

Ash Grove Primary Academy Science Progression Grid

Children have the opportunity to work scientifically throughout each each unit of work to develop their understanding and knowledge. Each academic year, students will study topics within the three broad areas of Biology, Physics and Chemistry. An exemplar series of lessons is available to support staff in developing these units of work and, over time, pupils' knowledge and skills in science.

<p>At Key Stage One: During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:</p> <ul style="list-style-type: none"> • asking simple questions and recognising that they can be answered in different ways • observing closely, using simple equipment • performing simple tests • identifying and classifying • using their observations and ideas to suggest answers to questions • gathering and recording data to help in answering questions 	<p>At Lower Key Stage Two: During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:</p> <ul style="list-style-type: none"> • asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings 	<p>At Upper Key Stage Two: During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:</p> <ul style="list-style-type: none"> • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments
<p>Science Tier 3 Vocabulary @ KS1:</p>	<p>Science Tier 3 Vocabulary @ LKS2:</p>	<p>Science Tier 3 Vocabulary @ UKS2:</p>
<p>observe, observing, identify, classify, diagram, chart, map, data, contrast, biology, chemistry, physics,</p>	<p>research, scientific enquiry, comparative and fair test, conclusion, predictions, differences, similarities, evidence, guides, keys, construct, interpret</p>	<p>variables, precision, repeat readings, classification keys, causal relationship, explanations, degree of trust, quantitative measurements</p>

The Key Stage One curriculum builds on the foundation work completed throughout Early Years. The following progression highlights 'expected' level for areas of the Science curriculum which is woven throughout the different aspects of Early Years curriculum

Understanding of the World Personal Development Physical Development		
Biology	Chemistry	Physics
<p>At Nursery:</p> <ul style="list-style-type: none"> - Observational and investigative skills... I wonder if... - Look at life cycles - Taking care of animals and first hand explorations including chicks and caterpillars - Explore light and dark including shadows - Using our senses - Protecting ourselves - Plants and Living Things – how do they grow? <p>Examples of specific disciplinary science:</p> <ul style="list-style-type: none"> - Make collections of natural objects and talk about different types of leaves, seeds, rocks etc - Plant seeds and care for growing plants - Show and explain concepts of growth, change and decay e.g. observe an apple going brown and mouldy over time - Understand the key features of lifecycle of a plant/animal - Explore and talk about forces we n feel e.g. magnetic attraction and repulsion, how water pushes up when you push a boat under it - Explore how materials float and sink - Talk about differences in materials and how they change e.g. melting and cooling - Explore how light can shine through some materials and not others. - Investigate shadows - Kite marking – which materials are lifted easily by the wind? - Exploring the seasons using our senses and observations 		

Understanding of the World Personal Development Physical Development		
Biology	Chemistry	Physics
<p>At Reception:</p> <ul style="list-style-type: none"> - 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 experience 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 - Offer explanations for why things might happen, making use of recently introduced vocabulary from stories, non-fiction, rhymes and poems when appropriate 	<p>At Reception:</p> <ul style="list-style-type: none"> - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter - Explain some similarities and differences between states of matter 	<p>At Reception:</p> <ul style="list-style-type: none"> - Know that our world is called Earth - Know that Earth is a planet and that we have other plants including their names - Understand that the Sun is a star not a planet - Explore floating and sinking and different objects - Know about different textures and materials and how they feel using adjectives to describe this
<p>Examples of specific disciplinary science:</p> <ul style="list-style-type: none"> - Opportunities to use senses to observe - Sing songs and rhymes about the natural world - Draw pictures of the natural world after close observation, including animals and plants - Observe and interact with natural processes e.g. ice melting, sound causing vibration, light travelling through transparent material, object casting a shadow, magnet attracting an object and a boat floating on water. - Focused observations of the natural world - Describe and comment on things they have seen, including plants and animals. - Name and describe some plants and animals that children are likely to see - Teach children about a range of contrasting environments - Vocabulary to name specific features both natural and man made. - Understand the effect of changing seasons. - Draw attention to weather and seasonal features - Provide opportunities for children to note and record the weather. - Share texts about the changing seasons - Observe how animals behave differently as the seasons change. 		

Repeated Vocabulary
Scientist, experiment, Earth, natural/man-made, season, animal, plant, environment, healthy, texture, life cycle, larva, pupa, metamorphosis, habitats

		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KS1	Year A	Sound	Seasons & weather	Light	Animal Kingdom	Habitats	Human Lifestyle
	Awe & Wonder	Investigate pitch and volume of sounds.	Create a weather log.	How to test if an object is reflective. Investigating shadows.	Do similar animals live in similar places?	Investigate the features of a habitat.	Impact of different exercises on our body. Why should we wash our hand before we eat?
	Year B	Materials	Building things	Changing materials	Mixing and making	Plants	Space
	Awe & Wonder	Does it bend or stretch?	Investigating materials that are fit for purpose.	Can all solid objects change shape in the same way? Which materials are elastic / absorbent / waterproof?	Can you melt an ice cube in your hands? Which mixture makes the best bubbles? Which materials are soluble in water?	Investigate what a plant needs to grow.	Human solar system
LKS2	Year A	Phases of Matter	Rock Cycle	Light	Space	Adaptations	Human Anatomy
	Awe & Wonder	Investigating different objects in different phases of matter.	Investigate the formation of sedimentary rocks, weathering and erosion.	Refraction with a pencil in oil, torches and mirror, periscopes, white light etc	Investigate the changes in the moon using a Moon diary.		Effect of different liquids on teeth. Recreate a digestive system and observe the changes in the food as it travels through the system.
	Year B	Practical Skills	Raw & Synthetic materials	Sound	Forces	Plants	Ecosystems
	Awe & Wonder	Learning about the elements of a scientific investigation	Make recycled paper	Investigation into what blocks sound. Build a musical instrument. Make a string telephone.	Investigate the force of friction. Investigate magnetic fields and buoyancy.	Dissecting flowers	Investigate the role of leaves in photosynthesis.
UKS2	Year A	Chemical Reactions	Sustainability	Heat	Energy	Cells	Diet and Lifestyle
	Awe & Wonder	Dissolving, filtering and sieving. Investigating if its chemical reaction or physical change.		How to stop an ice cube from melting? Investigating how heat transfer works.	Using the formula to calculate energy and speed and investigating their own speed.	Can we grow potatoes from a cutting?	Design an investigation into how effective different antiseptics are?
	Year B	Separating Mixtures	Physical and Chemical Changes	Magnetism	Electrical Circuits	Humans and Animals over Time	Reproductive Cycles
	Awe & Wonder	Investigate evaporation. Investigation into your own types of formulations. Investigation to separate out your own mixture of gravel, sand and water.	Investigate which metal is the most reactive when it is placed in vinegar.	Use bar magnets to investigate how the magnetic force acts. Use bar magnets and paper clips to test the strength of the magnet. Investigation to find out how to sort magnetic and non-magnetic materials. Investigation to build an electromagnet.	Investigation below to test whether the materials you have been given are electrical conductors or electrical insulators. Investigation to see what effect changing the number of cells OR the number of bulbs has on the circuit.	Investigating how finches have adapted their beaks (Darwin's finches).	Can you grow your own potatoes from a cutting?

Biology - Animals including humans				
	Key Stage One	Lower Key Stage Two		Upper Key Stage Two
Substantive Knowledge	<ul style="list-style-type: none"> 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 describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets) identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense 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 	<ul style="list-style-type: none"> 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 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> describe the changes as humans develop to old age
Disciplinary Knowledge	<ul style="list-style-type: none"> Can they point out some of the differences between different animals? Can they sort photographs of living things and non-living things? Can they identify and name a variety of common animals? (birds, fish, amphibians, reptiles, mammals, invertebrates) Can they describe how an animal is suited to its environment? Can they identify and name a variety of common animals that are carnivores, herbivores and omnivores Can they name the parts of the human body that they can see? Can they draw & label basic parts of the human body? Can they identify the main parts of the human body and link them to their senses? Can they name the parts of an animal's body? Can they name a range of domestic animals? Can they classify animals by what they eat? (carnivore, herbivore, omnivore) Can they compare the bodies of different animals? Can they describe what animals need to survive? Can they explain that animals grow and reproduce? Can they explain why animals have offspring which grow into adults? Can they describe the life cycle of some living things? (e.g. egg, chick, chicken) Can they explain the basic needs of animals, including humans for survival? (water, food, air) Can they describe why exercise, balanced diet and hygiene are important for humans? Can they begin to classify animals according to a number of given criteria? Can they point out differences between living things and non-living things? Can they name some parts of the human body that cannot be seen? Can they say why certain animals have certain characteristics? Can they name a range of wild animals? Can they explain that animals reproduce in different ways? 	<ul style="list-style-type: none"> Can they explain the importance of a nutritionally balanced diet? Can they describe how nutrients, water and oxygen are transported within animals and humans? Can they identify that animals, including humans, cannot make their own food: they get nutrition from what they eat? Can they describe and explain the skeletal system of a human? Can they describe and explain the muscular system of a human? <u>Extend</u> Can they explain how the muscular and skeletal systems work together to create movement? Can they classify living things and non-living things by a number of characteristics that they have thought of? Can they explain how people, weather and the environment can affect living things? Can they explain how certain living things depend on one another to survive? Can they identify and explain the function of the organs of the human circulatory system? (heart, blood vessels, blood, blood pressure, clotting) Can they identify and explain the function of the organs of the human gaseous exchange system? (lungs, nose, throat, bronchi, bronchial tubes, diaphragm, ribs, breathing) Can they name the major organs in the human body? Can they locate the major human organs? Can they make a diagram that outlines the main parts of a body? Can they explore the work of medical pioneers, for example, William Harvey and Galen and recognise how much we have learned about our bodies? Can they compare the organ systems of humans to other animals? Can they make a diagram of the human body and explain how different parts work and depend on one another 	<ul style="list-style-type: none"> Can they identify and name the basic parts of the digestive system in humans? Can they describe the simple functions of the basic parts of the digestive system in humans? Can they identify the simple function of different types of teeth in humans? Can they compare the teeth of herbivores and carnivores? Can they explain what a simple food chain shows? Can they construct and interpret a variety of food chains, identifying producers, predators and prey? Can they classify living things and non-living things by a number of characteristics that they have thought of? Can they explain how people, weather and the environment can affect living things? Can they explain how certain living things depend on one another to survive? 	<ul style="list-style-type: none"> Can they describe the changes as humans develop to old age? Can they create a timeline to indicate stages of growth in certain animals, such as frogs and butterflies? Can they describe the changes experienced in puberty? Can they draw a timeline to indicate stages in the growth and development of humans?
Vocabulary	amphibian, bird, fish, gills, mammal, reptile, carnivores, herbivores, omnivores senses, smell, taste, hear, see, touch offspring, survival, nutrition, reproduce, hygiene, lifecycle	endoskeleton, exoskeleton, carbohydrates, protein, fats, fibre, vitamins, minerals, vertebrate, invertebrate, socket/hinge/gliding joint, muscles digestive system, oesophagus, acid, enzymes, intestine, colon, incisors, canines, molars	producer, consumer, predator, prey, classification, ecosystem,	puberty, life cycle, gestation, foetus, fertilisation, adolescence organ system, tissues, cells, liver, kidney, lungs, circulatory system, blood vessels, nutrients,

Living Things | Year 1 | Summer 2

INVERTEBRATES - without a spine

- CRUSTACEANS**: Hard outside shell, jointed legs, 1 whole body. *Crabs, Lobster, Shrimp*
- ARACHNIDS**: Hard exoskeleton, large 2 pairs to their body. *Spiders, Scorpions*
- INSECTS**: Hard exoskeleton, large 3 pairs to their body. *Ants, Bees, Wasps, Flies*

VERTEBRATES - have a spine

- FISH**: Have gills to breathe, live underwater, are cold-blooded. *Goldfish, Tuna, Sharks*
- AMPHIBIANS**: Survive in water and in air, breathe through their skin, lay eggs without shells. *Frog, Toad, Newt*
- REPTILES**: Dry, scaly skin, cold-blooded, breathe with lungs. *Crocodile, Snake, Tortoise*
- BIRDS**: Have feathers and wings, lay hard-shelled eggs, warm-blooded. *Duck, Penguin, Rambling Quail, Dove*
- MAMMALS**: Have hair or fur, warm-blooded, give birth to live young. *Humans, Cats, Dogs, Elephants*

ALL ANIMALS GET FOOD BY EATING OTHER LIVING THINGS

YOU CAN TELL IF SOMETHING IS LIVING IF THEY:

- CARNIVORES**: Only eat meat. Have sharp, pointy teeth.
- HERBIVORES**: Only eat plants. Have flat teeth.
- OMNIVORES**: Eat plants and animals. Have sharp and flat teeth.

Other icons: Need air to breathe, Get rid of waste, Reproduce, React to surroundings.

Human lifestyle | Year Two | Spring 1

Food groups

- Proteins**: Give your body energy. Protein helps your body to grow and repair itself. *e.g. meat, fish, eggs, beans, e.g. milk, cheese, yogurt*
- Carbohydrates**: Contains lots of calcium which keep your bones and teeth strong. *e.g. apples, tomatoes, carrots*
- Fats**: These foods are not very healthy, it is important not to eat too many foods from this group. *e.g. chocolates, crisps, butter, fatty drinks*

Brain: Controls your actions and helps you to learn new things.

Heart: Pumps blood and oxygen around the body.

Lungs: Help us to breathe air in and out.

Keywords: Exercise, Healthy, Hygiene, Germs.

Investigations: How far can a sneeze spread? How does exercise affect your breathing?

Balanced diet: Includes Fruit and vegetables, Dairy, etc.

Knowledge Organiser - Human Anatomy - Year 4

Vocabulary: Organ, Protein, Fibre, etc.

Components of blood: Red blood cells, White blood cells, Platelets, etc.

Parts of the body: Skull, Shoulder, Elbow, etc.

The human skeleton: Diagram of the human skeleton with labels.

Circulatory system: Heart, Arteries, Veins, Capillaries.

Knowledge Organiser - Ecosystems - Year 3

Vocabulary: Organism, Microorganism, Habitat, Predator, Prey, Producer, Consumer, Photosynthesis, Herbivore, Carnivore, Omnivore.

Investigations: What would happen if you remove one organism from the food chain? What ecosystems can we find in our local area?

Food chains: A food chain shows how plants and animals get their energy. A food chain always starts with a producer. Most food chains start with a green plant, because plants can make their food by photosynthesis. Predators are found at the top of a food chain.

Ecosystems: A community of animals, plants and microorganisms, together with their habitat is called an ecosystem. For example, a pond ecosystem may consist of a pond habitat, inhabited by aquatic plants, microorganisms in the mud at the bottom, fish in the water and a heron on the bank. If one part of an ecosystem is changed, this may affect other living things in the ecosystem. For example, if a disease suddenly wipes out the plants in a pond, it might affect the fish and heron because they have less food to eat.

Knowledge Organiser - Cells - Year 5

Vocabulary: Cell, Nucleus, Cytoplasm, Mitochondria, Chloroplast, Vacuole, Cell Wall, Cell Membrane, Prokaryotic, Eukaryotic.

Antagonistic muscle pair: Diagram showing how muscles work in pairs.

Specialised cells: Diagram showing different types of cells and their functions.

Cell Structure: Diagram of a plant cell and an animal cell with labels.

Biology - Living things and their habitats

	Key Stage One	Lower Key Stage Two	Upper Key Stage Two	
Substantive Knowledge	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals give reasons for classifying plants and animals based on specific characteristics 	<ul style="list-style-type: none"> 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
Disciplinary Knowledge	<ul style="list-style-type: none"> Can they match certain living things to the habitats they are found in? Can they explain the differences between living and non-living things? Can they describe some of the life processes common to plants and animals, including humans? Can they decide whether something is living, dead or non-living? Can they describe how a habitat provides for the basic needs of things living there? Can they describe a range of different habitats? Can they describe how plants and animals are suited to their habitat? Can they name some characteristics of an animal that help it to live in a particular habitat? Can they describe what animals need to survive and link this to their habitats? 	<ul style="list-style-type: none"> Can they recognise that living things can be grouped in a variety of ways? Can they explore and use a classification key to group, identify and name a variety of living things? (plants, vertebrates, invertebrates) Can they compare the classification of common plants and animals to living things found in other places? (under the sea, prehistoric) Do they recognise that environments can change and this can sometimes pose a danger to living things? Can they give reasons for how they have classified animals and plants, using their characteristics and how they are suited to their environment? Can they explore the work of pioneers in classification? (e.g. Carl Linnaeus) Can they name and group a variety of living things based on feeding patterns? 	<ul style="list-style-type: none"> Can they explain the classification of living things into broad groups based on common observable characteristics? (five kingdoms of all living things, vertebrates, mammals, marsupials) Can they sub divide their original groupings and explain their divisions? Can they group animals into vertebrates and invertebrates? Can they explain why classification is important? Can they readily group animals into reptiles, fish, amphibians, birds and mammals? 	<ul style="list-style-type: none"> Can they describe the differences in the life cycles of a mammal, an amphibians, an insects and a bird? Can they describe the life cycles of common plants? Can they explore the work of well know naturalists and animal behaviourists? (David Attenborough and Jane Goodall) Can they observe their local environment and draw conclusions about life-cycles, e.g. plants in the vegetable garden or flower border? Can they compare the life cycles of plants and animals in their local environment with the life cycles of those around the world, e.g. rainforests?
Vocabulary	living, dependant, habitat, microhabitat, food chain, conditions	ecosystems, adaptation, nocturnal, organism, marine, diurnal, echolocation, vertebrate,	domain, kingdom, phylum, class, order, family, genus, species, characteristics	sexual, asexual reproduction, metamorphosis,

Habitats | Year 2 | Spring 1

REMEMBER:
You can tell if something is living if they do the following things:

- Movement
- Reproduction
- Sensitivity
- Nutrition
- Excretion
- Respiration
- Growth

Things that were never living do not do any of the things above and never did do them.

We call anything that is alive an **organism**.

FOOD CHAIN
All animals need energy to survive. Plants make their own food using the sun. A food chain describes the order in which organisms depend on each other for food, this creates a flow of energy from one living thing to another.

grass

deer

leopard

leaves

rat

python

MICROHABITATS
A microhabitat is a small area that's different to the surrounding habitat.

A spider lives on a web.

An ant lives in an anthill.

A bee lives in a hive.

A woodlouse lives under a rock.

HABITATS
A habitat is a small area that's different to the surrounding habitat.

Rainforest Rain forests are humid, rainy and they have lots of trees.	Woodland Woodlands are where trees are the dominant plant.	Desert Deserts are hot during the day, cold during the night and very dry.	Urban An area with lots of buildings and roads.
Pond A small area of still, fresh water.	Ocean An ocean is a huge body of salt water.		

Knowledge Organiser • Adaptations • Year 4

Vocabulary

Organism	Anything that is alive
Habitat	Natural home of an organism
Adaptation	The characteristics of an organism that help it to survive in its environment
Camouflage	An adaptation that allows animals to blend in with their environment
Nocturnal	Animals that are active at night
Echolocation	A way of finding objects using sound

Adaptations of bats to being nocturnal

1. Big eyes to help them see in the dark
2. Dark colour to camouflage with their surroundings
3. Some bats can use echolocation to find their prey in the dark

Adaptations of a whale to living under water

1. Can dive for a long time before coming up to the surface to breathe
2. A streamlined body and fins for swimming
3. Blubber that keeps them warm
4. Can use echolocation to navigate underwater

Adaptations of a camel to hot climates

1. 30-like humps and two rows of eyelashes to keep sand out
2. Can go for a long time without water
3. Large, fat feet to spread their weight on the sand

Adaptations of a polar bear to cold climates

1. a greasy coat that sheds water after swimming
2. large feet with claws to grip on the ice
3. a white colour to camouflage on the ice
4. thick layers of fat and fur for insulation against the cold

Knowledge Organiser • Reproductive Cycles • Year 5

Vocabulary

Pollination	When pollen from one plant is transferred to the ovary of another
Fertilisation	When an egg and pollen (or sperm) join together
Sexual reproduction	To reproduce with both a male and female
Asexual reproduction	To reproduce on your own without a mate
Larva	The young form of some animals which looks very different from its parents
Gestation	When a baby animal develops inside its mother
Metamorphosis	A dramatic change in the life cycle of an animal in which it ends up looking totally different

Mammal life cycle

1. Embryo: The embryo grows inside the mother
2. Young/ adolescence: The main period of growth and development
3. Adult: Female and male reproduce. Adult females nurse their young

Bird life cycle

Butterfly life cycle

1. Eggs: Adult butterfly lays eggs on the leaf of a plant
2. Caterpillar: Larvae called caterpillars hatch from the eggs
3. Pupa/Chrysalis: Caterpillar undergoes metamorphosis
4. Adult butterfly: Butterfly develops and emerges from pupa

Flowering plant life cycle

1. Germination: The seeds starts to grow
2. Flowering: The plant grows and develops flowers
3. Pollination: Insects transfer pollen between plants
4. Fertilisation: Seeds develop and flowers die
5. Seed dispersal: Seeds spread out helped by water, wind and animals

Investigations

- How and why do the life cycles of different animals differ?
- How could you clone a plant?

Biology - Plants			
	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Substantive Knowledge	<ul style="list-style-type: none"> 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 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 	<ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 	
Disciplinary Knowledge	<ul style="list-style-type: none"> Can they name the petals, stem, leaf, bulb, flower, seed, stem and root of a plant? Can they identify and name a range of common plants and trees? Can they recognise deciduous and evergreen trees? Can they name the trunk, branches and root of a tree? Can they describe the parts of a plant (roots, stem, leaves, flowers)? Can they describe what plants need to survive? Can they observe and describe how seeds and bulbs grow into mature plants? Can they find out & describe how plants need water, light and a suitable temperature to grow and stay healthy? Can they name the main parts of a flowering plant? Can they describe what plants need to survive and link it to where they are found? Can they explain that plants grow and reproduce in different ways? 	<ul style="list-style-type: none"> Can they identify and describe the functions of different parts of flowering plants? (roots, stem/trunk, leaves and flowers)? Can they explore the requirement of plants for life and growth (air, light, water, nutrients from soil, and room to grow)? Can they explain how they vary from plant to plant? Can they investigate the way in which water is transported within plants? Can they explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal? 	
Vocabulary	wild plants, garden plants, deciduous, evergreen, plant, leaf, root, leaves, bud, flowers, blossom, petals, stem, tree, trunk, branches, fruit, vegetables, bulb, seed germination, reproduction, mature, survive,	flowering plant, germination, seed dispersal, adaptations, transpiration, functions, pollination	

Plants | Year 1 | Summer 1

What plants need to survive

Sunlight

Carbon dioxide from the air

Water

The correct temperature

Types of tree

Deciduous Trees	Evergreen Trees
Lose leaves each year	Keep leaves all year round
Deciduous leaves are: <ul style="list-style-type: none"> • flat • broad • have veins • running through them 	Evergreen leaves are: <ul style="list-style-type: none"> • thick • small • narrow like needles
Examples include: Oak trees Sycamore trees	Examples include: Yew trees Pine trees

Parts of a flower

Stigma: contains lots of pollen

Petal: attract insects and birds which spread the pollen

Anther: contains lots of pollen

Filament: holds the plant upright

Stem: holds the plant upright

Flower: attract insects and birds which spread the pollen

Roots: take up water and nutrients from the soil

Leaves: where the plants make their own food

How a bean grows

Step 1: Seed

Step 2: Roots

Step 3: Seedling

Step 4: Leaves and flowers

Knowledge Organiser • Plants • Year 3

Factor	Effect on plant growth	Flower parts	Function
Light brightness	Increasing the brightness of light during the day increases growth	Sepals	the green part that protects flowers before they open
Water level	Plants need a steady supply of water to increase growth (but not too much!)	Ovule	the egg part of the plant that contains female sex cells
Warmth	Plants will grow more quickly in warm conditions (but not too hot!)	Ovary	the part of the plant where the ovules are produced
Nutrients	Plants will grow more quickly when they have nutrients available (which can be found in soil)	Style	the long stalk that connects the stigma to the ovary
		Stigma	the sticky top of the style that collects pollen
		Petal	Outer part of a flower that attracts insects (usually with bright colours)
		Filament	Thinner long stalk that holds up the anther
		Anther	the part that produces pollen (the male sex cell)

Process	Description
Germination	the process of a plant beginning to grow from a seed
Flowering	when the stem and leaves have grown and a flower begins to bud
Pollination	the process of pollen being moved from anther to stigma
Fertilisation	when pollen travels down to join with an ovule in the ovary
Seed dispersal	how seeds are spread away from a plant to be able to grow in a new location

Transpiration is the process of water exiting a plant's leaves through small gaps called stomata.

Water enters the roots

Water soaks up the stem

Water exit the leaves

Biology - Evolution and inheritance				
	Key Stage One	Lower Key Stage Two		Upper Key Stage Two
Substantive Knowledge				<ul style="list-style-type: none"> 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
Disciplinary Knowledge				<ul style="list-style-type: none"> Can they give reasons for why living things produce offspring of the same kind? Can they give reasons for why offspring are not identical with each other or with their parents? Can they explain the process of evolution and describe the evidence for this? Can they begin to appreciate that variation in offspring over time can make animals more or less able to survive in particular environments? Can they talk about the life of Charles Darwin? Can they explain how some living things adapt to survive in extreme conditions? Can they analyse the advantages and disadvantages of specific adaptations, such as being on two rather than four feet? Can they begin to understand what is meant by DNA?
Vocabulary				evolution, fossilisation, homo sapiens, species, conservationist, adaptation, variation, inheritance, adaptation, traits

Knowledge Organiser • Humans & Animals Over Time • Year 5

Fossilisation process

Animal dies, its skeleton settles on the sea floor and is buried by sediment.
The sediment surrounding the skeleton thickens and begins to turn to stone.
The skeleton dissolves and a mould is formed.
Minerals crystallise inside the mould and a cast is formed.
The fossil is exposed in the Earth's surface.

How evolution works:

- Not all individuals of a species are exactly the same. There is variation between them.
- The individuals of a species who are best adapted to their environment are most likely to survive.
- These individuals are more likely to reproduce and pass their useful adaptations onto their offspring.
- Individuals that were poorly adapted were less likely to survive.
- Over time, the characteristics that help survival become more common and a species gradually changes.
- Given enough time, these small changes can add up to the extent that a new species altogether can evolve.

Variation
The differences between living things in a species.

Adaptation
How living things are specialised to suit their environment.

Species:
A group of living things with very similar characteristics. They can breed together to make more living things of the same type.

Evolution:
The process by which living things can gradually change over time.

Charles Darwin



Born: 1809
Died: 1882
Nationality: British
Famous for: his book 'On the Origin of Species' (1859). In his book he laid out his theory of evolution which was very controversial at the time but is now widely accepted as scientific fact.

Life on Earth timeline

Cenozoic Era	Modern humans first appear (Homo sapiens)	0.2 mya
	First human-like animals appear	2.5 mya
Mesozoic Era	Dinosaurs go extinct	66.4 mya
	First flowering plants	141 mya
	First birds	195 mya
	First dinosaurs and mammals	230 mya
Paleozoic Era	First reptiles	340 mya
	First insects	360 mya
	First amphibians	370 mya
	Plants appear on land	420 mya
	Cambrian explosion – the first fish	530 mya
Proterozoic Era	Simple single celled creatures appear	700 mya
	Algae, fungi, single-celled animals appear	2100 mya
	Life first begins with single-celled creatures like bacteria	3600 mya

Chemistry - Materials			
	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Substantive Knowledge	<ul style="list-style-type: none"> 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 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 	<ul style="list-style-type: none"> 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 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 	<ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> the action of acid on bicarbonate of soda

Disciplinary Knowledge

- Can they distinguish between an object and the material from which it is made?
- Can they describe materials using their senses?
- Can they describe materials using their senses, using specific scientific words?
- Can they explain what material objects are made from?
- Can they explain why a material might be useful for a specific job?
- Can they name some different everyday materials? e.g. wood, plastic, metal, water and rock
- Can they sort materials into groups by a given criteria?
- Can they explain how solid shapes can be changed by squashing, bending, twisting and stretching?
- Can they describe the simple physical properties of a variety of everyday materials?
- Can they compare and group together a variety of materials based on their simple physical properties?
- Can they explore how the shapes of solid objects can be changed? (squashing, bending, twisting, stretching)
- Can they find out about people who developed useful new materials? (John Dunlop, Charles Macintosh, John McAdam)
- Can they identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper, cardboard for particular uses?
- Can they explain how things move on different surfaces?
- Can they describe things that are similar and different between materials?
- Can they explain what happens to certain materials when they are heated, e.g. bread, ice, chocolate?
 - Can they explain what happens to certain materials when they are cooled, e.g. jelly, heated chocolate?
- Can they describe the properties of different materials using words like, transparent or opaque, flexible, etc.?
- Can they sort materials into groups and say why they have sorted them in that way?
- Can they say which materials are natural and which are man made?
- Can they explain how materials are changed by heating and cooling?
- Can they explain how materials are changed by bending, twisting and stretching?
- Can they tell which materials cannot be changed back after being heated, cooled, bent, stretched or twisted?

Vocabulary

absorbent, waterproof, material, properties, wood, plastic, metal, water, rock, magnetic, attract, repel, translucent, opaque
 fabric, brittle, flexible, mixture, length, height, weight, design

- Can they compare and group together different rocks on the basis of their appearance and simple physical properties?
- Can they describe and explain how different rocks can be useful to us?
- Can they describe and explain the differences between sedimentary and igneous rocks, considering the way they are formed?
- Can they describe in simple terms how fossils are formed when things that have lived are trapped within rock?
 - Can they recognise that soils are made from rocks and organic matter?
- Can they classify igneous and sedimentary rocks?
- Can they begin to relate the properties of rocks with their uses?
- Can they compare and group materials together, according to whether they are solids, liquids or gases?
- Can they explain what happens to materials when they are heated or cooled?
- Can they measure or research the temperature at which different materials change state in degrees Celsius?
- Can they use measurements to explain changes to the state of water?
- Can they identify the part that evaporation and condensation has in the water cycle?
- Can they associate the rate of evaporation with temperature?
- Can they group and classify a variety of materials according to the impact of temperature on them?
- Can they explain what happens over time to materials such as puddles on the playground or washing hanging on a line?
- Can they relate temperature to change of state of materials?

igneous, sedimentary, metamorphic, rock cycle, chemical weathering, metamorphosis, intrusive, extrusive
 solids, liquids, gases, state of matter, particles, non-newtonian fluid, properties, evaporation, condensation

- Can they compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets?
- Can they explain how some materials dissolve in liquid to form a solution?
- Can they describe how to recover a substance from a solution?
- Can they use their knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving, evaporating?
- Can they give reasons, based on evidence for comparative and fair tests for the particular uses of everyday materials, including metals wood and plastic?
- Can they describe changes using scientific words? (evaporation, condensation)
- Can they demonstrate that dissolving, mixing and changes of state are reversible changes?
- Can they 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?
- Can they use the terms 'reversible' and 'irreversible'?
- Can they describe methods for separating mixtures? (filtration, distillation)
- Can they work out which materials are most effective for keeping us warm or for keeping something cold?
- Can they use their knowledge of materials to suggest ways to classify? (solids, liquids, gases)
- Can they explore changes that are difficult to reverse, e.g. burning, rusting and reactions such as vinegar with bicarbonate of soda?
 - Can they explore the work of chemists who created new materials, e.g. Spencer Silver (glue on sticky notes) or Ruth Benerito (wrinkle free cotton)?

pure substances, mixtures, formulation, insoluble, soluble, condensation, solubility, transparency, conductivity, physical changes, chemical changes, combustion, irreversible, insulation,

Expectation of skills progression

Physics - Forces			
	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Substantive Knowledge		<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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
Disciplinary Knowledge		<ul style="list-style-type: none"> Can they explain that unsupported objects fall towards the earth because of the force of gravity acting between the earth and the falling object? Can they identify the effects of air resistance, water resistance and friction that act between moving surfaces? Can they recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect? Can they describe and explain how motion is affected by forces? (including gravitational attractions, magnetic attraction and friction) Can they design very effective parachutes? Can they work out how water can cause resistance to floating objects? Can they explore how scientists, such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation? 	<ul style="list-style-type: none"> Can they compare how things move on different surfaces? Can they observe that magnetic forces can be transmitted without direct contact? Can they observe how some magnets attract or repel each other? Can they classify which materials are attracted to magnets and which are not? Can they notice that some forces need contact between two objects, but magnetic forces can act at a distance? Can they compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet? Can they identify some magnetic materials? Can they describe magnets have having two poles (N & S)? Can they predict whether two magnets will attract or repel each other depending on which poles are facing? <p>Can they investigate the strengths of different magnets and find fair ways to compare them?</p>
Vocabulary		contact forces, non-contact forces, up thrust, gravitational force, air resistance, water resistance, friction, magnetic force, Newtons, mechanism, accelerate	attract, repel, compass, magnetic field, magnetic, non-magnetic, electromagnet,
Expectation of skills progression		<p>Knowledge Organiser - Forces - Year 3</p> <p>Vocabulary Forces: Are a push or a pull on an object. The can cause: • A push on an object • A pull on an object • The object to twist Contact forces: Act between two objects that are touching each other. Non-contact forces: Act between two objects that are not touching each other.</p> <p>Newton Born: 1643 Died: 1727 Occupation: Scientist, mathematician, Head of the royal mint Nationality: British</p> <p>Contact force examples Friction Up thrust Air resistance</p> <p>Non-contact force examples Magnetic force Gravitational Force</p> <p>Float or not? When an object is in water, weight pulls it downwards, and up thrust pushes it upwards. Object sinks if weight is bigger than upthrust. Object floats if up thrust is the same size as the weight.</p> <p>Simple machines that can increase the size of a force: Levers: to lift heavy objects Pulleys: to raise objects up to high heights Gears: to turn a small force into a big one.</p> <p>Hook to hang Newon meter on Hook to connect to objects being tested Object being tested Numbers to measure size of force (in N)</p>	<p>Knowledge Organiser - Magnetism - Year 5</p> <p>Vocabulary Forces: Are a push or a pull on an object. Contact forces: Act between two objects that are touching each other. Non-contact forces: Act between two objects that are not touching each other.</p> <p>Electromagnet An electromagnet is a magnet that can be switched on and switched off. It is made from a power source (like a battery), wire and a piece of iron. Electromagnets are used in electronic locks, scrapyards cranes and in electric motors.</p> <p>Non - contact forces Gravitational force acts between any object and earth. Magnetic forces act between two magnets (when they attract or repel) or a magnet and a magnetic material (when they attract). Iron, steel and nickel are examples of magnetic materials.</p> <p>Magnetic fields Magnetic fields - the field of a force is an area in which an invisible force will act. Magnetic field diagram - this shows a map of how the magnetic force will act in different places around a magnet. It can be mapped out by: • Using iron filings on paper above the magnet • Placing a compass in a range of positions around the magnet.</p> <p>Magnet Magnets are objects that attract or repel other magnetic objects or materials. Examples of magnetic materials include steel, iron, Cobalt and nickel. Attract: S-N, N-S Repel: S-S, N-N</p> <p>Compass How does a compass work? A compass is a small, thin magnet made from steel which is placed on a pivot. The magnet spins to line up with the earth's magnetic field to show where north is.</p>

Physics - Light

	Key Stage One	Lower Key Stage Two	Upper Key Stage Two																																																			
Substantive Knowledge	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> recognise that light appears to travel in straight lines use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye <ul style="list-style-type: none"> explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them 																																																				
Disciplinary Knowledge	<ul style="list-style-type: none"> Can they recognise that they need light in order to see things? Can they recognise that dark is the absence of light? Can they notice that light is reflected from surfaces? Can they recognise that light from the sun can be dangerous and that there are ways to protect their eyes? Can they recognise that shadows are formed when the light from a light source is blocked by a solid object? Can they find patterns in the way that the size of shadows change? Can they explain why lights need to be bright or dimmer according to need? Can they explain the difference between transparent, translucent and opaque? Can they explain why lights need to be bright or dimmer according to need? Can they make a bulb go on and off? Can they say what happens to the electricity when more batteries are added? Can they explain why their shadow changes when the light source is moved closer or further from the object? 	<ul style="list-style-type: none"> Can they explain how light travels? Can they explain how the human eye sees objects? Can they explain how different colours of light can be created? Can they use and explain how simple optical instruments work? (periscope, telescope, binoculars, mirror, magnifying glass, Newton's first reflecting telescope) Can they explain changes linked to light (and sound)? Can they use the ray model to explain the size of shadows? 																																																				
Vocabulary	source, reflection, refraction, periscope, lens	reflection, periscope, filters, shadows																																																				
Expectation of skill progression	<p>Light Year Two Summer 1</p> <table border="1"> <thead> <tr> <th colspan="3">Reflective vs non-reflective materials</th> <th colspan="2">Keywords</th> </tr> </thead> <tbody> <tr> <td>reflective</td> <td>Smooth, shiny surfaces</td> <td>Reflects light well. Most of the light that hits the surface bounces off</td> <td>Reflection</td> <td>Light source: Something that makes light e.g. the sun, a fire or a torch.</td> </tr> <tr> <td>Non-reflective</td> <td>Dull, dark surfaces</td> <td>Do not reflect light well. Some light bounces off the object but most of the light is absorbed.</td> <td>Absorption</td> <td>Light: A type of energy that travels in waves from a light source.</td> </tr> <tr> <td colspan="3"> How a shadow is formed When an object is opaque light cannot pass through it and so a shadow is formed. </td> <td>Dark</td> <td>The absence of light.</td> </tr> <tr> <td colspan="3"> How we see 1) A light source produces light 2) Light travels from the light source to the object 3) Light bounces off the object 4) Light travels from the object to our eye 5) Light enters your eye through the pupil 6) Our eyes send a signal to our brain </td> <td>Shadow</td> <td>Formed when an object blocks a source of light.</td> </tr> <tr> <td colspan="3"> Why we have day and night 1) The Earth spins on an axis. 2) When a part of the Earth is facing the sun its light can reach you. This is called daytime. 3) When a part of the Earth is facing away from the sun its light cannot reach you and so it is dark. 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Absorb	When something (e.g. light) is taken in.	<p>Knowledge Organiser • Light • Year 4</p> <p>Light is form of energy that can be passed from one object to another across space.</p> <p>Reflection Reflection takes place when light bounces off an object Uses: as a mirror to look behind yourself, in a periscope Specular reflection - when all light reflects in the same direction Diffuse reflection - when all light reflects off an object in many different directions</p> <p>Vocabulary</p> <table border="1"> <tbody> <tr> <td>Sources of light:</td> <td>Objects that give off light (e.g. light bulbs, flames, the Sun)</td> </tr> <tr> <td>Luminous:</td> <td>A word that means gives off light</td> </tr> <tr> <td>Darkness:</td> <td>A place that is lacking light</td> </tr> <tr> <td>Light meter:</td> <td>An instrument that measures the amount of light in given place</td> </tr> <tr> <td>Lux:</td> <td>A measurement of amount of light</td> </tr> <tr> <td>Transparent:</td> <td>An object that allows all light to pass through it</td> </tr> <tr> <td>Translucent:</td> <td>An object that allows some light to pass through it</td> </tr> <tr> <td>Opaque:</td> <td>An object that allows no light to pass through it</td> </tr> </tbody> </table> <p>Refraction Refraction takes place when light changes direction when it moves from one transparent material to another Uses: jewellery to make an object 'sparkle', to get different colours of light from white light, in lenses (e.g. glasses)</p> <p>Parts of the Human Eye</p> <p>Primary and Secondary Colours of Light</p>	Sources of light:	Objects that give off light (e.g. light bulbs, flames, the Sun)	Luminous:	A word that means gives off light	Darkness:	A place that is lacking light	Light meter:	An instrument that measures the amount of light in given place	Lux:	A measurement of amount of light	Transparent:	An object that allows all light to pass through it	Translucent:	An object that allows some light to pass through it	Opaque:	An object that allows no light to pass through it	
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Physics - Electricity

	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Substantive Knowledge			<ul style="list-style-type: none"> • 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 • identify common appliances that run on electricity • construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • recognise that a switch opens and closes 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
Disciplinary Knowledge			<ul style="list-style-type: none"> • Can they identify and name the basic parts of a simple electric series circuit? (cells, wires, bulbs, switches, buzzers) • Can they compare and give reasons for variation in how components function, including bulb brightness, buzzer volume and on/off position of switches? • Can they explain how to make changes in a circuit? • Can they explain the impact of changes in a circuit? • Can they explain the effect of changing the voltage of a battery? • Can they identify common appliances that run on electricity? • Can they construct a simple series electric circuit? • Can they identify and name the basic part in a series circuit, including cells, wires, bulbs, switches and buzzers? • Can they 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? • Can they recognise that a switch opens and closes a circuit? • Can they associate a switch opening with whether or not a lamp lights in a simple series circuit? • Can they recognise some common conductors and insulators? • Can they associate metals with being good conductors? • Can they make their own traffic light system or something similar? • Can they explain the danger of short circuits? • Can they explain what a fuse is? • Can they explain how a bulb might get lighter? • Can they recognise if all metals are conductors of electricity? • Can they work out which metals can be used to connect across a gap in a circuit? • Can they explain why cautions are necessary for working safely with electricity? •
Vocabulary			static electricity, static charge, electrical circuit, insulators, conductors, appliances, switch

Knowledge Organiser • Electrical Circuits • Year 5

Electricity comes in two forms: static electricity and electricity in circuits.

Static Electricity

Happens when:
Two object rubs against each other

Because:
The positive and negative charge in a material become unbalanced

Discharge:
is when the charge jumps from one object to another to balance out again

Examples:



Rubbing a balloon on hair



Socks rubbing on a trampoline



Clothes spinning in a dryer



Storm clouds leading to lightning

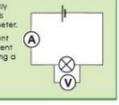
Rules for building circuits

- There must be at least one cell
- There must be a complete loop for electricity to flow
- The wires must be plugged in to each component on one side and come out of the component on the other side
- The switch must be closed to make it work

Taking measurements in a circuit

Current tells us how quickly electricity is flowing and is measured using an Ammeter.

Voltage tells us the amount of energy each component uses and is measured using a voltmeter



When we want to show the parts of a circuit (known as components) we use a circuit diagram which shows the main features of a circuit in a simplified form.

Cell		What is commonly known as a 'battery' is a cell. Provides the power to make electricity flow.
Battery		When two or more cells are used together
Bulb		Produces light when electricity flows through it
Buzzer		Produces sound when electricity flows through it
Switch (open)		Creates a gap in the circuit to stop the flow of electricity
Switch (closed)		Closes the gap in the circuit to allow electricity to flow

Electrical insulators and conductors

Electrical insulator - an object or material that will not allow electricity to pass through itself easily.
Examples: plastic, wood, rubber, glass and oil

Electrical conductor - an object or material that will allow electricity to pass through itself easily.
Examples: include silver, gold, copper, graphite and sea water

Adding cells or bulbs to a circuit

Adding more BULBS to a circuit:

- Bulbs are less bright
- Current is lower
- Voltage for each bulb is less

Adding more CELLS to a circuit:

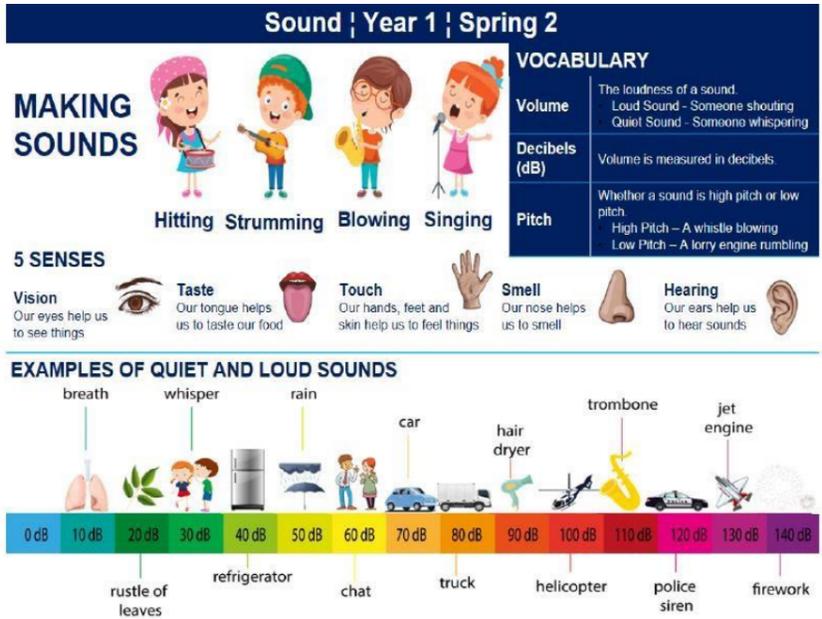
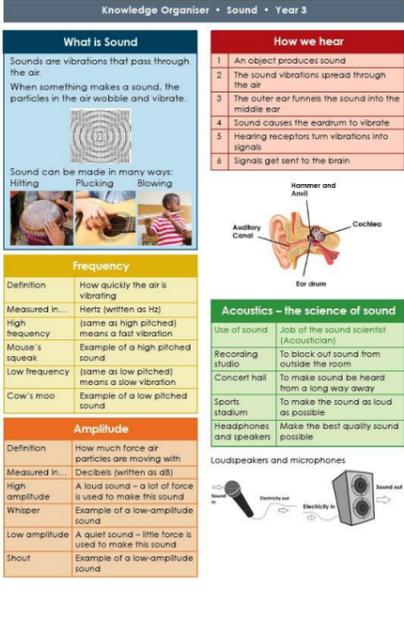
- Bulbs are brighter
- Current is higher
- Voltage for each bulb is more

Uses of buzzers

Buzzers enable sound to be made from electricity. This can be useful for:

- Alarms - buzzers that go off when something is touched
- Electric doorbells - release a ringing sound when a button is pressed
- Shop door sensor - makes a noise when someone opens the door

Physics - Sound

	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Substantive Knowledge	<ul style="list-style-type: none"> identify how sounds are made, associating some of them with something vibrating Know that sounds are measured in decibels. Know that the higher the decibels, the louder the sound. find patterns between the volume of a sound and the strength of the vibrations that produced it recognise that vibrations from sounds travel through a medium to the ear 	<ul style="list-style-type: none"> 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 	
Disciplinary Knowledge	<ul style="list-style-type: none"> Can they associate some sounds with something vibrating? Can they compare sources of sound and explain how the sounds differ? Can they explain how to change a sound (louder/softer)? Can they recognise how vibrations from sound travel through a medium to a ear? Can they find patterns between the pitch of a sound and features of the object that produce it? Can they find patterns between the volume of the sound and the strength of the vibrations that produced it? 	<ul style="list-style-type: none"> Can they associate some sounds with something vibrating? Can they compare sources of sound and explain how the sounds differ? Can they explain how to change a sound (louder/softer)? Can they recognise how vibrations from sound travel through a medium to a ear? Can they find patterns between the pitch of a sound and features of the object that produce it? Can they find patterns between the volume of the sound and the strength of the vibrations that produced it? Can they recognise that sounds get fainter as the distance from the sound source increases? Can they explain how you could change the pitch of a sound? Can they investigate how different materials can affect the pitch and volume of sounds? Can they explain why sound gets fainter or louder according to the distance? Can they explain how pitch and volume can be changed in a variety of ways? Can they work out which materials give the best insulation for sound? 	
Vocabulary	decibels, pitch, volume, vibrate	frequency, amplitude, acoustics, Hertz, eco-location, percussion,	
Expectation of skills progression			

Physics – Earth and space

	Key Stage One	Lower Key Stage Two	Upper Key Stage Two
Substantive Knowledge	<ul style="list-style-type: none"> observe changes across the 4 seasons observe and describe weather associated with the seasons and how day length varies describe the movement of the Earth and other planets relative to the sun in the solar system name the planets in the solar system. 	<ul style="list-style-type: none"> describe the movement of the Earth and other planets relative to the sun in the solar system describe the movement of the moon relative to the Earth describe the sun, Earth and moon as approximately spherical bodies <p>use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky</p>	
Disciplinary Knowledge	<ul style="list-style-type: none"> Can they observe changes across the four seasons? Can they name the four seasons in order? Can they observe and describe weather associated with the seasons? <ul style="list-style-type: none"> Can they observe and describe how day length varies? Can they observe features in the environment and explain that these are related to a specific season? Can they observe and talk about changes in the weather? <ul style="list-style-type: none"> Can they talk about weather variation in different parts of the world? Can they define space? Can they say what is in space? Can they name some of the planets in our solar system? Can they describe how the Earth rotates and orbits the sun? Can they explain why the Earth is tilted? Can they talk about stars and constellations? 	<ul style="list-style-type: none"> Can they identify and explain the movement of the Earth and other plants relative to the sun in the solar system? Can they explain how seasons and the associated weather is created? Can they describe and explain the movement of the Moon relative to the Earth? Can they describe the sun, earth and moon as approximately spherical bodies? Can they use the idea of the earth's rotation to explain day and night and the apparent movement of the sun across the sky? Can they compare the time of day at different places on the earth? Can they create shadow clocks? Can they begin to understand how older civilizations used the sun to create astronomical clocks, e.g. Stonehenge? <p>Can they explore the work of some scientists? (Ptolemy, Alhazen, Copernicus)</p>	
Vocabulary	sleet, hail, fog, season, summer, winter, autumn, spring, weather, hibernation, forecast constellations, universe, solar system, orbit, tilt, scientists	lunar, solar, eclipses, galaxies, astronomy, Milky Way, astronomer, heliocentric, geocentric, hemisphere, orbit, axis	

Seasons and The Weather | Year 1 | Spring 1






SEASONS

SPRING
March, April, May

- trees grow leaves
- weather becomes warmer
- days become longer
- baby animals born

SUMMER
June, July, August

- trees have full green leaves
- weather is usually warm
- days are bright and long

WEATHER

Rainy
Water falling from clouds.

Cloudy
Some clouds in the sky.

Snowy
Snow falls from cold clouds.

Sunny
The sun is shining brightly in the sky.

Stormy
Thunder, lightning, wind and rain.

Foggy
Clouds we can see.

KEY TERMS

Hibernation
Animals sleep in the winter to survive the cold weather.

hedgehog, snail, tortoise

bat, bee

Weather Forecast
Shows the weather today and in the future.

AUTUMN
September, October, November

- leaves become brown and fall
- weather becomes more rainy and cool
- days become shorter
- animals prepare to hibernate

WINTER
December, January, February

- no leaves on trees
- weather is cold and there can be snow
- days are dark and short
- animals hibernate

Space | Year Two | Spring 2



Planets	Number from the Sun	Key features	Distance from the Sun (kilometres)
Mercury	1	Closest planet to the Sun. It turns very slowly on its axis.	57 million
Venus	2	Brightest planet. It's air is 100% carbon dioxide.	108 million
Earth	3	Where we live! Humans live on Earth. The only planet with liquid water.	149 million
Mars	4	Known as the red planet because of the oxide in the land.	483 million
Jupiter	5	The largest planet and it is very stormy there!	778 million
Saturn	6	The second largest planet. It has 18 moons.	1.4 billion
Uranus	7	The frozen planet because it is frozen. It has 27 moons.	2.8 billion
Neptune	8	The gas giant because it is made of gas.	4.4 billion

Keywords	Definition
Solar System	The group of objects that orbit the sun.
Orbit	Goes around a planet or star.
Axis	An invisible line around which a planet spins.
Rotate	The way an object turns.
Satellite	A machine put into orbit around the Earth used for science or communications.
NASA	North American Space Agency
Astronaut	A person who travels in space.

Knowledge Organiser • Space • Year 4

Vocabulary

The Sun	The largest object in the solar system that the solar system was named after
Planets	Large spheres of rock that orbit around the sun
Moons	Large balls of rock that orbit planets
Asteroids, Meteors, Meteorites, Comets	An example of another rocky object that can be found in the solar system
Dust and gas	Left over material from stars that have exploded in the past

Astrology

The belief that the motion of the stars and planets affects human lives

Astronomy

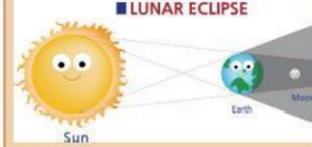
The scientific study of anything in space outside of the Earth's atmosphere

The universe and the Big Bang

The universe	All the stars, planets, rocks and dust in space
Galaxy	A group of stars held together by gravity
Big Bang theory	The theory that all matter in the universe started in a single point that exploded outwards
Dwarf star	A smaller cooler star without nuclear fusion
Star colour	Hot stars are closer to blue, colder closer to red

Lunar eclipse

When the Earth blocks the light from the Sun as the Moon moving into the Earth's shadow



Solar eclipse

When the moon blocks the light from the sun to create a shadow on Earth



A very hot ball of gas where nuclear fusion happens

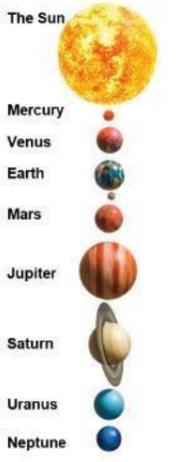
The Sun

Inner rocky planets

- Closer to the Sun
- Mostly solid rock
- The warmer planets
- Smaller
- Take less time to orbit the sun

Outer gas giants

- Further away from the Sun
- Mostly made from gas
- The colder planets
- Often have rings of dust and rock around them
- Larger
- Take more time to orbit the sun



Mercury

Venus

Earth

Mars

Jupiter

Saturn

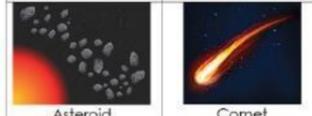
Uranus

Neptune



Meteor

Meteorite



Asteroid

Comet