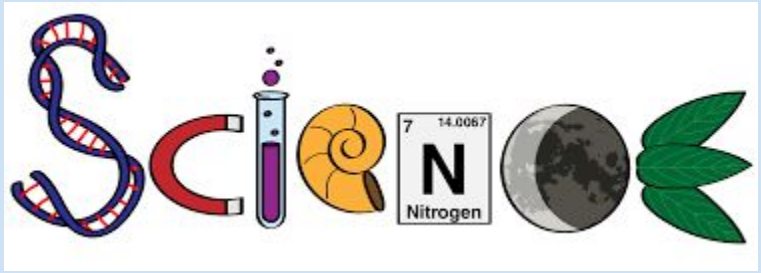

Year 6

Year 6 • Animals Including Humans

Unit overview

KEY KNOWLEDGE

Name the main parts of the human circulatory system. Describe the functions of the heart (structure), blood vessels (artery, vein & capillaries) & blood (components). Understand & describe the double circulatory system of humans (Big-Picture Model – using the parts above) to describe the way water, nutrients & oxygen are transported in animals
Know the impact of diet, exercise, drugs & lifestyle on the way our bodies function

KEY VOCABULARY

Circulation (circulatory), heart, atrium (atria), ventricle (ventricles), valve, vessel, artery, vein, capillary, blood, red blood cell, white blood cell, platelets, plasma, lungs, oxygen, oxygenated, deoxygenated, carbon dioxide, nutrients, obesity, exchange, exercise, pulse, recovery time, drugs (various), variable, cause, effect, independent variable, dependent variable, controlled variable, data range, data interval, repetition, reliability, risk, relationship prediction, hypothesis, method, precision, error.

PRIOR LEARNING

Needs – food, air / exercise / hygiene (Animals Yr2) Processes of life – respiration, nutrition, excretion (Living Yr2) Digestive system organs and function – absorption in small intestine; muscles need oxygen (energy) (Animals Yr3) Nutrition from food; food types (energy); uses (Animals Yr3) Solids, liquids & gases; changes (States of matter Yr4) Dissolve to form solutions; mixtures; reactions (Materials Yr5)

DISCIPLINARY KNOWLEDGE & SKILLS

Identify the main human organs and describe key functions of the heart and lungs. • Identify the main components of blood and describe their functions in transport and defence. • Describe arteries, veins and capillaries and explain how the heart pumps blood around the body. • Describe the heart's chambers, valves and double circulatory system. • Investigate pulse and recovery rate and explain why heart rate changes during exercise. • Explain how diet, exercise, drugs and lifestyle affect body function and health.

ENQUIRY TYPES

Researching

SCIENTISTS / STEM LINKS

William Harvey (1578-1657) English doctor that used dissection to discover that blood circulates in the body and is pushed by the heart. He also describes the action of heart chambers and valves. Reverend Stephen Hales (1677-1761) English curate that attached long glass tubes to arteries in live horses. He observed blood pulsing up the tube and discovered blood pressure. Richard Lower (1631-1691) English doctor who was the first to develop blood transfusions (used sheep blood). He also was the first to suggest blood carried 'nitrous spirit' around the body (later oxygen).

WHY THIS? WHY NOW?

Builds on nutrition, digestion, muscles and healthy lifestyles from Years 2–5. Pupils now connect the heart, blood vessels, blood and lungs in a double-circulation model and investigate exercise/lifestyle. This prepares for KS3 organ systems and respiration.

CAREERS LINK

Cardiologist • Biomedical scientist • Paramedic • Sports physiologist
Gatsby: BM4 — connect circulation to health science; BM5 — encounter a healthcare professional; BM6 — explore hospital, ambulance or sports-science workplaces.C

Year 6 • Animals Including Humans

Learning sequence • knowledge, disciplinary skills and enquiry

Learning objectives / key knowledge	Disciplinary knowledge / skills	Enquiry opportunities	Enquiry type
Where are our body organs and what do they do?	Identify the main human organs and describe key functions of the heart and lungs.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	Researching
Why do we have blood?	Identify the main components of blood and describe their functions in transport and defence.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How does blood get around our body?	Describe arteries, veins and capillaries and explain how the heart pumps blood around the body.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
Why do we have two sides to our heart?	Describe the heart's chambers, valves and double circulatory system.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
What happens when we exercise?	Investigate pulse and recovery rate and explain why heart rate changes during exercise.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How can we help our body to work?	Explain how diet, exercise, drugs and lifestyle affect body function and health.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	

Year 6 • Electricity

Unit overview

KEY KNOWLEDGE

Confidently draw a range of series circuits using symbols. Link the brightness of a bulb / volume of a buzzer to the number & Voltage of cells used in the battery. Measure Voltage. Explain changes in brightness / volume using the Energy Transfer Model (link to Voltage). Explain the action of a switch. Begin to explain component 'failure' by resistance to electrical flow (energy transfer out of the circuit as heat energy). Begin to describe electrical flow as Current.

KEY VOCABULARY

Electric (electricity), source, energy, transfer, Voltage, flow, Current, resistance, insulator, conductor, closed / open circuits, series, cell, battery, positive, negative, wire, bulb, buzzer, motor, switch, clip, metal, light energy, sound energy, heat energy, kinetic energy, Voltmeter,
variable, cause, effect, independent variable, dependent variable, controlled variable, data range, data interval, repetition, reliability, risk, relationship prediction, hypothesis, method, precision, error.

PRIOR LEARNING

Identify electric dangers & stay safe (Circuits; yr2) Construct a wide range of series circuits (Electricity; yrs 2/4) Identify and draw components (Electricity; yrs 2/4) Knows a switch 'opens' and 'closes' a circuit (Electricity; yr4) Recognises and solves simple errors in circuits (Electricity; yr4) Electrical insulators/conductors (Electricity yr4; Materials yr5) Energy is transferred (Light yr3; Sound yr4; Electricity yr4)

DISCIPLINARY KNOWLEDGE & SKILLS

Construct and represent series circuits using recognised circuit symbols and safe working practices. • Use a voltmeter to measure voltage and relate voltage to energy transfer. • Investigate how changing the number or voltage of cells affects component output. • Investigate how the number and type of components affect brightness, volume or movement. • Begin to explain resistance as opposition to electrical flow and energy transfer as heat. • Explain how switches open and close circuits and apply circuit knowledge to solve problems.

ENQUIRY TYPES

Researching

CAREERS LINK

Electrical engineer • Electronics engineer • Renewable-energy engineer • Electrician Gatsby: BM4 — connect circuit variables to engineering; BM5 — encounter an electrical professional; BM6 — explore energy, electronics or engineering workplaces.

SCIENTISTS / STEM LINKS

Nikola Tesla (1856-1943) Serbian-American inventor who developed AC current as a safe way to conduct electricity over long distances. George Westinghouse later developed this into the Power Grid. Georg Ohm (1789-1854) German scientist who discovered the relationship between voltage, current and resistance in a circuit. He developed Ohm's Law and the unit of resistance is named after him. Michael Faraday (1791-1867) English scientist recognised as the father of electricity and one of the greatest ever scientists. Discovered electromagnetism. Einstein had a picture of him on his study wall.

WHY THIS? WHY NOW?

Builds on Year 4 series circuits, components, conductors and switches. Pupils now investigate how voltage/cell number and components affect circuit behaviour and represent circuits accurately. This prepares for KS3 electricity and electrical engineering.

Year 6 • Electricity

Learning sequence • knowledge, disciplinary skills and enquiry

Learning objectives / key knowledge	Disciplinary knowledge / skills	Enquiry opportunities	Enquiry type
Can you build working circuits safely?	Construct and represent series circuits using recognised circuit symbols and safe working practices.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	Researching
How can we measure electrical energy transfer in a circuit?	Use a voltmeter to measure voltage and relate voltage to energy transfer.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
Can you investigate series circuits?	Investigate how changing the number or voltage of cells affects component output.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How do components affect a series circuit?	Investigate how the number and type of components affect brightness, volume or movement.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
What is electrical resistance?	Begin to explain resistance as opposition to electrical flow and energy transfer as heat.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How do switches control circuits?	Explain how switches open and close circuits and apply circuit knowledge to solve problems.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	

Year 6 • Evolution and Inheritance

Unit overview

KEY KNOWLEDGE

Living things can produce identical offspring (asexual) but sexual reproduction results in offspring that, although share inherited features, may vary (not identical) from their parents. Know some inherited features. This variation means that some individuals will have features better suited to a changing environment. These better features will be selected for by nature, and so, individuals that have them are more likely to survive. Natural selection is the process where species adapt to their environment. It is the engine that drives evolution. Know how some species are adapted Fossil evidence shows how living things have changed over time

KEY VOCABULARY

Inherit (inheritance), variation, asexual, sexual, reproduction, sperm, egg, cell, nucleus, gene, characteristic, feature, trait, environment, parent, offspring, selection (selected), adapt (adaptation), species, evolution, fossil, extinct (extinction), survival, table of results, cause, effect, repeats, bar chart, bar, coordinate, graph, data point, extrapolate, scale, plot, mean, trend line, linear, non-linear.

PRIOR LEARNING

Plant life cycle and reproduction; fertilisation (Plants Yr3) Fossil formation & timelines (Rocks Yr3) Biodiversity, environmental pressure, adaptation (Living Yr4) Human life cycle; puberty, gametes & fertilisation (Animals Yr5) Life cycles; (a)sexual reproduction, adaptation (Living Yr5) Classification system; inherited features; species (Living Yr6) Species diversity & idea of evolution (Living Things Yr4/5/6)

DISCIPLINARY KNOWLEDGE & SKILLS

Explain inheritance as the passing of genetic features from parents to offspring through sexual reproduction. • Describe variation within a species and distinguish inherited and environmental influences. • Explain how variation can affect survival when environments change. • Explain natural selection as the process through which populations become adapted over generations. • Identify and explain adaptations that help organisms survive in particular environments. • Use fossil evidence to explain how living things have changed over long periods of time.

ENQUIRY TYPES

Researching

SCIENTISTS / STEM LINKS

Mary Anning (1799-1847) English fossil collector and scientist. Her discoveries in Dorset changed ideas about prehistoric life and the history of the earth. Charles Darwin (1809-1882) English scientist developed the theory of natural selection as a driver for evolution. One of the most influential scientists in history. He built his theory from the work of others. Alfred Russell Wallace (1823-1913) Welsh scientist

WHY THIS? WHY NOW?

Builds on Year 3 fossils and Year 4/5 habitats, classification and life cycles. Pupils now explain inheritance, variation, adaptation, natural selection and evolution over time. This synthesises biological learning and prepares directly for KS3 genetics and evolution.

CAREERS LINK

Evolutionary biologist • Geneticist • Palaeontologist • Conservation scientist
Gatsby: BM4 — connect evidence and variation to biological careers; BM5 — encounter a scientist; BM6 — explore museum, university or conservation workplaces.

Year 6 • Evolution and Inheritance

Learning sequence • knowledge, disciplinary skills and enquiry

Learning objectives / key knowledge	Disciplinary knowledge / skills	Enquiry opportunities	Enquiry type
How do we inherit our features?	Explain inheritance as the passing of genetic features from parents to offspring through sexual reproduction.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	Researching
How are we different? How are we the same?	Describe variation within a species and distinguish inherited and environmental influences.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
Why is variation so important?	Explain how variation can affect survival when environments change.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
What is evolution?	Explain natural selection as the process through which populations become adapted over generations.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How are living things adapted?	Identify and explain adaptations that help organisms survive in particular environments.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
What evidence do fossils provide?	Use fossil evidence to explain how living things have changed over long periods of time.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	

Year 6 • Light

Unit overview

KEY KNOWLEDGE

Light travels in straight lines from a light source (Energy Transfer Model) directly, reflects, goes through a material or is absorbed. Light travels in straight lines from a light source directly into the eye (represent this using a light ray diagram) Light travels in straight lines from a light source to an object and reflected into the eye (represent using a light ray diagram) Know the angle of incidence is equal to the angle of reflection.
Explain the size and shape of a shadow knowing that light travels In straight lines (represent using a light ray diagram)

KEY VOCABULARY

Light, source, energy, transfer, reflection (reflected), transmits (transmitted), absorbs (absorbed), shiny, dull, mirror, transparent, translucent, opaque, ray, eye, receptor, shadow, angle, incidence, perpendicular, pattern, data, primary data, secondary data, trend, relationship, conclusion, valid (validity), limitation.

PRIOR LEARNING

Identify light sources (natural & man-made) (Light Yr1/3) Describes path/transfer of light energy (Model) (Light Yr3) Reflected light energy (shiny/dull). Transmitted (transparent, translucent & opaque) (Materials Yr1/2/5, Light Yr1/3) Sun across the sky. Day-length (Seasons/Light Yr1, Space Yr5) Opaque materials form shadows. Absence of transmitted light energy. Can change length & size of a shadow (Light 1/3).

DISCIPLINARY KNOWLEDGE & SKILLS

Explain that light travels in straight lines from a source and represent this with light-ray diagrams. • Explain reflection and show light travelling from a source to an object and then to the eye. • Compare transparent, translucent and opaque materials in terms of transmitted light. • Explain that materials can absorb light energy and investigate patterns in absorption. • Investigate and explain that the angle of incidence equals the angle of reflection. • Explain shadow size and shape using straight-line travel of light and ray diagrams.

ENQUIRY TYPES

Researching

CAREERS LINK

Optical engineer • Physicist • Ophthalmologist • Lighting designer
Gatsby: BM4 — connect ray models to optics careers; BM5 — encounter an optics/physics professional; BM6 — explore optical, medical or creative-lighting workplaces.

SCIENTISTS / STEM LINKS

Isaac Newton (1643-1727) English scientist that proposed that light was made out of tiny ‘particles’ and used shadows as evidence. He was one of our greatest every scientists. Christiaan Huygens (1629-1695) Dutch scientists. Said light spread out in all directions from a source. Described light as a ‘wave’ of energy. Thomas Young later said colour was due to wavelength. Albert Einstein (1879-1955) German-born scientist who proposed light was neither a particle nor a wave, but a ‘photon’ of energy. Developed theory of relativity that the speed of light is independent.

WHY THIS? WHY NOW?

Builds on Year 3 light and shadows. Pupils now use a light-ray model to explain straight-line travel, seeing, reflection and shadow formation more precisely. This prepares for KS3 optics and increasingly mathematical physics.

Year 6 • Light

Learning sequence • knowledge, disciplinary skills and enquiry

Learning objectives / key knowledge	Disciplinary knowledge / skills	Enquiry opportunities	Enquiry type
How does light travel? Direct light.	Explain that light travels in straight lines from a source and represent this with light-ray diagrams.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	Researching
How does light travel? Reflected light.	Explain reflection and show light travelling from a source to an object and then to the eye.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How does light travel? Transmitted light.	Compare transparent, translucent and opaque materials in terms of transmitted light.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How does light travel? Absorbed light.	Explain that materials can absorb light energy and investigate patterns in absorption.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
What happens when light reflects?	Investigate and explain that the angle of incidence equals the angle of reflection.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How are shadows formed and changed?	Explain shadow size and shape using straight-line travel of light and ray diagrams.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	

Year 6 • Living Things and their Habitats

Unit overview

KEY KNOWLEDGE

Living things are classified into broad groups according to observable features (binomial naming system). Reasons for classifying. There are five Kingdoms of living things. Know the binomial naming
System. Can use & construct classification Keys. Know how to sample a habitat for species diversity (biodiversity). Measure species richness, abundance & evenness. Measure abiotic factors over time. Manage/plan change to encourage biodiversity. Micro-organisms include bacteria and fungi.

KEY VOCABULARY

Classification, taxonomy, characteristic, diversity, variation, Kingdom, phylum, class, order, family, genus, species, binomial, animal, plant, fungi, Protista (single-celled), Monera (bacteria), virus, vertebrate, invertebrate, agar, sort, group, re-group, classify, criteria, spider key, number key, variable, cause, effect, independent variable, dependent variable, controlled variable, data range, data interval, repetition, reliable, risk, relationship prediction, hypothesis, method, precision, error.

PRIOR LEARNING

Identify local plants & animals by sight (Plants; Animals Yr1/4) Grouping & use of keys to identify (Living things Yr4) Define/identify carnivore, herbivore & omnivore (Animals Yr1) Requirements for plant/animal growth (Plants; Animals Yr2/3) Life cycle of plants & animals (Plants; Animals Yr2/3/5) Describe habitats & micro-habitats (Living things Yr2) Food chains (transfer food/energy) (Living Yr2; Animals Yr4) Measure & change biodiversity (random sampling) (Living Yr4)

DISCIPLINARY KNOWLEDGE & SKILLS

Use and construct increasingly complex classification keys to identify living things. • Describe the five kingdoms and recognise fungi, Protista and Monera as living groups. • Investigate micro-organisms safely and recognise bacteria and fungi as micro-organisms. • Explain the hierarchy of classification and use the binomial naming system. • Sample habitats and calculate species richness, abundance and evenness. • Use evidence from sampling and abiotic factors to plan changes that encourage biodiversity.

ENQUIRY TYPES

Researching; Classification

SCIENTISTS / STEM LINKS

Carl Linnaeus (1707-1778) Swedish scientist developed the binomial classification system that is still used today. He used observable characteristics to order living things into increasingly similar groups. Robert Whittaker (1920-1980) American scientist that divided living things into five kingdoms 1969. These were then sub-divided using the Linnaean system but also included evolutionary links. Sandra Myrna Diaz (1961-) Argentinian scientist who is in the top 1% cited scientists in the world. She was one of the first to describe the effect of environmental change on biodiversity and ecosystems.

WHY THIS? WHY NOW?

Builds on Year 4 classification keys and Year 5 life cycles. Pupils now classify organisms using more detailed characteristics, including microorganisms, and justify classification decisions. This prepares for KS3 taxonomy, cells, ecosystems and biodiversity.

CAREERS LINK

Microbiologist • Taxonomist • Ecologist • Biomedical scientist
Gatsby: BM4 — connect classification to laboratory/environmental careers; BM5 — encounter a biologist; BM6 — explore a lab, museum or conservation workplace.

Year 6 • Living Things and their Habitats

Learning sequence • knowledge, disciplinary skills and enquiry

Learning objectives / key knowledge	Disciplinary knowledge / skills	Enquiry opportunities	Enquiry type
Can you group animals and plants by observable features?	Use and construct increasingly complex classification keys to identify living things.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	Researching; Classification
Are animals and plants the only living things in this world?	Describe the five kingdoms and recognise fungi, Protista and Monera as living groups.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
Can we grow micro-organisms?	Investigate micro-organisms safely and recognise bacteria and fungi as micro-organisms.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
What is a binomial name?	Explain the hierarchy of classification and use the binomial naming system.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How can we measure biodiversity?	Sample habitats and calculate species richness, abundance and evenness.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	
How can we improve biodiversity?	Use evidence from sampling and abiotic factors to plan changes that encourage biodiversity.	Use increasingly precise scientific vocabulary/models; plan, measure, record, analyse and explain using evidence as appropriate.	