

Science Year 4 Skills and knowledge documents to support medium term planning



	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	<u>Animals including humans</u> Digestion and food	<u>Energy</u> Sound and Vibrations	<u>Materials</u> States of Matter	<u>Living things and their habitats</u> Classification and changing habitats	<u>Energy</u> Electricity and circuits	<u>Making connections</u> How does the flow of liquids compare?

Progression of Working Scientifically Skills

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Posing questions	<p>Asking simple scientific questions and noticing that questions can be answered in different ways.</p> <p>Exploring the world around them and raising their own simple questions.</p> <p>Recognising there are different types of enquiry (ways to answer a question).</p> <p>Responding to suggestions on how to answer questions.</p>		<p>Asking my own scientific questions & using different ways to answer them.</p> <p>Beginning to raise further questions during the enquiry process.</p> <p>Considering what makes a testable question.</p> <p>Beginning to recognise that there are different types of enquiry and that they are suitable for different questions.</p> <p>Beginning to make suggestions about how different questions could be answered.</p> <p>Asking scientific questions.</p> <p>Raising questions throughout the enquiry process.</p> <p>Identifying testable questions.</p> <p>Selecting the most appropriate enquiry method to answer questions and give justification.</p>		<p>Asking scientific questions.</p> <p>Raising questions throughout the enquiry process.</p> <p>Identifying testable questions.</p> <p>Selecting the most appropriate enquiry method to answer questions and give justification.</p>	
Planning	<p>Planning how to find things out with help (including planning tests)</p>		<p>Able to plan tests (inc. fair tests) with help.</p> <p>Able to plan different types of scientific enquiries to answer questions.</p>		<p>Able to plan different types of scientific enquiries to answer questions.</p>	

<p>Predicting</p>	<p>Suggesting what might happen, often justifying with personal experience.</p>	<p>Making predictions about what they think will happen by:</p> <ul style="list-style-type: none"> ● Using scientific Knowledge and/or personal experience to explain their prediction (because...) ● 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) <p>Making increasingly scientific predictions by:</p> <ul style="list-style-type: none"> ● 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. 	<p>Making increasingly scientific predictions by:</p> <ul style="list-style-type: none"> ● 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.
<p>Observing (Qualitative)</p>	<p>Able to observe, describe & compare.</p> <p>Using their senses to describe, in simple terms, what they notice or what has changed.</p>	<p>Able to observe, describe & compare using scientific language.</p> <p>Using their senses to describe, in more detail and with simple scientific vocabulary, what they notice or what has changed.</p> <p>Able to observe, describe and compare in detail using scientific language.</p> <p>Using their senses to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.</p>	<p>Able to observe, describe and compare in detail using scientific language.</p> <p>Using their senses to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.</p>

<p>Measuring (Quantitative)</p>	<p>Able to measure using non-standard and standard measures e.g. rulers, metre sticks, trundle wheels, weighing scales, balance scales)</p> <p>Using non-standard units to measure and compare.</p> <p>Beginning to use standard units and read simple scales to measure and compare.</p> <p>Beginning to use simple measuring equipment to make approximate measurements.</p>	<p>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)</p> <p>Using standard units to measure and compare.</p> <p>Using measuring equipment with increasing accuracy.</p> <p>Reading scales with unmarked intervals between numbers.</p> <p>Able to select different equipment to measure with precision & take repeat readings when needed</p> <p>Using standard units to measure and compare with increasing precision (decimals).</p> <p>Reading a wider variety of scales with unmarked intervals between numbers.</p>	<p>Able to select different equipment to measure with precision & take repeat readings when needed</p> <p>Using standard units to measure and compare with increasing precision (decimals).</p> <p>Reading a wider variety of scales with unmarked intervals between numbers.</p>
<p>Researching</p>	<p>Gathering specific information from one simplified, specified source.</p>	<p>Gathering specific information from a variety of sources.</p> <p>Gathering answers to open-ended questions from a variety of sources.</p>	<p>Gathering answers to open-ended questions from a variety of sources.</p>
<p>Recording</p>	<p>Gathering & recording simple data on tables, pictograms & bar charts.</p>	<p>Able to gather, record and present data in different ways inc. drawings, labelled diagrams, tables.</p> <p>Choosing how to record data and results using scientific diagrams, labels, classification, keys, tables.</p>	<p>Choosing how to record data and results using scientific diagrams, labels, classification, keys, tables.</p>

Grouping and classifying	Beginning to be able to sort and order.	Classifying things & using keys. Sorting and classifying with precise reason.	Sorting and classifying with precise reason.
Graphing	Able to gather & record simple data on tables, pictograms & bar charts.	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	Able to talk, write and draw about what I've found out. Explaining why (in a simple way). Able to use simple scientific language.	Communicating my findings in a variety of ways. 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.	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.
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.

Y4: Autumn 1

Topic title: Digestion and food

Enquiry question: What types of teeth do carnivores need? Why?

<p>Prior Learning</p> <p>Nursery Explore how things work. Explore and talk about different forces they can feel Talk about the differences in materials and changes they notice.</p> <p>Reception Explore the natural world around them Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.</p> <p>Year 1 Identify and name a variety of common herbivores and carnivores and omnivores</p> <p>Year 2 Find out about and describe the basic needs of animals, including humans, for survival (water food and air) Describe the importance for humans of exercise, eating the right amounts of food and hygiene.</p> <p>Year 3</p>	<p>Knowledge:</p> <ul style="list-style-type: none"> • Name the main organs of the human digestive system (mouth, teeth, tongue, oesophagus, stomach, small and large intestines) and describe their simple functions. • Recognise the different types of human teeth (incisor, canine, premolar and molar) and their simple functions. • Know that teeth can be damaged, including the effect of sugary and acidic food. • Know that it is important to brush teeth twice a day, make good food choices and visit the dentist regularly. • Describe the teeth of carnivores and herbivores and understand why they are different. • Know that predators hunt for their food and prey are the animals being hunted. • Know that producers make their own food. • Know that food chains begin with a producer followed by consumers, and arrows to show the energy passed on. 	<p>Skills:</p> <ul style="list-style-type: none"> • Evaluate a strength or weakness of the digestive system model. • Describe an example of evidence that can be used to study teeth. • Select which variables need to be changed, measured and controlled in an experiment. • Recall that scientific research needs repeated results before being used in society. • Identify trends in predators and prey. • Draw a results table that has space for observations about different poo samples. 	<ul style="list-style-type: none"> • <u>Digestive system:</u> digest, digestion, tongue, teeth, saliva, salivary glands, oesophagus, stomach, liver, pancreas, gall bladder, small intestine, duodenum, large intestine, rectum, anus, faeces, organ. • <u>Types of teeth and dental care:</u> molar, premolar, incisor, canine, wisdom teeth, tooth decay, plaque, enamel, baby (milk) teeth. • <u>Food chains and animal diets:</u> decomposer, food web.
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<p>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</p> <p>Future learning: 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 way their body functions. Describe the ways in which nutrients and water are transported within animals including humans</p>			
<p>Critical Content Statements:</p> <ul style="list-style-type: none"> • Digestion is the how the body breaks down food so it can be taken in and used. • The main organs of the human digestive system are the mouth, teeth, tongue, oesophagus, stomach, small and large intestines and each has an important job to do. • The different types of human teeth are called incisors, canines, premolars and molars • Teeth can be damaged by sugary and acidic food. • It is important to brush teeth twice a day, make good food choices and visit the dentist regularly. • The teeth of carnivores and herbivores look different because they eat different foods. • Predators hunt for their food and prey are the animals being hunted. • Producers make their own food. • Food chains begin with a producer, followed by consumers and arrows to show the energy passed on. 		<p>Common Misconceptions Pupils May Have: Some pupils may think that....</p> <ul style="list-style-type: none"> • Arrows in a food chain mean eat • The death of one part of a food chain or a web has no or limited consequence on the rest of the chain • There is always plenty of food for wild animals • Your stomach is where your belly button is • Food is only digested in the stomach • When you have a meal, your food goes down one tube and your drink in another • The food you eat becomes poo and the drink becomes wee. 	

Y4: Autumn 2

Topic title: Sound

Enquiry question: How is sound made?

<p>Prior learning: Nursery Explore how things work Reception Describe what they see, hear and feel whilst outside Year 1 Identify, name and draw and label the basic parts of the human body and say which part of the body is associated with touch sense</p> <p>Future learning: KS3 Waves on water as undulations which travel through water with transverse motion; these waves can be reflected. Frequencies of sound waves measured in Hertz, echoes, reflection and absorption of sound. Sound needs a medium to travel, the speed of sound in air, in water, in solids. Sound produced by vibrations of objects, in loudspeakers, detected by their effects on</p>	<p>Knowledge:</p> <ul style="list-style-type: none">• Describe that sound is a result of vibrations.• Know that vibrations from sounds travel through a medium to the ear.• Know a variety of ways to change the pitch or volume of a sound.• Know that stronger vibrations cause louder sounds and weaker vibrations cause quieter sounds.• Know that sounds get fainter as the distance from the sound source increases.• Know that quicker vibrations cause higher-pitched sounds and slower vibrations cause lower-pitched sounds.• Know that an insulating material reduces the amount of vibrations that pass through it and can be used to protect the ears from damaging sounds.• Know that different materials provide different amounts of insulation against sound.	<p>Skills:</p> <ul style="list-style-type: none">• Beginning to raise further questions during the enquiry process.• Consider 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 select from options which variables will be changed, measured and controlled.• Beginning to make suggestions about how different questions could be answered.• Beginning to suggest what observations to make and how long to make them for.• Plan a simple method, verbally and in writing.• Write a simple method in numbered steps.• Select what simple equipment might be used to observe and measure results.• To observe closely how different instruments create a sound.• Research how whales and dolphins communicate underwater.• Present results using a bar chart.	<p>Vocabulary:</p> <ul style="list-style-type: none">• <u>Parts of the ear:</u> eardrum.• <u>Making sound:</u> vibration, vocal cords, particles.• <u>Measuring sound:</u> pitch, volume, amplitude, sound wave, quiet, loud, high, low, travel, distance. <p><u>Other:</u> soundproof, absorb sound.</p>
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<p>microphone diaphragm and the ear drum; sound waves and longitudinal. Auditory range of humans and animals Pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound Waves transferring information for conversion to electrical signals by microphone.</p>		<ul style="list-style-type: none"> • Suggest which variables to measure and for how long. • Design simple results tables. • Identify when results or observations do not match predictions. 	
<p>Critical Content Statements:</p> <ul style="list-style-type: none"> • Sound is a vibration which travels through a medium from the source to our ears. • Different mediums such as solids, liquids and gases can carry sound. • Sound cannot travel through a vacuum (an area empty of matter). • The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. • The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. • Sounds decrease in volume (are quieter) as you move away from the source and sounds increase in volume (are louder) as you move closer to the source. • A sound insulator is a material which blocks sound effectively. • Pitch is how high or low a sound is and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds. 		<p>Pitch and volume are frequently confused, as both can be described as high or low.</p> <p>Some children may think:</p> <ul style="list-style-type: none"> · sound is only heard by the listener · sound only travels in one direction from the source · sound can't travel through solids and liquids · high sounds are loud and low sounds are quiet. 	

Y4: Spring 1

Topic title: States of matter

Enquiry question: How do the changes in states of matter impact our environment and everyday life?

Prior learning:

Nursery

Nursery

Explore how things work.

Talk about the differences in materials and changes they notice.

Reception

Describe what they see, hear and feel whilst outside.

Y1

Describe simple physical properties of a variety of everyday materials.

Future learning:

Y5 Solutions and

Knowledge:

- Identify solids, liquids and gases using their properties.
- Know that a property of a solid is that it keeps its shape unless a force is applied to it.
- Know that a property of a liquid can flow freely and take on the shape of a container.
- Know that a property of a gas does not have a fixed shape and can escape from an unsealed container.
- Know that heating causes solids to turn into liquids (melting) and liquids to turn into gases (evaporating).
- Know that cooling causes gases to turn into liquids (condensing) and liquids to turn into solids (freezing).
- Know that water can exist as a solid, a liquid or a gas and the melting point of water is zero degrees Celsius and the boiling point of water is 100 degrees Celsius.
- Understand that water flows around the world in a continuous process called the water cycle.
- Know that in the water cycle, evaporation is when bodies of water are heated and turn into water vapour. Know that in the water cycle, condensation is the process of water vapour cooling to form water droplets in clouds, which can result in precipitation.
- Know that the rate of evaporation increases as temperature rises.

Skills:

- Ask relevant questions.
- Use results to draw simple conclusions.
- Use thermometers to take accurate measurements.
- Make predictions for new values.
- Record findings using labelled diagrams.
- Research using more than one source.

Vocabulary:

Boiling, condensing, evaporating, evaporation rate, gas, liquid, melting, freezing, precipitation, solid, steam, the water cycle, temperature, thermometer, conclusion

Critical Content Statements:

- Water can exist as a solid, liquid or gas.
- Solids stay the same shape unless a force is applied.
- Liquids can flow freely and take on the shape of a container.
- Gases do not have a fixed shape and can escape from an unsealed container.
- Heating makes solids to turn into liquids (melting) and liquids to turn into gases (evaporating)

Common Misconceptions Pupils May Have:

- ≠ Solid is another word for hard or opaque
- ≠ Solids are hard and cannot break or change shape easily and are often in one piece
- ≠ Substances are made of very small particles like sugar or sand cannot be solids

- Cooling makes gases turn into liquids (condensing) and liquids to turn into solids (freezing)
- Water can be a solid, liquid or gas. The melting point of water is 0°C and the boiling point of water is 100°C
- Water flows around the world in a continuous process called the water cycle.
- In the water cycle, evaporation is when bodies of water are heated and turn into water vapour.
- In the water cycle, condensation is the process of water vapour cooling to form water droplets in clouds, which can result in precipitation.
- As the temperature rises the rate of evaporation increases.

- ∉ Particles in liquids are further apart than in solids and they take up more space
- ∉ When air is pumped into balloons they become lighter
- ∉ Water in different forms – steam, water, ice – are all different substances
- ∉ All liquids boil at the same temperature as water
- ∉ Melting, as a change of state is the same as dissolving
- ∉ Steam is visible water vapour

Y4: Spring 2

Topic title: Classification and changing habitats

Enquiry question: How do changes in habitats impact the classification and survival of living organisms?

Prior learning:

Y1

Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.

Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals)

Y2

Find out about and describe the basic needs of animals including humans for survival (water, food air)

Describe the importance for humans of exercise, eating the right amounts of different types of food and hygiene.

Future learning:

Y6 Classifying big and small

Knowledge:

Know that living things can be grouped in different ways.

Know that a classification key can be used to group and identify plants and animals.

Know that vertebrates are animals which have a backbone and invertebrates are animals which do not have a backbone.

Know that plants can be grouped into flowering or non-flowering varieties.

Know that flowering plants include grasses and non-flowering plants includes ferns and mosses.

Know that there are five main vertebrate groups: birds, mammals, reptiles, amphibians and fish.

Know that invertebrate groups include snails, slugs, worms, spiders and insects.

Know that habitats can change throughout the year and this can be dangerous for living things.

Know that humans can have both a positive and negative impact on the environment

Skills:

Record data in different ways.

Apply and create classification keys.

Make careful observations.

Make and use classification keys.

Present information in different ways.

Research using an information sheet.

• Living things:
organisms,
specimen, species.

• Grouping living things:
classification,
classification keys,
classify,
characteristics.

• Names of invertebrate animals: snails and slugs, worms, spiders, insects.

• Invertebrate body parts: e.g. wing case, abdomen, thorax, antenna, segments, mandible, proboscis, prolegs.

• Environmental changes:
environment,
environmental dangers, adapt, natural changes, climate change, deforestation, pollution,

urbanisation,
invasive species,
**endangered
species, extinct.**

Critical Content Statements:

- Living things can be grouped in different ways.
- A classification key can be used to group and identify plants and animals.
- Vertebrates are animals that have a backbone and invertebrates are animals that do not have a backbone.
- Plants can be grouped into flowering or non-flowering varieties.
- Flowering plants include grasses and non-flowering plants include ferns and mosses.
- There are five main vertebrate groups: birds, mammals, reptiles, amphibians and fish.
- Invertebrate groups include snails, slugs, worms, spiders and insects.
- Habitats can change throughout the year, which can be dangerous for living things.
- Humans can have both a positive and negative impact on the environment.

Common Misconceptions Pupils May Have:

Some pupils may think that

- Snakes are like worms, so they must also be invertebrates
- Invertebrates have no form of skeleton

Y4: Summer 1

Topic title: Electricity and circuits

Enquiry question: Why do we need electricity?

<p>Prior learning: Y2 materials</p> <p>Future learning: Y6 Electricity</p> <p>Associate the brightness of a bulb or the volume of a buzzer with the number and voltage of cells in a circuit.</p> <p>Compare and give reasons for variations in how components function including brightness of bulbs, on/off position of switches and loudness of buzzers.</p> <p>Use recognised symbols when drawing circuit diagrams.</p>	<p>Knowledge:</p> <ul style="list-style-type: none"> • Know that all electrical appliances need a power source, including batteries or mains electricity. • Know that an electrical circuit needs a complete path for the electrical charge to flow through. • Know the main components in a simple series circuit. • Know how to work safely with electricity. • Know that some materials allow electrical charge to pass through them quickly and these are known as electrical conductors (e.g. metals). • Understand that metals are used for cables and wires because they are good conductors of electricity. • Know that some materials do not allow electrical charge to pass through them easily and these are known as electrical insulators (e.g wood and plastic). • Understand that plastic is used to cover cables and wires because it is a good insulator. • Understand that an open switch breaks a series circuit so the components will be off. • Understand that a closed switch completes a series circuit so the components will be on. • Explain the relationship between bulb brightness and the number of bulbs in a circuit. 	<p>Skills:</p> <ul style="list-style-type: none"> • Draw a results table and record a range of appliances under the correct headings 'Mains' or 'Batteries'. • Identify and draw simplified electric circuit symbols and use these to draw a simplified circuit diagram. • Write a method for the investigation that considers appropriate equipment, ordering clearly written steps and considering safety. • Ask questions relating to bulbs in an electrical circuit. • Explain why a selected question is testable. • Suggest that new inventions will change safety advice. 	<ul style="list-style-type: none"> • Electricity: mains-powered, battery-powered, mains electricity, plug, appliances, devices. • Circuits: circuit, simple series circuit, complete circuit, incomplete circuit. • Circuit parts: bulb, cell, wire, buzzer, switch, motor, battery. • Materials: electrical conductor, electrical insulator. • Other: safety.
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<p>Critical Content Statements:</p> <ul style="list-style-type: none"> • All electrical appliances need a power source, this is usually batteries or mains electricity. • Electrical circuits need a complete path for the electrical charge to flow through. • Circuits are made with components. (wire, bulb, battery, switch)
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- We must be safe when working with electricity.
- Some materials allow electrical charge to pass through them quickly and these are called electrical conductors (e.g. metals).
- Metals are used for cables and wires because they are good conductors of electricity.
- Some materials do not allow electrical charge to pass through them easily and these are known as electrical insulators (e.g. wood and plastic).
- Plastic is used to cover cables and wires because it is a good insulator.
- An open switch breaks a series circuit so the components will be off.
- A closed switch completes a series circuit so the components will be on.
- The number of bulbs in a circuit affects the brightness of the bulbs. The more bulbs we add the dimmer they are.

Y4: Summer 2

Topic title: Making connections

Enquiry question: How does the flow of liquids compare?

<p>Prior learning: this unit builds on learning from Year 3</p>	<p>Knowledge:</p> <ul style="list-style-type: none"> • Recall key knowledge from previous units. • Apply knowledge in new contexts. 	<p>Skills:</p> <ul style="list-style-type: none"> • Carry out a full scientific enquiry. 	<p>Vocabulary:</p> <p>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.</p>
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