Year 6 Science Curriculum

Living things and their habitats

Prior learning

Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats)
Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats)
Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats)
Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)

Common misconceptions

Some children may think:

- all micro-organisms are harmful
- mushrooms are plants.

Reading Opportunities

Beetle Boy - M G Leonard
Insect Soup - Barry Louis Polisar
Fur and Feathers - Janet Halfmann

Vocabulary

vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, warm-blooded, cold-blooded, insects, spiders, snails, worms, flowering, non-flowering, mosses, ferns, conifers

National curriculum principles	Knowledge and key vocabulary	Activities and working scientifically
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	Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other livings things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food whereas animals cannot. Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics. Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.	Research the work of Carl Linnaeus, who invented the classification system, and why it is important. Focus: asking questions Classify plants and animals, presenting this in Venn diagrams and Carroll diagrams. Focus: recording Use secondary sources to research the characteristics of animals that belong to each group. Focus: interpreting and communicating results Use information about the characteristics of an unknown animal or plant to assign it to a group e.g. duck billed platypus Focus: observation Create an imaginary animal which has features from one or more groups. Focus: evaluate why the animals should or should not belong to a particular group
Give reasons for classifying plants and animals based on specific characteristics.	Living things are classified to help us understand and organise them	Explain why living things are classified based on specific characteristics

Light

Prior learning:

Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light)
Notice that light is reflected from surfaces. (Y3 - Light)
Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light)
Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light)
Find patterns in the way that the size of shadows change. (Y3 - Light)
Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)

Common misconceptions

Some children may think:
• we see objects because light travels from our eyes to the object

Reading Opportunities

Letters from the Lighthouse - Emma Carroll
The Gruffalo's Child - Julia Donaldson
The King Who Banned the Dark - Emily Haworth-Booth

Vocabulary

As for Year 3 - Light, plus straight lines, light rays

Light

National curriculum principles	Knowledge and key vocabulary	Activities and working scientifically
Pupils should be taught to recognise that light appears to travel in straight lines	Light appears to travel in straight lines.	Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card. Focus: interpret and report
Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye	We see objects when light from them goes into our eyes	Use diagrams to explain how objects can be seen Focus: recording using diagrams
Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes	Light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen.	Can predict and explain, with diagrams or models as appropriate, how the path of light rays can be directed by reflection to be seen, e.g. the reflection in car rear view mirrors or in a periscope Focus: Recording using diagrams
Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them	Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.	Can predict and explain, with diagrams or models as appropriate, how the shape of shadows varies Focus: interpret and report 
		Predict and investigate how the size of shadows can change without changing the size of the shape Focus: Setting up enquiries 

Evolution and Inheritance

Prior learning:

Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. (Y2 - Living things and their habitats)
Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)
Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)
Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks)
Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats)
Describe the life process of reproduction in some plants and animals. (Living things and their habitats - Y5)

Common misconceptions

Some children may think:

- adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life
- offspring most resemble their parents of the same sex, so that sons look like fathers
- all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited
- cavemen and dinosaurs were alive at the same time.

Reading Opportunities

One Smart Fish - Christopher Wormell
The Molliebird - Jules Pottle
Our Family Tree - Lisa Westberg Peters
The Moth - Isabel Thomas and Daniel Egneus

Evolution and inheritance

National curriculum principles	Knowledge and key vocabulary	Activities and working scientifically
To know that fossils provide information about living things that inhabited the earth millions of years ago.	Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.	Observe different fossils using a magnifying glass and produce observational drawings Generate own questions about living things in the past, based on observations of fossils
To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents	All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other.	Match pictures of offspring to their parents. Design offspring for Mr Men and Little Miss and explain why they have specific characteristics.
To know how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution	Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die.	Study how different animals and plants have adapted to their environment. Eg hedgehog, African elephant, polar bear, cactus, Venus fly trap Design a new plant or animal to live in a specific habitat.
To recognise that living things have changed overtime	If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution.	Research how one animal has changed over time e.g. peppered moth, Galapagos finches Focus: interpret and report

Vocabulary

offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils, evolve, evolution

Animals inc humans

Prior learning:

Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)
Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)
Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans)
Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)

Common misconceptions

Some children may think:

- your heart is on the left side of your chest
- the heart makes blood
- the blood travels in one loop from the heart to the lungs and around the body
- when we exercise, our heart beats faster to work the muscles more
- some blood in our bodies is blue and some blood is red
- we just eat food for energy
- all fat is bad for you
- all dairy is good for you
- protein is good for you, so you can eat as much as you want
- foods only contain fat if you can see it
- all drugs are bad for you.

Reading Opportunities

Pig-Heart Boy - Malorie Blackman
Skellig – David Almond
A Heart Pumping Adventure – Heather Manley

Vocabulary

Animals inc humans

National curriculum principles	Knowledge and key vocabulary	Activities and working scientifically
Identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood.	The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system.	Ask questions about how the circulatory system works Use diagrams or models to explain the human circulatory system
Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well out heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE	Research how much sleep humans need at different ages. Observe pulse before and after exercis Investigate if boys have higher pulse rates than girls Evaluate the success of the enquiry
Describe the ways in which nutrients and water are transported within animals including humans	• red blood cells (red jelly beans) - transport oxygen • White blood cells (white marshmallows) - protect against disease • Platelets (rice)- repair cuts and clot blood • Plasma (cooking oil) - Liquid that carries cells and dissolved nutrients	Model the components of blood and explain how they help transport nutrients and water around the body.

Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle,

circulatory system, diet, exercise, drugs, lifestyle

Electricity

Prior Learning:
Identify common appliances that run on electricity. (Y4 - Electricity)
Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity)
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. (Y4 - Electricity)
Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity)
Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)

Common misconceptions
Some children may think:

- larger-sized batteries make bulbs brighter
- a complete circuit uses up electricity
- components in a circuit that are closer to the battery get more electricity

Reading Opportunities
Electrical Wizard: How Nikola Tesla Lit Up the World – Elizabeth Rusch
Goodnight Mister Tom – Michelle Magorian
Blackout – John Rocco
Hitler's Canary – Sandi Toksvig

Vocabulary
Circuit, complete circuit, circuit diagram, circuit symbol, battery, bulb, buzzer, motor, switch, voltage

Electricity

National curriculum principles	Knowledge and key vocabulary	Activities and working scientifically
Use recognised symbols when representing a simple circuit in a diagram	You can use recognised circuit symbols to draw simple circuit diagrams.	Identify whether a circuit drawn using symbols will work or not and explain why. Focus: recording using symbols
Pupils should be taught to associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit	Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens.	Plan a fair test to investigate how the brightness of a bulb is affected by different numbers of batteries or strength (voltage) of batteries. Focus: Asking questions and planning 
		Carry out a fair test to investigate how the loudness of a buzzer is affected by the number of batteries or the strength (voltage) of batteries. Focus: Setting up tests 
		Evaluate the success of the fair test carried out. 
		Research work of Michael Faraday Focus: Explain results of research 
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	Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well.	Explore and explain the impact of varying the number of components in a circuit Focus: explaining results
		Children to make a circuit/product for a specific purpose eg model of a lighthouse, burglar alarm. Focus: Asking questions and planning 

N.B. Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words “cells” and “batteries” are now used interchangeably.

Working Scientifically in Year 5 and 6

Asking Questions
Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work

Observation and Measurement
The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).

Setting up and carrying out practical work
Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary . The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long.

Recording
The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. Children present the same data in different ways in order to help with answering the question.

Interpreting
Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. They talk about how their scientific ideas change due to new evidence that they have gathered. They talk about how new discoveries change scientific understanding.

Evaluating
Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used. They identify any limitations that reduce the trust they have in their data. Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests

Working Scientifically Skills

Science Enquiry Types

- Comparative and fair testing
- Research
- Observation over time
- Pattern seeking
- Identifying and classifying
- Problem solving