Key Learning in Science: Year 6

There should be plenty of opportunities throughout the year for children to use the school/local environment to observe and identify a variety of plants and animals that live there focusing on their adaptations for survival. This could be done through an ongoing/monthly nature journal to observe, record and review a variety of examples over a period of time and would support their learning and wider research in the 'Living Things and Their Habitats' unit and the 'Evolution and Inheritance' unit.

Living Things and their Habitats - Classification	Living Things and their Habitats – Evolution and Inheritance	Animals/Health – Exercise, Health and The Circulatory System
Pupils should be taught to: ▪ Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. ▪ Give reasons for classifying plants and animals based on specific characteristics. ▫ Living things can be grouped into micro-organisms, plants and animals. ▫ Vertebrates can be grouped as fish, amphibians, reptiles, birds and mammals. ▫ Invertebrates can be grouped as snails and slugs, worms, spiders and insects. ▫ Plants can be grouped as flowering plants (incl. trees and grasses) and non-flowering plants (such as ferns and mosses). **Notes and Guidance (non-statutory):** Pupils should build on their learning about grouping living things in Year 4 by looking at the classification system in more detail. They should be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. Through direct observations where possible, they should classify animals into commonly found invertebrates (e.g. insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). They should discuss reasons why living things are placed in one group and not another. Pupils might find out about the significance of the work of scientists such as Carl Linnaeus. **Pupils might work scientifically by:** • **Using classification systems and keys**. • **Identifying [grouping and classifying]** some animals and plants in the immediate environment. • **Researching** unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system **[grouping and classifying]**.	Pupils should be taught to: ▪ 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. **Notes and Guidance (non-statutory):** Building on what they have learnt about fossils in the topic on rocks in Year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution. ***At this stage, pupils are not expected to understand how genes and chromosomes work.*** **Pupils might work scientifically by:** • **Observing** and **raising questions** about local animals and how they are adapted to the environment. • **Comparing** how some living things adapt to survive in extreme conditions, e.g. cactuses, penguins and camels. • **Analysing the advantages and disadvantages** of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.	Pupils should be taught to: ▪ 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 (in the long term and short term). ▪ Describe the ways in which nutrients and water are transported within animals, including humans. ▫ The heart is a major organ and is made of muscle. ▫ The heart pumps blood around the body through vessels and this can be felt as a pulse. ▫ The heart pumps blood through the lungs in order to obtain a supply of oxygen. ▫ Blood carries oxygen/essential materials to different parts of the body. ▫ During exercise muscles need more oxygen so the heart beats faster and our breathing and pulse rates increase. ▫ Animals are alive; they move, feed, grow, use their senses, reproduce, breathe/respire and excrete. ▫ An adequate, varied and balanced diet is needed to help us grow and repair our bodies (proteins), provide us with energy (fats and carbohydrates) and maintain good health (vitamins and minerals). ▫ Tobacco, alcohol and other 'drugs' can be harmful. ▫ All medicines are drugs, not all drugs are medicines. **Notes and Guidance (non-statutory):** Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function. Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body. **Pupils might work scientifically by:** • **Exploring the work of scientists** and • Scientific **research** about the relationship between diet, exercise, drugs, lifestyle and health. *Provide an opportunity to use ICT to collect/interpret data • **Observing/Measuring changes** to breathing, heart beat and or pulse rates after exercise.

Key Learning in Science: Year 6

Light and Astronomy – How Light Travels	Electricity
Pupils should be taught to: ▪ 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 the light that travels from light sources to our eyes or from light sources to objects and then to our eyes (and represent this in simple diagrammatic form). ▪ Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. **Notes and Guidance (non-statutory):** Pupils should build on the work in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions. **Pupils might work scientifically by:** • Deciding **[observe/explore]** where to place rear-view mirrors on cars. • **Designing and making [Create / Invent / Design]** a periscope and using the idea that light appears to travel in straight lines to explain how it works. • **Investigating** the relationship **[looking for patterns]** between light sources, objects and shadows by using shadow puppets. • Extend their experience **[explore and observe]** of light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).	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. ▪ 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 (at least: cells, wires, switches, bulbs, buzzers and motors) when representing a simple circuit in a diagram. ▫ Use/interpret circuit diagrams to construct a variety of more complex circuits predicting whether they will 'work'. **Notes and Guidance (non-statutory):** Building on their work in Year 4, pupils should construct simple series circuits, to help them answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols. ***Pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity.*** **Pupils might work scientifically by:** • Systematically identifying **[testing]** the effect of changing one [thing] component at a time in a circuit. • **Designing and making [Create / Invent / Design]** a set of traffic lights, a burglar alarm or some other useful circuit.

Year Group Expectations: Year 6

Exploring / Observing *UKS2 - developing a deeper understanding of a wide range of scientific ideas and encountering more abstract ideas*	**Grouping and Classifying** *UKS2 - Compare and contrast a variety of examples linked to UKS2 PoS*	**Questioning** *UKS2 - asking their own questions about scientific phenomena*	**Researching** *UKS2 – summarise research from a wide variety of sources and recognising that scientific ideas change and develop over time*	**Modelling** *using dance, drama or a visual aid to represent science in the real world*	**Collaborating** *interacting effectively as part of a group*
▪ Use correct scientific knowledge and understanding and relevant scientific language to discuss their observations and explorations (linked to Y6 PoS) ▪ Identify changes that have occurred over a very long period of time (evolution) and discuss how changes have impacted the world ▪ Explore more abstract systems / functions /changes / behaviours and record their understanding of these *(e.g. the relationship between diet, exercise, drugs, lifestyle and health; evolutionary changes; how light travels)*	▪ Recognise the importance of classification to the scientific world and form a conclusion from their sorting and classifying ▪ Compare and contrast more complex processes, systems, functions (e.g. sexual and asexual reproduction) ▪ Construct a classification key / branching database using more than two items ▪ Compare and contrast things beyond their locality and discuss advantages/disadvantages, pros/cons of the similarities and differences ▪ Use *research** to identify and classify things ▪ Use classification systems, keys and other information records [databases] to help classify or identify things.	▪ Recognise scientific questions that do not yet have definitive answers (linked to Y6 PoS) ▪ Refine a scientific question to make it testable i.e. Ask a testable question which includes the change and measure variables - *e.g. what would happen to … if we changed …?* *e.g. What affect would we have on … if we …?* *e.g. How would exercise affect the pulse rate?* ▪ Use observations to suggest a further (testable or research) question. ▪ Independently ask a variety of scientific questions and decide the type of enquiry needed to answer them	▪ Research how scientific ideas have developed over time and had an impact on our lives. ▪ Use evidence from a variety of sources to justify their ideas ▪ Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. ▪ Interview people to find out information.	▪ Make / perform and use their own versions of simple models to describe and explain scientific ideas (e.g. circulatory system drama, periscopes to explain how light travels, burglar alarm to explain components in a circuit).	▪ Propose their own ideas and make decisions with agreement in a group ▪ Support, listen to and acknowledge others in the group ▪ Check the clarity of each other's suggestions ▪ Build on / add to someone else's idea to improve a plan or suggestion Understand that it is okay to disagree with their peers and offer a reasons for their opinion

Planning and Testing *UKS2 - using different types of scientific enquiry making decisions about and explaining choices for testing*	**Using Equipment and Measures** *UKS2 - increasing complexity and increasing accuracy and precision make their own decisions about the data to collect*	**Communicating** *Reporting findings, recording data, presenting findings* *Read, spell and pronounce scientific vocabulary correctly linked to the relevant Yr Grp*	**Considering the results of an investigation / writing a conclusion** **Describing results / Looking for patterns** *UKS2 - Looking for patterns analysing functions, relationships and interactions more systematically*	**Explaining results** *UKS2 - draw conclusions based on / supported by evidence*	**Trusting results** *UKS2 - comment on how reliable the data is*
▪ Predict what a graph might look like before collecting results ▪ Make a hypothesis where they say how one thing will affect another and give a reason for their suggestion with a developing understanding of the scientific concept ▪ Identify **variables** to change, measure and keep the same in order for a test to be **fair** ▪ Independently plan investigations and explain planning decisions ▪ Decide when it is appropriate to carry out a **fair test** investigation, comparative test or alternative	▪ Decide whether to **repeat** any **readings** and justify the reason for doing so ▪ Make their own decisions about what measurements to take (and begin to identify the ranges used). ▪ Make, and act on, suggestions to control/reduce risks to themselves and others ▪ Use equipment fit for purpose to take measurements which are increasingly **accurate** and precise ▪ Decide the most appropriate equipment to use to collect data	▪ Articulate understanding of the concept using scientific language and terminology when describing abstract ideas, observations and findings (linked to the Y6 PoS) ▪ Record data and results of increasing complexity using scientific diagrams and labels, recognised symbols, classification keys, tables, bar and line graphs, and models. Make decisions about how to present and explain their findings through talk, in written forms or in other ways (e.g. using technology)	▪ Spot unexpected results that do not fit the pattern (anomalies) ▪ Identify patterns in results collected and describe them using the **change and measure variables** (causal relationships) (e.g. as we *increased the number of batteries* the *brightness the bulb increased*	▪ Identify **evidence** that refutes or **supports** their ideas ▪ Independently form a conclusion which draws on the **evidence** from the test (linked to Y6 PoS) ▪ Use scientific language and terminology (linked to Y6 PoS) to explain why something happened	▪ Be able to suggest reasons for unexpected results (anomalies) ▪ Describe how to improve planning to produce more **reliable** results ▪ Say how confident they are that their results are **reliable** and give a reason

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