INSPIRING TOMORROW'S LEADERS

Science Primary Curriculum
Curriculum Plan

REVISED VERSION SEPTEMBER 2023

Science Curriculum Intent

Our young scientists will acquire life-long enquiry science skills, in order to explore and understand the world they live in, alongside the vast knowledge of the disciplines of biology, physics and chemistry. They will also develop an understanding of the vital role that major scientific ideas and scientists have played in society. In doing so, all our children, regardless of their starting points, will be fully prepared for their next stage of science education, and beyond.

Science is taught discretely, with a focus on substantive knowledge-rich content and the development of essential disciplinary knowledge. The National Curriculum programmes of study and Early Years Foundation Stage framework are fully adhered to and then supplemented with additional knowledge-rich content. This provides a coherent science curriculum that both prepares children extremely well for future learning and gives them the tools to independently investigate and explore the world further.

The science curriculum encourages children to be curious about natural phenomena and to be excited by the process of understanding the world around them. We want our children to remember the concepts they learn. Therefore, the curriculum focuses on the sequential development of essential substantive knowledge underpinning biology, chemistry and physics, as per the science progression map below. Over time, these building blocks of component 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. For example, the biology strand of 'plants' is revisited multiple times throughout the year groups, with the component learning of basic plant structure in Year 1 transforming into the composite learning of water transportation within plants in Year 3.

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 the progression in these skills as per the science progression map. Thus, essential science concepts are developed whilst children investigate the world around them. The different approaches to science enquiry, such as fair testing, research and classifying are also systematically developed in the disciplinary knowledge section of the progression map. Each science unit of work is then framed around an enquiry question, ensuring a systematic, contextualised development of both substantive and disciplinary knowledge.

Science Curriculum Implementation

Substantive knowledge sets out the subject-specific content that is to be learned - i.e. the National Curriculum units that can be separated into the disciplines of biology, physics and chemistry. *This is the knowledge of the products of science, such as concepts, laws, theories and models.* The progression map below, separated into biology, chemistry and physics, sequences the substantive knowledge in the Star science curriculum, from Reception to Year 6, drawing directly from the EYFS framework and National Curriculum. Additional substantive knowledge content that goes beyond the National Curriculum is labelled in red.

Disciplinary knowledge considers how substantive knowledge originates, is debated and is 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..

We set out the **Working Scientifically** stand of the National Curriculum as **ten distinct skills**:

I. *Asking scientific Questions* that are the starting points for different types of science enquiry.
II. *Planning an enquiry*, systematically requiring more independent decision making.
III. *Observing Closely*, communicating these observations via increasingly more elaborately e.g. through diagrams, graphs, presentations.
IV. *Taking Measurements* according to relevant age-related strands of the mathematics National Curriculum.
V. *Gathering and recording results* appropriately, for example, using a variety of tables, tally charts, pictures and graphs.
VI. *Presenting Results* in a range of ways, including age-appropriate charts and graphs.
VII. *Interpreting Results* by spotting patterns and describing relationships.
VIII. *Drawing Conclusions* (KS2 only) and presenting them orally and in writing.
IX. *Making Predictions* (KS2 only) about further results or investigations, by drawing on what has been learnt.
X. Evaluating an enquiry by suggesting improvements and discussing the degree of trust in secondary sources and their results.

The **approaches to science enquiry** includes:

I. *Observing over time, over a range of different spans of time - in the moment and over a longer period of days, weeks or months.*
II. *Pattern seeking*, including the use of scatter graphs in UKS2.
III. *Identifying, grouping and classifying*, for example by working with Venn diagrams, Carrol diagrams and branching databases.
IV. *Comparative and fair testing* (controlled investigations), by controlling variables, presenting data in graphs and describing causal relationships.
V. *Researching using secondary sources,* presenting what is found and using it to answer enquiry questions.

Acquiring disciplinary knowledge is an important curriculum goal and occurs alongside substantive knowledge development. The science enquiries in the Star curriculum integrate both forms of knowledge. Disciplinary knowledge is introduced, developed and mastered alongside the substantive content of biology, physics and chemistry.

National Curriculum and EYFS Framework

Subtantive Knowledge

Biology

plants, animals, habitats, human systems

Physics

light, electricity, space, sound, forces, weather

Chemistry

changes in matter, rocks, everyday materials

Disciplinary Knowledge

Approaches to Science Enquiry

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

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

There are four key elements to the implementation of the science curriculum:

- **Plan:** each lesson is judiciously planned to identify the different types of knowledge that the lesson focusses on. It builds on pupils' prior learning, drawing upon previously lessons and the prior learning as identified in the medium-term plans.
- **Teach:** the Science Charter is used when implementing the science curriculum.
- **Assess:** pupils are given enquiry-based composite tasks that enable pupils to demonstrate their understanding of the component knowledge.
- **Intervene and re-teach:** composite tasks identify knowledge components that are not secure. These are re-taught before moving on to avoid future gaps from emerging.

Adapting the curriculum for pupils with SEND in science

- Adaptive teaching takes place.
- For sensory or physically impaired pupils, science learning may necessitate enlarging texts, using clear fonts, using visual overlays, or audio description of images.
- Dyslexic pupils may benefit from well-spaced print.
- Teachers identify and break down the components of the subject curriculum into manageable chunks for pupils who find learning more difficult, particularly those with cognition and learning needs. These may be smaller 'steps' than those taken by other pupils to avoid overloading the working memory.
- A variety of additional scaffolds may be used in lessons, such vocabulary banks, additional visual stimuli or adult support.

Science Curriculum Implementation - Star Science Charter

1. Focus the science unit on a Big Question.
2. Ensure that key scientific concepts are explored and developed within a framework of practical and collaborative science enquiry lessons.
3. Develop pupils' disciplinary knowledge – thinking, investigating and communicating like a scientist.
4. Check prior learning has been retained through the Do Now Activity (DNA)/starter.
5. Introduce the learning objective of the lesson, making links to both the wider learning journey and the real world of science.
6. Model and develop key concepts to cement knowledge, skills and understanding, using the "I do, we do, you do" pedagogical structure, ensuring that teacher modelling is built around appropriate success criteria.
7. Use concrete and pictorial models and analogies to help pupils develop a deeper understanding of abstract scientific concepts.
8. Maximise engagement, learning and progress through regular use of Teach Like A Star techniques such as Cold Call, Turn and Talk, Everybody Writes, Show Call and Right is Right.
9. Build in regular checks for understanding during lessons, including through assertive monitoring and targeted questioning, addressing misconceptions quickly and remodelling where necessary.
10. Check priority knowledge has been retained to the working memory at the end of every lesson, including through the use of Exit Tickets.
11. Ensure a focus on target science language to enable pupils to articulate science concepts with accuracy in both the spoken and written word.
12. Model and explicitly teach the relevant mathematical requirements to enhance their scientific understanding and enquiry.
13. Include studies of influential scientists, at a minimum of two per year.
14. Ensure pupils take pride in their written work, continually focus on their handwriting and quality of diagrams, and provide clear evidence in their books of responding to written and verbal teacher feedback.
15. Promote a love of science and how things work.

EYFS

Animals including humans.

The Natural World

Star

Year 1

Everyday Materials

Magnetism

Plants

Seasonal Changes

Taking care of the Earth

Year 2

Matter

Plants

Animals including humans.

Living things in their habitats

Electricity

Astronomy and the Earth

Year 3

Light

Magnetism

Plants

Animals including humans.

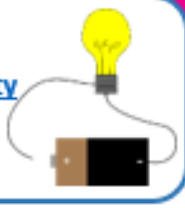
Rocks

Insects

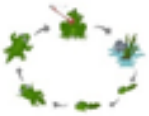
Science Pathway Years 1-6

Star

Year 4

- Animals including Humans 
- Living things & their habitats 
- Sound 
- States of Matter 
- Electricity 
- The Human Body: Systems, Vision and Hearing 

Year 5

- Forces 
- Earth & Space 
- Properties & changes of Materials 
- Living things & their habitats 
- Meteorology 
- Geology 

Year 6

- Living things & their habitats 
- Electricity 
- Animals including Humans 
- Evolution & Inheritance 
- Light 
- Matter & Change 

Science Roadmap Years R-6

Detailed Guidance Regarding Approaches to Science Enquiry

Throughout the course of a year / key stage, pupils should carry out several enquiries / tests / investigations, which involve the following different approaches to enquiries. These opportunities are signposted in all STAR Science planning.

Enquiry approach	Symbol	Definition and guidance notes
Research using 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.
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. <u>Examples of identifying, grouping and classifying:</u> • *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.

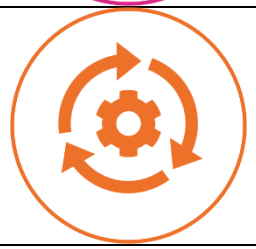
Enquiry approach	Symbol	Definition and guidance notes
Comparative and fair testing		**Changing one variable to see its effect on another, while keeping all the other variables the same.** Start talking about comparative or fair testing with children by first talking about what can be changed (the 'variables') and whether this might make a difference to the outcome. <u>Examples of comparative and fair testing:</u> • 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.
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.

Enquiry approach	Symbol	Definition and guidance notes
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 shadow). *[Note: it is important that children understand that a direct relationship between two variables does not always mean a causal relationship exists. It is more common to find a direct relationship between two things that is not completely the result of one variable directly affecting the other.]* In extreme cases, two variables can be related to each other without either variable directly affect the other. An example of this could be a relationship between children's height and their hair colour. For example, children might measure their height and record their hair colour on a numerical scale (1-5 representing black, dark brown, brown, pale brown, blonde) and conclude that 'in our class, the tallest children have the fairest colour hair'. This might be true, but the tall children have not grown taller because they have blonde hair, and their hair is not fair because they are tall. If you can find a direct relationship that exists that is clearly not a causal relationship, this may help the children understand that not all relationships are causal. <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.

Detailed Guidance Regarding Working Scientifically Skills

Below are the ten skills in the STAR curriculum that are drawn from the Working Scientifically strand of the National Curriculum. These should be shared with children, together with the symbol, so that they develop a common language for talking about how they work as scientists. All STAR planning detail the skill(s) coverage in a particular lesson. Only one or two of these skills should be the principle focus of any one lesson, although children will often be employing others in the background.

- These **Working Scientifically** skills are revisited multiple times within our spiralling curriculum to ensure that they are systematically developed over time.
- These **Working Scientifically** skills used by children when carrying out the **five approaches to science enquiry.**
- The symbols used feature in all STAR planning and can be shared with children.

1. Asking questions		2. Making predictions	
3. Setting up tests		4. Observing and measuring	
5. Recording data		6. Interpreting and communicating results	
7. Evaluating			

Working Scientifically in Key Stage 1

Working Scientifically Skill	Guidance	Symbol
1. Asking questions	• While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions. • The children answer questions developed with the teacher often through a scenario	
2. Making predictions	• Children make a prediction about what they think might happen. • They use any experience or knowledge they have to make 'a guess'.	
3. Setting up tests	• The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered. • They start to make choices about the things they might use and start to say why.	
4. Observing and measuring	• Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. • They begin to take measurements, initially by comparisons, then using non-standard units.	
5. Recording data	• The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time. • The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings. • Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting	
6. Interpreting and communicating results	• Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing. • The children recognise 'biggest and smallest', 'best and worst' etc. from their data.	
7. Evaluating	• Children identify 'what went well'. • Children identify 'even better if'. • They begin to understand, through discussion, that tests can be repeated and changed.	

Working Scientifically in Lower Key Stage 2

Working Scientifically Skill	Guidance	Symbol
1. Asking questions	• The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher.	
2. Making predictions	• Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface.	
3. Setting up tests	• Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work and they identify the type of enquiry that they have chosen to answer their question. • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations & tests to classify; comparative & simple fair tests; observations over time; & pattern seeking.	
4. Observing and measuring	• The children make systematic and careful observations • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.	
5. Recording data	• The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). • They record classifications e.g. using tables, Venn diagrams, Carroll diagrams	
6. Interpreting and communicating results	• Children are supported to present the same data in different ways in order to help with answering the question. • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary. • Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence. • They draw conclusions based on their evidence and current subject knowledge.	
7. Evaluating	• They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. • Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.	

Working Scientifically in Upper Key stage 2

Working Scientifically Skill	Guidance	Symbol
1. Asking questions	• Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.	
2. Making predictions	• Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.	
3. Setting up tests	• Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work. • The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.	
4. Observing and measuring	• During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value). • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.	
5. Recording data	• The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys	
6. Interpreting and communicating results	• The children decide how to record and present evidence. Children present the same data in different ways in order to help with answering the question. • They communicate their findings to an audience using relevant scientific language and illustrations. • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.	
7. Evaluating	• They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used. • They identify any limitations that reduce the trust they have in their data. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding.	

Progression in working scientifically skills

Year	Expectations
6	• 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.
5	• 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.
4	• 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.
3	• 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.
2	• 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. • Use more than one secondary source to gather and present information clearly.
1	• Explore the world around them and raise own questions. (e.g. growing, animals in their habitat, everyday materials, why seasons change.) • Can answer questions supported by the teacher, often through scenarios and recognise questions can be answered in different ways. • Can begin to ask simple questions and use simple secondary sources to find answers. • Able to ask yes and no questions to sort and classify.
EYFS	• Shows curiosity about objects, events, plants, people, and animals. • Questions why things happen. • Asks questions to clarify understanding and aspects of their familiar world e.g. place they live or natural world. • Ask questions to find out how things work or to clarify what is happening.

Setting up tests

Year	Expectations
6	• 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.
5	• 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.
4	• 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.
3	• 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).
2	• Carry out simple comparative tests using own ideas (May use Discovery Dog model) • 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.
1	• 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.
EYFS	• 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.

Year	Expectations
6	• 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.
5	• 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.
4	• 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.
3	• 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.
2	• 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.
1	• Can make basic predictions over things they can see or their own ideas. • Can use some scientific vocabulary.
EYFS	• Shows curiosity about objects, events, and people. • Question why things happen. • Can make simple predictions based on comparisons e.g. float or sink?

Observing and measuring

Year	Expectations: Observation	Expectations: Measurement
6	• 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.	• 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.
5	• 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.	• 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.
4	• 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.	• 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.
3	• 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.	• 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.

2	• 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.	• 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.
1	• 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.	• 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.
EYFS	• 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.	• Take measurements initially by comparisons then begin to use non-standard units. • Make links and notice patterns in their experiences.

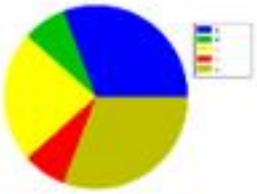
Recording data

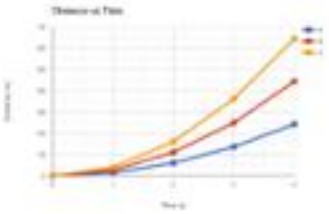
Year	Expectations: Recording	Expectations: Tables	Expectations: Sorting	Expectations: charts & graphs
6	Present the same data in different ways to help answering the question. Record data and results with increasing complexity e.g. accuracy of measurements, multiple data sets and different scales. Use scientific diagrams, models, and labels.	Can calculate the mean and range of a set of data. Use multiple data sets.	Can use and produce classification keys independently by posing questions.	Can independently collect data and produce scatter and line graphs using various scales and multiple data. Can create bar charts and pie charts to present data.
5	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.	Can produce own results table indicating cause and effect. Records results systematically.	Use and develop classification keys and other information records to identify, classify and describe. Can classify in a number of ways.	Use line or scatter graphs to calculate range in a set of data. (Different scales used) Can produce bar graphs with various increments.
4	Record findings using systematic and careful observational drawings and labelled diagrams. Supported to present the same data in different ways- choice over recording.	Can create own tables with own headings. Can convert between units of measure.	Can record using classification keys. Can use Venn and Carroll diagrams for classification, choosing own criteria.	Can use discrete and continuous data, presenting data in a line/scatter graph. Can construct a pictogram/bar chart independently.
3	Record findings using scientifical language, drawings and labelled diagrams and detailed written explanations based on observations.	Can complete a table (with given template) where they add headings and results.	Can use simple classification keys and Venn diagram with 2 sorting criteria and 1 intersecting. Begin to use Carroll diagrams. Can give reasons for their sorting criteria.	Can produce vertical and horizonal bar charts adding own labels and bars.
2	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.	Can count results using a tally chart. Use prepared tables to record results.	Can identify and classify. Use simple keys based and yes or no questions. Can sort into 2 groups explaining their reasons clearly.	Can record using prepared vertical bar charts. Can use results from tally charts.
1	Begin to show accuracy in drawings, observations, and simple labels. Use key scientific vocabulary provided by the teacher.	Can complete a simple table of results. (Prepared) Can add marks to a chart to collect data.	Can using sorting rings to classify in more than 2 groups answering yes or no questions. Can sort using a simple 2 criteria Venn diagram.	Can complete a prepared block graph/pictogram.

EYFS	Draw pictures of objects in their own environment. Can take photos of things of interest to them.	Can count results. Start to mark make to record results.	Can order items. Can sort in more than 2 groups using familiar categories.	Can create a class chart using pictures and objects.

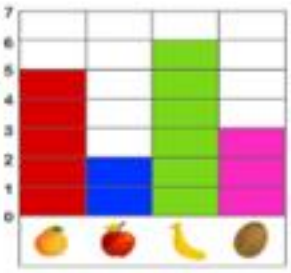
Examples of charts & graphs:

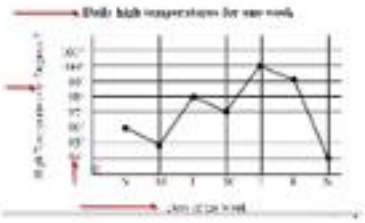
Year 6





Year 2





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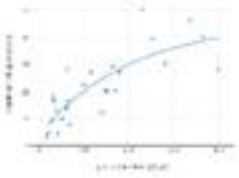
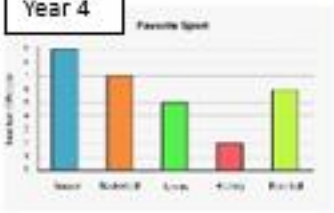
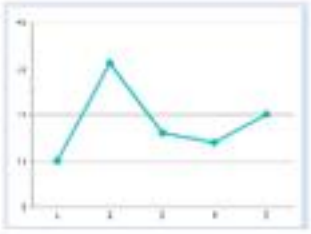


Favourite Pets in Our Class

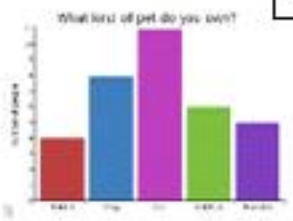
Year 1

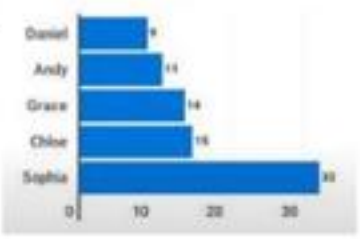
Year 4



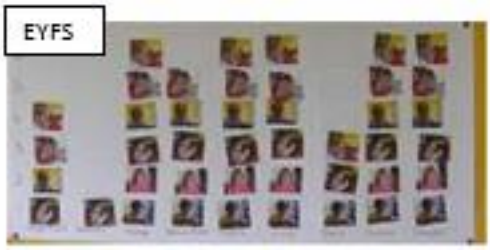


Year 3





EYFS



Interpreting and communicating results

Year	Expectations
6	• 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. • 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.
5	• 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. • Use results to make predictions and identify whether further observations, comparative tests, fair tests, pattern seeking, or research might be needed. • 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.
4	• 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. • Draw conclusions based on straightforward evidence and current subject knowledge to support their findings • Suggest improvements and raise further questions.
3	• 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. • 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.
2	• 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.
1	• 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.
EYFS	• 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.

Year	Expectations
6	• 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.
5	• 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.
4	• 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.
3	• 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.
2	• 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.
1	• 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.
EYFS	• 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. • They can say or indicate by smiley faces/scale if they have achieved the learning objective.

Science Enquiry: Supporting the Curriculum

Further ideas, support and guidance for planning for the different enquiry types can be found at: [Practical Work: Supporting Scientific Enquiry - Years 1-6 | PSEC (primary-science.co.uk)]

The suggestions below represent possible ideas for enquiries linked to each enquiry type and topics within a year group. These are suggestions only; some are included in STAR medium and short term planning.

Year 1

 **Comparative and fair testing**	 **Identifying, grouping and classifying**	 **Observing over time**	 **Pattern seeking**	 **Research from secondary sources**
What type of compost grows the tallest sunflower? Which tree has the biggest leaves? Is our sense of smell better when we can't see? 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? What are the names for all the part of our bodies? 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? Which materials will float and which will sink?	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? 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? How does the colour of a UV bead change over the day?	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? Do you get better at smelling as you get older? 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? 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?

Year 2

Comparative and fair testing	Identifying, grouping and classifying	Observing over time	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? Is there the same level of light in the evergreen wood compared with the deciduous wood? 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 these plants and animals based on what habitat you would find them in? How would you group things to show which are living, dead or have never been alive? Which materials are shiny and which are dull? Which materials will let electricity go through them and which will not?	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 magnetic materials always conduct electricity?	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? 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?

Year 3

Comparative testing	Fair testing	Identifying, grouping and classifying	Observing over time	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 does the mass of an object affect how much force is needed to make it move? How does the distance between the shadow puppet and the screen affect the size of the shadow?	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? Which materials are magnetic?	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? Is the Sun the same brightness all day?	What colour flowers do pollinating insects prefer? Do male humans have larger skulls than female humans? 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?

Year 4

Comparative testing	Fair testing	Identifying, grouping and classifying	Observing over time	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? Are two ears better than one? Which metal is the best conductor of electricity?	Does the amount of light affect how many woodlice move around? How does the mass of a block of ice affect how long it takes to melt? How does the surface area of a container of water affect how long it takes to evaporate? 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 would you sort these objects / materials based on their temperature?	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 long does a battery light a torch for? When is our classroom the quietest?	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? Is there a link between how loud it is in school and the time of day? If there is a pattern, is it the same in every area of school? 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?

Year 5

Comparative testing	Fair testing	Identifying, grouping and classifying	Observing over time	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 the level of salt affect how quickly brine shrimp hatch? 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 angle of launch affect how far a paper rocket will go? 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 identify all the stages in the human life cycle? Compare the collection of animals based on similarities and differences in their lifecycle. 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 Moon?	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? Do all objects fall through water in the same way?	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? How do submarines sink if they are full of air?

Year 6

Comparative testing	Fair testing	Identifying, grouping and classifying	Observing over time	Pattern seeking	Research from secondary sources
Which is the most common invertebrate on our school playing field? Which type of exercise has the greatest effect on our heart rate? What is the most common eye colour in our class? 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 angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface? How does the voltage of the batteries in a circuit affect the brightness of the lamp / volume of the buzzer?	How would you make a classification key for vertebrates / invertebrates or microorganisms? 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? Can you identify all the colours of light that make white light when mixed together? What colours do you get if you mix different colours of light together? How would you group electrical components and appliances based on what electricity makes them do?	What 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? Which brand of battery lasts the longest? 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 between the size and shape of a bird's beak and the food it will eat? 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? Why do some people need to wear glasses to see clearly? How has our understanding of electricity changed over time? How do astronomers know what stars are made of?

Summary of Science in EYFS

Topic	Nursery	Reception
Animals including humans	• Learn about the life cycles of animals • Compare adult animals to their babies • Observe how baby animals change over time	• Name and describe animals that live in different habitats. • Describe different habitats
Humans	• Learn about the life cycles of humans • Learn about how to take care of themselves • Learn about their senses	• Describe people who are familiar to them • Learn about how to take care of themselves
Living things and their habitats	• Explore the surrounding natural environment • Explore natural objects from the surrounding environment	• Explore the plants in the surrounding natural environment • Explore the animals in the surrounding natural environment • Explore plants and animals in a contrasting natural environment
Plants	• Grow plants	• Explore plants and grow from seeds
Seasonal changes	• Observe the changes in different seasons	• Play and explore outside in all seasons and in different weather • Observe living things throughout the year
Materials including changing materials	• Explore a range of materials • Shape and join materials • Combine and mix ingredients • Change materials by heating and cooling, including cooking	• Explore a range of materials, including natural materials • Make objects from different materials, including natural materials • Observe, measure and record how materials change when heated and cooled • Compare how materials change over time and in different conditions
Electricity	• Identify electrical devices • Use battery-powered devices	• Identify electrical devices • Discuss electrical safety
Light	• Explore light sources • Shine light on or through different materials	• Explore shadows • Explore rainbows
Forces	• Feel forces • Explore how things work • Explore how objects/materials are affected by forces	• Explore how to change how things work • Explore how the wind can move objects • Explore how objects move in water
Sound	• Listen to sounds • Make sounds	• Listen to sounds outside and identify the source • Make sounds
Earth and Space		• Learn about the Earth, Sun, Moon, planets and stars • Learn about space travel

Working Scientifically Skills Progression: KEY STAGE 1

	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather and record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classification	Be able to ask yes/no questions to aid sorting	Identify the headings for the two groups (it is…, it is not…)	Be able to compare objects, based on obvious features e.g. size, shape, colour			Sort objects and living things into two groups using a basic Venn diagram or simple table.	Talk about the number of objects in each group i.e. which has more or less.	Children in KS1 are not expected to draw conclusions. They are expected to make observations which will help them answer questions. They do not have the subject knowledge yet to give reasons for what they observe so they cannot draw scientific conclusions.	Children in KS1 are not expected to make scientific predictions as they do not have the subject knowledge to do this. That does not mean that you should not ask children what they think may happen, but this will be based on experience or may simply be a guess.	Children in KS1 are not expected to evaluate. However, children should be encouraged to consider their method (what they did) and adapt this where necessary.
Research	Ask one or two simple questions linked to a topic.					Present what they have learnt verbally or using pictures.	Be able to answer their questions using simple sentences.			
Comparative / fair testing	Identify the question to investigate from a scenario or choose a question from a range provided.	Choose equipment to use and decide what to do and what to observe or measure to answer a question.	Make observations linked to answering the question.	Measure using standard units, when appropriate, where all the numbers are marked on the scale.	Record data in simple prepared tables, pictorially or by taking photographs.	Present what they learnt verbally, using pictures or block diagrams.	Answer their question in simple sentences using their observations or measurements.			
Observation over time	Ask a question about what might happen in the future based on an observation.				Record data in simple prepared tables, pictorially or by taking photographs.	Present what they learnt verbally or using pictures.				
Pattern seeking	Ask a question that is looking for a pattern based on observations.				Record data in simple, prepared tables and tally charts.	Present what they learnt verbally.				

Working Scientifically Skills Progression: LOWER KEY STAGE 2

	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather and record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classification	Be able to ask a yes / no question to aid sorting.	Be able to put appropriate headings into intersecting Venn and Carroll diagrams.	Be able to compare objects based on more sophisticated, observable features. Present observations in labelled diagrams.			Sort objects and living things into groups using intersecting Venn diagrams and Carroll diagrams.	Spot patterns in the data particularly two criteria with no examples.	Draw simple conclusions, when appropriate, for patterns.		Suggest improvements. Suggest new questions arising from the investigation.
Research	Ask a range of questions linked to a topic.	Choose a source from a range provided.				Present what they learnt verbally or using labelled diagrams.	Be able to answer their questions using simple scientific language.			Suggest limitations. Suggest new questions arising from the investigation.
Comparative / fair testing		Decide what to change and what to measure / observe.	Make observations linked to answering the question.	Measure using standard units where not all the numbers are marked on the scale. Take repeat readings if needed.	Prepare own tables to record data.	Present data in bar charts.	Refer directly to their evidence when answering their question.	Where appropriate provide oral or written explanations for their findings.	Use results from an investigation to make a prediction about a further result.	Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation.
Observation over time		Decide what to measure / observe. Decide how often to take measurements.	Make a range of relevant observations.	As above. Use dataloggers to measure over time.		Present data in time graphs.				
Pattern seeking		Decide what to measure or observe.	Make observations linked to answering the question.	Measure using standard units where not all the numbers are marked on the scale.		Use ICT package to present data as a scattergram.				

Working Scientifically Skills Progression: UPPER KEY STAGE 2

	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather and record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classification	Be able to ask a range of questions to aid sorting and decide which ways of sorting will give useful information.	Identify specific clear questions that will help to sort without ambiguity.	Be able to compare not only based on physical properties but also on knowledge gained through previous enquiry.			Use and create branching databases and keys to enable others to name living things and objects	Be able to talk about the features that objects and living things share and do not share based on information from keys etc.	Be able to use data to show that living things and materials that are grouped together have more things in common than with things in other groups.		Be able to explain using evidence that the branching database or key will only work for the living things or materials it was created for.
Research	Ask a range of questions recognising that some can be answered through research and others may not.	Choose suitable sources to use. Use a range of sources.				Present what they learnt in a range of ways e.g. different graphic organisers.	Be able to answer questions using scientific evidence gained from a range of sources.			Be able to talk about their degree of trust in the sources they used.
Comparative / fair testing	Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results and research.	Recognise and control variables where necessary.	Make observations linked to answering the question.	Measure using standard units using equipment that has scales involving decimals.	Prepare own tables to record data including columns for repeated results.	Choose an appropriate form of presentation, including line graphs.	Be able to answer their questions, describing casual relationships.	Provide oral or written explanations for their findings.	Use test results to make predictions for further investigation	Explain their degree of trust in their results e.g. precision in taking measurement, variables that may not have been controlled and accuracy of results.
Observation over time			Make a range of relevant observations.		Prepare own tables to record data.		Be able to answer their questions describing the change over time.			
Pattern seeking			Make observations linked to answering the question.			As above- including scatter graphs.	Be able to answer their questions, identifying patterns			

	Progression in Substantive Knowledge - Biology						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Living Things and Habitats	ELG 15a: Explore the natural world around them, making observations and drawing pictures of animals and plants	**Taking Care of The Earth (CKS)** Understand that some natural resources are limited Learn practical measures for conserving energy and resources Understand that some materials can be recycled Understand that pollution (for example, littering, smog, water pollution) can be harmful Understand how to help reduce pollution	**Living Things and Their Habitats (NC)** 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 habitats provide for the basic needs 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) such as forests, meadows & plains, underground, deserts and water Understand oceans and undersea Life Describe how animals obtain their food from plants and other animals using a simple food chain, and identify and name different sources of food	**Insects (CKS)** Understand ways that insects can be helpful, such as: pollination; products like honey, beeswax, and silk; and eating harmful insects Understand ways that insects can harmful such as: destroying crops, trees, wooden buildings, clothes; carrying disease; and biting or stinging Distinguish key characteristics such as: the exoskeleton, the chitin, the six legs and three body parts: head, thorax and abdomen; and wings Understand the life cycles of some insects, including metamorphosis Understand the behaviour of some social Insects	**Living Things and Their Habitats (NC)** 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 Become familiar with and recognise basic characteristics of: fish, amphibians, reptiles, birds and mammals Recognise that environments can change and that this can sometimes pose dangers to living things Understand how ecosystems can be affected by changes in environment (for example, rainfall, food supply, etc.) and by man-made changes Understand man-made effects of the environment	**Living Things and Their Habitats (NC)** Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird Describe the life process of reproduction in some plants and animals Understand the growth stages of a human: embryo, foetus, new-born, infancy, childhood, adolescence, adulthood, old age Understand external fertilisation of some animals Understand internal fertilisation of some animals (e.g. birds and mammals) Understand development of an embryo - egg, zygote, embryo, growth in uterus, foetus, new-born	**Living Things and Their Habitats (NC)** Describe how living things are classified into broad groups according to common observable characteristics, and based on similarities and differences, including microorganisms, plants and animals Give reasons for classifying plants and animals based on specific characteristics Understand basic taxonomy Understand different classes of vertebrates and major characteristics (review of Y4) Understand basic cell structure Understand the differences between animal & plant cells

	Progression in Substantive Knowledge - Biology						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Plants	ELG 15a: Explore the natural world around them, making observations and drawing pictures of animals and plants	**Plants (NC)** Identify and name a variety of common wild and garden plants, including deciduous/evergreen trees Describe the basic structure of common flowering plants, including trees - seed, root, stem, branch, leaf flower	**Plants (NC)** 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	**Plants (NC)** Identify and describe functions of parts of flowering plants Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary between plants *(revision of year 2 but in depth)* Investigate how water is transported within plants Explore the life cycle of flowering plants, including pollination, seed formation and seed dispersal			

	Progression in Substantive Knowledge - Biology						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Animals	ELG 15a: Explore the natural world around them, making observations and drawing pictures of animals and plants	**Animals, Including Humans (NC)** 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	**Animals, Including Humans (NC)** Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) Notice that animals, including humans, have offspring which grow into adults Understand that offspring are very much (but not exactly) like their parents Understand that most animal babies need to be fed and cared for by their parents, especially human babies Recognise that pets have special needs and must be cared for Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene	**Animals, Including Humans (NC)** Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food, they get nutrition from what they eat Identify that humans and some other animals have skeletons and muscles for support, protection and movement Understand that germs can cause diseases and how to prevent Illness, by taking care of your body and having vaccinations	**Animals, Including Humans (NC)** Describe the simple functions of the basic parts of the digestive system in humans Describe the functions and parts of the excretion system in humans Identify the different types of teeth in humans and functions Understand how to take care of your body with a healthy diet, including the 'food pyramid', vitamins and minerals Construct and interpret a variety of food chains, identifying producers, predators and prey **The Human Body: Systems, Vision and Hearing (CKS)** Understand how the eye works Name parts of the eye: cornea, iris and pupil, lens, retina, optic nerve Understand far-sightedness and near-sightedness Understand how the ear works Name parts of the ear	**Animals, Including Humans (NC)** *(taught as part of Living Things and Their Habitats Year 5 above)* Describe the changes as humans develop to old age	**Animals, Including Humans (NC)** Identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood Understand the basic workings of the respiratory system Recognise the impact of diet, exercise, drugs and lifestyle on the way bodies function Describe the ways that nutrients/water are transported within humans (revision of year 4) **Evolution and Inheritance (NC)** Recognise that living things have changed over time and that fossils provide info about living things that inhabited Earth millions of years ago Recognise that living things produce offspring of the same kind but they vary and aren't identical to parents Identify how animals and plants are adapted to suit their environment in different ways and that this leads to evolution

	Progression in Substantive Knowledge - Chemistry						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Matter	ELG 15c: Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter	**Everyday Materials (NC)** Distinguish between an object and the material from which it is made Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a variety of everyday materials Compare and group together a variety of everyday materials on the basis of their simple physical properties	**Uses of Everyday Materials (NC)** Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Compare how things move on different surfaces. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	**Rocks (NC)** Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties Describe in simple terms how fossils are formed when things that have lived are trapped within rock Recognise that soils are made from rocks and organic matter	**States of Matter (NC)** Compare and group materials together according to whether they are solids, liquids or gases Observe that some materials change state when 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: associate the rate of evaporation with temperature	**Properties and Changes of Materials (NC)** Compare and group together everyday materials on the basis of their properties Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution (solute/solvent) Use knowledge of solids, liquids and gases to decide how mixtures might be separated Give reasons 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 **Geology (CKS)** Name the Earth's layers: crust, mantle, core (outer core and inner core) Understand movement of tectonic plates (earthquakes, Tsunamis and volcanoes) Understand basic volcanology: active, dormant, extinct volcanoes Understand basic theories of how the continents & oceans were formed, mountain/rock formation	**Chemistry: Matter and Change (CKS)** Understand the basics of atomic structure: nucleus, protons (positive charge), neutrons (neutral), electrons (negative charge) Understand that atoms are constantly in motion: electrons move around the nucleus in paths called shells (or energy levels) Understand that atoms may join together to form molecules or compounds Name common compounds and their formulas Know that elements have atoms of only one kind Understand the organisation of the periodic table Name some well-known elements and their symbols Understand there are two important categories of elements: metals and non-metals Understand properties of metals: most are shiny, ductile, malleable, conductive

	Progression in Substantive Knowledge - Physics						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Light				**Light (NC)** Recognise that we need light in order to see things and that dark is the absence of light To know that light travels at an amazingly high speed and in straight lines Notice that light is reflected from surfaces Recognise that sun rays can be dangerous and that there are ways to protect eyes Identify transparent and opaque objects 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			**Light (NC)** Recognise that light appears to travel in straight lines (revision) 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 eyes Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. Understand mirrors: plane/concave/convex Understand use of mirrors in telescopes/microscopes
Sound					**Sound (NC)** Identify how sounds are made, associating some of them with vibration Recognise that vibrations from sounds travel through a medium to the ear, and that sound waves are slower than light waves Find patterns between the pitch of sounds & features of the object/speed of vibration Find patterns between the volume of a sound and the strength of the vibrations that produced it Recognise that sounds get fainter as distance from source increases		

	Progression in Substantive Knowledge - Physics						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Forces	ELG 15c: Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter	**Introduction to Magnetism (CKS)** Identify familiar everyday uses of magnets (for example, in toys, in cabinet locks, in refrigerator magnets, etc.) Metals are attracted to magnets and non-metal are not.		**Forces and Magnets (NC)** Compare how things move on different surfaces Notice that some forces need contact between two objects, but magnetic forces act at a distance Observe how magnets attract or repel each other and attract some materials and not others Group everyday materials on the basis of whether they are attracted to a magnet, and identify magnetic materials (revision) Describe magnets as having two poles Predict whether two magnets will attract or repel each other, depending on which poles are facing Discuss our magnetic field Understand that the Earth behaves like a huge magnet Understand basic use of a magnetised needle in a compass, which always point to the north		**Forces (NC)** 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, gears, inclined planes, wedges and screws allow a smaller force to have a greater effect Understand how a gear works and some of its common uses	

	Progression in Substantive Knowledge - Physics						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Electricity			**Electricity (CKS)** Name basic parts of simple electric circuits (for example, batteries, wire, bulb or buzzer, switch) Name conductive and nonconductive materials Understand safety rules for electricity		**Electricity (NC)** Identify common appliances that run on electricity Make simple series circuit - cells, wires, bulbs, switches and buzzers Identify if a lamp will light in a simple circuit, based on being part of a complete loop with a battery Recognise that a switch opens/closes a circuit and associate this with whether or not a lamp lights in a series circuit Recognise conductors & insulators		**Electricity (NC)** Associate the brightness of a lamp or volume of a buzzer with the number and voltage of cells used in the circuit Compare/give reasons for variations in how components function, including brightness of bulbs, loudness of buzzers and on/off position of switches (open and closed circuits) Understand short circuits Understand electric current Use recognised symbols when representing a simple circuit in a diagram
Space			**Astronomy and The Earth (CKS)** Name the sun and 8 planets Know that the sun is a star and is the source of our light and heat (revision of year 1 seasons) Describe basic movement of the planets Understand that the moon moves around the Earth Understand that the Earth rotates			**Earth and Space (NC)** Describe the movement of the Earth, and other planets, relative to the Sun in the solar system (revision and development of yr2) Describe the movement of the Moon relative to the Earth and understand the moon's phases (revision and development of yr2) Describe the Sun, Earth and Moon as approximately spherical bodies Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky Understand Big Bang theory and the universe Understand how seasons are caused by Earth's orbit and rotation	

	Progression in Substantive Knowledge - Physics						
	Year R	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Climate and Weather	ELG 15c: Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter	**Seasonal Changes (NC)** Observe changes across the four seasons Observe and describe weather associated with the seasons and how day length varies.				**Meteorology (CKS)** Understand the water cycle (Revision and development of year 4) Name different clouds: cirrus, stratus, cumulus Understand the layers of the atmosphere Understand how the Sun and the Earth heat the atmosphere Understand air movement Understand cold and warm fronts Understand forecasting Understand weather maps Understand difference between weather and climate	

Progression in the use of scientific vocabulary

- The vocabulary included for Nursery and Reception are words that children should be exposed to. They should use some correctly in a scientific context.
- The vocabulary included from Year 1 onwards are the words that children should know and use correctly in a scientific context. They should be able to define the specialist scientific vocabulary included.
- The vocabulary in red is from other linked topics. The topic they come from is indicated.
- The vocabulary in purple is from STAR CKS units (Core Knowledge Skills) which extend beyond the National Curriculum
- The Working Scientifically vocabulary identified in the first table of this document should be taught through the topics in each year-group during practical work or scientific enquiry.

Working Scientifically

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

Plants

Year group(s)	vocabulary
Nursery	plant, leaf, stem, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil, names of plants they grow
Reception	tree, bush, herb, names of plants they see (Reception - Living things and their habitats)
Year 1	leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud, names of trees in the local area, names of garden and wild flowering plants in the local area
Year 2	light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling names of plants in local habitats and micro-habitats (Y2 - Living things and their habitats)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport
Year 4	classification, classification keys (Y4 - Living things and their habitats)
Year 5	life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)
Year 6	flowering, non-flowering, mosses, ferns, conifers (Y6 - Living things and their habitats)

Living things and their habitats

Year group(s)	vocabulary
Nursery	natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern plant, leaf, stem, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil (Nursery - Plants)
Reception	plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment (e.g. beach, forest)
Year 1	names of garden and wild flowering plants in the local area (Y1 - Plants) head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, names of animals experienced first-hand from each vertebrate group (Y1 - Animals, including humans) weather, sunny, rainy, raining, shower, windy, snowy, cloudy, hot, warm, cold, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, rainbow, seasons, winter, summer, spring, autumn, Sun, sunrise, sunset, day length (Y1 - Seasonal changes)
Year 2	living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, names of local habitats (e.g. pond, woodland etc.), names of micro-habitats (e.g. under logs, in bushes etc.), conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold, names of living things in the habitats and micro-habitats studied light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants) offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, cat/kitten, caterpillar/butterfly) (Y2 - Animals, including humans)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport insect, helpful, harm / harmful, aphids, wasps, bees, butterflies, flowers, pollen, mosquitos, germ, diseases, locusts, Horseflies, head, thorax, abdomen, antennae, exoskeletons, lave, caterpillar, prolegs, cocoon / chrysalis, pupa, pupation, grasshopper, moulting, termites, ant, colony, nectar, cooperate, worker, beehives, waggle, queen bee, worker bee, drone, honeycomb
Year 4	classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)
Year 5	life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, cuttings
Year 6	vertebrates, fish, amphibians, reptiles, birds, mammals, warm-blooded, cold-blooded, invertebrates, insects, spiders, snails, worms, flowering, non-flowering, mosses, ferns, conifers

Animals, including humans

Year group(s)	vocabulary
Nursery	egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young, fur, feathers, scales, tail, wings, beak, claws, paws, hooves, swim, walk, run, jump, fly, patterns, spots, stripes, grow, change, baby, toddler, child, adult, old person, smell, taste, touch, feel, hear, see, blind, deaf
Reception	names of animals, live, on land, in water, jungle, desert, North Pole, South Pole, sea, hot, cold, wet, dry, snow, ice, hair (e.g. black, brown, dark, light, blonde, ginger, grey, white, long, short, straight, curly), eyes (e.g. blue, brown, green, grey), skin (e.g. black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman
Year 1	head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, names of animals experienced first-hand from each vertebrate group, parts of the human body including those within the school's RSE policy, senses, touch, see, smell, taste, hear, fingers, skin, eyes, nose, ears, tongue
Year 2	offspring, reproduction, growth, baby, toddler, child, teenager, adult, old person, names of animals and their babies (e.g. chick/chicken, kitten/cat, caterpillar/butterfly), survive, survival, water, food, air, exercise, heartbeat, breathing, hygiene, germs, disease, food types (e.g. meat, fish, vegetables, bread, rice, pasta, dairy) living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival (Y2 - Living things and their habitats)
Year 3	nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine
Year 4	digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, large intestine, rectum, anus, incisor, canine, molar, premolar, herbivore, carnivore, omnivore, producer, predator, prey cornea, iris, pupil, optic nerve, retina, lens, ear canal, ear drum, auditory, nerve, cochlea, ear bones (charmer, anvil and stirrup), outer ear, ear canal, cartilage
Year 5	puberty, the vocabulary to describe sexual characteristics in line with the school's RSE policy life cycle, foetus, baby, child, adolescent, adult, reproduce, sexual, sperm, fertilises, egg, live young (Y5 - Living things and their habitats)
Year 6	heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, cycle, circulatory system, diet, drugs, lifestyle

Evolution and inheritance

Year group(s)	vocabulary
Nursery	natural, plant, animal, leaves, seeds, conkers, acorns, twigs, bark, shells, feathers, pebbles, stones, same, different, pattern (Nursery - Living things and their habitats)
Reception	plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment (e.g. beach, forest) (Reception - Living things and their habitats)
Year 1	leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud (Y1 - Plants)
Year 2	light, shade, Sun, warm, cool, water, space, grow, healthy, bulb, germinate, shoot, seedling (Y2 - Plants) living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, water, air, survive, survival, conditions, light, dark, shady, sunny, wet, damp, dry, hot, cold (Y2 - Living things and their habitats)
Year 3	photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (e.g. wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil (Y3 - Plants) soil, fossil, bone, flesh, minerals (Y3 - Rocks)
Year 4	environment, habitat, human impact, positive, negative, migrate, hibernate (Y4 - Living things and their habitats) herbivore, carnivore, omnivore, producer, predator, prey (Y4 - Animals, including humans)
Year 5	life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, cuttings (Y5 - Living things and their habitats)
Year 6	offspring, sexual reproduction, vary, characteristics, adapted, inherited, species, evolve, evolution

Seasonal changes / Taking care of the environment

Year group(s)	vocabulary
Nursery	grow, shoot, die, dead (Nursery - Plants) egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young (Nursery - Animals, excluding humans)
Reception	spring, summer, autumn, winter, seasons, sunny, cloudy, hot, warm, cold, shower, raining, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, windy, rainbow, animals, young, plants, flowers
Year 1	weather, sunny, rainy, raining, shower, windy, snowy, cloudy, hot, warm, cold, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, rainbow, seasons, winter, summer, spring, autumn, Sun, sunrise, sunset, day length natural resources, man-made resources, renewable, non-renewable, pollution, logging, environment, graze, crops, extinct, endangered, contaminated, recycle, conserve

Materials

Year group(s)	vocabulary
Nursery	mix, stir, cook, hot, oven, microwave, change, burn, melt, hard, runny, set, freeze, freezer, cold, blended, hard, soft, bendy, stiff, wobbly, wood, plastic, paper, card, fabric
Reception	ice, water, frozen, icicle, snow, melt, wet, cold, slippery, smooth, big, bigger, biggest, smaller, smaller, smallest, hard, soft, bendy, rigid, wood, plastic, paper, card, metal, strong, weak, hot, apply heat, waterproof, soggy, not waterproof, best, change, change back
Year 1	object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through
Year 2	opaque, transparent, translucent, reflective, non-reflective, flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching absorbent, bendy, brittle, bumpy, dull, elastic, flexible, hard, man-made, natural, opaque, rough, shiny, smooth, twist / twisting, properties, changed, change, recycle, fabric, glass, metal, paper, plastic, rubber, squash / squashing, bounce / bouncing, rigid, transparent, waterproof, soft, stretchy, stiff,
Year 3	rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay) (Y3 - Rocks) magnetic force, magnet, attract, magnetic material, metal, iron, steel (Y3 - Forces and magnets)
Year 4	solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle electrical conductor, electrical insulator, metal, non-metal (Y4 - Electricity)
Year 5	thermal insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material water cycle, precipitation, condensation, transport, ground water, flow, transpiration, surface run off, infiltration, weather forecast, weather symbols, temperature, wind direction, rain, sleet, sunny, showers, spells of sunshine, heavy rain, thunder, stormy, cirrus, stratus, cumulus, atmosphere, troposphere, stratosphere, mesosphere, thermosphere, exosphere, cold front, warm front, warm air, cold air, prevailing wind, wind direction

Rocks

Year group(s)	vocabulary
Nursery	natural, shells, pebbles, stones
Reception	
Year 1	object, material, rock, brick, clay, hard, soft, waterproof, absorbent, rough, smooth, shiny, dull, see-through, not see-through (Y1 - Everyday materials)
Year 2	opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)
Year 3	rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorbs water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, types of soil (e.g. peaty, sandy, chalky, clay)
Year 5	Crust, mantle, magma, outer core, inner core, earthquake, geologists, vibrations, seismographs, Richer scale, magnitude, plates, boundary, fault, San Andreas fault, epicentre, tsunami, volcanoes, erupts, lava, ash vent, active, dormant, extinct, Mount Vesuvius, Pompeii, archaeologists, dome mountains, folded, minerals, igneous rock, sedimentary rock, metamorphic rock, erosion, glacier, weathering

Light

Year group(s)	vocabulary
Nursery	light, torch, bulb, lamp, spotlight, shiny, bright, brighter, brightest, Sun, shine, glow, mirror
Reception	Sun, sunny, light, shadow, shady, clouds, torch, see-through, not see-through, source, light source
Year 1	senses, see, eyes (Y1 - Animals, including humans) shiny, dull, see-through, not see-through (Y1 - Materials)
Year 2	opaque, transparent, translucent, reflective, non-reflective (Y2 - Uses of everyday materials)
Year 3	light, light source, dark, absence of light, surface, shadow, reflect, mirror, Sun, sunlight, dangerous
Year 6	straight lines, light rays

Forces

Year group(s)	vocabulary
Nursery	object, float, sink, water, up, down, top, bottom, push, pull, magnet, spring, squash, bend, twist, stretch, turn, spin, smooth, rough, fast, slow
Reception	float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest, wind, air, water, blow, bounce
Year 2	flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching (Y2 - Uses of everyday materials)
Year 3	force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole
Year 5	force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears

Sound

Year group(s)	vocabulary
Nursery	sound, noise, loud, quiet, high, low, music, bang, blow, pluck, soft, hard, fast, slow, names of instruments
Reception	sound, noise, listen, hear, music, voices, bird song, traffic, sirens, thunder, high, low, loud, quiet, soft, volume, crackle, thunder, hum, buzz, roar
Year 1	senses, hear, ear (Y1 - Animals, including humans)
Year 4	sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, quiet, loud, insulation

Electricity

Year group(s)	vocabulary
Nursery	battery, plug, socket, electricity, wire, sound, light, move
Reception	battery, plug, socket, electricity, wire, sound, light, move
Year 4	electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol
Year 6	circuit diagram, circuit symbol, voltage

Earth and Space

Year group(s)	vocabulary
Reception	Sun, Moon, Earth, star, planet, sky, day, night, space, round, bounce, float
Year 2	Planet, dwarf planet, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, solar system, orbit, rotate, rotation, spinning, axis, moon, Sun, light source
Year 3	light, light source, Sun, sunlight, dangerous (Y3 - Light)
Year 5	Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit

Science: Recommended curriculum sequence 2023/24

Key Stage 1

Year 1

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Animals including Humans (NC) What are animals? **Biology**	Everyday Materials (NC) Why do we use different materials for different jobs? **Chemistry**	Plants (NC) Are all plants and tress the same? **Biology**	Introduction to Magnetism (CKS) **Physics**	Taking care or the Earth (CKS) **Biology**	Seasonal changes (NC) See note* How does the weather change during the different seasons **Physics**

Seasonal Changes (NC) runs throughout the year to cover all 4 seasons and for pupils to experience first hand

Year 2

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Animals including Humans (NC) How do we stay healthy? **Biology**	Living Things and their Habitats (NC) How are animals and plants connected? **Biology**	Materials (NC) How are materials chosen in design? **Chemistry**	Plants (NC) How do seeds and bulbs grow into healthy plants? **Biology**	Electricity (CKS) **Physics**	Astronomy and The Earth (CKS) **Physics**

*National Curriculum content and skills should be mastered before CKS units are taught. *

Lower Key Stage 2

Year 3

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Animals including Humans (NC) How does the human body move? **Biology**	Forces and Magnets (NC) How do magnets behave? How do forces affect us? **Physics**	Rocks (NC) What's beneath our feet? **Physics**	Light (NC) How does light behave? **Physics**	Plants (NC) What factors affect plant growth? **Biology**	Insects (CKS) **Biology**

Year 4

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Electricity (NC) How do we make electric circuits? **Physics**	Sound (NC) What is sound and how does it travel? **Physics**	Animals including Humans (NC) What happens to the food we eat? **Biology**	Living Things and their Habitats (NC) How do we group animals? **Biology**	States of Matter (NC) How do materials changed when heated and cooled? **Chemistry**	The Human Body Systems: Vision and Hearing (CKS) **Biology**

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Upper Key Stage 2

Year 5

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Forces (NC) How do forces help us? **Physics**	Properties and Changes of Materials (NC) How do different materials behave and change? **Chemistry**	Earth and Space (NC) How do things move in our solar system? **Physics**	Living Things and their Habitats (NC) How do living things reproduce and why is this important in a life cycle? **Biology**	Meteorology (CKS) **Physics**	Geology (CKS) **Physics**

Year 6

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Electricity (NC) What is electricity? How does voltage affect the components in a circuit? **Physics**	Animals including Humans (NC) Why is it important to look after our heart? **Biology**	Living Things and their Habitats (NC) How are organisms classified? **Biology**	Evolution and Inheritance (NC) What is evolution? How do organisms evolve to suit their environment? **Biology**	Light (NC) How do we see? What is light? **Physics**	Matter and Change (CKS) **Chemistry**

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Long Term Science Plan

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer2
Year 1	Animals, Including Humans (NC) *Jane Goodall (studied chimps)*	Everyday Materials (NC) *John Dunlop, Charles Macintosh or John McAdam*	Plants (NC) *Joseph Banks (Botanist)*	Introduction to Magnetism (CKS) *Albert Einstein (physicist)*	Taking Care of the Earth (CKS)	Seasonal Changes (NC)
	Seasonal Changes throughout the year as appropriate to the changing seasons					
Year 2	Animals, Including Humans (NC)	Living Things and their Habitats (NC)	Matter (NC) *John Dunlop or C. Macintosh (creating new materials)*	Plants (NC)	Electricity (CKS) *Thomas Edison (light bulb)*	Astronomy and The Earth (CKS) *Galileo Galilei (astronomer) Copernicus (solar system*
Year 3	Animals including humans (NC) *Louis Pasteur (vaccinations) A. Fleming (penicillin)*	Forces and Magnets (NC) *Albert Einstein (physicist*	Rocks (NC) *Mary Anning (fossil hunter)*	Light (NC)	Plants (NC)	Insects (CKS)
Year 4	Electricity (NC) *Michael Faraday (invented electric motor)*	Sound (NC) *Alexander Bell (inventor of telephone)*	Animals, Including Humans (NC)	Living Things and Their Habitats (NC) *Rachel Carson (pollution)*	States of matter (NC)	The Human Body: Systems, Vision and Hearing (CKS)
Year 5	Forces (NC) *Isaac Newton (gravity) Albert Einstein (physicist)*	Properties and changes of materials (NC) *Spencer Silver (invented glue) Benerito (wrinkle free cotton)*	Earth & Space (NC) *Galileo Galilei (astronomer) Copernicus (solar system) Stephen Hawking (physicist)*	Living things and their Habitats (NC) [inc Animals inc Humans] *David Attenborough (naturist)*	Geology (CKS) *Leonardo Da Vinci (anatomist and geologist)*	Meteorology (CKS)
Year 6	Electricity (NC) *Michael Faraday (invented electric motor)*	Animals, Including Humans (NC)	Living Things and their habitats (NC) *Carl Linnaeus (classification)*	Evolution and Inheritance (NC) *Charles Darwin and Alfred Wallace (theory of evolution)*	Light (NC) *Ibn Al-Haytham (studied optics)*	Chemistry: Matter and Change (CKS) *Marie Curie (radiation) Ernest Rutherford (atom)*

Pupils should study at least two influential scientists per year, supported by above exemplar scientists.