Science

National Curriculum Aims

The national curriculum for science aims to ensure that all pupils:

- 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
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

Expected covered content from Key Stage 1

Working scientifically

- During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:
- asking simple questions and recognising that they can be answered in different ways
- observing closely, using simple equipment
- performing simple tests
- identifying and classifying
- using their observations and ideas to suggest answers to questions
- gathering and recording data to help in answering questions

Year 1 programme of study

Plants

Pupils should be taught to:

- identify and name a variety of common wild and garden plants, including deciduous and evergreen trees
- identify and describe the basic structure of a variety of common flowering plants, including trees

Animals, including humans

Pupils should be taught to:

- identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals
- identify and name a variety of common animals that are carnivores, herbivores and omnivores
- describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets)
- identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense

Everyday materials

Pupils should be taught to:

- distinguish between an object and the material from which it is made
- identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock
- describe the simple physical properties of a variety of everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties

Seasonal changes

Pupils should be taught to:

- observe changes across the 4 seasons
- observe and describe weather associated with the seasons and how day length varies

Year 2 programme of study

Living things and their habitats

Pupils should be taught to:

- 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

Plants

Pupils should be taught to:

- observe and describe how seeds and bulbs grow into mature plants
- find out and describe how plants need water, light and a suitable temperature to grow and stay healthy

Animals, including humans

Pupils should be taught to:

- 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

Uses of everyday materials

Pupils should be taught to:

- 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

Dimensions – Science knowledge building – **processes and changes**

		Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8
			Competency (NC Ess – Yr 4)	NC Essentials			NC Essentials	Competency	
	Composite	**Key Knowledge**							
Year 3	**Understand more complex scientific processes and know some factors that can affect change**			**Rocks:** Know that rocks have developed from other parts of organic matter, such as sand Know, in simple terms, how fossils are formed **States of Matter:** Know that evaporation and condensation play a key role in the water cycle Know that changes in temperature can affect how quickly condensation and evaporation happens	Know that the process of displacement has an effect on water level Understand that the mass of an object has an effect on the displacement of water	Know the life cycle of plants, including the process of pollination and seed dispersal Know how animals and environmental factors affect the pollination / seed dispersal process			Know that animals are part of food chains and this is how they gain the right type and amount of food Know that food chains and webs start with a producer followed by prey and predator
Year 4		Know that circuits need to be complete in order for the components to work Understand how using a switch affects an electrical circuit		Know that magnets can attract or repel other magnets, depending on their poles Know that forces are affected by distance		Understand the link between the production of sounds and vibration and how sounds can be changed e.g. volume Know that sounds travel in order to reach our ears and that materials they travel through affect what we hear			
Year 5	**Understand that numerous factors can affect or prevent change**	Know that the Earth orbits the sun and the Earth rotates, creating the change between day and night Know that the relationship between the Moon and the Earth causes the tides		Know how the human body changes as we age Understand that drugs / medicine can speed up and slow down the aging process, depending on what is taken		Know that the brightness of a bulb or volume of a buzzer can be changed by altering components Understand how the brightness of a bulb or volume of a buzzer is affected when components are changed			Know the basic changes that cotton undergoes as part of the manufacturing process Know that some man-made materials are made to be useable for items
Year 6		Know that unsupported objects fall towards Earth because of gravity Know that air resistance affects the speed at which items fall towards Earth			Know how the position of the sun in the sky affects the size of a shadow Know that objects are seen through reflected or given out light and that a shiny surface reduces the absorption of light	Know that, while some materials can be changed and made into new materials, others cannot Know that some changes are not always reversible and explain why			Know that offspring can vary in appearance to its parents Know that animal reproduction can be more or less successful depending on external factors such as poor nutrition, climate change

Dimensions – Science knowledge building – **Methods**

		Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8
			Competency (NC Ess – Yr 4)	NC Essentials			NC Essentials	Competency	
	Composite	**Key Knowledge**							
Year 3	**Understand that methods are a key part of safe experimentation and have a secure knowledge of features**			**Rocks:** Know how to fairly test rocks for their different qualities, such as permeability Know how to pose an hypothesis about the properties of different rocks, using observation and touch beforehand **States of Matter:** Know how to safely experiment with evaporation and condensation Know how to produce detailed results following an investigation	Know that prediction is an important element and predict whether a range of materials will float or sink Understand why some materials float and why some sinks, using evidence to draw conclusions	Know how to conduct a fair test when growing a plant from seed by using the requirements for life Understand how plant species grow differently and how deprivation of certain life requirements can affect growth			Understand how food is processed through the digestive system by observation Know how to carry out a fair test showing the effects of sugar on teeth
Year 4		Know how to safely experiment with basic components to make a circuit Understand how some components work within the circuit and how their use affects the effectiveness of it		Know how to make predictions and give reasons why they think some materials are not magnetic Know how to draw conclusions based on an experiment involving magnets		Understand the factors that can affect how well sound travels, through experimentation Know that sounds that are too loud can affect hearing so safety is important when experimenting with sound			
Year 5	**Know what makes a good methodology and explain how adaptations can lead to improvements**	Know how to explain a theory well by backing it up with evidence, such a diagrams and clear labelling Understand that learning about other methods can lead to adaptations and improvements		Know how to plan an investigation involving height and arm span, making hypotheses Know how to plan and carry out an experiment involving head circumference and height, drawing conclusions from observations		Know how to construct a circuit and introduce a larger number of or higher voltage of cells to make a bulb brighter Understand why it can be beneficial to use lower voltage bulbs in certain situations			Know how to develop an experiment based on cotton, showing a clear focus on one quality of the material Know how to improve an investigation through making adaptations e.g. change one thing
Year 6		Know how to carry out a fair test on air or water resistant objects Know how to provide a clear hypothesis and conclusion linked to an investigation and suggest improvements 'If we...'			Know how to make adaptations to create an experiment about shadows Understand how to use previous knowledge to support a methodology when conducting an experiment about light	Know how adaptations can be used in an investigation to separate solids and liquids Know that dissolving and mixing can often be reversible and, therefore, helpful when separating solids, liquids or gases			Understand how some animals have adapted to suit their environments and know the ways that some animals have done this Know what a biome is and understand how adaptations differ in different biomes

Dimensions – Science knowledge building – **Observing and Recording**

		Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8
			Competency (NC Ess – Yr 4)	NC Essentials			NC Essentials	Competency	
	Composite	**Key Knowledge**							
Year 3	**Know that clear observations and recordings support findings and prove theories**			**Rocks:** Understand how observation of fossils and their location can help us to determine what kind of creature it was Understand how, by observing and recording the properties of rocks and soils, we can check their suitability for different uses **States of Matter:** Know how to make clear recordings of the evaporation process to prove theories regarding temperature and if possible, wind speed Know how to use recordings and observations of evaporation and condensation to monitor changes	Observe and make recordings of floating and sinking objects Observe and record objects that sink or float using volume and mass recordings	Observe growth in plants and make some simple recordings Observe and record water transportation in plants and explain what can affect it			Know how to group things using classification Understand how classification keys are used to support findings about features of animals and plants
Year 4		Identify parts of a circuit and know the effect of an open and closed circuit Know how to draw a simple circuit using correct symbols		Observe and record a range of magnetic materials from around the school Know how to use observations to prove hypotheses about magnetic and non-magnetic materials		Understand how to observe patterns between volume and vibration strength, and object features and pitch Know how to hypothesise regarding volume and vibration strength or object size and pitch and test them out, recording findings			
Year 5	**Identify, analyse and explain findings that support or dismiss theories or arguments**	Know the basis of Copernicus's theory of planetary motion Know about the 'Flat Earth' theory and present basic evidence to support or dismiss this		Know how to make clear recordings for a range of body tests to support hypotheses and analyse health Understand how to make clear recordings for a range of body tests and link them to taking averages and making charts		Understand why some circuits work better than others by analyzing the components being used Understand how a circuit can be improved to make it more efficient or produce more power			Understand, through observation, why cotton is a good material for moisture control in hot weather Discuss and compare materials, both man-made and natural, to explain why some materials are chosen for certain purposes
Year 6		Know that simple pulleys, levers and gears make it easier to move larger or heavier objects using less force Know how to build a lever, pulley or gear system and explain how it is making it easier to move heavier or larger items			Understand how reflections work by exploring light and supporting findings with clear and concise diagrams and labels Know how to analyse and identify how light can be refracted	Know how to use a range of recording methods when sorting and analysing materials Know how to use comparative testing to sort materials and give evidence for placing materials in certain categories			Understand why animals, birds, plants and insects are classified and give reasons for such classifications Know the basic theory of evolution and compare it to alternative theories and arguments about the existence of life

Dimensions – Science knowledge building – **Scientific Vocabulary**

		Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8
			Competency (NC Ess – Yr 4)	NC Essentials			NC Essentials	Competency	
	Composite	**Key Knowledge**							
Year 3	**Know how scientific language learned relates to new science concepts and ideas**			**Rocks:** Know and use vocabulary relating to rocks and soil, such as "crumbling", "smooth" and "coarse" Know and use vocabulary relating to soil and rocks such as "permeability", "loamy" and "erosion" **States of Matter:** Know and use vocabulary relating to states of matter e.g; "molecule", "evaporate" and "condensation" Know and use vocabulary relating to states of matter, such as using Celsius as a measure of temperature and "precipitation"	Know and understand the terms 'buoyancy' and 'displacement' Know, understand and use the terms 'mass' and 'volume' appropriately	Know a range of vocabulary relating to the structure of flowering plants e.g. stigma, stamen Understand and use a range of vocabulary relating to the functions of flowering plants e.g. carbon dioxide			Know the names of the different types of teeth e.g. canine, incisor Know and use a wide range of vocabulary relating to digestion e.g. oesophagus
Year 4		Learn new vocabulary relating to electricity, such as 'components' and 'current' Know and understand a range of vocabulary relating to electricity such as 'circuit' and 'current'		Know and use language relating to magnets and force, such as 'attract' and 'repel' Know and use language relating to magnets and force, such as 'poles' and 'repulsion'		Know and understand the terms 'vibration', 'volume' and 'pitch' Know and understand the terms 'insulate' and 'sound waves'			
Year 5	**Know how to use a range of scientific vocabulary in various contexts**	Know and understand the terms 'orbit', 'spherical' and 'solar system' Know and understand the terms 'cycle', 'galaxy', 'constellations' and 'axis'		Know and understand the terms 'skeletal', 'digestive' and 'circulatory', relating to systems Know and understand the terms 'platelet', 'plasma', 'white blood cell' and 'red blood cell'		Know and understand the terms 'voltage' and 'circuit diagram' Use a wider range of vocabulary related to electricity, including interpreting symbols used in circuit diagrams			Know and understand the terms 'man-made', 'natural' and use in different contexts Know and understand the terms 'classify', 'criteria', 'properties', 'flexibility' and 'absorbency'
Year 6		Know and understand the terms 'accelerate', 'decelerate', 'brake' and 'gravity' Know and understand the terms 'pulley', 'gear', 'spring' and 'resistance'			Know and understand the terms 'reflect', 'periscope' and 'transparent' Know the names of different parts of the eye and understand the terms 'refraction' and 'translucent'	Know and understand the terms 'recycling' and 'reusing' Know language that connects to other subjects to support scientific knowledge e.g. 'dredging ', ' pollution '			Know and understand the terms 'classification', 'hereditary', 'environment' and 'theory of evolution' Know a wider range of vocabulary relating to specific species, such as 'tendrils' and 'gills'

Dimensions – Science knowledge building – **Uses and Implications**

		Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8
			Competency (NC Ess – Yr 4)	NC Essentials			NC Essentials	Competency	
	Composite	**Key Knowledge**							
Year 3	**Understand how science affects our lives and the implications its use has on them**			**Rocks:** Know what a paleontologist does and how their work helps us understand pre-historic creatures and plants Know how studying rocks and fossils in more depth and detail leads to greater understanding of the past **States of Matter:** Know why we add salt to ice on icy days Know why water conservation is important as the planet experiences global warming	Know that displacement is factored into the manufacture of boats and ships Understand why some boats and ships are manufactured to make them displace less water	Know that plants can require a wide range of growing conditions and can either thrive or die in various environments Know how environments can be managed to ensure successful plant growth and reproduction			Know that poor dental and digestive health can lead to problems in both animals and humans, such as weight gain Know that lack of the right food for animals in a food chain can have an impact on the biodiversity of an area
Year 4		Understand how important the availability and use of electricity is in our everyday lives Understand how electricity can make a range of appliances perform different tasks e.g. move, heat up, make a noise		Know that magnets are used in a range of industries Understand why magnets are important to a range of industries		Know that noise can be a pollutant in a similar way to light Understand how noise can be a pollutant and suggest some ways that this can be stopped or improved			
Year 5	**Know that science has implications for world issues and that it can be used for good or bad**	Know that the research of the Earth and Moon is used by space agencies and companies globally Know that research by global space agencies of the Earth, Sun and Moon develops our understanding of other planets		Know that being aware of your own health (resting heart rate etc.) is important Know how developments in understanding the human body has improved our health care system		Know about ways of producing energy that have a better global impact Know about renewable and non-renewable energy sources and give pros and cons for their use			Know that the cotton industry developed into a manufacturing process that involves many countries Understand how the cotton industry has had an impact on farming in the Americas
Year 6		Find and describe other uses for pulleys, lever and gears in everyday situations Compare gear, lever or pulley systems in a range of everyday situations and find those that are most effective			Understand how periscopes work and how their use has been influential e.g. World War 1 Know that studying how light behaves can support a wide range of industries and technologies such as improving eye health	Know that recycling can change a material so it can be used for something else Know the process of recycling paper or glass and what can be made from these substances			Know that some animals are at risk due to changes in their biome and, therefore, reproduction rates and births are decreasing Understand how humans can affect habitats and biomes and know some solutions to help save animals and plants living there

Dimensions – Science knowledge building – **Cross Curricular (STEM)**

		Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8
			Competency (NC Ess – Yr 4)	NC Essentials			NC Essentials	Competency	
	Composite	**Key Knowledge**							
Year 3	**Understand that the links between science, technology, engineering and mathematics are key to many industries**			**Rocks:** Know a range of rock types that would be best suited to building structures Understand how different plants need different soils and, therefore, how humans can engineer soils to be best for food plants **States of Matter:** Know how to read a thermometer in Celsius and explain how it works (Maths) Know how to collate data from a thermometer to create a detailed graph (Maths)	Know how to make an object that floats e.g. boat (Design Technology) Know how to develop an object that floats so that is more efficient in water (Design Technology)	Know how to use data from plant experiments to create charts and graphs Know how to use data collected from plant experiments to suggest ways of improving plant growing conditions			Understand, in simple terms, how the medical industry works to protect our teeth Know how zoos and safari parks ensure animals get the right types and amounts of nutrition
Year 4		Know how simple conductors and insulators work and how they can keep us safe Know that metals in general are better conductors and begin to learn which are better conductors than others		Know how to design and make a fishing game using magnets (Design Technology) Know that magnets are used for lifting, holding, separating and moving (Engineering)		Know how factors can affect the travel of vibrations and explore ways these could be improved Know that we can send sound without wires/strings, through wireless sound systems			
Year 5	**Understand how their own STEM skills can benefit future science work in school and beyond**	Know how to put together a presentation of findings, share it with a group and prepare for questions Know how to put together an argument for a particular theory e.g. spherical Earth		Know how to make clear graphs and calculate averages (Maths) Know that companies design advertising campaigns to encourage consumers to buy their food and drink products (DT)		Understand how STEM has an impact on developing energy sources and consider ways of making their own energy sources Know how electricity gets to our homes and school and how it is measured			Explore ways of producing materials so they have a global benefit Know that technology is being developed to ensure manufacturing is becoming more environmentally friendly
Year 6		Know how to make a useable pulley, lever or gear system Know how to use a Newton Meter and take measurements			Know that light is needed to make a range of objects work e.g. camera Know how adaptations have lead to improvements in the use and quality of light-emitting devices	Know how use ratios to create solutions (Maths) Know how to record findings correctly, using mathematical diagrams (Maths)			Know how to find more in-depth information about a specific animal, plant, insect or bird Understand that information needs to be relevant and carefully read to ensure that theories are supported by evidence