

## Year 6 Science Medium Term Plan

<p><b>Y6</b></p>	<p><b><u>Animals Including Humans</u></b></p> <p>This is the final unit of pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. This Year 6 unit builds on pupils' knowledge of the importance of a healthy lifestyle, including a balanced diet and the effects of sugar, the different food groups and their role in human development. New learning includes recognising the impact of diet, exercise, drugs and lifestyle on the way their bodies function. In Year 6, pupils identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Pupils also describe the ways in which nutrients and water are transported within animals, including humans. This is the precursor to work studied in KS3 when pupils continue to study the human body as part of the discipline of biology.</p>	
<p><b>National Curriculum (End of Unit Outcomes)</b></p>	<p><b>Sequence of Learning (small steps)</b></p>	<p><b>Key skills – Working Scientifically</b></p>
<p>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</p>	<ul style="list-style-type: none"> <li>- To recall main body parts linked to previously taught systems (skeletal and muscular in y3 and digestive in y4)</li> <li>- To know that the heart beats, pumping blood around the body.</li> <li>-To explain the 'route' that blood takes through the body – heart, to lungs, back to heart, around the body and back to the heart.</li> <li>-To know that blood vessels carry the blood and that arteries carry blood away from the heart and veins carry blood to the heart.</li> <li>-To understand that oxygen goes into the blood and is transported to muscles and other parts of the body, through blood vessels (arteries).</li> <li>-To understand that carbon dioxide and other waste products are produced, which are carried in the blood through blood vessels (veins) to be removed.</li> <li>-To explain this as an ongoing cycle.</li> </ul>	

<p>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</p>	<p>-To know that when we exercise our heart beats more frequently so that the oxygen that is used can be replenished.</p> <p>-To understand that afterwards our heart returns to a resting heart rate.</p> <p><b>-To understand that fitter people tend to have lower resting heart rates.</b></p> <p><b>-To know that drug are chemicals that have an impact on a persons body and can be harmful.</b></p> <p>-To know that some drugs can be helpful depending on how and when they are used e.g. paracetamol as a painkiller, but that all drugs are harmful if overused.</p> <p>-To know that there are illegal drugs that can have serious negative effects.</p> <p>-To know that there are legal drugs (alcohol and tobacco to adults) that have can serious negative effects such as liver disease and lung disease.</p>	<p><b>Comparative/ fair testing</b> Exercise and pulse experiment Planning and enquiry to answer a question (recognising and controlling variable for fair test) <b>WS1 a and b</b> Taking measurements, with a range of scientific equipment accurately and precisely and, taking repeat readings <b>WS 2</b> Recording data and results using tables and scatter graphs and line graphs <b>WS 3</b> Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations <b>WS 5</b></p> <p><b>Observing over time</b> Observe pulse rate before, during and after exercise. Over the course of a month, investigate whether some volunteers can lower their resting heart rate. Use scientific evidence to support or refute ideas – possibly research or use given information about the effects of drugs and alcohol on heart rates and lifestyle. <b>WS 6</b> <i>Caution with the materials that may be used for this and ensuring they are appropriate for the age range.</i></p>
<p>Describe the ways in which nutrients and water are transported within animals, including humans</p>	<p>-To know that food passes through the body with nutrients being extracted and waste products being excreted. (recap from y4) This process is called digestion.</p> <p>-To know that the nutrients are absorbed through the walls of our intestines into the blood in a process called <i>diffusion</i>.</p> <p>-To know that water doesn't need breaking down and moves between membranes in the body to arrive in the correct place, via our blood through a diffusion process called <i>osmosis</i>.</p> <p><b>-To know that blood vessels carry blood around the body and transport nutrients and water to other parts of the body.</b></p>	
<p><b>Vocabulary</b></p>	<p><b>Heart, pulse, rate, pumps, blood, blood vessels, artery, vein, lungs, oxygen,</b> transported, carbon dioxide, nutrients, water, muscles, cycle, <b>circulatory system,</b> diet, exercise, resting heart rate, drugs, lifestyle</p>	

<b>Common Misconceptions</b>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>-Your heart is on the left side of your chest</li> <li>-The heart makes blood</li> <li>-The blood travels in one loop from the heart to the lungs and around the body.</li> <li>- When we exercise, our heart beats faster to work the muscles more.</li> <li>- Some blood in our bodies is blue and some blood is red.</li> <li>-We just eat food for energy.</li> <li>-All fat is bad for you.</li> <li>-All dairy is good for you.</li> <li>-Protein is good for you, so you can eat as much as you want.</li> <li>-Foods only contain fat if you can see it.</li> <li>-All drugs are bad for you.</li> </ul>
<b>Key Questions</b>	<ul style="list-style-type: none"> <li>- What is the function of the heart?</li> <li>- What is the function of the circulatory system?</li> <li>- What are blood vessels?</li> <li>- What is the role of blood in our circulatory system?</li> <li>- How might exercise impact our heart rate?</li> <li>- How are nutrients carried around the body?</li> </ul>

<b>Year 6</b>	<b><u>Living Things and their Habitats</u></b>	
	<p><b>This unit is the final science units where pupils learn about plants and animals as part of the discipline of biology- the study of living organisms. This unit comes after pupils have studied a variety of living things in their local and wider environment. Pupils can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Pupils have secure knowledge of the seven life processes, the requirements of plants for life and growth and food chains. This unit builds on pupils' previous knowledge of the classification of living things. In Year 6, pupils 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.</b></p>	
<b>National Curriculum (End of Unit Outcomes)</b>	<b>Sequence of Learning (small steps)</b>	<b>Key skills – Working Scientifically</b>
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	<ul style="list-style-type: none"> <li>-To understand that living things can be grouped into 3 main groups – plants, animals (as covered in year 4) and micro-organisms such as bacteria or fungi.</li> <li>-To know that micro-organisms are too small to see with the human eye. They are microscopic.</li> <li>-To understand that there can be helpful and harmful microorganisms.</li> <li>-To understand that these groups can then be subdivided into smaller groups e.g. animals – vertebrates and invertebrates.</li> <li>-To know that vertebrates can then be divided again into 5 smaller groups: fish; amphibians; reptiles; birds; and mammals and that each of these have common characteristics.</li> </ul>	<p><b>Classifying</b> Classification of living things in our local environment Classify animals according to Carl Linnaeus' system. Classify plants into flowering, mosses, ferns and conifers, based on specific characteristics. Classify unfamiliar animals and plants from a range of other habitats. Create a branching database/dichotomous key to classify a set of living things. <b>WS 3</b></p>

	<p>-To know that invertebrates can be divided into a number of groups, including insects, spiders, snails and worms.</p> <p>-To know that plants can be divided broadly into two main groups – flowering and non-flowering plants.</p> <p><b>-To create classification keys for plants and animals.</b></p> <p>-To explain some of the work of Carl Linnaeus, a pioneer of classification.</p>	<p><b>Researching</b> Research the difference between bacteria, virus and fungi to give reasons why these are not plants or animals. Research how microorganisms can be helpful or harmful. <b>WS 6</b></p>
Give reasons for classifying plants and animals based on specific characteristics	<p>-To state key characteristics of the 5 vertebrate groups – fish, amphibians, reptiles, birds, mammals.</p> <p>-To state key characteristics of some invertebrate groups.</p> <p>-To discuss and explain reasons why living things are placed in one group and not another.</p>	
<b>Vocabulary</b>	<b>Vertebrates, Fish, Amphibians, Reptiles, Birds, Mammals, Invertebrates</b> , Insects, Spiders, Snails, Worms, Flowering, Non-flowering	
<b>Common Misconceptions</b>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>• all micro-organisms are harmful</li> <li>• mushrooms are plants.</li> </ul>	
<b>Key Questions</b>	<ul style="list-style-type: none"> <li>- What are the 3 main groups that living things can be grouped into?</li> <li>- What does microscopic mean?</li> <li>- What are the features of different vertebrate groups?</li> <li>- What are the features of different vertebrate groups?</li> <li>- What are the features of flowering and non-flowering plants?</li> <li>- Who was Carl Linnaeus?</li> </ul>	

Year 6	<p><b><u>Evolution and Inheritance</u></b></p> <p>The children should be introduced to the idea that characteristics are passed from parents to their offspring. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of paleontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.</p> <p>Note: at this stage, pupils are not expected to understand how genes and chromosomes work</p>	
National Curriculum (End of Unit Outcomes)	Sequence of Learning (small steps)	Key skills – Working Scientifically
Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.	<ul style="list-style-type: none"> <li>- To know that fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution.</li> <li>-To know that fossilisation is the process that forms fossils.</li> <li>-To know that a fossil is 'the remains or impression of a prehistoric plant or animal embedded in rock and preserved in petrified form'</li> <li>-To know that prehistoric means 'before written history'.</li> <li>-To know that preserved means 'to keep something as it is'.</li> <li>-To know that petrified means 'change into stone'</li> </ul>	<p><b><u>Observation</u></b></p> <p>Look at different fossils and explore how they can show what life was like in prehistoric times. <b>WS 6</b></p>
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents	<ul style="list-style-type: none"> <li>-To know that characteristics are passed from parents to their offspring. Use the example of different breeds of dog (including what happens when Labradors are crossed with poodles).</li> <li>-To know that this is known as inheritance.</li> <li>-To know that due to sexual reproduction, the offspring are not identical to their parents and vary from each other.</li> </ul>	
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution	<ul style="list-style-type: none"> <li>-To understand that adaptation is defined as 'the process of change by which an organism or species becomes better suited to its environment.'</li> <li>- To know that variation in offspring over time can make animals more or less able to survive in particular environments e.g. the development of insulating fur on the arctic fox.</li> <li>-To understand the term <b>evolution</b> as 'the process by which different kinds of living organisms are believed to have developed from earlier forms during the history of the earth'.</li> <li>-To know that <b>adaptations</b> can lead to the evolution of a species.</li> <li>-To know the story of Darwin's finches and how the shape of their beaks helped Darwin to develop his</li> </ul>	<p><b><u>Classifying (to show variation within a species)</u></b></p> <p>Classify a species of plant e.g. daffodils, tulips, lilies. <b>WS 6</b></p> <p><b><u>Researching</u></b></p> <p>Identifying scientific evidence that has been used to support or refute ideas or arguments –evidence for evolution <b>WS 6</b></p> <p>Observing and raising questions about local animals and how they are adapted to their environment</p> <p>Finding out about the peppered moths.</p>

	<p>theories.</p> <p><b>-To understand Darwin’s role in the theory of evolution.</b></p> <p>-To know that Darwin studied animals and plants (a biologist) and developed the idea of <b>natural selection</b> to explain how different species had evolved over time.</p> <p>-To understand briefly the theory of evolution as follows, stating some of the following points: <u>The Process of Evolution</u></p> <ol style="list-style-type: none"> <li>1. More organisms are born than can survive.</li> <li>2. These individuals all have slight variations between them.</li> <li>3. Some of these variations are helpful and improve an organism's chance of survival</li> <li>4. Those that survive pass their characteristics onto their offspring.</li> <li>5. Over time these helpful variations are passed on to the next generation.</li> <li>6. This process takes thousands of years and can't be seen from one generation to the next.</li> </ol> <p>-To know the case study of the <b>peppered moths</b> as described in Moth: An Evolution Story. <u>Peppered Moths Case Study</u></p> <ol style="list-style-type: none"> <li>1. Light-coloured moths were common</li> <li>2. During the Industrial Revolution (1760 – 1840) coal burning covered the moth’s habitats in black soot</li> <li>3. This gave the dark coloured moths a greater chance of survival because they had better camouflage than the light moths</li> <li>4. Many light-coloured moths died as they were easily spotted by their prey</li> <li>5. Dark coloured moths became more common</li> <li>6. As pollution has reduced over time the light-coloured moths have now become more common again</li> </ol>	<p>- Make predictions about the effectiveness of camouflage on the moths. <b>WS 4</b></p>
<p><b>Vocabulary</b></p>	<p><b>evolution, inheritance</b>, biology, <b>offspring</b>, breeds, adaptations, natural selection, generation, <b>characteristics</b></p>	
<p><b>Common Misconceptions</b></p>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>• adaptation occurs during an animal’s lifetime: giraffes’ necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life</li> <li>• offspring most resemble their parents of the same sex, so that sons look like fathers</li> <li>• all characteristics, including those that are due to actions during the parent’s life such as dyed hair or footballing skills, can be inherited</li> <li>• cavemen and dinosaurs were alive at the same time.</li> </ul>	
<p><b>Key Questions</b></p>	<ul style="list-style-type: none"> <li>- What do fossils tell us about the past?</li> <li>- What does ‘preserve’ mean?</li> </ul>	

	<ul style="list-style-type: none"> <li>- What is variation?</li> <li>- What is a species?</li> <li>- What is inheritance?</li> <li>- Which characteristics could be inherited by offspring?</li> <li>- How might adaptations allow animals to live in certain habitats?</li> <li>- How does evolution benefit plants and animals?</li> </ul>
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Year 6	<p><b>Electricity</b></p> <p>In this unit, children learn about electricity as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils are able to identify common appliances that run on electricity. Pupils have a secure knowledge of simple series electrical circuits including that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They know some common conductors and insulators, and associate metals with being good conductors.</p> <p>In Year 6, pupils revise and build upon their previous knowledge of electrical circuits. New learning includes associating the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Pupils 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.</p>	
National Curriculum (End of Unit Outcomes)	Sequence of Learning (small steps)	Key skills – Working Scientifically
Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit	<p><i>Recap from y4 – Understand that materials that let electricity pass through are called conductors and that those which do not are insulators.</i></p> <p><i>To understand that electricity can be dangerous (mains for example) and how we can be safe with electricity.</i></p> <ul style="list-style-type: none"> <li>- To know how electricity travels through a circuit</li> <li>- To know that electricity must be able to flow around the circuit for components to work</li> <li>- To know that electricity can flow through the components in a complete electrical circuit.</li> <li>- To know that a circuit always needs a power source, such as a battery, with wires connected to both the positive (+) and negative (-) ends.</li> <li>- To understand that a battery is made from a collection of cells connected together.</li> <li>- To know that the more volts there are in a circuit, the more power there is travelling through it. Understand that the higher the volts, the brighter a lamp and the louder a buzzer.</li> <li>- To understand that adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer</li> </ul>	
Compare and give reasons for variations in	-To know that electricity flows through a circuit, with the volt being the push that moves electrons along the wires.	<b>Comparative/ fair testing</b> Experimenting with voltage – brightness and volume

<p>how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches</p>	<p>-To know that a circuit can also contain other electrical components, such as bulbs, buzzers or motors, which allow electricity to pass through</p> <p>-To know that electricity will only travel around a circuit that is complete. That means it has no gaps. You can use a switch in a circuit to create a gap in a circuit. This can be used to switch it on and off.</p> <p>-To know that adding more bulbs to a circuit will make each bulb less bright.</p> <p>-To know that using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter.</p>	<p>(Adding more bulbs/cells to a circuit) Systematically identifying the effect of changing one component at a time in a circuit <b>WS 1</b> Planning and enquiry to answer a question <b>WS 1</b> (recognising and controlling variable for fair test) Recording data and results using scientific diagrams and labels (of circuits) <b>WS 3</b> Using test results to make predictions for further testing – from lamp to buzzer <b>WS 4</b> Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations <b>WS 5</b></p>
<p>Use recognised symbols when representing a simple circuit in a diagram</p>	<p>-To know that when drawing circuit diagrams, rather than drawing detailed components, we use simple symbols to represent the different components.</p>	
<p><b>Vocabulary</b></p>	<p>Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage</p>	
<p><b>Common Misconceptions</b></p>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>• larger-sized batteries make bulbs brighter</li> <li>• a complete circuit uses up electricity</li> <li>• components in a circuit that are closer to the battery get more electricity.</li> </ul>	
<p><b>Key Questions</b></p>	<ul style="list-style-type: none"> <li>- What do these symbols represent? (bulb/cell)</li> <li>- What are the rules for drawing circuits and symbols?</li> <li>- What is current?</li> <li>- What is voltage?</li> <li>- (using diagrams) Why does this circuit work/not work?</li> <li>- If more components are added to a circuit, how would this affect a bulb or buzzer?</li> </ul>	



<p>Year 6</p>	<p><b>Light</b></p> <p>In this unit, pupils learn about light as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the terms opaque, transparent and translucent; what plants need, including light, to grow well and how energy from light is the start of a food chain.</p> <p>Previous learning includes knowing that light from the sun can be dangerous and that there are ways to protect their eyes. This unit builds upon pupils' prior knowledge that shadows form when the light from a light source is blocked by an opaque object. New learning includes building on knowing how light appears to travel in straight lines. Pupils learn that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. This new knowledge acquired in Year 6 is used to explain why shadows have the same shape as the objects that cast them and that those objects are seen because they give out or reflect light into the eye.</p> <p>This is the precursor to work studied in KS3 as pupils continue to learn about how light can be reflected, refracted and dispersed as part of the discipline of physics.</p>	
<p><b>National Curriculum (End of Unit Outcomes)</b></p>	<p><b>Sequence of Learning (small steps)</b></p>	<p><b>Key skills – Working Scientifically</b></p>
<p>Recognise that light appears to travel in straight lines</p>	<p>-To know that <b>light travels in straight lines from its source.</b></p> <p>-To identify some effects of refraction (objects looking bent in water).</p> <p>-To identify the visible spectrum and explore colours using light. (See twinkl lessons on refraction and colour spectrum)</p> <p><b>(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. NC non stat guidance)</b></p>	<p><b>Observation</b> Observe the effects of light with objects in water and with rainbows etc. <b>WS 4</b></p>
<p>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</p>	<p>-To know that light either travels in a straight line directly from the source or by reflecting off a surface into our eye.</p> <p>-To know that <b>reflection is when light bounces off a surface, changing the direction of a ray of light.</b></p> <p>-To know that all objects reflect light; smooth and shiny surfaces reflect all the rays of light at the same angle, rather than <b>scattering</b> the rays of light like rough or dull surfaces.</p> <p>-To know that when rays of light reflect, they obey the law of reflection: The <b>angle of incidence</b> always equals the angle of <b>reflection</b>. Demonstrate with a laser pointer and mirror. Predict where the laser will point given a change in angle.</p>	<p><b>Comparative/ fair testing</b> Investigate the shape of shadows and link this to light travelling in straight lines.</p> <p>Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card. <b>WS 1</b></p> <p>Use sticks/boxes and mirrors to create simple <b>periscopes</b> that allow people to see what is happening behind or above them.</p> <p>Create labelled diagrams that show the path that the light took to reach the eye. <b>WS 3</b> Report on findings and give explanations. <b>WS5</b></p>
<p>Explain that we see things because light travels from light sources to our eyes or from light</p>	<p>-To know how to draw arrows to show light entering the eye from a light source or reflection.</p> <p>-To know that the amount of light entering the eye is controlled by the pupil, which is surrounded by the iris – the coloured part of the eye.</p>	

sources to objects and then to our eyes	-To know that the pupil dilates when it is darker to let more light into the eye. The pupil constricts when it is bright to reduce the amount light entering the eye	
Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them	<p><i>Recap from year 3</i></p> <p><i>-To know that a shadow is formed when light is blocked by an opaque object.</i></p> <p><i>-To know that opaque means light cannot pass through, translucent means some light can pass through but it is difficult to see through and that transparent means light can pass easily through and it is easy to see through.</i></p> <p><b>-To understand that because light travels in straight lines, the shadow will take the shape of the object.</b></p> <p>-To know that the further the light source from the opaque object the bigger the shadow.</p> <p>-To know that the nearer the light source from the opaque object the smaller the shadow.</p> <p>-To know that the shadow of an object can be moved by moving the light source.</p> <p>-To know that a silhouette is different from a shadow because a silhouette is the solid dark shape that you see when someone or something has a bright light or pale background behind them.</p>	
<b>Vocabulary</b>	<b>Light, light source, dark</b> , absence of light, <b>transparent, translucent, opaque</b> , shiny, matt, surface, <b>shadow, reflect</b> , mirror, sunlight, dangerous, straight lines, <b>light rays</b>	
<b>Common Misconceptions</b>	<p>Some children may think:</p> <ul style="list-style-type: none"> <li>• we see objects because light travels from our eyes to the object.</li> </ul>	
<b>Key Questions</b>	<ul style="list-style-type: none"> <li>- What is the pupil in the eye?</li> <li>- How does light travel?</li> <li>- Why do we need light to see?</li> <li>- How does a shadow form?</li> <li>- What is refraction?</li> <li>- What is a spectrum of light?</li> </ul>	