

Science at Kent

Science Intent

At the Kenton, it is our intention to recognise the importance of Science in every aspect of daily life, both the knowledge of biology, chemistry and physics, but also the transferable skills that pupils will learn through scientific enquiry. This will develop the natural curiosity of the child, encourage respect for living organisms and the physical environment and provide opportunities for critical evaluation of evidence.

We will build and deliver a Science curriculum which develops learning and results in the acquisition of knowledge and build a Science curriculum which enables all children to become enquiry-based learners.

Staff will deliver regular, high quality lessons and sequences of work, built into cross-curricular learning where possible, which build upon previously learnt objectives and nurture a seed of curiosity which children can use well beyond their

Science Implementation

To ensure that our intended outcomes happen in Science, we use a clear and comprehensive scheme of work in line with the National Curriculum where teaching and learning shows progression across all key stages within the strands of Science. Children are exposed to key scientific vocabulary in order to understand and readily apply to their verbal, written and mathematical communication of their skills. In science lessons, children will use a range of resources, including the school and forest school environments, to develop their knowledge and understanding that is integral to their learning and develop their understanding of working scientifically. Children reflect on previous learning and cross curricular links will be made wherever possible with a particular emphasis on using scientific vocabulary across subjects; children will be able to build on prior knowledge and link ideas together, enabling them to question and become enquiry based learners. Attainment will be assessed each term through relevant assessment tasks and recorded on traffic light sheets in line with the school assessment policy. The science coordinator will carry out reviews of the state of science teaching through meetings with children across the school and looking at examples of children's work. We will involve parents in their child's science work by setting homework and holding an annual science week where parents are invited into school to complete investigations with their children or talk about the role of science in their working lives.

Science Impact

The vast majority of children will achieve age related expectations in Science at the end of their cohort year. Through quality first teaching and the experiences of a great range of lessons and activities, children will retain knowledge that is pertinent to Science with a real life context, including being able to name scientists and scientific roles in the workplace. Children are able to question ideas and reflect on knowledge. Learners work collaboratively and practically to investigate and experiment critically. Our monitoring shows that children are able to explain the process they have taken and be able to reason scientifically. Children develop a range of technical vocabulary in the context of their Science lessons. These are referred to and reinforced regularly



Meeting the needs of our disadvantaged children, including Children Looked After, those eligible for 2 Pupil Premium funding and those with SEND

Our Science curriculum is inclusive and accessible - all of our children achieve their potential in Science. Pupils who may find other curriculum areas challenging have the opportunity to excel in this area of the curriculum. Children are encouraged to be independent in their learning and to have a thirst to do well. New knowledge is broken down into meaningful components and introduced sequentially. This supports all children when learning scientific concepts and developing the skills of scientific enquiry. Science learning outcomes are not always recorded in a written format, which can often remove a barrier for our disadvantaged children. Children may work in groups to explore ideas and complete practical activities to support their learning and give them access to positive role models. Our enriched curriculum gives our more disadvantaged children the opportunity to increase their vocabulary and develop their Science capital.

What Science is taught at Kenton?

This is an overview of what the year groups will cover in our 2-year rolling programme.

Cycle A

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Willow (Year N/R)	My body - parts	Sources of light Shadow making Making bulbs light up Autumn Season	Changes - freezing and melting	Woodland animal habitats Spring Season		Rockpool habitats What is it like at the seaside? Under the sea creatures Summer Seasons
Willow (Year 1)	<p>Animals, including humans</p> <ul style="list-style-type: none"> Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. 	<p>Animals, including Humans</p> <ul style="list-style-type: none"> Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). 	<p>Seasonal Changes</p> <ul style="list-style-type: none"> Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies 	<p>Materials Year 1</p> <ul style="list-style-type: none"> Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties 		<p>Plants</p> <ul style="list-style-type: none"> Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants, including trees

<p>Oak (Year 2/3/4)</p>	<p>Light Year 3</p> <ul style="list-style-type: none"> •recognise that they need light in order to see things and that dark is the absence of light •notice that light is reflected from surfaces •recognise that light from the sun can be dangerous and that there are ways to protect their eyes •recognise that shadows are formed when the light from a light source is blocked by a solid object •find patterns in the way that the size of shadows change. 	<p>Sound Year 4</p> <ul style="list-style-type: none"> •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. 	<p>Living Things and their Habitats Year 4</p> <ul style="list-style-type: none"> •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 •recognise that environments can change and that this can sometimes pose dangers to living things 	<p>States and Matters Year 4</p> <ul style="list-style-type: none"> •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 	<p>Plants Year 3</p> <ul style="list-style-type: none"> •identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers •explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant •investigate the way in which water is transported within plants •explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal 	
<p>Chestnut (Year 5/6)</p>	<p>Evolution & inheritance Year 6</p> <ul style="list-style-type: none"> •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 •recognise that living things have changed over time and that 	<p>Light Year 6</p> <ul style="list-style-type: none"> •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. 		<p>States of matter/properties and changes of materials.</p> <ul style="list-style-type: none"> •compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets •know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution •use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating 	<p>Living things and their habitats Y6 classification</p> <ul style="list-style-type: none"> •Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals give reasons for classifying plants and animals based on specific characteristics. 	<p>Animals including humans Y5</p> <ul style="list-style-type: none"> •Explain the stages of human development (baby, toddler, child, adolescence, adult, old age) and the changes that happen at each stage. •Explain how babies grow and develop (height and weight - data and graphs). •Describe and explain the main changes of puberty and reasons for these changes. Similarities and differences experienced

	fossils provide information about living things that inhabited the Earth millions of years ago			<ul style="list-style-type: none"> •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 		by boys and girls during puberty.
--	--	--	--	---	--	-----------------------------------

Cycle B

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Willow (Year N/R)	<p>My Body Forces</p> <p>EYFS</p> <ul style="list-style-type: none"> • Explore the natural world around them. • Describe what they see, hear and feel whilst outside. 	<p>Sources of light</p> <p>Autumn Season Sound</p> <p>EYFS</p> <ul style="list-style-type: none"> • Describe what they see, hear and feel whilst outside. 	<p>Woodland Habitats</p> <p>Earth and Space</p> <p>EYFS</p> <ul style="list-style-type: none"> • Explore the natural world around them. 	<p>Our senses - how do we know about the world around us</p> <p>Spring Season Light</p> <p>EYFS</p>	Changes - freezing/melting	Where do minibeasts like to live? Summer Season

			<ul style="list-style-type: none"> Describe what they see, hear and feel whilst outside. 	<ul style="list-style-type: none"> Describe what they see, hear and feel whilst outside. 		
Willow (Year 1)	<p>Materials</p> <p>Year 2</p> <ul style="list-style-type: none"> Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. 		<p>Animals including humans</p> <ul style="list-style-type: none"> Notice that animals, including humans, have offspring which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. 	<p>Plants</p> <ul style="list-style-type: none"> Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy 		<p>Living things and their habitat</p> <ul style="list-style-type: none"> Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including microhabitats. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.
Oak (Year 2/3/4)	<p>Animals including Humans</p> <p>Year 4</p> <ul style="list-style-type: none"> In humans (child 20 teeth; adult 32 teeth), identify incisors, canine, premolar and molar teeth and their function (slicing, biting, holding, grinding). Link functions to other animals eg, lion, cow, shark. Identify the 5 main food groups needed for a balanced 			<p>Rocks</p> <p>Year 3</p> <ul style="list-style-type: none"> 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 	<p>Forces and Magnets</p> <p>Year 3</p> <ul style="list-style-type: none"> Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract or repel each other and attract some materials and not others. Compare and group together a variety of everyday materials on the 	<p>Electricity</p> <p>Year 4</p> <ul style="list-style-type: none"> 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

	<p>diet (carbohydrates, protein, dairy, fat, fruit & vegetables) and sort food items into them.</p> <ul style="list-style-type: none"> Identify the 7 nutrient types needed for a balanced diet (carbohydrates, protein, fibre, fat, vitamins, minerals, water) and sort food items into them. Describe the simple functions of the digestive system in humans (see key vocab below). <ul style="list-style-type: none"> Construct and interpret different types of food chain identifying producers, predators and prey. 			<p>formed when things that have lived are trapped within rock.</p> <ul style="list-style-type: none"> Recognise that soils are made from rocks and organic matter. 	<p>basis of whether they are attracted to a magnet, and identify some magnetic materials.</p> <ul style="list-style-type: none"> Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing. 	<p>circuit, based on whether or not the lamp is part of a complete loop with a battery</p> <ul style="list-style-type: none"> 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.
<p>Chestnut (Year 5/6)</p>	<p>Earth and Space</p> <ul style="list-style-type: none"> 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. 	<p>Electricity</p> <p>Y6</p> <ul style="list-style-type: none"> 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. 	<p>Forces</p> <p>Y5</p> <ul style="list-style-type: none"> 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 	<p>Living things and their habitats</p> <p>Y5</p> <ul style="list-style-type: none"> Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals 		<p>Animals including humans</p> <p>Y6</p> <ul style="list-style-type: none"> identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function describe the ways in which nutrients and water are transported within animals, including humans

Formative Assessment.

Opportunities to assess are built into our curriculum plans. We will use these benchmark statements to inform and set expectations for pupils' achievement and to create assessment criteria in the individual teaching units. We will provide formative day to day assessment, end of long or short enquiry assessments which may be quizzes, short tests or purposeful assessment tasks which may be labelling a diagram or answering an open ended, rich question for instance, 'Is a flame alive?' 'Is a deciduous tree dead in winter?'

End Points. And Expectations.

These may need to be broken down into skills as set out in your examples.

We will use the Attainment Targets expectations in the National Curriculum, to help plan an engaging and challenging key stage that provides opportunities for pupils to make progress and to consider 'what a scientist looks like' at certain points in their education.

In order for our children to operate as successful scientists, they will be taught a wide range of essential enquiry skills. These skills will build upon earlier opportunities they have had to play, explore, create, engage in active learning, and think critically in the Early Years Foundation Stage.

By the end of Key Stage 1, children will:	By the end of Year 4, children will:	By the end of Key Stage 2, children will build on their prior knowledge and extend this further. Children will:
<ul style="list-style-type: none">• experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them.	<ul style="list-style-type: none">• broaden their scientific view of the world around them through exploring, talking about, testing and developing ideas about everyday phenomena.	<ul style="list-style-type: none">• develop a deeper understanding of a wide range of scientific ideas.

- Show curiosity and ask questions about what they notice.
- Have developed 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.
- Use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways.

- Identify relationships between living and non-living things and familiar environments and by begin to develop ideas about functions, relationships and interactions.
- Explore, talk about, test and develop ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions.
- Ask their own questions about what they observe and are able to make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information.
- Draw simple conclusions and uses some scientific language, first, to talk about and, later, to write about what they have found out.
- Read and spell scientific vocabulary correctly and with confidence, using their growing word and spelling knowledge

- Explore and talk about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically.
- Encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates.
- Recognise that scientific ideas change and develop over time.
- Select the most appropriate ways to answer science 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 their scientific knowledge and understanding to explain their findings

Early Years Foundation Stage

The statements that are applicable to the development of children's geographical understanding and knowledge are drawn from Understanding the World and The natural world where children are guided to make sense of their physical world and their community, and Mathematics, where children's positional language and descriptions of routes and locations is progressed.

Knowledge Skills and Understanding Break Down for Geography

Foundation Stage

Science in the EYFS focuses on the development area of Understanding of the World. In the EYFS, children are given opportunities throughout the year within their continuous provision to explore, ask and answer questions about the world around them. All year children will explore their natural environment through weekly trips to the Woodland Camp. They will regularly visit the school animals to observe and care for them, including feeding them, grooming them and collecting eggs from the chickens.

In the EYFS, Understanding of the World is developed throughout the year and revisited in line with children's interests and learning needs. Planning is flexible and where links can be made to the wider world, discussions of space, place and people should be made.

- Understanding the world involves guiding children to make sense of their physical world. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them. In addition, listening to a broad selection of stories and non-fiction will foster their understanding of our ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across areas. Enriching and widening children's vocabulary will support later reading comprehension.

Pre and Post Primary Objectives

Because children begin school at very different starting points, and with very different life experiences, we feel it important to include Nursery objectives in our Curriculum Document to ensure that if there are big gaps in a child's understanding, the school can quickly address these gaps and ensure barriers to learning are minimised.

Likewise, throughout a child's time in at Kenn, they may experience a vast range of learning opportunities in Science outside of school with their families. To ensure that a broader and deeper understanding in Science is catered for, we refer to the Key Stage 3 Science objectives to allow teachers to challenge learners and ensure pupils continue to progress.

Nursery Objectives

Plants	<ul style="list-style-type: none">• Use all their senses in hands-on exploration of natural materials.• Explore collections of materials with similar and/or different properties.• 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.
Living Things and their Habitats	<ul style="list-style-type: none">• Use all their senses in hands-on exploration of natural materials.• Explore collections of materials with similar and/or different properties.• Begin to understand the need to respect and care for the natural environment and all living things
Animals, including humans	<ul style="list-style-type: none">• Use all their senses in hands-on exploration of natural materials.• Begin to make sense of their own life-story and family's history.• 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.
Evolution and Inheritance	<ul style="list-style-type: none">• Begin to understand the need to respect and care for the natural environment and all living things. (Nursery – Living things and their habitats)
Seasonal Changes	<ul style="list-style-type: none">• Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans)

Materials	<ul style="list-style-type: none"> • Use all their senses in hands-on exploration of natural materials. • Explore collections of materials with similar and/or different properties. • Talk about the differences between materials and changes they notice.
Rocks	<ul style="list-style-type: none"> • Use all their senses in hands-on exploration of natural materials. (Nursery – Living things and their habitats) • Explore collections of materials with similar and/or different properties. (Nursery – Living things and their habitats)

Light	<ul style="list-style-type: none"> • Explore how things work. • Talk about the differences in materials and changes they notice.
Forces	<ul style="list-style-type: none"> • Explore how things work. • Explore and talk about different forces they can feel. • Talk about the differences between materials and changes they notice
Sound	<ul style="list-style-type: none"> • Explore how things work.
Electricity	<ul style="list-style-type: none"> • Explore how things work.
Earth and Space	-

Key Stage 3 Objectives

Plants	<ul style="list-style-type: none"> • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms.
Living Things and their Habitats	<ul style="list-style-type: none"> • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms.

	<ul style="list-style-type: none"> • Differences between species.
Animals, including humans	<ul style="list-style-type: none"> • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. • The structure and functions of the gas exchange system in humans, including adaptations to function. • The mechanism of breathing to move air in and out of the lungs. • The impact of exercise, asthma and smoking on the human gas exchange system.
Evolution and Inheritance	<ul style="list-style-type: none"> • 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.
Seasonal Changes	<ul style="list-style-type: none"> • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres.
Materials	<p>Chemical reactions as the rearrangement of atoms.</p> <ul style="list-style-type: none"> • Representing chemical reactions using formulae and using equations. • Combustion, thermal decomposition, oxidation and displacement reactions. • Defining acids and alkalis in terms of neutralisation reactions. • The pH scale for measuring acidity/alkalinity; and indicators.
Rocks	<ul style="list-style-type: none"> • The composition of the Earth. • The structure of the Earth. • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks
Light	<ul style="list-style-type: none"> • 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

	<p>focusing (qualitative); the human eye.</p> <ul style="list-style-type: none"> • Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.
Forces	<ul style="list-style-type: none"> • Magnetic fields by plotting with compass, representation by field lines. • Earth's magnetism, compass and navigation. • Forces as pushes or pulls, arising from the interaction between two objects. • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. • Moment as the turning effect of a force. • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. • Forces measured in Newtons, measurements of stretch or compression as force is changed.
Sound	<ul style="list-style-type: none"> • Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. • Sound needs a medium to travel, the speed of sound in air, in water, in solids. • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. • Auditory range of humans and animals. • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. • Waves transferring information for conversion to electrical signals by microphone.
Electricity	<ul style="list-style-type: none"> • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. • Differences in resistance between conducting and insulating components (quantitative). • Static electricity.
Earth and Space	<ul style="list-style-type: none"> • Gravity force, weight = mass x gravitational field strength (g), on Earth $g=10 \text{ N/kg}$, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). • Our Sun as a star, other stars in our galaxy, other galaxies.

- The seasons and the Earth's tilt, day length at different times of year, in different hemispheres.
- The light year as a unit of astronomical distance.

Science Skills Progression

The working scientifically statements from the science National Curriculum for England are presented in bold. The bullet points that follow each statement are additional guidance that clarifies the expectations.

Working scientifically statements that feature in more than one of the broader skills definitions are shown in italics.

In the EYFS, the characteristics of effective learning from the Statutory Framework for the Early Years Foundation Stage are the foundations on which the *working scientifically* skills build in Key Stage 1. While children are playing and exploring, teachers should be modelling, encouraging and supporting them to do the following:

- show curiosity and ask questions
- make observations using their senses and simple equipment
- make direct comparisons
- use equipment to measure
- record their observations by drawing, taking photographs, using sorting rings or boxes and, in Reception, on simple tick sheets
- use their observations to help them to answer their questions
- talk about what they are doing and have found out
- identify, sort and group.

In EYFS, children will:

Communication and language

- Learn new vocabulary.
- Ask questions to find out more and to check what has been said to them.
- Articulate their ideas and thoughts in well-formed sentences. • Describe events in some detail.
- Use talk to help work out problems and organise thinking and activities, and to explain how things work and why they might happen.

	<ul style="list-style-type: none"> • Use new vocabulary in different contexts.
Personal, Social and Emotional Development	Know and talk about the different factors that support their overall health and wellbeing: - regular physical activity - healthy eating - toothbrushing - sensible amounts of 'screen time' - having a good sleep routine - being a safe pedestrian
Understanding the World	<ul style="list-style-type: none"> • 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.
Early Learning Goal Communication and Language	Listening, Attention and Understanding <ul style="list-style-type: none"> • Make comments about what they have heard and ask questions to clarify their understanding.
Early Learning Goal Personal, Social and Emotional Development	Managing Self <ul style="list-style-type: none"> • Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.
Early Learning Goal Understanding the World	The Natural World <ul style="list-style-type: none"> • 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.

In KS1 and KS2, children will:

Year 1 and 2	Year 3 and 4	Year 5 and 6
Asking questions and recognising that they can be answered in different ways		
<p>Asking simple questions and recognising that they can be answered in different ways</p> <ul style="list-style-type: none"> • While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions. • The children answer questions developed with the teacher often through a scenario. • The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered. 	<p>Asking relevant questions and using different types of scientific enquiries to answer them</p> <ul style="list-style-type: none"> • The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question. 	<p>Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <ul style="list-style-type: none"> • Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. • Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.
Investigations Planned to Ensure Children Develop these Skills		

Year 1 and 2	Year 3 and 4	Year 5 and 6
Making observations and taking measurements		
<p>Observing closely, using simple equipment</p> <ul style="list-style-type: none"> • Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate 	<p>Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</p>	<p>Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</p> <ul style="list-style-type: none"> • The children select measuring equipment to give the

<p>senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations.</p> <ul style="list-style-type: none"> • They begin to take measurements, initially by compar 	<ul style="list-style-type: none"> • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements. 	<p>most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.</p> <ul style="list-style-type: none"> • During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).
---	---	---

Investigations Planned to Ensure Children Develop these Skills

<p>Year B Summer 2 – ‘Living things in their habitats’ – What can I notice about plants and insects? Use a range of equipment, including magnifying glasses, to observe mini beasts and plants and flowers found in the school playing field.</p>	<p>Year B Autumn 1 – ‘My Body - Animals including humans’: Do children with longer legs jump further? Measure how far children in the class can do a standing jump, and compare this to the length of their legs.</p>	<p>Year B Spring 1 – ‘Forces’ – Can I make a parachute to slow down the rate an object falls to Earth? Create parachutes and drop them from a controlled height. Measure the length of time it takes the parachute to fall to earth. What forces are at work? Does a bigger parachute slow down the figure? What is the relationship between the size of the parachute and the time it takes to fall to earth?</p>
--	--	---

Year 1 and 2	Year 3 and 4	Year 5 and 6
<h3>Engaging in practical enquiry to answer questions</h3>		
<p>Performing simple tests</p> <ul style="list-style-type: none"> • The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time. Identifying and classifying 	<p>Setting up simple practical enquiries, comparative and fair tests</p> <ul style="list-style-type: none"> • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; 	<p><i>Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</i></p> <ul style="list-style-type: none"> • The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations

<ul style="list-style-type: none"> • Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing. 	<p>observations over time; and pattern seeking.</p> <p><i>Explanatory note A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome. A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.</i></p>	<p>or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.</p>

Investigations Planned to Ensure Children Develop these Skills

--	--	--

Year 1 and 2	Year 3 and 4	Year 5 and 6
Recording and presenting evidence		
<p>Gathering and recording data to help in answering questions</p> <ul style="list-style-type: none"> • The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings. 	<p>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</p> <ul style="list-style-type: none"> • The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications e.g. using tables, Venn diagrams, Carroll diagrams. 	<p>Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</p> <ul style="list-style-type: none"> • The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. • Children present the same data in different ways in order to help with answering the question.

- Children are supported to present the same data in different ways in order to help with answering the question.

Investigations Planned to Ensure Children Develop these Skills

Year 1 and 2

Year 3 and 4

Year 5 and 6

Answering questions and concluding

Using their observations and ideas to suggest answers to questions

- Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources.

Using straightforward scientific evidence to answer questions or to support their findings

- Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence.

Identifying scientific evidence that has been used to support or refute ideas or arguments

- Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer.
- They talk about how their scientific ideas change due to new evidence that they have gathered.
- They talk about how new discoveries change scientific understanding.

Using their observations and ideas to suggest answers to questions

- The children recognise 'biggest and smallest', 'best and worst' etc. from their data.

Identifying differences, similarities or changes related to simple scientific ideas and processes

- Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships.

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

- In their conclusions, children: identify causal relationships and patterns in the natural world from

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

- They draw conclusions based on their evidence and current subject knowledge.

their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.

Investigations Planned to Ensure Children Develop these Skills

--	--	--

Year 1 and 2

Year 3 and 4

Year 5 and 6

Evaluating and raising further questions and predictions

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

- They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry

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

- They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used.
- They identify any limitations that reduce the trust they have in their data.

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

- Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface.
- Following a scientific experience, the children ask

Using test results to make predictions to set up further comparative and fair tests

- Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

	further questions which can be answered by extending the same enquiry.	
Investigations Planned to Ensure Children Develop these Skills		

Year 1 and 2	Year 3 and 4	Year 5 and 6
Communicate their findings		
	<p>Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</p> <ul style="list-style-type: none"> • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary. 	<p><i>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></p> <ul style="list-style-type: none"> • They communicate their findings to an audience using relevant scientific language and illustrations.
Investigations Planned to Ensure Children Develop these Skills		

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	<p><u>Animals including humans</u> Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, carnivore, herbivore, omnivore, amphibian, reptiles, birds, mammals.</p> <p><u>Materials</u> Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through</p>	<p><u>Materials</u> Wood, plastic, glass, metal, water, rock, brick, paper, fabric, card, rubber Properties – rough/smooth, flexible/rigid, strong/weak, reflective/non-reflective, transparent/translucent/opaque Changing Shape - squashing, bending, twisting and stretching, pushing and pulling</p> <p><u>Plants</u> As for year 1 plus - light, shade, sun, warm, cool, water, grow, healthy</p> <p><u>Living things and their habitats</u> Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g.</p>	<p><u>Animals including humans</u> Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, skull, ribs, spine, muscles, joints</p> <p><u>Forces</u> Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole</p> <p><u>Light</u> Light, Light source, Dark, Absence of light, Transparent, Translucent, Opaque, Shiny, Matt, Surface, Shadow, Reflect, Mirror, Sunlight, Dangerous</p>	<p><u>Animals including humans</u> Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain</p> <p><u>Living things and their habitats</u> Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate</p> <p><u>Electricity</u> Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection,</p>	<p><u>Materials</u> Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material</p> <p><u>Living things and their habitats</u> Life cycle, reproduction, sexual reproduction, asexual reproduction, fertilise, gestation, metamorphosis, pollination</p> <p><u>Forces</u> Gravity, air resistance, water resistance, friction, surface, force, accelerate, mechanism, pulley, gear, spring</p> <p><u>Animals including humans</u> Human, development, baby, toddler, child, teenager, adult, puberty, gestation</p> <p><u>Light</u> Hardness, solubility,</p>	<p><u>Animals including humans</u> Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle</p> <p><u>Electricity</u> Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage NB Children do not need to understand what voltage is but will use volts and voltage to describe different batteries. The words cells and batteries are now used interchangeably</p> <p><u>Evolution and inheritance</u> Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils</p> <p><u>Light</u> Straight lines, Light rays.</p>

	<p><u>Seasonal changes</u> Weather (sunny, rainy, windy, snowy etc.) , Seasons (winter, summer, spring, autumn), Sun, sunrise, sunset, Day length</p> <p><u>Plants</u> Leaves, flowers, blossom, petals, fruit, roots, bulb, seed, trunk, branches, stem. Names of plants in their local environment for example grass, clover, daisy, buttercup, dandelion, oak, holly, daffodil, tulip etc. and plants we grow to eat such as lettuce, tomatoes, cucumber, radish, herb etc.</p>	<p>under logs, in bushes etc.</p> <p><u>Animals including humans</u> Offspring, Reproduction, Growth, Child, Young/Old stages (examples - chick/hen, baby/child/adult, caterpillar/butterfly) , Exercise, Heartbeat, Pulse, Breathing, Hygiene, Germs, Disease, Nutrition, Food types (examples – meat, fish, vegetables, bread, rice, pasta)</p>	<p><u>Plants</u> Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal – wind dispersal, animal dispersal, water dispersal</p> <p><u>Rocks</u> Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil</p>	<p>short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol N.B. Children in year 4 do not need to use standard symbols as this is taught in year 6</p> <p><u>Sound</u> sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation</p> <p><u>Materials</u> Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle</p>	<p>transparent, translucent, opaque, conductivity.</p> <p><u>Earth and Space</u> Earth, Sun, Moon, Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune Spherical, Solar system, rotates, star, orbits, planets, axis</p>	<p>(Y3 vocabulary - Light, Light source, Dark, Absence of light, Transparent, Translucent, Opaque, Shiny, Matt, Surface, Shadow, Reflect, Mirror, Sunlight, Dangerous)</p> <p><u>Living things and their habitats</u> Micro-organisms, plants, animal, classification, invertebrates, insects, vertebrates, amphibians, reptiles, mammals.</p>
--	--	---	--	--	---	--

