








Working Scientifically in KS2 - Years 3 - 6

	What pupils should know and be able to do Lower KS2	Key vocabulary Lower KS2	What pupils should know and be able to do Upper KS2	Key vocabulary Upper KS2
	<p>Identifying means to recognise something. Pupils learn that living and non-living things can be sorted according to their differences (classifying) They can then group things according to similarities and differences. These are called criteria. Pupils record classifications using Venn and Carroll diagrams and tables.</p>	<p>differences, similarities, classify, diagram, chart, key, Carroll Diagram, Venn Diagram, behaviour, properties, criteria,</p>	<p>Identifying means to recognise something. Pupils learn that living and non-living things can be sorted according to their differences (classifying) They can then group things according to similarities and differences. These are called criteria. Pupils record classifications using Venn and Carroll diagrams and tables. Pupils use classification keys to group according to criteria.</p>	<p>differences, similarities, classify, diagram, chart, key, Carroll Diagram, Venn Diagram, behaviour, properties, criteria, classification key</p>
	<p>A systematic observation is a way scientists observe repeatedly with a clear purpose. Pupils need to know that they can use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements, using a range of equipment, including thermometers and data loggers. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings)</p>	<p>systematic, notice, patterns, observations, careful, accurate, evidence, increase, decrease, predict, conclude, relationships, appearance, unit measurements</p>	<p>Pupils must know how to select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value)</p>	<p>systematic, notice, patterns, observations, careful, accurate, evidence, increase, decrease, predict, conclude, relationships, appearance, unit measurements (force, mm, cm, mins, seconds)</p>
	<p>In a scientific test, scientists make predictions and hypotheses. A prediction is what they think the outcomes might be, and a hypothesis is an explanation of phenomena. In simple comparative tests children compare one event with another and identify different outcomes. A variable is something that can change. In order to demonstrate a causal relationship between two variables children carry out a fair test. For a fair test, they identify a variable that can be changed and measured while keeping the other variables the same.</p> <p>In investigations, conclusions summarize how your results support or contradict your original prediction and help to form a hypothesis.</p> <p>Pupils learn to recognise when a simple fair test is necessary and help to decide how to set it up. They learn to think of more than one variable factor. They</p>	<p>cause, effect, enquiry, fair test, comparative test, variable factor, record, measure, prediction, conclusion, evidence, hypothesis, phenomena.</p>	<p>The children show they know how to select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. During an enquiry, they assimilate other scientific processes into their learning. They make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value). They evaluate their findings, suggest improvements to their methods and form hypotheses.</p>	<p>Control, relationships, reliability, accuracy, interpret, justify, prove, Question/Enquiry, Method, Variables, Prediction, Results, Conclusion, Evaluation</p>

	recognise when a simple comparative test is necessary and help to decide how to set it up.			
	<p>Children begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them.</p> <p>With help, children can look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. Children can say what they found out, linking cause and effect.</p>	<p>patterns, relationships, cause, effect, data, changes, similarities, differences, predict, question, observations, conclude,</p>	<p>Pupils learn how to identify causal relationships and patterns in the natural world from their evidence; make simple conclusions, make predictions for new values, suggest improvements and raise further questions. They draw conclusions based on their evidence and current subject knowledge. They identify results that do not fit the overall pattern; and explain their findings using their subject knowledge (anomalies)</p>	<p>causal, interpret, data, graphs and charts, anomaly, atypical, typical, impact</p>
	<p>Begin to recognise when and how secondary sources might help to answer questions that cannot be answered through practical investigations</p>	<p>secondary source, reliability, fact, interpretation</p>	<p>Begin to recognise when and how secondary sources might help to answer questions that cannot be answered through practical investigations</p>	<p>secondary source, reliability, fact, interpretation</p>

Scientific Knowledge Year 6

<p>Topic Title (Concept)</p> <p>NC Reference</p>	<p>Animals Including Humans (Animals and Humans)</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> <p>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</p> <p>Describe the ways in which nutrients and water are transported within animals, including humans.</p>	<p>Evolution and Inheritance (Evolution and Inheritance)</p> <p>Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</p>	<p>Living Things & Their Habitats (Living Things & Their Habitats)</p> <p>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</p> <p>Give reasons for classifying plants and animals based on specific characteristics.</p>	<p>Light (Light and Seeing)</p> <p>Recognise that light appears to travel in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</p>	<p>Electricity (Electricity)</p> <p>Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</p> <p>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> <p>Use recognised symbols when representing a simple circuit in a diagram.</p>
<p>Prior learning</p>	<p>Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans) • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)</p>	<p>Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants). Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats)</p>	<p>Describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. (Y2 - Living things and their habitats) Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)</p>	<p>Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. • Find patterns in the way that the size of shadows changes. (Y3 - Light) • 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. (Y5 - Properties and changes of materials)</p>	<p>Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)</p>

<p>Sticky knowledge</p>	<p>The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system.</p> <p>Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well our heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE</p>	<p>All living things have offspring of the same kind. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other. Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited will survive to reproduce and pass their characteristics on to their young. Over a longer period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution.</p>	<p>Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food. Animals can be divided into two main groups: vertebrates and invertebrates. Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics. Invertebrates can be divided into a number of groups, including insects and spiders. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.</p>	<p>Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object. Light can change direction in a process called refraction</p>	<p>Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well. You can use recognised circuit symbols to draw simple circuit diagrams.</p>
<p>Working Scientifically</p> <p>(These are suggested WS areas that complement unit - also refer to and highlight WS milestones as cover and ensure all covered over year/phase)</p>	<p>Identify classify and describe Classify and describe the roles of veins, capillaries and arteries in the circulatory system Classify healthy and unhealthy foods, describe the importance of exercise, the impact of illegal drugs on the body. Pattern Seeking Investigate how exercise affects heart rate, before, just after and minutes after exercise. Investigate recovery period. Identify mean for class/ group and compare with average for age group. Comparative and fair testing Investigate variables affecting heart rate in exercise, design a fair test. Secondary Sources Use secondary sources to research the negative impact of drugs such as tobacco</p>	<p>Identify classify and describe Identify features in animals and plants that are passed onto offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs Observations over time Investigate conditions needed for bread to go mouldy and microorganisms to thrive Pattern Seeking Compare how humans and other mammals have evolved over time Comparative and fair testing Which bird 'beak' has adapted best for which type of bird 'food' (models Galapagos finches)</p>	<p>Identify classify and describe Classify animals, plants, fungi, bacteria and Protista according to the Carl Linnaeus system. Create classification charts for vertebrates and invertebrates Create a classification system for some of the living things in the school ground</p>	<p>Identify classify and describe Identify ways that light can change direction, including through refraction Pattern Seeking 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 the card. Note patterns in how mirrors change the direction of light travelling Comparative and fair testing Investigate the best reflective material for a periscope Investigate variables which affect the size of a shadow</p>	<p>Identify classify and describe Make circuits then represent them in circuit diagrams and applying component symbols appropriately. Pattern Seeking Experiment with, explain and demonstrate the pattern between the voltage of cells and the brightness of a bulb. Comparative and fair testing Compare and explain, using correct scientific language, what happens to lamps, buzzers and motors when a resistor changes the flow of electricity in a circuit.</p>

<p>End of unit task</p>	<p>Understand animals and humans Write a booklet explaining how the heart and circulatory systems work and the importance of looking after them</p>	<p>Understand evolution and inheritance Explain and give examples of the idea of adaptation and evolution</p>	<p>Understand how to use and create a classification system for living things Follow a key and use to classify. Create own key for a friend to follow and use to classify.</p>	<p>Understand how light travels Experiment with making or using a periscope to demonstrate how objects may be seen. Explain what is happening to the light.</p>	<p>Understand electrical circuits Devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test Using correct scientific language, describe how changing the number and types of components in a circuit affects how they operate, such as increasing number of motors, buzzers</p>
--------------------------------	--	--	---	--	---