

## Science Scheme of Work – Upper Key Stage Two

### Phase Five

#### Working Scientifically - Pupils should be taught to:

	<u>Covered</u>
To independently ask scientific questions, stimulated by a scientific experience or by asking further questions from a previous enquiry.	
Give a wide range of resources in order to plan different types of scientific enquiries, to answer questions, and justify their choice.	
Independently carry out fair tests, recognising and controlling variables, deciding what observations or measurements to make.	
Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate	
Choose how to record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs	
Children begin to present the same data in different ways in order to help answering questions.	
Use test results to make predictions to set up further comparative and fair tests	
Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations	
Identify scientific evidence that has been used to support or refute ideas or arguments	

	<u>Covered</u>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Explore ideas and raise different kinds of questions</li> <li>○ Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions</li> <li>○ Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why</li> <li>○ Use and develop keys and other information records to identify, classify and describe living things and materials</li> <li>○ Identify patterns that might be found in the natural environment</li> <li>○ Make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them</li> <li>○ Choose the most appropriate equipment to make measurements and explain how to use it accurately</li> <li>○ Decide how to record data from a choice of familiar approaches</li> <li>○ Look for different causal relationships in their data and identify evidence that refutes or supports their ideas</li> <li>○ Should use their results to identify when further tests and observations might be needed</li> <li>○ Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact</li> <li>○ Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time</li> </ul>	

#### Living things and their habitat – Upper - Pupils should be taught to:

	<u>Covered</u>
Can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.	
Can describe the life process of reproduction in some plants and animals.	
<b>Key vocabulary for living things and their habitat:</b> mammal, amphibian, insect, bird, plants, animals, vegetable garden, flower border, life cycles, life process of reproduction, animal naturalists,	

animal behaviourist, reproduction, sexual, asexual, rainforest, ocean, desert, prehistoric, similarities, differences	
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	<u>Covered</u>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Pupils should study and raise questions about their local environment throughout the year.</li> <li>○ They should observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment.</li> <li>○ They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall.</li> <li>○ Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.</li> <li>○ Observe and compare the life cycles of plants and animals in their local environment with other plants and animals around the world (rainforest, oceans, desert areas and prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences</li> <li>○ Try to grow new plants from different parts of the plant, for example, seeds, stem and root cuttings, tubers, bulbs</li> <li>○ They might observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow</li> </ul>	

**Animals including humans –Upper - Pupils should be taught to:**

	<u>Covered</u>
Can describe the changes as humans develop to old age	
<b>Key vocabulary:</b> growth, development, puberty, gestation periods	

	<u>Covered</u>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Pupils should draw a timeline to indicate stages in the growth and development of humans.</li> <li>○ They should learn about the changes experienced in puberty.</li> <li>○ Research gestation periods of other animals and comparing them with humans</li> <li>○ Find out and record the length and mass of a baby as it grows</li> </ul>	

**Properties and changes of materials – Upper - Pupils should be taught to:**

	<u>Covered</u>
Is able to compare and group together every day materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets	
Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.	
Use knowledge of solids, liquids, and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating	
Gives reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.	
Demonstrates that dissolving, mixing and changes of state are reversible changes.	
Explains that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	
<b>Key vocabulary:</b> materials, properties, compare, group, hardness, solubility, transparency, conductivity, electrical, thermal, magnets, dissolve, solution, solids, liquids, gases, filtering, sieving, evaporating, comparative, fair, metals, wood, plastic, reversible/irreversible, change of state.	

	<u>Covered</u>
<b>Working scientifically notes and guidance (non-statutory)</b>	

	<ul style="list-style-type: none"> <li>○ Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4.</li> <li>○ They should explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.</li> <li>○ Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda.</li> <li>○ They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.</li> </ul> <p>(Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials).</p> <ul style="list-style-type: none"> <li>○ Carry out tests to answer questions, for example, “which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting?”</li> <li>○ Compare materials in order to make a switch in a circuit</li> <li>○ They could observe and compare the changes that take place, for example, when burning different materials or baking bread and cakes</li> <li>○ They might research and discuss how chemical changes have an impact on our lives e.g. cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials</li> </ul>	
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### **Earth and Space – Upper - Pupils should be taught to:**

		<b><u>Covered</u></b>
	Is able to describe the movement of the Earth, and other planets, relative to the Sun in the solar system.	
	Is able to describe the movement of the Moon relative to the Earth.	
	Is able to describe the Sun, Earth, Moon as approximately spherical bodies	
	Can use the idea of the Earth’s rotation to explain day and night and the apparent movement of the sun across the sky	
	<b>Key vocabulary:</b> Earth, planets, Sun, solar system, Moon, spherical bodies, day/night, solar system, star, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune, celestial body, Pluto.	

		<b><u>Covered</u></b>
	<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night.</li> <li>○ Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a ‘dwarf planet’ in 2006).</li> <li>○ They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).</li> </ul> <p>(Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses).</p> <ul style="list-style-type: none"> <li>○ Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.</li> <li>○ Compare the time of day at different places on the Earth through the internet links and direct communication</li> <li>○ Create simple models of the solar system</li> <li>○ Construct simple shadows clocks and sundials, calibrated to show midday and the start and end of the school day</li> <li>○ Find out why some people think that structures such as Stonehenge might have been used as astronomical clocks</li> </ul>	

## Forces – Upper - Pupils should be taught to:

	<u>Covered</u>
Explains that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object	
Identify the effects of air resistance, water resistance and friction, that act between moving surfaces	
Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	
<b>Key vocabulary:</b> force, gravity, air resistance, water resistance, friction, mechanism, pulley, lever, gears, movement.	

	<u>Covered</u>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Pupils should explore falling objects and raise questions about the effects of air resistance.</li> <li>○ They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall.</li> <li>○ They should experience forces that make things begin to move, get faster or slow down.</li> <li>○ Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel.</li> <li>○ Pupils should explore the effects of levers, pulleys and simple machines on movement.</li> <li>○ Pupils might find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.</li> <li>○ Explore falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out</li> </ul>	

## Science Scheme of Work – Upper Key Stage Two

### Phase Six

#### Working Scientifically - Pupils should be taught to:

	<u>Covered</u>
To independently ask scientific questions, stimulated by a scientific experience or by asking further questions from a previous enquiry.	
Give a wide range of resources in order to plan different types of scientific enquiries, to answer questions, and justify their choice.	
Independently carry out fair tests, recognising and controlling variables, deciding what observations or measurements to make.	
Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate	
Choose how to record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs	
Children begin to present the same data in different ways in order to help answering questions.	
Use test results to make predictions to set up further comparative and fair tests	
Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations	
Identify scientific evidence that has been used to support or refute ideas or arguments	

	<u>Covered</u>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Explore ideas and raise different kinds of questions</li> <li>○ Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions</li> <li>○ Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why</li> <li>○ Use and develop keys and other information records to identify, classify and describe living things and materials</li> <li>○ Identify patterns that might be found in the natural environment</li> <li>○ Make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them</li> <li>○ Choose the most appropriate equipment to make measurements and explain how to use it accurately</li> <li>○ Decide how to record data from a choice of familiar approaches</li> <li>○ Look for different causal relationships in their data and identify evidence that refutes or supports their ideas</li> <li>○ Should use their results to identify when further tests and observations might be needed</li> <li>○ Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact</li> <li>○ Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time</li> </ul>	

#### Living things and their habitat – Upper - Pupils should be taught to:

	<u>Covered</u>
Can describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals.	
Is able to give reasons for classifying plants and animals based on specific characteristic	

<b>Key vocabulary:</b> characteristics, similarities, differences, micro-organisms, plants, animals, classifying, invertebrates, spiders, insects, snails, worms, vertebrates, fish, amphibians, reptiles, birds, mammals, environment, habitat.	
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	<u>Covered</u>
<b>Working scientifically notes and guidance (non-statutory)</b> <ul style="list-style-type: none"> <li>○ Pupils should build on their learning about grouping living things in year 4 by looking at the classification system in more detail.</li> <li>○ They should be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided.</li> <li>○ Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals).</li> <li>○ They should discuss reasons why living things are placed in one group and not another.</li> <li>○ Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.</li> <li>○ Pupils might work scientifically by using classification systems and keys to identify some animals and plants in the immediate environment.</li> <li>○ They could research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system</li> </ul>	

### Animals including humans –Upper - Pupils should be taught to:

	<u>Covered</u>
Can identify and name the main parts of the human circulatory system.	
Can describe the functions of the heart, blood vessels and blood.	
Is able to recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.	
Describes the ways in which nutrients and water are transported within animals, including humans.	
<b>Key vocabulary:</b> circulatory system, heart, blood vessels, blood, diet, exercise, drugs, lifestyle, nutrients, water, transported, internal organs, skeletal, muscular, digestive system, healthy.	

	<u>Covered</u>
<b>Working scientifically notes and guidance (non-statutory)</b> <ul style="list-style-type: none"> <li>○ Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function.</li> <li>○ Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.</li> <li>○ Pupils might work scientifically by exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.</li> </ul>	

### Evolution and Inheritance –Upper - Pupils should be taught to:

	<u>Covered</u>
Recognises that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.	
Understands that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.	
Can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	

<b>Key vocabulary:</b> fossils, inhabited, offspring, adapted, environment, evolution, characteristics, environment, palaeontologist.	
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	<b><u>Covered</u></b>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function.</li> <li>○ Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.</li> <li>○ Pupils might work scientifically by exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.</li> <li>○ Pupils might work scientifically by observing and raising questions about local animals and how they are adapted to their environment</li> <li>○ Compare how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels.</li> <li>○ They might analyse the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.</li> </ul>	

**Light – Upper - Pupils should be taught to:**

	<b><u>Covered</u></b>
Is able to recognise that light appears to travel in straight lines	
Uses the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.	
Can explain that we see things because light travels from light sources to objects and then to our eyes.	
Uses the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them	
<b>Key vocabulary:</b> light, straight lines, reflect, eye, source, shadows, translucent, transparent, opaque.	

	<b><u>Covered</u></b>
<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions.</li> <li>○ Pupils might work scientifically by deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works.</li> <li>○ They might investigate the relationship between light sources, objects and shadows by using shadow puppets.</li> <li>○ They could extend their experience of light by looking a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).</li> </ul>	

**Electricity – Upper - Pupils should be taught to:**

	<b><u>Covered</u></b>
Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit	

	Is able to compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.	
	Use recognized symbols when representing a simple circuit in a diagram	
	<b>Key vocabulary:</b> brightness, lamp, volume, buzzer, voltage, cells, circuit, components, switches, symbols, diagram,	

		<b><u>Covered</u></b>
	<p><b>Working scientifically notes and guidance (non-statutory)</b></p> <ul style="list-style-type: none"> <li>○ Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors.</li> <li>○ They should learn how to represent a simple circuit in a diagram using recognised symbols. (Note: Pupils are expected to learn only about series circuits, not parallel circuits).</li> <li>○ Pupils should be taught to take the necessary precautions for working safely with electricity.</li> <li>○ Pupils might work scientifically by systematically identifying the effect of changing one component at a time in a circuit</li> <li>○ Design and make a set of traffic lights, a burglar alarm or some other useful circuit.</li> </ul>	