Science

Progression of knowledge, skills and understanding: Key Stage 2

Working Scientifically **Class 3**	**Working Scientifically** **Class 4**	**Working Scientifically** **Class 5**
Ask relevant questions. Set up simple practical enquiries and comparative and fair tests. Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers. Gather, record, classify and present data in a variety of ways to help in answering questions. Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables. Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. Use results to draw simple conclusions and suggest improvements, new questions, and predictions for setting up further tests. Identify differences, similarities or changes related to simple, scientific ideas and processes. Use straightforward, scientific evidence to answer questions, or to support my findings.	Ask relevant questions, using different types of scientific enquiries to answer them. Use appropriate techniques, apparatus and materials during fieldwork and laboratory work. Make systematic and careful observations and, where appropriate, take measurements, using a range of scientific equipment. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs. Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions. Use test results to make predictions to set up further comparative and fair tests. Simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas.	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Use appropriate techniques, apparatus and materials during fieldwork and laboratory work. Take measurements, using a range of scientific equipment, with increasing accuracy and precision. Record data and results choosing the most effective approach to record and report results. Report findings from enquiries, identifying validity of conclusion and required improvement to methodology. Use test results to make predictions to set up further comparative and fair tests. Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments.

Autumn 1	**Autumn 1**	**Autumn 1**
Physics: Forces and Magnets (Y3) Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract or repel each other and attract some materials and not others. Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet and identify some magnetic materials. Describe magnets as having two poles.	**Chemistry: Properties and Changes of Materials (Y5)** 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. Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Demonstrate that dissolving, mixing and changes of state are reversible changes. 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.	**Physics: Electricity (Y6)** Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. Use recognised symbols when representing a simple circuit in a diagram.
VOCAB: *attract, friction, bendy, force, gravity, magnet, magnetic, magnetic field, metal, motion, non-magnetic, poles, repel, opposite, position, pull, push, resistance, surface*	***VOCAB:*** *materials, condensation, dissolves, electricity, evaporating, freezing, filtering, flexible, gas, insoluble, insulator, conductor, irreversible, liquid, magnetic, melting, particles, permeable, process, properties, rate, resistance, reversible, solid, soluble, solution, state, temperature, thermal, transparent, variable*	***VOCAB:*** *ammeter, appliances, amps, battery, bulb, buzzer, cell, circuit, component, conductor, current, device, electricity, energy, fuel, generate, insulator, mains, motor, power, resistance, resistor, source, switch, symbol, voltage, wires*
Scientist **- The Wright Brothers** - Airplanes (Year A/C) **Henry Ford**- Cars (Year B/D)	***Scientist*** **- Sir Humphrey Davy-** Separating gases (Year A/C) **Becky Schroeder** – fluorescent material (Year B/D)	***Scientist*** **– Alessandro Volta**- Electrical battery (Year A/C) **Edith Clarke** – Electrical Engineer (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the mass of an object affect how much force is needed to make it move? Which magnet is strongest? Which surface is best to stop you slipping?	Which materials are magnetic?	If we magnetise a pin, how long does it stay magnetised for?	Do magnetic materials always conduct electricity? Does the size and shape of a magnet affect how strong it is?	How have our ideas about forces changed over time? How does a compass work?

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the temperature of tea affect how long it takes for a sugar cube to dissolve? Which type of sugar dissolves the fastest? Which material rusts fastest/ slowest? How can we change the 'jelly-ness' of jelly?	Can you group these materials based on whether they are transparent or not? Can you identify and classify these reactions and changes into reversible and irreversible? Can you describe their groups similarities and differences?	How does a container of saltwater change over time? How does a sugar cube change as it is put into a glass of water? How does a nail in saltwater change over time?	Do all stretchy materials stretch in the same way? How does temperature affect how much solute we can dissolve? What patterns can you notice in different reactions? How does the amount of bicarbonate of soda, washing up liquid and vinegar affect the reaction?	What are microplastics and why are they harming the planet? What are smart materials and how can they help us?

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
How does the voltage of the batteries in a circuit affect the brightness of the lamp? How does the voltage of the batteries in a circuit affect the volume of the buzzer? Which make of battery lasts the longest?	How would you group electrical components and appliances based on what electricity makes them do?	How does brightness of bulb change as the battery runs out? How can we measure how quickly a battery is used up?	Does the temperature of a light bulb go up the longer it is on?
Research			
How has our understanding of electricity changed over time?			

Autumn 2

Physics: States of Matter (Y4)

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.

VOCAB: *condensation, cooling, evaporation, freezing, freezing point, gas, heating, liquid, melting point, particles, precipitation, process, properties, solid, temperature, vibrations,*
water cycle, water vapour

***Scientist* – Lord Kelvin** – Absolute Zero temperature (Year A/C)
Daniel Fahrenheit - Temperature Scale / Invention of the Thermometer (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
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	Can you group these materials and objects into solids, liquids, and gases?	Which material is best for keeping our hot chocolate warm? How does the level of water in a glass change when it is	Is there a pattern in how long it takes different sized ice lollies to melt? How does evaporation rate change as you add	What are hurricanes and why do they happen?

Autumn 2

Physics: Electricity (Y4)

Identify common appliances that run on electricity.

Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.

Identify whether 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.

VOCAB: *appliances, battery, bulb, buzzer, cell, circuit, component, conductor, current, device, electricity, energy, fuel, generate, insulator, mains, motor, power, source, switch, wires*

***Scientist* – Michael Faraday** – Discovered relationship between magnets and electricity (Year A/C)
Thomas Edison – Light bulb (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the thickness of a conducting material affect how bright the lamp is? Which metal is the best conductor of electricity?	How would you group these electrical devices based on where the electricity comes from?	How long does a battery light a torch for?	Which room has the most electrical sockets in a house?	How has electricity changed the way we live?

Autumn 2

Physics: Forces (Y5)

Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.

Identify the effects of air resistance, water resistance and friction that act between moving surfaces.

Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.

VOCAB: *accelerate, air resistance, friction, fulcrum, gear, gravity, lever, mass, magnetism, mechanism*

***Scientist* – Isaac Newton** – Gravity (Year A/C)
Albert Einstein – The theory of relativity (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
How does the angle of launch affect how far a paper rocket will go? How does the surface area of an object affect the time it takes to sink?	Can you label and name all the forces acting on the objects in each of these situations?	How long does a pendulum swing for before it stops?	Do all objects fall through water in the same way? How does surface area of parachute affect the time it takes to fall?
Research			
How do submarines sink if they are full of air?			

takes to evaporate?		left on the windowsill?	more salt to your water?	

Spring 1

Physics: Light (Y3)

Recognise that we need light in order to see things and that dark is the absence of light.

I can notice that light is reflected from surfaces.

Recognise that light from the sun can be dangerous and that there are ways to protect our eyes.

Recognise that shadows are formed when the light from a light source is blocked by an opaque object.

Find patterns in the way the size of shadows change.

VOCAB: *angle, bright, chemical reactions, dark, dim, electricity, emits, light, mirror, opaque, product, reflects, shadows, source, sunglasses, surface, torches, translucent, transparent*

***Scientist* – Justus Von Liebig** – Mirrors (Year A/C)
James Clerk Maxwell – Visible and invisible waves of light (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the distance between the	How would you	When is our classroom darkest?	Are you more likely to have bad	How does the Sun make light?

Spring 1

Biology: Animals Including Humans (Y4)

Describe the simple functions of the basic parts of the digestive system in humans.

Identify the different types of teeth in humans and their simple functions.

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

VOCAB: *absorb, canine, carnivore, decay, digestion, enamel, excretion, faeces, herbivore, incisor, ingested, intestines, molar, muscles, nutrition, oesophagus, omnivore, organ, plaque, premolar, process, saliva, stomach*

***Scientist* – Ivan Pavlov**– Digestive system mechanism (Year A/C)
Washington & Lucius Sheffield – Toothpaste in a tube (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
In our class, are omnivores	What are the names	How does an eggshell change when	Are foods that are high in	How do dentists fix

Spring 1

Biology: Animals Including Humans (Y6)

Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.

Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.

Describe the ways in which nutrients and water are transported within animals, including humans.

VOCAB: *aorta, arteries, blood vessels, capillaries, carbon dioxide, circulatory system, deoxygenated, heart, lungs, nutrients, organ, oxygen, oxygenated, pulse, respiration, vein, vena cava, via*

***Scientist* – Dr. Katherine Dibb**– Expert in cardiovascular services (Year A/C)
Sir Richard Doll – Linking smoking and health problems (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
How does the length of time we exercise for	Which organs of the body	How does my heart rate	Is there a pattern between

shadow puppet and the screen affect the size of the shadow? Which pair of sunglasses will be best at protecting our eyes?	organise these light sources into natural and artificial sources?		eyesight and to wear glasses if you are older?			taller than vegetarians?	for all the organs involved in the digestive system? How can we organise teeth into groups?	it is left in cola?	energy always high in sugar?	broken teeth?		affect our heart rate? Can exercising regularly affect your lung capacity?	make up the circulation system, and where are they found?	change over the day? How much exercise do I do in a week?	what we eat for breakfast and how fast we can run?
												Research			
												How have our ideas about disease and medicine changed over time?			

Spring 2

Biology: Plants (Y3)

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.

Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.

Investigate the way in which water is transported within plants.

Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

VOCAB: *absorb, anther, branches, bulb, carbon dioxide, climate zone, common, deciduous, dispersed, dissect, evergreen, fertilisation, fertiliser, flower, flowering, fruit, function, garden, germination, healthy, leaf/leaves, life cycle, mature, nutrients, ovule, petal, pollen, pollination, roots, seed, stem, stigma, structure, temperature, tree, trunk, vegetation, wild*

***Scientist* – Joseph Banks** – Botanist (Year A/C)
Ahmed Mumin Warfa- Botanist (Year B/D)

Spring 2

Biology: Animals Including Humans (Y5)

Describe the changes as humans develop to old age.

VOCAB: *adolescence, adulthood, development, foetus, genitals, gestation, growth, hormones, independent, infancy, life cycle, life processes, mature, offspring, organ, puberty, rapid, reproduction, toddler, vertebrate*

***Scientist* – Virginia Apgar** – Obstetrical anaesthesiologist (Year A/C)
Louis Pasteur – Vaccination (Year B/D)

Spring 2

Biology: Evolution and Inheritance (Y6)

Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.

Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

VOCAB: *adaptation, ancestor, biodiversity, biome, breeding, characteristics, environment, evolution, extinct, fossil, generation, inherit, maladaptation, mutation, natural selection, offspring, palaeontology, reproduction, species, survive, theory, variation*

***Scientist* – Professor Alice Roberts** – Evolutionary biologist (Year A/C)
Charles Darwin – Evolution (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals? Which conditions help seeds germinate faster?	How many ways can you group our seed collection?	What happens to celery when it is left in a glass of coloured water?	What colour flowers do pollinating insects prefer?	What are all the different ways that seeds disperse?

Summer 1

Biology: Animals Including Humans (Y3)

Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does age affect a human's reaction time? Who grows the fastest, girls or boys?	Can you identify all the stages in the human life cycle?	How do different animal embryos change?	Is there a relationship between a mammal's size and its gestation period?	Why do people get grey/ white hair when they get older?

Summer 1

Biology: Living Things and Their Habitats (Y4)

Recognise that living things can be grouped in a variety of ways.

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
What is the most common eye colour in our class?	Compare the skeletons of apes, humans, and Neanderthals – how are they similar, and how are they different? Can you classify these observations into evidence for the ides of evolution, and evidence against?	How has the skeleton of the horse changed over time?	Is there a pattern between the size and shape of a bird's beak and the food it will eat?
Research			
What happened when Charles Darwin visited the Galapagos islands? What ideas did American geneticist Barbara McClintock have about genes that won her a Nobel Prize?			

Summer 1

Biology: Living Things and Their Habitats (Y6)

Describe how living things are classified into broad groups according to common observable characteristics and based on

Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	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. **Living Things and Their Habitats (Y5)** Describe the differences in the life cycles of a mammal, an amphibian, an insect, and a bird. Describe the life process of reproduction in some plants and animals.	similarities and differences, including microorganisms, plants and animals. Give reasons for classifying plants and animals based on specific characteristics. **Physics: Earth and Space (Y5)** Describe the movement of the Earth and other planets relative to the sun in the solar system. Describe the movement of the moon relative to the Earth. Describe the sun, Earth and moon as approximately spherical bodies. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
VOCAB: *backbone, bones, contract, elbow, endoskeleton, joints, muscles, organs, protect, relax, skeleton, support, tendons, vertebrate*	***VOCAB:*** *biomes, carnivore, classification key, criteria, deciduous, environment, evergreen, excretion, food chain, habitat, herbivore, invertebrate, life processes, microhabitat, minibeast, nutrition, omnivore, organism, reproduction, respiration, sensitivity, urban, vegetation, vertebrate* ***Y5*** *– anther, bulb, cell, dispersed, dissect, embryo, fertilisation, flower, flowering, function, gamete, germination, life cycle, mature, metamorphosis, ovary, ovule, petal, plant, pollen, pollination, reproduction, seed, stigma, structure*	***VOCAB:*** *micro-organisms, animal, plants, classification, classify animals, invertebrates, vertebrates, fish, amphibians, reptiles, birds, mammals, Carl Linnaeus* ***Y5*** *- asteroid, axis, comet, galaxy, gravity, leap year, meteorite, orbit, planet, shadow, Solar System, sphere, spin, star, time zones, universe*
***Scientist* – Marie Curie** – Radiation (Year A/C) **Wilhelm Rontgen**– Xrays (Year B/D)	***Scientist – Sir David Attenborough*** – Animal Behaviourist (Year A/C) **Joan Beauchamp Procter** – Zoologist (Year B/D) ***Y5* – Jane Goodall –** Naturalist (Year A/C) **Dr. Paula Kahumbu** – Wildlife Conservationist (Year B/D)	***Scientist* – Libby Hyman** – Classification Invertebrates (Year A/C) **Carl Linnaeus** – Classification (Year B/D) ***Y5* – Stephen Hawking –** Black holes (Year A/C) **Margaret Hamilton** – Computer scientist – Moon landings (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the angle that your elbow/knee is bent affect the circumference of your upper arm/thigh? How does the skull circumference of a girl compare with that of a boy?	How do the skeletons of different animals compare?	How does our skeleton change over time? (From birth to death)	Do male humans have larger skulls than female humans?	Why do different types of vitamins keep us healthy and which foods can we find them in?

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
Does the amount of light affect how many woodlice move around? How does the average temperature of the pond water change in each season?	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 the bee population?	Why are people cutting down the rainforests?

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the level of salt affect how quickly brine shrimp hatch?	Compare this collection of animals based on similarities and differences in their life cycle.	How do brine shrimp change over their lifetime? How does a bean change as it germinates?	Is there a relationship between number of petals and number of stamens?	What are the differences between the life cycle of an insect and a mammal?

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
Which is the most common invertebrate on our school playing field?	How would you make a classification key for vertebrates/ invertebrates or 9microorganism?	What happens to a piece of bread if you leave it on the windowsill for two weeks?	Do all flowers have the same number of petals?
Research			
What do different types of microorganisms do? Are they always harmful?			

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
How does the length of daylight hours change in each season?	How could you organise all the objects in the solar system into groups?	Can you observe and identify all the phases in the cycle of the Moon?	Is there a pattern between the size of a planet and the time it takes to travel around the Sun?
Research			
What unusual objects did Jocelyn Bell Burnell discover? How do astronomers know what stars are made of? How have our ideas about the solar system changed over time?			

Summer 2

Chemistry: Rocks (Y3)

Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.

Describe in simple terms how fossils are formed when things that have lived are trapped within rock.

Recognise that soils are made from rocks and organic matter.

VOCAB: *absorb, bedrock, decaying, grain, igneous, imprint, leaf litter, magma, manmade, metamorphic, mineral, molten, natural, nutrients, palaeontology, permeable, porous, prehistoric, preserve, pressure, properties, rock, sediment, soil, surface, surrounding, volcano, weathered*

***Scientist* – Mary Anning** – Fossil hunter (Year A/C)
Katia Krafft – Geologist and Volcanologist (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does adding different amounts of sand to soil affect how quickly water drains through it?	Can you use the identification key to find out the name of each of	How does tumbling change a rock over time? What happens when water	Is there a pattern in where we find volcanoes on planet earth?	Who was Mary Anning and what did she discover?

Summer 2

Physics: Sound (Y4)

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.

I can recognise that sounds get fainter as the distance from the sound source increases.

VOCAB: *amplitude, decibel, electricity, energy, frequency, medium, pitch, power, sound waves, source, transmit, travel, vibrations, volume*

Scientist – Alexander Graham Bell – Invented the telephone (Year A/C)
Aristotle – Sound waves (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking	Research
How does the volume of a drum change as you move further away from it? How does the length of a	Which material is best to use for muffling sound in ear defenders?	When is our classroom the quietest?	Is there a link between how loud it is in school and the time of day?	Do all animals have the same hearing range?

Summer 2

Physics: Light (Y6)

Recognise that light appears to travel in straight lines.

Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.

Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.

Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

VOCAB: *angle, dark, dim, electricity, emits, light, mirror, opaque, reflects, shadows, source, surface, torches, translucent, transparent*

***Scientist* – Percy Shaw** – Cat's Eye (Year A/C)
Patricia Bath (BP website) **–** Saving sight (Year B/D)

Working Scientifically – Enquiry ideas and types

Comparative tests	Identify and classify	Observation over time	Pattern Seeking
How does the angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface?	Can you identify all the colours of light that make white light when mixed together? What colours	How does my shadow change over the day?	Is there a pattern to how bright it is in school over the day? And, if there is a pattern, is

Which soil absorbs the most water?	the rocks in your collection?	keeps dripping on a sandcastle?		

guitar string/tuning fork affect the pitch of the sound?			If there is a pattern, is it the same in every area of the11chool?	

Which material is most reflective?	do you get if you mix different colours of light together?		it the same in every classroom?
Research			
Why do some people need to wear glasses to see clearly? How do our eyes adapt to different conditions?			