MPPS - Science Curriculum Whole School Overview

This document shares Science curriculum narrative from EYFS to Year 6, as well as a more in-depth look at how each unit builds up on prior learning and concepts. CUSP materials are used in Key Stage 1 and 2. Whilst the EYFS Framework is structured differently to the national curriculum, we aim to show how The Natural World aspect of the Early Years Framework feeds into the Science national curriculum programmes of study, and how children in Reception are prepared for Year 1.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
EYFS	**Explore the natural world around them, making observations and drawing pictures of animals and plants** Exploring the school environment and grounds. **Seasons** Understanding changes in weather and the seasons—Autumn hunt, exploring the woodland	**Seasons** **Understand some important processes and changes in the natural world around them, including the and changing states of matter.** Changes in weather and the seasons—Winter Noticing frost and ice, exploring how to melt ice	**Explore the natural world around them, making observations and drawing pictures of animals** Night and Day time Nocturnal animals	**Seasons** Understanding changes in weather and the seasons—Spring Planting and growing **Explore the natural world around them, making observations and drawing pictures of animals and plants** Eggs and chicks (visiting nursery)	**Explore the natural world around them, making observations and drawing pictures of animals and plants** Caring for animals and the environment. —Drawing pictures of flowers and animals. understanding different minibeasts and their habitats Planting	**Seasons** Understanding changes in weather and the seasons—Summer Planting—Growth and decay **Explore the natural world around them, making observations and drawing pictures of animals and plants** Sea creatures
Year 1	**Everyday Materials** distinguish between an object and the material from which it is made identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock	**Seasonal change** **Animals, Including Humans** (identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	**Animals, Including Humans (**identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)	**Seasonal Change** **Plants (**identify and name a variety of common wild and garden plants, including deciduous and evergreen trees	**Plants (**identify and name a variety of common wild and garden plants, including deciduous and evergreen trees)	**Animals, Including Humans (**identify and name a variety of common animals that are carnivores, herbivores and omnivores **Seasonal Change**
Year 2	**Revisit Yr1 Materials** **Materials** identify and compare the suitability of a variety of	**Animals including humans (**notice that animals, including humans, have offspring which grow into adults	**Revisit Materials** **Introduce Living things and their habitats.**	**Revisit (Yr1)** **Plants (**identify and name a variety of common wild and garden plants, including deciduous and evergreen trees)	**Plants** observe and describe how seeds and bulbs grow into mature plants find out and describe how plants need water, light	**Revisit Animals including humans** **Living things and their habitats**

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	everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	find out about and describe the basic needs of animals, including humans, for survival (water, food and air) describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	(explore and compare the differences between things that are living, dead, and things that have never been alive 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	**Plants** observe and describe how seeds and bulbs grow into mature plants find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	and a suitable temperature to grow and stay healthy.	(identify and name a variety of plants and animals in their habitats, including micro- habitats describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.
Year 3	**Rocks** (end point- not covered again) 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	**Revisit Yr2 Plants** **Plants** 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 **Introduce Animal including human** (identify that humans and some other animals have skeletons and muscles for support, protection and movement.	**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.	**Forces and Magnets** compare how things move on different surfaces notice that some forces need contact between 2 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 2 poles; predict whether 2 magnets will attract or repel each other, depending on which poles are facing	**Plants** 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.	**Light** 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 an opaque object. Find patterns in the way that the size of shadows change
Year 4	**Electricity**	**States of Matter**	**Living things and their habitats**	**Animals, including humans**	**Living things and their habitats** **Revisit**	**Sound** (end point- note covered again)

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			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 dangers to living things	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.		
Year 5	**Properties and changes of materials** Everyday Materials	**Earth and Space** **(**end point – not covered again) Galileo Galilei 1564 - 1642	**Revisit and introduce Animals Including humans** Maria Meron	**Introduce Living things and their habitats**	**Revisit magnets and introduce Forces** (end point- not covered again)	**Revisit Living Things and their Habitats**
Year 6	**Revisit Yr4 Electricity and Introduce Electricity**	**Introduce Living Things and their Habitats** Carl Linnaeus	**Introduce Evolution and Inheritance** Alfred Wallace Charles Darwin	**Animals including Humans (circulatory system)** Galen AD 157 William Harvey, English physician 1602	**Animals including Humans – water transportation**	**Light** 1671 Sir Isaac Newton

Year 7 (at Moorend Academy)

Cells & Photosynthesis	Particles & Simple chemical reactions	Energy & electricity	The solar system	Energy transfers	Ecology

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EYFS - (Understanding of the World - The Natural World)		
Biology - Explore the natural world around them, making observations and drawing pictures of animals and plants.	**Chemistry** - Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.	**Physics -** Understand some important processes and changes in the natural world around them, including seasons and changing states of matter.

In EYFS, children are provided with activities that encourage them to explore, problem solve, observe, predict, think, make decisions and talk about the world around them.

Nursery incubate eggs (chicks) observing the wonder of hatching. They experience taking care of newly hatched chicks observing their growth over a week or two. They experience gentle handling, understanding their own hygiene at this time as well as that of the birds. In Reception, they think carefully about how to look after animals to keep them healthy. They study their own body and start naming parts of the body and how to keep healthy.

Children make good use of the school grounds, exploring the school environment, seeing how it changes over the different seasons. They investigate snow and ice and seeing what happens when it melts.

They study plants and what makes plants grow and investigate growing plants from seeds or bulbs. Children plant their own seeds and keep a record of the growth as well as talk about how they are going to look after it, such as watering.

Children explore textures of familiar and more unusual foods. They observe the changes that occur when ingredients are mixed whisked, kneaded, heated and frozen. In baking or cooking, or preparing food, children explore textures and see how materials change when mixed together or when heat is applied.

KEY STAGE 1

Pupils study the **Seasons** and develop an early conceptual understanding of how **day becomes night**. An understanding of change, over time connects to the study of **Plants, including trees**. This focus enables children to associate trees as belonging to the plant kingdom and notice the changes deciduous trees go through connected to the seasons.

Contrasting that study, pupils learn about **Animals, including humans.** They learn about animals in the five kingdoms and what similarities and differences they have. Vocabulary such as carnivore, herbivore and omnivore is explicitly taught. They learn humans mammals and about the five senses.

Pupils are introduced to **identifying and classifying materials**. Scientific terms, such as transparent, translucent and opaque are taught explicitly through vocabulary instruction and pupils make further sense by applying it to what they know and then to working and thinking scientifically tasks. This substantive knowledge is enriched by pupils use of disciplinary knowledge through scientific enquiry.

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To sophisticate their understanding, Year 1 pupils revisit the study **Animals, including humans** as a retrieval module and deepen their knowledge through revisiting and thinking hard through increasingly challenging tasks.

As pupils progress through KS1, new knowledge is integrated with pre-existing understanding. For example, in Year 2, the study of **Living things and their habitats** and **Uses of everyday materials**, engages pupils to integrate and draw upon their knowledge of **Animals, including humans** as well as **Plants**, and the study of **Materials**. New substantive knowledge is constructed and made sense of through **Working and Thinking scientifically** tasks.

KEY STAGE 2

Substantive knowledge is always present and acts as a precurosor for pupils' understanding. This will enable them to successfully apply disciplinary knowledge. In KS2 we introduced disciplinary scientific terms, including:

- variable
- independent variable
- dependent variable
- controlled variable

These give structure to working and thinking scientifically tasks in relation to the substantive knowledge taught in that specific study.

"what scientists observe, or choose to control in an experiment, depends on what they know. For example, classifying flowering plants scientifically requires knowledge of floral parts to place specimens in appropriate groups. However, classifying insects requires knowledge of body parts."
Ofsted Research Series: Science, 2021

In KS2 Science, we have defined these terms:

- **variable** - the things that can change in a science experiment
- **independent variable** - the *variable* that is changed by the scientist
- **dependent variables** - are the things that the scientist watches closely for to see how they *respond* to the change made to the *independent* variable
- **controlled variables** - the things that a scientist wants to remain the same and not change so they can see how the independent variable reacts.

LOWER KEY STAGE 2

The unit on **Rocks** is studied and connected with prior knowledge from 'Everyday materials' in KS1. A study of **Animals, including humans** is built upon from KS1 and contrasts the physical features with the functions they perform, including the skeleton and muscles.

Rocks is revisited again to sophisticate and deepen pupils' knowledge, advancing their understanding.

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Forces and magnets are introduced and connect with KS1 materials, including twisting, bending and squashing. Contact and non-contact forces are taught and understanding applied through Working and Thinking Scientifically. The abstract concept of **Light** is made concrete through knowing about light sources and shadows.

Plants are studied to develop a more sophisticated understanding of their parts and functions, including pollination.

A study of **Living things and their habitats** pays close attention to classification and is directly taught using prior knowledge to ensure conceptual frameworks are secure. Explicit vocabulary instruction supports pupils to deconstruct words for their component meaning, for example **in**vertebrate. **Animals, plants and environments** are connected in this study with a summary focusing on positive and negative change.

Electricity is introduced. Substantive knowledge is taught so that pupils acquire understanding about electrical sources, safety and components of a single loop circuit. Practical tasks give pupils the opportunity to think using disciplinary knowledge in the context of variables. Pupils make sense of what they know by testing, proving and disproving hypotheses.

Animals, including humans focuses on the sequence of digestion, from the mouth to excretion. Misconceptions, such as digestion begins in the stomach, are pre-empted, limited and represented as non-examples.

States of matter and **Sound** are taught using knowledge of the particle theory. Acquiring substantive knowledge about 'states' of matter supports pupils to understand how solids, liquids and gases behave. This knowledge is connected further to geographical studies of the **Water cycle** and life processes. Practical scientific tasks and tests help pupils build a coherent understanding of the particle theory by applying what they know through structured scientific enquiry. Misconceptions, such as 'liquid particles are slightly more separated than gas and less compacted than solids are addressed.

UPPER KEY STAGE 2

In the study of **Properties and changes of materials**, it is important that pupils reuse and draw upon their understanding of states of matter. This prior content eases the load on the working memory to process and make sense of new knowledge, including solutions, mixtures, reversible and irreversible changes.

Change is also studied within **Animals, including humans**, focusing on growth and development of humans and animals.

Earth in Space develops the conceptual understanding of our place in the universe. This study unwraps misconceptions, including the Moon changing shape, the Sun moving across the sky and how seasons occur.

A study of **Forces** sophisticates the substantive knowledge acquired in KS1 and LKS2. New content, including air resistance and water resistance is studied. Force multipliers, such as levers are studied to understand how we can be efficient with effort. For example, a spanner with a long handle multiplies the force and makes it easier

to turn a bolt than spanner with a shorter handle. Simple machines, such as pulleys are also studied as force multipliers – they move the load through a greater distance with the same energy being used. Enhancing this study of **Forces**, pupils learn about Galileo Galilei 1564 - 1642 (considered the father of modern science).

Living things and their habitats focuses on differences in life cycles of living things and how they reproduce. This study also contrasts previous scientific thinking. Pupils contrast how people in the past thought and constructed understanding, in the absence of scientific evidence, to explain things they didn't understand. Maria Merion is the significant scientist studied, she observed closely and carefully drew insects undergoing biochemical metamorphosis. David Attenborough describes Maria Marion as one of the most important contributors to the field of entomology.

A further study of **Living things and their habitats** enables pupils in UKS2 to revisit and add to their understanding of classification through the taxonomy created by Carl Linnaeus. More complex animals are studied, including invertebrates such as Myriapods and Echinodermata (starfish and Sea urchins) as well as Arthropods such as Crustacea, Arachnids, and Insects.

Light is revisited and taught with advanced substantive knowledge. This is physics study with a focus on the properties of light, not the biology of the eye.

The study of **Animals, including humans** enables pupils to add new knowledge to their mental models of biological systems. Circulation, the components of blood and the mechanism of the heart is connected to healthy living through diet and exercise. Many of these science studies are enriched and conceptual frameworks extended through the deliberate curriculum choice to study charts and graphs in Maths, food in Design Technology or reuse and retrieve substantive knowledge in other contexts, such as in writing.
Further retrieval learning modules are deployed, so that pupil knowledge can be advanced and sophisticated to increase their depth of understanding.

Electricity is enhanced with an advanced study of electrical circuits. New substantive knowledge is acquired in the context the particle theory, which was previously studied. Working and thinking scientifically tasks help to deepen and make sense of new learning, such as the concept of electricity and the way we explain it using terms such as charge, potential difference and flow.

Evolution and inheritance introduces two significant scientists - Charles Darwin and Alfred Wallace as pioneers of scientific thinking in the field of evolution. This study draws on how misconceptions may have been arrived at to explain the past and how theories explain significant change, over time. Substantive concepts, including adaption and variation are taught explicitly through vocabulary and clarity is achieved through worked examples. This supports pupils to use this substantive knowledge in a disciplinary way.

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Science Curriculum in Detail (using CUSP resources)

Highlighted section indicate prior learning linked to the new unit of learning.

Yr group, Unit Title	Substantive concept	Previous Learning	National Curriculum – Learning Questions	Tier 2 Vocabulary	Tier 3 Vocabulary
Y1 Everyday materials	Chemistry	EYFS - The Natural World Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. EYFS Creating with materials Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function; Share their creations, explaining the process they have used; Make use of props and materials when role playing characters in narratives and stories.	Pupils should be taught to: • distinguish between an object and the material from which it is made • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • describe the simple physical properties of a variety of everyday materials • compare and group together a variety of everyday materials on the basis of their simple physical properties What are materials? • Know the names of everyday materials, wood, metal, plastic, glass rock, paper, cardboard and fabric. What are things made of in school? • Identify objects made of the materials taught in previous lesson. How can I describe materials? • Observe materials to identify properties. • Describe the properties using the key vocabulary. Which materials are waterproof, and which are not? • Know the meaning of waterproof and not waterproof • Predict which materials are waterproof and which are not • Carry out an investigation to find out. What's the best material for the job and why? • Identify the material an object is made from • Know the properties of the material • Identify the best property for the job for objects given	Absorb Rough Smooth Waterproof Metal plastic	Materials Property Flexible Transparent Opaque physical

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Y1 Animal including humans	Biology	EYFS -– The Natural World They talk about the features of their own immediate environment and how environments might vary from one another similarities and differences in relation to places, objects, materials and living things They make observations of animals and plants and explain why some things occur and talk about changes.	Pupils should be taught to: • identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • identify and name a variety of common animals that are carnivores, herbivores and omnivores What is an animal? • Know that animals are living things that move, eat and need water • Sort pictures identifying what is an animal and what is not using questions supporting the above criteria What types of animals are there? • Know mammal. Birds, amphibians, reptiles and fish • Know the features of each type of animal • Carry out research to identify if animals within one type always have the same features What is similar and what is different? • Use research to investigate similarities and differences between the types of animals. • Sort them according to similarities and differences • Identify groups of animals that are alike and ones that are least alike What does food tell us about an animal? • Understand the terms, carnivore, herbivore and omnivore • Show understanding through being able to explain what foods are eaten by what group and identify any foods they would not eat. What makes me an animal? What senses do I have? • Know the five senses and name the feature of the body related that sense. • Use discussion to know the importance of each sense • Investigate if one can work better without the other e.g. hearing without sight.	Blood Senses Young Feather Fur scales	Mammal Amphibian Reptile Herbivore Carnivore omnivore
Y1	Biology	EYFS: The Natural World	Pupils should be taught to: • identify and name a variety of common wild and garden plants, including deciduous and evergreen trees	Bud Trunk Branch	Nutrients Stem Deciduous

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Plants including trees		Explore the natural world around them, making observations and drawing pictures of animals and plants. Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	• identify and describe the basic structure of a variety of common flowering plants, including trees What are the parts of a plant? • Name the flower, leaves, stem, and root of a plant • Observe similarities and differences of leaves What are wild plants and where do you find them? • Identify plants that are wild and understand why they grow in the wild • Know where plants grow in the wild • Know the names of some wild plants What are garden plants and where do you find them? • Identify and name some garden plants • Compare garden and wild plants • Know what seeds and bulbs are • Plant seeds and bulbs to observe and monitor plant growth What makes a tree? • Know the names of parts of a tree (crown, leaves, twig, branch, trunk, roots • Observe branches on different trees What types of trees are there? (around my school) • Identify and name trees in the school grounds • Observe fruits and seeds and compare them from different trees What's the difference between trees? • Know the meaning of deciduous and evergreen • Know some names of deciduous and evergreen trees • Identify similarities and differences.	Bark Seed wild	evergreen
Y1 Changes Introduce seasons and weather	Physics	EYFS - The Natural World Explore the natural world around them, making observations and drawing pictures of animals and plants.	Pupils should be taught to: • observe changes across the 4 seasons • observe and describe weather associated with the seasons and how day length varies What are the four seasons?	Dawn Dusk Mild Rotate Soaked weather	Month Season Spring Summer Autumn Winter

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Day and night		Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class. Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	• Know the names of the four seasons and which months they fall in • Understand the changes in deciduous trees through the seasons - Plants start to grow in spring as it gets warmer - Trees have full leaves in summer, and it is hotter - leaves fall from the trees in autumn as it starts to get cooler - In winter it is cold and trees have no leaves • Through observation of deciduous trees in the school grounds children work out the current season What's the weather like in Autumn, Winter, Spring and Summer? • Know which types of weather occur in every season • Understand that different types of weather can appear in more than one season Why does day become night? • Know that when the sun shines it is day • Know that when the sun has set it gets dark and it is night • Understand that the Earth spins around the sun - Know that it is day where the sun shines onto the Earth and night where there is no sun, through carrying out an investigation using balls/globes and torches.		
Y1 Revisit Plants, including trees	Biology	EYFS: The Natural World Explore the natural world around them, making observations and drawing pictures of animals and plants. Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class	Pupils should be taught to: • identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • identify and describe the basic structure of a variety of common flowering plants, including trees What do I remember about plants? Using questioning, children to respond to show what they remember ablur plants, including identifying wild and garden plants. Remember: What are the parts of a plant? • Know the parts of wild and garden plants	Bud Trunk Branch Bark Seed wild	Nutrients Stem Deciduous evergreen

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		Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. Year 1 Plants including trees	• Know what the functions of each part are • Use Venn diagrams to Identify similarities and differences between wild and garden plants Remember: What are deciduous and evergreen trees?		

Yr group, Unit Title	Substantive concept	Previous Learning	National Curriculum – Learning Questions	Tier 2 Vocabulary	Tier 3 Vocabulary
Y2 Introduce Use of Everyday materials		EYFS -The Natural World Explore the natural world around them, making observations and drawing pictures of animals and plants Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class Y1 – Everyday materials	Pupils should be taught to: • identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching What are materials used for? Categorise and compare wood, metal, plastic and glass. • Know which objects can be made of wood, metal, plastic or glass • Know why a material is suitable for an object through understanding it's properties. • Can carry out an investigation to identify how properties of materials decide how the material is used. What are materials used for? Categorise and compare ceramics, rock, paper and card, and fabric. • Know that some properties of materials are not always the same using true or false statements - For example, all rigid materials are waterproof, a smooth material is always shiny - Can justify this by providing examples of materials	artificial inflexible manufactured natural brittle extracted fabric	Ceramic Durable Inflexible Reflective Rigid translucent

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			• Work scientifically to investigate which combinations of properties are useful together What happens when we squash, bend, twist or stretch a material? • Investigate materials to find out if they have the above properties. • Investigate different materials against one property (e.g. how stretchy are different materials?) • Understand one material can have more than one of the properties (modelling clay is a good example.) What's the right material for the job? • To be able to decide which is the ,most significant property of a material an object is made of. E.g. Window, made of glass, (transparent, shiny, rigid, hard) Transparent is most significant , shiny is the least. • Categorise the properties from most significant to least What's the most absorbent material? • Design a fair test to see which material is the best at absorbing water - Predict which material will be the most absorbent - Know you change the materials - Know you keep the following variables amount of water, size of sheet and time given the same What is waterproofing? • Know the properties of waterproof materials • Test the best material to be used for an umbrella • Know that Charles Mackintosh invented the waterproof coat		
Y2 Introduce Living things and their habitats	Biology	EYFS: The Natural World Explore the natural world around them, making observations and drawing pictures of animals and plants. Understand some important processes and changes in the natural world around them,	Pupils should be taught to: • explore and compare the differences between things that are living, dead, and things that have never been alive • 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	Thrive Depend Producer Consume Prey predator	Oxygen Nutrient Respiration Sensitivity Reproduction excretion

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		including the seasons and changing states of matter Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class. Year 1 Plants Everyday materials Animals, including humans	• identify and name a variety of plants and animals in their habitats, including microhabitats • describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food What is alive and what is not? What do all living things have in common? • Use the acronym MRSGREN to understand the vocabulary and know what each word means and how it relates to living things • Identify in the school grounds things that are alive and not alive by using the terminology of MRSGREN • Discuss how they know things are alive, never been alive and not alive. What do all living things have in common • Identify how living things show the characteristics of MRSGREN • Identify similarities between living things Where do plants and animals live? Know the terminology macrohabitat (e.g. desert) and microhabitat (e.g. rockpool.) • Research one of each to identify animals that live there • Repeat the above for plants • Observe the woodland habitat in school and identify the animals and plants that live there • Understand what would happen to the animals if the plants in the woodland area were removed • Work scientifically to investigate what conditions a minibeast (e.g. woodlouse) would prefer. What plants and animals live in our local environment? • Identify plants and animals that live in the local area • Children to use MRSGREN to prove a plant and animal from the local area are living • Create and interpret data (table) to show the plants and animals that live in the local environment What are food chains? How are they connected?		

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			• To create and explain different food chains to understand how they work • Identify the foods that can be in a specific food chain • Know the placements of the foods in the food chain (a plant will always be at the beginning, different animals could be at the top of the same food chain) • Understand that some foods can be replaced with others and make suggestions of different foods Why do plants and animals need each other? • Understand the key words, predator, prey, consumers, producer, habitat • Use Venn diagrams to show animals that are predators and those that are prey and understand that some can be both • Use food chains to show how an animal can be a predator and prey • Understand that living things that make up a food chain live in the same habitat and explain what would happen if a plant or an animal in a habitat died out		
Y2 Introduce Animals, including humans	Biology	Y1 - Animals including humans Introduction and revisit. Y2 - Living things and their habitats. Y1 – Plants Y2 – Plants and bulbs	Pupils should be taught to: • notice that animals, including humans, have offspring which grow into adults • find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene REMEMBER: what is an animal? • Know what invertebrate and vertebrate mean • Identify groups animals that are invertebrates and vertebrates • Know the acronym MRSGREN and how it relates to animals and not plants How do animals change as they mature? • Look at different life cycles of animals to know how they change and grow as they get older.	Healthy Survive Exercise Heart Lungs muscles	Hygiene Lava Pupa Vertebrates Invertebrates metamorphosis

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			• Identify animals that look like their parents and ones that are different How do we change as we mature? • Know that there are 6 stages; baby, toddler, child, teenager and adult • Work scientifically to answer the question, are the oldest children in the class the tallest? • Understand that as humans grow and change physically, they can change in terms of what they can do. (What is the same what is different between a child and an adult?) What do all animals have to do to stay alive? • Know that all animals need water, air and food to survive • Understand that animals cannot make their own food • Understand that different animals take in water and air in different ways Keeping healthy – why do we exercise? • Know that exercise keeps our bodies fit (heart, lungs and muscles) • Know that we have to drink enough water to help keep our bodies fit • Understand that good hygiene is part of keeping out bodies healthy Keeping healthy – why do we eat different types of food? • Know that food keeps us healthy, gives us energy and helps us to grow • Know the different food groups and identify how each group helps us • Understand the importance of a balanced diet by designing a healthy meal.		
Y2 Introduce Plants	Biology	Y1 Science Animals and living things Y1 Science Plants Y2 Science Living things and habitats	Pupils should be taught to: • observe and describe how seeds and bulbs grow into mature plants • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	Wither Dormant Mature Bulb Anchor sustain	Germination Perennial Carbon dioxide Glucose clone

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			How do seeds germinate and what happens? • Know conditions a seed needs to germinate • To identify each stage of the germination process • Explain what is the best season to plant seeds and know the worst times for a seed to germinate • Plant seeds to observe and draw seeds germinating over time. What happens when bulbs sprout? • Explain the growth stages of a bulb • Understand how bulbs grow - Set up an investigation planting bulbs different ways around - Observe, measure and record the growth overtime - Answer the question, has the orientation of the bulb affected the way it has grown? What do plants need to thrive and be healthy? • Identify different growing conditions of different plants (e.g. desert, cactus) • Understand how plants survive in different growing conditions (e.g. rainforest) • Understand how a greenhouse helps plants to grow What can happen if plants don't get the things they need? • Set up an investigation to observe and record what happens to a plant without a specific growing condition over time - Identify the states of plant in different conditions - Understand what has happened to the plant without a specific condition What do I notice about plants around the school? How are they healthy? How are they unhealthy? • Observe plants around school and the conditions they are growing in • Identify if the plants are healthy or not		

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			• Explain how the growing conditions have resulted in how healthy the plant is Show what you know How do seeds and bulbs grow? What do plants need to be healthy?		
Y2 Revisit Everyday materials (Y2 retrieval unit)	Chemistry	EYFS -The World Children know about similarities and differences in relation to places, objects, materials and living things Y1 Science Properties of materials Y2 Use of Everyday materials	Pupils should be taught to: • identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching REMEMBER IT – what are everyday materials and how are they used? APPLY IT – why do you think materials should and should not be used for certain jobs? PROVE IT – what is the hardest and softest material? P199 Essential Primary Science	Extracted inflexible Brittle Polished Durable artificial	Sturdy Tough Flexible Fragile versatile
Y2 Revisit Living things and their habitats	Biology	Y1 Science Animals and living things Revisited Summer Y1 Science Plants Revisited Summer Y2 Science Living things and their habitats	Pupils should be taught to: Living things and their habitats • explore and compare the differences between things that are living, dead, and things that have never been alive • 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 • identify and name a variety of plants and animals in their habitats, including microhabitats • describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food Remember - what is alive and what is not?	Stalk Thrive Consume Require Identify approach	

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			What do all living things have in common? Remember - where do plants and animals live? Remember - what are food chains?		
Y2 Revisit Plants and Animals including humans	Biology	Y2 Science Living things and habitats Y2 Science Plants Year 2 Science Animals, including humans	Pupils should be taught about plants: • observe and describe how seeds and bulbs grow into mature plants • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy Pupils should be taught about animals, including humans: • notice that animals, including humans, have offspring which grow into adults • find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene PLANTS EXPLAIN-IT • How do seeds and bulbs grow? • Complete knowledge organiser on P27 and flick back to check. Use knowledge note 1 to support explanations through organisational or explanative drawings. Try using sentence stems, such as I know… Download and select questions from the Socrative Quiz to test pupil retention. 2. ANIMALS (Page 29 and 30) SUMMARISE-IT • What do I know about animals, including humans? • Complete knowledge organiser and use knowledge notes to elaborate. Use knowledge note 2 to engage pupils in retrieval practice – model going back to prior learning and using what you know. You could ask pupils to verbally explain characteristics of animals or explain through a diagram using drawings and annotations as cues. You could provide diagrams of life cycles that are completed and ask pupils to explain similarities and differences between how animals		

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			change as they grow older or link to life cycles. Download and select questions from the Socrative Quiz to test pupil retention. 3. PLANTS and ANIMALS (Page 31) INTERLEAVING EXPLAIN-IT • What do plants need to thrive and be healthy? This could be a guided or independent activity to draw on prior learning and explain in their own way. ELABORATE-IT • What do I know about animals, including humans? Download and select questions from the Socrative Quiz to test pupil retention.		

Yr group, Unit Title	Substantive concept	Previous Learning	National Curriculum – Learning Questions	Tier 2 Vocabulary	Tier 3 Vocabulary
Y3 Introduce Animals including humans	Biology	Year 1 Animals including humans Introduction Year 1 Animals including humans revisit Year 2 Animals including humans Introduction	Pupils should be taught to: • 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 • identify that humans and some other animals have skeletons and muscles for support, protection and movement What effect does the food we eat have? - Know that blood, muscles, and organs need water to work, water is a large component, muscles are 79% water - Carbohydrates give us energy. These can be found in bread cereals vegetables - Protein helps us to grow. This can be found in meat, fish eggs and dairy. - Know that fats provide us with energy and helps nerves and the brain help absorb vitamins Where is my skeleton and what does it do? - Know that bones are alive, blood flows through them. - Skeleton – supports	Minerals Skelton Skull Voluntary Involuntary nerves	Biceps Triceps Vertebra vitamins proteins carbohydrates

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			– protects brain / lungs – joints enable movement Where are my muscles and what do they do? - Know that there are two types of muscle: -Muscles that move voluntarily (You are in control) -Muscles that move involuntarily (You are not aware) -Skeletal muscles move voluntarily. -Cardiac muscles move involuntarily. -Smooth muscles move involuntarily. - Know that biceps contract to raise arm and relax to lower arm. triceps contract to lower arm and relax to raise arm		
Y3 Introduce Forces and Magnets	Physics	Year 1 Everyday materials Year 2 Uses of everyday materials	Forces and magnets • compare how things move on different surfaces • notice that some forces need contact between 2 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 2 poles • predict whether 2 magnets will attract or repel each other, depending on which poles are facing What are contact forces? - A contact force occurs when two objects physically touch e.g. boot + football = contact force - Work scientifically to observe and identify contact forces in the classroom, in PE and with toys. How do surfaces affect the motion of an object? - Resistance is a force that slows down an object that is moving. - Forces act in opposite directions	Consequences Contact Force Attract North south	Magnet Resistance Friction Repel Pole Magnetic field

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			- Work Scientifically to identify which surfaces would be high resistance and which would be low resistance? Why is that? How does friction affect moving objects? - Know that the lower the friction, the further an object will travel. - The higher the friction, the slower an object travel - Know that a forcemeter measures friction in Newtons (N) What is a non-contact force? - Know that it is a force that acts on an object without touching it. - That gravity is an unseen, non-contact force that pulls things to the ground. - Magnets are a non-contact force How is this different to a contact force? - A contact force is any force that occurs as a result of two objects making contact with each other e.g. friction, air resistance. How do magnets attract and repel? - Know that magnets have an invisible force field that repels or attracts certain materials. Which materials are magnetic? - Any material made of iron or steel - Know that the magnetic field will only act on materials made of iron or steel. - Not all metals are magnetic aluminium and copper do not contain iron or steel - Know that magnetic force can work through water. - Work scientifically to sort and classify materials based on their magnetic properties. Forces and magnetism summary		
Y3 Introduce Plants	Biology	Year 2 Plants and bulbs Year 3 Animals, including humans	Pupils should be taught to: • identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers	Adapt Essential Glucose Transport Variety	Transpiration Stoma Pollination Stamen Pistil

			• 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 What are the parts of a flowering plant? What do they do? - Flower: o Purpose is to attract insects o Cause pollination o To make seeds - Leaves: o Make food for the plant. - Stem: o Support leaves. o Transports water and nutrients up from roots o Sends food down to the roots and rest of plant - Roots: o Anchor plant to the ground o Tiny hairs absorb water Do all plants need the same things to thrive and grow? - Movement Respiration Sensitivity Growth Reproduction Excretion Nutrients - Working scientifically to identify whether plants all need the same things to thrive? How does water move through a plant? - Work scientifically to observe when carnations are placed in water with artificial food dye what happens. - Roots have tiny hairs which absorb water. - The stem transports water and nutrients from roots. It also sends food down to the roots and rest of the plant. What do flowers do? - The purpose pf the flower is to attract insects, cause pollination and to make seeds.	vital	Photosynthesis

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			- Know that the purpose of the flower/petals is to attracts insects - Sepal protects the bud. - Working scientifically to identify and observe different parts of a plant. Male parts stamen, anther makes pollen, filament holds anther up. - Female parts pistil. Stigma catches pollen, style is the tube to the ovary, ovary is where the seed grows. What is pollination? - Pollen is a fine powder made by the anther; it is the genetic code to make a seed - Pollination is the transfer of pollen - Insects are vital for pollination Wind also distributes pollen How do plants keep on growing? • Know the stages of the life cycle of a flowering plant • Know the different ways seeds are dispersed • Identify seeds which are dispersed in a specific way		
Y3 Introduce Rocks	Chemistry	Year 1 Everyday materials Year 2 Uses of everyday materials	Rocks Pupils should be taught to: • 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 How are rocks formed? What types of rocks are there? Can rocks change? How can we test a rock to see if it is limestone or chalk? Is soil just dirt? What makes soil? How are fossils formed? Optional Elaborate and remember rocks, soils and fossils	cemented compacted inorganic matter transform	metamorphic sedimentary igneous fossil magma minerals
Y3 Introduce	Physics	Year 3 Animals, including humans Forces and magnets	Pupils should be taught to: • 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	Absence Cast (shadow) Impenetrable Reflect	Constant dependent Independent Illuminate

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Light		Y3 Plants	• 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 an opaque object • find patterns in the way that the size of shadows change Do we need light to see things? Remember: what are light sources and what are not light sources? How are shadows formed? What happens to the size of a shadow when the object moves closer to, or away from, the light source?	Shadow Source (light)	Translucent Variable
Y3 Revisit and Retrieve Rocks	Chemistry	Year 1 Everyday materials Year 2 Uses of everyday materials Y3 Rocks	Rocks Pupils should be taught to: • 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 How are rocks formed and what types are there? Remember: how can rocks change? Remember: how are fossils formed and how do we know?	cemented compacted inorganic matter transform	metamorphic sedimentary igneous fossil magma minerals

Yr group, Unit Title	Substantive concept	Previous Learning	National Curriculum – Learning Questions	Tier 2 Vocabulary	Tier 3 Vocabulary
Y4 Introduce Animals, including humans (Teeth, digestion and food chains	biology	Year 1 Animals, including humans animals, senses, body parts Year 2 Animals, including humans offspring, basic needs, exercise Year 3 Animals, including humans nutrition, skeleton	Animals, including humans • identify the different types of teeth in humans and their simple functions • describe the simple functions of the basic parts of the digestive system in humans • construct and interpret a variety of food chains, identifying producers, predators and prey What teeth do humans have? What do they do?	Expel Compact Digestion Acid Stomach intestines	Incisor Canine Molar Enzyme Saliva Peristalsis

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			- Incisor: located at the front of the mouth and they are the cutters. - Canines: these are the grippers and tearers - Pre-molars and molars: located at the back of the mouth, they crush and grind. - Usually there are 20 children's teeth 32 adult's teeth How does our mouth and teeth help digestion? What's the process? - Teeth: cut, rip, grind - Tongue: moves food, taste, pushes bolus into the oesophagus. - Saliva is the liquid produced in the mouth; it contains enzymes which break food down. Can teeth tell us what animals eat? - Discuss that humans have incisors, canines, molars. What types of food are we designed to eat? - Herbivores have incisors and lots of molars. What types of food are they designed to eat? - Carnivores have incisors, canines and a few molars. What types of food are they designed to eat?		
Y4 Introduce Sound	Physics	Year 3 Light	Pupils should be taught to: • 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 • recognise that sounds get fainter as the distance from the sound source increases What is sound? Remember particles from states of matter - Sound is a very quick vibration; it travels as waves.	Produce Property Source Frequent Regular affect	Vibrate Pitch Volume Medium Vacuum Sound wave

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			- Sound waves can only travel through a medium such as: gas (air), liquid (water), solid (wood).
			- Sound travels as vibrations through anything with particles
			- Sound: you can hear, see vibrations, feel vibrations
			
			How does sound travel?
			- Vibrating sound waves move through the medium of a gas, liquid or solid.
			- Sounds get fainter energy spreads out as it travels
			- Sound gets fainter over larger areas
			- Sound travels at 340 metres per second in air
			
			What is the pitch and loudness of sound?
			- Pitch - how high or low sounds are
			- Measured in Hertz (Hz)
			- Means the number of sound waves that are produced in 1 second
			- 3 things that affect pitch: size, length, tightness
			- Work Scientifically: Twang an elastic band that is placed around a block with a pencil. Experiment with the pitch by changing the position of the pencil. Why does the pitch change?
			- 2 things that affect loudness:
			  ○ amount of energy (harder you hit, blow, strum, or twang)
			  ○ Amount of stuff vibrating (larger sound boxes make larger sounds)		

Y4 Introduce Electricity	Physics	Year 3 Light reflection, sources and shadows Year 3 Forces and magnets forces attract and repel	Pupils should be taught to: • 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	Associate Identify Portable Effect series	component electrical insulator electrical conductor hypothesis

			• recognise that a switch opens and closes a 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 Notice it - What appliances use electricity? What sort of power makes them work? How can we be safe with electricity? - Know that mains electricity is supplied to a building by wires - A battery is portable source of stored energy - Be able to identify appliances and electrical equipment which run on mains and battery energy - State safety rules: o Do not use switches with wet hands. o Do not recharge normal batteries only recharge rechargeable batteries. o If a wire is exposed on an appliance – DO NOT touch it. Name it - What are the components in a simple series circuit? Test it – What happens when a circuit is open or closed? - simple series circuit components: o Battery (cell), bulb (lamp), motor, switch, buzzer, wire - Work scientifically: create circuits open and closed identify and explain what happens to the components Diagnose it – what are the effects of changing circuit components and batteries? - Hypothesis: statement you prove or disprove through experiments - Work scientifically: “The brightness stays the same when you add more bulbs in a simple series circuit.” True or false? How do you know? - Set up an investigation identifying the controlled, independent and dependent variables - What did you notice? Explain it - why do think that happened? -		variable

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Y4 Introduce States of Matter	Chemistry	Year 3 Forces and magnets Year 4 - Electricity	Pupils should be taught to: • 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 What is matter? What does 'state' mean? - Matter: something that takes up space, despite its size or composition e.g., ice, water, air. - Anything that exists is called 'matter'. - Matter: has a mass. Mass is the amount of matter in an object. It is measured in milligrams (mg) grams (g) kilograms (kg) - State, one of the 3 distinct ways matter exists: solid, liquid, gas What are solids, liquids and gases? - Solid: can't flow, has a fixed volume, particles very close and have a fixed position - Liquid: takes shape of the container, can flow, has a fixed volume, particles very close but not fixed - Gas: will escape from a container, can flow, particles move apart quickly - Work scientifically: describe materials around and sort into the 3 states of matter. Compare materials. What properties define their state? Melting: how do materials change state? - Materials are not permanently solid; they can change state depending on the temperature - Work scientifically: Set up an investigation to find the melting point of butter. Evaporating: how do materials change state?	Permanent Particle Solid Liquid Gas vapour	Evaporate Condense Melt Matter State volume

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			- Know that liquids that evaporate do not simply vanish or disappear for ever and that this is a misconception
			- Evaporation: invisible to the eye, water evaporates slowly, turns into water vapour in the air.
			- Working Scientifically- Evaporation: does the size of the container matter?
			  ○ Which container will water evaporate more quickly from?
			  ○ Investigate with controlled variables
			  ○ All containers must have identical amounts of water
			  ○ Accurate daily measurement to record evaporation
			
			Condensing: how do materials change state?
			- Condensation: water vapour (gas) cools and condenses, the gas then returns to a liquid, water droplets form.
			- Working scientifically: Why do cold cans taken from the fridge start to get wet on the outside? "Does the liquid inside the can start to escape?" (not true - this is a misconception)
			
			Summary: how do materials change?
			- Matter: something that takes up space, despite its size or composition.
			- One of the 3 distinct ways matter exists: solid, liquid and gas
			- Materials are not permanently solid, they can change state, depends on the temperature.
			- Materials have different melting points.		

Y4 Introduce Living things and their habitats		Year 3 Rocks Year 3 Animals, including humans Year 3 Plants	Pupils should be taught to: • 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 dangers to living things What are the characteristics of living things?	Classification Environment Interdependence Interact Beneficial Hierarchy	Vertebrate Invertebrate Biotic Ecosystem Species niche

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			- MRS GREN: Movement Respiration Sensitivity Growth Reproduction Excretion Nutrition - Work scientifically: observe the difference between living things What animals are vertebrates? - Vertebrates: have a backbone sometimes called a spine - Fish: cold-blooded, gills to 'breathe' and take oxygen from the water - Amphibians: cold-blooded, live part of life in water and part on land, lay eggs - Reptiles: cold-blooded, dry, thick, scaly skin, lay eggs, breathe air with lungs - Mammals: warm–blooded, breathe with lungs, covered in fur or hair, single boned lower jaw, most born alive (not in an egg) - Birds: warm-blooded, covered with feathers, have wings, lay eggs, have beaks - Work scientifically: categorise and compare vertebrates What animals are invertebrates? - Insects: hard shell-like body, 6 legs, hatch from eggs, 3 body sections, 2 antennae, usually have wings, ant, bee, ladybird, butterfly - Annelids (worms): segmented body, bilaterally symmetrical (both sides of body the same), no scales or limbs - Arachnids (spiders): 8 jointed legs, 2 body parts, no antennae - Molluscs (slugs and snails): no segmented body, bilaterally symmetrical (both sides of body the same), muscular foot or tentacles, some have a shell or reduced shell. - Work scientifically: Categorise and compare invertebrates What groups are plants classified in? - Plants are classified as flowering or non-flowering - Flowering plants: plants that reproduce using flowers to make seeds e.g., daffodil, grass, oak tree		

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			- Non-flowering plants: plants that reproduce using spores and seed cones e.g., ferns, moss, conifer - Scots Pine - Spore: minute organism, grow into a new individual all by itself (no fertilisation needed) - Work scientifically: categorise and compare flowering and non-flowering plants What is classification? How do I use a key? - Classification to divide or sort into groups - Carl Linnaeus invented the way to classify living things in 1737 through taxonomy - Know the top three layers: o Kingdom: animal, plant, fungi o Phylum: invertebrates, vertebrates o Class: mammal, reptile, fish - Work scientifically: classify living things using a key What happens if the environment in a habitat changes? - Habitat: natural place where an organism lives - Environment: conditions and surroundings that affect survival and growth of living things - Ecosystem: how living things interact with their habitat and environment - Nature reserves: protect habitats and environments - Pollution: harmful or poisonous things that negatively affect an environment, they change the balance of the ecosystem.		
Y4 Revisit Living things and their habitats	Biology	Year 3 Rocks Year 3 Animals, including humans Year 3 Plants	Pupils should be taught to: • 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 dangers to living things What animals are vertebrates and invertebrates? - What are vertebrates?	Classification Environment Interdependence Interact Beneficial Hierarchy	Vertebrate Invertebrate Biotic Ecosystem Species niche

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			- What are the names of vertebrates - Elaborate and explain the characteristics of: Mammals Birds Fish Reptiles Amphibians - What are invertebrates? - What are the names of invertebrates? - Elaborate and explain the characteristics of: Insects Annelids Arachnids Molluscs What groups are plants classified in? - What groups are plants sorted into? - What are the names of flowering plants? - What are the characteristics of flowering plants? - What are the names of non-flowering plants? - What are the characteristics of non-flowering plants? Explain it: what's a classification key and how do you use it? - Select the animals to sort and list the obvious characteristics of the group e.g., warm or cold-blooded feathers or scales - Decide if statements are to be used or questions 'Has a backbone.' or 'Does it have a backbone?' - Organise the characteristics, starting with general ones first e.g., 'Has a shell' is more general than 'Has two antennae'		

Yr group, Unit Title	Substantive concept	Previous Learning	National Curriculum – Learning Questions	Tier 2 Vocabulary	Tier 3 Vocabulary
Y5 Introduce Living things and their habitats	Biology	Year 4 Living things and their habitats Year 4 Animals, including humans Year 4 Plants	Pupils should be taught to: • 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 Life cycle differences – what's the difference between a mammal and an amphibian? - Recap: Kingdom = Animal, Phylum = Vertebrate, Class = Mammal	Deduce Process Re-form Adolescence Transform Contrast	Embryo Sexual Metamorphosis biochemical Incubate Fertilisation

			- Mammal example:
			  ○ Dog: vertebrates, sexual reproduction, embryos develop inside the mother's womb, give birth to live babies, babies fed with mother's milk, young grow bigger, adolescents mature into adults
			- Amphibian example:
			  ○ Frog: vertebrates, sexual reproduction, eggs laid in water, embryos form in eggs outside of the mother, larvae hatch with gills, all amphibian larvae called tadpoles, physically change as they mature – metamorphosis, grow legs and lungs, young grow into adults
			- Use Venn diagrams to list and match what is similar. Notice and deduce what is different
			
			Life cycle differences – what's the difference between an insect and a bird?
			- Kingdom = Animal Phylum = Arthropod Class = Insect
			- Insect example:
			  ○ Ladybird: invertebrates, sexual reproduction, eggs laid outside of the mother, now larvae hatch, larva feed and grow, transform into a pupa, a biochemical change occurs, larval body broken down and reformed into an adult, hatch from pupa as an adult
			- Kingdom = Animal Phylum = Vertebrate Class = Bird
			- Bird example:
			  ○ Bird: vertebrates' sexual reproduction, lay eggs with hard shells, most eggs kept warm in a nest, an embryo grows from fertilised eggs, unfertilised eggs don't produce chicks, chicks hatch from hard eggs, chicks grow more feathers, mature into adults
			- Use Venn diagrams to list and match what is similar. Notice and deduce what is different
			- Use Venn diagrams to list and match what is similar. Notice and deduce what is different		

			What is similar and what is different between the life cycles of a mammal, an insect, an amphibian and a bird? - Categorise by listing the characteristics of each one - Compare by organising into a Venn diagram – noticing what is similar and what is different - Contrast by looking at the big differences (juxtaposition) or very close similarities - Deduce and conclude by reasoning and explaining what you notice - Use the matrix (helps to compare) Summer birds – who was Maria Merion and what did she do? - Maria Merion: o Born in Germany 1647 (over 300 years ago) o Religion was used to explain things people didn't understand. o People thought insects were evil and born from mud o Maria Merion was fascinated by butterflies and silkworms. o She watched their biochemical change (entomology) o She studied and drew them carefully, made notes and drew diagrams to record what she noticed. o Published her drawings and findings in 1705 o David Attenborough described her as one of the most important contributors to the field of entomology. The science of life - how do living things reproduce? - Reproduction: all living things make copies of themselves, - It continues and ensure the survival of the species - Sexual reproduction: o male + female o plants and animals make copies of themselves through sexual reproduction o male cells and female cells combine, similar process in plants and animals. o Produces variation within the species		

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			- Asexual reproduction:
			  ○ Without male + female
			  ○ Make an identical copy of the parent (animal or plant)
			  ○ Only very few animals reproduce sexually and asexually: female Komodo dragons, jellyfish, some sharks and snakes
			  ○ Many plants use asexual reproduction as an efficient and fast way to populate.
			
			Plants and animals: what's the life process of reproduction?
			- Flowering plants:
			  ○ Sexual reproduction
			  ○ Pollination male reproductive cells = pollen, female reproductive cells = ovule
			- Asexual reproduction one parent = identical copy
			  ○ Tubers
			  ○ Runners (stolon above ground)
			  ○ Rhizomes (below ground)
			  ○ Bulbs (below ground)		

Y5 Introduce Earth and Space	Physics	Year 4 Light	Earth and Space • 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, the Earth and the 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 What are the planets in our solar system? - Planets orbit the Sun - Each one spins on an axis - Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune - Planets are described as approximately spherical bodies How does our view of the Moon change in a lunar month? - The Moon doesn't change shape	Luminous Phenomena Attraction Approximately Relative apparent	Orbit Axis Crescent Gravitational Waning Waxing

			- Our view of the Moon changes as it orbits Earth
			  o Waxing = increase
			  o Waning = decrease
			  o Crescent = less than a quarter
			  o Gibbous = in between a ½ and full moon
			
			Why does the rotation of Earth result in night and day?
			- The Earth turns one full rotation in 24 hours
			- Earth spins anti-clockwise
			- Sunrise: our place on the Earth turns and begins to face the sun
			- Midday: where we are faces the Sun directly - the sun is highest in the sky.
			- Sunset: after midday, the place where we are begins to turn away from the Sun - this looks like the sun is setting and going down, but it is not
			- Night: the part of the Earth where we are is now turned away from the sun - we are in shadow, so darkness happens
			- Work scientifically to explain does the sun move across the sky? Why do we get day and night?
			  o From Earth, the Sun looks like it moves across the sky in the daytime and appears to disappear at night. This is because the Earth is spinning towards the east.
			  o We get day and night because the Earth rotates on an imaginary line called an axis. During daytime, our part of the Earth is facing the sun. As the Earth rotates, we move away from the sun until eventually, the sun is no longer visible. This is now night-time.
			
			Why is the Earth's tilt (axis) responsible for the seasons?
			- Seasons: Autumn, Winter, Spring, Summer
			- Earth spins on its axis, it does not spin vertically.
			- Different strengths of sunlight hit the Earth when it is tilted
			- Earth is tilted and spins.
			- When we tilt towards the Sun. The Sun appears higher in the sky = Spring and Summer		

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			- When we are tilted away from the sun, the Sun appears lower in the sky = Autumn and Winter Review and summarise - present what you know about Earth and Space - Planets in the solar system orbit - Phases of the moon, sequence of the moon phases - Rotation of the Earth: day and night - Tilt of the Earth and seasons, what the tilt means to us on Earth, sequence of the seasons.		
Y5 Introduce Properties and changes of materials	Chemistry	Science / Geography Y4 Water cycle Science Y4 Electricity Science Y4 States of matter Science Y5 Earth and space	Pupils should be taught to: • 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 What properties do materials have? How do we use them? - Working scientifically: Sort and match materials to their purpose - Conductor, insulator, hardness, solubility, transparency, magnetism What is a solution and what is a mixture?	Property Particle Separate Combine Recover comparative	Atom Molecules Chemical (changes) Physical (changes) Reversible reaction

			- Working scientifically to observe physical changes
			- Experiment with various mixtures:
			  ○ Liquid + solid (water + salt)
			  ○ Solid + solid (pebbles + sand)
			  ○ Liquid + liquid (oil + water)
			- Solution: materials that combine e.g., salt + water = solution
			- Salt = solute, soluble water = solvent
			- What happens if you put too much salt in the water? (saturated)
			
			How can we separate materials from a mixture?
			- Working scientifically: separating larger solid e.g., using a sieve to separate soils, rocks, and pebbles
			- Separating smaller solids and liquids e.g., using filter paper to separate sand and water or coffee granules and coffee
			- Separating metals using magnets e.g., iron, steel or nickel
			
			How can we separate materials from a solution?
			- Working scientifically to separating materials from a solution (evaporation) e.g, sugar or salt from water
			- Kitchen Disaster: separate sugar + raisins + flour mixture
			
			What changes are reversible?
			- Working scientifically: reverse it using knowledge from previous lessons.
			- Dissolving- how do you reverse it?
			- Melting solid to a liquid, how do you reverse it?
			- Freezing liquid to a solid, how do you reverse it?
			- Evaporating liquid into vapour, how do you reverse it?
			
			What changes are irreversible?
			- Chemical changes: some materials react and make new substances, they cannot change back, this is known as irreversible.
			- Working scientifically: test which materials melt? Which materials burn?		

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Y5 Introduce Forces	Physics	Science Y3 Forces Science Y4 Electricity States of matter Sound Science Y5 Earth and space Y5 Properties and changes of materials	Pupils should be taught to: • 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 Remember gravity When is friction helpful and when is it not? - Friction: a force that always opposes the direction of an object's movement - Helpful: brakes on a bike, anti-slip surfaces, tread of bike tyres - Unhelpful: friction can cause the chain on a bike to stick and become harder to cycle, axles harder to turn on the wheels - Working scientifically: Test it: using chopsticks, move cubes of jelly from one board to another. Then cover the jelly cubes in cooking oil and repeat the test. How has the oil changed the effect of friction? What's the effect of air resistance? - Air resistance: a type of friction that opposes the movement of an object through the air. - Factors that affect air resistance: surface area and speed - Working scientifically: What does air resistance feel like? Two people hold a large piece of card – walk, jog and run with it. Describe what do you notice? Describe what you feel? How does increasing the speed affect air resistance? What happens if you reduce the surface area? - Discuss variables. What's the effect of water resistance? - Water resistance: push occurs when an object moves through water	Opposite Reaction Advantage Displace Weight mass	Pulley Gear Pivot Fulcrum Lever upthrust

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			- Upthrust: force acts upwards on objects in liquid or gas
			- The shape of the object changes the amount of water it displaces. More liquid or gas displaced: more upthrust
			- Work scientifically:
			  ○ Hypothesis: the same piece of Plasticine can sink and float. Use what you know to increase the upthrust of water to make the Plasticine float.
			  ○ Define Controlled variable
			  ○ Choose Independent variable
			  ○ Measure Dependent variable
			
			How do levers help us?
			- All levers have: fulcrum, pivot, load, arm, or rod.
			- Working scientifically: in each object identify the fulcrum, arm and load.
			
			How do pulleys and gears help us?
			- A pulley: mechanism to help move heavy things.
			- Consists of grooved wheel, axle, rope
			- Working scientifically: observe how do pulleys reduce the force to move a load?
			- Gears: mechanism to give a mechanical advantage.
			  ○ Driver gear
			  ○ Follower gear
			  ○ Notice gears on a bicycle to increase or decrease effort needed to ride
			
			Who was Galileo Galilei?
			- Galileo Galilei 1564 – 1642
			- Italian astronomer and physicist
			- Tested all his ideas by experiment to prove or disprove his theories
			- Studied the science of motion discovered the weight of an object doesn't affect how fast it falls		

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			- Dropped 2 different sized balls from the Leaning Tower of Pisa to prove that the size and mass of an object didn't affect the speed it fell - Improved the telescope - He studied the surface of the Moon - 1610 Galileo discovered 4 large moons of Jupiter - Io, Europa, Ganymede, and Callisto - His observations supported the work of Copernicus who said the Earth orbited the Sun - This contrasted with Catholic beliefs and Galileo was sentenced to house arrest for the rest of his life!		
Y5 Introduce Animal, including Humans	Biology	Year 2 Animals, including humans notice that animals, including humans, have offspring which grow into adults Year 3 Animals, including humans skeletons for growth and support	Pupils should be taught to describe the changes as humans develop to old age • Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty. • Pupils could work scientifically by researching the gestation periods of other animals and comparing them with humans; by finding out and recording the length and mass of a baby as it grows. What is the human timeline? - Embryo 0-7 weeks - Foetus 8 – 40 weeks - Baby 0 - 1 year - Toddler 1 – 3 years - Child 3 – 12 years - Teenager 13 – 19 years - Adult 20 - 64 - Older adult 65 onwards - Womb: the organ in a female that the unborn baby grows and develops in - Embryo: an unborn human in the earliest stages of growth - Foetus – the name for a baby when it is 8 weeks old in the womb	Development Unique Diverse Generation Mature Equipped	Adolescence Puberty Gestation Embryo Foetus womb

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			How do we change into adults?
			- Adolescence: youth, young man, or woman
			- Puberty girls start to develop earlier than boys
			- It is totally normal for puberty to begin from 8 – 14 years old.
			- Boys start to change about 12 - 13 years old
			- Girls start to develop breasts, pubic hair, underarm hair
			- Boys start to develop pubic hair, underarm hair.
			- Girls and boys get more spots as their skin adjusts
			- Why do girls and boys need to go through puberty?
			How does human and animal lifespan compare?
			- Human gestation period is about 40 weeks
			- African elephant gestation period | about 95 weeks
			- Life expectancy: how long a living thing is expected to be alive
			  ○ Human life expectancy about 79 years
			  ○ African elephant life expectancy about 60 – 70 years
			  ○ Butterfly life expectancy about 2 weeks
			- Work scientifically: Do all animals follow the same pattern of gestation? 1. fertilisation 2. growth in the womb 3. Born		

Y5 Revisit Living things and their habitats	Biology	Year 4 Living things and their habitats Year 4 Animals, including humans Year 4 Plants	Pupils should be taught to: • 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 Life cycles: what's the difference between an insect and an amphibian? - Kingdom = Animal Phylum = Arthropod Class = Insect - Insect example: ○ Ladybird: invertebrates, sexual reproduction, eggs laid outside of the mother, now larvae hatch, larva feed and grow, transform into a pupa, a biochemical change occurs, larval body broken down and reformed into an adult, hatch from pupa as an adult - Kingdom = Animal Phylum = Vertebrate Class = Amphibian - Amphibian example:	Development Unique Diverse Generation Mature Equipped	Adolescence Puberty Gestation Embryo Foetus womb

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			○ Vertebrates, sexual reproduction, eggs laid in water, embryos form in eggs outside of the mother, larvae hatch with gills, all amphibian larvae called tadpoles, physically change as they mature – metamorphosis, grow legs and lungs, young grow into adults - List and match what is similar notice and deduce what is different What is similar and what is different between the life cycles of an insect and an amphibian? - Work scientifically to: ○ Categorise by listing the characteristics of each one ○ Compare by organising into a Venn diagram – noticing what is similar and what is different ○ Contrast by looking at the big differences (juxtaposition) or very close similarities ○ Deduce and conclude by reasoning and explaining what you notice Remember plants: what's the process of reproduction? - Flowering plants: ○ Sexual reproduction ○ Pollination male reproductive cells = pollen, female reproductive cells = ovule - Asexual reproduction one parent = identical copy ○ Tubers ○ Runners (stolon above ground) ○ Rhizomes (below ground) ○ Bulbs (below ground)		
Y5 2nd Revisit Living things and their habitats	Biology	Year 4 Living things and their habitats Year 4 Animals, including humans Year 4 Plants	Pupils should be taught to: • 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 SELECT and ORGANISE information		

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			DESIGN and CREATE animal information using explanative response frameworks COMPARE differences between animals using organisational (relational) response frameworks		

Yr group, Unit Title	Substantive concept	Previous Learning	National Curriculum – Learning Questions	Tier 2 Vocabulary	Tier 3 Vocabulary

Y6
 	
Introduce
 	
Living things and their habitats
	Biology	Year 4 Living things and their habitats
		
		Year 5 Living things and their habitats
		Year 5 Animals, including humans
			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 microorganisms, plants and animals
			• give reasons for classifying plants and animals based on specific characteristics
			
			Who was the scientist Carl Linnaeus and what did he do?
			- He was a Swedish scientist
			- Carl Linnaeus created the taxonomy system to organise living things from about 1737
			- Before this time the way plants and animals were organised was very complicated
			- Linnaeus' classification looked at natural things to decide if they were related
			  ○ KINGDOMS (e.g. Animal, Plant, Fungi, Bacteria, Algae)
			  ○ PHYLUM (e.g. Vertebrate, Mollusc, Arthropod)
			  ○ CLASS (e.g. mammals; reptiles; and fish)
			- Linnaeus later inspired Charles Darwin to study his theory of evolution through observations in the field (environment)
			
			How do we classify vertebrates?
			- Vertebrates all have a backbone in common
				Characteristics
				Interdependence
				Specific
				Categorise
				Primitive
				Hierarchy
					Fungus
					Arthropod
					Taxonomy
					Kingdom
					Phylum
					genus

			- Vertebrates are grouped into 5 classes: Amphibians, Birds, Fish, Mammals, Reptiles
			- Work scientifically to categorise, describe, sort and classify vertebrates.
			- Discuss similarities and differences
			
			How do we classify invertebrates we know?
			- Invertebrates: no backbone
			- Invertebrates occupy about 95% of the animal species
			- Invertebrates:
			  o Annelida (worms)
			  o Mollusc (snail, slug, octopus)
			  o Arthropods, including
			  o Arachnida (spiders and harvestmen)
			  o Insects (bees, ants, beetles, butterflies)
			- Work scientifically to categorise, describe, sort, and classify invertebrates.
			- Discuss similarities and differences
			
			How do we classify invertebrates we don't know? (Sponges, Jellyfish and Flatworms)
			- Invertebrates: no backbone
			- Invertebrates occupy about 95% of the animal species
			- Invertebrates e.g., Sponges, Jellyfish, Flatworms
			- Work scientifically to categorise, describe, sort, and classify invertebrates.
			- Discuss similarities and differences
			
			How do we classify invertebrates we don't know? (Starfish and Sea urchins, Crustacea and Myriapoda)
			- Work scientifically to categorise, describe, sort, and classify invertebrates.
			- Discuss similarities and differences
			
			Apply it: what animals can I classify? What animals and plants exist in my local environment?		

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			- Identify and record animals and plants in the local habitat - Habitat: natural place where an organism lives - Look for connections, how do animals live interdependently within the ecosystem? - Ecosystem: how living things interact with their habitat and environment. - The role of an organism in an ecosystem is called their niche. A garden spider hunts for prey amongst plants. - Working scientifically: Observe like an entomologist notice and record physical features of the invertebrates observed.		
Y6 Introduce Evolution and Inheritance	Biology	Science Y3 Rocks Geography Y4 Water cycle Science Y5 Life cycles and reproduction Science Y5 Animals, including humans Science Y5 Properties and changes of materials Science Y6 Classification	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 How have living things changed over time? How do we know? - Fossils: living things converted to rock, tell us about the past, deduce what life was like. - Mould fossil: cavity where living thing died leaves an imprint - Cast fossil: cavity gradually filled with minerals - Trace fossil: living thing leaves a mark in wet mud How has life evolved over time? - Record the Earth's history on a timeline - First life 3.6 billion years ago - Fish 550 million years ago - Land plants 470 million years ago - Amphibians 360 million years ago - Reptiles 310 million years ago - Dinosaurs 230 million years ago	Characteristics Adaptation Acquire Theory Modify generation	Evolve Survival Species Clone Inherit fossil

			- Mammals 220 million years ago
			- Birds 150 million years ago
			- Modern humans 200,000 years ago
			- Today
			
			What is DNA and what does it do?
			- DNA: molecule in a cell that carries genes, genes hold biological instructions
			  ○ Humans: eye, hair, facial characteristics
			  ○ Strawberry plant size, sweetness, colour
			- Work scientifically to extract DNA from a strawberry.
			
			Working scientifically - Are all offspring identical to their parents?
			- Reproduction: asexual and sexual
			- Asexual reproduction: direct copy from one parent, cloning, identical offspring
			- Sexual reproduction: DNA from two parents, variation in species, inheritable characteristics e.g., eye colour, hair colour etc
			- Variation: differences within the same species
			- Diversity: differences between species
			- Variation is not diversity
			- Work scientifically: Select and organise examples to show variation and diversity. Summarise and explain the difference. Variation or diversity? - What happens if a Labrador is bred with a Poodle?
			
			Darwin and Wallace – what evidence did they share to argue the case for evolution?
			- Charles Darwin's THEORY OF EVOLUTION (published in 1859)
			- Explored Australia and the Galapagos Islands
			- Discovered humans had a common ancestor (Modern scientists still don't know, agree or know what this ancestor is.)
			- Theorised that species change over time, can lead to new species (descent with modification)		

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			- Natural selection: living things with inherited characteristics, that favour survival, leave more offspring. Favourable characteristics increase over generations - Alfred Wallace's THEORY OF EVOLUTION, similar conclusion to Darwin 1858 - Studied variation within species - Explored Singapore and Malaysia (Asia) - Wrote to Darwin with his theory of evolution Survival of the fittest - how have animals adapted and evolved to suit their environment? - Darwin did not consider natural selection as survival of fittest but survival of the fitter. E.g., mammoth more fit to survive during Ice Age. Less fit to survive when the world warmed up and humans hunted mammoths. Couldn't adapt or change, led to extinction. - Compare-It: how did the animals adapt, change and survive. Look at polar bear, penguin, arctic fox, cacti and Venus flytrap. Look at the advantages and disadvantages of specific adaptions.		
Y6 Introduce Light	Physics	Year 3 Light reflection, sources and shadows Year 3 Forces and magnets forces attract and repel Year 4 Sound source, vibrations, pitch and volume Year 4 Electricity series circuits and elements	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 when representing a simple circuit in a diagram How does light travel? - Know that light only travels in straight lines example: sunlight through clouds - when light reflects from an object it continues to travel in a straight line however in a new direction - Shadows are formed in the absence of light	Component Consequence Proton Neutron Systematic Represent Source Generate	Proton Neutron Electron Terminal Series voltage

			- Shadows have the same shape as the object that cast them - Shadows are formed when an object blocks the path of light - Work scientifically to prove that light travels in straight lines. What colour is light made of? - Light or white light consists of these colours: Red Orange Yellow Green Blue Indigo Violet - Use the acronym: R.O.Y.G.B.I.V to remember the order - Work scientifically to observe the visible spectrum. Shine a torch on the shiny side of a CD or look at an artificial light source (safely) through a prism. Observe white light being split into its constituent parts. This is called dispersion. - In 1671 Sir Isaac Newton described visible spectrum of light. - Use a Newton colour wheel. Describe what happens to the colours as they spin. Does this happen with just primary colours? What is observed if a spinner just has two colours? Reflection - how does light help us to see objects? - Recap light travels in straight lines. - A mirror is a smooth surface, the angle that light hits the mirror (angle of incidence) is the same as it leaves the mirror (angle of reflection) - Work scientifically: TEST place an object where it can be seen in a mirror, measure the angle of incidence and reflection using a protractor. What is noticed? What happens when the observer moves, and the object stays in the same place? What surfaces make the best reflectors? - Work scientifically: TEST IT in a darkened classroom set up an investigation that has controlled variables, dependent and independent variables. - Select a range of materials to test reflectivity e.g., cardboard, hessian, tin foil, A4 paper, fabric - Record information either using lux or descriptions Why do we see objects as a particular colour?		

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			- Recap: white light can be split into a visible spectrum - Materials have colour pigments; a pigment is the colour of a material. - Example: an object has a blue pigment. Blue pigment absorbs all other colours in the visible spectrum. Blue light is the only colour reflected and that is how we see the colour blue. - Work scientifically: Why do filters only allow certain colours through? What happens when you mix coloured filters? What happens to the appearance of objects when placed in water? - Work scientifically: 1. Observe and accurately draw a pencil standing in a glass. 2. Carefully add water to the glass. 3. Look carefully and notice when the appearance of the pencil changes. 4. Observe and accurately draw a pencil standing in a glass of water. - This is called refraction because water (liquid) is denser than air (gas). Light slows down when it enters water, changes direction (but does not bend), carries on in a new straight line.		
Y6 Introduce Electricity	Physics	Year 3 Light reflection, **sources and shadows** Year 3 Forces and magnets **forces attract and repel** Year 4 Sound source, **vibrations, pitch and volume** Year 4 Electricity series **circuits and elements**	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 when representing a simple circuit in a diagram What is electricity? How does it work? - Electricity is a form of energy - The power source gives energy to electrons (potential difference). This can make them move around the circuit (current) - Conductors (allow electrons to move) gold, silver, copper liquids (salty water) - Insulators | (do not allow electrons to flow) glass, air, plastic, wood	Component Consequence Systematic Represent Source Generate	Proton Neutron electron Terminal Series voltage

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			What are the components in a series circuit? - To be able to create series circuits and then represent them as a scientific diagram using the correct symbols. - Work scientifically: How does the number of batteries and potential difference affect components in a circuit? What are the effects and consequences of changing circuit components and batteries? - Working scientifically: In groups of three, children write a hypothesis such as: If longer wires are used in a series circuit, the bulb will be dimmer. They then plan and carry out a fair test to prove or disprove their hypothesis. Each group also produces a short video describing the investigation and explaining the results. Next, pupils watch each video and as a group, record the information needed to fill in the table for each experiment.		
Y6 Introduce Animals, including humans (Circulatory System)	Biology	Year 3 Animal, including humans nutrition, skeletons and muscles Year 4 Animal, including humans teeth, digestion and food chains Year 5 Animal, including humans changes as humans develop to old age	Animals, including humans • 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 What is blood made of and why do we need it? - Plasma is mainly water and a liquid that blood cells are suspended in, and waste is carried - Red blood cells carry oxygen to cells in the body - Respiration: red blood cells take oxygen and exchange it for carbon dioxide - White blood cells: defend us and attack threats that could make us ill. It is made in the bone marrow - Platelets clot together to stop blood leaking out when wounds occur. Fibrin bonds platelets together	Cell Chamber System Circulation Vessel Clot	Plasma Platelet Artery Capillary Vein ventricle

			Why do our bodies need nutrients and how are they transported? - Cells in our bodies need to feed, grow and multiply. Cells feed by getting nutrients through cell walls. - Respiration: food must be a liquid for cells (why our bodies break food down). - Blood is mostly water (plasma) that carries red and white blood cells, platelets and nutrients. Plasma carries other nutrients. - Important nutrients: carbohydrates, fats, proteins, vitamins, minerals, water, fibre What is our circulatory system? - Origin of circulatory: Latin 'circulator' form a circle, French 'circulatoire' move through a circuit of blood - Circulatory system: heart, lungs, arteries, veins, capillaries. What is the pathway that blood takes? What is our heart like inside? How does it work? - Know that the right side receives blood from the body and sends it to the lungs: deoxygenated - Left side receives blood from the lungs and pumps it away from the heart: oxygenated. Who influenced what we know about our circulatory system? - Galen AD 157 - Chief physician to gladiators in Pergamon. He thought oxygenated blood was from heart and deoxygenated blood from liver. - William Harvey, English physician 1602 - First to describe how blood was pumped around the body - Fascinated by anatomy of veins and valves - 1618 became physician to King James I - 1628 published and explained how the heart propelled blood in a circular course What can we do to keep healthy?		

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			- Healthy means helping the body to keep functioning by exercising muscles and the heart and drinking water to help our blood do its job - Healthy means eating the right foods to keep our bodies functioning effectively. Occasional treats of sweets and fats, less sugar, less fat, more fruit, more fibre. - What benefit do we get from eating healthily? - Work Scientifically: HYPOTHESIS- Fruit juices have less sugar than cans of fizzy drink. Plan an investigation to prove or disprove this hypothesis. Present and explain what we know about the circulatory system, nutrients and keeping healthy. - Use these questions to help put together a presentation: ○ What are the components of blood? ○ What do cells do? What do they need? ○ How does blood circulate in our bodies? ○ Why does blood circulate in our bodies? ○ How does the heart work to help blood circulate? ○ Who were the great thinkers of the past who have helped us learn about circulation? ○ Why do we need to be healthy? ○ How can we be healthy?		
Y6 Introduce Animals, including humans: water transportation	Biology	Year 3 Animal, including humans nutrition, skeletons and muscles Year 4 Animal, including humans teeth, digestion and food chains Year 5 Animal, including humans changes as humans develop to old age Year 6 Animal, including humans circularity system	Animals, including humans • describe the ways in which nutrients and water are transported within animals, including humans Remember circulation and digestion: how are these two systems connected? - Circulatory system: the flow of blood around the body. Involves: • heart • lungs • arteries • veins • capillary - Blood carries oxygenated and deoxygenated blood and nutrients from digestion - Digestive system: the breaking down of food and liquids so that nutrients can be absorbed into the bloodstream, This	Filter Expel Substance Function Regulate transform	Kidney Bladder Urine Excretion Toxin Nutrient

			involves: • mouth, teeth and oesophagus • stomach • small and large intestines • colon and rectum • faeces Where are the kidneys and what do they do? - Kidneys are located either side of the spine. - Blood enters the kidneys - Filters out waste substances (toxins) that the body does not need. - Kidneys clean the blood. - Toxins must be dissolved in liquid to be excreted so they are transformed into urine using water, that's why urine is liquid. - Cleaned blood sent back to the collect more oxygen, nutrients and waste products kidneys send urine down two tubes – ureter - Urine collects in the bladder - Excreted by having a wee: urination How do kidneys keep us healthy? - Kidneys cleans blood of waste toxins. They transform waste toxins into urine and balances the amount of water taken from the body. - Colour of urine matters - Dehydration symptoms: thirst, dry mouth, headache, decreased urination - Water makes up 75% of your body		