them. • To know that metal make good conductors. • To know that a series circuit contains elements in a single complete loop.	• Sound energy • Sound • Vibrations • Pitch • Volume • Frequency • Fainter • Louder • Series • Appliances	• Electricity • Bulb • Cell • Switch • Wire • Buzzer • Circuit • Power • Component • Insulator • conductor
Year 5 NC				

National Curriculum	Energy Knowledge Progression		Essential New Vocabulary	
Year 6 NC • recognise that light appears to travel in straight lines • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. • 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.	**Light** • To know that light appears to travel in straight lines • To know that light can travel directly to the eye. • To know that light can travels from a source to an object and then to the eye. • To know that light can be reflected into the eye. • To know that shadows are the same shape as objects as light travels in straight lines.	**Electricity** • To know that voltage is an electrical force. • To know that the more volts the brighter / louder the component. • To know that a cell is 1.5v • To know that a battery is multiple cells. • To know that in a circuit with a fixed voltage, the more components the quieter, dimmer the component. • To know the recognised circuit symbols for switch, cell, bulb, buzzer and switch.	• Source • Voltage • Battery • Components	

Progression Tables – Disciplinary Knowledge

Key Concept: Investigating Cause and Effect	Key Concept: Analysing
Science is about finding the cause or causes of phenomena in the natural world • Science is a search to explain and understand phenomena in the natural world. • There is no single scientific method for doing this; the diversity of natural phenomena requires a diversity of methods and instruments to generate and test scientific explanations. • Often an explanation derives from the factors that must be present for an event to take place, as shown by evidence from observations and experiments. • In other cases, supporting evidence is based on correlations revealed by patterns in systematic observation.	Scientific explanations, theories and models are those that best fit the evidence available at a particular time • A scientific theory or model representing relationships between variables of a natural phenomenon must fit the observations available at the time, and lead to predictions that can be tested. • Any theory or model is provisional and subject to revision in the light of new data, even though it may have led to predictions that accord with data in the past.

National Curriculum	Observing and measuring	Recording Data	Asking and exploring questions	Performing Tests	Concluding, prediction, evaluating
LKS2 NC • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions	• I know that I observe / measure the dependent variable. • I know that a dependent variable is the variable that is changing • I know that systematic observation is one that is controlled. • I know that temperature is measured in 0C using alcohol and digital thermometers. • I know that force is measures in N using a Newton meter • I know that sound is measure in decibels using dataloggers. *(KS1 Maths Curriculum)* • *I know that length in measured in m and cm using a ruler, tape measure* • *I know that capacity is measured in ml and L using measuring cylinders* • *I know that time is measured in mins and sec using a stopwatch*	• I know that the control variable builds the table • I know that the dependent variable data is organised in a table. • I know that the control variable builds the x axis • I know that the dependent variable data is organised on the y axis • I can label and identify features I have observed • I know that a diagram is simplified and contains key features. • I know how to use my careful observations in a given simple key to identify	• I know there are different types of scientific enquires. • I know that comparative and fair testing involves exploring cause and effect. • I know that classifying involves sorting and grouping according to similarities and differences. • I know that researching involves using secondary sources to find answers to questions • I know that 'observations over time' focus on similarities and differences, patterns and change at regular intervals. • I know and give reasons for my choice of enquiry • I know that my question is based on my variables • I can identify the control and dependent variables	• I can make suggestions as to how to investigate	• I know how to describe the similarities and differences or changes in my data • I know how to use tables and bar charts to look for patterns and relationships (cause and effect) and describe these in words. • I know how to use the relationship (cause and effect) or pattern to predict a future change • I can use my scientific knowledge to explain my findings.

National Curriculum	Observing and measuring	Recording Data	Asking and exploring questions	Performing Tests	Concluding, prediction, evaluating
• identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• *I know that mass is measured in g and Kg using balanced and digital scales* • *I can read scales in divisions of 1,2,5 and 10.*		• I can recognise a fair test		
UKS2 NC • 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 • identifying scientific evidence that has been used to support or refute ideas or arguments.	• I use my knowledge of variables and measures to make decisions about which to observe and measures and equipment to use. • I know that systematic observation is based on the control variable *(LKS2 Maths Curriculum)* • I can read scales that involve decimal numbers and negative numbers.	• I know how to organise data using my knowledge of control and dependent variables in tables, charts and diagrams. • I know that a line graph represents changes over time. • I know that the x axis is the control variable • I know that the y axis is the dependent variable • (line graphs are taught in maths in year 6)	• I can identify how to control variables in different enquiry types • I know how to use variable to generate an enquiry question for different enquiry types. • I can explain my choice of enquiry choice • I can design a fair test •	• I can plan and perform part of an investigation independently	• I can use my scientific knowledge to question my findings and decide when further testing is required. • I know that all results allow me to question and predict, however, not all results are reliable

Key Concept: Communication	Key Concept: Application
The knowledge produced by science is used in engineering and technologies to create products to serve human ends • The use of scientific ideas in engineering and technologies has made considerable changes in many aspects of human activity. • Advances in technologies enable further scientific activity; in turn this increases understanding of the natural world. • In some areas of human activity, technology is ahead of scientific ideas. • In other areas, scientific ideas precede technology.	Applications of science often have ethical, social, economic, and political implications • The use of scientific knowledge in technologies makes many innovations possible. • Whether or not particular applications of science are desirable is a matter that cannot be addressed using scientific knowledge alone. • Ethical and moral judgments may be needed, based on such considerations as justice or equity, human safety, and impacts on people and the environment.

	Communicating	Applications
LKS2 NC • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions	• I know relevant scientific language and can use that language to discuss and present my ideas	• I can name an application of science and an associated scientist
UKS2 NC • 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	• I know that relevant scientific language and illustrations can be used to communicate and justify my ideas • I know how scientific ideas have developed over time.	• I can use my knowledge of science to understand its uses and implication

Adaption for children with SEND

Following the expectations laid out by the SEN Code of Practise, adaptations are made for individuals who need something that is addition to or different from others in the class.

'Scientists have become the bearers of the torch of discovery in our quest for knowledge'.

-Stephen Hawking-