Year 6 Science Long Term Plan

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
What is classification? What do different types of microorganism do? Living things and their habitats	What happened when Charles Darwin visited the Galapagos islands? Evolution and inheritance	How can we vary the effects of electricity? Electricity		How do I see? Light	How do an animal's living systems work together to maintain a healthy body? Animals including humans

Unit 1 Science – What is classification? What do different types of microorganism do?		
National Curriculum Links	**Disciplinary Knowledge (working scientifically)**	**Key Vocabulary**
Living Things and Their Habitats • 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 • Give reasons for classifying plants and animals based on specific characteristics	• To write classification keys, and be able to compare them • To record findings from an experiment which was observed over time	**Tier 2:** insects, algae, moss, fern, conifer, bacteria **Tier 3:** vertebrate/non-vertebrate, taxonomy, arachnids, crustaceans, millipedes, annelids, echinoderms, molluscs, coelenterates, dichotomous key, ginkgoes, angiosperms, microorganism, microbes, fungi, protists

Pupil Offer	Famous People
Creating and classifying own animal	Carl Linnaeus Dr Tanisha Williams

Unit 1	Week 1	Week 2	Week 2	Week 3
Lesson Overview including Substantive knowledge	**Identifying, grouping and classifying** **Is The Classification of Animals Helpful?** • Know the purpose and origin of classification systems. • Know some ways in which animals can be classified. Retrieval: Ask what is remembered about why classify from Year 4. Create a mind map of different characteristics that can be used to classify. Explain that classifying helps us stay organised, keep track and be able to compare different things. Scientists classify to help explain relationships and learn things about newly discovered organisms. Before classification, people called the same animals by different names. Complete quick classification activity using living things from previous learning in Year 4. Discuss Linnaeus and how he used kingdoms. Give children a list of animals and model creating a classification chart with vertebrates and invertebrates. After all children have completed the first step together, allow them to explore how to split the animals further. This will include teaching the children about different types of invertebrates, such as annelids and molluscs. Share and defend placement of animals. Are all keys the same? Would their key be helpful if a new animal was discovered?	**Identifying, grouping and classifying** **Are There Many Similarities Between Animals in The Local Area?** • Know how to identify and classify animals in the local area based on their characteristics. Retrieval: Discuss benefits and difficulties of using classification, linking to last lesson. Recap vocabulary. Introduce term taxonomy. Discuss the different habitats and microhabitats that we know exist in the school. Pupils to decide how they will record the animals that they find, and the group it is in. Children then to explore the school grounds for animals in addition to using animals from a pre-made list. Children to make a graph to show the difference in numbers for each group, using this to help them answer questions about what they found.	***Working Scientifically TAPS*** Outdoor Keys Remind children about how to use/make a classification key e.g. using wildlife from a different habitat, design a branching key (using IT or large sheets of paper). Emphasise the requirement for yes/no questions and scientific language. We do not yet have a classification key specific to our local environment – what living things would we expect it to include? Discuss classification groups (in/vertebrates, flowering/nonflowering plants etc) appropriate to local habitat. Conduct a local wildlife survey of plants and animals in or around the school grounds, collecting plant samples or drawings/photos of animals/plants to help to make a key. Ask pupils to make a key to identify 6-8 local animals and/or plants. Children try others' keys to see it can successfully classify a member of their sample.	**Research** **How Can Plants Be Classified?** • Know ways to classify plants and to know the reasons why this is useful for scientists. Retrieval: Classification of flowering and non-flowering plants. Following on from retrieval, show children some additional plants and ask if they can be sorted into the provided classification key, and decide that it would be helpful to have more information like in week 1. Introduce term dichotomous and the process of plant taxonomy. Pupils to be given a range of photographs of plants from each of the groups. Ensure children are also shown where the seeds are in the plant and what they look like. plants to be classified using the dichotomous key. Finish by asking questions that allow children to discuss similarities and differences between the groups; e.g. What do we know about all conifers? Is algae more similar to moss or to ginkgoes?
Working Scientifically	Use classification keys. Scientists **classify** living things to help explain their relationships to each other and to help us learn things about newly discovered organisms by noting their similarities to known organisms. Know that Carl Linnaeus' taxonomy was significant and has an impact today.	Use and apply classification process to animals. Record data using classification keys and tables.	Record results using a classification key.	Use and compare a different classification system.
Organisation & Communication	Classification key	Recording of animals when searching (children to choose best method, but likely to be a table of some form) Graphs (children to choose, but likely to be bar chart)		Pictures to be labelled with information about which groups it belongs to
Opportunities for reading and maths	Carl Linnaeus reading comprehension activity			

Unit 1	Week 4	Week 5	Week 6	Week 7
Lesson Overview including Substantive knowledge	**Identifying, grouping and classifying** **Pattern-seeking** **Is There a Link Between Plant Groups and The Environment They Grow In?** • Know that different plants need different environments. • Know the plants that commonly grow in the area and plants that do not. Retrieval: Look at key from last lesson and remember how to use it. Start by allowing children to create a table, like in week 2, to organise plants they would find in the woods. This should include where they are found, e.g. light or dark places. Children to explore a woodland area to fill in their tables. Afterwards discuss how easy it was to use the key in real life. Discuss what plants were most common and why, along with links to the conditions where they were found. Revisit how plants live in environments they are adapted to survive in. Understanding the characteristics of plant groups help scientists predict where certain plants are likely to grow and how they interact with their environment.	**Observation over time** **Research** **Do Microorganisms Matter?** • Know the purpose of microorganisms. • Know some ways in which microorganisms can be classified. • Know the significance of the work of Joseph Lister Retrieval: Recap on bread making from year 4. Ask if anyone can remember what happened when yeast was added to the water. Introduce term micro-organism and explore how the term can be broken down into further groups. Discuss what their purposes are and their impact on ecosystems. Show pictures of micro-organisms. What differences can be seen? Set up a yeast experiment. Research why protists are important, and why Joseph Lister's work with micro-organisms significant. Children to present findings to each other.	***BIG QUESTION ANSWER*** Give children a range of animals and plants to research. Children to decide where they belong using the classification systems learned. Suggest presenting this as a mind map, but children can make their own choices. This task will be extended by allowing children to create their own animal, providing information about how it would be classified if real.	***REVIEWING*** Teachers to plan one additional week to address missing knowledge or remaining misconceptions. This lesson content and outcomes will vary between classes.
Working Scientifically	Select an appropriate way to record data. Seek data using a different type of classification key.	Set up an experiment and select ways to conduct observations and record results. Use prior knowledge to select three locations where they think mould will spread fastest. Set up an experiment to prove this. Present findings from enquiries and secondary source research.	Reporting and presenting 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	
Organisation & Communication	Recording of animals when searching (children to choose best method, but likely to be a table of some form) Present findings from tables.	Annotated photographs to show observation over time for yeast experiment Presentation of research	Mind map or other presentation method Fact file for animal created	
Opportunities for reading and maths	Pattern seeking (maths)			

Unit 2 Science – What happened when Charles Darwin visited the Galapagos Islands?		
National Curriculum Links	**Disciplinary Knowledge (working scientifically)**	**Key Vocabulary**
Evolution and Inheritance • 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	• use scientific evidence to support or refute an ideas • apply knowledge of a scientific idea to discuss advantages and disadvantages, including future effects	Tier 2: diversity, siblings, characteristics, traits, habitats, climate, extinction, crossbreed Tier 3: evolution, mould/body/trace/ cast fossil, fossil record, species, variation, inheritance, inherited/environmental variation, selective-breeding, natural selection, adaptation, organism, pollinators

Pupil Offer	Famous People
Making a Charles Darwin quiz	Charles Darwin Sylvia Earle

Unit 2	Week 1	Week 1	Week 2	Week 3
Lesson Overview including Substantive knowledge	**Observation over Time** **How Do Scientists Know That Living Things Have Changed Over Time?** • Know that fossils give us proof of evolution. • Know some examples of animals that we know have evolved because of fossils. • Know what the fossil record is. Retrieval: Year 3 – Fossils are the remains or traces of plants and animals that lived long ago Introduce words evolution and generations. This will also include a discussion on natural selection. Show children photos of mould fossils, body fossils, trace fossils and cast fossils. Children to reflect upon how they are similar to living things now and the challenges they might have if using to identify things that lived in the distant past. Show image of relative dating to explain how we can work out the age of a living thing from its fossil. Discuss the layers of rock in the fossil record. Compare images of whale, crocodile and horse fossils from different times so children can see what changes have happened over time. Discuss changes and what they tell us, as well as anything that surprises them.	***Working Scientifically TAPS*** Fossil Habitats Show a picture of a fossilised skeleton/creature and discuss the children's ideas about fossils, what it was, what it ate, where it lived etc. (Could provide only one part to start with, or parts to different groups, to show how we only have part of the information). Discuss strong/weak evidence e.g. strong evidence that has skeleton/teeth etc, place where fossil was found suggests habitat, similarities with modern creatures suggest colour etc. Provide children with photos or real/resin fossils (trilobite, ammonite, ichthyosaurus etc, plus any found locally or linked/displayed at local museums). Ask them to use the fossils and their own research to develop ideas about the creatures e.g. labelled drawing with size, possible appearance, diet, habitat, what other fossils could exist eg what prints could be left behind. Could colour code or star ideas for which there is the strongest evidence.	**Research** **How Does Variation Explain the Different Features and Characteristics of Living Things?** • Know that animals produce offspring with animals of the same species. • Know the differences between species is called diversity and the difference within species is called variation. • Know the individual members of a species have different characteristics from each other. Retrieval: Fossil records Introduce word diversity linked with pictures of animals from different species. Apply to differences between species. Introduce word variation and provide examples such as siblings. Children to use pictures to consider variation. Children to explore two causes of variation: inherited and environmental, and how sometimes it can be a mixture. Look at family pictures (real if possible), and animal families to discuss inherited variation. Discuss selective breeding, talking about particular dog cross breeds and what the desirable/undesirable characteristics are.	**Research** **How Has Variation Led to Evolution** • Know that variation leads to natural selection which leads to evolution • Know examples of this in nature Retrieval: Variation within species Explore why Charles Darwin's findings were significant at the time. Outline the process he discovered. Children to understand that natural selection is the process by which living things with traits better suited to their environment are more likely to survive and reproduce, passing those beneficial traits onto their offspring. Pupils to research natural selection in giraffe neck length, rock pocket mice colour and Darwin's study of the finches. Children to be given scenarios for different animals and they should predict how natural selection may have played out in each one.
Working Scientifically	Understand how scientists examine fossils to find out about the evolution of different species. Use a range of fossils and/or images of fossils over time and both identify changes and observe changes identified by scientists.	Identify scientific evidence that has been used to support or refute ideas or arguments	Observe closely to identify inherited characteristics in a range of living things. Analyse how cross/selective breeding has led to animals with certain inherited characteristics. Consider the advantages and disadvantages of selective breeding.	Know how Charles Darwin conducted scientific studies to inform his theory of evolution Analyse how different circumstances may lead to natural selection and evaluation
Organisation & Communication	Paragraph to explain changes in one fossil looked at.		Lists of variation seen within photographs provided Venn diagram of inherited and environmental variation	Paragraph explaining research
Opportunities for reading and maths				Charles Darwin information sheets

Unit 2	Week 4	Week 5	Week 6	Week 7
Lesson Overview including Substantive knowledge	Research **Do All Living Things Adapt in The Same Way?** • Know that animals have adapted to their environment to survive. • Know that this leads to evolution. • Know some ways in which animals have adapted to their environment. Retrieval: Natural selection and year 4 – life processes Discuss adaptation as physical or behavioural traits that make an organism better suited to its environment. Show children challenging habitats, e.g. Antarctica or the ocean. Using fish as an example, explain how it can carry out all life processes in the habitat. Children to discuss similar adaptations in animals looked at. They should also consider how the animal that they have researched is not adapted to other environments, linking to the life processes. Link to global warming, which animals is best suited for it. What might happen? How could these animals adapt?	Observation over time Research **How Have Plants in The Local Area Adapted?** • Know the plants adapt to ensure that they get enough light and water • Know that, where relevant, plants have adapted to encourage pollination Retrieval: Year 5 – life processes of reproduction in some plants Visit school grounds to find out what plants do to get more light. Find climbing plants, those with large leaves, those with many small leaves and other helpful characteristics. It is likely that this will need to be supplemented with photographs from other times of the year. Adults could carefully dig up some roots for children to look at in transparent containers. Children to look at flowers, and discuss how they have adapted to get more sun and water. In the local area, they should note the areas where the flowers do and do not grow to help with this. Provide information about cacti and ask whether this plant would survive in this local area and why/why not.	***BIG QUESTION ANSWER*** Children to create their own quiz for everything they have learned so far. Give time for children to present their quiz to a partner. After this, children to be given 5 questions covering the whole unit.	***REVIEWING*** Teachers to plan one additional week to address missing knowledge or remaining misconceptions. This lesson content and outcomes will vary between classes.
Working Scientifically	Compare the adaptations of animals in different habitats. Use and apply knowledge of climate change to consider what this means for the adaptation of living things.	Observe and raise questions about how local plants are adapted to their environment; if possible, use microscopes to look at roots	Reporting and presenting 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	
Organisation & Communication	List of other animals carrying out life processes in other habitats	Chosen recording method of how plants in the local area have adapted to the environment		
Opportunities for reading and maths		Measurement of plants		

Unit 3 Science – How can we vary the effects of electricity?		
National Curriculum Links	**Disciplinary Knowledge (working scientifically)**	**Key Vocabulary**
Electricity • Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • 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 recognised symbols when representing a simple circuit in a diagram.	• Draw detailed circuit diagrams, using correct symbol notation • Consider the reliability and accuracy of results, and explaining the link to repeat readings • Create further questions to investigate, which link clearly to findings	**Tier 2:** symbol, device **Tier 3:** series circuit, cell, battery, component, voltage

Pupil Offer	Famous People
Creating a burglar alarm (As part of DT)	Nikolas Tesla , , M. Stanley Whittingham

Unit 3	Week 1	Week 2	Week 3
Lesson Overview including Substantive knowledge	**Observation over Time** **How can we represent a simple circuit in a diagram?** • Know the symbols and the conventions that are used to represent the components. • Know how to organise a working electric circuit and how to draw a circuit diagram using them. Retrieval: Year 4 – appliances that use electricity and electrical safety Children to make a simple circuit including a bulb, motor or buzzer. Remind children of knowledge about components and a complete circuit. Discuss how electrical energy is converted into movement when using the motor. Show children symbols for drawing circuits and explain that they make drawings more universal and easier to understand. Children should understand the difference between battery and cell. Play games to remember which are which.	**Comparative / Fair Testing** **How Does the Number of Batteries Effect the Brightness of the Bulb?** • Know the brightness of a bulb (or the volume of a buzzer) is associated with the number and voltage of cells used in the circuit. Retrieval: Electricity symbols Pupils to decide how to use a fair test to investigate how the number of batteries effect the brightness of the bulb. Pupils to consider how to record this, for example with data loggers, and discuss accuracy and reliability in relation to their choices. After the experiment, children should explain what they have found out. They should explain how reliable their results are and what they did to ensure they were precise and reliable.	**Comparative / Fair Testing** **How Does the Number of Batteries Effect the Brightness of the Bulb?** • Know that different things can affect how components behave in a circuit. Retrieval: TBC Pupils to discuss other variables that could affect the brightness of the bulb. ***Working Scientifically TAPS*** Bulb brightness Provide a mix of basic circuit components and challenge pairs or trios to make a quick simple circuit. Compare and discuss the differences in bulb brightness and how to measure/observe this e.g. light seen through layers of paper, datalogger, observation. Main task: to investigate how they can change the brightness of the bulb choosing from the available equipment (to include different lamps, cells and different thickness/length of high resistance/fuse wires). Each pair/trio to generate a list of variables which could be changed in their circuit and how they will observe/measure the effect of this change. Create a scientific question which identifies the 'change' and 'measure'. Record their plan e.g. question, variables and diagram of test circuit. Carry out and discuss investigations
Working Scientifically	Create circuits of increasing complexity and represent them using diagrams, annotated with scientific diagrams and labels. *Know how scientists have developed ideas over time and improved efficiency (Nikolas Tesla).* *Understand why scientists use symbols i.e. international understanding, efficiency*	Recognise which variable to control in a fair test and carry out a fair test to see how the number of cells in a circuit affects the brightness. Consider the reliability of results. Understand why scientists often repeat readings to increase the accuracy and precision of their results. Use a data logger to measure the brightness of a bulb. Create a scale to compare according to brightness. Reflect on accuracy of measuring methods. Record and represent findings, including drawing conclusions.	Plan a scientific enquiry to answer a question, recognising and controlling variables Raise a question based on their experience. Plan a fair test to answer this question, recognising the variables and controlling these. Come up with their own linked questions. Record and represent findings, including drawing conclusions. Plan and design own table for recording results. Ensure results are accurate and reliable. *Identify how scientists build on the work of other scientists (M. Stanley Whittingham designing lithium-ion batteries).*
Organisation & Communication	Photographs of circuits Drawing of circuit using symbols	Post it note planning Findings paragraphs	Post it note planning Diagrams, finding paragraph or other, as determined by children
Opportunities for reading and maths		Reading scales and measuring brightness	

Unit 3	Week 4	Week 5	Week 6	Week 7
Lesson Overview including Substantive knowledge	**Pattern Seeking** **What Can Affect the Function of a Component in a Circuit?** • Know how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Know how to use recognised symbols when representing a simple circuit in a diagram. Retrieval: Bulb brightness and Year 2 – complete or incomplete circuit Children will be asked to draw their own circuit diagrams following given instructions. They will then predict each time whether the bulb or buzzer is brighter or louder than the previous diagram. They will make the circuits to test their predictions.	**Problem Solving** **How Can I Use My Knowledge of Electrical Components to Make a Device?** • Know how electrical components interrelate and use this knowledge to make a working device Retrieval: Year 4 - switches Show images of bulb circuits and ask the children which ones would light a torch (involving a switch). Children to make a simple circuit using a switch. They will then be provided with a real life example, e.g. burglar alarm for their trays.	***BIG QUESTION ANSWER*** Children to complete a poster to answer multiple questions regarding the electricity topic. They can share their answers in written form, with diagrams and pictures as appropriate. Success criteria should be determined with the children before starting, e.g. technical vocabulary, labelled diagrams, following looking at some good examples of work. Children to be stopped at different points to allow them to check they have met the criteria.	***REVIEWING*** Teachers to plan one additional week to address missing knowledge or remaining misconceptions. This lesson content and outcomes will vary between classes.
Working Scientifically	Record with increasing complexity using scientific diagrams and labels the different ways to affect the function of a component in a circuit. Make predictions about what will happen in a range of circuit set-ups and test the accuracy of these. Report findings and provide clear explanations.	Plan a specific scientific enquiry, which recognises and controls variables, to make a working device	Reporting and presenting 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	
Organisation & Communication	Diagrams, predictions and findings	Diagrams of real life switched circuit, with explanation of how it works		
Opportunities for reading and maths				

Unit 4 Science – How do I see?		
National Curriculum Links	**Disciplinary Knowledge (working scientifically)**	**Key Vocabulary**
Light • 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.	• Take measurements of angles of incidence and reflection, using a protractor • Report findings about a phenomenon • Use scientific evidence to support their findings from an experiment	**Tier 2:** beam, ray, shadow, cast, object, reflect, light source, **Tier 3:** energy, distortion, factor, *incident ray,* reflected ray*, angle of incidence*, angle of reflection, normal line, phenomenon, refraction, spectrum, prism

Pupil Offer	Famous People
Children to make a presentation or booklet covering all elements taught about light and how we see.	Isaac Newton Jo Shien Ng

Unit 4	Week 1	Week 2	Week 3
Lesson Overview including Substantive knowledge	**Problem Solving** **How Does Light Travel?** • Know light travels in straight lines. • Know light reflects off objects and that is how we see them. • Know light can also travel to our eyes directly from light sources. Retrieval: Year 3 – Light quiz Shine a torch in a dark room, and ask children why it is not lighting up a particular child. Discuss in relation to knowledge about light children already have. Explain that light is a type of energy but it does not need the air to travel through like sound does. Light travels in straight lines from the light source. Look at diagrams that show this and how we see the reflection. Provide children with some card with holes in. Children to stand these up and shine the light through, seeing that the light travels when the holes are lined up. Children to explain how their model works.	**Comparative / Fair testing** **Is A Shadow Always The Same Shape As The Object That Cast it?** • Know a shadow will always be the same shape as the object that cast it because the object that blocks the light only blocks the rays that hit it. The rest of the light around the edges can continue to travel in straight lines. Retrieval: Year 3/5 shadows changing over the day ***Working Scientifically TAPS*** Investigating shadows Introduce the investigation by shining a light on an object and asking how the shadow of the object could be changed (e.g. size of object/number of blocks, distance/angle of torch). List potential investigation questions. Ask children to select a question which will result in numerical data and carry out the investigation. As a class, generate clear success criteria for taking precise measurements and drawing accurate line graphs to display results. Focus on recording of results. Children could peer assess graphs against the success criteria, giving each other feedback for improvement. After children complete experiment, discuss reasons for shadow not being exactly the same as the object. Children to create a model, using small umbrellas, to show how the shadow may change slightly over a day, using a torch to represent the sun.	**Pattern Seeking** **How Does a Mirror Reflect Light?** • Know the angle at which light is reflected from a mirror is equal to the angle that the light hits the mirror Retrieval: Year 3 – mirrors/ shiny objects Use mirrors to see around corners in the classroom and to see behind themselves. Children to draw a diagram to show how they think this works. Show children diagram after giving them a short amount of time to correct anything needed. Introduce 'Mirror Maze Challenge' where children will use the mirrors to get a beam of light from one end of the maze to the other.
Working Scientifically	Record results of light model using scientific diagrams and labels. Record findings from enquiry to find out whether light travels in straight lines.	Take accurate measurements and record on a graph Plan a scientific enquiry to answer the question: Is a shadow always the same shape as the object that casts it? Record data using diagrams or models. Report findings from the enquiry, sharing conclusions.	Take measurements of angles of incidence and reflection, using a protractor, with increasing accuracy and precision, taking repeat readings when appropriate Report and present findings from enquiries, including conclusions about the angles of incidence and reflection
Organisation & Communication	Ibn Al-Haytham	post it note planner Measurement table Graph	Drawings or photos of mirror maze
Opportunities for reading and maths	Measuring using light meters	Creating tables and graphs	

Unit 4	Week 4	Week 5	Week 6	Week 7
Lesson Overview including Substantive knowledge	**Pattern Seeking** **What is Refraction and Why Is It a Phenomenon?** • Know that scientific phenomenon is an observable (and sometimes surprising) event. • Know that refraction is the bending of light as it moves between one transparent material and another Retrieval: TBC Explain term phenomena, giving example of common natural phenomena e.g. lightning and tornadoes, followed by less noticeable ones light gravity and electricity passing through a circuit. Look at two arrows through a glass of water to demonstrate refraction. Explain how this links to light. Repeat with a pencil in water: looking from side and above. Children to apply understanding to help a fisherman spear a fish.	**Problem Solving** **What Colour is Light? Is this a phenomenon?** • Know refraction can also cause light to separate into its different colours/wavelengths • Know that light is made up of the colours of the rainbow Retrieval: TBC Discuss current knowledge about the colour of light, e.g. sunlight being associated with yellow. Explain that Isaac Newton discovered that refraction shows the colour of light. Use prisms to demonstrate this. Children to investigate further by experimenting with bubbles. They should note all of the colours they could see on the bubbles. Link learning to rainbows.	***BIG QUESTION ANSWER*** Children to make a presentation or booklet covering all elements taught about light and how we see. The children might be provided with key words or questions to answer to ensure their work contains all required key knowledge. Children to be provided with opportunities to share work with others and take ideas to improve their own work before the end of the lesson.	***REVIEWING*** Teachers to plan one additional week to address missing knowledge or remaining misconceptions. This lesson content and outcomes will vary between classes.
Working Scientifically	Record and present findings about the refraction of light (as per pencil and glass demonstration) being an example of scientific phenomenon	Report and present findings about the refraction of light (colours of the spectrum) being an example of scientific phenomenon. Identify scientific evidence that has been used to support or refute ideas or arguments – Isaac Newton's discovery about the colours of light.	Reporting and presenting 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	
Organisation & Communication	Diagram with explanation of what refraction is.	Diagram and explanation of refraction on bubbles		
Opportunities for reading and maths				

Unit 5 Science – How do an animal's living systems work together to maintain a healthy body?		
National Curriculum Links	**Disciplinary Knowledge (working scientifically)**	**Key Vocabulary**
Animals, including Humans • identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood • recognise the impact of diet, exercise, drugs and lifestyle on the ways their bodies function • describe the ways in which nutrients and water are transported within animals including humans	• Use scientific diagrams and annotations to explain a scientific process • Measure and record using a pulse meter • Use test results to predict findings in further experiments • Draw conclusions from case studies	**Tier 2:** pump, heart, lifestyle, drugs, medicine, illegal, vitamins **Tier 3:** circulatory system, organ, blood vessels, arteries, veins, capillaries, living cells, oxygen, carbon dioxide, deoxygenated, oxygenated, platelets, plasma, red/white blood cells, antibodies, single/double circulatory system, nicotine, caffeine, proteins, stimulant, hallucinogen, depressant, nicotine, ethanol

Pupil Offer	Famous People
Children to present their findings in the form of a scientific interview or TV show.	William Harvey (Kent link) , Donald Palmer

Unit 5	Week 1	Week 2	Week 3	Week 3
Lesson Overview including Substantive knowledge	**Research** **What Is the Purpose of The Circulatory System?** • Know that the circulatory system pumps blood around the body. • Know that the heart, blood and blood vessels play an important role in the circulatory system. • Know that blood vessels transport oxygenated blood around the body and return to the heart with deoxygenated blood. Retrieval: Year 3 – skeletons and Year 4 – digestive system Children to feel their heart beat after 30 seconds of exercise. Explain that your blood moves through the circulatory system and that the heart is a muscle. Children to watch videos to understand the process of the circulatory system, along with seeing other simple models. Children will explain the process to others in the class.	**Research** **Why Is Blood So Important?** • Know that blood is made up of red blood cells, white blood cells, platelets and plasma. • Know that red blood cells carry oxygen around the body for the living cells and white blood cells protect the body from disease. • Know that platelets help blood to clot to repair cuts. • Know that plasma is a liquid made mostly of water that transports the blood cells and important nutrients. Retrieval: circulatory system Show images of different parts of blood, talking about the proportion of the different parts. Children to make a model of blood using water, food colouring, and other small objects. Ask children why models are helpful to scientists. Explain the function of the different parts. Teacher can model the function of placelets, following risk assessment guidance.	**Pattern Seeking** **How Does Exercise Affect Our Circulatory System?** • Know that exercise strengthens the heart muscle which improves the heart's ability to pump blood around the body. Retrieval: Year 2 – exercise and healthy living Model finding pulse points or use pulse meters to find resting heart rates. Show children a chart of heart rates changing over time for three children. Ask the children what they think the children were doing based on their knowledge of heart rate. Children to complete pattern seeking investigation, planned by themselves. They should work out if there is a relationship between the type of exercise they do and the number of heart beats per minute.	***Working Scientifically TAPS*** Heart Rate Pose Discuss previous findings about pulse rate: can be hard to measure, but generally found that pulse rate increases after exercise. Recap why: *blood carries oxygen around the body, the muscles need more oxygen during exercise, so your heart works harder to supply more oxygen.* But what if your body is still e.g. headstand, raised arms, balance, yoga pose, plank? Focus individual recording on predictions and explanations. Discuss with the children how to plan and carry out a test into a stationary exercise. Consider how long the pose should last, comparison with resting pulse rate, whether one child or several children should be tested, how to carry out the tests safely. Ask the children to carry out the test and record results as in a group. Discuss findings.
Working Scientifically	Use scientific diagrams and annotations to explain a scientific process	Build on prior understanding of how scientists use models by creating a model of blood to show the proportions of component parts. Create a model of blood, keeping proportions accurate	Plan a pattern-seeking experiment to explore the relationship between the types of exercise we can do and heart rate. Identify the variables that need to be controlled. Write a hypothesis. Plan a method independently for how they will keep this a fair test, how they will measure and record. Present findings in a graph that pupils consider appropriate. Draw conclusions and suggest further investigations. Use a heart monitor/pulse meter.	Use test result to make predictions to set up further comparative and fair tests
Organisation & Communication	Flow diagram or other to show process	Labelled diagram of model	Post it note plan Measurement recording Findings paragraph	
Opportunities for reading and maths	How the heart works reading comprehension			Using timers, plotting graphs

Unit 5	Week 4	Week 5	Week 6	Week 7
Lesson Overview including Substantive knowledge	**Research** **How are nutrients and water transported within animals, including humans?** • Know that humans have a double and closed circulatory system as do most vertebrates. • Know that some animals have a single circulatory system, and some have an open circulatory system. Retrieval: circulatory system Share the process for how nutrients and water are transported around the body, using games and role play to help. Children to predict if they think the human systems are the same for animals. After discussing, provide some examples such as fish and insects where it is different. Children to play true or false with statements about the circulatory system.	**Observation over time** **Research** **How Do Diet, Exercise, Drugs and Lifestyle Impact Our Bodies?** • Know the impact of diet, exercise, drugs and lifestyle on the way our bodies function. Retrieval: lifestyles and year 3 – healthy eating Provide children with some (made-up) examples of a weekly diet. Children to decide if they are healthy or unhealthy and give some advice to that person. Discuss benefits of a healthy diet. Children to model how much sugar is in different drinks, looking at labels for amount for 100ml. Discuss implications for this on our food choices. Look at the food packaging colours and information of different foods, including those commonly thought of as healthy or semi-healthy. Use internet research to learn about importance of water. Share information about sleep amounts. Children to think about changes in behaviour and thoughts when they have not had enough sleep. Look at medicine packets and share the side effects people may have. Create a side-effect list for all medicines. Also discuss other drugs such as cigarettes, alcohol, caffeine and illegal drugs in line with the school policy.	***BIG QUESTION ANSWER*** Children to present their findings in the form of a scientific interview or TV show. The children should spend time preparing questions and follow up questions. Class should create success criteria for the interview, including a list of key vocabulary. Children could be challenged to debate which body part works the hardest.	***REVIEWING*** Teachers to plan one additional week to address missing knowledge or remaining misconceptions. This lesson content and outcomes will vary between classes.
Working Scientifically	Learn about scientific evidence that has been used to support or refute ideas or arguments (William Harvey)	Analyse case studies and use learning to give advice. Explore nutritional guidance and draw conclusions. Monitor sleep over the course of a week and draw conclusions.	Reporting and presenting 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	
Organisation & Communication	True or false statements corrected	Advice Sorting grids for foods		
Opportunities for reading and maths		How does diet and exercise help us? Reading comprehension		