

# Ebchester CE Primary School

## Progression of Learning – Science *Upper KS2*



By the end of Upper KS2			Knowledge and Skills
		Breadth of Study	By the end of Year 6, pupils will be able to:
<b>Working Scientifically</b>	<ul style="list-style-type: none"> <li>Asking questions</li> </ul>	<ul style="list-style-type: none"> <li>plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> </ul>	<ul style="list-style-type: none"> <li>Use their science experiences to explore ideas and raise different kinds of questions</li> <li>Talk about how scientific ideas have developed over time</li> <li>Make links between concepts</li> <li>Decide on an appropriate approach, including using a fair test to answer a question</li> <li>Select suitable equipment and information from that provided</li> <li>Select and use methods that are adequate for the task</li> </ul>
	<ul style="list-style-type: none"> <li>Measuring and recording</li> </ul>	<ul style="list-style-type: none"> <li>take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> </ul>	<ul style="list-style-type: none"> <li>Select and use methods to obtain data systematically</li> <li>Decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>Make a series of observations and measurements and vary one factor while keeping others the same.</li> <li>Record observations, to support comparisons and measurements using tables and bar charts and begin to plot points to form simple graphs.</li> </ul>
	<ul style="list-style-type: none"> <li>Concluding</li> </ul>	<ul style="list-style-type: none"> <li>identify scientific evidence that has been used to support or refute ideas or arguments</li> </ul>	<ul style="list-style-type: none"> <li>Communicate conclusions using appropriate scientific language</li> <li>Identify scientific evidence that has been used to support or refute ideas or arguments</li> <li>Interpret data containing positive and negative numbers</li> </ul>

		<ul style="list-style-type: none"> <li>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</li> </ul>	<ul style="list-style-type: none"> <li>Begin to relate conclusions to patterns in data, including graphs, and to scientific knowledge and understanding</li> <li>Analyse findings to draw scientific conclusions that are consistent with the evidence</li> <li>Communicate these using scientific and mathematical conventions and terminology</li> </ul>
	<ul style="list-style-type: none"> <li>Evaluating</li> </ul>	<ul style="list-style-type: none"> <li>use test results to make predictions to set up further comparative and fair tests</li> </ul>	<ul style="list-style-type: none"> <li>Suggest improvements to work, giving reasons</li> <li>Evaluate working methods to make practical suggestions for improvements</li> <li>Reflect on results and consider whether they are valid</li> </ul>

### Working Scientifically Vocabulary

**By the end of Year 6, pupils will recognise and understand the terms:**

Variables, accuracy, precision, systematic, quantitative

<b>Biology</b>	<ul style="list-style-type: none"> <li>Animals (including humans)</li> </ul>	<ul style="list-style-type: none"> <li>describe the changes as humans develop to old age</li> <li>identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</li> <li>recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</li> <li>describe the ways in which nutrients and water are</li> </ul>	<ul style="list-style-type: none"> <li>Identify ways in which the appearance of humans changes as they get older</li> <li>Identify some characteristics that will not change with age</li> <li>Recognise stages in growth and development of humans including puberty</li> <li>Know that the heart is made of muscle</li> <li>Describe what the heart and blood vessels do</li> <li>State how to measure pulse rate</li> <li>Recognise that pulse rate is a measure of how fast the heart is beating</li> <li>Discover that during exercise the heart beats faster to take blood more rapidly to the muscles</li> <li>Make careful measurements of pulse rate</li> <li>Describe the different functions of the blood (e.g. transporting and protecting)</li> </ul>
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		<p>transported within animals, including humans</p>	<ul style="list-style-type: none"> <li>• Know that the blood comes from the heart in arteries and returns to the heart in veins</li> <li>• Know that blood carries oxygen and other essential materials around the body</li> <li>• Explain how ideas about the circulatory system have changed over time</li> <li>• Identify some of the harmful effects of smoking</li> <li>• Recognise that care needs to be taken with medicines and that they can be dangerous</li> <li>• Give several reasons why it is sometimes necessary to take medicines</li> <li>• Identify some harmful effects of drugs</li> <li>• Identify food as a fuel for the body</li> <li>• Name the major groups into which food is categorised and identify sources for each group</li> <li>• Describe the main function of organs of the human body</li> <li>• Explain the effect of diet on particular organs of the body/aspects of health</li> <li>• Explain the effect of exercise on particular organs of the body/aspects of health</li> <li>• Explain how ideas about smoking have changed over time</li> <li>• Explain why advice on diet changes (e.g. butter vs margarine, five a day, tax on sugary drinks)</li> </ul>
	<ul style="list-style-type: none"> <li>• Living things and their habitats</li> </ul>	<ul style="list-style-type: none"> <li>• describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li> <li>• describe the life process of reproduction in some plants and animals</li> <li>• describe how living things are classified into broad groups according to common observable characteristics and based on similarities and</li> </ul>	<ul style="list-style-type: none"> <li>• Sequence the life cycles of a variety of plants and animals</li> <li>• Recognise the similarities in the life cycles of plants, animals and humans</li> <li>• Describe the functions of some parts of a flower</li> <li>• Describe the main functions of parts of a plant involved in reproduction</li> <li>• Describe the processes of sexual and asexual reproduction in plants</li> <li>• Name the parts of the human reproductive system</li> <li>• Describe the simple functions of parts of the human reproductive system</li> <li>• Compare methods of seed dispersal</li> <li>• Know that most animals reproduce by sexual reproduction</li> </ul>

		<p>differences, including micro-organisms, plants and animals</p> <ul style="list-style-type: none"> <li>• give reasons for classifying plants and animals based on specific characteristics</li> </ul>	<ul style="list-style-type: none"> <li>• Compare internal and external fertilisation in animals</li> <li>• Explain that living things need to reproduce if the species is to survive</li> <li>• Compare gestation periods (pregnancy) of different animals</li> <li>• Explain what is unusual about the life cycle of a kangaroo or koala</li> <li>• Recognise that there is a wide variety of living things</li> <li>• Understand why classification is important</li> <li>• Name and describe the five vertebrate groups</li> <li>• Devise own keys to classify organisms and objects</li> <li>• Describe early ideas about classification (e.g. Aristotle)</li> <li>• Understand there are living things that are too small to be seen and these can affect our lives</li> <li>• Recognise that there are many micro-organisms, some which can cause illness or decay</li> <li>• Recognise that there are useful micro-organisms which can be used in food production</li> <li>• Describe how micro-organisms feed, grow and reproduce like other organisms</li> <li>• Describe evidence, from investigations, that yeast is living</li> <li>• Explain how micro-organisms can move from one food source to another or from one animal to another</li> <li>• Compare the rate of reproduction in microorganisms to other animals</li> <li>• Describe how the development of the microscope has contributed to our understanding of microorganisms</li> </ul>
	<ul style="list-style-type: none"> <li>• Evolution and Inheritance</li> </ul>	<ul style="list-style-type: none"> <li>• recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago</li> <li>• recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</li> </ul>	<ul style="list-style-type: none"> <li>• Recognise variation in different species (e.g. dogs, horses)</li> <li>• Recognise that offspring have some of the features of their parents</li> <li>• Recognise that animals have to compete for food</li> <li>• Describe how animals avoid predators (e.g. speed, camouflage)</li> <li>• Describe how animals and plants are adapted to their environments</li> <li>• Explain how being well adapted to an environment means an organism is more likely to survive</li> <li>• Explain that animals which are better adapted to an environment are more likely to survive, reproduce and pass on characteristics to their offspring meaning the animal species will gradually change and evolve (giraffe with the tallest neck could reach more leaves to feed on)</li> <li>• Explain why we do not have a complete fossil record</li> </ul>

		<ul style="list-style-type: none"> <li>identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</li> </ul>	<ul style="list-style-type: none"> <li>Describe the story of the peppered moth and how this provides evidence for natural selection</li> <li>Explain why we can see evidence for natural selection in fast reproducing organisms like bacteria (e.g. antibiotic resistant bacteria and pesticide resistant insects)</li> <li>Explain how the introduction of a new species to an isolated environment can affect native species (e.g. Dodo, Kakapo or Stephen's island wren)</li> <li>Compare the ideas of Darwin and Lamarck on evolution</li> </ul>
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### Biology Vocabulary

By the end of Year 6, pupils will recognise and understand the terms:

puberty, veins, arteries, capillaries, pulse, beats, oxygen, carbon dioxide nutrients, minerals, pupae, larvae, chrysalis, reproduction, asexual, sexual, pollination, seed dispersal, pollen, stamen, stigma  
 Micro-organism, microbe, fungus, bacteria, virus, classification key, yeast, microscope  
 Variety, variation, offspring, species, reproduce, evolve, fossil record, gills, blubber, moulting, generation

<b>Chemistry</b>	<ul style="list-style-type: none"> <li>Properties and changes of materials</li> </ul>	<ul style="list-style-type: none"> <li>compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets</li> <li>know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</li> <li>use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</li> </ul>	<ul style="list-style-type: none"> <li>Observe and explore the properties of materials (e.g. hardness, transparency, magnetism, electrical and thermal conductivity)</li> <li>Identify some materials that are good thermal insulators and some everyday uses of these</li> <li>Recognise that metals are both good thermal and good electrical conductors</li> <li>Suggest why particular materials are used for different jobs depending on their properties</li> <li>Explain why some materials are good thermal insulators</li> <li>Recognise that salt or sugar dissolves in water but sand won't</li> <li>Name some materials that will and some that will not dissolve in water</li> <li>Recognise that although it is not possible to see a dissolved solid, it remains in the solution</li> <li>Describe melting and dissolving and give everyday examples of each</li> <li>Describe the difference between melting and dissolving</li> <li>Identify and explore factors that affect the rate at which a solid dissolves</li> <li>Recognise that an undissolved solid can be separated from a liquid by filtering</li> </ul>
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|  |  | <ul style="list-style-type: none"> <li>• give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</li> <li>• demonstrate that dissolving, mixing and changes of state are reversible changes</li> <li>• explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda</li> </ul> | <ul style="list-style-type: none"> <li>• Recognise that a solid can be recovered from a solution by evaporation</li> <li>• Describe the properties of mixtures which can be separated by filtration</li> <li>• Describe some methods that are used to separate simple mixtures</li> <li>• Explain that when solids dissolve they break up so small they can pass through the holes in the filter paper</li> <li>• Use knowledge about how a specific mixture can be separated to suggest ways in which other similar mixtures might be separated</li> <li>• Recognise that inks and dyes are often mixtures of different colours and these can be separated by chromatography</li> <li>• Explain why ink or dye moves up the paper in chromatography</li> <li>• Recognise that dissolving is a reversible change</li> <li>• Recognise that some changes can be reversed and some cannot</li> <li>• Recognise that changes of state are reversible</li> <li>• Observe and explore a variety of chemical changes (e.g. burning)</li> <li>• Identify whether some changes are reversible or not</li> <li>• Recognise dissolving as reversible</li> <li>• Classify some changes as reversible (e.g. dissolving) and others as irreversible (e.g. burning)</li> <li>• Recognise that irreversible changes often make new and useful materials</li> <li>• Recognise the hazards of burning materials</li> <li>• Describe what happens when acid and bicarbonate of soda are mixed</li> <li>• Explain that in some cases the new materials made are gases and identify some evidence for the production of gases (e.g. vigorous bubbling)</li> </ul> |
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### Chemistry Vocabulary

**By the end of Year 6, pupils will recognise and understand the terms:**

solubility, transparency, conductivity, thermal, insulation, dissolve, solution, separation, polymers, reversible, irreversible, filtering, sieving, rusting, bicarbonate of soda, magnetism, insulators, conductors, soluble, insoluble

<p><b>Physics</b></p>	<ul style="list-style-type: none"> <li>• Forces</li> </ul>	<ul style="list-style-type: none"> <li>• explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</li> <li>• identify the effects of air resistance, water resistance and friction, that act between moving surfaces</li> <li>• recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect</li> </ul>	<ul style="list-style-type: none"> <li>• Identify weight as a force</li> <li>• Identify that force is measured in Newtons</li> <li>• Name simple forces such as gravity, friction and air resistance</li> <li>• Recognise that more than one force can act on an object</li> <li>• Draw force diagrams with arrows showing the direction of forces acting on an object</li> <li>• Observe and explore the effect of several forces on objects</li> <li>• Recognise that air resistance slows things down</li> <li>• Recognise that friction can be useful or not useful</li> <li>• Describe some situations in which there is more than once force acting on an object</li> <li>• Describe and explain the motion of some familiar objects in terms of several forces acting on them</li> <li>• Identify forces on an object as either balanced or unbalanced</li> <li>• Use the terms 'balanced' and unbalanced' when describing several forces on an object</li> <li>• Explain that balanced forces on an object cause it to remain stationary or travel at the same speed</li> <li>• Explain that unbalanced forces on an object cause it to speed up, change shape or slow down</li> <li>• Understand that air resistance is the frictional force of air on objects moving through it</li> <li>• Describe some of the factors that increase friction between solid surfaces and increase air and water resistance</li> <li>• Describe situations in which frictional forces are helpful as well as those in which frictional forces are unhelpful</li> <li>• Compare the tread on bicycle tyres according to how much friction they need</li> <li>• Identify streamlined objects and describe why they have been designed in this way (e.g. cycling helmets, formula 1 cars, dolphins)</li> <li>• Explore the effects of levers, pulleys and gears</li> <li>• Describe how levers, pulleys and gears are used in everyday life (e.g. describe how having gears can make it easier to pedal a bike, how a bottle opener makes it easier to open a bottle lid)</li> </ul>
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	<ul style="list-style-type: none"> <li>• Earth and Space</li> </ul>	<ul style="list-style-type: none"> <li>• describe the movement of the Earth, and other planets, relative to the Sun</li> <li>• describe the movement of the Moon relative to the Earth</li> <li>• describe the Sun, Earth and Moon as approximately spherical bodies</li> <li>• use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and name the components of the solar system (i.e. Sun, Moon, Earth and other planets)</li> <li>• Locate the Sun, Earth and other planets in the solar system</li> <li>• Recognise that the Earth and other planets orbit the Sun</li> <li>• Recall that the Earth takes one year to orbit the Sun</li> <li>• Recall that the Earth rotates on its axis and this takes one day</li> <li>• Use simple physical models to explain effects that are caused by the movement of the Earth</li> <li>• Recognise that the Moon orbits the Earth</li> <li>• Explain that gravity is a force of attraction and it is what holds the planets in orbit around the Sun and the Moon in orbit around the Earth</li> <li>• Explain that the changes in the appearance of the Moon over a period of 28 days arise from the Moon orbiting the Earth once every 28 days</li> <li>• Recognise that the Earth, Sun and Moon are spherical and support this with some evidence</li> <li>• Recognise that it is daylight in the part of the Earth facing the Sun</li> <li>• Recall that a shadow from the Sun changes over the course of a day</li> <li>• Explore and describe how a shadow from the Sun changes over the course of a day</li> <li>• Explain in terms of the rotation of the Earth why shadows change and the Sun appears to move across the sky during the course of the day</li> <li>• Explain why it is night time in Australia when it is day time in England</li> <li>• Explain how ideas about the solar system have changed over time</li> </ul>
	<ul style="list-style-type: none"> <li>• Light</li> </ul>	<ul style="list-style-type: none"> <li>• recognise that light appears to travel in straight lines</li> <li>• 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</li> <li>• explain that we see things because light travels from light sources to our eyes or</li> </ul>	<ul style="list-style-type: none"> <li>• Explore how light travels using torches and periscopes</li> <li>• Describe reflection as light 'bouncing off' objects</li> <li>• Understand that in order to be seen, all non-luminous objects must reflect light</li> <li>• Diagrammatically represent light from sources and bouncing off reflective surface using arrows</li> <li>• Draw diagrams to illustrate how light is travelling from the source to the eye</li> <li>• Describe a variety of ways of changing the size of the shadow produced by an object</li> </ul>



		<p>from light sources to objects and then to our eyes</p> <ul style="list-style-type: none"> <li>• use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the relationship between the size of a shadow and the distance between the light source and an object</li> <li>• Diagrammatically represent the formation of shadows using arrow convention</li> <li>• Know that, when sunlight passes through some objects, coloured light is produced (for example in rainbows, soap bubbles and prisms)</li> <li>• Describe how curved mirrors distort a reflection</li> </ul>
	<ul style="list-style-type: none"> <li>• Electricity</li> </ul>	<ul style="list-style-type: none"> <li>• associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</li> <li>• 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</li> <li>• use recognised symbols when representing a simple circuit in a diagram</li> </ul>	<ul style="list-style-type: none"> <li>• Know that the 'amount' of electricity (voltage) depends on the number of batteries</li> <li>• Construct some working series circuits with specified components</li> <li>• Recognise conventional circuit symbols</li> <li>• Draw circuit diagrams and construct circuits from diagrams using conventional symbols</li> <li>• Explore how to change the brightness of bulbs and the volume of a buzzer</li> <li>• Describe ways of changing the brightness of a bulb in a circuit or the volume of a buzzer</li> <li>• Compare different circuits (e.g. for brightness of bulb)</li> <li>• Recall that the amount of electricity is measured in voltage</li> <li>• Explore the thickness of a wire in a circuit</li> <li>• Describe the differences between wires usually used for circuits and fuse wires</li> <li>• Describe what would happen if all the lights in a home were connected in the same circuit and one broke</li> </ul>

**Physics Vocabulary**

**By the end of Year 6, pupils will recognise and understand the terms:**

periscope, luminous, non-luminous,

Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, solar system, spherical, celestial body, rotation, hemisphere, orbit, gravity,

air resistance, water resistance, gravitational attraction, upthrust, Newton, forcemeter, surface area, pulley, lever, gear Voltage, current, series, component, conductor, positive/negative terminal, complete circuit