Science Year 6 Skills and knowledge documents to support medium term planning

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	**Living things and their habitats** Classifying big and small	**Animals including humans** Circulation and Health	**Living things and their habitats** Evolution and Inheritance	**Energy** Light and reflection	**Making connections** Are some sunglasses safer than others?	**Electricity** Circuits, batteries and switches

Progression of Working Scientifically Skills

	Year 3	Year 4	Year 5	Year 6
Posing questions	Asking my own scientific questions & using different ways to answer them. Beginning to raise further questions during the enquiry process. Considering what makes a testable question. Beginning to recognise that there are different types of enquiry and that they are suitable for different questions. Beginning to make suggestions about how different questions could be answered. Asking scientific questions. Raising questions throughout the enquiry process. Identifying testable questions. Selecting the most appropriate enquiry method to answer questions and give justification.		Asking scientific questions. Raising questions throughout the enquiry process. Identifying testable questions. Selecting the most appropriate enquiry method to answer questions and give justification.	
Planning	Able to plan tests (inc. fair tests) with help. Able to plan different types of scientific enquiries to answer questions.		Able to plan different types of scientific enquiries to answer questions.	
Predicting	Making predictions about what they think will happen by: ● Using scientific Knowledge and/or personal experience to explain their prediction (because…)		Making increasingly scientific predictions by: ● Using previous scientific Knowledge and evidence to inform their predictions. ● Using scientific language to describe a potential outcome or explain why they think something will happen.	

	● Beginning to consider cause and effect when making predictions, where appropriate. ● Predicting a trend by considering how the changing variable will affect the measured variable. (The smoother the surface, the longer the distance the car will travel) Making increasingly scientific predictions by: ● Using previous scientific Knowledge and evidence to inform their predictions. ● Using scientific language to describe a potential outcome or explain why they think something will happen. ● Making links between topics to evidence a prediction.	● Making links between topics to evidence a prediction.
Observing (Qualitative)	Able to observe, describe & compare using scientific language. Using their senses to describe, in more detail and with simple scientific vocabulary, what they notice or what has changed. Able to observe, describe and compare in detail using scientific language. Using their senses to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.	Able to observe, describe and compare in detail using scientific language. Using their senses to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.
Measuring (Quantitative)	Able to use a variety of equipment to measure accurately (such as data loggers, newton meters, weighing scales, thermometers, stopwatches, rules, metre sticks, trundle wheels, measuring cylinders) Using standard units to measure and compare. Using measuring equipment with increasing accuracy.	Able to select different equipment to measure with precision & take repeat readings when needed Using standard units to measure and compare with increasing precision (decimals). Reading a wider variety of scales with unmarked intervals between numbers.

	Reading scales with unmarked intervals between numbers. Able to select different equipment to measure with precision & take repeat readings when needed Using standard units to measure and compare with increasing precision (decimals). Reading a wider variety of scales with unmarked intervals between numbers.	
Researching	Gathering specific information from a variety of sources. Gathering answers to open-ended questions from a variety of sources.	Gathering answers to open-ended questions from a variety of sources.
Recording	Able to gather, record and present data in different ways inc. drawings, labelled diagrams, tables. Choosing how to record data and results using scientific diagrams, labels, classification, keys, tables.	Choosing how to record data and results using scientific diagrams, labels, classification, keys, tables.
Grouping and classifying	Classifying things & using keys. Sorting and classifying with precise reason.	Sorting and classifying with precise reason.
Graphing	Recording and presenting data in different ways inc. scattergrams and bar charts. Learning to choose how to record data and results using scatter, bar and line graphs.	Learning to choose how to record data and results using scatter, bar and line graphs.
Analysing and drawing conclusions	Communicating my findings in a variety of ways.	Gathering the things I've learned and say why they matter to me.

	Explaining using cause and effect and scientific facts and ideas Able to use relevant scientific language. Gathering the things I've learned and say why they matter to me. Explaining using cause and effect, scientific facts and own ideas. Able to use relevant scientific language.	Explaining using cause and effect, scientific facts and own ideas. Able to use relevant scientific language.
Evaluating	Able to talk about how to improve my work. Learning to evaluate and able to improve my own work.	Learning to evaluate and able to improve my own work.

<table>
<tr><th colspan="4">Y6: Autumn 1</th></tr>
<tr><th colspan="4">Topic title: Classifying big and small</th></tr>
<tr><td colspan="4">Enquiry question: All life on Earth started from the same single-celled organism, so how are we all so different?</td></tr>
<tr>
<td>Prior Learning
Y4
Classifying living things
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.
Y5
Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird
Describe the life process of reproduction in some plants and animals.

Future learning:
KS3
Differences between species.</td>
<td>Knowledge:
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.
Define the term ‘organism’ and name the seven life processes of all living things.
Describe the work of Carl Linnaeus.
Define the term ‘vertebrate’ and name the vertebrate groups.
Describe the characteristics of fish, amphibians, reptiles, birds and mammals.
Compare the characteristics of the vertebrate groups.
Define the term ‘invertebrate’.
Describe the characteristics of worms, snails, spiders and insects.
Compare the characteristics of the invertebrate groups.
Name the plant groups.
Describe the characteristics of flowering plants, ferns, mosses and conifers.
Define the term ‘micro-organism’ and name some examples.</td>
<td>Skills:
Use a classification key to group and identify organisms.
Make a simple classification key.</td>
<td>Vocabulary
Vertebrates,
fish,
amphibians,
reptiles,
birds,
mammals
invertebrates,
warm-blooded,
cold-blooded,
insects,
spiders, snails,
worms,
exoskeleton
Flowering plant,
non-flowering plant,
mosses,
ferns,
conifers.
binomial system
characteristic
Classify
classification key
life process
Linnaean system
micro-organism
Microscopic
organism</td>
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Critical Content Statements:	**Common Misconceptions Pupils May Have:**
• All living things carry out the seven life processes. These are movement, respiration, sensitivity, growth, reproduction, excrement, nutrition • An organism is a living thing. It can be any type of plant, animal or micro-organism. • Carl Linneaus was a scientist in the 18th century. In his work he organised living things into groups. • A vertebrate is an animal that has a backbone. There are 5 vertebrate groups including fish, amphibians, reptiles, birds and mammals. • Fish breathe through gills, have scaly skin and lay eggs. • Amphibians have smooth slippery skin, can live on land and in water and reproduce with eggs. • Reptiles have dry scaly skin and lay soft leathery eggs. • Birds have feathers and lay eggs. Many birds can fly. • Mammals have fur or hair covering their bodies, they give birth to live young who drink milk. • Invertebrates are animals that do not have a backbone. Some have soft bodies and some have an exoskeleton. Worms, snails, spiders and insects are all examples of invertebrates. • Plants can be grouped into flowering plants (including trees and grasses) and non-flowering plants. Mosses, ferns and conifers are all non-flowering plants. • I can describe the characteristics of flowering plants, ferns, mosses and conifers. • A micro-organism is incredibly small and cannot usually be seen without a microscope. Bacteria, viruses and yeast are all micro-organisms. Some are helpful like yeast for making bread and some are harmful to humans like bacteria that makes us ill. • A classification key can be used to identify the characteristics of an organism. They can be used to group and identify different organisms.	Some pupils may think that • All micro-organisms are harmful • Mushrooms are plants.

<table>
<tr><th colspan="3">Y6: Autumn 2</th></tr>
<tr><th colspan="3">Topic title: Circulation and health</th></tr>
<tr><td colspan="3">Enquiry question: How does the heart pump blood throughout the body, and why is this process important for our health?</td></tr>
<tr>
<td>Prior learning:
Y2
Describe the importance for humans of exercise, eating the right amounts of different types of food and hygiene.
Y3
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.
Y4
Describe the simple functions of the basic parts of the digestive system in humans
Identify the different types of teeth in humans and their simple functions.

Future learning:
KS3
The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases.
The effects of recreational drugs including substance misuse on behaviour, health and life processes.
The structure and functions of the gas exchange system, in humans, including adaptations to function.
The mechanism of breathing to move air in and out of the lungs.</td>
<td>Knowledge and skills:
Identify and name the main parts of the human circulatory system. (heart, blood vessels and blood)
Describe the functions of these parts of the circulatory system.
To know that the heart pumps blood around the body.
To know that the blood vessels transport blood around the body.
To know that the blood transports vital substances around the body, including water, oxygen and nutrients.
Understand the impact of diet, exercise, drugs and lifestyle on the way their body functions.
Know that heart rate is the number of beats per minute.
Know that exercise increases heart rate.
Begin to understand the relationships between different organ systems.</td>
<td>Vocabulary:

Heart, pulse, heart rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle, pulse, average, mean.</td>
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The impact of exercise, asthma and smoking on the human gas exchange system.		

Critical Content Statements:

It is important to keep our body healthy. We can do this by eating a balanced diet, getting enough sleep, taking care of our mental health and having good relationships with others.

Some lifestyle choices are bad for our health. These include eating unhealthy foods, not getting enough sleep or exercise as well as smoking, drinking alcohol and other drugs.

The circulatory system contains the heart and blood vessels transporting blood around the body.

The heart is a pump that pushes blood through the circulatory system.

Our blood travels through the circulatory system. Blood passes through the heart twice in a complete circuit through the body.

Blood transports substances like oxygen, water and nutrients around the body.

We can measure our heart rate, which is the number of heart beats per minute. We can check this by taking our pulse.

When we exercise it increases our heart rate. This is because our heart pumps faster to take blood to our muscles faster and deliver oxygen so our muscles can make energy faster.

After exercise, our heart rate will slow back down to the resting heart rate. There is a link between heart rate and fitness.

Common Misconceptions Pupils May Have:

Some children may think that

- Your heart is on the left side of your chest.
- The heart makes blood.
- The blood travels in one loop from the heart to the lungs and around the body.
- When we exercise out heart beats faster to work the muscles more.
- Some blood in our bodies is blue and some is red.
- We just eat food for energy
- All fat is bad for you
- All dairy is good for you
- Protein is good for you so you can eat as much as you want
- All drugs are bad for you

Y6: Spring 1		
Topic title: Evolution and inheritance		
Enquiry question: Why do living things change over time?		
Prior learning: **Y2** Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the needs of different kinds of animals and plants and how they depend on each other. Notice that animals including humans have offspring that grow into adults. **Y3** Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. **Y4** Recognise that environments can change and that this can sometimes pose dangers to living things Describe the life process of reproduction in some plants and animals. **Future learning:** **KS3** Heredity as the process by which genetic information is transmitted from one generation to the next. A simple model of chromosomes, genes and DNA in heredity including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. Variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. Changes in the environment may leave individuals within a species and some entire species less adapted to compete successfully and reproduce which in turn can lead to extinction.	**Knowledge and skills** • 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. • Scientific knowledge has changed overtime leading to the current understanding of science • How scientific evidence is used to support or refute ideas or arguments.	**Vocabulary:** Offspring, vary, characteristics, suited, adapted, environment, inherited, species, fossils, evolve, evolution. environmental evaluate evidence (Y5) evolution extinct fossil (Y3) gene habitat (Y2) inherit inheritance mean average model (Y5) natural selection offspring (Y5) parent (biological) population reliable reproduce scientific theory

		selective breeding survival of the fittest Variable variation

Critical Content Statements: • Living things have changed over time. • Fossils provide information about living things that inhabited the Earth millions of years ago. • Characteristics are passed from parents to their offspring, but all offspring vary from their parents. • Over time, variation in offspring can affect animals' chances of survival in particular environments. • Animals and plants have adapted to suit their environment over many millions of years and this process can be called evolution.	**Common Misconceptions Pupils May Have:** Some children may think that: • Adaptation occurs during an animals lifetime, giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow think fur during their life. • Offspring most resemble their parents of the same sex, so that sons look like their fathers, • All characteristics, including those that are due to actions during the parents' life such as dyed hair or football skills can be inherited. • Cavemen and dinosaurs were alive at the same time.

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<tr><th colspan="4">Y6: Spring 2</th></tr>
<tr><th colspan="4">Topic title: Light and Shadows</th></tr>
<tr><td colspan="4">Enquiry question: When we look at the stars why do we see history?</td></tr>
<tr>
<td>Prior learning:
Y3
Recognise that they need light to see things and that dark is the absence of light.
Notice that light is reflected from surfaces.
Recognise that the light from the sun can be dangerous and that there are ways to protect our eyes.
Recognise that shadows are formed when the light from a light source is blocked by an opaque object.
Y5
Compare and group together everyday materials including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets.

Future learning:
KS3</td>
<td>Knowledge:
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 light 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 eyers.
Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</td>
<td>Skills:

Identifying testable questions. Selecting the most appropriate enquiry method to answer questions and give justification.
Planning

Suggesting which variables will be changed, measured and controlled. Writing a method including details about how to ensure control variables are kept the same.
Observing

Using their senses to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.
Measuring

Using standard units to measure and compare with increasing precision (decimals). Reading a wider variety of scales with unmarked intervals between numbers.
Recording

Drawing scientific diagrams with increasing accuracy, labelling with a broader range of</td>
<td>Vocabulary
Light, straight lines, light rays. Plus Y3 vocab.

luminous
non-luminous
reflective
reflection
refraction
shadow
straight
light source
periscope</td>
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The similarities and differences between light waves and waves in matter. Light waves travelling through a vacuum, speed of light The transmission of light through materials: absorption. Diffuse scattering and specular reflection at a surface. Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focussing(qualitative) the human eye. Light transferring energy from source to absorber leading to chemical and electrical effects; photosensitive material in the retina and in cameras Colours and the different frequencies of light, white light, and prisms (qualitative only) differential colour effects in absorption and diffuse reflection.		scientific vocabulary and annotating diagrams to explain concepts and convey opinions. Using tables with columns that allow for repeat readings. Calculating the mean average. Graphing Representing data by using line graphs and scatter graphs. Plotting points with greater accuracy. Reading the value of plotted points with greater accuracy. Analysing and drawing conclusions Writing a conclusion to summarise findings using increasingly complex scientific vocabulary. Suggesting with increasing independence how one variable may have affected another. Identifying anomalies in repeat data and excluding results where appropriate. Using identified patterns to predict new values or trends. Evaluating Identifying steps in the method that need changing and suggesting improvements. Identifying which variables were difficult to control and suggesting how to control them better.	

Critical Content Statements: • Light travels in a straight line from a light source. • Luminous objects such as light bulbs, torches and the Sun, these objects give off light which travels directly into our eyes. • Non-luminous objects reflect light into our eyes and this is how we can see them all.	**Common Misconceptions Pupils May Have:** Some pupils may think that • We see objects because light travels from our eyes to the object.

• When light is reflected off a surface, its direction changes. • On a smooth shiny surface, light is reflected uniformly. • Shadows have the same shape as the objects that cast them as a result of light travelling in a straight line.	

Y6: Summer 1			
Topic title: Electricity and circuits			
Enquiry question:			
Prior learning: Y4 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 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 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 a lamp lights in a simple series circuit. Recognise some common conductors and insulators and associate metals with being good conductors. **Future learning:**	**Knowledge:** • 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. • A variety of components in a series circuit (including buzzer and motor). • A range of jobs and careers that use scientific knowledge and methods • How scientific evidence is used to support or refute ideas or arguments	**Skills:** • Suggesting which variables will be changed, measured and controlled. • Writing a method, including details about ensuring control variables are kept the same. • Writing a method that considers reliability by planning repeated readings. • Suggesting the most appropriate equipment to make observations and measurements and justifying their choices. • Using previous scientific knowledge and evidence to inform their predictions. Using scientific language to describe a potential outcome or explain why they think something will happen. • Using standard units to measure and compare with increasing precision • Reading a wider variety of scales with unmarked intervals between numbers. • Drawing scientific diagrams by using a wider range of standard symbols and drawing with increasing accuracy. • Using tables with columns that allow for repeat readings. • Suggesting headings to tables, including units.	Vocabulary Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage NB Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words cells and batteries are now used interchangeably.

KS3 Electric current, measured in amperes in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. Potential difference, measured in volts, battery, and bulb ratings; resistance measured in ohms, as the ratio of potential difference to current. Differences in resistance between conducting and insulating components Static electricity.		• Designing results tables with increasing independence with consideration of variables where applicable. • Calculating the mean average. • Writing a conclusion to summarise findings using increasingly complex scientific vocabulary. • Suggesting with increasing independence how one variable may have affected another. • Quoting relevant data as evidence of relationships. • Identifying anomalies in repeat data and excluding results where appropriate. • Comparing individual, class and/or model data to the prediction and recognising when they do not match. • Using identified patterns to predict new values or trends. • Identifying steps in the method that need changing and suggesting improvements. • Identifying which variables were difficult to control and suggesting how to control them better.	

Critical Content Statements: • A component is a device in an electrical circuit • Symbols are often used to represent the components so they are easier to draw and easily recognised. • A circuit diagram is a simple line drawing that represents how the components in an appliance join together • A complete circuit must have a power supply, a complete loop and at least one component • You do not use wet hands when using electrical appliances or switches as it is dangerous	**Common Misconceptions Pupils May Have:** Some children may think that • Larger sized batteries make bulbs brighter • A complete circuit uses up electricity. • Components in a circuit that are closer to the battery get more electricity.

• You do not put anything other than a plug in an electrical socket • The more bulbs, the dimmer their brightness • The more buzzers, the quieter the sound • The more components added to a circuit, the greater the resistance	

Y6: Summer 2			
Topic title: Making connections			
Enquiry question: Are some sunglasses safer than others?			
Prior learning: **this unit builds on learning from Year 6 units.**	**Knowledge:** • Recall key knowledge from previous units. • Apply knowledge in new contexts.	**Skills:** • Carry out a full scientific enquiry.	**Vocabulary:** bar chart, bone, carbohydrate, conclusion, evaluate, fat, flower, fruit, friction, grip strength, joint, light source, material, muscle, nutrition, opaque, predict, property, protein, seed, shadow, trustworthy, variable.