

Evolution & Inheritance: offspring, inheritance, variations, characteristics, adaptation, habitat, environment, evolution, natural selection, fossil, adaptive trait, inherited traits, natural selection

Scientists & Inventors: Stephen Hawkin, Libbie Hymen, Marie Maynard Daly, Alexander Fleming, Mary Leakey, Dr Daniel Hale Williams

Properties & Changes of Materials: materials, solids, liquids, gases, melting, freezing, evaporating, condensing, conductor, insulator, transparency, dissolve, soluble, insoluble, solution, sieving, filter

Light: light source, reflection, incident ray, reflected ray, law of reflection, refraction, visible spectrum, prism, shadow, transparent, translucent, opaque

Electricity: circuit, symbol, cell / battery, current, amps, voltage, resistance, electrons, components

Animals including Humans: circulatory system, heart, blood vessels, oxygenated blood, deoxygenated blood, drug, alcohol, nutrients, plasma, platelets

Year 6

Earth & Space: Sun, star, moon, planet, sphere, spherical bodies, satellite, orbit, rotate, axis, geocentric model, heliocentric model, astronomer, solar system, celestial bodies

Scientists & Inventors: David Attenborough, Eva Crane, Stephanie Kwolek, Leonardo da Vinci, Margaret Hamilton, Neil deGrasse Tyson, biology, chemistry, chromatography, DNA, geology, naturalist, physicist

Living Things & their Habitats: asexual reproduction, fertilise, gestation, life cycle, metamorphosis, pollination, reproduction, sexual reproduction, forces: gravity, Earth's gravitational pull, weight, mass, friction, air resistance, water resistance, buoyancy, streamlined, mechanism, upthrust

Animals including Humans: Fertilisation, prenatal, infancy, childhood, adolescence, early / middle / late adulthood, gestation, reproduce, asexual reproduction, sexual reproduction, life cycle, puberty, menstruation, life expectancy

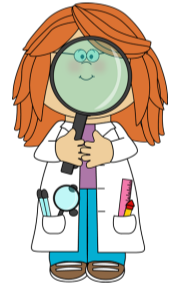
Year 5

## Overview of Key Vocabulary



# Science at Mill Lane

## Becoming an Investigative Scientist



At Mill Lane Community Primary School and the Windmill Community Nursery, the aim of Science is to develop the natural curiosity of the child, encourage respect for living organisms and the physical environment and provide opportunities for critical evaluation of evidence. It is also to recognise the importance of Science in every aspect of daily life and to increase pupils' knowledge and understanding of our world, and with developing skills associated with Science as a process of enquiry. The aim is to inspire children by the work of influential scientists and to give them the opportunity to develop their own investigative skills and passion for the subject.

At Mill Lane, our Science teaching offers opportunities for children to:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- be equipped with the scientific skills required to understand the uses and implications of science, today and for the future.
- develop the essential scientific enquiry skills to deepen their scientific knowledge.
- Use a range of methods to communicate their scientific information and present it in a systematic, scientific manner, including I.C.T., diagrams, graphs and charts.
- develop a respect for the materials and equipment they handle with regard to their own, and other children's safety.
- develop an enthusiasm and enjoyment of scientific learning and discovery.



# Science in the Early Years

*In Nursery children should:*

- Use all their senses in hands-on exploration of natural materials.
- Explore collections of materials with similar and/or different properties.
- Talk about what they see, using a wide vocabulary.
- Begin to make sense of their own life-story and family's history.
- Explore how things work.
- Plant seeds and care for growing plants.
- Understand the key features of the life cycle of a plant and an animal.
- Begin to understand the need to respect and care for the natural environment and all living things.
- Explore and talk about different forces they can feel.
- Talk about the differences between materials and changes they notice.



## Overview of Key Vocabulary

### Year 3

**Rocks:** igneous rock, sedimentary rock, metamorphic rock, magma, lava, sediment, permeable, impermeable, fossilisation, palaeontology, erosion, topsoil, subsoil, bedrock

**Forces & Magnets:** forces, friction, surface, magnet, magnetic, magnetic field, poles, repel, attract, poles

**Plants:** roots, stem, leaves, flowers, nutrients, evaporation, nutrients, fertilisation, petal, stamen, carpel (pistil), sepal, pollination, pollinator, germination, seed dispersal, life cycle, stigma, style, anther, filament

**Animals including Humans:** healthy, nutrients, energy, saturated fats, unsaturated fats, carbohydrates, protein, fibre, vitamins, minerals, water, energy, vertebrate, invertebrate, muscles, tendon, joints, skeleton, endoskeleton, exoskeleton

**Light:** light, light source, dark, reflection, reflect, reflective, ray, pupil, retina, shadow, opaque, translucent, transparent

**Reduce, Reuse, Recycle:** waste, biodegradable, sustainable, landfill, reduce, reuse, recycle, decompose, biodiversity, renewable, non-renewable, greenhouse gas, greenhouse effect, climate change, carbon footprint

### Year 4

**States of Matter:** solids, liquids, gases, water vapour, melting / freezing point, melt, freeze, evaporate, condense, precipitation

**Electricity:** generate, electricity, renewable, non-renewable, appliances, battery, circuit, electrical insulators / conductors

**Sound:** vibration, sound wave, volume, amplitude, pitch, ear, particle, distance, soundproof, absorb sound, vacuum, eardrum

**Living Things & their Habitats:** organisms, life processes, respiration, sensitivity, reproduction, excretion, nutrition, habitat, environment, endangered species, extinct, classification, vertebrates, invertebrates, specimen, characteristics

**Animals including Humans:** digest, oesophagus, stomach, small intestine, large intestine, rectum, incisor, canine, molar, premolar, herbivore, carnivore, omnivore, producer, predator, prey, tooth decay

**Scientists & Inventors:** Gerald Durrell, Alexander Graham Bell, James West, Gerhard M. Sessler, Maria Telkes, Garrett Morgan, Lewis Howard Latimer, Thomas Edison, Washington Sheffield, Lord Kelvin, conservationist, endangered species, solar powered, respiration, oxygen

# Overview of Key Vocabulary

## Year 1

**Everyday Materials:** object, material, hard, soft, stretchy, shiny, dull, rough, smooth, bendy, waterproof, absorbent, transparent

**Seasonal Changes (Autumn & Winter):** autumn, winter, seasons, weather, daylight,

**Animals including Humans:** amphibians, birds, fish, mammals, reptiles, carnivores, herbivores, omnivores, sight, hearing, touch, taste, smell

**Plants:** wild plants, garden plants, weed, deciduous, evergreen, roots, stem, leaves, flowers, petals, fruit, seed, bulb

**Seasonal Changes (Spring & Summer):** seasons, spring, summer, weather, daylight,

**Scientists & Inventors:** Ole Kirk Christiansen, Mae Jemison, George Mottershead, George James Symons, Linda Brown Buck, inventor, scientist, astronomer, biologist, veterinarian (vet)

## Year 2

**Use of Everyday Materials:** materials, suitability, properties, squash, bend, twist, stretch, transparent, flexible, waterproof, strong, opaque

**Biodiversity Minibeasts:** minibeast, invertebrate, decomposer, predator minibeast, pollinator, habitat, microhabitat, biodiversity, ecosystem, depend, food chain

**Animals including Humans:** adult, develop, life cycle, offspring, young, live young, Eatwell guide, diet, disease, exercise, germs, hygiene, nutrition, pulse

**Scientists & Inventors:** Tim Smit, Nicholas Grimshaw, Jane Colden, Elizabeth Garrett Anderson, Louis Pasteur, Charles Macintosh, Rachel Carson, James Blyth, biome, Eden Project, botanist, doctor, germs, turbine, waterproof

**Plants:** germination, shoot, seed dispersal, sunlight, water, temperature, nutrition

**Living Things & their Habitats:** life processes, living, dead, never living, food chain, food sources, habitats, microhabitat, depend, survive

## Science in the Early Years

**In Reception children should:**

- Explore the natural world around them.
- Describe what they see, hear and feel while they are outside.
- Recognise some environments that are different to the one in which they live.
- Understand the effect of changing seasons on the natural world around them.



**By the end of Reception children should:**

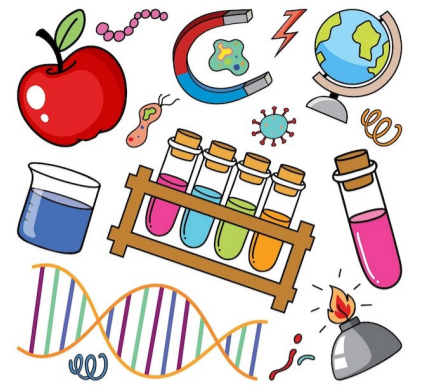
- ♦ Explore the natural world around them, making observations and drawing pictures of animals and plants.
- ♦ Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.
- ♦ Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.



# Science in Key Stage 1

In KSI pupils are:

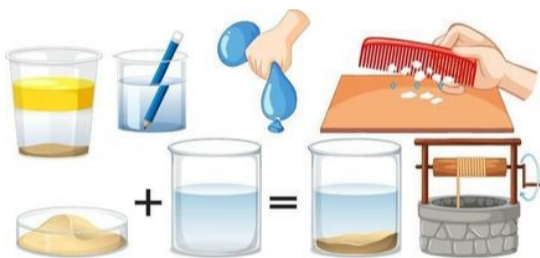
- encouraged to be curious and ask questions about what they notice;
- given opportunities to experience and observe phenomena, looking more closely at the natural and humanly constructed world around them;
- helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information;
- taught to use scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways;
- learning about Science through first-hand practical experiences and secondary sources such as books, photographs and videos.



# Science in Key Stage 2

In KS2 pupils develop a deeper understanding of a wide range of scientific ideas. They are taught to:

- explore and talk about their ideas; ask their own scientific questions about scientific phenomena; and analyse functions, relationships and interactions more systematically;
- recognise how more abstract ideas help them to understand and predict how the world operates;
- select the most appropriate way to answer questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information;
- draw conclusions based on their data and observations, use evidence to justify their ideas, and use scientific knowledge and understanding to explain their feelings.



# Science in Year 6

**Evolution & Inheritance:** This unit builds on the children's learning from the Year 3 Rocks unit as well as the Animals including Humans and Living Things and their Habitats units. Children will learn about variation and adaptation. They will be able to explore how both Charles Darwin and Alfred Wallace separately developed their theories of evolution. They will examine the scientific evidence from plants and animals that has been gathered to support the theory of evolution.

**Properties & Changes of Materials:** This unit teaches children about different materials, their uses and their properties, as well as dissolving, separating mixtures and irreversible changes. The children will sort and classify objects according to their properties. They will explore the properties of materials to find the most suitable material for different purposes. They will investigate the best thermal insulator to make a lunch box. They will find the best electrical conductor, in the context of making floodlights brighter. They will explore dissolving, identifying the different variables in their own investigations. They will find out about different ways to separate mixtures of materials, using filtering, sieving and evaporating. Finally, they will learn about irreversible changes.

**Electricity:** This unit builds on from the Year 4 Electricity unit. Children will learn to represent circuits using symbols in a diagram. They will learn about two of the most important scientific inventors in the field of electricity - Thomas Edison and Nikola Tesla. Children will get the opportunity to develop their understanding of what electricity is and how to measure it. As well as conducting their own investigation, they will get the opportunity to create their own torch!

**Scientists & Inventors:** Children learn about the life and work of Stephen Hawking, and carry out an investigation into Hawking's theories on black holes. The children will learn about Libbie Hyman, a zoologist, who worked on the characteristics and classification of these invertebrates. Children explore the effects of cholesterol on the heart and blood vessels like Marie Maynard Daly. They will find out about Alexander Fleming and his discovery of penicillin. They will learn about Mary Leakey and her role in finding significant fossil evidence, and what her fossils prove about evolution. Children will explore the circulatory system and find out about the medical, and social, advancements made by Dr Daniel Hale Williams. Finally, children will find out about the life and work of Steve Jobs, and his development of new electronics and technologies.

**Light:** The children will learn how light travels and how this enables us to see objects. The children will make a periscope, finding out about mirrors and the angles of reflection and incidence. They will investigate refraction, carrying out some experiments into the effects of bending light. Furthermore, they will have chance to predict what will happen in an investigation into the visible spectrum. They will explore how light creates the colours we see, designing coded messages. Finally, they will learn about Isaac Newton and his theory of light and colour.

**Animals including Humans:** This unit teaches the importance of diet, exercise and lifestyle in the way that bodies function. Children learn about the three main parts of the circulatory system and the job of the heart and also learn about what blood is comprised of and how it is transported around the body. Children carry out an investigation to explore how heart rate is affected by exercise. Children learn the importance of exercise. They then apply their understanding by discussing different people's lifestyles and how this can affect their bodies. Finally, children will learn about drugs and alcohol and how they can have an impact on our bodies, specifically in relation to the circulatory system.

# Science in Year 5



**Earth & Space:** Children identify scientific evidence to support / refute the idea that the Sun, Earth & Moon are spherical. They explore the movement of Earth, and other planets, relative to the Sun in the solar system by examining geocentric & heliocentric theories. Children will explore and explain day & night and the apparent movement of the Sun across the sky. They will also use this knowledge to predict night & day in different places on Earth. Finally, children will investigate how the Moon orbits the Earth and will recreate the phases of the moon using Oreos!

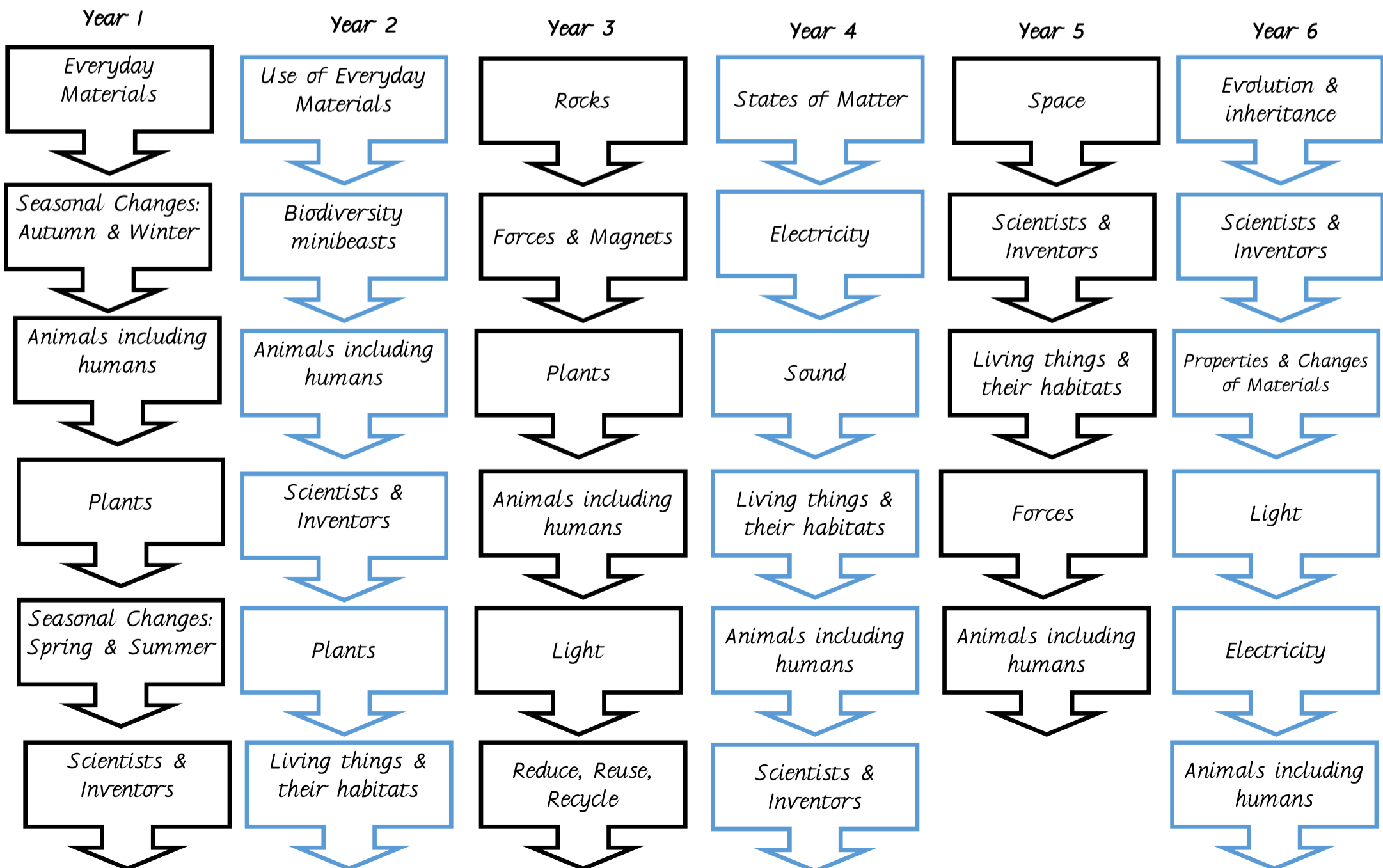
**Living Things & their Habitats:** The children explore reproduction in different plants, including different methods of pollination and asexual reproduction. The children will have take cuttings from plants, creating clones of the parent plant. They will learn about different types of mammals and their different life cycles. Furthermore, the children will find out about Jane Goodall and her work with the now-endangered chimpanzees in Africa. They will explore metamorphosis in insects and amphibians, comparing their life cycles. Finally, the children will explore the life cycles of birds, and will write and star in their own wildlife documentary comparing the life cycles of different living things.

**Scientists & Inventors:** This unit teaches children about famous scientists & inventors linked to the Y5 science curriculum. They will create a documentary about a living thing of their choice based on David Attenborough's work. Children will learn about how CSI technicians use scientific techniques to analyse evidence and they will use chromatography to analyse ink. Children explore the invention of the software and computer code that enabled Apollo 11 to go the Moon (Margaret Hamilton). They investigate the classification of planets through finding out about Neil deGrasse Tyson's role in the reclassification of Pluto. Children will investigate the hardness of materials and consider Stephanie Kwolek's invention of Kevlar. Using Leonardo da Vinci's ideas about the proportions of the human body (The Vitruvian Man) children will measure their height, arm span and other measurements to see whether da Vinci's theories about proportion were accurate. Finally, children explore the evidence that suggests that Stonehenge could have been used as an astronomical calendar, and develop their own theories based on this evidence.

**Animals including Humans:** This unit teaches about the changes that human beings experience as they develop to late adulthood. It tackles subjects including puberty and late adulthood and death. Children will learn about the life cycle of a human being. They will compare the gestation period of humans and other animals and investigate the development of babies. They will learn about the changes experienced during puberty and why these occur and will also look at the changes that other animals experience. Children will look at the body as humans get older and look at how the life expectancy of humans has changed over time.

**Forces:** Children learn about types of forces such as gravity, friction, water resistance and air resistance. Children also learn about the use of mechanisms such as levers, gears and pulleys. The children will identify forces, find out about Isaac Newton and his discoveries about gravity. The children will look for patterns and links between the mass and weight of objects, using newton meters to measure the force of gravity. They will investigate air and water resistance, by designing the best parachute and boat. They will explore friction, developing their own brake pad for a tricycle or scooter. Finally, they will find out about different mechanisms, including levers, gears and pulleys, and will design their own marvellous machine.

## Overview of Learning within Each Year Group





## Science in Year 1



**Everyday Materials:** Children learn about everyday materials including wood, plastic, metal, water and rock. They learn to identify and name everyday materials and will explore the properties of these materials. Children carry out a simple investigation to help them decide which material would be most suitable to use for an umbrella. Children apply their knowledge of everyday materials to sort objects by their properties.

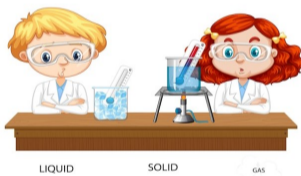
**Seasonal Change (Autumn / Winter):** Children will learn what the word weather means and find out how different types of weather can be measured. Children will use a class weather station to observe measure and record the weather across the seasons. They will also observe changes across the seasons by exploring the signs of autumn and winter through nature and wildlife.

**Animals including Humans:** Children learn about five of the groups that scientists use to classify animals: mammals, fish, birds, reptiles and amphibians. They will learn to identify the group an animal belongs to by its features and will classify animals according to their group. They will also learn about the different diets animals eat. Children learn about the parts of the human body and explore the five senses through a simple investigation. Finally, children will use all their knowledge from this unit to classify animals according to their own criteria.

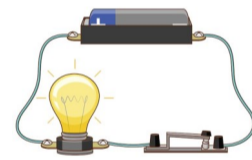
**Plants:** In this unit about plants, children will learn to name the basic parts of a plant, including seeds. They will have the opportunity to plant their own seeds and to make observations of how they grow over time. Children will also learn to identify, name and describe a variety of garden and wild plants as well as evergreen and deciduous trees. Finally, the children will use all of their knowledge gained throughout the topic to identify, compare and classify plants.

**Seasonal Changes (Spring / Summer):** Children will learn about the changes that can be seen between spring and summer, as well as across all four seasons. They will go on a nature walk to observe some of these changes. They learn about what weather is and the weather that is associated with each season. They will observe and collect data about the weather. Working scientifically and enquiry skills are incorporated throughout the unit, including using simple equipment, making observations and gathering data.

**Scientists & Inventors:** This unit will teach children about famous scientists & inventors linked to the Year 1 science curriculum. Children will learn about the inventions of Lego and ear muffs, and will explore the materials used to make them. They will investigate other materials that keep us warm. Children will find out about the work of animal scientists, such as vets and zoo keepers. Children will have the opportunity to collect data when finding out about horticulturists and meteorologists. They will create bar charts of their favourite sensory plants, and make rain gauges to gather data on rainfall.



## Science in Year 4



**States of Matter:** Children will learn about the differences between solids, liquids, gases, classifying objects and identifying their properties. The children will investigate the weight of a gas. Furthermore, they will have chance to find the ideal temperature to melt chocolate. They will explore how water changes state, exploring melting, freezing, condensing as well as a particular focus on evaporation. Finally, they will learn about the stages of the water cycle, creating mini water worlds and an interactive water wheel to represent the different stages.

**Electricity:** Children will learn about common electrical appliances and how to construct simple series circuits. Children will learn about cells, wires, bulbs and buzzers and about the different types of switches. They will be able to troubleshoot and identify whether or not a bulb will light in a simple series circuit and be able to identify a complete circuit. The children will also learn about conductors and insulators and know that metals are very good electrical conductors.

**Sound:** Children learn about how vibrations cause sounds, how sounds travel, as well as how sounds can change pitch and loudness. They will learn about how sounds are made and will complete a sound survey of the school. They will create a human model of the way particles pass sound vibrations on. The children will explore pitch, and will use their understanding of how high & low sounds are made to create their own set of pan pipes. They will make a string telephone, and will use this to investigate how sounds change over distance and through different materials. The children will investigate the best material for soundproofing. Finally, they will apply their learning by designing and creating their own musical instrument that will play high, low, loud and quiet sounds.

**Living Things & their Habitats:** In this unit children explore a variety of ways to identify, sort, group and classify living things. They learn how animals are split into 'vertebrates' and 'invertebrates' and begin to consider the differences between living things within these classifications. They use and create classification keys to group, identify and name living things from the local habitat and beyond. This unit also introduces children to the idea that environments are subject to human-made and natural changes, and that these changes can have a significant impact on living things.

**Animals including Humans:** Children explore the different organs of the digestive system in humans and the functions of teeth in both humans & animals. Children learn about different types of teeth and the importance of good dental hygiene; then they investigate tooth decay using an egg as a model tooth. They will then learn about the parts and functions of individual organs of the human digestive system and carry out their own scientific demonstration of the process using everyday household items. Children will then learn more about herbivores, carnivores and omnivores in the context of teeth, digestion and food chains. They will learn about more complex food chains, using the terms 'consumers' and 'producers' and compare food chains in different habitats.

**Scientists & Inventors:** This unit teaches children about famous scientists & inventors linked to the Y4 science curriculum. They will learn about the dangers posed to living things in Madagascar (Gerald Durrell's conservation efforts on the island). The children learn about Alexander Graham Bell (invention of the telephone) and modern improvements on his invention (James West and Gerhard M. Sessler). Children will look at the early uses of solar energy in homes, Maria Telkes and Eleanor Raymond, then build their own basic solar oven. After re-searching Garrett Morgan, children build their own traffic lights using basic electrical circuits. They will find out about the discovery of oxygen and carry out an experiment to investigate the effects of oxygen on burning objects. Finally, children will find out about the invention of toothpaste, and will invent their own brand of toothpaste to compare against real brands.



## Science in Year 3



**Rocks:** In this unit, children will discover the different types of rocks and how they are formed. Children will compare and group rocks based on appearance and simple properties. They will learn how fossils are formed and learn about the contribution of Mary Anning to the field of palaeontology. Children will understand how soil is formed and then investigate the permeability of different types of soil.

**Forces & Magnets:** Children learn about forces, friction and magnetic attraction. They learn about forces in the context of pushing and pulling. The children will investigate friction, by exploring the movement of a toy car over different surfaces. They will also identify magnetic materials. They will conduct an investigation into the strength of different types of magnet. The children will have chance to explore the way magnetic poles can attract and repel by making their own compass and using it to find hidden items. The children will use their understanding of magnetic attraction to design and create their own magnetic game.

**Plants:** Children will learn the names of different parts of plants and the jobs they do. The children will investigate what plants need to grow well. They will have chance to predict what will happen in an investigation into the transportation of water within plants. They will work in a hands-on way to identify the parts of a flower, and will explore the different stages of the life cycle of a flowering plant.

**Animals including Humans:** Children learn about the nutrients that different foods provide and how these nutrients help our bodies. They explore how different animals eat different types of foods and need different proportions of nutrients. They understand what food labels on packaging show and gather information from food labels to help them to answer questions. Children also explore the different types of skeletons that animals. They learn some names of bones in the human body and carry out an investigation to explore if people with longer femurs jump further. Children learn about how muscles help us to move and will make a simple scientific model.

**Light:** Children will learn about different sources of light, and that we need light to see. The children will investigate reflective materials. They will work in a hands on way to play a range of mirror games, finding out more about reflective surfaces. Furthermore, they will learn that the sun's light can be dangerous. The children will investigate which objects are opaque and will find out how shadows change when the distance between the object and light source changes.

**Reduce, Reuse, Recycle:** Children will learn about different types of waste and how waste is produced, as well as the importance of reducing it through the 3Rs - reducing, reusing and recycling. They will learn about what 'energy' is, what a carbon footprint is and how it is measured. Children will also learn about how waste impacts the environment and wildlife and what they could potentially do to help.



## Science in Year 2



**Use of Everyday Materials:** Children learn about the uses of everyday materials including wood, plastic, metal, glass, brick, paper and cardboard. Children will compare the suitability of different everyday materials for different purposes. They explore how objects made of some everyday materials can change shape and how the recycling process is able to reuse some everyday materials numerous times. Finally, children learn about new discoveries which have made over time with a specific focus on John McAdam.

**BioDiversity Minibeasts:** Children will learn about the importance of biodiversity and what an ecosystem is. The unit focuses on minibeasts and habitats found in the UK. Children will learn about different types of minibeasts, their microhabitats, what they need from their habitat and how living things depend on each other in order to survive. They will also learn about the benefits of minibeasts for the planet and the important roles they play, including pollination.

**Animals including Humans:** Children begin by looking at animal young and comparing them to their adults. They look at how animals change as they grow up and look at the life cycles of several varied common animals, including humans. They look in detail at how humans change as they grow older, drawing on their own observations. Children are introduced to the three basic needs of animals for survival (water, food and air) and will apply this knowledge, alongside research from secondary sources, to suggest ways to look after pets. Finally, children look at healthy lifestyles, including the importance of exercise, healthy eating and hygiene and they investigate the impact of exercise on our bodies and how handwashing is essential for good hygiene.

**Scientists & Inventors:** This is about famous scientists and inventors linked to the Year 2 science curriculum. Children explore the invention of the waterproof coat, and test waterproof materials. They find out about the work of doctors e.g. Elizabeth Garrett Anderson, the first woman doctor in Britain. Children create a greenhouse based on the invention of the biomes at the Eden Project, and use the greenhouse to compare the growth of plants. They learn about how germs are spread, looking at the work of Louis Pasteur and carry out an experiment to prove how far germs can spread in a few minutes. Children will set up a small world to show the effects of water pollution, as discovered by Rachel Carson during her research on ocean habitats.

**Plants:** In this unit, children learn what plants need to stay healthy. They will have the opportunity to carry out their own investigations into what plants need to grow well. Children will also closely observe the inside of a seed and learn about the life cycle of a plant. They will also learn how plants look when they don't get the things they need. At the end, children will learn how plants have adapted to live in different environments around the world.

**Living Things & their Habitats:** Children learn about a variety of habitats and the plants and animals that live there. They learn to tell the difference between things that are living, dead and things that have never been alive, and apply this in a range of contexts. They will look at a local habitat and the creatures that live there, investigating conditions in local microhabitats and how they affect the minibeasts found within them.