Year 4 Animals including humans - LIFE

National Curriculum objectives

- 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
- construct and interpret a variety of food chains, identifying producers, predators and prey.

Notes and guidance

- be introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach and small and large intestine and explore questions that help them to understand their special functions.

Sticky knowledge

- Animals have teeth to help them eat.
- Different types of teeth do different jobs.
- Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood.
- The blood takes nutrients around the body.
- Nutrients produced by plants move to primary consumers then to secondary consumers through food chains.

Food enters the body through the mouth. Digestion starts when the teeth start to break the food down. Saliva is added and the tongue rolls the food into a ball. The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken down further by being churned around and other chemicals are added. The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting, canines for tearing, and molars and premolars for grinding (chewing). Living things can be classified as producers, predators and prey according to their place in the food chain.

Vocabulary

Herbivore, carnivore, omnivore, digestive system, digestion, tongue, mouth, teeth, saliva, oesophagus, stomach, gall bladder, small intestine, pancreas, large intestine, rectum, anus, liver, tooth, canine, incisor, molar, premolar, producer, consumer, predator, prey, food chain, nutrients

Key scientists

Ivan Pavlov
(Digestive System Mechanisms)

Joseph Lister
(Discovered Antiseptics)

Linked texts

Human Body Odyssey
(Werner Holzwarth)
Crocodiles Don't Brush Their Teeth
(Colin Fancy)
Wolves
(Emily Gravett)

Prior Learning

- Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans)
- Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans)
- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)
- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)

Future learning

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. (Y6 - Animals, including humans)
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)
- Describe the ways in which nutrients and water are transported within animals, including humans. (Y6 - Animals, including humans)

Possible misconceptions

- arrows in a food chains mean 'eats'
- the death of one of the parts of a food chain or web has no, or limited, consequences 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 digested only in the stomach
- when you have a meal, your food goes down one tube and your drink down another
- the food you eat becomes "poo" and the drink becomes "wee".

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
In our class, are omnivores taller than vegetarians? 	What are the names for all the organs involved in the digestive system? How can we organise teeth into groups? 	How does an eggshell change when it is left in cola? 	Are foods that are high in energy always high in sugar? 	How do dentists fix broken teeth? 	How has a visit to the dentist changed since ancient times?	What different types of food are there? Why do we need a variety of different foods? Do all organisms eat the same things? Why do some people need different diets? (weightlifter vs marathon runner) Why are teeth important? What happens to our food? What is our digestive system? How does our food turn into poo and wee?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries.	Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.						

Linked TAPS Assessment	Additional TAPS ideas	Working scientifically	
Teeth (eggs in liquids) • Can children use results to draw conclusions? • Can children suggest explanations for their findings?	Describe the simple functions of the basic parts of the digestive system in humans. Function of teeth - to find out about what damages teeth and how to look after them	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements • using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• comparing the teeth of carnivores and herbivores, and suggesting reasons for differences • finding out what damages teeth and how to look after them. • draw and discuss their ideas about the digestive system and compare them with models or images.

Activities	Possible evidence
• Research the function of the parts of the digestive system. • Create a model of the digestive system using household objects. • Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing). • Classify animals as herbivores, carnivores or omnivores according to the type of teeth they have in their skulls. • Use food chains to identify producers, predators and prey within a habitat. • Use secondary sources to identify animals in a habitat and find out what they eat.	Can sequence the main parts of the digestive system Can draw the main parts of the digestive system onto a human outline Can describe what happens in each part of the digestive system Can point to the three different types of teeth in their mouth and talk about their shape and what they are used for Can name producers, predators and prey within a habitat. Can construct food chains Can use diagrams or a model to describe the journey of food through the body explaining what happens in each part Can record the teeth in their mouth (make a dental record) Can explain the role of the different types of teeth Can explain how the teeth in animal skulls show they are carnivores, herbivores or omnivores Can create food chains based on research

Year 4 - ELECTRICITY - ENERGY

National Curriculum objectives

- identify common appliances that run on electricity
- construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- recognise some common conductors and insulators, and associate metals with being good conductors.

Notes and guidance

- construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices.
- draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; *these will be introduced in year 6.*

Note: Pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. be taught about precautions for working safely with electricity.

Sticky knowledge

- A source of electricity (mains of battery) is needed for electrical devices to work.
- Electricity sources push electricity round a circuit.
- More batteries will push the electricity round the circuit faster.
- Devices work harder when more electricity goes through them.
- A complete circuit is needed for electricity to flow and devices to work.
- Some materials allow electricity to flow easily and these are called conductors.
- Materials that don't allow electricity to flow easily are called insulators.

Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off. Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.

Vocabulary

Electricity, electric current, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, wires, switch, buzzer, motor, conductor, insulator, component, metal, non-metal, symbol

Key scientists

Thomas Eddison
(First Working Lightbulb)

Joseph Swan
(Incadesecant Light Bulb)

Linked texts

Until I Met Dudley (Roger McGough)
Oscar and the Bird: A Book about Electricity (Geoff Waring)
Electrical Wizard: How Nikola Tesla Lit Up the World (Elizabeth Rusch)

Prior Learning

- Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)

Future learning

- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity)
- 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. (Y6 - Electricity)
- Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)

Possible misconceptions

Some children may think:

- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- electricity works by simply coming out of one end of a battery into the component.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
How does the thickness of a conducting material affect how bright the lamp is?	How would you group these electrical devices based on where the electricity comes from? How would you sort these objects/materials based on their temperature?	How long does a battery light a torch for?	Which room has the most electrical sockets in a house?	Which room has the most electrical sockets in a house?	Who actually invented the light bulb, Thomas Edison or Joseph Swan?	• What would life be like without electricity? • What sorts of things use/need electricity? • What electricity do I use? • In which ways can we 'get' electricity? (mains/plugs/batteries/wireless) • How do we make electricity? • How do batteries work? • How quickly can batteries run out? • Does this make a difference depending on number of components? • How does the number of batteries added to the circuit affect a device? • What materials can carry electricity? (conductors/insulators)
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Linked TAPS Assessment	Other TAPS ideas	Working scientifically	
Does it conduct electricity? • Can children explain results and their conclusions? • Can children recognise common conductors and insulators, and associate metals with being good conductors?	Recognise some common conductors and insulators, and associate metals with being good conductors. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements • using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.

Activities	Possible evidence
• Construct a range of circuits. • Explore which materials can be used instead of wires to make a circuit. • Classify the materials that were suitable/not suitable for wires. • Explore how to connect a range of different switches and investigate how they function in different ways. • Choose switches to add to circuits to solve particular problems, such as a pressure switch for a burglar alarm. • Apply their knowledge of conductors and insulators to design and make different types of switch. • Make circuits that can be controlled as part of a DT project. N.B. Children should be given one component at a time to add to circuits.	• Can name the components in a circuit • Can make electric circuits • Can control a circuit using a switch • Can name some metals that are conductors • Can name materials that are insulators • Can communicate structures of circuits using drawings which show how the components are connected • Use classification evidence to identify that metals are good conductors and non-metals are insulators • Can incorporate a switch into a circuit to turn it on and off • Can connect a range of different switches identifying the parts that are insulators and conductors • Can add a circuit with a switch to a DT project and can demonstrate how it works • Can give reasons for choice of materials for making different parts of a switch • Can describe how their switch works

Year 4 - Living things and their habitats - LIFE

National Curriculum objectives

- 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
- recognise that environments can change and that this can sometimes pose dangers to living things.

Notes and guidance

- Use the local environment throughout the year to raise and answer questions that help them to identify and study plants and animals in their habitat.
- identify how the habitat changes throughout the year.
- explore possible ways of grouping a wide selection of living things that include animals and flowering plants and non-flowering plants.

Note: Plants can be grouped into categories such as flowering plants (including grasses) and non-flowering plants, such as ferns and mosses.

- begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects.
- explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks, or garden ponds, and the negative effects of population and development, litter or deforestation.

Sticky knowledge

- Living things can be divided into groups based upon their characteristics
- Environmental change affects different habitats differently
- Different organisms are affected differently by environmental change
- Different food chains occur in different habitats
- Human activity significantly affects the environment

Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited (Year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.

Vocabulary

Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation.

Key scientists

Cindy Looy
(Environmental Change and Extinction)

Jaques Cousteau
(Marine Biologist)

Linked texts

The Vanishing Rainforest
(Richard Platt)

The Morning I Met a Whale
(Michael Morpurgo)

Journey to the River Sea
(Eva Ibbotson)

Prior Learning

- Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants)
- Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)
- Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans)
- Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans)
- Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)

Future learning

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats)
- Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)
- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. (Y6 - Living things and their habitats)
- Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)

Possible misconceptions

Some children may think:

- the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain
- there is always plenty of food for wild animals
- animals are only land-living creatures
- animals and plants can adapt to their habitats, however they change
- all changes to habitats are negative.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
How does the average temperature of the pond water change in each season? Does the amount of light affect how many woodlice move around?	Can we use the classification keys to identify all the animals that we caught pond dipping?	How does the variety of invertebrates on the school field change over the year?	How has the use of insecticides affected bee population?	Why are people cutting down the rainforests and what effect does that have?	How did Jane Goodall learn about the habits and behaviours of chimpanzees and why does she still need to work to protect their habitat?	• What food chains and webs are there in our local habitat? • How does energy move through the food chain? • How does removal of one species from an environment, affect others? (keystone species) • How does environmental change affect different organisms? • What are the most important things we could do to improve our outside area? (big hotels, pond, compost, wildflowers) • How does human activity affect our environment (ferries on the Solent? Sandown Airport? KFC?)
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries.	Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.						

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
Local environment study • Can children group living things in different ways?	Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. 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.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements • using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• using and making simple guides or keys to explore and identify local plants and animals • making a guide to local living things • raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched.

Activities	Possible evidence
• Observe plants and animals in different habitats throughout the year. • Compare and contrast the living things observed. • Use classification keys to name unknown living things. • Classify living things found in different habitats based on their features. • Create a simple identification key based on observable features. • Use fieldwork to explore human impact on the local environment e.g. litter, tree planting. • Use secondary sources to find out about how environments may naturally change. • Use secondary sources to find out about human impact, both positive and negative, on environments.	• Can name living things living in a range of habitats, giving the key features that helped them to identify them • Can give examples of how an environment may change both naturally and due to human impact • Can keep a careful record of living things found in different habitats throughout the year (diagrams, tally charts etc.) • Can use classification keys to identify unknown plants and animals • Can present their learning about changes to the environment in different ways e.g. campaign video, persuasive letter

Year 4 - Sound - ENERGY

National Curriculum objectives

- Identify how sounds are made, associating some of them with something vibrating.
- Recognise that vibrations from sounds travel through a medium to the ear.
- Find patterns between the pitch of a sound and features of the object that produced it.
- Find patterns between the volume of a sound and the strength of the vibrations that produced it.
- Recognise that sounds get fainter as the distance from the sound source increases.

Notes and guidance

- explore and identify the way sound is made through vibration in a range of different musical instruments from around the world
- find out how the pitch and volume of sounds can be changed in a variety of ways.

Sticky knowledge

- Sound travels from its source in all directions and we hear it when it travels to our ears.
- Sound travel can be blocked.
- Sound spreads out as it travels.
- Changing the shape, size and material of an object will change the sound it produces.
- Sound is produced when an object vibrates.
- Sound moves through all materials by making them vibrate.
- Changing the way an object vibrates changes its sound.
- Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds.
- Faster vibrations (higher frequencies) produce higher pitched sounds

A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but 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. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively.
Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.

Vocabulary

Amplitude, volume, quiet, faint, loud, ear, pitch, high, low, particles, instruments, wave, sound, source, vibrate, vibration, travel, insulation

Key scientists

Aristotle
(Sound Waves)

Gallileo Galilei
(Frequency and Pitch of Sound Waves)

Alexander Graham Bell
(Invented the Telephone)

Linked texts

Horrid Henry Rocks
(Francesca Simon)

Moonbird
(Joyce Dunbar)

The Pied Piper of Hamelin
(Natalia Vasquez)

Prior Learning

- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)

Future learning

- Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel - superposition. (KS3)
- Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3)
- Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3)
- Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3)
- Auditory range of humans and animals. (KS3)
- Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3)
- Waves transferring information for conversion to electrical signals by microphone. (KS3)

Possible misconceptions

Pitch and volume are frequently confused, as both can be described as high or low.
Some children may think:

- 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 load and low sounds are quiet.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
Which material is best to use for muffling sound in ear defenders? Are two ears better than one? How does the volume of a drum change as you move further away from it? How does the length of a guitar string/tuning fork affect the pitch of the sound? 	How would you group these instruments based on how they produce sound? How would you group these instruments based on how they change pitch or volume? 	When is our classroom the quietest? 	Is there a link between how loud it is in school and the time of day? If there is a pattern, is it the same in every area of the school? 	Do all animals have the same hearing range? 	How has our understanding and use of ultrasound changed over time? Since the 1800s, how has science helped people who are deaf?	How can you change the volume of a sound? • How does the size of an ear trumpet affect the volume of sound detected? • How does the type of material affect how well is blocks a sound? • How does thickness of material affect how well it blocks a sound? • Which materials vibrate better and produce louder sounds? Can we identify any patterns? • Which materials make the best string telephone components? (tin cans, paper cups, plastic cups, wire, cable, string, plastic or elastic - predict and test) • How does length of the tube (when making a straw oboe) affect the pitch and volume? • Can you predict the relative pitch of tuning forks from the patterns of ripples they make in the water?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.						

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
Investigating pitch • Can children suggest how to alter the pitch? • Can children carry out simple tests of these ideas? **String telephones** • Can children recognise that vibrations from sounds travel through a medium to the ear?	Recognise that vibrations from sounds travel through a medium to the ear.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements • using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. • make earmuffs from a variety of different materials to investigate which provides the best insulation against sound. • make and play their own instruments by using what they have found out about pitch and volume.

Activities	Possible evidence
• Classify sound sources. • Explore making sounds with a range of objects, such as musical instruments and other household objects. • Explore how string telephones or ear gongs work. • Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks. • Measure sounds over different distances. • Measure sounds through different insulation materials.	• Can name sound sources and state that sounds are produced by the vibration of the object • Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases • Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear • Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects • Can use data to identify patterns in pitch and volume

Year 4 - States of Matter - Where do ice cubes go when they disappear? Why does it rain and hail?

National Curriculum objectives

- compare and group materials together, according to whether they are solids, liquids or gases
- observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)
- identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Notes and guidance

- explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container).
- observe water as a solid, a liquid and a gas and note the changes to water when it is heated or cooled.
- Note: Teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning.

Sticky knowledge

• Solids, liquids and gases are described by observable properties.
• Materials can be divided into solids, liquids and gases.
• Heating causes solids to melt into liquids and liquids evaporate into gases. d) Cooling causes gases to condense into liquids and liquids to freeze into solids.
• The temperature at which given substances change state are always the same.

A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid.
Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0oC. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100oC. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling.
Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.

Vocabulary

Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, temperature, water cycle, particles, materials, properties, matter, water, ice, process, condensation, evaporation, water vapour, energy, precipitation, collection,

Key scientists

Anders Celsius (Celsius Temperature Scale)

Daniel Fahrenheit (Fahrenheit Temperature Scale / Invention of the Thermometer)

Linked texts

Once Upon a Raindrop: The Story of Water (James Carter)

Sticks (Diane Alber)

Prior Learning

- Distinguish between an object and the material from which it is made. (Y1 - Everyday materials)
- Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials)
- Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials)
- Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)
- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)

Future learning

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)
- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials)
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials)
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials)
- Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials)
- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. (Y5 - Properties and changes of materials)

Possible misconceptions

Some children may think:

- '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 made of very small particles like sugar or sand cannot be solids
- 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 (100 degrees)
- melting, as a change of state, is the same as dissolving
- steam is visible water vapour (only the condensing water droplets can be seen)
- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
How does the mass of a block of ice affect how long it takes to melt? How does the surface area of water affect how long it takes to evaporate? Does seawater evaporate faster than fresh water?	Can you group these materials and objects into solids, liquids, and gases? How would you sort these objects/materials based on their temperature?	Which material is best for keeping our hot chocolate warm? How does the level of water in a glass change when left on the windowsill?	Is there a pattern in how long it takes different sized ice lollies to melt? How does evaporation rate change as you add more salt to your water?	What are hurricanes, and why do they happen?	How have scientific tests for predicting the weather changed over time?	• How does the amount of water added to flour affect its state? • How does the amount of detergent added to water affect how slippery it is? • How does the temperature affect how viscous a liquid is (use cooking oil)? • Place a peach in a glass of lemonade and watch it spin. Why does it behave that way, and can you prove it? • How does the material sprinkled on ice and snow affect how quickly it melts? • What chocolate would be best to smuggle? How does the type of chocolate affect its melting temperature? • What is the melting temperature of ice and how does it compare with the freezing temperature of water? • Is the melting temperature of wax the same as its freezing temperature?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Linked TAPS Assessment	Other assessment ideas	Working scientifically	
Drying materials • Can children identify what is to be changed and what is to be kept the same? • Can children identify what to observe/measure to see if there is a difference? **Measuring temperature** • Can children use a thermometer to measure temperature accurately?	Rate of evaporation. Observe that some materials change state when they are heated or cooled. Observe that some materials change state when they are heated.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements • using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• grouping and classifying a variety of different materials • exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). • research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. • observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting.

Activities	Possible evidence
• Observe closely and classify a range of solids. Observe closely and classify a range of liquids. • Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. • Classify materials according to whether they are solids, liquids and gases. • Observe a range of materials melting e.g. ice, chocolate, butter. • Investigate how to melt ice more quickly. • Observe the changes when making rocky road cakes or ice-cream. • Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. • Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. • Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration). • Observe water evaporating and condensing e.g. on cups of icy water and hot water. • Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. • Use secondary sources to find out about the water cycle.	• Can give reasons to justify why something is a solid liquid or gas • Can give examples of things that melt/freeze and how their melting points vary • From their observations, can give the melting points of some materials • Using their data, can explain what affects how quickly a solid melts • Can measure temperatures using a thermometer • Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup • From their data, can explain how to speed up or slow down evaporation • Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet • Can create a concept map, including arrows linking the key vocabulary • Can name properties of solids, liquids and gases • Can give everyday examples of melting and freezing • Can give everyday examples of evaporation and condensation • Can describe the water cycle