+Year 6 – Scientific Enquiry Skills

	Comparative Test	• Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
	Identify & Classify	• Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.
	Observation Over Time	• Taking measurements, using a range of scientific equipment with increasing accuracy and precision, taking repeat readings when appropriate.
	Pattern Seeking	• Using test results to make predications to set up further comparative and fair tests.
	Research & Communication	• Identify scientific evidence that has been used to support of refute ideas or arguments. • Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, line and bar graphs. • Reporting and presenting findings from enquiries (including conclusions, causal relationships and explanations of and a degree of trust in results) in oral and written forms such as displays and other presentations.

Types of Scientific Enquiry

Comparative / fair testing
Changing one variable to see its effect on another, whilst keeping all others the same.

Research
Using secondary sources of information to answer scientific questions.

Observation over time
Observing changes that occur over a period of time ranging from minutes to months.

Pattern-seeking
Identifying patterns and looking for relationships in enquiries where variables are difficult to control.

Identifying, grouping and classifying
Making observations to name, sort and organise items.

Skill Statements

Asking questions
Asking questions that can be answered using a scientific enquiry.

Making predictions
Using prior knowledge to suggest what will happen in an enquiry.

Setting up tests
Deciding on the method and equipment to use to carry out an enquiry.

Observing and measuring
Using senses and measuring equipment to make observations about the enquiry.

Recording data
Using tables, drawings and other means to note observations and measurements.

Interpreting and communicating results
Using information from the data to say what you found out.

Evaluating
Reflecting on the success of the enquiry approach and identifying further questions for enquiry.

Year 6

- ★ I can plan different types of scientific enquiry to answer questions
- ★ I can recognise and control variables where necessary
- ★ I can identify useful secondary sources

- ★ I can use test results to make predictions to set up further comparatives and fair tests.
- ★ I can look for different causal relationships in my data

- ★ I can recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why.
- ★ I can can suggest improvements to my method and give reasons.

- ★ I can take measurements, using a range of scientific equipment, with accuracy and precision
- ★ I can make decisions on which observations or measurements to take

- ★ I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables and bar and line graphs.
- ★ I can decide how to record data from a choice of familiar approaches.

- ★ I can report and presenting findings from enquiries, including conclusions, causal relationships and explanations of results
- ★ I can choose how best to present data.

- ★ I can identify scientific evidence that has been used to report or refute ideas and arguments
- ★ I can use my results to identify when further tests and observations are needed.

Year 6 – Animals, including Humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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.**	• The heart pumps blood around the body. • Oxygen is breathed into the lungs where it is absorbed by the blood. • Muscles need oxygen to release energy from food to do work. (Oxygen is taken into the blood in the lungs; the heart pumps the blood through blood vessels to the muscles; the muscles take oxygen and nutrients from the blood.)	Oxygenated, deoxygenated, valve, exercise, respiration, circulatory system, heart, lungs, blood vessels, blood, artery, vein, pulmonary, alveoli, capillary, digestive, transport, nutrients, water, oxygen, alcohol, drugs, tobacco, internal organs, muscular system, transported. Key Scientists: **Christiaan Barnard** (First heart transplant) Linked Texts: **Pig Heart Boy** (Malorie Blackman)

Prior Learning	Key Question(s):	Future Learning
In Year 5 children should: • Describe the changes as humans develop to old age.	• Why do we need oxygen? • How do we breathe? • Do all living things need oxygen? • Why do we have blood? • How does our heart work? • How does exercise effect our pulse rate? • Is the air you breathe out, the same as that you breathe in?	In Key Stage 3 children will learn about: • the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) • calculations of energy requirements in a healthy daily diet • the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • the structure and functions of the gas exchange system in humans, including adaptations to function • the effects of recreational drugs (including substance misuse) on behaviour, health and life processes.

Teaching Ideas

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	
What is the circulatory system?	How does a heart work?	How does exercise affect my heart rate?	What does blood transport around the body?	How can I live a healthy lifestyle?	What can damage our health?	

Year 6 – Evolution & Inheritance

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Know about evolution and can explain what it is.** • **Know how fossils can be used to find out about the past.** • **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- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago**	• Life cycles have evolved to help organisms survive to adulthood. • Over time the characteristics that are most suited to the environment become increasingly common. *NB: The following could be duplicated in Year 6 Living things and their habitats.* • Organisms best suited to their environment are more likely to survive long enough to reproduce. Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristics. • Variation exists within a population (and between offspring of some plants)	Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics, Variation, Inherited, Environmental, Mutation, Competition, Survival of the Fittest, Evidence, Key Scientists: **Charles Darwin** (Theory of Evolution by Natural Selection) Linked Texts: **The Fossil Girl** (Catherine Brighton); **Charles Darwin** (Cath Senker); **Prehistoric Life** (Foxton); **Evolution and Inheritance** (Foxton); **Charles Darwin's On the Origin of Species** (Sabina Radeva)

Prior Learning	Key Question(s):	Future Learning
From Key Stages 1 & 2, children should: • **Understand there is a variety of life on Earth** • **Know that some animal's differences are important to their survival** • **Know how animals and plants reproduce** • **Know how fossils form over time**	• Why are we all different? • What is variation, and why is it important? • How did life begin on Earth? • How do we change? • What is evolution? • What evidence is there for evolution? • How does evolution happen? • What reasons do animals become extinct? • How did Darwin come up with the theory?	In Key Stage 3 children will learn about: • heredity as the process by which genetic information is transmitted from one generation to the next • the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

Teaching Ideas

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	
How are plants adapted to their environment?	How do animals adapt to their environment?	How do adaptations lead to evolution?	Do offspring vary and are they identical to their parents?	How can fossils help us explain evolution?	What will make the best 'beak'?	WOW science (Skittles and sound vibrations as not completed in year 5) Quiz/assessment

Year 6 – Living Things & their Habitats

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **Classify living things into broad groups according to observable characteristics and based on similarities and differences.** • **Give reasons for classifying plants and animals based on specific characteristics.**	• Variation exists within a population (and between offspring of some plants) – *NB: this Key Idea is duplicated in Year 6 Evolution and Inheritance.* • Organisms best suited to their environment are more likely to survive long enough to reproduce. • Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Competition exists for resources and mates.	Variation organisms populations. classification characteristics environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. classify, compare, bacteria, microorganism, organism, invertebrates, vertebrates. Key Scientists: **Carl Linnaeus** (Identifying, Naming and Classifying Organisms) Linked Texts: **Classification** (Foxton)

Prior Learning	Key Question(s):	Future Learning
In Year 4, children should: • **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 danger to living things.**	• Why do we need to classify living things? • How do we classify? • What are the difficulties with classification? (penguins, whales, platypus) • How do animals change over time? • Why does variation exist? • What happens if animals of different species breed? (hybrids) • What happens to house plants outside? • What are microorganisms? • How can we prevent the spread of disease? • Why do animals and plants compete – and what for?	In Key Stage 3 children will learn about: • the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere • the adaptations of leaves for photosynthesis. • the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • the importance of plant reproduction through insect pollination in human food security • how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
How are animals classified?	How can I classify trees?	What is a classification key?	What are five main groups of microorganisms?	Are microorganisms living things?	Who was Carl Linnaeus?	Quiz

Year 6 – Electricity

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• 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.	• Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.' • The greater the current flowing through a device the harder it works. • Current is how much electricity is flowing round a circuit. • When current flows through wires heat is released. The greater the current, the more heat is released.	Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor, components. Key Scientists: **Nicola Tesla** (Alternating Currents) Linked Texts: **Electricity** (Foxton); **Who Was Nikola Tesla?** (Jim Gigliotti)

Prior Learning	Key Question(s):	Future Learning
In Year 4, children should: • **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 the 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.** • **Know the difference between a conductor and an insulator; giving examples of each.** • **Safety when using electricity.**	• What is electricity? • How does the voltage of a batters affect how much current is pushed? • How does the length of time I leave the current flowing for affect the brightness of the bulb? • How does number of bulbs affect the brightness of a bulb? • Are all types of wires as good as conducting electricity? • Why are wires insulated in plastic? Does type of material make a difference? • Does length of wire make a difference? • Does the type of circuit affect how the components work/long the battery lasts?	In Key Stage Three children will learn: • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects • The idea of electric field, forces acting across the space between objects not in contact.

Teaching Ideas

Week 1	Week 2	Week 3	Week 4	Week 5	BIG Question – Assessment Opportunity
What are electrical cells?	What are the functions of electrical components?	How can we draw electrical circuits?	What are the functions of different circuits?	How can we identify and fix circuits?	Quiz

Year 6 – (ENERGY) Light and Sight

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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.** • **Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.**	• Animals see light sources when light travels from the source into their eyes. • Animals see objects when light is reflected off that object and enters their eyes. • Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light so we don't see the beam. • Light travels in straight lines.	Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent, reflect, absorb, emitted, scattered, refraction Key Scientists Linked Texts **Light and How it Moves** (Foxton)

Prior Learning	Key Question(s):	Future Learning
In Year 3 children should: • **Recognise that they need light in order to see things and that dark is the absence of light.** • **Notice that light is reflected from surfaces.** • **Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.** • **Recognise that shadows are formed when the light from a light source is blocked by a solid object.** • **Find patterns in the way that the sizes of shadows change.**	• How does the size of an object affect the size of a shadow? • How does the distance between the light and the object change the size of a shadow? • How would a solar eclipse be different if: - The moon was a different size? - The sun was larger or smaller? • How does the amount of aluminium foil scrunched affect how much light is scatters? • What happens to light when it is shone through water? How is this affected by putting glitter, salt or talc in the water? • How does a periscope/microscope/telescope work?	In Key Stage 3, children will learn about: • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light • the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science • use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye • light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

Teaching Ideas

Week 1	Week 2	Week 3	Week 4	Week 5	
How does light travel?	Can light reflect off of surfaces?	How do shadows change?			