Upper Nidderdale Primary Federation

Science

Intent, Implementation and Impact
Long Term Plans & Progression
EYFS, KS1 and KS2 – updated September 2024

At Upper Nidderdale Primary Federation, we will all approach everything we do in the CHAMPS way, help every child flourish into a caring, confident and resilient young person who has a **love of learning** and:

Chooses the right way and takes **responsibility** for their own actions
Honest in everything they do and shows **compassion** for others
Achieves the best they can with the talents they have and develop their **wisdom**
Manners shown to everyone and treats everyone with **respect**
Perseveres when situations are difficult and shows **courage** when they are challenged
Safety and knowing how to keep safe on and offline to ensure that everyone is kept physically and emotionally safe. This shows the special relationship we have with each other, where as a **community,** we look after each other, keeping each other safe – **Koinonia**

As Rights Respecting schools, our intents are based around the following articles;

Article 23

You have the right to special education if you have a disability.

Article 28

All children have the right to a good quality education.

Article 29

All children have the right to an education that helps to develop their talents and abilities.

Science - Intent:

"Children are naturally curious. Science at primary school should nurture this curiosity and allow them to ask questions and develop the skills they need to answer those questions."
Louise Stubberfield

At The Upper Nidderdale Primary Federation, Science is taught discretely with a focus on substantive knowledge and the development of essential disciplinary knowledge. Our Science curriculum ensure that pupils will acquire life-long enquiry skills in order to explore an understand the world they live in. They will also develop an understanding of the vita; role that major scientific ideas and scientists have played in society. In doing so, all our pupils, regardless of their starting points, will be fully prepared for their next stage of scientific education, and beyond.

Our Science curriculum encourages children to be curious about natural phenomena and to be excited by the process of understanding the world around us. We want our pupils to remember the concepts that they learn. Therefore, the curriculum focuses on the sequential substantive knowledge, underpinning all three areas of Science (Physics, Biology and Chemistry). Over time, these building blocks of learning are transformed into a deep understanding of the real world. Each year group deepens their understanding of key concepts, adding new generative knowledge to existing schema.

Science - Intent:

Procedures and concepts that underpin scientific methods are developed through the systematic focus on disciplinary knowledge. Every unit of work contains opportunities to develop the Working Scientifically skills of asking questions, planning enquiries, observing, measuring, recording, presenting and interpreting results, drawing conclusions, predicting and evaluating, according to these skills as per the progression map.

The different approaches to science enquiry, such as fair testing, research and classifying are also systematically developed in the disciplinary knowledge section of the unit. Each science unit of work is then framed around an enquiry question, ensuring systematic, contextualised development of both substantive and disciplinary knowledge.

Science

Implementation:

Prior to Session 1	Children complete a Essential Knowledge Check 1 (prior knowledge that needs to be in place in order to built on new learning as per the sequential knowledge grids) so that the teacher can plan how to close any knowledge gaps or address any misconceptions.
Session 1	Teaching gaps in knowledge and misconception (these will need to be revisited) Share the learning journey for new knowledge – the connections between prior knowledge an the new knowledge need to be made explicit(i.e. what links to what) to the children as you are building on prior knowledge – explain that they needed to know ……., in order to built ……. into their schema. Share the big question and explain what they will be learning to enable us to answer this. (Metacognition) Share Knowledge Organiser with vocab and sticky knowledge.
Session 2	Recapping new vocabulary/connecting previous vocabulary. Verbal recalling of previous learning. Carefully plan the introduction to the new unit of learning – engaging and inspiring, awe and wonder (not just PowerPoints) Share the learning journey again - what are we learning today and why. Using CPD on Being a Great teacher – explicit modelling, questioning etc. Teacher modelling and work for children to show how far they have met the intended outcome.

Science

Implementation:

Session 3	Teaching session 3 – Verbal retrieval – lesson matched to learning journey. Using day to day assessment to identify any gaps and misconceptions – adapt lesson for these. Teach session using explicit modelling, carefully planned question (vary using Blooms) Continue to develop vocabulary in context. Mini Knowledge Check 1 – True or False (4 questions) Lesson objectives taught – explicit modelling and discussion.
Session 4	Teaching session 4 – Retrieval – Read and Retrieve (10 mins) Teach session using explicit modelling, carefully planned question (vary using Blooms) Continue to develop vocabulary in context. Lesson objectives taught – explicit modelling and discussion.

Science

Implementation:

Session 5	Teaching session 5 – Verbal retrieval – lesson matched to learning journey. Lesson objectives taught – explicit modelling and discussion. Building on substantive knowledge – disciplinary knowledge – Teach session using explicit modelling, carefully planned question (vary using Blooms) Continue to develop vocabulary in context.
Session 6	. Teaching session 6 – Verbal retrieval – lesson matched to learning journey. Lesson objectives taught – explicit modelling and discussion. Building on substantive knowledge – disciplinary knowledge – Mini Knowledge Check 2 – Multiple Choice – adapting and personalising teaching to address misconceptions and gaps in learning.

Science

Implementation:

Session 7	Teaching session 7 – Retrieval – Read and Retrieve (10 mins) Lesson objectives taught – explicit modelling and discussion. Building on substantive knowledge – disciplinary knowledge
Session 8	Teaching session 8 – Verbal retrieval – lesson matched to learning journey. Lesson objectives taught – explicit modelling and discussion. Building on substantive knowledge – disciplinary knowledge Essential Knowledge Check 2 – Prior and New Knowledge Check – Teacher can act as scribe for a pupil.

Science

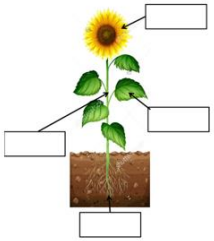
Implementation:

Session 9	Teaching session 9 – Vocabulary Retrieval Using information from the Essential Knowledge 2 - address gaps in knowledge and any misconceptions. Check Lesson objectives taught – explicit modelling and discussion. Building on substantive knowledge – disciplinary knowledge – working scientifically. Learning Log - Composite assessment tasks. These require pupils to draw on a range of subject knowledge (including different types of knowledge) to construct a more complex output.

Essential Knowledge 1

Prior Knowledge – Science Year 2

1) Label the parts of a plant.



2) What is a deciduous tree?

Example of an Essential Knowledge Check 1

Mini Knowledge Check 1

True or False

1) A plant releases oxygen
_____

2) A stem make food for a plant
_____

3) Water travels from the petals down into the roots _____

Example of a Mini Knowledge Check 1 – True or False

Mini Knowledge Check 2

Multiple Choice

1) When a bee delivers nectar, this is called _____

A) flower B) pollination C) photosynthesis

2) When a flower spreads it seeds it is called

A) reproduction B) Seed dispersal C) flowering

Example of a Mini Knowledge Check 2 - Multiple Choice

Essential Knowledge 2

Prior Knowledge and New Knowledge – Science Year 1 and Year 2

1) How does water travel in a plant?

2) What is the function of the petals?

3) What is pollination?

Example of an Essential Knowledge Check 2

Science

Implementation:

The final lesson in the learning journey will give children an opportunity to connect their new and prior knowledge, along with the disciplinary knowledge that they have gained to answer the 'big question.'

To encourage pupils to think, read and write like scientists, they are introduced to a variety of famous scientists in the context of the area of the area of science that they are learning about.

Science

Implementation - Vocabulary

Acquisition of Scientific vocabulary is vital for Scientific education. We have carefully selected the vocabulary that we want children to learn the meaning of, and to use in context. This vocabulary list is sequential and progressive and has been organised to be taught in specific units of work.

Definitions will be taught, and this will be displayed on working walls to be referred to throughout discussions and investigations during the unit of work. Vocabulary definitions will be revisited and used in context.

Knowledge Organisers (which will be sent home and used in lessons) will pinpoint key vocabulary and definitions to support embedding the use of scientific vocabulary.

Science

Implementation of Working Scientifically - Floorbooks

Working Scientifically informs our planning for each unit, and scientific skills are woven in with scientific knowledge, rather than a bolt on. We use the Programme of Study guidance on Working Scientifically to ensure that all skills are taught in an age-appropriate manner, and revisited and recapped throughout each key stage so that the knowledge is deepened and embedded.

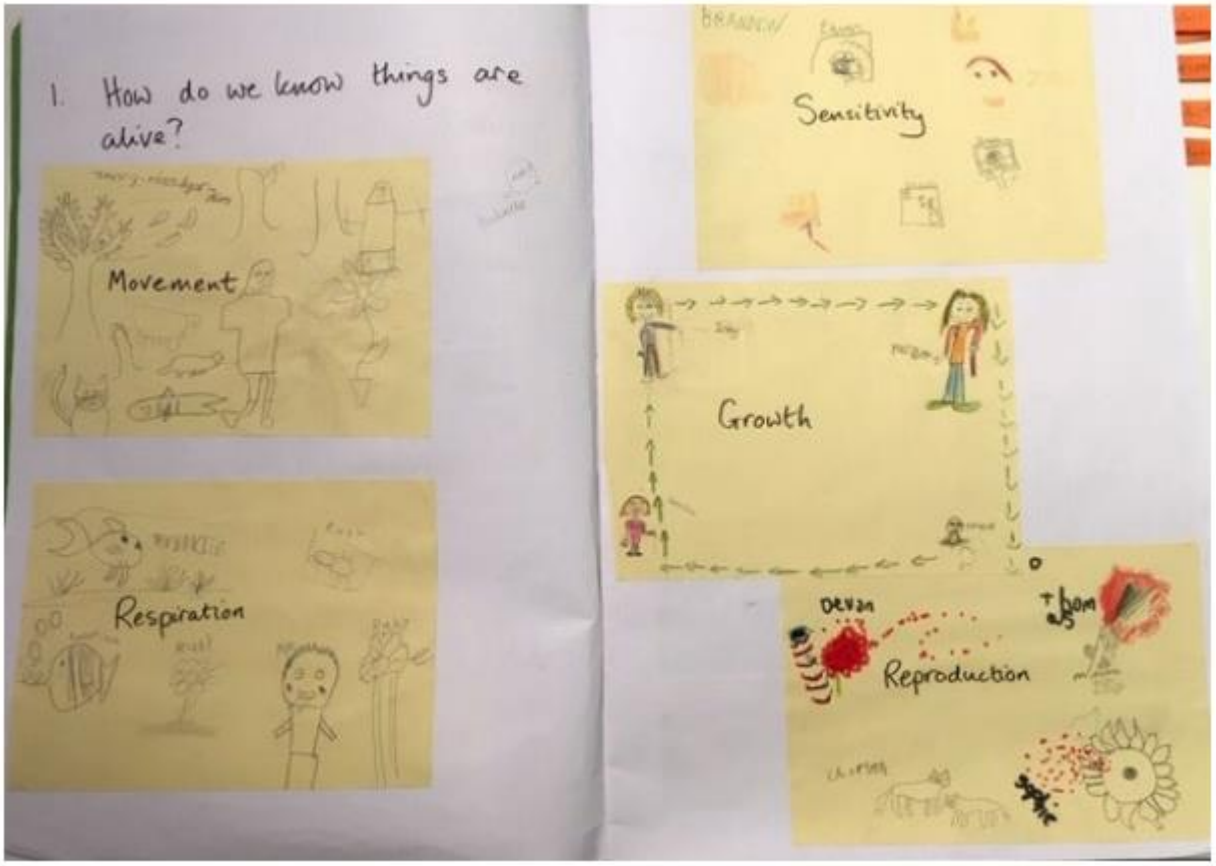
We use 'Floorbooks' to provide an insight into children's practical scientific skills/ Children must develop many skills to work scientifically in the classroom: sharing ideas, making predictions, planning investigations, observing and measuring, recording results, drawing conclusions and evaluating findings. To make a valid assessment of children's practical science skills, teachers needs to draw on a body of evidence collected over time. However, some of these skills are only evident when children are talking in small groups or in a class discussion. Some children do not have the literacy skills to match their science skills and successfully record their ideas, predictions or findings in written form. At The Upper Nidderdale Primary Federation, all practical science skills are recorded by the teacher in a Floorbook.

Science is a collaborative subject. Many investigations require that children work in groups in science lessons. We believe that a Floorbook is an ideal way to record group work and avoids the need to photocopy outcomes for individual records.

Floorbooks are worked on in year groups, even in mixed aged classes. This is to ensure that working scientifically and enquiry skill progression is built up in small, appropriate steps and that children get a chance to recall and retrieve previously learnt knowledge and skills to develop as scientists.

Science

Implementation of Working Scientifically - Floorbooks



Science

Implementation of Working Scientifically – Teaching Fair Testing

What are we trying to find out?	
Which variables will stay the same?	
Which variables will you change	
What do you predict will happen?	
Why do you think this?	
Evaluation – What were the results?	

Science

Impact:

Our Science Curriculum is high quality, well thought out and is planned to demonstrate progression, as well as allowing pupils to link and connect previous knowledge with newly acquired knowledge.

We measure the impact of our curriculum through the following methods:

- **A reflection on standards achieved against the planned outcomes;**
- **A celebration of learning for each term which demonstrates progression across the school;**
- **The measurable impact of development of substantive knowledge and disciplinary skills.**

SEND Adaptions in Science

SEND Adaptions for Science

Cognition and Learning

Subject Challenges for SEND	SEND Provision
The ability to explain a scientific concept/provide reasoning to explain a thought or opinion. The ability to recall basic scientific information e.g. the five groups of animals (mammals, fish, birds, reptiles and amphibians). Understanding of subject specific vocabulary. Difficulty in producing accurate pieces of writing e.g. an explanatory text of a scientific concept.	Use stem sentences to provide subject specific language in a particular format – this will enable children to accurately communicate their thoughts and opinions. Pre-teach can be used to revisit key scientific information as well as planned retrieval questions. The use of 'hooks' at the beginning of lessons informed by previous gap analysis should revisit objectives children are not secure with. Pre-teach subject specific vocabulary e.g. dependent/independent variables. Draw particular attention to subject specific vocabulary which could be viewed as ambiguous. E.g. 'results table' or 'culture.' Support the understanding of key vocabulary through definitions/visual aids. Use writing frames, 'fill in the blank' sentences, sentence starters, vocabulary mats, visuals to sequence etc. Children who have difficulties structuring their writing/who have difficulties with short term memory could use talking tins to 'hold their sentences' whilst they write at an individual word pace. Children can record work differently e.g. through the use of ICT (PowerPoints, Word documents, videos etc). Where possible, begin the lesson by using concrete resources before you discuss the abstract scientific reasoning behind. For example, make a circuit with a bulb, battery and wires before you discuss the concept of electricity/drop different shapes objects before you discuss air resistance.

SEND Adaptions for Science

Communication and Interaction	
Subject Challenges for SEND	SEND Provision
Expressing themselves and sharing their thoughts and opinions orally.	Use stem sentences to provide subject specific language in a particular format – this will enable children to accurately communicate their thoughts and opinions. Use alternative recording devices e.g. whiteboards/iPads/talking tins to allow children the option of sharing their thoughts and opinions in an alternative way. Allow children processing time when asking them a direct question. Some children need upwards of 10 seconds to process a question before they can answer.
Acquiring, comprehending and using scientific language.	Use visuals to support children in using the correct scientific name for apparatus. Widgit Online can support with creating visuals. Create flashcards with the common name for an object on one side and the scientific name on the other side. E.g. taste buds/fungiform papillae
EAL pupils may find it difficult to access resources/learning.	Use a reduced number of simple instructions which are supported by visuals. Appropriate modelling to aid understanding. Differentiated written resources can be supported by visuals and could be translated using Word. (Teachers click Review – Translate – Translate Document). This will fully translate the document and open in a new window.

SEND Adaptions for Science

Sensory and Physical		SEMH	
Subject Challenges for SEND	SEND Provision	Subject Challenges for SEND	SEND Provision
Physical difficulties accessing specific environments during RE trips to places of worship.	Ensure that any environments visited during school trips are fully accessible for children with physical disabilities e.g. wheelchair accessible. Ensure that alternative transport arrangements are made for any children who have a physical disability which makes walking difficult. Above information should be identified on risk assessment prior to visit.	The acceptance that others have different religious views and that they have a right to hold and express them. This can be particularly difficult for pupils with ASD.	Use a multi-sensory approach to teaching religious concepts e.g. through drama and role play. This will make concepts unfamiliar to themselves less abstract. Trips to different places of worship/visitors from different faiths will similarly make unfamiliar concepts less abstract.
Children with a visual impairment may find it difficult to view text/images/religious artefacts.	Ensure that font size used in resources matches the specific font size specified in the child's report provided by the Visual Impairment Team (saved in SEND files on T Share). Enlarge images to appropriate sizes to aid access. Use a visualiser to enlarge an artefact to ensure that children with visual impairments can observe religious artefacts.	Difficulties with social skills may result in children finding group work challenging.	Carefully consider seating arrangements during group work to ensure that children are placed next to patient, non-dominant children. Additional adult support can be deployed as necessary. Ensure children have access to usual aides such as ear defenders to reduce noise. Provide talking tins for children who struggle with impulsivity so that they can record their contributions as they think of them but can play them back to other children at the appropriate time.
		Distress caused by exposure to unfamiliar environments during trips/fieldwork.	Children to be prepared for change of environment via Social Stories, identification of change on visual timetable and photos/videos of environment to reduce anxiety caused by lack of familiarity.

RSE Objectives linked to Science

The Changing Adolescent Body February 2021 – Statutory RHSE guidance
Know key facts about puberty and the changing adolescent body, particularly from age 9 through to 11, including physical and emotional changes.
Know about menstrual wellbeing including the key facts about the menstrual cycle.

Health & Prevention February 2021 – Statutory RHSE guidance
Know how to recognise early signs of physical illness, such as weight loss, or unexplained changes to the body.
Know about safe and unsafe exposure to the sun, and how to reduce the risk of sun damage, including skin cancer.
Know the importance of sufficient good quality sleep for good health and that lack of sleep can affect weight, mood and ability to learn.
Know about dental health and the benefits of good oral hygiene and dental flossing, including regular check ups at the dentist.
Know about personal hygiene and germs including bacteria, viruses, how they are spread and treated, and the importance of handwashing.
Know the facts and science relating to allergies, immunization and vaccination.

Fundamental British Values and SMSC in Science

Science → SMSC Links

Spiritual

- Encourage pupils to reflect on the wonders of the natural world.

Moral

- Consider that not all developments have been good, and that they may have caused harm to the environment.
- Consider different perspectives and viewpoints and the reasons for these differences.
- Consider moral dilemmas in scientific developments.

Social

- Researching the work of different scientists, including female scientists.
- Opportunities to work in different pairings and groups.
- Explore the social dimension of scientific advances.
- Show respect for differing opinions i.e. creation.
- Co-operate in practical activities together.

Cultural

- Visits to different habitats and areas within the local environment.
- Raise awareness that scientific developments are the product of many different cultures.

Science → British Values

Democracy

- Take the views and opinions of others into account
- Take turns and instructions from others

The Rule of Law

- Understand the importance of safety rules when working scientifically
- Know that there are consequences in rules are not followed

Individual liberty

- Make choices when planning an investigation
- Others may have different points of view as to where to start

Tolerance

- Scientific discoveries have come from other cultures
- Religious beliefs often compete with scientific understanding

Mutual respect

- Work as a team
- Discuss findings
- Offer support and advice to others

Substantive Knowledge in Science

Science
Substantive Knowledge

Substantive knowledge sets out subject specific content that is to be learned – i.e. the National Curriculum. This is the knowledge of the products of science such as concepts, laws, theories and models. because expertise comes from domain-specific knowledge and not generic skills, pupils need to develop an extensive and connected knowledge base. When pupils learn new knowledge, it should become integrated with the knowledge they already have. This ensures that learning is meaningful. In science, pupils need their knowledge to be organised around the most important scientific concepts, which predict and explain the largest number of phenomena. An ambitious curriculum therefore needs to identify the most important concepts for pupils to learn. It must also teach pupils how these concepts are related so that, over time, the logical structure of each scientific discipline is made explicit.

Second, the limited capacity of human working memory means that the curriculum should break down complex concepts and procedures into meaningful 'chunks' of content. These 'chunks', or components, can then be sequenced in the curriculum over time. This allows pupils to successfully build knowledge of science concepts and their relationships over multiple years, without working memory being overloaded.

Disciplinary Knowledge in Science

Science
Disciplinary Knowledge

Disciplinary Knowledge considers how substantive knowledge originates, is debated and revised – i.e. how we create, contest and evaluate substantive knowledge over time. Disciplinary knowledge tells us how we know what we know, it is through disciplinary knowledge that pupils learn the enquiry practices of Science. It gives an insight into the ways that scientists think – how they ask questions, plan an enquiry, observe, measure, interpret, conclude, predict and evaluate. Disciplinary knowledge enables one to think 'like a scientist.' Disciplinary knowledge in Science includes;

- The Working Scientifically strand of the National Curriculum Programme of Study.
- The approaches to scientific enquiry as detailed in the 'aims' of the National Curriculum.

Essentially, Working Scientifically skills and knowledge of approaches to science enquiry are distinct yet connected, and a particular lesson or sequence of learning is likely to incorporate elements of both.

Substantive Knowledge

Biology

- Plants, animals, habitats, human systems

Physics

- Light, electricity, space, sound, forces, weather

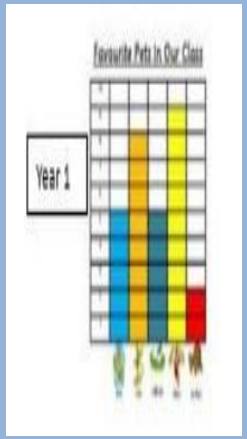
Chemistry

- Changes in matter, rocks, everyday materials

Approaches to Scientific Enquiry

Comparative and fair testing, researching, observing over time, pattern seeking, identifying, grouping, classifying and problem solving.

Disciplinary Knowledge



Working Scientifically Skills

Asking scientific questions, planning an enquiry, observing closely, taking measurements, gathering and recording results, presenting results, making predictions, drawing conclusions, evaluating enquiries.

Science

Progression and Connected Knowledge

(Substantive Knowledge)

Connected Substantive Knowledge - Seasonal Changes			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
some important processes and changes in the natural world around them, including the seasons and changing states of matter.	•Observe changes across the 4 seasons •Observe and describe weather associated with the seasons and how day length varies		

Connected Substantive Knowledge - Living Things and Habitats			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
ELG 15a: Explore the natural world around them, making observations and drawing pictures of animals and plants	**•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**	**•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 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**

Connected Substantive Knowledge - Plants			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
ELG 15a: Explore the natural world around them, making observations and drawing pictures of animals and 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	•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	

Connected Substantive Knowledge - Animals, including Humans			
EYFS	**Year 1 Year 2**	**Year 3 Year 4**	**Year 5 Year 6**
ELG 15a: Explore the natural world around them, making observations and drawing pictures of animals and plants	**•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**	**• 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**
	•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		

Connected Substantive Knowledge - Materials			
EYFS	**Year 1 Year 2**	**Year 3 Year 4**	**Year 5 Year 6**
Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	• **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** • **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**	**<u>States of Matter</u>** **•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**	**•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**

Connected Substantive Knowledge - Rocks			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
		•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	

Connected Substantive Knowledge - Sound			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
		•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	

Connected Substantive Knowledge - Electricity			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
		•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	•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

Connected Substantive Knowledge - Light			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
		•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

Connected Substantive Knowledge - Forces and Magnets			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
		•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	•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

Connected Substantive Knowledge - Earth & Space			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
			•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

Connected Substantive Knowledge - Evolution & Inheritance			
EYFS	Year 1 Year 2	Year 3 Year 4	Year 5 Year 6
***Connect previous knowledge from Animals and their Habitats, as well as units on Plants, Animals including Humans.**			**•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**

Golden Threads in Science

Progression and Connected Knowledge in Working Scientifically

(Disciplinary Knowledge)

Science
Disciplinary Knowledge

We set out the Working Scientifically strand of the National Curriculum are ten distinct skills.

1. Asking scientific questions that are the starting points for different types of science enquiry.
2. Planning an enquiry, systematically requiring more than one independent decisions making.
3. Observing Closely, communicating these observations via increasingly more elaborately e.g. through diagrams, graphs, presentations.
4. Taking Measurements according to relevant age-related strands of the mathematics National Curriculum.
5. Gathering and recording results appropriately, for example, using a variety of tables, tally charts, pictures and graphs.
6. Presenting Results in a range of ways, including age-appropriate charts and graphs.
7. Interpreting Results, by spotting patterns and describing relationships.
8. Drawing Conclusions (KS2 only) and presenting them orally and in writing.
9. Making Predictions (KS2 only) about further results or investigations by drawing on what has been learnt.
10. Evaluating an enquiry by suggesting improvements and discussing the degree of trust in secondary sources and their results.

Science
Disciplinary Knowledge

 Asking Scientific Questions	 Making Predictions
 Setting Up Tests	 Observing and Measuring

 Recording Data	 Interpretating & Communicating Results
 Evaluating	

Golden Threads and Connected Knowledge - Asking Questions

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Shows curiosity about objects, events, plants, people and animals. Questions why things happen. Asks questions to clarify understanding and aspects of their familiar world. Ask questions to find out how things work or to clarify what is happening.	Explore the world around them and raise own questions. Can answer questions supported by the teacher, often through scenarios and to recognise that questions can be answered in different ways. Can begin to ask simple questions and use simple secondary sources to find answers. Able to answer yes and no questions to sort and classify.	Raise questions that help them become familiar with scientific processes (e.g. life processes that are common to all living things, their local environment, materials) Can ask simple questions relevant to the topic. Can use a range of question stems. (e.g. Is a flame alive? Is a deciduous tree dead in winter? What makes the best habitat for a minibeast? Do seeds grow quicker inside or out?) Know their questions can be answered in different ways.	Raise own questions about the world around them and why this happens the way they do (e.g. the role of the roots and stem in nutrition and support, or how rocks are formed) Recognise how and when to use secondary sources to answer questions that cannot be answered in practical science. • Can write a range of questions relevant to the topic. Can answer questions posed by the teacher, independently or with support. Identify new questions from data. Can raise questions and carry out tests with support to find things out. • Can carry out research using a small range of secondary sources	Can decide how to gather evidence to answer questions. Raise questions to help identify and group (such as how a habitat changes, animals and living things including plants, different states of matter and how sounds are made) Can write a range of questions using the world around them and their own scientific knowledge. They recognise when secondary sources can be used to answer questions and can select appropriate information from sources. Can ask a range of questions to sort and classify	Can study and raise questions to answer (including about their local environment throughout the year, properties of materials, forces, space, animals or living things). Can ask relevant questions and suggest reasons for similarities and differences. Use their scientific experiences to explore ideas and raise different questions. Can create further questions from enquiries to investigate. Independently uses secondary sources to find relevant facts about a topic. Raise further questions from enquiries/research	Can raise questions about local animals and how they are adapted to their environment. Can raise questions about a range of phenomena. Asks a range of appropriate questions to group and classify into many different categories. Can use secondary sources to research (e.g. unfamiliar animals/ plants from a range of habitats). Use ideas from secondary sources to support their ideas. Can raise questions to further prove or disprove a scientific enquiry

Golden Threads and Connected Knowledge
Setting Up Tests

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
*Find ways to solve problems/find new ways to do things. • Test out ideas. • Take risks through trial and error. • Engage in open ended activities. • Choose the resources they need for their chosen activity from their environment	*Begin to recognise different ways they may answer scientific questions. • Experience different types of enquiries including practical activities. • Use practical resources provided by the teacher and can suggest some resources of their own e.g. pipettes, viewers, magnifying glasses. • Can carry out simple tests to classify, compare or pattern seek	*Carry out simple comparative tests using own ideas. • Experience different types of enquiries including practical activities. • Within the planning frame can suggest resources they may need for the test. • Can carry out simple tests linked to the types of enquiries: observation, testing, pattern seeking, identifying, and classifying and research.	*Perform a range of scientific investigations including different types of scientific enquiry. • Set up practical enquiries: comparative, and fair tests. (Post it note approach scaffolded by the teacher). • Investigate and answer own questions linked to shared planning Frame e.g. post it note approach • Understand there are different variables to be controlled. (Can identify some variables e.g. what was changed and what was kept the same) • Follow basic instructions scaffolded by the teacher to conduct investigation. • Use a range of equipment including thermometers and data loggers (with support).	Can identify the type of enquiry needed to answer a question. Follow a plan to carry out observations and tests. Can select from a range of resources to gather evidence and answer questions, to classify, compare and perform fair tests. Use post it note planning approach with more independence in identifying variables and what needs measuring. Children choose their method to carry out the investigation.	Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and changed. Can identify independent and dependent variables to identify causal relationships. Understand what type of scientific enquiry is needed to answer and prove/disprove scientific questions or phenomenon.	Can choose the type of enquiry needed to carry out their investigation. Can pose and answer their own questions, controlling variables where necessary independently. Decide whether they need to increase the sample size for validity. Understand how to gather data to prove a prediction. Can identify a range of factors which may affect their investigation

Golden Threads and Connected Knowledge
Making Predictions

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
*Shows curiosity about objects, events, and people. • Question why things happen. • Can make simple predictions based on comparisons	*Can make basic predictions over things they can see or their own ideas. • Can use some scientific vocabulary	*Draws on knowledge from observations to make a prediction. • Can begin to test predictions and later answer questions (predictions can be a guess). • Ask questions about what might happen in the future.	*Uses evidence and subject knowledge to refute statements. • Make predictions from questions posed. • Add detail to their predictions giving reasons linked to own scientific knowledge. • Makes further predictions from what is observed or tested.	*Use subject knowledge or research to make predictions. • Predictions are detailed and explains their thinking, they link to previous tests and use scientific language. • Raise further predictions from results based on patterns. • Make predictions for new values.	*Use subject knowledge, observations, or previous learning to make predictions. • Can add further detail and explanations for their predictions. • They review their predictions to state whether their predictions were correct. • Can base predictions on previous scientific enquiry. • Can identify a range of variables which could affect their investigation	*Develops predictions not based on results of a scientific enquiry but using own ideas and subject knowledge. • Use evidence to support predictions. • Gathers evidence through practical science to support predictions. • Use test result to make predictions to set up further comparative and fair tests.

Golden Threads and Connected Knowledge
Observation

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
*Explore the natural world making observations (e.g. seasons) • Explore different equipment, finding out what its uses are. • Know similarities and differences between the natural world around them. • Observe and describe what they see using everyday language. • Use basic equipment such as magnifying glasses and viewers	*Uses appropriate senses aided by equipment such as magnifying glasses, viewers and digital microscopes to make observations. • With help and prompting, observe changes over time and can describe the changes. • Can identify and group, compare and contrast using observations, video and photographs.	*Observe closely, using simple equipment with greater precision. • Can identify a variety of plants, animals and materials using observations. • May use ID charts with support. • Observe how different plants grow and record findings including similar plants at different stages of growth and notice similarities and differences. • Use their observations and ideas to suggest answers to questions. • Observe through video, first-hand observations and measurement how different animals including humans grow and offer explanations. • Compare objects based on observable features.	*Make systematic and careful observations. • Draw diagrams and pictures with detail. • Select own equipment for observing e.g. magnifying glasses, viewers, microscopes, digital cameras. • Look for naturally occurring patterns and relationships. • Collect data from their own observations and measurements. • Closely observe stages of plant lifecycle over a period of time, noting patterns. • Observe how water is transported in plants. • Observe patterns in the way magnets behave in relation to each other. • Can make observations and decide how to record them to answer a question	*Make systematic and careful observations to identify plants and animals in their habitats and how the habitat changes throughout the year. • Use observations to ask questions and group objects using classification keys. • Observe closely and describe processes such as changes of state. • Observe and record evaporation over a period of time. • Identify differences, similarities or changes related to simple scientific ideas or processes.	*Observe and compare the life cycles of plants and animals in their local environment with other plants and animals around the world. • Observe changes over a period of time. (e.g. animals) • Make own decisions about what to observe. • Can use observation skills and ID kits to identify different animals and minibeasts. • Can use careful observations to identify different rocks and group them depending on their observable characteristics	*Answer their own and others' questions on observations they have made. • Their answers are based on evidence. • Observe and raise questions about animals and how they are adapted to their environment. • Observe properties of materials to group and classify based on their characteristics and properties. • Can make accurate detailed drawings of plants and animals based on their own observations.

Golden Threads and Connected Knowledge
Measuring

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
*Make measurements initially by comparisons then begin to use non-standard units. • Make links and notice patterns in their experiences.	Use discrete e.g., counting and continuous data e.g. liquid to manageable common standard units. • Can use simple measurements and equipment such as hand lenses and egg timers to gather data. • Can use non-standard measures to compare.	Use standard units to estimate and measure length, height, temperature, and capacity. • Can use rulers, scales, thermometers and measuring vessels with some degree of accuracy. • Make decisions about what measurements to use and how long to make them for.	Take accurate measurements using standard units, can measure and compare. (e.g., amount of liquid and height of a plant to nearest ½ cm) • Use a range of equipment for measuring time, length, capacity and temperature. • Begin to use a range of scales. • Can read digital measurements from data loggers appropriately	Uses a range of scales. • Takes and records accurate measurements using standard units. • Can record measurements to 2dp. • Use thermometers to explore the effects of temperature on substances. • Use data loggers to record sound in decibels and notice patterns. • Use volt metres to measure voltage in a circuit to observe patterns and answer questions. • Begin to gather repeat readings to increase accuracy	Take repeat measurements where appropriate. • Can choose the middle value or finds mean average. • Select measuring equipment to give most precise results e.g., ruler, tape measure, trundle wheels, force metres with suitable scales. • Can explain advantages and disadvantages of different measuring equipment. • Children make quantitative measurements about conductivity and insulation.	Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings where appropriate. • When collecting measurements, the decide whether they need to increase sample size for validity and reliability. • Can record measurements to 3dp. • Can use protractors and rulers and force metres to measure accurately choosing correct units.

Golden Threads and Connected Knowledge
Interpreting and Communicating Results

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Offer explanations for why things happen- making use of some recently introduced scientific vocabulary. • Develop own narrative and explain by connecting ideas or events. • Develop vocabulary which meets the breadth of their experiences • Use basic writing frames, sequencing or pictures to explain what has happened.	Can use evidence from simple tests when answering questions. • With help begin to notice patterns and relationships. • Talk about what they have found out and how they found it out. • Can make comparisons and recognise biggest/smallest, most effective/least effective from data. • Can use simple models to explain processes e.g. seasonal changes, lifecycles.	Communicate findings to an audience using relevant scientific language and illustrations. • Can identify casual relationships and patterns in results. • Can identify which results do not fit the overall pattern and explain findings. • Refers to the table of results when describing what has happened. • Draws a basic conclusion (with support from the teacher) using own scientific knowledge, observations, and comparisons. • Uses results of investigations to answer enquiry questions	Begin to look for naturally occurring patterns and relationships from data. • Draws conclusions based on observations. • Can compare something using results and the conclusion is consistent with the data. • Able to adjust opinion and predictions based on results. • Can give reasons for results including any anomalies. • Uses findings and results to answer questions raised.	Draws simple conclusions from results to answer questions and support their ideas. • Look for casual relationships in data and identify evidence that refutes/supports ideas. • Report on findings to an audience orally and in writing using appropriate scientific vocabulary for a range of audiences. • Children use evidence to suggest values for different items tested using the same method.	Identify patterns and casual relationships that may be found in the natural environment. • Interpret data to generate simple comparative statements based on evidence. • Use results to draw conclusions and can identify external factors that cannot be controlled e.g. temperature inside and outside. • Use scientific language and illustrations to discuss, communicate and justify scientific ideas.	Look for patterns and relationships using a suitable sample. • Use oral and written forms such as displays to report conclusions, casual relationships and give an explanation of the degree of trust in their results. • Can pose further questions which can be answered by extending the enquiry. • Makes suggestions for ideas that can be explored using pattern seeking.

Golden Threads and Connected Knowledge Interpreting and Communicating Results (Continued)						
EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
			• Use simple scientific language to discuss ideas and communicate their findings in ways appropriate for different audiences orally and written. • Explain any amendments and how this impacted the investigation/test.	• Draw conclusions based on straightforward evidence and current subject knowledge to support their findings • Suggest improvements and raise further questions.	• Use results to make predictions and identify whether further observations, comparative tests, fair tests pattern seeking, or research might • Can use comparative statements to explain results and how things work. • Evaluate how effectively variables were controlled and what they may do to improve the enquiry.	•Can spot anomalies and identify results that do not fit the overall pattern. Use data to refute or support ideas or arguments. • Focuses on scientific reasons for overall pattern rather than a comparison. • Uses labelled diagrams to support their explanation. • Use ideas from secondary sources to support their ideas, choosing appropriate websites. • Create detailed models to explain processes such as circulatory system and lifecycles.

Golden Threads and Connected Knowledge
Evaluating

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Develop own narrative and explanations by connecting ideas or events. • Talk about what they have found and say what worked well. • Describe how things work in simple terms and make basic alterations and suggest things that did not work (e.g. this button does not work so press this one) • Question why things happen. • Come up with alternative ways of doing things through exploration.	With scaffolding and prompting can suggest simple improvements to their enquiries. • Talk about some changes that could be made. • Use simple success ladders to evaluate their tests or understanding against the learning objective	With support can suggest improvements to their enquiries. • Suggest some things that could be changed and evaluate why things went wrong. • Use success ladders with multiple criteria to evaluate the test or their understanding against the learning objective	Suggest improvements and raises further questions • Use evidence and subject knowledge to refute statements. • Make suggest improvements from enquiries. • Make basic statements about what worked well and what they would change. • Use success ladders confidently to evaluate their tests or understanding against multiple criteria and suggest simple next steps	Evaluate and communicate their methods and findings. • Suggest ways to improve what they have already done. • Begin to evaluate different aspects of their enquiries such as equipment. • Begin to understand how the enquiry improves outcomes from their questions. • Use different charts to evaluate such as ranking scales, star diagrams and success ladders. • Suggest points for development based on the weakest aspects.	Evaluate and decide when further observations, comparative and fair tests might be needed. • Evaluate different aspects of their enquiries such as equipment and accuracy of measurements. • State how the enquiry improves outcomes from their questions. • Can relate their results to the question and state if their test has enabled them to answer it. • Use a range of charts to evaluate such as ranking scales, star diagrams including those with negative numbers. • Suggest next steps based on the weakest aspects and state how this will help them or the test progress or give different results.	Can describe and evaluate their own and other people's scientific ideas using evidence from a range of sources. • Evaluate their choice of method, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources. • Use scientific language and evaluate how their enquiry has answered the question.

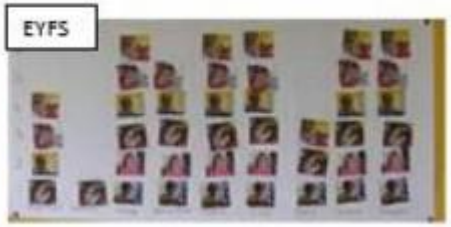
Golden Threads and Connected Knowledge Recording Data – see progression						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Draw pictures of objects in their own environment. **Can take photos of things of interest to them.**	**Begin to show accuracy in drawings, observations, and simple labels.** **Use key scientific vocabulary provided by the teacher.**	**Record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing.** **Record findings using scientific language.** **Gather and record data to help in answering questions.**	**Record findings using scientifical language, drawings and labelled diagrams and detailed written explanations based on observations.**	**Record findings using systematic and careful observational drawings and labelled diagrams.** **Supported to present the same data in different ways- choice over recording**	**Decide how to record data from a choice of familiar approaches.** **Present results in a variety of ways to help in answering questions.** **Can record ideas using accurately labelled diagrams using scientific language**	**Present the same data in different ways to help answering the question.** **Record data and results with increasing complexity e.g. accuracy of measurements, multiple data sets and different scales. Use scientific diagrams, models, and labels.**

Progression in recording data in Science

(Linked to Maths)

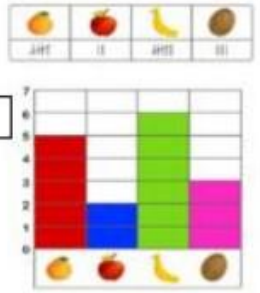
Recording in Science – Linked to Maths
Disciplinary Knowledge

EYFS

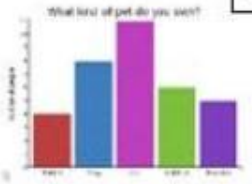


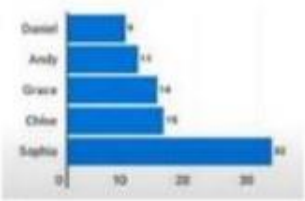
Year 1

Year 2

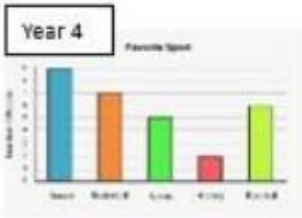


Year 3

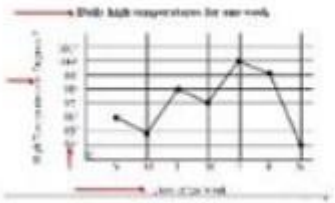


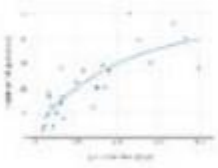


Year 4

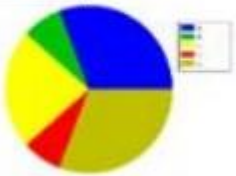


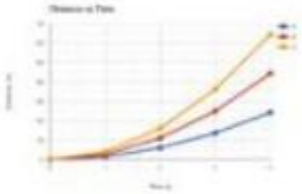
Year 5





Year 6





Disciplinary Knowledge in Science

Enquiry Skills Guidelines

Science
Disciplinary Knowledge – Enquiry Skills

The approaches to Science enquiry includes;

1. Observing over time over a range of different spans of time – in the moment and over a longer period of days, weeks or months.
2. Pattern Seeking, including a range of scatter graphs in UKS2.
3. Identifying, grouping and classifying, for example by working with Venn diagrams, Carroll diagrams and branching databases.
4. Comparative and fair testing (controlled investigations) by controlling variables, presenting data in graphs and describing causal relationships.
5. Researching using secondary sources, presenting what is found and using it to answer enquiry questions.

Acquiring disciplinary knowledge is a vital curriculum goal and occurs alongside substantive knowledge development. Disciplinary knowledge is introduced, developed and mastered alongside the substantive content of the science curriculum.

Skill and Symbol	Guidelines
Research from Secondary Sources 	**Using secondary sources of information to answer scientific questions. Pupils might use pictures, books, websites or information sheets that have been pre-prepared to help them find out answers to questions about any area of science. They may visit a museum or talk to a visitor in school or parent / carer about science. It is important that the websites children use are appropriate and that children are not discouraged from their research by too much text or complex vocabulary. Examples of websites and online materials are detailed in each unit plan.** **<u>Examples of research:</u>** **• Why is drinking salt water bad for humans? Children could watch a film clip showing the effect of a salt solution on living cells.** **• How do some animals manage to live in salty water? Children could use a website to find out which animals are able to drink salt water and how they are able to do this.** **• Can you explain some notable features of some of the 'bizarre creatures' that can be found in the deep-sea? How do these features help them to survive? Children could look at pictures in books or images easily obtained from the internet.** **• Can you name all the planets in the Solar System? Children could watch film clips or read texts in books/websites to find out the answers.** **• How does skin change as you grow older? Children could take pictures of family members and compare them**

Skill and Symbol	Guidelines
Identifying, Grouping and Classifying 	**Making observations to name, sort and organise items. Younger children, ages 4-5 years, perform simple grouping tasks, sorting items by simple observable features such as colours, shape and size. As children develop their knowledge of plants, animals and materials, they will sort and classify living things and materials using specific criteria. Older children may make charts or keys to help identify different animals and plants according to their observable features, and materials according to their properties.** **Examples of identifying, grouping and classifying:** **• Can you sort these materials? Explain how you have grouped them. Young children (ages 5-7 years) may identify simple observable properties of materials such as hard / soft, rough / smooth, shiny / dull, whereas older children (ages 7-11) could compare and group materials according to transparency, electrical or thermal conductivity or solubility.** **• How are sounds made by musical instruments? Pupils could explore sounds made by string and wind instruments and identify and group the ways in which sounds are made. They could identify patterns, such as the thicker strings on a guitar produce the lower notes or shorter strings produce higher-pitched notes.** **• How can we sort animals into groups? Younger children (5-7 years) may group animals according to their appearance e.g. number of legs, presence of fur or scales, their habitat e.g. live in nest or a burrow, or their diet (carnivore, herbivores, omnivores). Older children (ages 7-11 years) with a greater knowledge of the features of vertebrate and invertebrate groups could identify and classify animals as fish, amphibians, reptiles, birds, mammals or snails, slugs, worms, spiders and insects**

Skill and Symbol	Guidelines
Comparison and Fair Testing 	**Changing one variable to see its effect on another, while keeping all the other variables the same. Start talking about comparative or fair testing with children by first talking about what can be changed (the 'variables') and whether this might make a difference to the outcome.** **Examples of comparative and fair testing:** **• Consider a car rolling down a ramp. What will affect how far the car travels? Possible variables: the height of the ramp, the surface of the ramp, what the wheels of the car are made from, the shape of the car, the mass of the car, whether the car is pushed.** **Comparative test: If I change the car (the independent variable), what will happen to the distance the car travels (the dependent variable)? [Note: it is unlikely that you will have cars of different mass that are exactly the same shape, or cars of different shapes that are exactly the same mass, so this is a comparative test. You can compare different cars by keeping other variables the same. It is not a 'fair test' because at least two variables are being changed (e.g. mass and shape).]** **• Fair test: If I change the surface of the ramp (the independent variable), what will happen to the distance the car travels (the dependent variable)?** **Independent variable: the variable that is changed or controlled in a test / experiment / investigation.** **Dependent variable: the variable being tested in a test / experiment / investigation. It is 'dependent' on the independent variable. The change is the dependent variable is observed and recorded.**

Skill and Symbol	Guidelines
Observing Over Time 	Observing changes that occur, over a period of time, ranging from minutes to months. All sorts of questions can be answered through observation over time. The period of time might be seconds, minutes, days or even months depending on the question asked. <u>Examples of observation of time:</u> • How do some materials change when they are heated? Children may investigate what happens to chocolate when it is heated for a few minutes and then cooled. • How do shadows change throughout the day? Pupils might observe the shadow they cast at different times of the school day. • Which drinks are bad for your teeth? Pupils might observe eggshells in different liquids for a few days. • What happens to frog spawn? Children might observe tadpoles developing for a few weeks. • What changes happen to a tree? Pupils might visit the same tree every month for a complete year.

Skill and Symbol	Guidelines
Pattern Seeking 	**Identifying patterns and looking for relationships in enquiries where variables are difficult to control. Pattern seeking often starts with a question about a possible link between two events or phenomena (variables). You may start by asking the children 'I wonder whether the smallest ...' or 'I wonder if the largest....' To answer these types of questions, children will need to collect data: observing, measuring and recording events or systems or they could collect data from secondary sources such as images or texts. Pattern seeking enquiries provide excellent opportunities for children to learn about habitats, adaptation, growth, staying healthy (diet, exercise, disease), the weather, rocks and soils and the solar system.** **Sometimes, pupils will identify a direct relationship between two variables. For example, a shadow is taller when a light source is moved closer to the object. In this case, the tall shadow exists because the light has moved nearer the object: this is an example of a causal relationship. There are no other factors that can explain the relationship between the cause (the distance between the light and the object) and the effect (the size of the pattern? Pupils could look at the width of strings on a guitar, the number of holes covered on a recorder, or the volume of water in a glass bottle.**

Skill and Symbol	Guidelines
Pattern Seeking 	**<u>Examples of pattern seeking:</u>** **• Where do daisies grow? Children could count the number of daisies growing inside a hoop in different parts of the school grounds.** **• Do the biggest apples have the most seeds? Children could measure the mass or circumference of an apple and record the number of seeds inside.** **• Where do we find the most woodlice? Children could record the number of woodlice they find in different habitats.** **• Can children with the longest legs run fastest? There is often a child in the class who is smaller than average but can run faster than his/her peers. It is useful to find anomalies to these kinds of patterns and to discuss what other factors might be responsible for the effect. For example, this child may have more efficient muscles, larger lungs, do lots of sports.** **• How do musical instruments produce low notes? Is there a pattern? Pupils could look at the width of strings on a guitar, the number of holes covered on a recorder, or the volume of water in a glass bottle.**

Golden Threads in Science

Progression and Connected Knowledge in Enquiry Skills

(Disciplinary Knowledge)

The following suggestions represent possible ideas for enquiries linked to each enquiry type and topics within a year group.

Enquiry Skills - EYFS				
Comparative & Fair Testing	**Identifying, Grouping & Classifying**	**Observing**	**Pattern Seeking**	**Research from Secondary Sources**
				
Explore how things work.	Explore collections of materials with similar and/or different properties.	Describe what they see, hear and feel while outside. Explore the natural world around them, making observations and drawing pictures of animals and plants.	Understand the key features of the life-cycle of a plant and an animal.	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.

Enquiry Skills – Year One

Comparative & Fair Testing	Identifying, Grouping & Classifying	Observing	Pattern Seeking	Research from Secondary Sources
				
What type of compost grows the tallest sunflower? **Which tree has the biggest leaves?** **In which season does it rain the most?** **Which materials are the most flexible? Which materials are the most absorbent?**	**How can we sort leaves that are collected on our walk?** **How can we organise all the zoo animals?** **How would you group these things based on which season you are most likely to see them in?** **We need to choose a material to make an umbrella. Which materials ate waterproof?**	**How does a daffodil bulb change over the year?** **How does my sunflower change each week?** **How does my height change over a year?** **What happens to materials over time if we bury them in the ground?** **What happens to shaving foam over time?**	**Do trees with bigger leaves lose their leaves first in autumn?** **Is there a pattern in where we find moss growing in the school grounds?** **Does the wind always blow the same way?** **Is there a pattern in the types of materials that are used to make objects in school?**	**What are the most common British plants and where can we find them?** **How are the animals in Australia different to the ones that we find in Britain?**

Enquiry Skills – Year Two

Comparative & Fair Testing	Identifying, Grouping & Classifying	Observing	Pattern Seeking	Research from Secondary Sources
				
Do cress seeds grow quicker inside or outside? **Do amphibians have more in common with reptiles or fish?** **Do bananas make us run faster?** **Which shapes make the strongest paper bridge?** **Which material would be best for the roof of the little pig's house?**	**How can we identify the trees that we observed in our tree hunt?** **Which offspring belongs to which animal?** **How would you group things to show which are living, dead or have never been alive?** **Which materials are shiny and which are dull?**	**What happens to my bean after I have planted it?** **How does a tadpole change over time?** **How much food and drink do I have over a week?** **How long do bubble bath bubbles last for?** **What will happen to our snowman over the next few days?** **Would a paper boat float forever?**	**Do bigger seeds grow into bigger plants?** **What conditions do woodlice prefer to live in?** **Which age group of children wash their hands the most in a day?** **Which habitat do worms prefer?** **where can we find the most worms?**	**Do all animals have the same senses as humans?** **Are there plants that are in flower every season?** **What are they? How are bricks made?** **Which materials can be recycled?**

Enquiry Skills – Year Three

Comparative Testing	Fair Testing	Identifying, Grouping & Classifying	Observing	Pattern Seeking	Research from Secondary Sources
					
Which conditions help seeds germinate faster? **How does the skull circumference of a girl compare with that of a boy?** **Which soil absorbs the most water?** **Which pair of sunglasses will be the best at protecting our eyes?** **Which magnet is the strongest?** **Which surface is best to stop you slipping?**	**How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?** **How does the angle that your elbow / knee is bent affect the circumference of your upper arm / thigh?** **How does adding different amounts of sand to soil affect how quickly water drains through it?**	**How many different ways can you group our seed collection?** **How do the skeletons of different animals compare?** **Can you use classification keys to find out the names of the rocks in our collection?** **How would you organise these light sources into natural and artificial sources?** **How can we group the food that we eat?**	**What happens to celery when it is left in a glass of coloured water?** **How do flowers in a vase change over time? How does tumbling change a rock over time?** **What happens when water keeps dripping on a sandcastle/** **If we magnetise a pin, how long does it stay magnetised for?** **When is our classroom the darkest?**	**What colour flowers do pollinating insects prefer?** **Is there a pattern in where we find volcanos on planet Earth?** **Are you more likely to have bad eyesight and to wear glasses if you are older?** **Does the size and shape of a magnet affect how strong it is?**	**Why do different types of vitamins keep us healthy and which food can we find them in?** **Who was Mary Anning and what did she discover?** **How does the Sun make light?** **How have our ideas about forces changed over time?** **How does a compass work?**

Enquiry Skills – Year Four

Comparative Testing	Fair Testing	Identifying, Grouping & Classifying	Observing	Pattern Seeking	Research from Secondary Sources
					
How does the average temperature of the water change each season? Day? **In our class, are omnivores taller than vegetarians? Does seawater evaporate quicker than fresh water?** **Which material is best to use for muffling sound in ear defenders?** **Which metal is the best conductor of electricity?**	**How does the mass of a block of ice affect how long it takes to melt?** **How does the volume of a drum change as you move further away from it?** **How does the thickness of a conducting material affect how bright the lamp is?** **How does the length of a guitar string / tuning fork affect the pitch of the sound?**	**What are the names for all the organs involved in the digestive system?** **How can we organise teeth into groups?** **Can you group these materials and objects into solids, liquids or gases? Can we use classification keys to identify all the animals shown? How would you group these electrical devices based on where the electricity comes from?**	**How does the variety of invertebrates on the school field change over the year?** **How does an egg shell change when it is left in cola?** **Which material is best for keeping our hot chocolate warm?** **How does the level of water in a glass change when left on the windowsill?** **How does the mass of an ice cube change over time?**	**How has the use of insecticides affected bee population?** **Are foods that are high in energy always high in sugar?** **Is there a pattern in how long it takes different sized ice lollies to melt?** **Which room has the most electrical sockets in your home?**	**How do dentists fix broken teeth?** **What are hurricanes and why do they happen?** **How has electricity changed the way we live?** **How does a light bulb work?** **Do all animals have the same hearing range?**

Enquiry Skills – Year Five

Comparative Testing	Fair Testing	Identifying, Grouping & Classifying	Observing	Pattern Seeking	Research from Secondary Sources
					
Which seed shape takes the longest time to fall? **Who grows the fastest, girls or boys?** **Which type of sugar dissolves the fastest?** **How does the length of daylight hours change in each season?** **Which show is the most slippery?** **Which shape parachute takes the longest to fall?**	**How does age affect a human's reaction time?** **How does the temperature of tea affect how long it takes for a sugar cube to dissolve?** **How does the surface area of a container affect the time it takes to sink?** **How does the surface area of a parachute affect the time it takes to fall to the ground?**	**Can you group these materials based on whether they are transparent or not?** **How could you organise all the objects in the solar system into groups?** **Can you label and name all the forces acing on the objects in each of these situations?** **Can you observe and identify all the phases in the cycle of the**	**How does a bean change as it germinates?** **How does our compost heap change over time?** **How does a container of saltwater change over time?** **How does a sugar cube change as it is put in a glass of water?** **How does a nail in saltwater change over time?** **How long does a pendulum swing for before it stops?**	**Is there a relationship between a mammal's size and its gestation period?** **Are the oldest children in our school the tallest?** **Do all stretchy materials stretch in the same way?** **Is there a pattern between the size of a planet and the time it takes to travel around the Sun?**	**Why do people get grey / white hair when they get older?** **What are microplastics and why are they harming the planet?** **How have our ideas about the solar system changed over time?** **What unusual objects did Jocelyn Bel Burnell discover?**

Enquiry Skills – Year Six

Comparative Testing	Fair Testing	Identifying, Grouping & Classifying	Observing	Pattern Seeking	Research from Secondary Sources
					
Which is the most common invertebrate in our playground? **Which type of exercise has the greatest effect on our heart rate?** **Which material is the most reflective?** **Which make of battery lasts the longest?** **Which type of fruit makes the best fruity battery?**	**How does the temperature affect how much gas is produced by yeast?** **How does the length of time we exercise for affect our heart rate?** **Can exercising regularly affect your lung capacity?** **How does the voltage of the batteries in a circuit affect the brightness of the lamp / volume of the buzzer?**	**Which organs of the body make up the circulatory system and where are they found?** **Compare the skeletons of apes, humans and Neanderthals- how are they similar and how are they different?** **Can you classify these observations into evidence for the idea of evolution and evidence against?**	**hat happens to a piece of bread if you leave it on the windowsill for two weeks?** **How does my heart rate change over the day? How do different animal embryos change?** **How much exercise do I do in a week?** **Does the temperature of a light bulb go up the longer it is on?** **How does my shadow change over the day?**	**Do larger flowers have more petals?** **Is there a pattern between what we eat for breakfast and how fast we can run?** **Is there a pattern to how bright it is in school over the day? And, if there is a pattern, is it the same in every classroom?** **Does the temperature of a light bulb go up the longer it is on?**	**How have our ideas about disease and medicine changed over time?** **What happened when Charles Darwin visited the Galapagos islands?** **How has our understanding of electricity changed over time?** **How do astronomers know what stars are made of?**

Science

Long Term Planning Overview

Links to other curriculum subjects

KS1 Science – Long Term Overview

	AUTUMN		SPRING	SUMMER
2024 - 2025	**How are materials used in design?** **Uses of Everyday Materials** **(Y2 unit)**	**How do we stay healthy?** **Animals including Humans** **(Y2 unit)** **Link to DT and PSHE Healthy Eating**	**How are plants and animals connected?** **Living Things and their Habitats** **(Y2 unit)** **Extraordinary Scientists - Who is Steve Backshall?**	**How do seeds and bulbs grow into healthy plants?** **Plants - focus on plants from around the world** **(Y2 unit)** **Link to Maths – statistics and data handling**
2025 - 2026	**What are animals?** **Animals including Humans (Y1 Unit)** **Extraordinary Scientists - Who is Jane Goodall?**		**Why do we use different materials for different jobs?** **Everyday Materials** **Link to DT Structures** **(Y1 unit)**	**How are plants and animals connected?** **Plants – focus on the local area (inc trees)** **(Y1 unit)**
	How was the weather change during the different seasons? **Seasonal Changes runs throughout the year and includes;** • **Local area walks to observe and compare the world around us.** • **Observations of plants and trees in the local area at different times of year** **This is all recorded in a class big book.**			

Lower KS2 Science – Long Term Overview

	AUTUMN		SPRING		SUMMER
2024 - 2025	What happens to the food we eat? Animals including Humans (Y4 unit)	What is sound and how does it travel? Sound (Y4 unit) Extraordinary Scientists - Who was Alexander Graham Bell? Link to Maths - Length	How do materials change when they are heated and cooled? States of Matter (Y4 unit) Link to Geog – The Water Cycle	How do we make electrical circuits? Electricity (Y4 unit)	What factors affect plant growth? Plants - Farming (Y3 unit) Extraordinary Scientists - Who was George Washington Carver? Link to Maths – Bar Charts
2025 - 2026	How does the human body move? Animals including Humans (Y3 unit) Link to Maths - Measurement	How does light behave? How are shadow formed? Light (Y3 Unit) Link to English – Information texts	What is beneath our feet? Rocks (Y3 unit) Link to English – Writing Explanations	How do magnets behave? How do forces affect us? Forces and Magnets (Y3 unit) Link to Maths – Bar Charts	How do we group animals? Living Things and their Habitats (Y4 unit) Extraordinary Scientists - Who is David Attenborough?

Upper KS2 Science – Long Term Overview

	AUTUMN		SPRING		SUMMER
2024 - 2025	Why is it important to look after our heart? Animals including Humans (Y6 unit)	How do things move in our solar system? Earth & Space (Y5 unit) Extraordinary Scientists - Who was Katherine Johnson?	What is evolution? How do organism evolve to suit their environments? Evolution & Inheritance (Y6 unit) Extraordinary Scientists - Who was Charles Darwin?	What is electricity? How does voltage affect the components in a circuit? Electricity (Y6 unit) Link to DT - Fairgrounds	How do living things reproduce and why is this important in a life cycle? Living Things and Their Habitats (Y5 unit)
2025 - 2026	How are organisms classified? Animals including Humans (Y5 unit)	What is light? How do we see? Light (Y6 unit) Link to Maths – Line graphs	How do different materials behave and change? Properties and Changes of Materials (Y5 unit) Link to DT – Cooking Link to English –	Forces (Y5 unit) Extraordinary Scientists -Who was Isaac Newton? Link to Maths - Graphs	What habitats can be found in our local area? Living Things and their Habitats - local area study) (Y6 unit)

EYFS The Natural World
Long Term Overview

	AUTUMN	SPRING	SUMMER
2024 - 2025	What grows in our local area? What grows in the desert? 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.	**What are the signs of the seasons?** ELG - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**Where do minibeasts live?** ELG - Explore the natural world around them, making observations and drawing pictures of animals and plants.
2025 - 2026	What animals live in our local area? What animals live in other parts of the world? 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.	**What are the different types of weather?** **How can we record the weather in our local area?** ELG - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**How do plants grow?** ELG - Explore the natural world around them, making observations and drawing pictures of animals and plants.

Vocabulary Progression in Science

Science Vocabulary Progression

	EYFS	Key Stage One	Key Stage Two
Materials	Bumpy Dry Floating Material Sinking Smooth Wet	Absorb Bend Change Cool Flexible Heat Liquid Magnetic Man-Made Material Melting Metal Natural Plastic Opaque Rigid Smooth Stretch Texture Twist Waterproof Wood	Absorbent Bicarbonate Conductivity Dissolve Evaporation Filtering Irreversible Opaque Reversible Separate Soda Solubility Strong Thermal Translucent Transparent Weak
Forces	Fast Force Speed Up Slow	Change Direction Direction Distant Further Pull Push Spin Squeeze Stretch Turn Twist	Air Resistance Attract Force Friction gears Gravity Levers Magnetic Magnetic Field Magnetic Pole Non-Magnetic Newtons Pulleys Repel Surface Resistance

Science Vocabulary Progression

	EYFS	Key Stage One	Key Stage Two
Electricity			Appliance Buzzer Cells circuit Conductor Dimmer Switch Fuse Generator Insulator Series Circuits Socket Switch Volts
Sound			Amplitude Auditory Decibel Frequency Insulation Medium Pitch Sound Wave Vibrating Volume
Light			Concave Convex Cornea Iris Lens Light source Light Wave Pupil Refraction Retina

Science Vocabulary Progression

	EYFS	Key Stage One	Key Stage Two
Rocks			Crystal Fossil Igneous Metamorphic Mineral Organic Matter Sedimentary Soil Quartz
States of Matter			Celsius Condensation Evaporation Freezing point Gas Irreversible Liquid Matter Melting Point Molecules Precipitation Reversible Solid Solution Temperature
Earth & Space			Astronomical Axis Crescent Moon Eclipse Gibbous Moon Lunar Orbit Planer Rotation Solar System Spherical

Science Vocabulary Progression

	EYFS	Key Stage One	Key Stage Two
Living Things & Their Habitats	Habitat Home Safe	Adapt Bird Desert Dinosaur Fish Indigenous Insects Mammals Microhabitats Ponds Rainforest Reptiles Rivers Seas Species Woodland	Algae Amphibian Bacteria Classification Consumer Embryo Fungi Gestation Invertebrate Micro-organism Monera Organism Protista Species Vertebrate
Plants	Branch Flower Fruit Leaves Petal Plant Roots Stem Tree Trunk vegetable	Blossom Bulb Earth Environment Habitat Oxygen Seeds Shoot Trunk Woodland	Anther Deciduous Evergreen Fertiliser Nutrients Pollination Seed Dispersal Stigma

Science Vocabulary Progression

	EYFS	Key Stage One	Key Stage Two
Living Things & Their Habitats	Habitat Home Safe	Adapt Bird Desert Dinosaur Fish Indigenous Insects Mammals Microhabitats Ponds Rainforest Reptiles Rivers Seas Species Woodland	Algae Amphibian Bacteria Classification Consumer Embryo Fungi Gestation Invertebrate Micro-organism Monera Organism Protista Species Vertebrate
Plants	Branch Flower Fruit Leaves Petal Plant Roots Stem Tree Trunk vegetable	Blossom Bulb Earth Environment Habitat Oxygen Seeds Shoot Trunk Woodland	Anther Deciduous Evergreen Fertiliser Nutrients Pollination Seed Dispersal Stigma

Science Vocabulary Progression

	EYFS	Key Stage One	Key Stage Two
Evolution & Inheritance			Adaption Chromosomes Evolution Excavating Genes Inheritance Off-Spring Paleontologists Predators
Seasonal Change		Autumn Spring Summer Temperature Thermometer Weather Weather symbol Winter	

Science Vocabulary Progression

Animals inc Humans

EYFS	Key Stage One	Key Stage Two
Choice	Adult	Atriums
Ear	Baby	Balanced Diet
Emotions	Carbohydrate	Blood Vessels
Eye	Carnivore	Bone
Food	Diet	Capillaries
Healthy	Difference	Canine
Hydrated	Exercise	Cartilage
Living	Healthy	Circulatory
Mouth	Herbivore	Dentil
Non-Living	Hygeine	Digestive
Nose	Nocturnal	Enamel
Unhealthy	Nutrition	Food Chain
	Minerals	Incisors
	Omnivore	Intestine
	Protein	Joint
	Senses	Molars
	Skeleton	Muscle
	Vitamin	Nutrition/Nutrients
	Young	Oesophegus
		Pancreas
		Pre-molars
		Predators
		Prey
		Pulse
		Oxygen
		Spine
		Tendon
		Ventricles

Content to be taught in each unit – Sticky Knowledge

Key Stage One

National Curriculum

The principal focus of science teaching in Key Stage One 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.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Plants (Y1 unit)	**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 might work scientifically by;** • Observing closely, using magnifying glasses, and comparing and contrasting familiar plants. • Describing how they were able to identify and group plants. • Drawing diagrams showing the parts of different plants, including trees. • Keep records of how plants changed over time.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Animals including Humans (Y1 unit)	**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, draw and label the basic parts of the human body and say which part is associated with each sense.	**Pupils might work scientifically by;** • using their observations to compare and contrast animals at first hand or through videos and photographs, describing how they identify and group them; grouping animals according to what they eat; and using their senses to compare different textures, sounds and smells.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Everyday materials (Year 1 Unit)	**Pupils should be taught to;** • Distinguish between and object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, 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.	**Pupils might work scientifically by;** • Performing simple tests to explore questions, for example; 'What is the best material for an umbrella?' … for lining a dog basket? …. For curtains? …. For a book shelf?

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Seasonal Changes (Year 1 unit)	**Pupils should be taught to;** • Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies.	**Pupils might work scientifically by;** • Making tables and charts about the weather • Making displays of what happens in the world around them, including day length, as the seasons change.

Science – Key Stage One

Living Things and their Habitats (Year 2 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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 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.	**Pupils might work scientifically by;** • Sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts. They should describe how they decided where to place things, exploring questions, for example, Is a flame alive? Is a deciduous tree dead in winter? • Construct a simple food chain that includes humans (e.g. grass, cow, human) • Describe the conditions in different habitats and micro-habitats and find out how the conditions affect the number and types of plants and animals that live there.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Plants (Year 2 Unit)	**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 might work scientifically by;** • Observing and recording, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb. • Observing similar plants at different stages of growth. • Setting up a comparative test to show that plants need light and water to stay healthy.

Science – Key Stage One

Animals, including Humans (Year 2 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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 might work scientifically by;** • Observing, through video or first hand observation and measurement, how different animals, including humans grow. • Asking questions about what things animals need for survival and what humans need to stay healthy. • Suggesting ways to find answers to their questions.

Science – Key Stage One

Uses of Everyday Materials (Year 2 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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.	**Pupils might work scientifically by;** • Comparing the uses of everyday materials found in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs). • Observing closely, identifying and classifying the uses of different materials, and recording their observations.

Lower Key Stage Two

National Curriculum

The principal focus of science teaching in Lower Key Stage Two 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 decisions about which types of scientific enquiry are likely to be the best way of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things that out using secondary sources of information. They should draw simple conclusions and use scientific language, first to talk about and later to write about what they have found out.

Science – Lower Key Stage 2

	National Curriculum Statutory Requirements	Working Scientifically
Plants (Year 3 Unit)	**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.	**Pupils might work scientifically by;** • Comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertilizer. • Discovering how seeds are formed by observing the different stages of plant life cycles over a period of time. • Looking for patterns in the structure of fruits that relate to how the seeds are dispersed. • Observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.

Science – Key Stage One

Animals, including Humans (Year 3 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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 humans and some other animals have skeletons and muscles for support, protection and movement.	**Pupils might work scientifically by;** • Identifying and grouping animals with and without skeletons and observing and comparing their movement. • Exploring ideas about what would happen if humans did not have skeletons. • Compare and contrast the diets of different animals (including pets) and decide on ways of grouping them according to what they eat. • Research different food groups and how they keep us healthy and design meals based on what they have found out.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Rocks (Year 3 Unit)	**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 rocks and organic matter.	**Pupils might work scientifically by;** • Observing rocks, including those used in buildings and gravestones, and exploring how and why they have changed over time. • Using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether thy have fossils in them. • Research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. • Explore different soils. And identify similarities and differences between them. • Investigate what happens when rocks are rubbed together or what changes occur when they are in the water. • Raise and answer questions about the way soils are formed.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Light (Year 3 Unit)	**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 might work scientifically by;** • Looking for patterns in what happens to shadows when the light source moves or the distance between the ,light source and the object changes.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Force and Movement (Year 3 Unit)	**Pupils should be taught to;** • Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing.	**Pupils might work scientifically by;** • Comparing how different things move and grouping them. • Raising questions and carrying out tests to find out how far things move on different surfaces and gathering recording data to find answers to their questions. • Exploring the strengths of different magnets and finding a fair way to compare them. • Sorting materials into those are magnetic and those that are not. • Look for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another. • Identify how these properties make magnets useful in everyday items and suggest creative uses for different magnets.

Science – Key Stage One

Living Things and Their Habitats (Year 4 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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 might work scientifically by;** • Using and making simple guides or keys to explore and identify local plants and animals. • Making a guide to local living things. • Raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Animals, including Humans (Year 4 Unit)	**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 an interpret a variety of food chains, identifying producers, predators and prey.	**Pupils might work scientifically by;** • Comparing the teeth of herbivores and carnivores, and suggesting reasons for differences. • Finding out what damages teeth and how to look after them. • Draw and discuss ideas about the digestive system and compare them with images and models.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
States of Matter (Year 4 Unit)	**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. • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	**Pupils might work scientifically by;** • Grouping and classifying a variety of different materials, exploring the effect of temperature on substances such as chocolate, butter, cream (making food such as chocolate crispy cakes and ice-cream for a party). • Research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. • Observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line. • Investigate the effect of temperature on washing drying or snowmen melting.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Sound (Year 4 Unit)	**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.	**Pupils might work scientifically by;** • Finding patterns in the sounds that re made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. • Make earmuffs from different materials to investigate which provides the best insulation against sound. • Make and play own instruments by using what they have found out about pitch and volume.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Electricity (Year 4 Unit)	**Pupils should be taught to;** • Identify that common appliances run on electricity. • Construct a simple series electrical circuit, identifying and naming 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 might work scientifically by;** • Observing patterns, for example, that bulbs get brighter if more cells are added. • Investigate that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.

Upper Key Stage Two

National Curriculum

The principal focus of science teaching in Upper Key Stage Two 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 heir ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically.

At Upper Key Stage Two, pupils 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 a period 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.

Science – Key Stage One

Living Things and their Habitats (Year 5 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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 processes of reproduction in some plants and animals.	**Pupils might work scientifically by;** • Observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, desert, in the oceans and in prehistoric times). • Asking pertinent questions and suggesting reasons for similarities and differences. • Grow new plants from different parts of the parent plant, for example, seeds, stem and root cutting, tubers, bulbs. • Observe changes in an animal over a period of time (for example by hatching and rearing chicks). • Comparing how different animals reproduce and grow.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Animals, including Humans (Year 5 Unit)	**Pupils should be taught to;** • Describe the changes as humans develop to old age.	**Pupils might work scientifically by;** • Researching the gestation periods of other animals and comparing them with humans by finding out and recording the length and mass of a baby as it grows.

Science – Key Stage Two

Properties and Changes of Materials (Year 5 Unit)

National Curriculum Statutory Requirements

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.

Working Scientifically

Pupils might work scientifically by;

- Carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice-cream to stop it melting, or for making black out curtains?
- Compare materials in order to make a switch in a circuit.
- Observe and compare the changes that might take place, for example, when burning different materials or baking bread or cakes.
- Research and discuss how chemical changes have an impact on our lives for example cooing, and discuss the creative use of materials such as polymers, super-sticky and duper thin materials.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Earth and Space (Year 5 Unit)	**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 ad night and the apparent movement of the sun across the sky.	**Pupils might work scientifically by;** • Comparing the time of day at different places on the Earth through internet links and direct communication. • Create simple models of the solar system. • Construct simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day. • Find out why some people think that structures such as Stonehenge might have been used as astronomical clocks.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Forces (Year 5 Unit)	**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.	**Pupils might work scientifically by;** • Exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. • Explore resistance in water by making and testing boats of different shapes. • Design and make products that use levers, pulleys, gears and/or springs and explore their effects.

Science – Key Stage One

Living Things and their Habitats (Year 6 Unit)	National Curriculum Statutory Requirements	Working Scientifically
	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.	**Pupils might work scientifically by;** • Using classification systems and keys to identify some animals and plants in the immediate environment. • Research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Animals including Humans (Year 6 Unit)	**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 with animals, including humans.	**Pupils might work scientifically by;** • Explore the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Evolution and Inheritance (Year 6 Unit)	**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 adaption may lead to evolution.	**Pupils might work scientifically by;** • Observe and raise questions about local animals and how they are adapted to their environment. • Comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels. • Analyse the advantages and disadvantages of specific adaptions, such as being on two feet rather then four, having a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Light (Year 6 Unit)	**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.	**Pupils might work scientifically by;** • Deciding where to place rear view mirrors on cars. • Designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. • Investigate the relationship between light sources, objects and shadows by using shadow puppets. • Look at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters – though they do not need to explain why these phenomena occur.

Science – Key Stage One

	National Curriculum Statutory Requirements	Working Scientifically
Electricity (Year 6 Unit)	**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.	**Pupils might work scientifically by;** • Identifying the effect of changing one component at a time in a circuit. • Designing and making a set of traffic lights, a burglar alarm or some other useful circuit.

Agreed End Points – EYFS and KS1

We have plotted end points for each year group to ensure that children keep on track for the end of Key Stage end points. In this way we can get children ready for the next stage of their education

Our end points ensure that our curriculum is purposefully structured and logically sequenced, and new knowledge builds on previous knowledge – links can be made across different areas of study.

Units of Work – Knowledge

Key Stage One End Points

Year 1 Plants and Animals, Including Humans	
National Curriculum Objectives	Meeting Expectations
Plants - identify and name a variety of common wild and garden plants, including deciduous and evergreen trees	Can identify a range of local plants.
Plants – Identify and describe the basic structure of a variety of common flowering plants and trees.	Name parts of a range of familiar plants.
Animals, including humans – Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.	Name a variety of common animals.
Animals, including humans - identify and name a variety of common animals that are carnivores, herbivores and omnivores	Explain the differences between carnivores, herbivores and omnivores.
Animals, including humans - describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)	Identify key features of a range of common animals.
Animals, including humans – identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	Relate each of the human senses to organs.

Year 1 Materials	
National Curriculum Objectives	Meeting Expectations
Everyday Materials – Distinguish between an object and the material from which it is made.	Correctly identify both object and material
Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock .	Identify and name a range of materials.
Describe the simple physical properties of a variety of everyday materials	Describe a range of properties of a variety of materials.
Compare and group together a variety of everyday materials on the basis of their simple physical properties	Classify a variety of materials into groups based on physical properties.

Year 1 Seasons	
National Curriculum Objectives	Meeting Expectations
Observe changes across the four seasons	Describe seasonal changes.
Observe and describe weather associated with the seasons and how day length varies	Relate weather patterns and day length to seasons.

Year 2 Living things and Their Habitats and Plants	
National Curriculum Objectives	Meeting Expectations
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	Explain how, for a named animal or plant, it gets what it needs from its habitat and other living things that are there.
Identify and name a variety of plants and animals in their habitats, including micro habitats	Identify a range of living things in habitats of various sizes.
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	Construct a simple food chain and identify what is eating what.
Explore and compare the differences between things that are living, dead and things that have never been alive.	Identify things that have never been alive.
Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	Explore and identify what plants need to thrive.
Observe and describe how seeds and bulbs grow into mature plants	Describe stages of development of a full grown plant.

Year 2 Animals, including Humans	
National Curriculum Objectives	Meeting Expectations
Notice that animals, including humans, have offspring which grow into adults	Describe the relationship between adult animals and their offspring.
Find out about and describe the basic needs of animals, including humans, for survival (water, food and air)	Identify human's basic needs.
Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene	Describe the importance of a healthy diet and exercise.

Year 2 Uses of Everyday Materials	
National Curriculum Objectives	**Meeting Expectations**
Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	Describe changes achieved by applying forces in different directions.
Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses	Select and justify a material for a particular use.

Units of Work – Knowledge

Lower Key Stage Two End Points

Lower Key Stage Two (Year 3) → Plants	
National Curriculum Objectives	Meeting Expectations
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.	Explain what all plants need to flourish and recognise how these requirements vary in amount.
Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.	Describe what each part of a flowering plant does.
Investigate the way in which water is transported within plants	Explain, with the aid of a diagram or plant, how water is carried up from the soil.
Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	Explain how pollination, seed formation and seed dispersal play a role in the reproduction of flowering plants.

Lower Key Stage Two (Year 3) → Rocks	
National Curriculum Objectives	Meeting Expectations
Describe in simple terms how fossils are formed when things that have lived are trapped within a rock.	Explain how fossils are formed.
Recognise that soils are made from rocks and organic matter	Describe how soil is made.
Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.	Examine and test rocks, grouping them according to the results.

Lower Key Stage Two (Year 3) → Animals, including Humans	
National Curriculum Objectives	Meeting Expectations
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.	Describe why animals depend on the correct nutrition.
Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	Explain which parts of the skeleton provide support and protection, and how they allow for movement.

Lower Key Stage Two (Year 3) → Light	
National Curriculum Objectives	Meeting Expectations
Recognise that they need light in order to see things and that dark is the absence of light	Relate being able to see to the presence of light.
Notice that light is reflected from surfaces	Describe how some objects reflect light.
Recognise that light from the sun can be dangerous and that there are ways to protect their eyes	Describe how and why our eyes should be protected from sunlight.
Recognise that shadows are formed when the light from a light source is blocked by a solid objects	Explain how shadows are made.
Find patterns in the way that the size of shadows change	Describe how to change the size of a shadow.

Lower Key Stage Two (Year 3) → Forces and Magnets	
National Curriculum Objectives	Meeting Expectations
Compare how things move on different surfaces	Compare how an object, such as a toy car, will move on different surface.
Notice that some forces need contact between two objects, but magnetic forces can act at a distance	Recognise the difference between contact and contact forces.
Observe how magnets attract or repel each other and attract some materials and not others	Describe how magnets attract or repel each other, and attract magnetic materials
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	Group materials on the basis of testing for being magnetic.
Describe magnets as having two poles	Describe and identify the poles of a magnet.
Predict whether two magnets will attract or repel each other, depending on which poles are facing	Predict outcomes of a particular arrangement of magnets.

Lower Key Stage Two (Year 4) → Living Things and Habitats	
National Curriculum Objectives	**Meeting Expectations**
Recognise that living things can be grouped in a variety of ways.	Suggest different ways of sorting the same group of living things, e.g. grouping birds according to where they live, what they eat and size of adults.
Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment	Use classification keys to group and identify members from a range of familiar and less familiar living things.
Recognise that environments can change and that this can sometimes pose dangers to living things.	Describe examples of living things that are threatened by changes to environments, e.g. owls and habitat loss.

Lower Key Stage Two (Year 4) → Animals, including Humans	
National Curriculum Objectives	**Meeting Expectations**
Describe the simple functions of the basic parts of the digestive system in humans.	Identify what each of the principal organs in the digestive system do.
Identify the different types of teeth in humans and their simple functions	Describe the function of each type of tooth in the human skull.
Construct and interpret a variety of food chains, identifying producers, predators and prey	Use a food chain to represent predator-prey relationships.

Lower Key Stage Two (Year 4) → States of Matter	
National Curriculum Objectives	**Meeting Expectations**
Compare and group materials together, according to whether they are solids, liquids or gases	Group materials according to their state of matter.
Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	Describe how evaporation and condensation happen in the water cycle, and how temperature affects evaporation.
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 changes of state and research values of degrees Celsius at which changes happen.

Lower Key Stage Two (Year 4) → Sound	
National Curriculum Objectives	Meeting Expectations
Identify how sounds are made, associating some of them with something vibrating.	Explain, with reference to vibrations, how an object makes a sound.
Recognise that vibrations from sounds travel through a medium to the ear	Describe the role of a medium in the transmission of sound.
Recognise that sounds get fainter as the distance from the sound source increases	Describe the effect of moving further from the source of a sound.
Find patterns between the pitch of a sound and features of the object that produced it	Explain with reference to a particular object how the pitch of the sound can be changed.
Find patterns between the volume of a sound and the strength of the vibrations that produced it.	Explain with reference to a particular object how the volume of the sound can be changed.

Lower Key Stage Two (Year 4) → Electricity	
National Curriculum Objectives	Meeting Expectations
Identify common appliances that run on electricity	List examples of appliances that run on electricity.
Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers	Construct a simple circuit and name its components.
Recognise some common conductors and insulators, and associate metals with being good conductors	Sort materials into conductors and insulators, identifying metals as 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	Predict whether a particular arrangement of components will result in a bulb lighting.
Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit	Predict how the operation of a switch will affect bulbs lighting.

Units of Work – Knowledge

Upper Key Stage Two End Points

Upper Key Stage Two (Year 5) → Living Things and Habitats	
National Curriculum Objectives	**Meeting Expectations**
Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.	Identify similarities and differences in two different life cycles, e.g. sparrow and butterfly, with reference to eggs and intermediate stages
Describe the life process of reproduction in some plants and animals.	Describe in sequence the stages of reproduction in some plants and animals, e.g. dog and a thistle.

Upper Key Stage Two (Year 5) → Properties and Changes of Materials

National Curriculum Objectives	Meeting Expectations
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.	Test and sort a range of materials based on their physical properties.
Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution	Describe how some materials, e.g. sugar, will dissolve and can be retrieved.
Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating	Justify separation techniques proposed, with reference to materials being separated.
Demonstrate that dissolving, mixing and changes of state are reversible changes.	Show how the original materials can be retrieved from each of these 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	Identify reactants and products of chemical changes and recognise these as being irreversible.
Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.	Use evidence to justify the selection of a material for a purpose.

Upper Key Stage Two (Year 5) → Animals, including Humans	
National Curriculum Objectives	**Meeting Expectations**
Describe the changes as humans develop to old age.	Describe the changes as humans develop to old age, e.g. trends in changes to size, weight, mobility etc.

Upper Key Stage Two (Year 5) → Earth and Space	
National Curriculum Objectives	Meeting Expectations
Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.	Draw a diagram or use a model to describe planetary orbits.
Describe the movement of the Moon relative to the Earth	Draw a diagram or use a model to describe the Moon's orbit around the Earth.
Describe the Sun, Earth and Moon as approximately spherical bodies	Describe the Sun, Earth & Moon as spheres.
Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	Use a diagram or model to explain why the Sun seems to travel across the sky, and what causes day and night.

Upper Key Stage Two (Year 5) → Forces	
National Curriculum Objectives	Meeting Expectations
Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.	Explain that gravity causes objects to fall towards Earth.
Identify the effects of air resistance, water resistance and friction, that act between moving surfaces	Describe how motion may be resisted by air resistance, water resistance or friction.
Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect	Describe how some devices may turn a smaller force into a larger one.

Upper Key Stage Two (Year 6) → Living Things and Habitats	
National Curriculum Objectives	**Meeting Expectations**
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	Use similarities and differences in observable features to decide how living things should be grouped, e.g. a cat is a mammal because it is warm blooded and gives birth to live young.
Give reasons for classifying plants and animals based on specific characteristics	Explain why certain features are useful in classifying living things, e.g. backbones in animals and flowers in plants.

Upper Key Stage Two (Year 6) → Animals, including Humans			
National Curriculum Objectives	**Working towards Expectations**	**Meeting Expectations**	**Exceeding Expectations**
Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood	Name the main parts of the human circulatory system, e.g. heart, arteries, veins.	Describe what heart, blood vessels and blood do, e.g. carry oxygen to all parts of the body.	Explain some characteristics of the heart, blood vessels and blood, e.g. explain that the arteries are thicker because they carry blood at a higher pressure
Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	Recognise that diet, exercise, drugs and lifestyle impact on the way the body functions, e.g. knowing that exercise changes the body.	Suggest how their bodies are affected by substances and actions, e.g. that a high fat diet coupled with little exercise is likely to lead to obesity.	Explain how decisions about lifestyle can affect the quality of life, e.g. recognise that making excessive use of convenience foods may introduce more additives into the diet.
Describe the ways in which nutrients and water are transported within animals, including humans	Describe that nutrients and water are transported within humans.	Describe with aid of diagrams the route that water takes within animals, e.g. through the human body.	Compare the ways in which nutrients and water are transported in two animals that are quite different.

Upper Key Stage Two (Year 6) → Evolution and Inheritance	
National Curriculum Objectives	**Meeting Expectations**
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 fossils as evidence that living things have changed over time, e.g. explain that these have died out and others have taken their place.
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.	Recognise that offspring normally vary from each other and from their parents, e.g. that puppies vary from each other and from their parents.
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution .	Describe examples of a living thing that has adapted to live in a particular habitat and evolved as a result, e.g. a polar bear or cactus.

Upper Key Stage Two (Year 6) → Light	
National Curriculum Objectives	Meeting Expectations
Recognise that even when light changes in direction, the path is still continuous.	Represent light using straight line ray diagrams.
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.	Draw diagrams using straight lines showing light travelling to 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.	Explain how we can see an object by referring to light travelling into the eye.
Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them	Draw a diagram showing an object, shadow and light to relate object shape to shadow shape.

Upper Key Stage Two (Year 6) → Electricity	
National Curriculum Objectives	Meeting Expectations
Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in a circuit	Explain how number and voltage of cells affects the lamp or buzzer.
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	Explain the use of switches, how bulbs can be made brighter and buzzers made louder.
Use recognised symbols when representing a simple circuit in a diagram	Represent a circuit that has been constructed using symbols.