



SCIENCE

INTENT

At Alton Park Junior School, we recognise that science is a core curriculum subject and it is our *intent* that our pupils will learn scientific skills supported by our values:

Aspiration

- Have a positive attitude towards science and develop their scientific knowledge, understanding and skills.

Learning

- Access the National Curriculum to develop their scientific knowledge and conceptual understanding
- Develop understanding of the nature, processes and methods of science through different types of science enquiry (working scientifically) that help them to answer scientific questions about the world around them
- Use scientific methods to record and present their ideas
- Have their individual needs met through carefully planned and assessed activities
- Be taught by teachers who are being enabled to deepen and develop their knowledge and understanding of the pedagogy of Science

Tenacity

- Be resilient learners and use a growth mindset towards science

Opportunity

- Be equipped with the scientific skills required to understand the uses and implications of science
- Use science to enrich their mathematical understanding
- Use ICT to deepen their understanding of science
- Be given opportunities to creatively explore their ideas through a STEM approach

Nurture

- Be encouraged to respect the environment – locally and globally

IMPLEMENTATION

At Alton Park Junior School, science is implemented in line with the school's 'Know more, remember more', 'learning for all' and 'build character' agenda. Lessons are planned and sequenced based on the National Curriculum and the school's long term plan. Opportunities for scientific enquiry are embedded within units and children are taught to work scientifically through these. The curriculum has been organised so that pupils revisit previous curriculum concepts and build on the knowledge and skills systematically each year. Progression has been identified for content, vocabulary and working scientifically. Teachers explicitly teach the knowledge, skills and processes required to work scientifically. They guide pupils to apply this in practice and incorporate opportunities for discussion, reflection and evaluation.

Scientific enquiry

Each of the 5 types of scientific enquiry will be focused upon throughout each year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation (including over time)

YEAR 3		
Au 1: Animals including humans	Au 2: Forces and magnets	Sp 1: Rocks
<p>National Curriculum objectives: Pupils should be taught to:</p> <ul style="list-style-type: none"> • identify that animals including humans need the right type and amount of nutrition and that they cannot make their own food; know they get nutrition from what they eat. • identify that humans and some other animals have skeletons and muscles for support protection and movement. • introduce main body parts associated with the skeleton and muscles. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> • identifying and grouping animals with and without skeletons and observing and comparing their movement • exploring ideas about what would happen if humans did not have skeletons. • Compare and contrast the diets of different animals including their pets and decide ways of grouping them according to what they eat. • Research different food groups and how they keep us healthy and design meals based on what they find out. 	<p>National Curriculum objectives: Pupils should be taught to:</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 basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having two poles • predict whether two magnets will attract or repel each other, depending on which poles are facing. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> • comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces • gather and record data to find answers to questions. 	<p>National Curriculum objectives: Pupils should be taught to:</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 formed when things that have lived are trapped within rock. • recognise that soils are made from rocks and organic matter. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> • observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time; • using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. • researching and discussing the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. • exploring different soils and identifying similarities and differences between them

	<ul style="list-style-type: none"> • exploring the strengths of different magnets and finding a fair way to compare them; • sorting materials into those that are magnetic and those that are not; • looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; • identifying properties that make magnets useful and suggest creative uses. 	<p>and investigating what happens when rocks are rubbed together or what changes occur when they are in water. They can raise and answer questions about the way soils are formed.</p>
Sp 2: Light	Su 1 and Su 2: Plants	
<p>National Curriculum objectives: Pupils should be taught to:</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 an opaque object • find patterns in the way that the size of shadows change. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> • looking for patterns in what happens to shadows when the light source moves or 	<p>National Curriculum objectives: Pupils should be taught to:</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. Note that plants can make their own food. • 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>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> • comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser • discovering how seeds are formed by observing the different stages of plant life cycles over a period of time 	

the distance between the light source and the object changes.

- explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them answer questions about how light behaves.

- looking for patterns in the structure of fruits that relate to how the seeds are dispersed.
- observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.

YEAR 4

Au 1: Living things and their habitats

National Curriculum objectives

Pupils should be taught to:

- recognise that living things can be grouped in a variety of ways e.g. flowering plants (including grasses) and non-flowering plants, such as ferns and mosses
- explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds and mammals; and invertebrates into snails and slugs, worms, spiders and insects.
- recognise that environments can change (throughout the year and over time) and that this can sometimes pose dangers to living things. Include use of the local environment.
- explore examples of human impact e.g. the positive effect of nature reserves and the negative effects of litter/deforestation.

Examples of scientific enquiry for this unit:

- using and making simple guides or keys to explore and identify local plants and animals;
- making a guide to local living things;

Au 2: States of matter

National Curriculum objectives

Pupils should be taught to:

- compare and group materials together, according to whether they are solids, liquids or gases
- develop simple descriptions of states of matter e.g. solids hold their shape; liquids form a pool and not a pile; gases escape from an unsealed container.
- observe that some materials change state when they are heated or cooled (avoid using materials where heating is associated with chemical change eg baking or burning as this is studied later), and measure or research the temperature at which this happens in degrees Celsius (°C)
- observe water as a solid, liquid and a gas.
- identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Examples of scientific enquiry for this unit:

- grouping and classifying a variety of different materials;
- exploring the effect of temperature on substances such as chocolate, butter, cream

Sp 1: Electricity

National Curriculum objectives

Pupils should be taught to:

- 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
- draw circuits as pictorial representations not using circuit symbols as these are introduced later.
- identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- recognise some common conductors and insulators, and associate metals with being good conductors.
- work safely with electricity.

Examples of scientific enquiry for this unit:

- observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some

<ul style="list-style-type: none"> raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched. 	<ul style="list-style-type: none"> researching the temperature at which materials change state observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting 	<p>cannot be used to connect across a gap in a circuit</p>
<p>Sp 2: Sound</p>	<p>Su 1 and Su 2: Animals including humans</p>	
<p>National Curriculum objectives Pupils should be taught to:</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 use musical instruments, including from around the world, and find out how the pitch and volume can be changed in a variety of ways 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>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses 	<p>National Curriculum objectives Pupils should be taught to:</p> <ul style="list-style-type: none"> describe the simple functions of the basic parts of the digestive system in humans e.g. mouth, tongue, teeth, oesophagus, stomach, large and small intestine. identify the different types of teeth in humans and their simple functions construct and interpret a variety of food chains, identifying producers, predators and prey. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> comparing the teeth of carnivores and herbivores, and suggesting reasons for differences; finding out what damages teeth and how to look after them; drawing and discussing their ideas about the digestive system and comparing them with models or images 	

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| <ul style="list-style-type: none">• making earmuffs from a variety of different materials to investigate which provides the best insulation against sound• making and playing their own instruments by using what they have found out about pitch and volume | |
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YEAR 5

Au 1: Earth and space

National Curriculum objectives

Pupils should be taught to:

- 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
- recognise that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).
- 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.
- understand that the Sun is a star at the centre of our solar system and it has eight planets which should be named and note that Pluto is a dwarf planet.
- not look directly at the Sun as it is unsafe.

Examples of scientific enquiry for this unit:

- compare the time of day in different places on the Earth through internet links and direct communication
- creating simple models of the solar system

Au 2: Forces

National Curriculum objectives

Pupils should be taught to:

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- find out how Issac Newton helped develop the theory of gravitation
- 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.

Examples of scientific enquiry for this unit:

- exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective.
- exploring resistance in water by making and testing boats of different shapes.
- observing the effects of forces that make things begin to move, get faster or slow down

Sp1: Properties and changes of materials

National Curriculum objectives

Pupils should be taught to:

- 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
- give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic

Examples of scientific enquiry for this unit:

- carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'
- comparing materials in order to make a switch in a circuit.

<ul style="list-style-type: none"> constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day. find out why some people think that structure such as Stonehenge might have been used as astronomical clocks. 		
Sp 2: Properties and changes of materials	Su 1 & Su 2: : Animals including humans Living things and their habitats	
<p>National Curriculum objectives Pupils should be taught to:</p> <ul style="list-style-type: none"> 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. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> observing and comparing the changes that take place, for example, when burning different materials or baking bread or cakes. researching and discussing how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials. Look at the work of Spencer Silver and sticky 	<p>National Curriculum objectives Pupils should be taught to:</p> <ul style="list-style-type: none"> describe the changes as humans develop to old age. <p>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> researching the gestation periods of other animals and comparing them with humans; finding out and recording the length and mass of a baby as it grows. <p>National Curriculum objectives Pupils should be taught to:</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>Examples of scientific enquiry for this unit:</p> <ul style="list-style-type: none"> observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences. trying to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs. observing changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow. 	

notes on Ruth Benerito and wrinkle free cotton.

- Find out about the work of naturalists and animal behaviourists for example David Attenborough, Jane Goodall

YEAR 6

Au 1: Evolution and inheritance

National Curriculum objectives:

Pupils should be taught to:

- research the life of Mary Anning, Charles Darwin, Alfred Wallace
- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- understand that characteristics are passed from parents to their offspring e.g. by considering different breeds of dog and what happens when these are crossed
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
- know that variations in offspring over time can make animals more or less able to survive over time

Examples of scientific enquiry for this unit:

- exploring the work of scientists and scientific research about evolution

Au 2: Animals including humans

National Curriculum objectives:

Pupils should be taught to:

- describe the function of the circulatory system and the heart
- identify the main parts of the heart and the circulatory system
- describe the function of blood vessels and blood
- recognise the impact of diet on the way my body functions
- describe ways in which nutrients are transported
- recognise the impact of diet, drug and lifestyle on the way their bodies function

Examples of scientific enquiry for this unit:

- explore the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.

Sp 1: Light

National Curriculum objectives:

Pupils should be taught to:

- 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.

Examples of scientific enquiry for this unit:

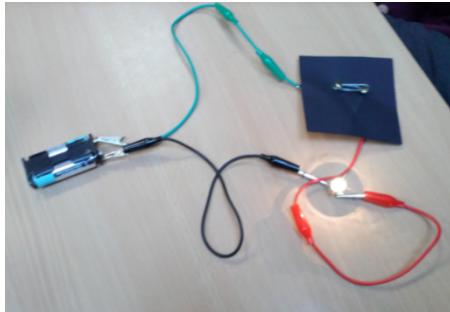
- Investigating the relationship between light sources, objects and shadows. Predict first what will happen.
- design and make a periscope and explain how it works

<ul style="list-style-type: none"> • observing and raising questions about local animals and how they are adapted to their environment; • comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels. • analysing the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers. 		
Sp 2: Electricity	Su 1 and Su 2: Living things and their habitats	
<p>National Curriculum objectives: Pupils should be taught to:</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 series circuit in a diagram. (Pupils are not expected at this stage to learn about parallel circuits) 	<p>National Curriculum objectives: Pupils should be taught to:</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. • understand that broad groupings such as microorganisms, plants and animals can be subdivided. 	

- work safely with electricity

Examples of scientific enquiry for this unit:

- systematically identifying the effect of changing one component at a time in a circuit e.g. designing and making a set of traffic lights of a burglar alarm



- classify animals into commonly found invertebrates (e.g.insects, spiders, snails, worms) and vertebrates (e.g fish, amphibians, reptiles, birds and mammals) and discuss reasons why they are in one group and not another.

Examples of scientific enquiry for this unit:

- using classification systems and keys to identify some animals and plants in the immediate environment.
- researching unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system.

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Working scientifically progression

This document shows how the working scientifically statements from the science National Curriculum for England are linked and built on across the three phases in Key Stage 1 and 2. To highlight the links, the working scientifically skills statements are grouped under the following broader skills definitions.

- Asking questions and recognising that they can be answered in different ways
- Making observations and taking measurements
- Engaging in practical enquiry to answer questions
- Recording and presenting evidence
- Answering questions and concluding
- Evaluating and raising further questions and predictions
- Communicating their findings.

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.

Focus objectives for year groups in each strand are highlighted as follows:

Year 3

Year 4

Year 5

Year 6

If unhighlighted, they apply to both year groups in the phase.

Year 1 & 2	Year 3 & 4	Year 5 & 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><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"> • 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.

Making observations and taking measurements

Observing closely, using simple equipment

- Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations.
- They begin to take measurements, initially by comparisons, then using non-standard units.

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

- 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.

Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate

- The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.
- 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).

Engaging in practical enquiry to answer questions

Performing simple tests

- 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

- 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.

Setting up simple practical enquiries, comparative and fair tests

- 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; observations over time; and pattern seeking.

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.

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

- 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 or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.

Recording and presenting evidence

Gathering and recording data to help in answering questions

- 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.

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

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

Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

- 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.

Answering questions and concluding		
<p><i>Using their observations and ideas to suggest answers to questions</i></p> <ul style="list-style-type: none"> 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. 	<p>Using straightforward scientific evidence to answer questions or to support their findings</p> <ul style="list-style-type: none"> 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. 	<p>Identifying scientific evidence that has been used to support or refute ideas or arguments</p> <ul style="list-style-type: none"> 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.
<p><i>Using their observations and ideas to suggest answers to questions</i></p> <ul style="list-style-type: none"> The children recognise 'biggest and smallest', 'best and worst' etc. from their data. 	<p>Identifying differences, similarities or changes related to simple scientific ideas and processes</p> <ul style="list-style-type: none"> Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. <p><i>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</i></p> <ul style="list-style-type: none"> They draw conclusions based on their evidence and current subject knowledge. 	<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"> In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.

Evaluating and raising further questions and predictions

	<p>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <ul style="list-style-type: none"> • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. 	<p>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</p> <ul style="list-style-type: none"> • 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.
	<p>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <ul style="list-style-type: none"> • 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 further questions which can be answered by extending the same enquiry. 	<p>Using test results to make predictions to set up further comparative and fair tests</p> <ul style="list-style-type: none"> • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

Communicating their findings

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

- They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary.

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 communicate their findings to an audience using relevant scientific language and illustrations.

Vocabulary progression

- The vocabulary in **red** is from other linked topics. The topic they come from is indicated.
- The working scientifically vocabulary identified in the first table of this document should be taught through the topics in each year-group during practical work or scientific enquiry.

Working scientifically

Year-group(s)	Vocabulary/Statement(s)
Years 1 & 2	observe, changes, patterns, grouping, sorting, compare, same, different, identify (name), measure, data, record results, drawing, picture, table, tally chart, present, pictogram, block chart, Venn diagram, ask questions, test, investigate, explore, equipment, resources, magnifying glass, hand lens, ruler, tape measure, metre stick, pipette, syringe, spoon, teaspoon, answer questions, interpret results, scientific enquiry, pattern seeking, comparative testing, observing over time, classifying, researching using secondary sources
Years 3 & 4	practical work, fair testing, relationships, accurate, thermometer, data logger, stopwatch, timer, estimate, data, diagram, identification key, chart, bar chart, prediction, similarity, difference, evidence, information, findings, criteria, values, properties, characteristics, conclusion, explanation, reason, evaluate, improve
Years 5 & 6	variables, independent variable, dependent variable, control variable, evidence, justify, argument (science), causal relationship, accuracy, precision, scatter graphs, bar graphs, line graphs, force meter

Plants

Year-group(s)	Vocabulary/Statement(s)
Year 2	light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling names of plants in local habitats and micro-habitats (Y2 - Living things and their habitats)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport
Year 4	classification, classification keys (Y4 - Living things and their habitats)
Year 5	life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)
Year 6	flowering, non-flowering, mosses, ferns, conifers (Y6 - Living things and their habitats)
Key Stage 3	<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

Year-group(s)	Vocabulary/Statement(s)
Year 2	<p>living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, names of local habitats (e.g. pond, woodland etc.), names of micro-habitats (e.g. under logs, in bushes etc.), conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold, names of living things in the habitats and micro-habitats studied</p> <p>light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants)</p> <p>offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, cat/kitten, caterpillar/butterfly) (Y2 - Animals, including humans)</p>
Year 3	<p>photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport</p>
Year 4	<p>classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate</p> <p>herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)</p>
Year 5	<p>life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, cuttings</p>
Year 6	<p>vertebrates, fish, amphibians, reptiles, birds, mammals, warm-blooded, cold-blooded, invertebrates, insects, spiders, snails, worms, flowering, non-flowering, mosses, ferns, conifers</p>

Key Stage 3	<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
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Animals, including humans

Year-group(s)	Vocabulary/Statement(s)
Year 2	<p>offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, kitten/cat, caterpillar/butterfly), survive, survival, water, food, air, exercise, heartbeat, breathing, hygiene, germs, disease, food types (e.g. meat, fish, vegetables, bread, rice, pasta, dairy)</p> <p>living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival (Y2 - Living things and their habitats)</p>
Year 3	<p>nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine</p>
Year 4	<p>digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, large intestine, rectum, anus, incisor, canine, molar, premolar, herbivore, carnivore, omnivore, producer, predator, prey</p>
Year 5	<p>puberty, the vocabulary to describe sexual characteristics in line with the school's RSE policy</p> <p>life cycle, foetus, baby, child, adolescent, adult, reproduce, sexual, sperm, fertilises, egg, live young (Y5 - Living things and their habitats)</p>
Year 6	<p>heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, cycle, circulatory system, diet, drugs, lifestyle</p>
Key Stage 3	<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

Year-group(s)	Vocabulary/Statement(s)
Year 2	<p>light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants)</p> <p>living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold (Y2 - Living things and their habitats)</p>
Year 3	<p>photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil (Y3 - Plants)</p> <p>soil, fossil, bone, flesh, minerals (Y3 - Rocks)</p>
Year 4	<p>environment, habitat, human impact, positive, negative, migrate, hibernate (Y4 - Living things and their habitats)</p> <p>herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)</p>
Year 5	<p>life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)</p>
Year 6	<p>offspring, sexual reproduction, vary, characteristics, adapted, inherited, species, evolve, evolution</p>
Key Stage 3	<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

Materials

Year-group(s)	Vocabulary/Statement(s)
Year 2	opaque, transparent, translucent, reflective, non-reflective, flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching
Year 3	<p>rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay) (Y3 - Rocks)</p> <p>magnetic force, magnet, attract, magnetic material, metal, iron, steel (Y3 - Forces and magnets)</p>
Year 4	<p>solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle</p> <p>electrical conductor, electrical insulator, metal, non-metal (Y4 - Electricity)</p>
Year 5	thermal insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material
Year 6	
Key Stage 3	<ul style="list-style-type: none"> ● Chemical reactions as the rearrangement of atoms ● Representing chemical reactions using formulae and using equations ● Combustion, thermal decomposition, oxidation and displacement reactions ● Defining acids and alkalis in terms of neutralisation reactions ● The pH scale for measuring acidity/alkalinity; and indicators

Rocks

Year-group(s)	Vocabulary/Statement(s)
Year 2	opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)
Year 3	rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay)
Year 4	
Year 5	
Year 6	evolution
Key Stage 3	<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

Year-group(s)	Vocabulary/Statement(s)
Year 2	opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)
Year 3	light, light source, dark, absence of light, surface, shadow, reflect, mirror, Sun, sunlight, dangerous
Year 4	
Year 5	
Year 6	straight lines, light rays
Key Stage 3	<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 focusing (qualitative); the human eye• 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

Year-group(s)	Vocabulary/Statement(s)
Year 2	flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching (Y2 - Uses of everyday materials)
Year 3	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
Year 4	
Year 5	force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears
Year 6	
Key Stage 3	<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

Year-group(s)	Vocabulary/Statement(s)
Year 2	
Year 3	
Year 4	sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, quiet, loud, insulation
Year 5	
Year 6	
Key Stage 3	<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

Year-group(s)	Vocabulary/Statement(s)
Year 2	
Year 3	
Year 4	electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol
Year 5	
Year 6	circuit diagram, circuit symbol, voltage
Key Stage 3	<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

Year-group(s)	Vocabulary/Statement(s)
Year 2	
Year 3	light, light source, Sun, sunlight, dangerous (Y3 - Light)
Year 4	
Year 5	Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit
Year 6	
Key Stage 3	<ul style="list-style-type: none">● Gravity force, weight = mass x gravitational field strength (g), on Earth $g=10$ 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