Science

Curriculum Expectations

Intent

In science we intend for children to have the opportunity, wherever possible, to learn through varied systematic investigations, leading to them being equipped for life to ask and answer scientific questions about the world around them. As children progress through the school, they build on their skills in working scientifically, as well as on their scientific knowledge, as they develop greater independence in planning and carrying out fair and comparative tests to answer a range of scientific questions. As part of learning the children will develop knowledge organisers to help to consolidate and retain the science knowledge they have learnt and also reinforce key scientific vocabulary from each unit.

Implementation

Science will be taught through engaging, motivating and progressive units across the school. Science lessons will:

- start with an engagement/thought provoking stimulus
- share a 'Big Learning Question'
- lead to some 'key enquiry questions'
- take the questions into a scheme of work
- allow pupils to develop their own Knowledge Organisers
- reinforce use of key vocabulary and concepts
- allow pupils to evidence their learning using scrapbooks, photographs and performances

Impact

To evidence that our pupils can do more and know more in Science we will:

- ✓ Collate evidence to monitor progress
- ✓ Review knowledge organisers
- ✓ Interview pupils
- ✓ Monitor teaching
- ✓ Review schemes of work
- ✓ Follow achievements through progression maps
- ✓ Review knowledge organisers

Science in Barndale

Science is an incredibly important part of our curriculum but due to the abstract and technical aspects of this the complete curriculum coverage would prevent any type of depth in learning. As such we have streamlined our offer to ensure the learning that takes places can be taught at a depth that is meaningful and appropriate. We map the entirety of the national curriculum so that if any pupils are showing an interest or capacity to go beyond the scope of the curriculum then this can be offered. As a small school we don't have the facilities to offer the specialist equipment and resources but will seek these from partnership settings, if required.

Teaching Sequence/Subject Coverage in Barndale

Class	2			3			4			5		
	Biology	Chemistry	Physics	Biology	Chemistry	Physics	Biology	Chemistry	Physics	Biology	Chemistry	Physics
Cycle 1	Living thing and their Habitats Animals inc. Humans Plants	Everyday materials	Autumn & Winter	Animals inc. Humans Plants Living things and their Habitats		Light Forces & Magnets	Evolution & Inheritance Living things and their Habitats	Properties of Materials	Earth & Space Forces	Cells & Organisms Reproduction	States of Matter Separating Mixtures Atoms & Periodic Table	Energy changes & transfers Forces
Cycle 2	Animals inc. Humans Plants	The environment Everyday materials	Spring & Summer	Animals inc. Humans	States of matter Rocks	Electricity Sound	Animals inc. Humans Living things and their Habitats		Light Electricity	Photosynthesis Inheritance & Evolution	Acids & Alkalis	Earth & Atmosphere Space Motion & Pressure

	Working Scientifically		
Engage	**Activate**		
EYFS	**KS 1 Expect**	**Key Stage 2 NC Expectations**	**Key Stage 3 + NC Expectations**
	Scientific methods, processes and skills: • 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.	Scientific methods, processes and skills: • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • using straightforward scientific evidence to answer questions or to support their findings • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • 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 • identifying scientific evidence that has been used to support or refute ideas or arguments.	Scientific methods, processes and skills: Scientific attitudes • pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility • understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review • evaluate risks. Experimental skills and investigations • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience • make predictions using scientific knowledge and understanding • select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate • use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety • make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements • apply sampling techniques. Analysis and evaluation • apply mathematical concepts and calculate results • present observations and data using appropriate methods, including tables and graphs • interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions • present reasoned explanations, including explaining data in relation to predictions and hypotheses • evaluate data, showing awareness of potential sources of random and systematic error • identify further questions arising from their results. Measurement Science • understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature • use and derive simple equations and carry out appropriate calculations • undertake basic data analysis including simple statistical techniques.

	Subject Content		
	Activate		
	Biology	**Chemistry**	**Physics**
KS1	**Plants:** • 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. • 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, inc. humans** • 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. • 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. **Living things and their Habitats** • 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 micro-habitats • 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.	**Everyday Materials:** • 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 • compare and group together a variety of everyday materials on the basis of their simple physical properties. **Use of Everyday Materials** • 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.	**Seasonal Changes** • observe changes across the four seasons • observe and describe weather associated with the seasons and how day length varies.

Subject Content KS 2

Plants

- 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.

Animals, inc. Humans

- identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat
- identify that humans and some other animals have skeletons and muscles for support, protection and movement.
- describe the simple functions of the basic parts of the digestive system in humans
- 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.
- describe the changes as humans develop to old age.
- 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.

Living things and their Habitats

- 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.
- 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.
- describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals
- give reasons for classifying plants and animals based on specific characteristics.

Evolution and Inheritance

- 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
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Rocks

- 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.

State of Matter

- 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.

Properties and changes of Materials

- 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
- 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.

Light

- 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.
- 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.

Forces & Magnets

- compare how things move on different surfaces
- notice that some forces need contact between two objects, but magnetic forces can act at a distance
- predict whether two magnets will attract or repel each other, depending on which poles are facing.
- 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

Sound

- 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.

Electricity

- 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
- recognise some common conductors and insulators, and associate metals with being good conductors.
- 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
- 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

Earth and Space

- 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
- use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky
- describe the Sun, Earth and Moon as approximately spherical bodies

Forces

- 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.

Subject Content KS 3

Structure and function of living organisms

Cells and organisation

- cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope
- the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts
- the similarities and differences between plant and animal cells
- the role of diffusion in the movement of materials in and between cells
- the structural adaptations of some unicellular organisms
- the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.

The skeletal and muscular systems

- the structure and functions of the human skeleton, to include support, protection, movement and making blood cells
- biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles
- the function of muscles and examples of antagonistic muscles.

Nutrition and digestion

- content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed
- calculations of energy requirements in a healthy daily diet
- the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases
- the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts)
- the importance of bacteria in the human digestive system
- plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots.

Gas exchange systems

- 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, using a pressure model to explain the movement of gases, including simple measurements of lung volume
- the impact of exercise, asthma and smoking on the human gas exchange system
- the role of leaf stomata in gas exchange in plants

Reproduction

- 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.

Health

- the effects of recreational drugs (including substance misuse) on behaviour, health and life processes.

Material cycles and energy

Photosynthesis

- the reactants in, and products of, photosynthesis, and a word summary for photosynthesis
- the dependence of almost all life on Earth on the ability of photosynthetic

The particulate nature of matter

- the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure
- changes of state in terms of the particle model.

Atoms, elements and compounds

- a simple (Dalton) atomic model
- differences between atoms, elements and compounds
- chemical symbols and formulae for elements and compounds
- conservation of mass changes of state and chemical reactions.

Pure and impure substances

- the concept of a pure substance
- mixtures, including dissolving
- diffusion in terms of the particle model
- simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography
- the identification of pure substances.

Chemical reactions

- 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
- reactions of acids with metals to produce a salt plus hydrogen
- reactions of acids with alkalis to produce a salt plus water
- what catalysts do.

Energetics

- energy changes on changes of state (qualitative)
- exothermic and endothermic chemical reactions (qualitative).

The Periodic Table

- the varying physical and chemical properties of different elements
- the principles underpinning the Mendeleev Periodic Table
- the Periodic Table: periods and groups; metals and non-metals
- how patterns in reactions can be predicted with reference to the Periodic Table
- the properties of metals and non-

Energy

Calculation of fuel uses and costs in the domestic context

- comparing energy values of different foods (from labels) (kJ)
- comparing power ratings of appliances in watts (W, kW)
- comparing amounts of energy transferred (J, kJ, kW hour)
- domestic fuel bills, fuel use and costs
- fuels and energy resources.

Energy changes and transfers

- simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged
- heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators
- other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.

Changes in systems

- energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change
- comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions
- using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.

Motion and forces

Describing motion

- speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time)
- the representation of a journey on a distance-time graph
- relative motion: trains and cars passing one another.

Forces

- 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
- force-extension linear relation; Hooke's Law as a special case
- work done and energy changes on deformation
- non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity.

Pressure in fluids

- atmospheric pressure, decreases with increase of height as weight of air above decreases with height
- pressure in liquids, increasing with depth; upthrust effects, floating and sinking
- pressure measured by ratio of force over area – acting normal to any surface.

Balanced forces

- opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.

Forces and motion

- forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)
- change depending on direction of force and its size.

Waves

Observed waves

- waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition.

Sound waves

- 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

organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere

- the adaptations of leaves for photosynthesis.

Cellular respiration

- aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life
- a word summary for aerobic respiration
- the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration
- the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism.

Interactions and interdependencies

Relationships in an ecosystem

- the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops
- the importance of plant reproduction through insect pollination in human food security
- how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

Genetics and evolution

Inheritance, chromosomes, DNA and genes

- 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
- differences between species
- the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation
- 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
- the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

metals

- the chemical properties of metal and non-metal oxides with respect to acidity.

Materials

- the order of metals and carbon in the reactivity series
- the use of carbon in obtaining metals from metal oxides
- properties of ceramics, polymers and composites (qualitative).

Earth and atmosphere

- the composition of the Earth
- the structure of the Earth
- the rock cycle and the formation of igneous, sedimentary and metamorphic rocks
- Earth as a source of limited resources and the efficacy of recycling
- the carbon cycle
- the composition of the atmosphere
- the production of carbon dioxide by human activity and the impact on climate.

- 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.

Energy and waves

- pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone.

Light waves

- 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.

Electricity and electromagnetism

Current electricity

- 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

- separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects
- the idea of electric field, forces acting across the space between objects not in contact.

Magnetism

- magnetic poles, attraction and repulsion
- magnetic fields by plotting with compass, representation by field lines
- Earth's magnetism, compass and navigation
- the magnetic effect of a current, electromagnets, D.C. motors (principles only).

Matter

Physical changes

- conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving
- similarities and differences, including density differences, between solids, liquids and gases
- Brownian motion in gases
- diffusion in liquids and gases driven by differences in concentration
- the difference between chemical and physical changes.

Particle model

- the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition
- atoms and molecules as particles.

Energy in matter

- changes with temperature in motion and spacing of particles
- internal energy stored in materials.

Space physics

- 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.

	Consolidate Teaching Sequence					
	Step 1	**Step 2**	**Step 3**	**Step 4**	**Step 5**	**Step 6**
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.	**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.	**Pupils should be taught to:** • identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; • identify that humans and some other animals have skeletons and muscles for support, protection and movement.	**Pupils should be taught to:** • describe the simple functions of the basic parts of the digestive system in humans; • 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.	**Pupils should be taught to:** • describe the changes as humans develop to old age.	**Pupils should be taught to:** • 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.
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.	**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.	**Pupils should be taught to:** • 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.			

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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.		**Pupils should be taught to:** • 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.	**Pupils should be taught to:** • 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.	**Pupils should be taught to:** • describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals; • give reasons for classifying plants and animals based on specific characteristics.
Evolution and Inheritance						**Pupils should be taught to:** • recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago; • 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.

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
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.					
Forces			Forces and Magnets **Pupils should be taught to:** • compare how things move on different surfaces; • notice that some forces need contact between 2 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 2 poles; • predict whether 2 magnets will attract or repel each other, depending on which poles are facing.		Forces **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; • 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.	

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Light			**Pupils should be taught to:** • 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.			**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.
Sound				**Pupils should be taught to:** • 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.		

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Earth and Space					**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; • 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.	
Electricity				**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; • 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.		**Pupils should be taught to:** • 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.

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Materials	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.	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.	Rocks **Pupils should be taught to:** • 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.	States of Matter **Pupils should be taught to:** • 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.	Properties and Changes of Materials **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; • 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.	

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Scientists and Inventors	**Pupils should be taught to:** • identify and name a variety of common wild and garden plants, including deciduous and evergreen trees; • 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; • 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; • observe and describe weather associated with the seasons and how day length varies.	**Pupils should be taught to:** • 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; • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy; • describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene; • 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 about people who have developed new materials (non-statutory).	**Pupils should be taught to:** • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant; • identify that humans and some other animals have skeletons and muscles for support, protection and movement; • 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; • notice that light is reflected from surfaces; • observe how magnets attract or repel each other and attract some materials and not others.	**Pupils should be taught to:** • recognise that environments can change and that this can sometimes pose dangers to living things; • identify the different types of teeth in humans and their simple functions; • 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); • recognise that vibrations from sounds travel through a medium to the ear; • 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; • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.	**Pupils should be taught to:** • describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird; • 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; • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating; • describe the movement of the Earth, and other planets, relative to the Sun in the solar system; • find out about the work of naturalists and animal behaviourists (non-statutory); • describe how scientific ideas have changed over time (non-statutory).	**Pupils should be taught to:** • give reasons for classifying plants and animals based on specific characteristics; • 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; • recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago; • use recognised symbols when representing a simple circuit in a diagram.