Progression in science

Key Concepts, Key scientific knowledge and Working Scientifically Skills

Key Concepts in Science

- Key knowledge in the science curriculum can be divided into three key concepts: Biology, Chemistry and Physics.
- Within the long term timetable, these are further divided into the following units:

Biology	Chemistry	Physics
Animals including humans	Materials	Energy (Light and Sound)
Living things and their habitats	Geology	Electricity
Plants		Earth and Space/Seasons
Evolution		Forces

Working scientifically - Skills

Plan

Asking questions
Asking questions that can be answered using a scientific enquiry.

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

Do

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

Carrying out an enquiry
Skills to complete a task

Record

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

Review

Interpreting and communicating results
Using information from the data to say what you found out.

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

Science whole school overview

Animals including humans	Living things and their habitats	Plants	Evolution	Geology	Forces	Earth and Space/ seasons	Energy (light and sound)	Electricity	Materials

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Reception						
Year 1	Animals including humans	Everyday materials – sorting, classifying and properties	Animals including humans – local animals	Everyday materials – investigating different materials	Animals including humans – mammals, birds, reptiles and mammals in hot places	Plants
	Seasons					
Year 2	Everyday materials – properties of materials	Animals including humans	Animals including humans	Plants	Everyday materials	Living things and their habitats/plants

Science whole school overview

Animals including humans	Living things and their habitats	Plants	Evolution	Geology	Forces	Earth and Space/ seasons	Energy (light and sound)	Electricity	Materials

	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Year 3	Geology	Light	Animals including humans - skeleton	Magnets	Friction	Plants
Year 4	Electricity	Animals including humans – the digestive system	Changing materials – Solids, liquids and gases and changing state	Sound	Living things and their habitats – Local study and water cycle	Living things and their habitats – classification and environmental impact
Year 5	Animals including humans/plants – lifecycles, reproduction and growth	Space	Forces - Resistance	Forces – Levers and Pulleys	Animals including humans/plants – lifecycles, reproduction and growth	Materials – reversible and irreversible
Year 6	Living things and their habitats – Classification	Light	Electricity	Animals including humans – the circulatory system	Evolution	Revisiting science Child-led investigation and transition project

Working Scientifically skills – Year 1

Children ask questions about the world around them

Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?

Children develop questions based on a context with a teacher or peers

Children can suggest ways of answering a question with a given selection of equipment

Children can plan for health and safety issues in their science work

Children use their senses to compare items

Children can use magnifying glasses to make observations

Children make measurements through comparisons (this is bigger, more flexible…)

Children can classify items in different ways, justifying their choices

Children can research using images and videos

Children use real objects for identification purposes (i.e. this is a oak leaf – can you find another one?)

Children follow methods planned as a class and understand the purpose of the investigation

Children can record results in a pre-made chart. This may include a tally.

Children can draw labelled diagrams of their results

Children can use sorting rings to make Venn diagrams to show their results

Children use photographs and/or videos to record their results

Children classify objects using sorting rings or prepared charts

Children can show their understanding through models, art, drama, video or written work

Children recognise the 'best' or 'worst' from their results (e.g. the brick was the worst material for a blanket)

Children use their life experiences to help draw conclusions from their results

Children start to see how their results relate to answering their question

Children can give a response (written or verbal) to a given context (e.g. letter to Father Christmas on the best material for wrapping paper).

Children create leaflets, e-books and dioramas to demonstrate their understanding

Key Science Knowledge – Year 1

Biology	Chemistry	Physics
Identify common British plants	Distinguish between objects and what they are made from	Record changes in weather and temperature throughout the year
Label plants with basic structure for a variety of plant types	Identify and name a variety of everyday materials	Understand that day length changes through the year
Know names of body parts of humans and associate with senses	Group and classify materials by their properties	Basic safety around light, electricity and fire
Describe the structure of different vertebrates	Use scientific vocabulary to describe the properties of different materials	Different materials float and sink
Describe changes across the seasons in nature		Understand that light is needed to see
Classify well-known animals as carnivores, omnivores or herbivores		

Working Scientifically skills – Year 2

Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?

Children can suggest more than one way to answer a question or build on the ideas of others

Children are able to select appropriate equipment for their investigation

Children can plan for health and safety issues in their science work

Children can use a stop watch, ruler, pipette and digital thermometer correctly

Children measure using non-standard units of measurement

Children can classify items in different ways, justifying their choices

Children can research using pre-prepared resources specific to their task

Children can research using images and videos

Children can use short, relevant pictorial identification sheets to classify living things

Children follow methods planned as a class and understand the purpose of the investigation

Children can record results in a pre-made chart. This may include a tally.

Children can draw labelled diagrams of their results

Children can use sorting rings to make Venn diagrams to show their results

Children use photographs and/or videos to record their results

Children can use technology to create a bar chart

Children can suggest the best way to record their results

Children recognise the 'best' or 'worst' from their results (e.g. the brick was the worst material for a blanket)

Children can give a response (written or verbal) to a given context (e.g. letter to Father Christmas on the best material for wrapping paper).

Children use their life experiences to help draw conclusions from their results

Children create leaflets, e-books and dioramas to demonstrate their understanding

Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.

Key Science Knowledge – Year 2

Biology	Chemistry	Physics
Give reasons why something is living, dead or never been alive	Test different materials to determine their appropriateness for different tasks	Understand that pushes, pulls and twists are all types of forces
Living things live in a habitat that is suited to them	Understand that materials can be manipulated to change shape	
Identify plants and animals living in a habitat		
Understand how simple food chains work		
Observe and describe how plants grow from seeds and bulbs		
Explain what factors seeds need to grow and compare to what plants need		
Understand that animals need exercise, healthy food, shelter, air and water to survive.		
The importance of keeping clean		
Identifying carbohydrates, proteins and fats		

Working Scientifically skills – Year 3

Children use their prior knowledge to help develop their questions (e.g. I know this is true – is it true for all types?

Children can suggest more than one way to answer a question or build on the ideas of others

Children identify control variables in a comparative/fair test

Children are able to select appropriate equipment for their investigation

Children can plan for health and safety issues in their science work

Children can use long tape measures and trundle wheels to measure longer distances.

Children can use measuring cylinders and beakers to measure volume accurately.

Children can use a stop watch, ruler, pipette and digital thermometer correctly

Children can record light and volume on a data logger

Children can use branching databases to identify items/ living animals

Children can research using pre-prepared resources specific to their task

Children follow methods planned as a class and understand the purpose of the investigation

Children can suggest the best way to record their results

Children can use technology to create a bar chart

Children can use more than one way to represent data (e.g. graph and chart)

Children can write about their results or record on video

Children create leaflets, e-books and dioramas to demonstrate their understanding

Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.

Children can interpret their data to make comparative statements.

Children identify if and how they adapted their method and how that benefited their investigation

Key Science Knowledge – Year 3

Biology	Chemistry	Physics
Identify and describe the function of different parts of the plant in a variety of plants	Evaluate and compare rocks by their properties and appearance	Opaque objects block light and cause shadows
Explore the requirements for a variety of plants to survive	Explain how fossils are formed and how scientists use them to understand the past	Investigate how to change the size of shadows
Animals get nutrition from food – need for vitamins and minerals, names of food groups	Thermal insulation reduces heat transfer	Demonstrate that light can be reflected
The role of skeletons and muscles in humans		Compare how things move on different surfaces
		Magnetic forces can act over a distance and some magnets are stronger than others
		Classify materials as magnetic or non-magnetic
		Use the words repel and attract

Working Scientifically skills – Year 4

- Children can suggest more than one way to answer a question or build on the ideas of others
- Children identify control variables in a comparative/fair test
- Children can break a 'big question' into smaller parts, understanding that the parts may be answered in different ways
- Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)
- Children can plan for health and safety issues in their science work
- Children are able to select appropriate equipment for their investigation
- Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use
- Children can use a stop watch, ruler, pipette and digital thermometer correctly
- Children can use long tape measures and trundle wheels to measure longer distances.
- Children can use measuring cylinders and beakers to measure volume accurately.
- Children can record light and volume on a data logger
- Children can research using images and videos
- Children can research using pre-prepared resources specific to their task
- Children can use branching databases to identify items/ living animals
- Children can follow method to undertake an enquiry
- Children can suggest the best way to record their results
- Children can use more than one way to represent data (e.g. graph and chart)
- Children can complete a prepared bar chart outline adding headings
- Children can write about their results or record on video
- Children can record 3 sets of data and suggest why they might be different. They would keep the median result.
- Children draw detailed and labelled observational drawings
- Children can make Venn diagrams and Carroll tables to represent data
- Children can make a digital branching database
- Children create leaflets, e-books and dioramas to demonstrate their understanding
- Children can interpret their data to make comparative statements.
- Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).
- Children can analyse how accurate their measurements are and highlight any data that should be disregarded
- Children identify if and how they adapted their method and how that benefited their investigation
- Children can identify any gaps in their results where further investigation or research would be required

Key Science Knowledge – Year 4

Biology	Chemistry	Physics
Recognise that living things can be classified as plants and animals	Classify materials by their state	Know that sound is caused by vibrations travelling through a medium
Classify vertebrates into the 5 categories. Classify invertebrates as insects, arachnids and crustaceans	Understand and use vocabulary related to change of state	Investigate the relationships that affect pitch and volume
Understand that environmental changes can impact living things	Know that water boils at 100°C and freezes at 0°C. Compare other materials	Understand how sound can be insulated
Construct food chains and webs, using predator, prey and producer	Investigate the factors affecting rate of evaporation and condensation	Make a simple circuit with cells, bulbs, wires, buzzers and explain how it works
Understand the human digestive system (including teeth)	Explain how changes of state create the water cycle	Use a demonstration to explain how electricity works and why the circuit must be closed
		Identify different electrical conductors and insulators

Working Scientifically skills – Year 5

Children identify control variables in a comparative/fair test

Children can break a 'big question' into smaller parts, understanding that the parts may be answered in different ways

Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)

Children can choose the independent variable for their question

Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use

Children can identify possible dependant variables and justify their choice of measurement

Children choose what to measure and how long for and at what intervals

Children can use measuring cylinders and beakers to measure volume accurately.

Children can choose the appropriate measuring equipment to give the most accurate results

Children can use an analogue thermometer and force meter accurately.

Children can use filter paper correctly.

Children can research using pre-prepared resources specific to their task

Children can research using a limited number of given websites/resources

Children can use more than one way to represent data (e.g. graph and chart)

Children can record 3 sets of data and suggest why they might be different. They would keep the median result.

Children draw detailed and labelled observational drawings

Children can make a bar chart manually

Children can plot data on a line graph (axes and scale can be given)

Children can choose which type of graph to use to represent data and explain the advantages of this choice

Children can use results from investigations or research to answer their questions. Their conclusions are consistent with their results.

Children can interpret their data to make comparative statements.

Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).

Children compare their results to that of others and determine whether they need more information to answer their questions

Children choose the best way to communicate their results to a given audience (poster, Sway, presentation, comic, video, letter…)

Children can analyse how accurate their measurements are and highlight any data that should be disregarded

Children identify if and how they adapted their method and how that benefited their investigation

Children can identify any gaps in their results where further investigation or research would be required

Children can suggest results for elements not tested (e.g. result for a temperature not tested)

Children understand that science understanding often changes due to new evidence being found

Key Science Knowledge – Year 5

Biology	Chemistry	Physics
Describe the lifecycle of mammal, bird, amphibian, insect and plant (including seed dispersal)	Classify materials based on their heat and electrical conductivity, solubility, hardness, transparency and response to magnets	Explain the position of the sun, Earth and moon in relation to each other and their relative movements
Explain the reproductive process of mammals and flowering plants	To define dissolving	Model how the rotation of the Earth causes day and night
Investigate asexual reproduction in plants	To separate materials through sieves, filtering and evaporation	Explain why you can't make a scale model of the solar system in your school
Name the main parts of a flower	To classify changes as reversible or irreversible	Explain how we know the Earth and other planets are spherical
	Explain what happens when materials burn	Know that the position and size of shadows are due to the movement of the Earth in relation to the sun
	A basic understanding a the reaction between an acid and alkali	Understand that gravity is an attractive force between two objects
		Investigate causal relationships with friction, air resistance and water resistance
		Explain how levers, pulleys and gears can make lifting objects easier

Working Scientifically skills – Year 6

- Children ask questions in different forms (e.g. what will happen to X if I change Y, which is the best…, how do these compare?)
- Children can choose the independent variable for their question
- Children ask further questions based on the findings of their original question
- Children understand that there are a number of scientific enquiry methods to answer a question and can identify which method they will use
- Children can identify possible dependant variables and justify their choice of measurement
- Children choose what to measure and how long for and at what intervals
- Children can plan an investigation, choosing which scientific enquiry method to use, which equipment and how to record and report their results.
- Children can record light and volume on a data logger
- Children can choose the appropriate measuring equipment to give the most accurate results
- Children can use an analogue thermometer and force meter accurately.
- Children can research using a limited number of given websites/resources
- Children can use a dichotomous key to identify living things
- Children make decisions during an enquiry 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).
- Children can plot data on a line graph (axes and scale can be given)
- Children can make a branching database manually
- Children can make a bar chart manually
- Children can choose which type of graph to use to represent data and explain the advantages of this choice
- Children can make a scatter graph.
- Children can record 3 sets of data and calculate the mean. They recognise and disregard any outlying results.
- Children can make causal statements from their data (e.g. the ……. the surroundings, the ……. the chocolate melted).
- Children choose the best way to communicate their results to a given audience (poster, Sway, presentation, comic, video, letter…)
- Children compare their results to that of others and determine whether they need more information to answer their questions
- Children can identify any gaps in their results where further investigation or research would be required
- Children can suggest results for elements not tested (e.g. result for a temperature not tested)
- Children understand that science understanding often changes due to new evidence being found
- Children use their results to make predictions for further investigations
- Children can critically evaluate their control of variables, accuracy of measurements and trustworthiness of secondary sources.
- Children recognise erroneous data and suggest how that could have happened

Key Science Knowledge – Year 6

Biology	Chemistry	Physics
Describe how living things are classified (including micro-organisms) and classify a variety of living things	Using prior chemistry learning to solve problems and conduct experiments	Use knowledge of light travelling in straight lines to explain how we see objects and why shadows are the same shape as the object that casts them
Identify and describe the purpose of the main elements of the circulatory system		Make links between the number/voltage of cells and the brightness of bulbs/volume of buzzer
How water and nutrients are transported around the body		Use their knowledge of circuits to make a circuit for a purpose
How diet, exercise, drugs and lifestyle impact on health		Using prior physics learning to solve problems and conduct experiments
Understand that offspring inherit traits from their parents - variation		
Some adaptations become more beneficial to life and evolution may happen		
Using prior biology learning to solve problems and conduct experiments		

PLAN

Asking questions
Asking questions that can be answered using a scientific enquiry.

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

Children ask questions about the world around them

Children can suggest ways of answering a question with a given selection of equipment

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Observing and measuring

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

Children use their senses to compare items

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REVIEW

Interpreting and communicating results
Using information from the data to say what you found out.

Evaluating
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- Children can show their understanding through models, art, drama, video or written work
- Children use their life experiences to help draw conclusions from their results
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