Science Teaching and Learning Policy

This teaching and learning policy is underpinned by the school's vision and values:

Be happy: aspire, believe, achieve

Happiness is… the feeling you get when you help others and contribute to the world; when you work hard at something that was difficult to begin with; when you feel safe, cared for and respected; when you feel confident in your uniqueness and know where you are going.

Philippians 4:13

'I can do all things through Christ who strengthens me.'

1. Introduction

1.1 This teaching and learning policy is written so that staff, parents and governors are clear with regard to teaching and learning standards and expectations of Science across the school.

1.2 The school's Science subject leader is Mrs McManus.

1.3 The school's Science link governor is Alison Russell.

2. Aims and objectives

2.1 Intent

We acknowledge and celebrate that each child is unique and that they learn in different ways. At Croft school, we provide a rich and varied Science learning experience that allows children to develop their skills and abilities to their full potential. Our Science curriculum is ambitious and designed to meet the diverse needs of the children who attend Croft School. It aims to provide all pupils with the knowledge, skills and cultural capital they need to succeed in their lives.

Our core aims are to provide a Science curriculum that builds on pupils' individual talents and uniqueness and empowers our children to be:

- Resilient
- Independent
- Emotionally intelligent

We believe that these are the three gifts that we would like to give our pupils help them to succeed as life-long learners and children of God. The 'giving' of these gifts are what drive the curriculum at Croft school.

The development of pupils as learners of the future is at the heart of what we are trying to achieve at Croft School. We want our children to be happy Scientists who are confident, reflective, and resilient.

2.2 Implementation

Our curriculum provides pupils with rich, deep, inter-connected curriculum contexts to develop their skills of resilience, independence and emotional intelligence. These key curriculum elements are woven into our coherently planned, sequenced, enquiry-led learning units. This is supported by an approach that highly values metacognition and self-regulated learning. Whilst developing key science skills and vocabulary to allow pupils to develop as scientists, learning in Science also supports pupils to debate, learn about influential scientists, engage in social action projects and have a positive impact the lives of others. Teaching promotes the development of pupils' resilience skills to become confident scientists.

Mental health and well-being is a right of way for all pupils at Croft school; it is given high priority. Learning in Science develops children's understanding of how to keep their body healthy, the positive effects of exercise and the impact this has on mental health and well-being.

2.3 Impact

Our Science curriculum ensures that our children develop detailed knowledge and skills across the curriculum and, as a result, achieve exceptionally well and is reflected in our consistently high outcomes for our pupils.

Our pupils will:

- be enthusiastic and proactive, independent learners, who want to find out about the word around them.
- retain knowledge that is pertinent to science with a real-life context.
- develop into emotionally intelligent individuals, with a strong sense of how their actions now will affect our world in the future.
- be able to question ideas and reflect on knowledge.
- work collaboratively and practically to investigate and experiment.
- be able to explain the process they have taken and be able to reason scientifically.
- be driven by their sense of wonder.

3. Effective learning

3.1 We acknowledge that children learn in many different ways and we recognise the need to develop strategies that allow all children to learn in ways that best suit them most effectively. We take into account the different ways that children learn when planning and teaching in order to ensure all children access a full and varied curriculum.

3.2 Pupils will work independently, in pairs, small groups and larger groups in structured and unstructured ways. Our Science curriculum encourages children to take responsibility for their own learning, to be involved as far as possible in reviewing the way they learn, and to reflect on how, what helps and what makes it difficult for them. In addition to the curriculum knowledge that we deliver we also aim to develop children's learning to learn skills; life-long skills that will play a major role in their learning both at school and in later life.

These include:

- Observation and reflections skills
- Group work and team work skills
- Problem-finding and problem-solving skills
- Creative thinking skills and imagination
- Analysis, logic, reasoning and synthesis
- Lateral thinking skills
- Listening skills
- Research skills (including locating and managing)
- Resources, questioning, skimming, scanning
- Comprehension; (summarising, note-making)
- Personal organisation skills
- Presentation skills
- Peer teaching and learning skills
- Evaluation skills
- Personal and collaborative decision-making skills
- Time management skills
- Memory skills
- Leadership skills
- Social skills
- Digital literacy skills

4. Curriculum Design

4.1 Curriculum

We use the Science National Curriculum and Key Stage expectations to plan our curriculum. Our curriculum aims to ensure that all pupils: develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics; develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them; are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

4.2 Content

In Early Years we use Development Matters Early Learning Goal 'Understanding The World' and focus on "The Natural World" to guide teaching and learning. By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes associated with the following content:

Early Years Foundation Stage

Pupils explore the world around them through a combination of child initiated and adult directed activities. They have opportunities to learn to:

- Explore the natural world around them, making observations and drawing pictures of animals and plants.
- Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

Key stage 1

Pupils are taught to use the following practical scientific methods, processes and skills through the teaching of specific topics, including: animals, including humans; living things and their habitats, materials and seasonal change:

- To ask simple questions and recognise that they can be answered in different ways
- To observe closely, using simple equipment
- To perform simple tests
- To identify and classify
- To use observations and ideas to suggest answers to questions
- To gather and record data to help in answering questions.

Key stage 2

Pupils are taught to use the following practical scientific methods, processes and skills through the teaching of specific topics, including: animals, including humans; living things and their habitats, plants, light, rocks, forces and magnets, sound, electricity, states of matter, properties and changes of materials, earth and space and evolution and inheritance:

- To ask relevant questions and use different types of scientific enquiries to answer them
- To plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- To set up simple practical enquiries, comparative and fair tests
- To make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- To take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- To gather, record, classify and present data in a variety of ways to help answer questions
- To record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- To record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- To report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- To use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

- To use test results to make predictions to set up further comparative and fair tests
- To identify differences, similarities or changes related to simple scientific ideas and processes
- To use straightforward scientific evidence to answer questions or to support findings.
- To identify scientific evidence that has been used to support or refute ideas or arguments.

4.2 How does the school ensure curriculum coverage?

The Science subject leader is responsible for developing the school's curriculum intent and ensuring that it is implemented consistently and effectively and is having an impact across the school. The Science curriculum is split into broad 'Learning Focuses' to form a long term map. The Science Learning Focuses are:

- Biology
- Physics
- Chemistry

The subject leader works with other subject leaders across the school to make relevant links between learning focuses and the co-curriculum. Children should know which aspect of Science they are studying. They are reminded at the beginning of every lesson that they are working as a biologist, chemist of physicist. The Science curriculum operates on a two year rolling cycle from Year 1 to Year 6 and ensures full curriculum coverage of learning focuses and an annual cycle for Early Years (see appendix 1 – Science Long Term Map). Early Years have a bespoke Learning overview for each area of Science: biology, chemistry and physics. The vital knowledge is recorded as mini-milestones and supports the Early Years team in planning exactly what children need to know and remember (see appendix 5 – Learning Unit Overviews).

4.3 Curriculum Organisation

The Science curriculum is organised so that key skills and key vocabulary are built upon sequentially to ensure that learning is deep and embedded. The subject leader developed a progression in Science key vocabulary and key skills document to communicate this (see appendix 3 – Science Key Vocabulary Progression Map and appendix 4 – Science Key Skills Progression Map).

4.4 Planning

Using the Science long term map and progression in key vocabulary and knowledge milestone documents, learning is structured into learning units (see appendix 4 - Science Learning Unit Overviews). The subject leader produces learning unit overviews for staff that summarise key aspects of learning in Science.

Science lessons are planned using the 8 Stage Learning Journal template. Every lesson starts with the pupils writing the **date and the title** on the front page of the Seesaw activity. Pupils then respond to **feedback** from the previous learning. Next, pupils creatively explore the **word of the day** using online definitions, examples around the school, photos, videos etc. Pupils are given a set amount of time to get up to this point. The class then stops and the teacher discusses **prior learning** that is needed to support their progress during that lesson and after this discussion the **teacher's lesson** provides the pupils with a short input about the new learning for that lesson. The main work pupils do during a lesson is called **Challenges,** there are usually four but this amount can vary. Challenges may be completed in pupils' books or on Seesaw. Pupils are then expected to **journal their work**, this gives the pupils a chance to develop metacognition skills and reflect on what they have learnt. Finally, pupils **take their learning further;** pupils are given examples of activities that will encourage them to think about the day's learning in different ways. Most lessons will follow this process; however, there is flexibility if a task or lesson does not allow for this system. We believe this system supports SEN pupils by giving every lesson a familiar structure while also having plenty of opportunities for pupils to independently extend their learning.

5.0 Teaching

Learning Units

5.1.1 Each learning unit will usually last around 6 weeks. Learning unit overviews provide key medium term planning for teachers to follow. They include: key learning focus; learning theme; learning objectives; vocabulary; resources; assessment tasks; assessment criteria and the key knowledge milestones children must know and remember.

- Key learning focus:
- Learning theme:
- Learning objectives:
- Vocabulary
- Resources:
- Assessment tasks:

5.1.2 Learning Unit Structure

Each Learning Unit begins with front-loading knowledge and vocabulary relating to the specific topic. Subsequent lessons will build and deepen knowledge and understanding associated to the topic, whilst developing practical scientific investigation skills. The bespoke milestone assessment at the end of each learning unit, demonstrates a child's level of acquisition of knowledge as well as on-going teacher assessment and work on Seesaw and in books.

5.2 Lessons

High quality Science teaching involves drawing on a range of strategies that are closely matched to the learning objectives of the lesson. This, in turn, will match the particular learning needs of the pupils in the class. Teachers plan and resource lessons with high expectations for all pupils including the most able. Learning objectives reflect this and are used to measure the outcomes of the lesson. Teachers may use the 8 stage learning journal.

Science teaching ensure that:

5.2.1 All tasks and activities that the children partake in are safe and appropriate risk assessments are made prior to learning.

5.2.2 The leaders and experts in the classroom are the adults. Adults lead pupils decisively and confidently following school policies and class routines having high expectations of what pupils can achieve.

5.2.3 Staff are always ready for pupils as soon as they enter the room with work and resources prepared.

5.2.4 Acquisition of key knowledge (mini-milestones) is vital. Staff and pupils are aware of the mini-milestones for the topic and know where to find them. **Appendix 2**

5.2.5 Learning objectives and the date are written and underlined (with a ruler) at the top of the page in pupils' "My Science" books.

5.2.6 Learning is differentiated. The teacher will use resources such as: word mats, visual prompts, now and next prompts, technology, simplified texts etc to ensure that pupils can access learning and achieve. Some pupils will require more intense, targeted support and may need guidance from an adult to meet their needs.

5.2.7 Learning is pitched to meet all children's needs. Children who are capable of more within a lesson are moved on swiftly to more challenging work. Pupils who are finding work challenging are quickly identified and supported.

5.2.8 Questioning is purposeful and promotes learning. Teachers anticipate where mistakes arise and plan probing questions or examples ready to shape learning. Teachers provide TAs with examples of questions prior to learning.

5.2.9 Teaching assistants and other adult helpers are deployed effectively. Sometimes they work with individual children or with groups.

5.2.10 Adults consistently and overtly praise and value 'hard work' and 'making mistakes' so that pupils feel empowered to take risks in their learning and develop resilience.

5.2.11 Adults promote a culture of independence and enable pupils to solve their own problems and not do this for them. They work hard to help pupils to 'help themselves'.

5.2.12 There is a school expectation that pupils work in silence when working independently and that pupils raise their hand if they would like to speak and not 'shout out' or get out of their seat to get an adult's attention. Staff ensure that that this always happens.

5.2.13 Staff do not accept poor standards of handwriting and spelling in Science. Pupils are challenged to rectify this swiftly and consistently.

5.3 What resources are available?

The Science subject leader is responsible for planning, ordering, managing, organising Science resources. There is an annual resources budget available for the subject leader.

6. Assessment

6.1 Formative assessment and feedback

Pupils' books and posts to Seesaw provide the main evidence for formative assessment. However, pupils are also observed when they are working and are assessed against learning outcomes using the school's one page learning evaluation and feedback summary sheet.

6.1.1 Staff follow the Marking and Feedback policy, specifically the Marking and Feedback key to assess learning and to provide next steps in learning.

6.1.2 Usually, teachers will assess learning using the school's one page learning evaluation and feedback sheet. This form of assessment reduces teacher workload and provides opportunities for teachers to asses all pupils swiftly. Outcomes of one page learning and feedback sheets are shared with pupils either at the end of the lesson or the beginning of the next lesson: groups of children may be provided with a follow up task to extend learning or tackle misconceptions.

6.1.3 Mini plenaries are used during learning to assess and provide consolidation opportunities for pupils at transition points within a lesson. Pupils are also provided with 'live' individual feedback as pupils work by teachers and teaching assistants.

6.1.4 Peer to peer feedback, discussion and reflection is used regularly as an essential part of learning in Science.

6.1.5 Science displays are used to exhibit high quality work and demonstrate that pupils' work is highly valued.

6.1.6 Every topic begins with the pre-learning assessment. This is then revisited at the end of the topic to support teacher judgements and to assess progress in learning.

6.2 Summative assessment

At the end of every topic, pupils will complete the relevant assessment. The results are recorded on the whole school tracking grid as a percentage and are used to support teacher judgement to gauge attainment.

Across each key stage, pupils are assessed against the following key assessment criteria:

Pupils are assessed as either:

SIG		Pupil is working significantly below the age-related expectations for Science
WTS		Pupil is working towards the age-related expectations for Science
EXS		Pupil is working at the age-related expectations for Science
GDS		Pupil is working above the age-related expectations for Science

At the end of the year, a judgement is made as to whether a pupil is 'on track' to complete the key stage as: working towards expectations, working at expectations or working above expectations. When a pupil reaches the end of a key stage a formal judgement is made using the same criteria.

7. The role of pupils

7.1 Our pupils will:

- value themselves and each other as scientists: biologists, chemists, physicists
- try hard and persevere with their learning
- value their Science book
- respect and value Science resources and materials
- model positive attitudes to learning
- listen to others well and be respectful towards adults and each other

8. The role of Staff

8.1 Teachers and teaching assistants are responsible for the delivering high quality teaching and learning. They will:

- Implement the school's Science Teaching and Learning Policy rigidly to ensure consistent practice across the school
- Model an enthusiasm for Science
- Model thinking and talk to develop pupils' metacognitive and cognitive skills and ensure that learning is sufficiently challenging to develop pupils' self-regulation and metacognition
- Ensure that pupils are taught how to organise and effectively manage their learning independently
- Plan lessons that consider prior attainment and individual learning needs in order for all students to access the curriculum and make at least good progress
- Use questioning styles to stretch and challenge students
- Keep up to date with their Science subject knowledge and pedagogical approaches to learning
- Be acutely aware of students who are not making progress in Science and plan timely interventions to ensure that good progress is made
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8.2 The Science subject leader is responsible for the overall leadership and management of Science across the school. They will:

- Maintain an effective Science subject leadership file.
- Create and implement an annual Science action plan and monitor and evaluate progress towards targets.
- Monitor the quality of teaching of Science (evidence includes: Lessons, Planning, Pupils' Work, Learning Walks, Class Displays, Learning Environments, Pupil Surveys, Staff Surveys, Pupil interviews)
- Maintain Science teaching and learning monitoring records.
- Maintain a termly updated Science One Page Leadership Summary.
- Ensure that the school's Science Teaching and Learning Policy and subject information on the school website are accurate and up-to date.
- Lead staff meetings, support staff and ensure that staff are clear about teaching and learning expectations in Science.
- Access and record Science CPD and maintain personal subject knowledge and skills.
- Have high expectations of themselves within the role of Science subject leader and of others in the implementation of the Science Teaching and Learning Policy.

9. The role of Science link governor.

9.1 The Science link governor will support, monitor and review the Science Teaching and Learning Policy.
In particular they will:

- Monitor the effectiveness of the school's Science teaching and learning policy through the school self-review processes.
- Complete two governor monitoring visits each year alongside the Science subject leader.

10. The role of parents

Parents have a fundamental role to play in helping children to learn. We expect that parents will be supportive of the implementation of the school's Science teaching and learning policy.

Appendix 1: Science Long Term Curriculum Map

Route A

	Autumn		Spring		Summer	
	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
KS1	**Chemistry** Everyday Materials : What are my toys made from and why? What is the best material to use when building a castle?		**Biology** Living Things and their Habitats : Why do animals live in different places?		**Biology** Plants : Which tree has the biggest leaves?	**Biology** Animals, including Humans: How could we organise animals that live under the sea?
	Physics Seasonal Change - Autumn and Winter : In which season does it rain the most?		**Physics** Seasonal Change - Spring : Does the wind always blow the same way?		**Physics** Seasonal Change – Summer 1: Why do people go to the beach in Summer?	
Lower KS2	**Chemistry** States of Matter: How does the mass of a block of ice affect the length of time it takes to melt?	**Chemistry** Rocks: What would be the best rock to use to build a pyramid?	**Biology** Living Things and their Habitats : How does the variety of invertebrates on the school field change over the year?		**Biology** Plants : How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?	**Biology** Animals Including Humans: Why do different types of vitamins keep us healthy and which foods can we find them in?
Upper KS2	**Chemistry** Properties and changes of materials: How can we change materials reversibly and irreversibly?		**Biology** Living Things and their Habitats : Why does variation exist?		**Biology** Evolution and Inheritance: Is there a pattern between the size and shape of a bird's beak and the food it will eat?	**Biology** Animals, including Humans: Is there a relationship between a mammal's size and its gestation period?

Route B

	Autumn		Spring		Summer	
	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
KS1	**Chemistry** Everyday Materials and their Uses: Why have materials been used to make certain things in my classroom? How is this different from the past? Which material would make the best parachute for an astronaut returning to Earth?		**Biology** Living Things and their Habitats: How does the habitat of the Arctic compare with the habitat of the rainforest?		**Biology** Plants: How does a cactus survive in the desert without water?	**Biology** Animals, including Humans: Do amphibians have more in common with reptiles or fish?
	Physics Seasonal Change - Autumn and Winter: Does it rain in space?		**Physics** Seasonal Change – Spring: Where is the hottest country in the world? Why?		**Physics** Seasonal Change – Summer: Which leaf is the best for providing shade from the sunshine?	
Lower KS2	**Physics** Sound: What is the best material for muffling sound?	**Physics** Light: Which coins are most reflective?	**Physics** Forces and Magnets: How does the mass of an object affect how much force is needed to make it move?		**Physics** Electricity: How has electricity affected the way we live?	**Biology** Animals Including Humans: How can we group our teeth?
Upper KS2	**Physics** Earth and Space: How does temperature/size/day length/year length change as you get closer/further to the sun?	**Physics** Light: Why does my shadow change length over the course of a day?	**Physics** Forces: Can you create a pulley system to life a given load?	**Biology** Living things and their habitats: Why do animals and plants compete – and what for?	**Physics** Electricity: Which type of fruit makes the best fruity battery?	**Biology** Animals, including Humans: How might the circulatory system of an elephant, a hummingbird, or a polar bear differ?

Understanding the World

Educational Programme	Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.

	Autumn	Spring	Summer
Reception	• Explore the natural world around them beginning to understand the local environment and the changes in the seasons • Describe what they see, hear and feel whilst outside • Begin to recognise some environments that are different from the one in which they live. • Understand the effect of changing seasons on the natural world around them (Autumn to Winter) – can the children compare this with other countries? • Begin to understand different materials familiar objects are made from. • Begin to suggest which materials might be best for an object.	• Explore the natural world around them • Describe what they see, hear and feel whilst outside • Recognise some environments that are different from the one in which they live. • Understand the effect of changing seasons (Winter to Spring) on the natural world around them. • Recognise different habitats in the local area. • Begin to suggest which habitat an animal is best suited to	• To explore the natural world around them. • Describe what they see, hear and feel whilst outside • Recognise some environments that are different from the one in which they live. • Understand the effect of changing seasons on the natural world around them. (Spring to Summer) • Understand the importance of sun safety. • To understand what a plant needs to grow. • To group animals in their own way and discuss.
Nursery	• Notice differences between people. • Explore natural materials, indoors and outside • Explore how things work. • Plant seeds and care for growing plants. • Use all their senses in hands-on exploration of natural materials. • Explore collections of materials with similar and/or different properties. • Talk about what they see beginning to use a wide vocabulary.	• Begin to understand the key features of the life cycle of a plant and an animal • Begin to understand the need to respect and care for the natural environment and all living things • Begin to talk about the differences between materials and changes they notice.	• Begin to understand what plants need to grow. • To begin to know ways we can look after our surroundings – putting litter in the bin. • Begin to talk about how materials are different – begin to link to properties.

Appendix 2: Vital Knowledge Milestones

Croft Church of England primary School Science Vital Knowledge Milestones		
Science Vital Knowledge Mile Stone 1 (by age 5 years)		
Biology	**Chemistry**	**Physics**
▪ I can locate the arms, legs, body and head on the picture of an animal / a human. ▪ I know that the life cycle of a chicken is: egg, chick, chicken. ▪ I know the life cycle of a frog is: egg, tadpole, frog. ▪ I know that a polar bear lives in cold places. I know that a fish lives in water. I know worms live in the ground. Camels live in hot places. ▪ I can locate the flower, root, stem, leaves on a plant (including soil). ▪ I know that David Attenborough is a famous Biologist.	▪ I can identify glass, metal, rubber and plastic objects.	▪ I can identify the sun, moon, day and night on a picture.
arms, legs, body, head, animal, human, life cycle, hot, cold, water, flower, root, stem, leaves, soil.	glass, metal, rubber, plastic.	sun, moon, day, night, dark, light.
Science Vital Knowledge Milestone 2 (by age 7 years)		
Biology	**Chemistry**	**Physics**
▪ I can locate and name the following body parts: feet, knees, hands, shoulders, elbows, neck, mouth, ears, eyes, nose, eyebrows, hair, penis and vagina. ▪ I can name and locate the following parts of a plant: petals, fruit, roots, flowers, seeds, trunk, branches and bulb. ▪ I know that an orangutan's habitat is the rainforest. I know that a penguin's habitat in the north and south pole. I know that a rattlesnake's habitat is the desert. ▪ I know that three characteristics of a mammal are: warm blood, give birth to live young, feed their young milk. ▪ I can identify the producer, predator and prey in a food chain. ▪ I know that Jane Goodall is a famous biologist who studied chimpanzees.	▪ I know that plastic, fabric and glass are man-made materials. I know that wood, coal and wool are natural materials. ▪ I can name materials that are shiny, strong, smooth and waterproof. ▪ I know that Louis Pasteur was a famous chemist who was important in developing understanding of vaccinations.	▪ Name all four seasons in order – winter, spring, summer, autumn ▪ I know that Isaac Newton is a famous Physicist and he discovered gravity.
body parts, feet, knees, hands, shoulders, elbows, neck, mouth, ears, eyes, nose, eyebrows, hair, penis, vagina, petals, fruit, roots, flowers, seeds, trunk, branches, bulb, habitat, desert, rainforest, north/south pole, mammal, producer, predator, prey, food chain.	plastic, fabric, glass, man-made, natural, material, shiny, strong, smooth, waterproof	Spring, Summer, Autumn, Winter
Science Vital Knowledge Milestone 3 (by age 9 years)		
Biology	**Chemistry**	**Physics**
▪ I can name and locate the skull, brain, ribs, heart, lungs, joints, muscles on a diagram of the body. ▪ I can locate and name the different teeth: incisors, canines, molars and premolars. ▪ I can classify the following animals as vertebrates or invertebrates: snake, dolphin, horse, parrot, newt, beetle, woodlouse, spider, octopus ▪ I know that plants need water, sunlight and CO2 to grow. ▪ I can identify and name key parts of the digestive system: teeth, tongue, saliva, oesophagus, stomach, small intestine, large intestine, rectum, faeces. ▪ I know that Edward Jenner is a famous biologist (and chemist) who discovered the vaccination for smallpox.	▪ I can name and locate the processes of the water cycle on a diagram: evaporation, condensation, precipitation, transpiration. ▪ I can classify simple rocks as sedimentary, metamorphic, igneous. ▪ I know that water freezes at 0 and water boils at 100 degrees. ▪ I know Alfred Nobel was a famous scientist who bequeathed the Nobel Peace prize.	▪ I know that the sun is a source of light and the moon is not. ▪ I can name and locate the following forces on a diagram: gravity, friction and magnetism. ▪ I can name and locate components on a simple circuit diagram. ▪ I know the meaning of the work pitch, amplitude and frequency. ▪ I know that Albert Einstein was a famous physicist who revolutionised our understanding of space, time and gravity.
skull, brain, ribs, heart, lungs, joints, muscles, teeth, incisors, canines, molars, premolars, snake, dolphin, horse, parrot, newt, beetle, woodlouse, spider, octopus, water, sunlight, digestive system, tongue, saliva, oesophagus, stomach, small intestine, large intestine, rectum, faeces	water cycle, evaporation, condensation, precipitation, transpiration, classify, sedimentary, metamorphic, igneous, freezing point, boiling point	light source, sun, moon, forces, gravity, friction, magnetism, component, simple circuit, diagram, wire, bulb, switch, batter (cell), pitch, amplitude, frequency
Knowledge Vital Milestone 4 (by age 11 years)		
Biology	**Chemistry**	**Physics**
▪ I can name and locate the parts of the circulatory system: heart, blood, lungs, arteries, veins, capillaries, oxygenated blood, deoxygenated blood, valves. ▪ I can draw and label the life cycle of a frog and flowering plant. ▪ I can name a species that is extinct, endangered and thriving. ▪ I know that Charles Darwin was a famous biologist who proposed the theory of evolution.	▪ I can name and describe a reversible and irreversible change in state. ▪ I know that Marie Curie was a famous chemist who carried out the first treatment of tumours.	▪ I know that light travels in straight lines, reflects from some objects and cannot travel through some objects. ▪ I know the names and order of all of the planets in the solar system. ▪ I can name and describe air resistance, water resistance, friction. ▪ I can use the following components: wires, battery (cell), switch, bulb, buzzer, ammeter, resister do draw a simple circuit diagram using the correct symbols. ▪ I know that Stephen Hawking was a famous theoretical physicist who proposed the idea of the origins of the universe.
circulatory system, heart, blood, lungs, arteries, veins, capillaries, oxygenated blood, deoxygenated blood, valves, life cycle, species, extinct, endangered, thriving.	reversible, irreversible, change in state	light, straight, reflect, translucent, opaque, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune,

		(Pluto), air resistance, water resistance, friction, buzzer, ammeter, resister, symbol.

Croft Church of England primary School Science Vital Knowledge Milestones Questions		
Science Vital Knowledge Mile Stone 1 Questions (by age 5 years)		
Biology	**Chemistry**	**Physics**
▪ Find the arms, legs, body and head on the picture. (human/animal) ▪ Put these in the correct order: egg, chick, chicken (pictures) ▪ Put these in the correct order: egg, tadpole, frog (pictures) ▪ Put the following animals where you think they should live (polar bear, fish, worm and camel) ▪ Name the parts of the plant – flower, root, stem, leaves, soil	▪ Identify the objects that are made from: glass, metal, rubber and plastic - practical	▪ Put the sun and moon onto these pictures. (pictures)
arms, legs, body, head, animal, human, life cycle, hot, cold, water, flower, root, stem, leaves, soil.	glass, metal, rubber, plastic.	sun, moon, day, night, dark, light.
Science Vital Knowledge Milestone 2 Questions (by age 7 years)		
Biology	**Chemistry**	**Physics**
▪ Name and identify the following body parts: feet, knees, hands, shoulders, elbows, neck, mouth, ears, eyes, nose, eyebrows, hair, penis and vagina. ▪ Name the parts of a plant: petals, fruit, roots, flowers, seeds, trunk, branches and bulb. ▪ Can you name the following habitats: rainforest, polar region, desert, ocean – and suggest an animal that might live there. ▪ Name three characteristics of a mammal. ▪ Identify the producer, predator and prey in a food chain (pictures given).	▪ Name three man-made and three natural materials. ▪ Name a material that is: stretchy, shiny, strong, smooth, waterproof	▪ Name all four seasons in order – winter, spring, summer, autumn
body parts, feet, knees, hands, shoulders, elbows, neck, mouth, ears, eyes, nose, eyebrows, hair, penis, vagina, petals, fruit, roots, flowers, seeds, trunk, branches, bulb, habitat, desert, rainforest, north/south pole, mammal, producer, predator, prey, food chain.	plastic, fabric, glass, man-made, natural, material, shiny, strong, smooth, waterproof	Spring, Summer, Autumn, Winter
Science Vital Knowledge Milestone 3 Questions (by age 9 years)		
Biology	**Chemistry**	**Physics**
▪ Locate and name the parts of the body: skull, brain, ribs, heart, lungs, joints, muscles. ▪ Locate and name the different teeth: incisors, canines, molars and premolars. ▪ Classify the following animals as vertebrates or invertebrates: snake, dolphin, horse, parrot, newt, beetle, woodlouse, spider, octopus ▪ What does a plant need to grow? (water, sunlight, CO2) ▪ Identify and name the parts of the digestive system: teeth, tongue, saliva, oesophagus, stomach, small intestine, large intestine, rectum, faeces.	▪ Name the processes of the water cycle: evaporation, condensation, precipitation, transpiration. ▪ Classify rocks: sedimentary, metamorphic, igneous. ▪ At what temperature does water: freeze? boil?	▪ Name a source of light. ▪ Name the following forces: ▪ gravity, friction and magnetism (diagram) ▪ Label the circuit diagram (simple circuit) ▪ Match the word with the definition: pitch, amplitude, frequency
skull, brain, ribs, heart, lungs, joints, muscles, teeth, incisors, canines, molars, premolars, snake, dolphin, horse, parrot, newt, beetle, woodlouse, spider, octopus, water, sunlight, digestive system, tongue, saliva, oesophagus, stomach, small intestine, large intestine, rectum, faeces	water cycle, evaporation, condensation, precipitation, transpiration, classify, sedimentary, metamorphic, igneous, freezing point, boiling point	light source, sun, moon, forces, gravity, friction, magnetism, component, simple circuit, diagram, wire, bulb, switch, batter (cell), pitch, amplitude, frequency
Knowledge Vital Milestone 4 Questions (by age 11 years)		
Biology	**Chemistry**	**Physics**
▪ Name the parts of the circulatory system (heart, blood, lungs, arteries, veins, capillaries, oxygenated, deoxygenated, valves). ▪ Draw the life cycle of a frog and plant. ▪ Name a species that is extinct, endangered and thriving.	▪ Name a reversible and irreversible change in state.	▪ Name three properties of light. ▪ Name the planets of the solar system. ▪ Name the force that is slowing down this object? (air resistance, water resistance, friction) ▪ Use the following symbols to draw a working circuit (wires, battery (cell), switch, bulb, buzzer, ammeter, resister).
circulatory system, heart, blood, lungs, arteries, veins, capillaries, oxygenated blood, deoxygenated blood, valves, life cycle, species, extinct, endangered, thriving.	reversible, irreversible, change in state	light, straight, reflect, translucent, opaque, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, (Pluto), air resistance, water resistance, friction, buzzer, ammeter, resister, symbol.

Appendix 3: Science Key Vocabulary Progression Map

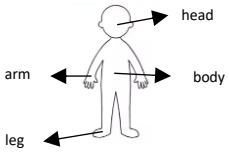
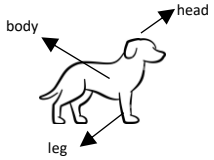
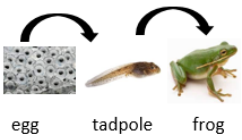
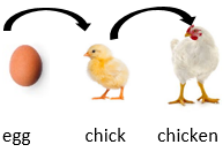
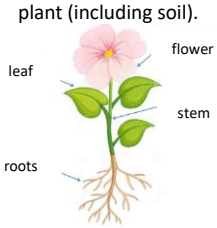
Progressive Technical Vocabulary				
Learning Focus	**EYFS**	**Years 1/2**	**Years 3/4**	**Years 5/6**
Working Scientifically	ask and answer questions look closely, listen, feel, smell, taste, measure, I wonder… I think… I could try… If I do… then …	question, answer, observe, observing, equipment, identify, classify, sort, group, measure, record, diagram, chart, map, data, compare, contrast, describe patterns, relationships, secondary sources	research, relevant, scientific enquiry, comparative and fair test, systematic, careful observation, accurate measurements, equipment, thermometer, record, drawings, labelled diagrams, keys, bar charts, tables, explain, conclusion, predictions, differences, similarities, changes, evidence, improve, construct interpret	plan, variables, measurements, accuracy, precision, repeat reading, record date, scientific diagrams, labels, classification keys, tables, scatter graphs, bar graphs, line graphs, causal relationships, degree of trust, evidence, support, refute, identify, classify, describe, patterns, systematic, quantitative measurements.
Progressive Specific Vocabulary				
Animals, including humans Biology	animal, human, head, body, arms, legs, plants, meat, egg, tadpole, froglet, frog, egg, chick, chicken.	common animals, fish, amphibians, reptiles, birds, mammals, pets, carnivores, meat eaters, herbivores, plant-eaters, omnivores, head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth. offspring, grow, adults, nutrition, reproduce, survival, water, food, air, exercise, hygiene, life cycle	nutrition, vitamins, minerals, fat, protein, carbohydrates, fibre, water, skeletons, support, protection, skull, brain, ribs, heart, lungs, movement, joint, muscles, movement, pull, contract, relax, diet. digestion, mouth, tongue, saliva, teeth, incisors, cutting, slicing, canines, ripping, tearing, molars, chewing, grinding, oesophagus, transport, stomach, acid, enzymes, small intestine, absorb, large intestine, compacts, brush, floss, food chain, producers, prey, predators.	development, puberty, gestation, length, mass, grow, heart, lungs liver, kidney, brain, skeletal, skeleton, muscle, muscular, digest, digestion, digestive, human circulatory system, heart, blood vessels, veins, arteries, capillaries, oxygenated, deoxygenated, valve, respiration, impact, diet, lifestyle, exercise, drugs, substances, damage
Living things and their habitats Biology	pond, farm, forest, nest, burrow, hot, cold, warm.	living, dead, habitat, micro-habitat, food, food chain, alive, healthy, shelter, seashore, woodland, ocean, rainforest, conditions, warm, cold, hot, dry, damp, wet, bright, damp, shade, predator, prey	vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, snails, slugs, worms, spiders, insects, environment, flowering, non-flowering, plants, animals, environments, habitats, human impact, positive, negative	life cycle, reproduction, offspring, naturalist, behaviourist, plants, sexual, asexual, prehistoric, microorganism.
Plants Biology	plant, flower, roots, stem, leaves, soil	deciduous, evergreen trees, leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem, garden plants, wild plants water, light, temperature, growth, germination, healthy	air, light, water, nutrients, soil, reproduction, transportation, dispersal, pollination, flower, nutrition,	
Evolution and inheritance Biology				adaptation, ancestor, biodiversity, biome, breeding, characteristics, environment, evolution, extinct, fossil, generation, inherit, maladaptation, mutation, natural selection, offspring, palaeontology, reproduction, species, survive, theory, variation
Materials Chemistry	glass, metal, rubber, plastic, natural, hard, soft, rough, smooth	absorbent, bendy, brick, dull, elastic, fabrics, foil, glass, man-made, natural, opaque, plastic, process, properties, purpose, recyclable, rock, rough, shiny, smooth, soft, squashy, rigid, suitable, stretchy, transparent, twist, waterproof, wood	condensation, cooling, evaporation, freezing, freezing point, gas, heating, liquid, melting, melting point, particles, precipitation, process, properties, solid, temperature, vibrations, water cycle, water vapour	material, property, solid, liquid, gas, dissolve, filter, sieve, evaporate, condense, thermal, conductor, insulator, transparent, opaque, homogenous, heterogeneous, soluble solvent, solute, solution, solubility, mixture, reversible change, irreversible change, changing state
Rocks Chemistry			absorb, decaying, grain, igneous, imprint, leaf litter,	

			magma, man-made, metamorphic, mineral, molten, natural, nutrients, palaeontology, permeable, porous, prehistoric, preserve, properties, rock, sediment, soil, surface, surrounding, volcano, weathered.	
Seasonal Change (KS1) Light Earth and Space Physics	night, day, sun, moon	Seasonal Change Summer, Spring, Autumn, Winter, sun, day, moon, night, light, dark, day length, holiday, hot, months, rain, season, sunny, temperature, warm, weather, windy.	Light light, see, dark, reflect, surface, natural, star, sun, moon, artificial, shadow, blocked, solid, sunlight, dangerous, protect,	Light travels, straight, reflect, reflection, light sources, object, shadows, mirrors, periscope, rainbow, filters Earth and Space Asteroid, axis, comet, galaxy, gravity, leap year, meteorite, orbit, planet, shadow, solar, system, sphere, spin, star, time zones, universe
Forces and Magnets Physics			attract, bendy, friction, force, gravity, magnet, magnetic field, metal, motion, non-magnetic, opposite, position, pull, push, repel, resistance, squash, stretchy, surface, twist	gear, lever, pulley, spring, streamlined, air resistance, water resistance, useful, not useful.
Electricity Physics			electricity, electrical circuit, cell, battery, wire, bulb, buzzer, motor, danger, safety, sign, insulators, wood, rubber, plastic, glass, conductors, metal, water, switch, open, closed.	voltage, brightness, volume, switches, series circuit, circuit diagram, symbols, ammeter, component, appliance, current, generate, energy, mains, source.
Sound Physics			amplitude, decibel, electricity, energy, frequency, medium, pitch, power, sound waves, source, transmit, travel, vibrations, volume	

Appendix 4: Science Key Skills Progression Map

Working Scientifically Skills Progression			
Early Years	**Year 1/2**	**Year 3/4**	**Year 5/6**
Pupils question why things happen.	Pupils ask simple questions and recognise these questions can be answered in different ways.	Pupils ask relevant questions and using different types of scientific enquiries to answer them	Pupils plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
Pupils use their senses and look closely.	Pupils observe closely, using simple equipment	Pupils can make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment.	Pupils make their own decisions about what observations to make, what measurements to use and how long to make them for.
Pupils notice similarities and differences.	Pupils identify and classify.	Pupils gather, record, classify and present data in a variety of ways to help me answer questions	Pupils use and develop keys to identify, classify, describe and identify relationships.
Pupils test their ideas.	Pupils perform a simple test.	Pupils set up simple practical enquiries, comparative and fair tests	Pupils take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
Pupils use equipment and tools carefully.	Pupils gather and record data answer their questions	Pupils record their findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables	Pupils record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
Pupils create simple representations of people and objects.	Pupils use their observations and ideas to suggest answers to their questions.	Pupils use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions	Pupils report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
		Pupils use straightforward scientific evidence to answer questions or to support their findings.	Pupils identify scientific evidence that has been used to support or refute ideas or arguments.

Appendix 5: Science Learning Unit Overviews

<table>
<tr><th colspan="4">Science Knowledge Milestone 1</th></tr>
<tr><td colspan="4">Learning Focus: Knowledge Milestone 1 Biology Assessment
Group: Reception
What pupils should know and remember by age: 5</td></tr>
<tr><th>Understanding the World - The Natural World</th><th colspan="3">My Mini Biology Milestones</th></tr>
<tr><td rowspan="4">Pupils will:
• Locate the arms, legs, body and head on the picture of an animal / a human.
• Know that the life cycle of a chicken is: egg, chick, chicken.
• Know the life cycle of a frog is: egg, tadpole, frog.
• Know that a polar bear lives in cold places. I know that a fish lives in water. I know worms live in the ground. Camels live in hot places.
• Locate the flower, root, stem, leaves on a plant (including soil).
• Know that David Attenborough is a famous Biologist.
Year 1 Ready Pupils will:
• Recognise animals are different and begin to group them in their own ways e.g. birds, fish, fur, no fur, etc.
• Recognise plants different and begin to group them in their own ways e.g. flowers, no flowers, garden, wild etc.
• Name parts of the body and say what they are used for e.g. eyes are used for seeing
• Recognise that animals eat different things e.g. meat and plants
• Recognise the same object may be made from different things e.g. a wooden, plastic and metal spoon.
• Recognise everyday materials and group objects based on them.
• Name the seasons of the year.
• Recognise when a water freezes and when it melts.</td><td>I can locate arms, legs, body and head on a picture of a human.
 
</td><td>I can locate arms, legs, body and head on a picture of an animal.
 
</td><td>I know the life cycle of a frog is: egg, tadpole, and frog.
 
</td></tr>
<tr><td>I know that the life cycle of a chicken is: egg, chick, chicken.
 
</td><td>I know that a polar bear lives in cold places.
  </td><td>I know that a fish lives in water.
  </td></tr>
<tr><td>I can locate the flower, root, stem, leaves on a plant (including soil).
 
</td><td>I know worms live in the ground.
  </td><td>I know camels live in hot places.
  </td></tr>
<tr><td colspan="3">I know that David Attenborough is a famous Biologist.
  </td></tr>
<tr><th colspan="4">Vocabulary</th></tr>
<tr><th>Technical</th><th colspan="3">Specific</th></tr>
<tr><td>ask and answer questions
look closely, listen, feel, smell, taste, measure,
I wonder…
I think…
I could try…
If I do… then …</td><td colspan="3">arms, legs, body, head, animal, human, life cycle, hot, cold, water, flower, root, stem, leaves, soil.</td></tr>
<tr><th colspan="4">Resources</th></tr>
<tr><td colspan="4">Images of human bodies and animals bodies to label. Life cycle images to order and discuss. Polar bear, fish, worm and camel toys / images and images of hot, cold, underground and under water habitats. Flowering plants and images.</td></tr>
<tr><th colspan="4">Assessment Task</th></tr>
<tr><td colspan="4">Pupils complete a pre learning task
Pupils complete the end of unit post learning task. (See below for these resources)</td></tr>
</table>

Assessment Criteria				
Assessment Focus	**Biology Mini Milestones**	**Basic Understanding**	**Advancing Understanding**	**Deep Understanding**
To name parts of a human and animal body, including: arms, legs, body and head	I can locate the arms, legs, body and head on the picture of an animal / a human.	Can point and **name** parts of the body for humans and common animals.	**Compare** the body parts of animals and humans in terms of shape and size.	**Debate**: Is the oldest human always the biggest?
To know the life cycle of a chicken	I know that the life cycle of a chicken is: egg, chick, chicken.	**Order** three pictures to show the life cycle of a chicken. **Name** each part.	Discusses **differences** between a chicken and human life cycle.	**Suggest** a difference between a chick and a human baby.
To know the life cycle of a frog	I know the life cycle of a frog is: egg, tadpole, frog.	**Order** three pictures to show the life cycle of a frog. **Name** each part.	Discusses **similarities** between a frog and chicken life cycle.	**Suggest** how a tadpole's life is different to a human baby.
To match animals with the most suitable habitat.	I know that a polar bear lives in cold places. I know that a fish lives in water. I know worms live in the ground. Camels live in hot places.	**Match** a polar bear, worm, camel and fish to the correct habitat using pictures.	**Discuss** why a polar bear is suited to living in a cold place. Thick fur, layer of fat under the skin, black skin to retain heat.	**Reason** why a polar bear should not live in a desert.
To name parts of a plant including flower, root, stem and leaves.	I can locate the flower, root, stem, leaves on a plant (including soil).	Can point and **name** parts of a flowering plant.	**Suggest** what each part of the plant does.	**Predict** what would happen if we did not water a plant.
To name a famous scientist.	I know that David Attenborough is a famous Biologist.	**Recognise** and **name** David Attenborough	**Discuss** what he does.	**Reason** why is he an important person in science.

Science

Learning Focus: Biology
Learning Theme: Plants
Group/s: 1/2
Term: Summer Route A

Big Question:

Which tree has the biggest leaves?

Learning Objectives (skills, knowledge, understanding)

What I should already know:
In EYFS Children should:

- Make observations of plants
- Know some names of plants, trees and flowers
- May be able to name and describe different plants, trees and flowers
- Show some care for their world around them

New Learning in Key stage 1

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

- I observe closely, using simple equipment
- I can identify and classify.
- I can perform a simple test.
- I gather data and record data to help me answer my questions
- I use my observations and ideas to suggest answers to my questions.

Vital Milestone Knowledge

- I can name and locate the following parts of a plant: petals, fruit, roots, flowers, seeds, trunk, branches and bulb.

My Mini Biology Milestones

I can name the garden plants rose, poppy and sunflower.

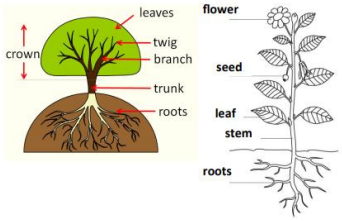
I can name the wild plants buttercup, daisy, dandelion, nettle and clover.

I can name an oak, horse chestnut and a willow tree.

I know deciduous trees lose their leaves in autumn.
I know evergreen trees keep their leaves all year round.

- **Deciduous trees** lose their **leaves** in the autumn every year. Their **leaves** are generally broad, flat and have veins running through them.
- **Evergreen trees** have green **leaves** all year round. Their **leaves** are generally thick, waxy and narrow like needles.

I can name and identify the roots, stem/trunk, leaves, flowers, crown, branch and twig.



Vocabulary

Technical	Specific
question, answer, observe, observing, equipment, identify, classify, sort, group, measure, record, diagram, chart, map, data, compare, contrast, describe patterns,	deciduous, evergreen trees, leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem, garden plants, wild plants, water, light, temperature, growth, germination, healthy

Resources

Selection of plants, seeds, bulbs, tree. Pots, soil, water, veg and fruit, Tree: Seasons Come, Seasons Go (Patricia Hegarty and Britta Teckentrup) A Little Guide to Wild Flowers (Charlotte Voake) The Things That I LOVE about TREES (Chris Butterworth) Harry's Hazelnut (Ruth Parsons)

Assessment Task

Pupils complete a pre learning task
Pupils complete the end of unit post learning task. (See below for this resource)

Assessment Criteria

Assessment Focus	Biology Mini Milestones	Basic Understanding	Advancing Understanding	Deep Understanding
Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen.	I can name the wild plants buttercup, daisy, dandelion, nettle and clover. I can name the garden plants rose, poppy and sunflower. I can name an oak, horse chestnut and a willow tree. I know deciduous trees lose their leaves in autumn. I know evergreen trees keep their leaves all year round.	What are the **names** of common wild plants? What are the **names** of some common garden plants? What are the **names** of common trees? **Which** trees are evergreen and which are deciduous? **(name)**	What are the **similarities and differences** between deciduous and evergreen trees? Think of some ways to **categorise** plants.	Could you **suggest** a garden **design** for someone who likes privacy and bright autumn colours?
Identify and describe the basic structure of a variety of common flowering plants and trees.	I can name and identify the roots, stem/trunk, leaves and flowers.	What are the **names** the parts of flowering plants? What is the structure **(names)** of each part of a flowering plant?	Making a selection of (real) different flowering plants, what are the structural features? (**apply**)	Are roots always at the bottom of plants **(generalise)?** Why do you think that is? (**explain concept**)

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research
Which type of compost grows the tallest sunflower? Which tree has the biggest leaves?	How can we sort the leaves that we collected on our walk?	How does a daffodil bulb change over the year? How does my sunflower change each week? How does the oak tree change over the year?	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?	What are the most common British plants and where can we find them? How did Beatrix Potter help our understanding of mushrooms and toadstools?

Science

Learning Focus: Biology
Learning Theme: Plants
Group/s: 3/4
Term: Summer Route A

Big Question:

How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?

Learning Objectives (skills, knowledge, understanding)

What I should already know:

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

New Learning in Key stage 2

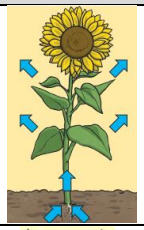
- I can identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- I can explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant
- I can investigate the way in which water is transported within plants
- I can explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Vital Milestone Knowledge

- I know that plants need water, sunlight and CO2 to grow.

My Mini Biology Milestones

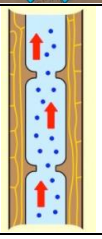
I know:
The roots absorb water from the soil.
The stem transports water to the leaves.
Water evaporates from the leaves.
Evaporation from the leaves causes more water to be sucked up the stem



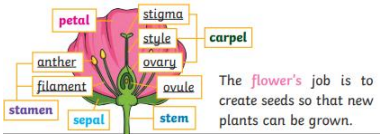
I know plants need air, light, water, nutrients from the soil and room to grow.

I know different plants need different amounts.
I know cactus plants can survive with little water.
I know water lilies need lots of water to survive.

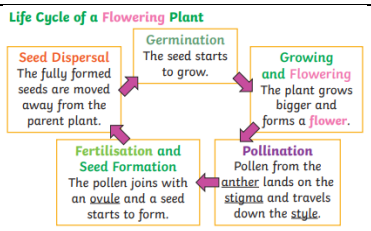
I know water travels from the roots through the stem to the rest of the plant.
Water is transported in xylem cells.



I know the stamen is the male plant part and is made from the anther and filament.
I know the carpel is the female plant part and is made from the stigma, style and ovary.



I know the stages of a plant life cycle are germination, flowering/growing, pollination, fertilisation / seed formation and seed dispersal.



Vocabulary

Technical	Specific
question, answer, observe, observing, equipment, identify, classify, sort, group, measure, record, diagram, chart, map, data, compare, contrast, describe patterns,	**Structure** flowering plants, roots, stem/trunk, leaves, flowers **Function** nutrition, support, reproduction, makes its own food, **Requirements for life and growth** air, light, water, nutrients from the soil, room to grow needs vary, fertiliser, **Life cycle**, flowers pollination, seed, formation, seed dispersal

Resources

Selection of flowering plants, seeds, bulbs, tree. Pots, soil, water, bags, food colouring, celery, carnations, bee keepers.

Assessment Task

Pupils complete a pre learning task
Pupils complete the end of unit post learning task. (See below for this resource)

Assessment Criteria

Assessment Focus	Biology Mini Milestones	Basic Understanding	Advancing Understanding	Deep Understanding
Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers	I know: The roots absorb water from the soil. The stem transports water to the leaves. Water evaporates from the leaves. Evaporation from the leaves causes more water to be sucked up the stem	**Describe** and **illustrate** the functions of different parts of flowering plants.	**Explain** how leaves are important in creating food for a plant.	**Prove** or **disprove** that roots act like straws sucking up water for the plant.
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.	I know plants need air, light, water, nutrients from the soil and room to grow. I know different plants need different amounts. I know cactus plants can survive with little water. I know water lilies need lots of water to survive.	Grow, **observe** and **record** the growth of a range of different plants.	**Compare** and **contrast** the conditions for growth for a range of different plants. **Explain** why these differences may exist	**Create** a planting plan for a 1 metre square bed of flowers that will look its best three years from planting. **Justify** your choice of plants.
Investigate the way in which water is transported within plants.	I know water travels from the roots through the stem to the rest of the plant. Water is transported in xylem cells.	**Observe** (or read about) and **answer** questions about how water is transported in plants.	**Experiment** with food colouring to demonstrate how water is transported through a plant. **Explain** the experiment and **summarise** your observations. **Compare** and **contrast** your observations with those of others.	Can you change the colour of celery? **Prove it** and draw some scientific **conclusions**.
Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	I know the stamen is the male plant part and is made from the anther and filament. I know the carpel is the female plant part and is made from the stigma, style and ovary. I know the stages of a plant life cycle are germination, flowering/growing, pollination, fertilisation / seed formation and seed dispersal.	**Label** the parts of a flower. **Describe** the process of pollination. **List** ways in which plants are pollinated. **Describe** how seeds are formed. **List** ways in which seeds are dispersed	Using a range of (real) flowering plants, **locate** and **name** the parts of the flower. (apply) **Compare** different flowers and **explain** the differences in the size and shape of the parts of the flower. **Explain** why a flower that is not pollinated will not reproduce	**Suggest reasons** why some people are worried about a fall in the number of bees in the British Isles. Why might flowering plants grow in high up rooftops or gutters even if humans did not put them there? Animals are a flowering plant's best friend. Do you agree? (**reason**)
Comparative tests	**Identify & Classify**	**Observation over time**	**Pattern Seeking**	**Research**
Do plants grow bigger with or without fertiliser?	How can we sort these plants? (Methods of seed dispersal)	What happens when food colouring is added to carnation flowers?	Are trees with the biggest leaves taller than other trees?	How are falling bee numbers affecting the growth of plants?

Science

Learning Focus: Biology
Learning Theme: Evolution and Inheritance
Group/s: 5/6
Term: Summer Route B

Big Question:

Is there a pattern between the size and shape of a bird's beak and the food it will eat?

Learning Objectives (skills, knowledge, understanding)

What I should already know:

- I understand there is a variety of life on Earth
- I know that some animal's differences are important to their survival
- I know how animals and plants reproduce
- I know how fossils form over time

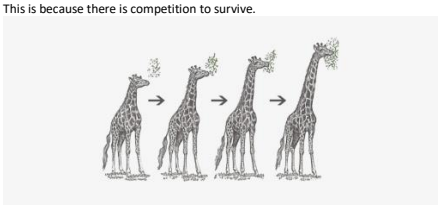
New Learning in Upper Key Stage 2:

- I can recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- I recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- I can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
- I can recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago

Vital Milestone Knowledge
I can name a species that is extinct, endangered and thriving.
I know that Charles Darwin was a famous biologist who proposed the theory of evolution.

What I should know by the end of this unit.

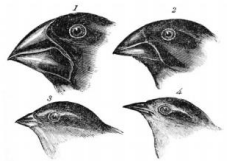
I know living things change over time and this gradual change is called evolution.
Evolution is a gradual process by which different kinds of living organisms have developed from earlier forms over millions of years.
I know natural selection is the cause of this change.
This is because there is competition to survive.

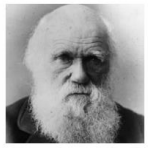


Giraffes have evolved over many generations to grow longer necks. This means more food is available to them and they are more liekly to survive if they are well nourished.

I know this gradual change of a species over millions of years can be observed by looking at examples of fossils.
Fossils are the preserved remains, or partial remains, of ancient plants or animals. Fossils let scientists know how plants and animals used to look millions of years ago. This is proof that living things have evolved over time.

I know that Charles Darwin was a famous biologist who proposed the theory of evolution.





The theory of evolution by natural selection (first formulated in Darwin's book "On the Origin of Species" in 1859) is the process by which organisms change over time as a result of changes in inheritable physical or behavioural traits.

Animals change over time and adapt to the surroundings in which they live.
Darwin observed that there were many forms of finches that had different beak sizes and shapes. Once he considered the food sources of each finch, he noted the reason for these adaptations

I know offspring vary and are not identical to their parents.
Animals and plants produce offspring that are similar but not identical to them. Offspring look like their parents because characteristics are passed on.

I know differences within a species (variation) are caused by **inherited and adaptive traits.**

The cat offspring are not identical to their parents. They are similar but they are not identical to their parents. This shows that **variation** exists even within a family.

I know **inheritance** is when characteristics are passed on to offspring from their parents.
Examples of this would be hair and eye colour.
Adaptive traits are characteristics influenced by the environment the living things live it to help it to survive.

I know members of a species with advantageous characteristics survive and reproduce; therefore, these characteristics are passed down to their offspring.
Adaptation is when animals and plants have evolved so that they have adapted to survive in their environments. For example, polar bears have a thick layer of blubber under their fur to survive the cold, harsh environment of the Arctic while giraffes have long necks to reach the leaves on trees.

I know changes to an environment can make it difficult for an animal to survive and reproduce; in extreme cases this leads to extinction, where an entire species dies.
Sometimes adaptations can be disadvantageous. One example of this can be the dodo, which became extinct as it lost its ability to fly through evolution. Flying was unnecessary for the dodo as it had lived for so many years without predators, until its native island became inhabited.
When adaptations are more harmful than helpful, they are called a **maladaptation**.

Vocabulary

Specific	adaptation, advantageous, ancestor, characteristics, endangered, environment, evolution, extinct / extinction, fossil, generation, inherit / inheritance, maladaptation, mutation, natural selection, offspring, palaeontology, reproduce / reproduction, species, survive, theory, thriving, variation
Technical	plan, variables, measurements, accuracy, precision, repeat reading, record date, scientific diagrams, labels, classification keys, tables, scatter graphs, bar graphs, line graphs, causal relationships, degree of trust, evidence, support, refute, identify, classify, describe, patterns, systematic, quantitative measurements.

Resources

iPads, laptops, fossils, One Smart Fish (Christopher Wormell) The Molliebird (Jules Pottle) Our Family Tree (Lisa Westberg Peters)

Assessment Task

Pupils complete a pre learning task
Pupils complete the end of unit post learning task. (See below for this resource)

Assessment Criteria

Assessment Focus	Biology Mini Milestones	Basic	Advancing	Deep
Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Tasks repeated from Rocks Learning Overview LKS2 Autumn Route A)	I know living things change over time and this gradual change is called evolution. I know natural selection is the cause of this change. I know this gradual change of a species over millions of years can be observed by looking at examples of fossils.	**Name** a variety of animal and plant fossils. **Describe** the conditions in which the fossils once lived. **Note, name** and **describe** plants and animals that inhabited the Earth millions of years ago.	**Categorise** fossils in a number of ways. **Compare** and **contrast** different fossils. Explain the process of the formation of fossils.	**Investigate** the conditions in which life on Earth survived millions of years ago. Burning fossil fuels is widely thought by scientists to contribute to a rise in worldwide temperature. Investigate this and **cite evidence** that **supports** or **questions** this view.
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.	I know offspring vary and are not identical to their parents. I know differences within a species (for example between parents and offspring) can be caused by inheritance and mutations. I know inheritance is when characteristics are passed on from one generation to the next. I know mutations in characteristics are not inherited from the parents and appear as new characteristics.	**Observe** and **describe** differences between living things and their offspring. **Observe** and **name** offspring that are not identical to their parents and **describe** how they vary.	**Categorise** differences in living things and their offspring. **Explain**, with examples, how offspring are not identical.	**Is it possible** that a litter of cocker spaniel puppies from two parents of the same colour may vary in colour?
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. (Some tasks repeated from Living Things and their Habitats Learning Overview LKS2 Spring Route A)	I know members of a species with advantageous characteristics survive and reproduce; therefore, these characteristics are passed down to their offspring. I know changes to an environment can make it difficult for an animal to survive and reproduce; in extreme cases this leads to extinction, where an entire species dies.	**Match** a range of animals and plants to the environments in which they are found. **Describe** how animals and plants are suited to the environments in which they are found. **Illustrate** how animals and plants adapt to environments in different ways. **Describe** the theory of evolution.	**Explain** and give examples of the idea of adaptation. **Compare** and **contrast** different types of adaptation. **Explain** why adaptation may lead to evolution.	**True or false:** plants and animals would not survive if they could not adapt? Which do you think are the best examples **(suggest)** of an animal and plant that shows adaptation? **Do you agree:** evolution is the only way a species can survive?
Comparative tests	**Identify & Classify**	**Observation over time**	**Pattern Seeking**	**Research**
What is the most common eye colour in our class?	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?	How has the skeleton of the horse changed over time?	Is there a pattern between the size and shape of a bird's beak and the food it will eat?	What happened when Charles Darwin visited the Galapagos islands? What ideas did American geneticist Barbara McClintock have about genes that won her a Nobel Prize?