St Paul's CofE Primary School

Science Pathway 1

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
	Through working scientifically, pupils will be encouraged to:			
Materials (Physics) – SOUND	To listen to and name a variety of sounds, understanding that animals hear with ears.	To recognise a range of sounds, beginning to understand that the sounds can change based on different factors.	To identify how sounds are made, associating some of them with something vibrating	To study the anatomy of the human ear. What allows us to hear? Investigate a number of different animals (predators and prey) and discuss why they might have evolved to have that shaped ear.
	To listen to different sounds and recognise loud and quiet	Using simple visual demonstrations, begin to understand that sound is vibration. Investigate loud and soft sounds, ask questions – why is does it make a loud/soft noise? To begin to think about the texture/structure of the materials that are used to make sounds. Begin to predict whether something will make a loud or soft noise.	To recognise that vibrations from sounds travel through a medium to the ear To recognise that sounds get fainter as the distance from the sound source increases Discuss why human ears are positioned to allow the hearing of from different angles.	To know that sound is made by the vibration of particles in a material (solid, liquid or gas) and is heard because tiny bones in ears move with the vibration of sound. Brains translate these vibrations into the sounds To know that sound cannot travel in a vacuum as there are no particles to vibrate.
	To explore a range of sounds and how they are made e.g. environmental - birds/animals, wind, striking/banging/stroking, vocal. Begin to predict and ask questions about different noises in their environment.	To predict what will happen to a sound as the sound source moves away. To explore in relation to surrounding environment (cars, sirens animal and crowd noises). To understand that some people cannot hear, this is called being	To investigate and measure the distance at which sounds becomes too faint to hear. To know the terms understand that sounds can be low or high (pitch), quiet & loud (volume). To find patterns between the pitch of a sound and features of the object that produced it	To ask questions about other animals' sense of hearing and how this may be better than a humans e.g. predator hearing over long distance (evolution over time enables animals to have a keener sense of sound).

	To know the terms understand that sounds can be low or high, quiet & loud.	deaf and the implications of this disability. To recognise the difference in sounds based on pitch and volume.	To find patterns between the volume of a sound and the strength of the vibrations that produced it To understand that it is easy to hear sound from a single output (one voice) than from multiple outputs (whole class talking at the same time) To begin to understand that some people have a sensitivity to noise and that this may cause stress/anxiety.	To use knowledge of the auditory system to explore why hearing deteriorates with age/disability. Can people with hearing disabilities appreciate sound/music? How do hearing aids work? To use vocals, untuned and tuned instruments to investigate the relationship between sound (pitch and volume) and its source. To give reasons for patterns between the pitch of a sound and features of the object that produced it To give reasons for patterns between the volume of a sound and the strength of the vibrations that produced it
	Working Scientifically Ideas			
	Identify and Classify: Can you group different sounds based on their characteristics? **Comparative Testing**: Compare the characteristics of different sounds e.g. volume, pitch etc. **Pattern Seeking**: Is there a pattern between the pitch of a sound and features of the object that produced it? Is there a patterns between the volume of a sound and the strength of the vibrations that produced it? **Research**: How do hearing aids work? **Observation over time**: Listening to the sounds of the school, what do you notice? When is the school the loudest?			
KS3: Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. Sound needs a medium to travel, the speed of sound in air, in water, in solids. Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. Auditory range of humans and animals. Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. Waves transferring information for conversion to electrical signals by microphone.				

Science Pathway 2

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Biology - PLANTS	To know what a plant is and can recognise some outside. To explore different types of plants and compare similarities and differences between flowers and leaves, describing colours and patterns. To draw different plants and flowers. To begin to understand seasons and how plants change from Spring to Summer, to Autumn, to Winter. To begin to understand that the seasons repeat in a cycle.	To name several types of plants, trees and bushes. To observe and describe how seeds and plants can grow into mature plants. To recognise and know the words deciduous and evergreen and can spot these outside and in pictures. To begin to identify and recognise a variety of wild plants that grow To begin to identify and recognise a variety of garden plants To know and can identify the basic structure of a flowering plant To begin to think about what a plant needs to grow big and strong To begin to think about plants that are safe to eat, and those you should never eat. To understand seasonal changes and how this effects different plants.	To identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers To begin to investigate the way in which water is transported within plants To start to explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. To investigate, find out & describe how plants need water, light & a suitable temperature to grow and stay healthy. To 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, naming different plants in the process. To think about how different plants are grown at different times of the year based on the conditions needed for successful growth.	To identify and describe several types of plants, trees and bushes, To discuss where plants are found and give reasons for this To understand and explain the different functions of flowers and how these change depending on the plant or tree. To explain how water is transported within plants. To understand and explain the life process of reproduction in some plants To understand the conditions required for successful growth and think about why crops are grown at different times of the year, why greenhouses are used and why food is transported around the world.

	Working Scientifically Ideas
	Identify and Classify: Identify different plants and flowers. Grouping different plants and flowers based upon their characteristics. **Comparative Testing**: Does the amount of water affect the amount of petals a flower grows? **Fair Test:** How do different environments affect the rate of growth in a plant? **Pattern Seeking**: Is there a pattern between the amount of sunlight/water/oxygen and the rate of growth? **Research**: Which plants are used for medicines and which plants are deadly? How many miles do different foods travel to be on our plates all year round? **Observation over time**: How does a plant change over time? (This could be seasonal with trees).
	KS3: Photosynthesis: the reactants in, and products of, photosynthesis, and a word summary for photosynthesis; the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere and the adaptations of leaves for photosynthesis. The similarities and differences between plant and animal cells.

Science Pathway 3

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Living Organisms (Biology) –ANIMALS & THEIR ENVIRONMENTS	To know basic animal groups (farm, polar, pet, safari, ocean). To begin to identify that there are differences between fish, reptiles, birds and mammals. To know the difference between something that is alive and something that is not.	To identify differences between fish, reptiles, birds and mammals To learn that animals and plants are livings things. To understand and discuss that there are things that were once living but are now dead. To know that there are things that have never been alive. To recognise that animal babies are sometimes similar, but not identical to their parents. To understand that a baby human may look like one, or both, or neither of its parents To understand that animals look different to each other and understand the reasons for this.	To know that mammals give birth to live babies that look similar to them whereas birds, most reptiles and amphibians lay eggs which hatch to produce the young which do not always look like the adult. (e.g. tadpoles/frog chick/chicken/ caterpillar/butterfly) To recognise that animal babies are sometimes similar, but not identical to their parents. To understand that human babies can look similar to their parents, siblings and extended family To understand that living things can be grouped according to their features and give reasons for their groupings	To identify reasons for differences between fish, reptiles, birds and mammals. To understand the differences between living and non-living objects and the processes required for successful growth and survival of a range of animals including fish, reptiles, birds and amphibians To understand that animals adapt to the environment that they live in, and this contributes to their appearance To understand that all plants and animals reproduce. To understand that most animals reproduce sexually involving a male fertilising the egg of a female. To understand and discuss that depending on the animal, the young will look similar to the parent or will undergo a process of metamorphosis through two or more stages before resembling the adult.

	To begin to group animals based on their similarities and differences.	To recognise some common animals including fish, amphibians, reptiles, birds and mammals	To use classification keys to help group, identify and name a variety of living things in their local and wider environment	To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
		To learn that animals come in many sizes, shapes and appearances. They can be differentiated in a number of ways such as appendages (limbs, tails, wings, claws) or skin coverings (hair, feathers, fur, scales).	To know that classification keys can be used to identify and name living things.	To learn and understand that human babies grow and change very rapidly and they are dependent on their parents for all their needs. As they mature, they develop new skills and acquire knowledge.
	To begin to understand the basic needs of animals and humans for survival (food, water and air).	To understand the basic needs of animals and humans for survival (water, food, air (oxygen))	To identify & name a variety of plant and animal habitats	To 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
		To understand what happens if living things do not get enough of these.		
	To understand that some animals eat other animals for food to survive.	To describe how animals obtain their food from plants and other animals.	To begin to explore and identify that most living things live in habitats to which they are suited.	To give reasons for classifying plants and animals based on specific characteristics.
	To construct a simple food chain for an animal they are familiar with (fox, chicken, snail)	To use a simple food chain, and identify and name different sources of food.	To construct food chains to include producers, predators and prey.	To understand why humans are not part of food chains in current day, discussing and debating the term 'apex predator'
		To understand that different animals have different diets: some only eat meat (carnivores), some only eat plants (herbivores), others eat both (omnivores).	To begin to understand the effect of natural and man-made environmental changes and the impact (positive & negative) on habitats and food chains	To understand the reasons why animal bodies need oxygen/ nutrients and water and how it is transported around the body.
		To understand that animals need safe places to live and survive and these are called habitats	To begin to describe co-dependency of animals and plants, exploring habitats and food chains.	To understand why some individuals have differing dietary beliefs and traditions

		To understand that these habitats are different based on the needs of the animal		To identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. To understand how animals adapt as their environment changes and the link between adaptation and offspring that resemble their parents, but are not exact copies. To understand that some animals and plants are co-dependent on each other and give reasons for this To understand how environmental changes and human impact can impact habitats and lead to an impact on food chains, animal survival and rising costs of living To learn how small adaptations over generations lead to evolution of species and that animals and plants evolve to survive in their environment
	Working Scientifically Ideas			
	Identify and Classify: How would you make a classification key for vertebrates/invertebrates or microorganisms? **Comparative Testing**: Which is the most common invertebrate on our school playground? **Pattern Seeking**: Do all flowers have the same number of petals? **Research**: What do different types of microorganisms do? Are all microorganisms harmful? **Observation over time**: How do different animal embryos change?			
	Famous Scientists: Carl Linnaeus (1707-1778) Libby Hyman – Classification (invertebrates) Evelyn Cheesman (1881-1969) Sir Hans Sloane (1660-1753) Gilbert White (1720-1793)			

	KS3: Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. Differences between species. The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. The structure and functions of the gas exchange system in humans, including adaptations to function. The mechanism of breathing to move air in and out of the lungs. The impact of exercise, asthma and smoking on the human gas exchange system. Heredity as the process by which genetic information is transmitted from one generation to the next. A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction.

Science Pathway 4

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Biology –ANIMALS, Including Humans.	To identify, name, draw and label the basic parts of the human body (head, eyes, nose, mouth, ears, feet, hands, arms, legs)	To understand that although humans all look different they have the same body parts.	To identify, name, draw and label all parts of the human body (ankles, knees, elbows, joints, bones, muscle, brain)	To recall all human body parts – both external and internal
		To understand that the nose, eyes, ears, mouth and skin are linked to the five senses *nose-smell, eyes-sight, hands-touch, ears-hearing, tongue-taste)*	To begin to recognise that humans may have adaptations of their bodies based on disability or additional needs	To explore human adaptations, understanding how this may impact an individual's life To recognise the impact of diet, exercise and drugs on the way human bodies function
		To understand that the body changes as humans get older	To give examples of how the human body changes as they grow older	To describe and explain the changes as humans develop to old age.
		To understand why humans have teeth	To know the different types of teeth in humans	To identify and recognise different types of teeth in humans and how this compares to different animals, based on their dietary requirements. To understand that teeth decay with age and that they contribute to facial shape and structure.
	To begin to understand how to keep teeth clean.	To begin to recognise that there are different types of teeth	To identify the different functions of each tooth type: incisors – cutting; canines –tearing; premolars & molars – chewing & grinding. To understand that the teeth are necessary as part of the digestive process in animals.	
		To know how to keep teeth clean, including through experimenting what happens to teeth when they are not kept clean.	To know how to keep teeth clean and understand what might happen if they are not looked after	To know that some foods e.g. sweet and acid and some drugs, including cigarettes) will accelerate dental decay.
	To understand that food needs to be cut up before eating to reduce risk of choking.	To begin to understand the journey of food through the body (in mouth, chew, swallow, stomach/tummy, poo).	To know the simple functions of the digestive system in humans (mouth, stomach, intestines)	To explore what happens if part of the human digestive system is compromised

			To understand the role of saliva and stomach acid in breaking down food to support digestion To know that nutrients are absorbed by the body and waste is excreted through the anus via the rectum	To understand the link between food choices and the impact on the body, now and in later life e.g. impact of obesity and on risk of developing diseases such as diabetes.
	Working Scientifically			
	Identify and Classify: Identifying body parts and organs e.g. which organs of the body make up the circulatory system? **Comparative Testing**: Comparing teeth of different animals, comparing different exercises and their effect on our heart rate. **Fair Testing**: How does the length of time effect our heart rate? Can exercising regularly affect your lung capacity? How does the length of time we do not brush our teeth affect how fast our teeth decay? **Pattern Seeking**: Is there a pattern between what we eat for breakfast and how fast we can run? **Research**: What ideas did Edward Jenner have about small pox and how did he test them? What is the role of the dentist and how do you become a dentist? **Observation over time**: How does my heart rate change over the day? How much exercise do I do in a week? What happens if I do not brush my teeth for a long period of time?			
	Famous Scientists: Claudius Galen – Anatomy Leonardo Da Vinci – Anatomy Sir Richard Doll – Linking smoking and health problems. Patricia Bath (BP Website) – saving sight (links to light). William Harvey (1578 – 1657) Discovery of the circulatory system.			
	KS3: The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. Cells and organisation. The skeletal and muscular system. Nutrition and digestion. Gas Exchange stems Reproduction and health.			

Science Pathway 5

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Materials – PROPERTIES & STATES OF MATTER	To identify and name a variety of everyday materials, (wood, plastic, glass, metal, water and rock)	To begin to distinguish between an object and the material from which it is made (*table-wooden; window-glass)* To begin to discuss that objects are made from one or more materials	To identify and compare the suitability of a variety of everyday materials (wood, metal, plastic, glass, brick, rock, paper and cardboard) for different uses	To identify and reason, based on evidence from comparative and fair tests, the particular uses of everyday materials (metals, wood and plastic)
	To begin to investigate using different materials such as clay, dough and paper how some objects can be remoulded into different shapes.	To know that specific materials are chosen for an object depending on the use of that object. To explore and investigate reasons and suitability of materials used in objects that are be found around home and school To explore the reasons for suitability of materials and begin to ask why. To find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	To understand that some materials can be changed and this change is irreversible	To compare and categorise everyday materials on the basis of their properties (hardness, solubility, transparency, conductivity (electrical and thermal) and responses to magnets) To explore the reasons for suitability of materials and their purpose based on knowledge of properties – both practical and impractical. To know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
	To describe simple physical properties of a variety of everyday materials (*rough, smooth, bumpy, scrunch, shiny, dull)*	Compare and group together a variety of everyday materials based on simple physical properties *(waterproof, see-through, absorbent)* To understand the term 'solid' and 'liquid'	To know that there are three states of matter (solid, liquid and gas)	To explore how materials change between solid, liquids and gases and understand that some changes are irreversible

	To begin to understand that it is cold and wet in winter and hot and dry in summer.	To begin to observe that materials change state when they are heated or cooled (snow to water.) To understand that it is cold and wet in winter and hot and dry in summer.	To compare and group materials together, according to whether they are solids, liquids or gases To observe some materials change state when they are heated or cooled and measure the temperature at which this happens in degrees Celsius (°C) To recognise that some changes between states are permanent and some are reversible	To understand the properties of the states of matter is dependent on the energy and freedom of their particles (atoms or molecules). To use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating To explain that dissolving, mixing and changes of state are reversible changes To know that some changes result in the formation of new materials, and that this is not usually reversible (burning).
	Working Scientifically			
	Identify and Classify: Group materials based on: colour, transparency, texture, thickness etc. **Comparative Testing**: What type of sugar dissolves the fastest? Which shoe is the most slippy? Which material is best at keeping Paddington dry in a storm? **Fair Testing**: How long does the temperature of tea affect how long it takes a sugar cube to dissolve? **Pattern Seeking**: Do all stretchy materials stretch in the same way? Do all transparent materials have the same use? **Research**: What are micoplastics and why are they harming the planet? **Observation over time**: How does a container of salt and water change over time? How does a sugar cube change as it is put in a glass of water? How does a nail in salt water change over time?			
	Famous Scientists: Jamie Garcia (BP website) – invention of a new plastic Sir Humphrey Davy – separating gases Spencer Silver – invented post-it notes Ruth Benerito – wrinkle free cotton Antoine Lavoisier (1743-1794) Dmitri Mendeleyev (1834-1907) John Dalton (1766-1844)			
	KS3: Chemical reactions as the rearrangement of atoms. Representing chemical reactions using formulae and using equations. Combustion, thermal decomposition, oxidation and displacement reactions. Defining acids and alkalis in terms of neutralisation reactions. The pH scale for measuring acidity/alkalinity; and indicators..			

Science Pathway 6

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
	Through working scientifically, pupils will be encouraged to:			
Physics: Light	To explore and understand that there is light and dark e.g. through dark dens, areas of darkness – tents/tunnels/slide etc	To understand the difference between light and dark, begin to understand that darkness is when there is little or no light.	To understand that dark is the absence of light	To explore the reasons why there is dark and light in the natural world and how humans create light
	To know that it is light in the day time and dark at night time.	To know and explore that light can be generated from a variety of sources (sun, light bulb, candle, lamps, fire)	To know that the Sun is a natural source of light	To recognise that light appears to travel in straight lines (because when there is no light, it is dark!) To explore how the sun's rays reach the Earth, and how this differs depending on location.
	To begin to understand that you should never look directly at the sun and explore ways of protecting eyes.	To understand that you should never look directly at the sun and explore ways of protecting eyes.	To understand that you should never look directly at the sun and explore suitable and practical ways of protecting eyes.	
			To understand that there are natural and man made sources of light	To begin to explore a range of phenomena including rainbows, colours on soap bubbles, coloured filters etc.
	To begin to explore our reflection in a mirror.	To explore the concept of reflection through mirror work and see that their own image is being "bounced back"	To know that light is reflected from the surface of an object, which enters the eye, that senses light	To understand that light travels in straight lines, so objects are seen because they give out or reflect light into the eye.
	To begin to recognise shadows from objects and our own shadows.	To recognise what a shadow is. To spot shadows outside when light is blocked by an object	To recognise that shadows are formed when the light from a light source is blocked by an opaque object.	To know that that light travels in straight lines therefore shadows have the same shape as the objects that cast them.
	To use shadow puppetry to explore shadows and their shape	To use shadow puppetry to explore shadows and their shape	Use shadow puppetry to find patterns in the way that the size of shadows changes.	To 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

				To compare/contrast the travel of light and sound. Which is faster?
	Working Scientifically Ideas			
	Identify and Classify: Can you identify all the colours of light that make white light when mixed together? What colours do you get if you mix different colours of light together? Can you identify different light sources? **Comparative Testing**: Which material is the most reflective? **Fair Testing**: How does the angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface? **Pattern Seeking**: Is there a pattern to how bright it is in school over a day? And, if there is a pattern, is it the same in every classroom? **Research**: How do astronomers know what stars are made of? **Observation over time**: How does my shadow change over the day?			
Famous Scientists: Nikola Telsa – founder of AC electric system (links to electricity topic too). Thomas Young (1773 – 1829) Wave theory of light. Double-slit experiment Sir David Brewster (1781-1868) Deduced "Brewster's Law" giving the angle of incidence that produces reflected light which is completely polarised; invented the kaleidoscope and the stereoscope, and improved the spectroscope. Jean-Bernard-Leon Foucault (1819-1868) Accurately measured the speed of light.				
KS3: The similarities and differences between light waves and waves in matter. Light waves travelling through a vacuum; speed of light. The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye.				

Science Pathway 7

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
SPACE & ROCKS	To begin to recognise that light from the sun can be dangerous and that there are ways to protect their eyes.	To understand that the sun is a light and heat source and that light from the sun gives us light in the day. Heat from the sun makes it warmer in summer.	To understand that the sun is at the centre of our solar system and that it is made of burning gases that give out heat and light energy. To understand that eyes are sensitive to light and light from the sun can damage our eyes.	To understand that the sun is a star which is the centre of our solar system. To describe the movement of the Earth, and other planets, relative to the Sun in the solar system
	To describe & discuss different times of day. To make links with the moon at night time and the sun during the day.	To observe and describe the weather associated with the seasons and how day length varies. To describe, discuss and observe seasonal changes as they occur.	To understand that the sun's rays are strongest at the equator and that summer is at different times of the year depending on which hemisphere you are in.	To understand why the sun's rays are strongest at the equator, where UV rays must travel the shortest distance through the atmosphere and summer is at different times of the year depending on which hemisphere you are in.
		To recognise that the Sun, Moon and the Earth make up part of the solar system	To understand that day length varies according to the Earth's position relative to the sun.	To understand and explain why day length varies according to the Earth's position relative to the sun. To relate the fact that the Earth rotates on its own access every 24hrs to day and night.
		To know there are 8 planets in the solar system	To understand that the moon does not disappear in the day	To know the different phases of the moon and begin to understand tidal movement.
			To recognise that the Sun, Moon and the Earth make up part of the solar system and are not all solid	To understand that the Sun, Moon and Earth are approximately spherical.
			To know and name the 8 planets in the solar system	To use knowledge of solids, liquids and gases to understand the difference in structure of planets To learn how the 8 planets in our solar system move and describe the

				elliptical paths (orbits) around the sun and our own planet.
	Working Scientifically Ideas			
	Identify and Classify: How could you organise all the objects in the solar system into groups? **Comparative Testing**: How does the length of daylight hours change in a season? **Pattern Seeking**: Is there a pattern between the size of a planet and the time it takes to travel around the sun? **Research**: How have our ideas about the solar system changed over time? What unusual objects did Jocelyn Burnell discover?			
	Famous Scientists: Aristarchus (310-230BC) he was the first to figure out that the Earth travels around the Sun. Nicholas Copernicus (1473-1543) had the idea that the Earth revolves on its axis and the Earth and other planets orbit around the Sun. Galileo Galilei (1564-1642) Discovered four of Jupiter's moons. In 1609, Galileo was the first person to make a study of the skies with a telescope. Aristotle Edwin Hubble (1889-1953) In 1924, Hubble showed that nebulae (fuzzy light patches in the sky) were distant galaxies. In 1929, he found the speed a galaxy moves away from Earth depends on its distance from the Earth. If a galaxy is four times as far away as another, it is moving four times as fast. This is Hubble's law.			
KS3	**KS3**: The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. Our Sun as a star, other stars in our galaxy, other galaxies. The light year as a unit of astronomical distance. The composition of the Earth. The structure of the Earth. The rock cycle and the formation of igneous, sedimentary and metamorphic rocks.			

Science Pathway 8

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Materials (Physics) – FORCES	Introduce the idea of pulling, as a force.	To understand that a force is a pull or a push and that the surface of both an object and the area it is on affects how it moves. (Frictional forces)	To understand that a force exerted by a surface may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.	To understand that air, water and friction are contact forces that act between moving surfaces
	To understand that when I pull something, it moves towards me.	To notice and describe how different things move. (*fast, slow, forwards, backwards).*		
	To understand that different objects can be pulled towards me.	To explore whether the surface of a material or the incline of the surface changes the movement of an object		To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect
	To know that push is the opposite of pull To understand that to push something means it moves away from me.	To begin to predict how the object might move. To understand that a force makes an object move		To investigate how devices such as levers, pulleys and gears allow a small force to be increased to a greater force that might allow for greater ease of movement
	To investigate different objects and how they move when they are pulled or pushed – roll/stack/slide.	Begin to investigate that the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching (Materials and Forces)	To understand that the shape of solid objects made from certain materials can be changed by squashing, bending, twisting and stretching (applying forces to the object)	To explain how a force affects the movement of an object and may hinder or help its movement
	To investigate what happens when you drop something.	To begin to think about why an object falls	To understand that gravity is the force of attraction between two objects. It is what makes things fall and what keeps us from floating off into space. Gravity is a fundamental force of nature.	To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object To understand that gravity is a force that pulls all objects towards the centre of the Earth.

			To understand that for some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Compare this to the concept that some forces can act at a distance e.g. gravity and magnetism. An object falls when you drop it. A magnet does not need to touch the object that it attracts	To explore and explain why unsupported objects always fall. To verbalise that the force exerted by a support counteracts gravity (link to strength of stems/trunks/bones)
	Magnetism To investigate with magnets and explore what 'sticks' and what doesn't. Discuss what the similarities and differences are of the magnetic objects.	**Magnetism** To understand that some metals can be magnetic To know that magnetic means for two metals to attract each other To begin to understand that magnetism works at a distance. Is it 'sticky'? To begin to investigate whether an object is magnetic or not. To investigate how far/close to an object they can get before the force is effective	**Magnetism** To notice that some forces need contact between two objects, but magnetic forces can act at a distance To describe magnets as having two poles To observe how magnets attract or repel each other and attract some materials and not others To compare a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials	**Magnetism** To explain how magnets attract or repel each other and attract some materials but not others To investigate how strong a magnet is To group together materials, giving reasons for categories, on the basis of whether they are attracted to a magnet, and identify magnetic materials To predict whether two magnets will attract or repel each other, depending on which poles are facing.
	Working Scientifically Ideas			
	Identify and Classify: Can you label and name all the forces acting on the objects in each of these situations? **Comparative Testing**: Which seed shape take the longest time to fall? Which shape parachute takes the longest to fall? **Fair Testing**: How does the angle of launch affect how far a paper rocket will go? How does the surface area od a container affect the time it takes to sink? How does the surface area of a parachute affect the time it takes to fall to the ground? **Pattern Seeking**: Do all objects fall through water the same way? **Research**: How do submarines sink if they are full of air? **Observation over time**: How long does a pendulum swing for before it stops?			

	Famous Scientists: Sir Isaac Newton (1642-1727) formulated the laws of motion. Christopher Cockerell (1910-1999) inventor of the hovercraft. Galileo – gravity (also in Earth and Space) Archimedes - levers
	KS3: Speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time). The representation of a journey on a distance-time graph. Forces as pushes or pulls arising from the interaction between two objects. Using force arrows on diagrams, adding forces in one dimension, balanced and unbalanced forces.

Science Pathway 9

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Materials (Physics) – ELECTRICITY	To understand that some toys have batteries. To understand electrical devices may need a charge or to be plugged into mains electricity to work. To begin to understand the safety around plug sockets and what we should do to keep safe.	To observe and name common appliances that run on electricity To understand the safety around plug sockets and what we should do to keep safe. To begin to recognise a wire, a bulb and a battery. To be given opportunities to put these together to make a simple circuit and recognise the circuit must be complete to turn the bulb on To understand that an appliance needs to be switched on and off to work To understand that wires are protected by rubber	To understand that some appliances need to be plugged in to work. To know that not all electrical items plug into the wall. Some run on batteries (toys, laptops, tablets) which are the source of energy. (power) To understand that an appliance needs to be switched on and off and that the electricity travels through cables/wires which are covered up for protection. To construct a simple series electrical circuit, identifying and name the basic parts, including cells, wires, bulbs, switches and buzzers. To 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 To recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit To recognise some common conductors and insulators, and	To understand that electricity in homes and buildings comes from a wider source and is distributed through electrical companies. To know that the brightness of a lamp or the volume of a buzzer will change with the number and voltage of cells used in the circuit To 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 To discuss the appropriate materials for certain objects, or to complete electrical circuits based on their conductive properties To be able to correctly draw and use electrical symbols when drawing an electrical circuit.

			associate metals with being good conductors. To be able to recognise electrical symbols when drawing an electrical circuit.	
	Working Scientifically Ideas			
	Identify and Classify: How would you group electrical components and appliances based on what electricity makes them do? **Comparative Testing**: Which make of battery lasts the longest? Which type of fruit or vegetable makes the best battery? **Fair Testing**: How does the voltage of the batteries in a circuit affect the brightness of the lamp? How does the voltage of the batteries in a circuit affect the volume of the buzzer? **Pattern Seeking**: Does the temperature of the light bulb go up the longer it is on? **Research**: How have batteries changed over time? **Observation over time**: Does the temperature of the lightbulb go up the longer it is on?			
	Famous Scientists: Thomas Edison (1847-1931) Inventor of the fuse Benjamin Franklin (1706-1790) Showed that lightning is caused by electricity. Charles Augustine Coulomb (1736-1806) He invented instruments for measuring forces between magnets and between charges. The unit for measuring an amount, or charge, of electricity is named after him. One coulomb (C) is the amount of electricity that flows past any point when a current of one-amp flows for one seconds. Andre-Marie Ampere (1775-1836) His studies allowed people to measure the amount of electric current flowing through a circuit. Thus, the current is measured in units called amperes (amps) Nikola Telsa – founder of the AC electric system (links to light too).			
	KS3: Electrical currents, measured in amperes, in circuits, series and in parallel circuits. Currents add where branches meet and current as a flow of charge. Measuring in volts. Battery and bulb rating, resistance, measured in ohms. Differences in resistance. Static electricity – the separation of positive or negative charges when objects are rubbed together. Force between charged objects. Electrical field and forces acting across the space between objects and not in contact.			

Science Pathway 10

	North Gate (N/R)	East Gate (1/2)	South Gate (3/4)	West Gate (5/6)
Rocks and Soils	To explore different types of rocks and begin to describe what the rocks are like (their texture and colour).	To understand that there are different types of rocks	To explore similarities and differences in different types of rock	To know that different types of rocks are formed due to different organic (and man made) processes
	To begin comparing rocks.	To understand that rocks can be found in different shapes and sizes, and use the vocabulary; rock, stone, pebble, boulder.	To compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.	To make links to volcanic activity and forces (pressure) & formation of different types of rock and the positives of this.
	To know that plants need soil to grow.	To learn that soil is very small pieces of rock (minerals) mixed with composted matter and living organisms.	To recognise that soils are made from rocks and organic matter. To recognise that there are different types of rock which all have different properties. To know that the size of the crystals and properties of the rock will determine the features of the landscape. To know that rocks can break down into smaller sizes and can eventually become soil when mixed with organic matter.	To use knowledge of rocks and soils to explore why certain areas of the country are sparsely or densely populated To recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
		To begin to understand that a fossil is extremely old and from the past.	To describe in simple terms how fossils are formed when things that have lived are trapped within rock.	To know that certain rocks contain fossils which were formed millions of years ago from plant and animal remains; these remains provide evidence of evolution.
		To begin to look at fossils and begin to learn that the marks and shapes are formed by the outline of an animal or plant.	To understand that certain rocks contain fossils which were formed millions of years ago from plant and animal remains.	

	Working Scientifically Ideas
	Identify and Classify: Grouping/ Pairing rocks based upon their characteristics. **Comparative Testing**: Compare rocks based upon their characteristics. **Fair Testing**: Testing the characteristics of rocks (e.g. adding drops of water to observe absorption, ensuring the same amount of water is added to each type of rock).
	KS3: • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks • Earth as a source of limited resources and the efficacy of recycling • Heredity as the process by which genetic information is transmitted from one generation to the next. • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model