

St. Peter's CE Primary, Farnworth



'Learn, Sparkle & Shine.'

SCIENCE CURRICULUM: YEAR 4
2025-2026

Psalm 111:2: "Great are the works of the Lord, studied by all who delight in them".



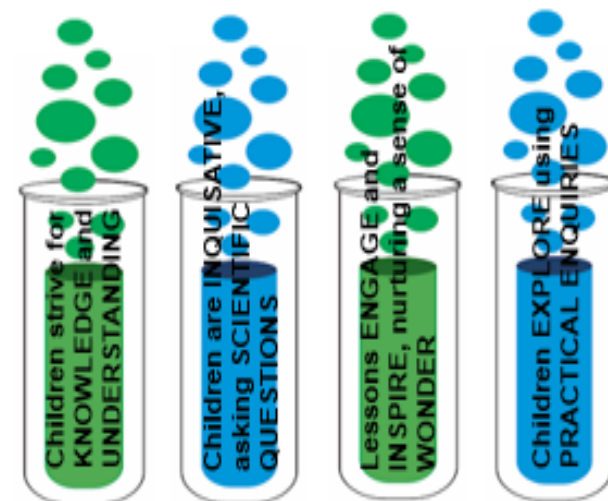
St Peter's C of E Primary School

Our Vision...

- Children at St Peter's **understand** what Science is, what it is for and why we do it. They acquire **knowledge capital**.
- They are **inquisitive**, and they are encouraged to **question** and **investigate**.
- They can explain the importance of science in the world. They have **aspiration** for the future.
- Children demonstrate an **enjoyment** of Science, being able to **talk** and **discuss** their thoughts, feelings and opinions using scientific **vocabulary**.
- The use of explicit **modelling** of concepts features prominently within **progressive** sequences of lessons.
- The children **engage** in science and **demonstrate working scientifically skills** through the **five strands of enquiry**.
- At St Peter's it is understood that **working scientifically** skills are taught alongside the **knowledge content** of the curriculum.

Principles...

Science '**Learns, Sparkles and Shines**' at St. Peter's when...



Proverbs 18:15: "An intelligent heart acquires knowledge, and the ear of the wise seeks knowledge".

Curriculum Overview:

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1-2
Unit of Study and Key objectives (Substantive Knowledge)	BIOLOGY: 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.	BIOLOGY: Animals, Including Humans (Digestion) - 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. - Food chains prevalent in habitats studied in year 2: - woodland, rainforest, hot and cold desert. - teeth of: tiger, lion, hedgehog, cow, horse, human, pig, fox.	CHEMISTRY: States 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.	PHYSICS: 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.	PHYSICS: 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. - 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.

Definitions within Science:

Science: the systematic study of the structure and behaviour of the physical and natural world through observation, experimentation and the testing of theories against evidence obtained.

Physics: the science of matter, energy and their interactions.

Chemistry: the science of explaining the composition, structure and properties of substances and the transformations they undergo.

Biology: the science explaining living organisms and their vital processes.

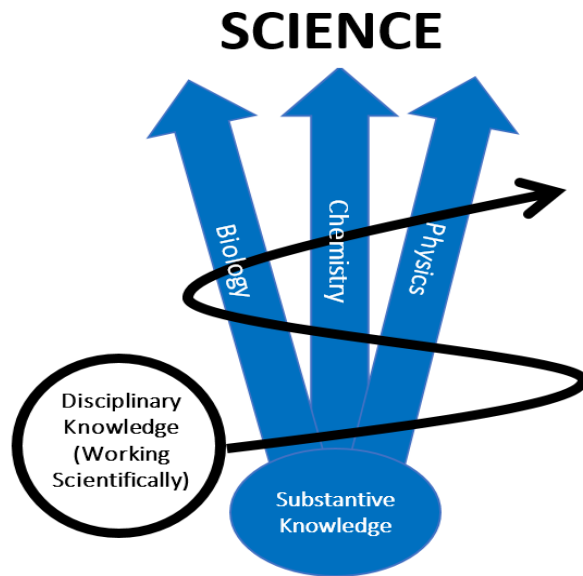
Geology*: the science that deals with the Earth's physical structure and substance, its history, and the processes that act on it.

Working Scientifically: the understanding of the nature, processes and methods of science. Includes the five strands of science enquiry: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing; and researching using secondary sources.

Scientific Enquiry: the processes of studying and investigating scientific ideas using the five strands of enquiry.

*Note: Geology is not identified as a separate strand of Science within the National Curriculum (2014). Geology is taught as part of the subject of Geography, but has significant Science overlap (Examples: the water cycle, rock formation etc.).

Disciplinary Knowledge: Lower Key Stage 2



Working scientifically is an integral strand of scientific learning within the Primary Science national Curriculum (2014). It is integrated throughout the wider substantive knowledge strands of **Biology**, **Chemistry** and **Physics**, rather than being discrete and separate from them. The Curriculum at St. Peter's CE Primary School reflects this.

How we 'work scientifically':

Asking questions

Asking questions that can be answered using a scientific enquiry.



Making predictions

Using prior knowledge to suggest what will happen in an enquiry.



Setting up tests

Deciding on the method and equipment to use to carry out an enquiry.



Observing and measuring

Using senses and measuring equipment to make observations about the enquiry.



Recording data

Using tables, drawings and other means to note observations and measurements.



Interpreting and communicating results

Using information from the data to say what you found out.



Evaluating

Reflecting on the success of the enquiry approach and identifying further questions for enquiry.



Working Scientifically Objectives (Y3-4):

- 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
- Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Identifying differences, similarities or changes related to simple scientific ideas and processes
- Using straightforward scientific evidence to answer questions or to support their findings.

The National Curriculum: Non-Statutory Guidance

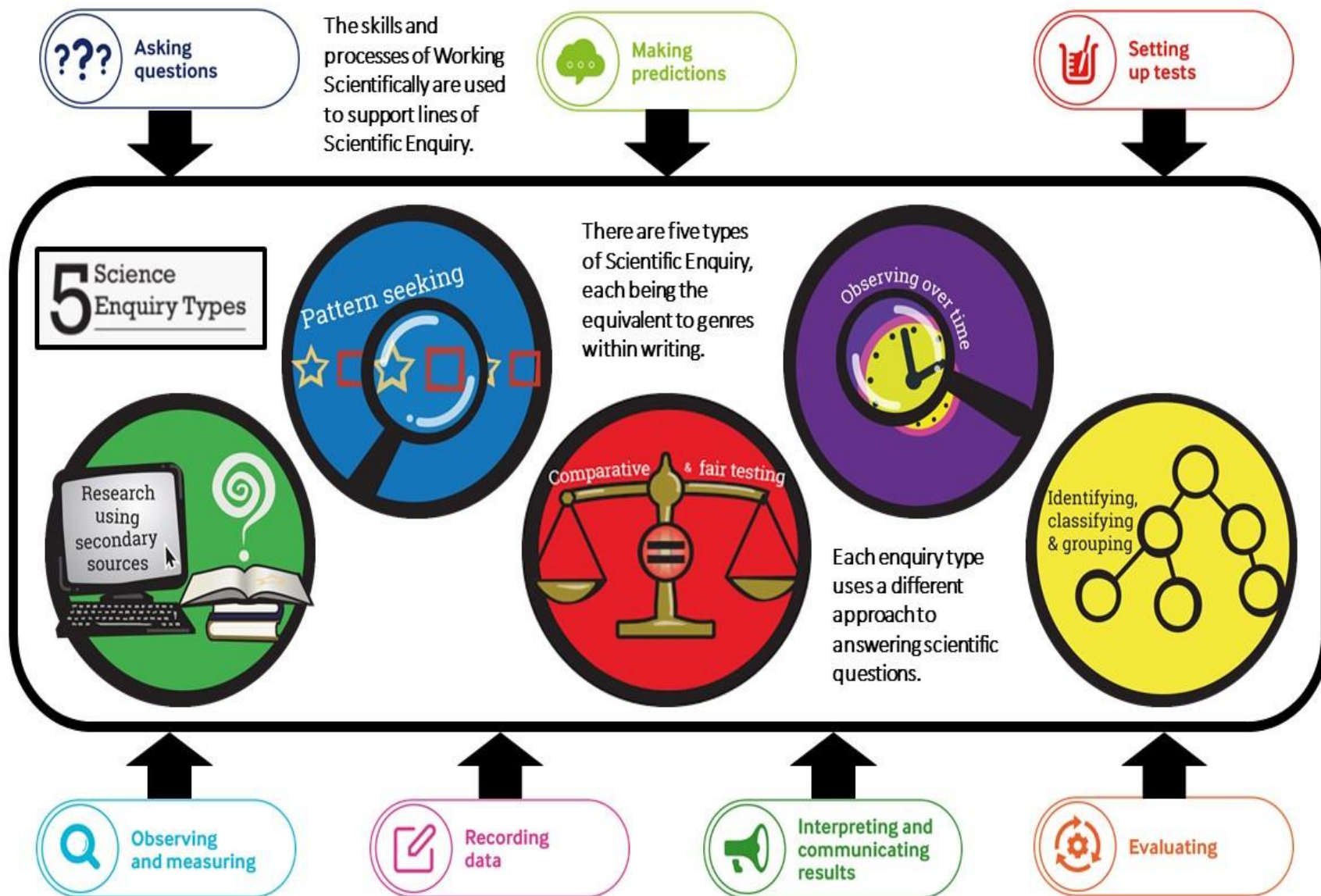
End of EYFS (YR)	Key Stage 1 (Y1/2)	Lower Key Stage 2 (Y3/4)	Upper Key Stage 2 (Y5/6)
Understanding the World ELG: The natural World Explore the natural world around them, making observations and drawing pictures of animals and plants. Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class. Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	The principal focus of science teaching in Key Stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly - constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos. 'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at Key Stage 1.	The principal focus of science teaching in Lower Key Stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out. 'Working scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.	The principal focus of science teaching in Upper Key Stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At Upper Key Stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings. 'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read, spell and pronounce scientific vocabulary correctly.

Year 4 Working Scientifically Objectives Breakdown:

	Plan		Do		Record	Review		
Year 4	Asking questions	Plan an enquiry	Making observations	Take measurements/using equipment	Gathering and presenting Evidence	Drawing conclusions	Explaining Evidence	Evaluating outcomes
	Children consider their prior knowledge when asking questions. 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.	Make systematic and careful observations.	Use a range of equipment (including thermometers and data loggers) for measuring length, time, temperature and capacity. They use standard units for their measurements. The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. Follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.	Gather evidence to answer questions generated by themselves or the teacher. 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.	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. Draw conclusions based on their evidence and current subject knowledge. 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.	Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. Communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary.	Identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.

Scientific Enquiry Types:

There are five types of scientific enquiry, which are used to support the scientific process. There should be a balance of enquiry types used within the Science Curriculum.



Key Vocabulary (Based on PLAN Documentation):

Year 4				
Biology: Living Things and Their Habitats	Biology: Animals, Including Humans (Digestion)	Chemistry: States of Matter	Physics: Sound	Physics: Electricity
classification key, environment, habitat, human impact, species, life process, seasonal change, hibernate, migration Vertebrate, Invertebrate, Warm-Blooded, Cold-Blooded, Flowering Plant, Non-Flowering Plant Additional: leaf arrangement, leaf edge, simple leaves, compound leaves, leaf veins (only required if these features are used for identification purposes)	digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, pancreas, nutrients, large intestine, rectum, anus, prey, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, food chain, organ, consumer	solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle, water vapour, precipitation, surface run-off	sound, source, vibrate / vibration, travel, pitch (high/low), volume, faint, loud, insulation, ear, sound wave, frequency	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, electrical conductor, electrical insulator
Vocabulary from previous units of study (Linked)				
Year 2: Living Things and Their Habitats living, non-living, dead, animal, habitat, food chain, prey, predator, carnivore, herbivore, omnivore, human, micro-habitat	Year 3: Animals, Including Humans (Skeletons and Muscles) nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, skull, ribs, spine, joints	Year 3: Rocks and Fossils rock / stone, pebble, boulder, grain, crystals, layers, organic matter, permeable (absorbs water), impermeable (waterproof), soil, fossil, sedimentary rocks, metamorphic rocks, magma, igneous rocks		

	Year 2: Animals, Including Humans (Staying Healthy) healthy, diet, exercise, nutrients, hygiene, vegetables, fruit, carbohydrates, meat, dairy, grow, sleep, off-spring	Year 2: Uses of Everyday Materials material, properties, squashing, rigid, bending / flexible, twisting, brittle, stretching, hard, soft, rough, smooth, waterproof, absorbent, transparent, translucent, opaque, stiff		
	Year 1: Animals, Including Humans (Senses) mammal, fish, reptile, bird, amphibian, herbivore, carnivore, omnivore, nocturnal, human, pet, senses	Year 1: Everyday Materials rough, property, smooth, material, object, hard, soft, stretchy, shiny, dull, waterproof, bendy, stiff, absorbent		

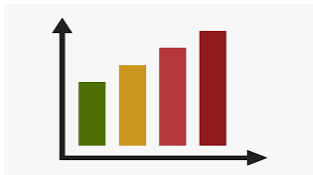
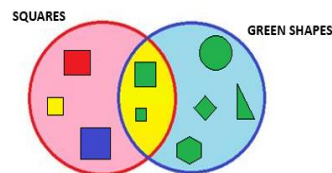
Mathematics within Science: Measuring, Recording and Representing Data

'... Scientific process is infused with maths; maths changes the look of science in a way that one cannot separate it from the other. So if maths is the language of science, then is science the reason for maths?' (Primary Science 124 Sept/Oct 2012)

Maths is an integral aspect of science as it is necessary in order to provide empirical evidence to support or refute scientific questions. Therefore, working scientifically and the scientific process requires children to be able to apply mathematical skills and concepts learned within the Primary Mathematics National Curriculum. Scientific investigation will require the use of measures (length, mass, volume, angles, time etc.) and subsequently, will require the representation of recorded data in the form of tables and charts/graphs. The type of graph required depends upon the type of data compiled: discrete or continuous numerical data. This in turn influences the choice of representation required (discrete: tally, bar, pie chart) or continuous (line, scatter graph). The selection of data representation should be in line with their age related expectations in Maths (Statistics).

Discrete Data Representation

Favorite Pets		
Pet	Tally Marks	Number
		10
		4
	I	6



Tally Chart / Frequency Table: A method of recording the number of things seen using tally lines, with totals (frequencies) counted at the end of data collection.

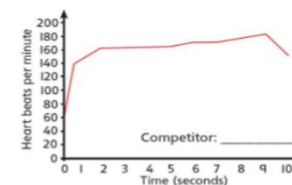
Venn Diagram: A pictorial method for sorting and separating according to properties (usually non-numerical within

Bar Chart / Graph: Used to compare the numerical values of discrete data sets.

Continuous Data Representation

Water temperature (°C)	Time taken for sugar to dissolve (seconds)
20	55
30	41
40	27

Table: Boxes (rows and columns) where numerical data can be studied.



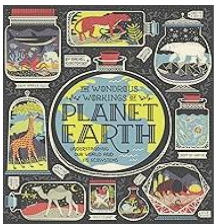
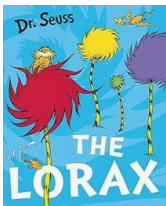
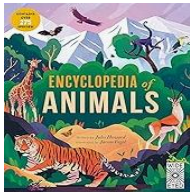
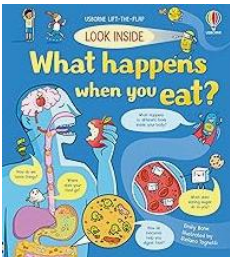
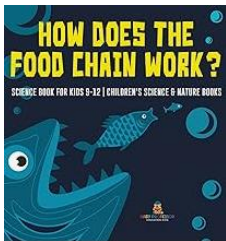
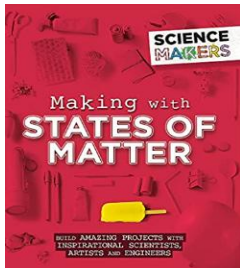
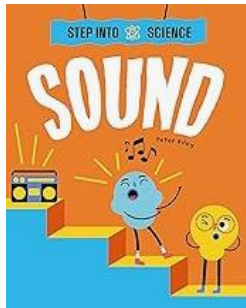
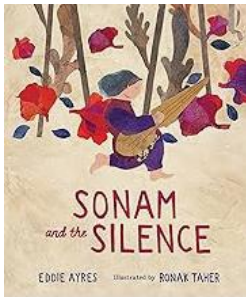
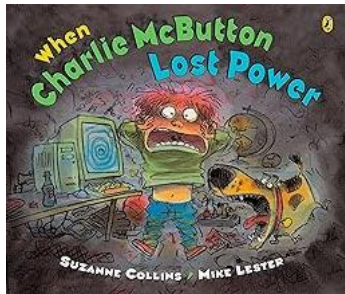
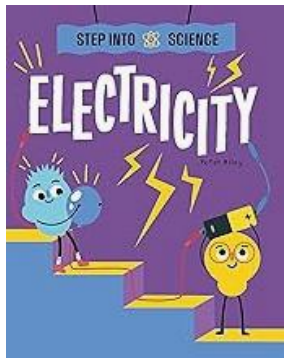
Line Graph: Used to plot continuous data that changes over time or distance.

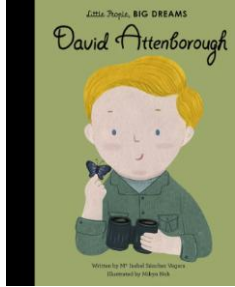
Reading within Science:

Reading is a vital delivery mechanism for the teaching and learning of Science. Consequently, it is fully integrated into the Science Curriculum, using key Reading skills / strands based upon 'Are You Really Reading?' (Identified on the unit overviews below). **Note:** the incorporation of reading within Science is to consolidate practicing those strands, whilst using them to deliver Science objectives. Therefore, the focus remains scientific.

All units of study have been allocated a key text (linked to the non-fiction reading spine – Science). These are as follow:

Key Texts:

Biology: Living Things and Their Habitats	Biology: Animals, Including Humans (Digestion)	Chemistry: States of Matter	Physics: Sound	Physics: Electricity
  	  Look Inside: What Happens When You Eat (Emily Bone)	  The Story of Snow (Jon Nelson) Science Makers: Making With States of Matter (Anna Claybourne)	  Sound (Step Into Science) (Peter Riley)	 



**The Wondrous Workings
of Planet Earth:
Understanding Our World
and Its Ecosystems (Rachel
Ignatofsky)**

The Lorax (Dr Seuss)

**Encyclopedia of Animals
(Jules Howard & Jarom
Vogel)**

**David Attenborough (Little
People, Big Dreams)
(Maria Isabel Sanchez
Vegara & Mikyo Noh)**

**How Does The Food
Chain Work? (Baby
Professor)**

**Sonam and the Silence
(Eddie Ayres & Ronak
Taher)**

**When Charlie McButton
Lost Power (Suzanne Collins
& Mike Lester)**

**Electricity (Step Into
Science) (Peter Riley)**

Science Capital – Key Scientist Studies:

Science capital is vital in broadening the children's wider understanding of Science and the role it plays within their wider lives. This includes understanding the contributions famous scientists have made in furthering knowledge and understanding in their respective disciplines. Whilst historically, there is a gender imbalance, where possible, the range of scientists linked to specific units of study better reflect modern attitudes towards Science and STEM. Linked scientist biographical studies are identified within the unit overviews below.

The **Lower KS2 Science Parents' Guide** contains additional information regarding what Science Capital is, why it is important for science education and provides lists of possible places to visit to enhance interest and understanding within the subject.

Unit of Study:	Biology: Living Things and Their Habitats	Biology: Animals, Including Humans (Digestion)	Chemistry: States of Matter	Physics: Sound	Physics: Electricity
Linked Scientists:	<u>Biographical Study:</u> Sir David Attenborough (1926-Present) (English BBC Presenter, naturalist and environmentalist)	<u>Other:</u> William Beaumont (1785-1853) (Surgeon who first observed and studied human digestion in the stomach)	<u>Biographical Study:</u> Robert Boyle (1627-1691) (Irish chemist who explored the relationships between pressures and volumes of gases)	<u>Other:</u> Aristotle (384BCE – 322BCE) (Ancient Greek philosopher who developed the concept that sound travels through air due to the movement of air molecules)	<u>Other:</u> Thomas Edison (1847-1931) (American inventor of the lightbulb and power grid)



SCIENCE CURRICULUM GUIDANCE: YEAR 4

'Learn, Sparkle & Shine.'

Year Group: 4	Unit of Study:	Science Branch:
Term: Autumn 1	Living Things and Their Habitats	Biology
Composite (The Big Idea): All living things (organisms) change and are affected by the environments in which they live. These environments are ever changing due to natural and man-made factors. Living things can be grouped according to their characteristics and can be identified using 'tree-like' diagrams called identification keys.	Context: In Years 1 and 2, children learnt to identify common wild and domestic animals and in doing so, recognise some of their common features. Similarly, within Years 1 to 3, pupils learn about plants, including their basic structure (Year 1) and requirements for life (Year 2). They also explored seed germination and water transportation within xylem vessels in Year 3. In doing so, they will be familiar with the names of several flowering and non-flowering plant species, including common trees (End of Year 3). This Year 4 unit builds upon pupils' prior knowledge of plants as they identify and name a variety of living things in their local and wider environment and begin to sort them according to identified features. The sorting process in Year 4 cumulates with children using and creating simple binary ('Yes/No') identification keys for both plants (flowering and non-flowering) and animals (vertebrates and invertebrates), again, posing questions based on observable features of their physiologies. Further grouping of animals occurs according to their key features (example: birds have feathers, beaks, wings and lay eggs etc.) and new concepts including warm-blooded (endotherms) and cold-blooded (ectotherms), vertebrates and invertebrates. Pupils learn that environments can change due to both natural and manmade reasons and that this can sometimes pose dangers to living things (precursor to Evolution and Adaptation – Year 6). Children in Year 4 will use their knowledge of plants acquired within this unit to construct and interpret a variety of food chains, identifying producers, predators and prey within the later Year 4 unit, Animals, Including Humans. This unit acts as a pre-cursor to the Year 6 Classification unit, where pupils explore the Linnaean classification, adaptations and develop their understanding of the need for adaptation (Evolution and Inheritance – Year 6).	

Prior Learning Requirements: • Animals can be grouped into vertebrates (and then further into fish, reptiles, amphibians, birds and mammals) and invertebrates. • Animals can be grouped into carnivores, herbivores and omnivores • The names of some common wild and garden plants and deciduous and evergreen trees. • Examples of habitats (including microhabitats) and the animals and plants that can be found there. • Living things depend on each other to survive. • How food chains and food webs work.	Common Misconceptions (PLAN): Some children may think: • The death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain. • There is always plenty of food for wild animals. • Animals are only land-living creatures. • Animals and plants can adapt to their habitats, however they change. • All changes to habitats are negative.
Biographical Study - Scientist: Sir David Attenborough (1926-Present) English broadcaster and natural historian, known for his work within the BBC's Natural History Unit, fronting productions such as Planet Earth II and Blue Planet II.	Key Vocabulary (Linked to PLAN) (Full list on Vocabulary progression document): • Classification Key: Living organisms can be sorted and identified using 'Yes/No' questions to identify them. • Environment: An area containing many different habitats, including both living things and non-living features. Examples: Desert, Forest. • Habitat: The specific area or place in which a living things both live, breed and obtain food and drink from. • Human Impact: Changed caused to environments by human activities. • Species: A specific type of living thing. Example: A rat is a species of rodent (type of mammal). • Life Process: Seven essential features needed for living (See: MRS GREN). • Seasonal Change: Changes to plant growth due to differences in the weather and temperature. • Hibernate: Animals enter a deep, extended sleep during winter months in order to avoid the cold and starvation due to a lack of food. • Migration: Animals and birds, who travel to other places, sometimes thousands of miles away, to avoid winter cold and food shortages.

	• Vertebrate: Animals that have a backbone (examples: fish, mammals, birds, reptiles, amphibians). • Invertebrate: Animals that do not have a backbone (examples: molluscs, insects, arachnids, worms). • Warm-Blooded: Animals who generate their own body heat to keep a constant body temperature. • Cold-Blooded: Animals whose bodies are the same temperature as their surroundings. • Flowering Plant: Plants, which produce flowers and fruits. • Non-Flowering Plant: Plants, which do not produce flowers (ferns, mosses).
NC Objectives (Substantive Knowledge): • 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.	Working Scientifically (Disciplinary Knowledge): • 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. • Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. • Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. • Identifying differences, similarities or changes related to simple scientific ideas and processes. • Using straightforward scientific evidence to answer questions or to support their findings. Key enquiry types: • Classification and Sorting (Venn and Carroll diagrams sorting living things according to their features) • Classification and Sorting (Use and creation of 'Yes/No' classification/identification keys) • Research Using Secondary Sources of Information (Habitat change causes and affects).

Maths Links:

- Venn and Carroll diagrams for sorting animals and plants according to their features.
- Tally charts and frequency tables (number of individuals of each species found)
- Graphs – bar chart linked to aforementioned tally / frequency tables.

ATRR Reading Links:

Strand 1: Timeline (environmental change – natural / manmade; Life of Sir David Attenborough)

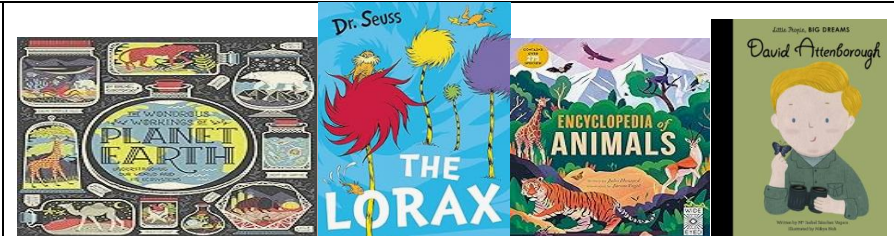
Strand 2: Six-Word Summary (Features of different types of animals)

Strand 4: Impression and Evidence (Habitat change)

Strand 5: 3/5 Most Important Things (Life and achievements of Sir David Attenborough)

Linked Texts:

- The Wondrous Workings of Planet Earth: Understanding Our World and Its Ecosystems (Rachel Ignotofsky)
- The Lorax (Dr Seuss)
- Encyclopedia of Animals (Jules Howard & Jarom Vogel)
- David Attenborough (Little People, Big Dreams) (Maria Isabel Sanchez Vegara & Mikyo Noh)

**(Components) Lesson Sequence:**

- LC1: What are vertebrates and invertebrates? (Sort animals into vertebrates and invertebrates, before focussing on identifying the five types of vertebrates: fish, amphibians, reptiles, mammals or birds, and explore their defining features).
- LC2: (Sorting -linked investigation) Are some animals more alike than other animals? (Use Venn and Carroll diagrams to sort animals according to features, including warm-blooded (endotherms) and cold-blooded (ectotherms)).
- LC4: (Long lesson) What is a classification key? (Split – part one, use identification keys. Part two – create identification keys using combinations of plants and animals).
- LC5: Where does an organism live? (General habitats)
- LC6: Can a habitat change? (Natural and manmade changes – focus on deforestation)
- **LC7:** (Additional extended write) – persuasive letter) Can we stop habitats from changing?
- LC8: What lives in my local area? (Local wildlife survey in park area – use of keys, tally charts and notes of habitat location)
- **LC9:** (Biography – complete as extended writing or reading comprehension) - Who is Sir David Attenborough?

Note: the lesson content for LC7 and LC9 are writing or reading lessons using Science content. Therefore, these can be taught outside of the main sequence of lessons.

Prior Learning (Can you still?):

Write questions from within this unit once taught. For example:

- What is a vertebrate? Give an example.
- What is an invertebrate? Give an example.
- Name the five types of vertebrate.
- What is an endotherm?
- What is an ectotherm?
- What are the key features of ... (birds, mammals, reptiles, fish, amphibians, insects, spiders etc.)?
- Using images of animals, pupils to construct identification key.
- What is a habitat? What must it provide to a living thing?
- What are the seven characteristics of life?
- Provide an example of natural habitat change.
- Provide an example of manmade habitat change.
- Use Venn or Carroll diagrams – pupils to sort various plants and animals.

Previous Years (example questions linked to biology units):

- What is germination?
- Six-word summary of germination process.
- What is pollination?
- Six-word summary of pollination process.
- What is seed dispersal?
- What are the different methods of seed dispersal?
- Name and label parts of a plant.
- What three functions do the roots of plant have?
- Muscles work in a _____ p _____ ? (Antagonistic pairs)
- What are the three types of skeleton found in animals?
- Naming of key bones in the body.
- Name a protein food source.
- Name a carbohydrate food source.
- Name a fat food source.
- Name a dairy food source.
- How do people stay healthy?
- Name the five senses of the human body.
- Which organ is used to see/hear/smell/taste?

Year Group: 4	Unit of Study: Animals, Including Humans (Digestion)	Science Branch: Biology
Term: Autumn 2		
Composite (The Big Idea): All living things need food and water. Some, such as plants produce their own food (sugar), whilst others eat other living things to acquire this energy, forming food chains. Animals, including humans have digestive systems, which are linked organs responsible for breaking down food into sugars, proteins and nutrients, alongside removing waste from the body.	Context: This unit builds upon prior knowledge of the human body developed in Year 1 (Senses), Year 2 (Staying Healthy) and Year 3 (Muscles and Skeletons for movement). Pupils will also know the importance of a healthy lifestyle (Years 2 and 3), including a balanced diet and the effects of sugar, the food groups and their role in human development. Pupils can identify and name a variety of animals, In this Year 4 unit, pupils learn about the simple functions of the basic parts of the digestive system in humans. New learning includes identifying the different types of teeth in humans and their functions. Pupils construct and interpret a variety of food chains, identifying producers, predators and prey. This unit is the precursor to work in Year 5 as pupils learn about puberty and gestation periods of animals. The knowledge acquired in this unit will help pupils in Year 6 to learn about the circulatory system and dental structures.	
Prior Learning Requirements: • How to be healthy by eating well and staying clean. • Know the names for the main parts of the body. • 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)	Common Misconceptions (PLAN): Some children may think: • Arrows in a food chain mean 'eats'. • The death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain. • There is always plenty of food for wild animals. • Your stomach is where your belly button is. • Food is digested only in the stomach. • When you have a meal, your food goes down one tube and your drink down another. • The food you eat becomes "poo" and the drink becomes "wee".	

• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. • Animals, including humans, have offspring, which grow into adults. • Know 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. • 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. • Humans and some other animals have skeletons and muscles for support, protection and movement.	
Biographical Study - Scientist: Possible Mention: William Beaumont (1785-1853) (Surgeon who first observed and studied human digestion in the stomach)	Key Vocabulary (Linked to PLAN) (Full list on Vocabulary progression document): • Digestive System: A series of linked organs which work together to break down food and drink. • Digestion: The process of breaking down food to acquire energy and nutrients. • Mouth: The part of the body where food and drink enters. • Teeth: Hard, enamel covered parts of the mouth, used for biting, ripping and chewing food. • Saliva: A liquid containing starch dissolving enzymes produced in the salivary glands in the mouth. • Oesophagus: The oesophagus is like a stretchy tube that moves food from the back of the throat to the stomach. • Stomach: An organ containing acid and amylase, where food proteins are digested. • Small Intestine: The main function of the small intestine is absorption of nutrients and minerals from food. • Pancreas: The pancreas produces juices called enzymes which helps the body digest food. • Nutrients: Vitamins and minerals needed to keep people healthy.

	• Large Intestine: The major function of the large intestine is to absorb water from the remaining indigestible food. • Rectum: The part of the intestines where faeces is stored and compacted. • Anus: The part of the digestive system where solid food waste leaves the body. • Prey: The term prey refers to an animal that is sought, captured, and eaten by a predator. • Teeth: Hard, calcified objects in the mouth used for biting, cutting and tearing food. • Incisor: Narrow teeth at the front of the mouth for cutting. • Canine: Pointy teeth that tear your food. • Molar: Molars are the teeth that are used for chewing and grinding our food. • Premolars: Wide back teeth for grinding food. • Herbivore: An animal that only eats plants. • Carnivore: An animal that only eats meat. • Omnivore: An animal that eats both plants and meat. • Producer: Something that creates its own food (usually plants). • Predator: Predators are wild animals that hunt, or prey on, other animals. Predator animals need the flesh of the animals that they kill to survive. • Food Chain: A food chain is a diagram that shows us how animals are linked by what they eat, starting with a producer. • Organ: The skin is the biggest organ of your body. Other organs include your brain, lungs, heart, liver, stomach, intestines, pancreas, and kidneys, and they are called internal organs. • Consumer: Something that eats another living thing.
NC Objectives (Substantive Knowledge): • 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.	Working Scientifically (Disciplinary Knowledge): • 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. • Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. • Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. • Identifying differences, similarities or changes related to simple scientific ideas and processes.

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

Key enquiry types:

- Research Using Secondary Sources of Information (Functions of the organs of the digestive system)
- Observation Over Time (Eggs in different liquids linked to acidity – note, can only be done when there are no allergies within school. Alternative, look at damaged and bruised apples over time)
- Classification and Sorting (Compare and sort according to teeth – images of animal skulls)

Maths Links:

- Time – length of time required to digest food (expand to different animals); time elapsed for cavities to form etc.
- Length – size of teeth in various animals.
- Venn diagrams – sorting animals according to diet.

ATRR Reading Links:

Strand 1: Timeline (Sequence processes linked to digestion; brushing teeth; formation of cavities and tooth decay etc.)

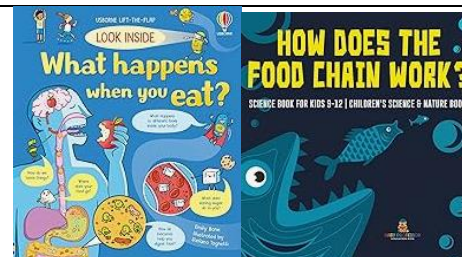
Strand 2: Six-Word Summary (Function of each organ within digestive system; brushing teeth; formation of cavities and tooth decay etc.)

Strand 4: Impression and Evidence (Tooth decay; egg shells after exposure to liquids)

Strand 5: 3/5 Most Important Things (Dental hygiene)

Linked Texts:

- Look Inside: What Happens When You Eat (Emily Bone)
- How Does The Food Chain Work? (Baby Professor)



(Components) Lesson Sequence:

- LC1: How do teeth help us to digest? (Types and function of human teeth; structure of teeth)
LC2: How can you look after your teeth? (Links to PSHE)
- LC3: What is a cavity? (How do different liquids affect our teeth? - Eggs in liquids over time. **Note:** if allergies, apples with holes and damage)
- LC4: What happens to a piece of food once you swallow it? (Organs of the digestive system and their functions)
- LC5: (Short) Modelling of the digestive process – see outline below)
- LC6: What did this animal eat? (Identification of carnivores, herbivores and omnivores based on teeth within skulls)
- LC7: Who eats who? (Construct and interpret food chains and food webs)

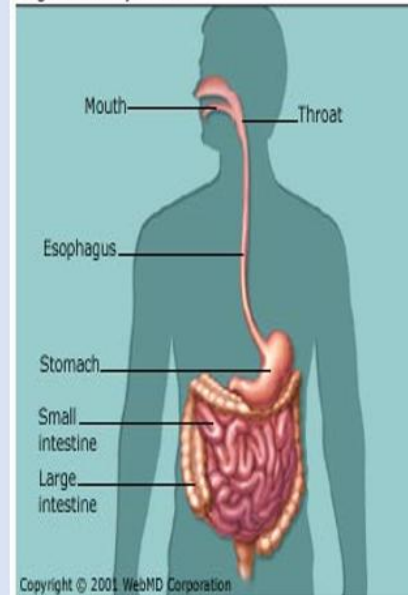
Notes for LC5 – Modelling the digestive system:

Digestion Modelling (Year 4):

Modelling (Example):

- Weetabix in a plastic bowl (food in mouth)
- Use plastic knife and water to chop and crush (saliva and teeth)
- Add red food colouring (enzymes in saliva)
- Use tights with foot cut off – pass mushed Weetabix through (Oesophagus)
- Place into a clear plastic bag (stomach)
- Add green food colouring (Bile)
- Add vinegar (Stomach acid)
- Add Fairy Liquid (Gas bubbles – methane production)
- Pass contents through a sieve (Intestines)
- Liquid onto paper plate (Nutrients for body and eventual urine)
- Remaining 'pulp' (Faeces)

Digestive System



Prior Learning (Can you still?):

Write questions from within this unit once taught. For example:

- Name the four types of teeth in the human mouth.
- What is the function of incisors / molars / premolars / canines?
- What is enamel?
- Write down three ways that you can keep your teeth healthy.
- Use images / names – pupils to construct food chains / webs.
- What is the role of ? (Different digestive organs).
- What is mechanical digestion? Where does it occur?

Previous Unit:

See prior learning section of Living Things and Their Habitats (Year 4).

Previous Years (example questions linked to biology units):

- What is germination?
- Six-word summary of germination process.
- What is pollination?
- Six-word summary of pollination process.
- What is seed dispersal?
- What are the different methods of seed dispersal?
- Name and label parts of a plant.
- What three functions do the roots of plant have?
- Muscles work in a_____ p_____ ? (Antagonistic pairs)
- What are the three types of skeleton found in animals?
- Naming of key bones in the body.
- Name a protein food source.
- Name a carbohydrate food source.
- Name a fat food source.
- Name a dairy food source.
- How do people stay healthy?
- Name the five senses of the human body.
- Which organ is used to see/hear/smell/taste?

Year Group: 4	Unit of Study: States of Matter	Science Branch: Chemistry
Term: Spring 1		
Composite (The Big Idea): Matter can exist in different forms – solids, liquids and gases. As temperature changes, these forms (states of matter) can change through processes such as freezing and melting and evaporation and condensation. All water on Earth is part of the hydrological (water) cycle, a process responsible for clouds, rain (precipitation) and rivers.	Context: This unit is the fourth of five science units where pupils study materials as part of the discipline of chemistry. Pupils have a secure knowledge of the properties of materials (Years 1 and 2) and can identify and compare the suitability of a variety of everyday materials (Years 1-3). Previous learning includes comparing how things move on different surfaces and pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects (Year 2). Children can compare and group different kinds of rocks on the basis of their appearance and simple physical properties and know how fossils are formed and recognise that soils are made from rocks and organic matter (Year 3). This year 4 unit builds on pupils' knowledge of properties of materials as pupils learn about states of matter, where they compare and group materials together, according to whether they are solids, liquids or gases. This understanding of matter is important, as it enables children to more fully understand abstract concepts such as Sound (later in Year 4). New learning includes that some materials change state depending on their temperature. Pupils will take measurements or use research to determine the temperature at which this happens in degrees Celsius (°C). The knowledge acquired during this unit will help children understand the water cycle in Geography: the parts played by evaporation and condensation, including associating the rate of evaporation with temperature. This unit is the precursor to work studied in Year 5 pupils learn about dissolving, mixing and changes of state, and reversible and irreversible changes. Pupils also build on previous knowledge of magnetic and non-magnetic metals.	
Prior Learning Requirements: - Some materials are heavier than others even though they are the same size e.g. medicine ball in PE. - Materials change when heated or cooled – observations of cooking /	Common Misconceptions (PLAN): Some children may think: 'Solid' is another word for hard or opaque. - Solids are hard and cannot break or change shape easily and are often in one piece. - Substances made of very small particles like sugar or sand cannot be solids.	

freezing e.g. ice-cream / puddles disappearing. Some changes can be reversed – observations of snow melting / ice.	- Particles in liquids are further apart than in solids and they take up more space. - When air is pumped into balloons, they become lighter. - Water in different forms – steam, water, ice – are all different substances.	
Biographical Study - Scientist: Robert Boyle (1627-1691) (Irish chemist who explored the relationships between pressures and volumes of gases)	Key Vocabulary (Linked to PLAN) (Full list on Vocabulary progression document): Solid: A substance that stays the same shape. Its particles do not move Liquid: Liquids will flow, it is made up of loosely packed particles. Gas: Gaseous matter is made up of matter that is so loose that it is always moving. State Change: Materials changing between solids, liquids and gases through freezing, melting, evaporation and condensation. Melting: Change in state from solid to liquid. The temperature at which this occurs is a material's 'melting point'. Freezing: Change in state from liquid to solid. Boiling Point: The temperature where a liquid begins to turn into a gas (vapour). Evaporation: Change in state from liquid into gas. Condensation: When water vapour that is around us changes from a gas back to water. Temperature: The amount of heat in a substance or object. Water Cycle: The continuous cycle of evaporation, condensation and precipitation of water around the world. Water Vapour: Water that is in the form of gas. Precipitation: Any watery substance such as rain, snow, hail or sleet that falls to Earth. Surface Run-Off: Surface water which travels across the land, flowing into streams and rivers.	
NC Objectives (Substantive Knowledge): - 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.	Working Scientifically (Disciplinary Knowledge): - 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. - Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. - Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.	

- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.
- Identifying differences, similarities or changes related to simple scientific ideas and processes.
- Using straightforward scientific evidence to answer questions or to support their findings.

Key enquiry types:

- Observing Over Time (Changes in state such as melting or evaporation)
- Comparative and Fair Testing (investigate evaporation rate)
- Pattern Seeking (Link between state of matter and temperature)
- Research Using Secondary Sources (Melting point temperatures for different materials)

Maths Links:

- Scale reading – thermometers in degrees Celsius (°C)
- Reading time intervals (Seconds, minutes, hours – time to melt / time for water to evaporate)
- Graphing (Line graph (Note: Y5/6 skill) or bar charts to measure melt water)
- Tables – to present data (temperatures / volume of melt water etc.)
- Venn diagrams (thermal conductors / thermal insulators)

ATRR Reading Links:

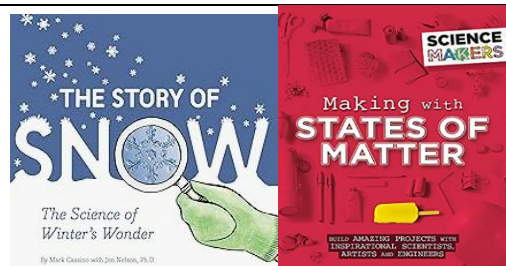
Strand 1: Timeline (The Water Cycle)

Strand 2: Six-Word Summary (The Water Cycle, processes – melting, freezing, condensation, evaporation etc.)

Strand 4: Impression and Evidence (Link to Water Cycle; Materials with different melting points)

Linked Texts:

- The Story of Snow (Jon Nelson)
- Science Makers: Making With States of Matter (Anna Claybourne)



(Components) Lesson Sequence:

- LC1: How can we tell the difference between a liquid, a solid and a gas? (Identifying states of matter, their properties and examples)
- LC2: Can a solid become a liquid and a gas? (Fair test)
- LC3: (Short skills lesson) How do I read a thermometer? (cc links to maths reading scales)
- LC4: What happens to the ice hand over time? (Observation of ice hand – photograph ice hand at regular intervals, measure melt water)
- LC5: Does the temperature of water affect the rate of evaporation? (Fair Test)
- LC6: Do all solids and liquids melt and evaporate at the same temperatures? (Research Using Secondary Sources of Information)
- LC7: What is the Water Cycle? (Write as explanation text)

Prior Learning (Can you still?):

Write questions from within this unit once taught. For example:

- Name the three states of matter. Give an example for each.
- What is the process when a solid changes into a liquid? (Change for liquid to solid / liquid to gas / gas to liquid).
- What do we call the temperature when a solid begins to change into a liquid?
- What causes changes in states of matter?
- Sorting activity (Venn or Carroll) – various solids, liquids and gases.
- What is the Water Cycle? (Alternative: Six-Word Summary).
- Define key words / phrases linked to the Water Cycle.

Previous Units:

See prior learning sections of Living Things and Their Habitats and Animals, Including Humans (Year 4).

Previous Years (example questions linked to physics units):

- What does opaque mean?
- What does translucent mean?
- What does transparent mean?
- Light travels in s_____ l_____. (Straight lines)
- What is a primary source of light? Give an example.
- What is a secondary source of light? Give an example.
- What is friction?
- Show images – which surface will create the most friction? Why?
- What will happen when magnets are arranged in different ways? (attract / repel poles)
- Name a magnetic material.
- What are the four seasons? Name them in order.
- What are the key features of spring? (Six-word summary) (Repeat for summer / autumn / winter)

Year Group: 4	Unit of Study: Sound	Science Branch: Physics
Term: Spring 2		
Composite (The Big Idea): Sound is created from a source and travels outwards in the form of a sound wave in all directions. Sound waves are caused by vibrating molecules in either solids, liquids or gases. Bigger sound waves create louder sounds and longer wave lengths create lower frequencies (pitches). Sounds are detected by the ears of animals.	Context: This is a stand-alone unit where pupils learn about sound as part of the discipline of physics - the study of the processes that shape our world and how we use it. It is important to note that children will have some prior knowledge through the use of terminology within music lessons. However, it should be noted that this unit has abstract ideas, building upon their understanding of matter (Year 4 Changing States of Matter). This unit does not link directly with any future science teaching so it is important that knowledge is secured during the unit. In Year 4, pupils identify how sounds are made and recognise that vibrations from sounds travel through a medium (solids, liquids or gases) to the ear. Learning includes the anatomy of the human ear, linking with knowledge of the human body gained within the Animals, Including Humans units from Y1 to Y4. The knowledge of sound acquired in this unit will help pupils find patterns between the pitch of a sound and features of the object that produced it. It also helps pupils find patterns between the volume of a sound and the strength of the vibrations that produced it. Pupils will know that sounds get fainter as the distance from the sound source increases.	
Prior Learning Requirements: • Hearing is one of our five senses. • We use our ears to hear. • Sounds vary: loud, quiet, high pitch, low pitch. • Sounds can be combined using musical instruments. • From Music, pupils will be aware of pitch, tempo and pulse.	Common Misconceptions (PLAN): Some children may think: • Sound is only heard by the listener • Sound only travels in one direction from the source • Sound can't travel through solids and liquids • High sounds are loud and low sounds are quiet.	
Biographical Study - Scientist: Possible Mention: Aristotle (384BCE – 322BCE) (Ancient Greek philosopher who developed the concept that sound travels	Key Vocabulary (Linked to PLAN) (Full list on Vocabulary progression document): • Sound: Noise created from the vibrations of mediums such as air and water. • Source: The place where the sound wave is first created.	

through air due to the movement of air molecules)	• Vibrate / Vibration: Vibrations backwards and forwards movements caused when a medium such as air wobbles in the form of sound waves. • Travel: To move from one place to another. • Pitch (High / Low): A high sound has a high pitch and a low sound has a low pitch. A tight drum skin gives a higher pitched sound than a loose drum skin. • Volume: How loud or quiet something is. • Faint: Very low volume sounds that are difficult to detect. • Loud: Very noisy sounds that are easy to detect. • Insulation: Protecting something by surrounding it with material that reduces or prevents the transmission of sound. • Ear: An organ of the body designed to detect sound waves. • Sound Wave: The continuous vibrations of a medium moving away from the source. • Frequency: Frequency is measured as the number of wave cycles that occur in one second. More waves means a higher frequency. This is linked to pitch.
NC Objectives (Substantive Knowledge): • 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.	Working Scientifically (Disciplinary Knowledge): • 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. • Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. • Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. • Identifying differences, similarities or changes related to simple scientific ideas and processes. • Using straightforward scientific evidence to answer questions or to support their findings. Key enquiry types: • Pattern Seeking (Sound over distance) • Pattern Seeking (Magnitude of vibration linked to volume) • Pattern Seeking (Size of vibration length linked to pitch) • Fair Test and Comparing (Sound insulation volume) • Classification and Sorting (Instrument type – string, woodwind etc.)

Maths Links:

- Distances – Measuring distances away from a sound source.
- Tables of decibel readings (including calculations between decimal levels if required).
- Graphing – bar chart (decibel readings comparing different sound sources)
- Graphing – line graph (note: Y5-6 mathematical skill, but remains the best method of visualising sound over distance).
- Reading scales – pitch (Hertz), volume (decibels) etc.

Note: The use of data logging is required using the iPad app, Decibel 10. To obtain a constant volume and pitch, use: [YouTube](#) (Henry Hoover Sleep Noise). This will allow consistent data readings.

ATRR Reading Links:

Strand 1: Timeline (How the ear works; how sounds are made)

Strand 2: Six-Word Summary (How the ear works; how sounds are made; what happens to sound over distance etc.)

Strand 4: Impression and Evidence (Noises / sounds made by various instruments / objects)

Linked Texts:

- Sound (Step Into Science) (Peter Riley)
- Sonam and the Silence (Eddie Ayres & Ronak Taher)

**(Components) Lesson Sequence:**

- LC1: What creates sound and how does it travel?
- LC2: How do we hear things? (Anatomy of the ear)
- LC3: How do we change the pitch and volume of sounds? (Explore using instruments – how are sounds made by each instrument? What are the pitches and volumes of each using Decibel 10? Bar chart usage)
- LC4: Which material is the best for soundproofing? (Investigation – measure volume using Decibel 10 app – bar chart usage)
- LC5: What happens to sound as you travel further away from it? (Investigation – line-graphing volume over distance. Note the background noise level, where volume will remain constant).

Prior Learning (Can you still?):

Write questions from within this unit once taught. For example:

- What is needed in order to create sound? (Vibration).
- What is pitch?
- What is volume?
- A shorter vibration will produce a high/low pitched sound. (Alter to longer).
- Sound travels in w____. (Waves).
- What happens to a sound over distance?

Previous Units:

See prior learning sections of Living Things and Their Habitats and Animals, Including Humans, Changing States of Matter (Year 4).

Previous Years (example questions linked to physics units):

- What does opaque mean?
- What does translucent mean?
- What does transparent mean?
- Light travels in s_____ l_____. (Straight lines)
- What is a primary source of light? Give an example.
- What is a secondary source of light? Give an example.
- What is friction?
- Show images – which surface will create the most friction? Why?
- What will happen when magnets are arranged in different ways? (attract / repel poles)
- Name a magnetic material.
- What are the four seasons? Name them in order.
- What are the key features of spring? (Six-word summary) (Repeat for summer / autumn / winter)

Year Group: 4	Unit of Study: Electricity	Science Branch: Physics
Term: Summer 1-2		
Composite (The Big Idea): Electricity is the flow of electrons within materials. As they move, they generate electrical power which can be used to make things work. Electricity flows through closed / complete circuits, using wires to connect a power source to electrical components such as bulbs.	Context: This unit is the first of two science units where pupils learn about electricity as part of the discipline of physics - the study of the processes that shape our world and how we use it. During this unit, pupils will identify common appliances that run on mains and battery electricity and construct a simple series electrical circuit, identifying and naming its basic components. Pupils will investigate whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a closed loop (circuit) with a battery. Pupils will recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They will also recognise some common conductors and insulators and associate metals with being good conductors (building on knowledge of everyday materials in Years 1 and 2). This knowledge will aid pupils when exploring properties of materials in Year 5 and form the basis for further study in Year 6, where they will begin to recognise and use formal symbols and investigate the effects of changing voltage within series circuits.	
Prior Learning Requirements: • Through play know which devices use electricity (battery and mains) and that the electricity provides the energy for the device to work. • Know some everyday devices which use electricity • Sources of light and sound may need electricity to work	Common Misconceptions (PLAN): Some children may think: • Electricity flows to bulbs, not through them • Electricity flows out of both ends of a battery • Electricity works by simply coming out of one end of a battery into the component.	
Biographical Study - Scientist: Possible Mention: Thomas Edison (1847-1931) (American inventor of the lightbulb and power grid)	Key Vocabulary (Linked to PLAN) (Full list on Vocabulary progression document): • Electricity: The flow of electrons through conducting materials such as metal. • Electrical Appliance: A machine or device which is powered by electricity. • Mains: The electricity source from sockets within homes. This supply is more powerful than batteries and is generated by power stations.	

	• Plug: Inserts into sockets to connect an electrical appliance to the mains. • Electrical Circuit: A complete loop with no gaps or breaks of electrical components (bulbs, buzzers, motors), linked by wires and containing a power source (cell / battery). • Cell / Battery: A container that chemically stores electricity. They are used to power portable electrical appliances. • Positive / Negative: The two, oppositely charged ends of a cell (battery). • Short Circuit: A circuit with a cell / battery with no appliances to power. The wires dangerously overheat and the battery is quickly drained. • Loose Connection: A wire that is not securely attached. • Crocodile Clip: A metal, toothed clip used to join wires to electrical components. • Bulb: An electrical device designed to create light. • Switch: A device which allows the controlled breaking and completion of circuits in order to turn things on/off. • Buzzer: An electrical device which makes a buzzing sound. • Electrical Conductor: Some materials let electricity pass through them easily. These materials (mostly metals) are known as electrical conductors. • Electrical Insulator: Some materials stop electricity passing through them.
NC Objectives (Substantive Knowledge): • 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	Working Scientifically (Disciplinary Knowledge): • 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. • Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. • Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. • Identifying differences, similarities or changes related to simple scientific ideas and processes. • Using straightforward scientific evidence to answer questions or to support their findings.

Key enquiry types:

- Classifying and Grouping – electrical conductors and electrical insulators (materials)
- Comparative and Fair Testing – does electricity flow through all materials?
- Pattern Seeking – identifying whether circuits work through closed loops, presence of a battery and open/closed switches.

Maths Links:

- Tables for recording information.
- Use of Venn or Carroll diagrams to sort materials according to electrical conductivity.

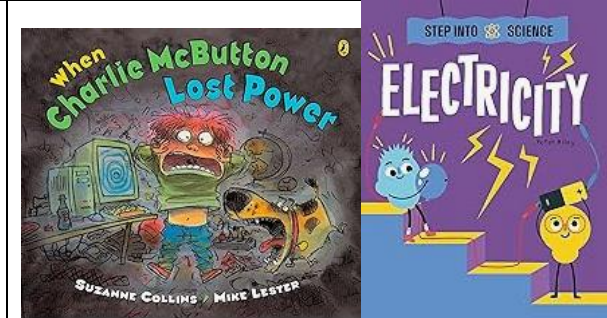
ATRR Reading Links:

Strand 2: Six-Word Summary (how a circuit works; electrical dangers etc.)

Strand 5: 3/5 Most Important Things (electrical dangers)

Linked Texts:

- When Charlie McButton Lost Power (Suzanne Collins & Mike Lester)
- Electricity (Step Into Science) (Peter Riley)

**(Components) Lesson Sequence:**

- LC1: What powers the electrical items around us? (Sort electrical / not electrical items; sort battery / mains powered – Venn Diagrams)
- LC2: How do we keep safe with electricity?
- LC3: What is a circuit and how does it work? (Predict / Result)
- LC4: Will my circuit work?
- LC5: Does electricity flow through all objects? (Investigate electrical conductors and insulators)
- LC5: How do switches work? (Construct switch using paper clip and split pins through cardboard)

Prior Learning (Can you still?):

Write questions from within this unit once taught. For example:

- What is electricity?
- Venn diagram – sorting appliances according to mains/battery or electrical/non-electrical.
- Name three electrical components.
- Will the circuit work? (Use images – note: do not use formal diagrams of circuits in Year 4)
- What is an electrical conductor? Give an example.
- What is an electrical insulator? Give an example.
- Name three ways to stay safe around electricity.
- Spot the electrical hazard. (Use images).

Previous Units:

See prior learning sections of Living Things and Their Habitats and Animals, Including Humans, Changing States of Matter, Sound (Year 4).

Previous Years (example questions linked to physics units):

- What does opaque mean?
- What does translucent mean?
- What does transparent mean?
- Light travels in s_____ l_____ (Straight lines)
- What is a primary source of light? Give an example.
- What is a secondary source of light? Give an example.
- What is friction?
- Show images – which surface will create the most friction? Why?
- What will happen when magnets are arranged in different ways? (attract / repel poles)
- Name a magnetic material.
- What are the four seasons? Name them in order.
- What are the key features of spring? (Six-word summary) (Repeat for summer / autumn / winter)

Appendix 1: Year 4 Unit Specific Substantive Knowledge Overviews

Living Things and Their Habitats

Grouping Plants and Animals

- Know that animals and plants can be put into different groups this is called classification.
- Warm Blooded vs Cold Blooded
- Know that animals can be divided into warm and cold blooded

Type	Definition	Example
Warm Blooded	Animals that can make their own body heat even when it is cold outside	Humans, mammals, birds
Cold Blooded	Animals that cannot make their own heat. They need the sun's warmth to heat their bodies.	reptiles, amphibians, fish

- Know that animals can be classified into vertebrates and invertebrates.
- Know that vertebrates are animals with a backbone and that invertebrates have no backbone and can be hard bodied or soft bodied.
- Know that vertebrates will include fish, amphibians, reptiles, birds and mammals. Invertebrates into molluscs, worms, arachnids and insects.
- Mammals are warm blooded, have fur or hair, usually give birth to live young and typically feed their young milk.
- Fish are cold blooded, breathe using gills, lay eggs and have fins.
- Reptiles are cold blooded, have dry scaly skin and lay their eggs on land. Birds are warm blooded, have feathers and lay eggs.
- Amphibians are cold blooded, breathe air but lay eggs underwater as their young use gills to breathe.
- Molluscs have soft, unsegmented bodies but use shells for protection. They live in damp, wet habitats.
- Worms are long, slender unsegmented animals that burrow underground and have no additional limbs. (Know that limb is a word used to mean arms and legs)
- Arachnids usually have segmented body parts and eight legs.
- Insects have six legs, 3 segmented body parts and generally have one or two sets of wings. Know that insects have 3 parts to their body structure head, thorax and abdomen

- Know how to identify these in a range of different insects (real and from pictures) Know the names of these common UK Woodland animals, the classification groups they are members of and identify pictures of them –
- Mammals: Weasel, badger, rabbit, bat, deer, fox, mole
- Fish: Salmon, brown trout
- Birds: Barn owls, blackbird, kestrel, cuckoo, great spotted woodpecker, kingfisher
- Reptiles: Adder, Grass Snake, Common lizard Amphibians: Common frog, Common toad, Smooth newt
- Molluscs: Slug, Garden Snail
- Arachnids: Harvestman, Garden Spider
- Worms: Common earthworm
- Insect: Peacock Butterfly, wood ant, wasp, bee, cricket, centipede, millipede, woodlouse, grasshopper

Classifying Plants

- Know that plants can be classified into flowering and non-flowering plants. Flowering plants such as grasses and non-flowering plants such as ferns, mosses.
- Discuss the key features of each plant group.
- Know how to identify grass and moss in the local environment
- Flowering plants will have a flower head or fruit. Non-flowering plants do not produce flowers or fruit.
- Flowering plants: dandelion, buttercup, daisy, bluebell
- Non-flowering plants include ferns and mosses

Changing Environments

- Know that humans can impact positively and negatively on the environment. Know that negative impacts include cutting down trees (deforestation), building roads/houses, growing population, littering, and plastic in oceans.
- Know that positive impacts include building nature reserves, protecting land, introducing different species
- Examples of re-wilding: reintroduction of Beavers. Conservation groups such as the Royal Society for the Protection of Birds (RSPB), Tiggywinkles (hedgehogs) and Bumblebee Conservation Trust.

Animals, Including Humans (Digestion)

- Know that digestion is the breaking down of food mechanically in the mouth before chemically in the stomach.
- Know that the mouth, tongue, teeth, oesophagus (sometimes spelled esophagus), stomach, small and large intestine make up the human digestive system.
- Know where each part is within the human body.

- Know the function of each part –
 - Mouth: food enters the digestive system and is mixed with saliva to make it softer
 - Tongue: moves food around to be broken down.
 - Teeth: break down the food so it can travel through the oesophagus.
 - Oesophagus: moves food from the mouth to the stomach.
 - Stomach: uses chemicals to break down the food into small parts before passing on to the small intestine.
 - Small intestine: digested food here is passed into the bloodstream where it can be taken to the body parts that require it.
 - Large intestine: any food leftover is unwanted, and is passed along the large intestine to the rectum.
- Know that, without digestion, we could not absorb nutrients from food into our bodies and use them.

Teeth

- Know that there are different teeth for different purposes.
- Incisors: the front teeth help bite off chunks of food to be broken down.
- Canines: pointed teeth designed to rip and tear meat and fish. (Premolars and)
- Molars: flatter, thicker teeth at the back of the mouth designed to crush and grind food. Know that you get two sets of teeth during your lifetime - the first set is often called the milk or baby teeth.
- Know that a child has 20 teeth and an adult has 32.
- Know that adults have wisdom teeth which grow at the end of each row of teeth. These are often removed in adults because they can affect the growth of the teeth nearby and can be painful.
- Know that it is important to look after teeth by brushing at least twice a day for two minutes at a time. It is important to use toothpaste which contains fluoride as this protects teeth from tooth decay.
- Know that you can also use mouthwash and dental floss to help look after your teeth.

Food Chains

- Know that a food chain is a series of living things which are linked to each other because each thing feeds on the one next to it in the series.
- Know that plants are producers, and create their own food through a process called photosynthesis
- Know that all animals are consumers, they eat food (either plants or other animals) rather than produce their own (as plants are able to)
- Know that prey are animals that are consumed by other animals and predators are animals that consume other animals.
- Understand that some animals can be both predator and prey (e.g. a baboon eats grasshoppers but is eaten by a leopard)
- Know the following food chains:
- Plant Roots (producer) -> Zebra (prey) -> Lion (predator) Green shoots (producer) -> antelope (prey) -> crocodile (predator)
Grass (producer) -> grasshopper (prey) -> Baboon (predator + prey) -> Leopard (predator). Grass (producer) -> cow (prey) -> human (predator).

States of Matter

- Know that everything is made up of tiny particles.
 - The properties of a substance depend on what its particles are like, how they move, and how they are arranged.
 - Most substances can exist in three states: solid, liquid and gas.
 - In a solid state the vibrating particles form a regular pattern. This explains the fixed shape of a solid and why it can't be compressed or poured.
 - In a liquid the particles still touch their neighbours but they move around, sliding over each other. This is why you can pour, but not compress (squash), a liquid.
 - In the gas state, widely-spaced particles move around randomly. This explains why you can compress gases and why they flow.
-
- Identify the following solids, liquids and gases at room temperature. Know that room temperature means neither heated nor cooled. Watch video clip at: <http://www.bbc.co.uk/guides/zqpv7p3#zh4fy4j>

Solid (at room temperature)	Liquid (at room temperature)	Gas (at room temperature)
Wood Iron Copper Plastic	water milk blood oil	oxygen carbon dioxide nitrogen steam

- Know that air is a collection of gases (not a single gas) and it contains - 78% nitrogen, 21% oxygen and a small amount of other gases including carbon dioxide.
 - Know that steam and smoke are not the same thing.
 - Know that steam is water in gas form and that smoke comes from burning solid material.
 - Know that when atoms are heated, the bonds between them break, allowing for solids to become liquids, and liquids to become gases.
 - Know that when materials are cooled, bonds are created in air to form liquids, and bonds are strengthened and become rigid, creating solids from liquids.
-
- Know that we measure temperature using degrees Celsius (°C)
 - Know that in many countries they use a Fahrenheit scale.
 - Compare the two scales.
-
- Know that condensation is the name of the process when water vapour changes into liquid through cooling.

- Know that condensation also refers to the liquid as it appears on windows on a cold day. Know that as water condenses clouds form in the sky.
- When it is cool enough, and a vast amount of water has formed, it falls in the form of rain and is called precipitation.
- Know that water can exist in all three states. (Use the word water vapour alongside steam).
- Understand that water will change from a liquid to a solid when cooled to 0°C and that this is the freezing process. When ice melts, it becomes liquid which becomes part of the water cycle again.

Sound

Sound

- Know sounds are made when something vibrates.
- Know that vibrate means to shake with repeated small quick movements.
- Metal vibrates when it is struck, vocal chords inside our throat vibrate when we speak. This causes the air around the source of the sound to vibrate. The vibration travels through the air to our ear in a wave. Sound waves can travel through solids (such as metal, stone and wood), liquids (such as water) and gases (such as air).
- Know that sound travels in longitudinal waves as each particle pushes the particles next to it.
- Know that where there is no gas, there is no sound. Sound cannot travel through space as there is no air. This is called a vacuum.

Anatomy of the ear

- Know the structure/ anatomy of the human ear.
- Know that the ear consists of the outer ear and inner ear.
- Know that the eardrum is a thin piece of stretched skin inside the ear, which vibrates. These vibrations then travel through a sequence of small bones (the smallest bones in the human body).
- These bones connect to the cochlea.
- The cochlea looks like a snail shell (the word 'cochlea' means snail in Ancient Greek).
- Small hairs in the cochlea convert the vibrations into nerve impulses, which send information to the brain for processing.

Pitch

- Know that pitch is how high or low a sound is.
- Know that the following words would be used to describe low and high pitch sound.

Low Pitch	squeak, squeal,
High Pitch	rumble, grunt, boom

- Know that pitch and volume are different - volume is how loud or quiet a sound is.
- Know that there are high pitches and low pitches.
- A short string gives a higher-pitched sound than a long string when they are plucked.
- A tight drum skin gives a higher-pitched sound than a loose drum skin.

Volume

- Know that the volume of a sound is how loud or quiet a sound is.
- Know that the stronger the vibrations the louder the sound.
- The weaker the vibrations the quieter the sound. Know that as sounds travel the vibrations become weaker, because they run out of energy.
- This means that the volume of the sound will decrease the further away a sound is from an ear to hear it (investigation – requires a loud, continuous, single-pitch sound: [Use YouTube: Vacuum Cleaner – White Noise Sound / Sleep Trick – Best for Babies \(8 Hours\)](#))

Electricity

- Know appliances that run on electricity in school and at home and those that do not.
- Know the difference between mains electricity and battery powered electricity.
- Know that electricity is dangerous, and know how to be safe using it.
- Identify the hazards that might be faced in the home.
 1. Overloaded plug extension sockets,
 2. Exposed wires,
 3. Damaged sockets,
 4. Wires left along the carpet for people to trip over,
 5. Electrical appliances and wires near water,
 6. Placing metal into electrical appliances or open sockets
- Know how to prevent these hazards and know not to touch anything they feel is unsafe.

- Know how electricity travels through a circuit, and the various components that create a circuit (Battery, cell, open and closed switches, buzzer, lamp, motor, wire and voltmeter.) Note: all batteries are cells, but not all cells are batteries.
- A cell is a power source, a battery is a power source that uses chemical reactions to generate power.
- Know how to create simple circuits using a battery, a bulb and a switch.
- Know that an open switch will not complete the circuit and that a closed switch will complete the circuit.
- Know that electricity must be able to flow around the circuit for components to work.
- Know that the word current describes the flow of electricity in a circuit.
- Know if the following circuits work or not.
- A complete circuit without switches.
- A circuit with wires not connected to the cell on one side.
- A complete circuit with an open switch.
- A complete circuit with a closed switch.