Core Values

Readiness Resilience Respect

Responsibility | Collaboration | Independence | Aspiration

Kindness | Confidence | Courage | Honesty | Compassion

Vision

At Kender we promote positive attitudes towards each other through the Kender Values. We provide a curriculum that is rich and diverse, all our curriculum areas are underpinned by our curriculum aims which are:

- To develop and build upon knowledge and skills year upon year.
- To raise aspiration so that children can reach their full potential.
- To develop self confidence, self belief and self control.
- To ensure that children are able to develop their own identity and are provided with role models who can help them to do this.
- To provide a wealth of experiences both academic and practical so that children can develop life skills.
- To engage with the local community and make links with the local area to enrich then children's learning and experience.
- To embed the Kender Values throughout the curriculum as they encompass all that we are trying to achieve.

RE

Faith and Belief
Belonging/community
The natural world
Being a good citizen
Philosophy

Music

Singing
Listening
Composing
Performing
Musicianships
Pulse beat
Rhythm
Pitch
Instruments and playing techniques

Art

Design and make
Draw
Paint
Sculpt
Generating ideas
Making links
Exploring artists
Sketchbooks
Evaluate

History

Time lines and Chronology
Artefacts
Interpretation, enquiry, analysis
Cause and consequence
Change and continuity
Past and Present
Fact and Fiction

English

Speaking and Listening
Vocabulary
Phonics
Handwriting
Reading
Spelling
Punctuation
Grammar
Writing
Composition
Transcription

Science

Animals, including humans
Plants
Living things and their habitats
Evolution and inheritance
Materials
Rocks
States of matter
Earth, space and the moon
Forces and magnets
Sound and light
Electricity
Working scientifically
Enquiry

PE

Games
Gymnastics
Dance
Yoga
Swimming
Athletics
Orienteering

Kender Curriculum 2022-23

Computing

E-safety
Programming
Handing data
Multimedia
Technology in our lives

MFL (KS2) French

Speaking and listening
Vocabulary
Reading
Writing
Grammar

PSHE/RSE/MHWB/CZS/BV

Relationships and health education (RHE)
Drug, alcohol and tobacco education (DATE)
Keeping safe and managing risk
Mental health and emotional wellbeing
Physical health and wellbeing
Identity, society and equality

DT

Using technology
Construction/joining
Practical skills
Designing skills
Textiles
Cooking and nutrition
Evaluating n

Geography

Map and Atlas work
Place and locational knowledge
Humans and physical geography
Geographical skills and field work
Impact of humans on the environment
Economy

Maths

Fluency
Reasoning
Problem solving
Number - Place Value Addition and subtraction, multiplication and division, fractions
Measurements
Geometry

Wider Curriculum

We offer a wide range of sporting opportunities including:
- Swimming lessons;
- Dance and gymnastic lessons;
- PE lessons led by sports coaches, which ensure progression in sports skills across the school;

We have a specialist Art teacher who enhances children's creativity through different media enhanced by local art community projects and in partnership with the South London Gallery, Bold Tendencies and British Council.

We contribute to children's life skills and Social, Moral, Spiritual and Cultural Development through experiences within the classroom and beyond. These opportunities include: Forest School, residential trips, making links with businesses, participating in sporting events and educational visits - including to places of worship.

Our involvement with the Opal Play Project – recognised nationally - and our school play philosophy encourages creativity, emotional and social development, independence and risk taking amongst our pupils.

Through a positive and caring ethos and meaningful curriculum, we provide the opportunity for every child strive to reach their full potential, becoming successful citizens.

SUBJECT: Science

Intent - We aim to…

We live in an increasingly scientific and technological age involving challenges such as an acute climate crisis and recent global pandemic, as well as accelerated developments in technology. Consequently, children need to acquire the knowledge, skills and attitudes necessary to prepare them for life in the 21st century.

We at Kender Primary School believe that the teaching of science develops in children an interest, curiosity and sense of responsibility about the world in which they live and fosters in them a respect for the environment.

As a result of our science teaching we want to develop children who:

- are able to keep up with the increasingly scientific and technological age we live in;
- are observant, curious and wish to care for and improve our environment for themselves and others;
- are future thinking and understand that science is a tool to help change the world for the better;
- view science as an enjoyable experience;
- can work individually and cooperatively, listening to and valuing the opinions of others;
- are able to relate science to everyday life and appreciate its contribution both in the present and historically, to our society and other cultures;
- appreciate the nature of science and the importance of collecting evidence.

Furthermore, pupils will develop, through practical work, the skills of observation, prediction, investigation, interpretation, communication, questioning and hypothesising, and to gain an increased expertise of precise measurement skills and ICT.

Implementation - How do we achieve our aims?

We use Outstanding Science and ASE PLAN documents for planning support. Below is an outline of the end of key stage expectations (Early Education, (2021) Birth to 5 Matters; DfE, (2018) KS1 and KS2 Teacher Assessment frameworks):

EYFS…

EYFS

In Nursery and Reception, the staff follows the 'Birth to 5 Matters' framework (Early Education, 2021), which gives the children opportunities to find out about the world they live in. Science is not discretely taught, but is delivered holistically through everyday learning activities. This involves, but is not limited to:

- Understanding the World: People and Communities, The World, and Technology
- Physical development: Self Care
- Making links and predictions, as well as noticing patterns
- Language of time, such as time of day and seasons

Refer to the EYFS PLAN matrices for further information.

KS1…

Science content

The pupil can:

- name and locate parts of the human body, including those related to the senses [year 1], and describe the importance of exercise, a balanced diet and hygiene for humans [year 2]
- describe the basic needs of animals for survival and the main changes as young animals, including humans, grow into adults [year 2]
- describe the basic needs of plants for survival and the impact of changing these and the main changes as seeds and bulbs grow into mature plants [year 2]
- identify whether things are alive, dead or have never lived [year 2]
- describe and compare the observable features of animals from a range of groups [year 1]
- group animals according to what they eat [year 1], describe how animals get their food from other animals and/or from plants, and use simple food chains to describe these relationships [year 2]
- describe seasonal changes [year 1]
- name different plants and animals and describe how they are suited to different habitats [year 2]
- distinguish objects from materials, describe their properties, identify and group everyday materials [year 1] and compare their suitability for different uses [year 2].

Working scientifically

The pupil can, using appropriate scientific language from the national curriculum:

- ask their own questions about what they notice
- use different types of scientific enquiry to gather and record data, using simple equipment where appropriate, to answer questions:
- observing changes over time
- noticing patterns
- grouping and classifying things
- carrying out simple comparative tests
- finding things out using secondary sources of information
- communicate their ideas, what they do and what they find out in a variety of ways.

KS2…

Science content

The pupil can:

- name and describe the functions of the main parts of the digestive [year 4], musculoskeletal [year 3] and circulatory systems [year 6]; and describe and compare different reproductive processes and life cycles in animals [year 5].
- Describe the effects of diet, exercise, drugs and lifestyle on how the body functions [year 6]
- Name, locate and describe the functions of the main parts of plants, including those involved in reproduction [year 5] and transporting water and nutrients [year 3]
- Use the observable features of plants, animals and micro-organisms to group, classify and identify them into broad groups, using keys and other methods [year 6]
- Construct and interpret food chains [year 4]
- Describe the requirements of plants for life and growth [year 3]; and explain how environmental changes may have an impact on living things [year 4]
- Use the basic ideas of inheritance, variation and adaption to describe how living things have changed over time and evolved [year 6]; and describe how fossils are formed [year 3] and provide evidence for evolution [year 6]
- Group and identify materials [year 5], including rocks [year 3], in different ways according to their properties, based in first-hand observation; and justify the use of different everyday materials for different uses, based on their properties [year 5]
- Describe the characteristics of different states of matter and group materials on this basis; and describe how materials change state at different temperatures, using his to explain everyday phenomena, including the water cycle [year 4]
- Identify and describe what happens when dissolving occurs in everyday situations; and describe how to separate mixtures and solutions into their components [year 5]
- Identify, with reasons, whether changes in materials are reversible or not [year 5]
- Use the idea that light from light sources, or reflected light, travels in straight lines and enters our eyes to explain how we see objects [year 6], and the formation [year 3], shape [year 6] and size of shadows [year 3]
- Use the idea that sounds are associated with vibrations, and that they require a medium to travel through, to explain how sounds are made and heard [year 4]
- Describe the relationship between the pitch of a sound and the features of its source; and between the volume of a sound, the strength of its vibrations and the distance from its source [year 4]
- Describe the effects of simple forces that involve contact (air and water resistance, friction) [year 5], that act at a distance (magnetic forces, including those between like and unlike magnetic poles) [year 3], and gravity [year 5]
- Identify simple mechanisms, including levers, gears and pulleys, that increase the effect of a force [year 5]
- Use simple apparatus to construct and control a series circuit, and describe how the circuit may be affected when changes are made to it; and use the recognised symbols to represent simple series circuit diagrams [year 6]
- Describe the shapes and relative movements of the Sun, Moon, Earth and other planets in the solar system; and explain the apparent movement of the sun across the sky in terms of the Earth's rotation and that this results in day and night [year 5]

Working scientifically

The pupil can, using appropriate scientific language from the national curriculum:

- describe and evaluate their own and others' scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources
- ask their own questions about the scientific phenomena that they are studying, and select the most appropriate ways to answer these questions, recognising and controlling variables where necessary (i.e. observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests, and finding things out using a wide range of secondary sources)
- use a range of scientific equipment to take accurate and precise measurements or readings, with repeat readings where appropriate
- record data and results using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- draw conclusions, explain and evaluate their methods and findings, communicating these in a variety of ways
- raise further questions that could be investigated, based on their data and observations.

Impact - How will we know we have achieved our aims?

- Children are actively engaged and thoughtful in lessons
- Teachers will have high expectations and quality evidence will be presented in a range of forms.
- Children will use scientific and technical vocabulary accurately.
- Children are confident carrying out scientific enquiries to explore the world around them.
- Children understand that science helps them understand, and connects them to, the world around them.
- They will be confident, respectful and scientifically literate citizens.

SUBJECT: Science

Implementation			
Domains	**Biology** (Animals, including humans; Plants; Living things and their habitats; evolution and inheritance) **Chemistry** (Everyday materials; Everyday materials and their uses; Rocks; States of matter; Properties and changes of materials) **Physics** (Seasonal changes; Light; Forces and magnets; Sound; Electricity; Earth and Space) **Enquiry types** (Observation over time; Pattern seeking; Research using secondary sources; Comparative and fair tests; Classifying; Modelling) **Scientific skills** (Asking scientific questions; Plan an enquiry; Observe closely; Take measurements; Gather and record results; Present results; Interpret results; Draw conclusions; Make predictions; Evaluate an enquiry)		
	AUTUMN	**SPRING**	**SUMMER**
EYFS	*EYFS planning is based on 'in the moment' teaching; therefore, individual topics have not been set. Teachers are encouraged to use the EYFS PLAN matrices to support the teaching and learning of science across the year.*	*(See Autumn)*	*(See Autumn)*
Year 1	**Everyday materials** (topic specific) **Animals, including humans** (human body parts statement) Ongoing: **Seasonal changes, Plants**	**Everyday materials** (topic specific) **Animals, including humans** (animal statements) Ongoing: **Seasonal changes, Plants**	**Everyday materials** (topic specific) **Plants** (parts of different plants) **Seasonal changes** (summary of observations)
Year 2	**Living things and their habitats** **Materials** (properties and uses of materials) Ongoing: **Living things and their habitats** (observations across seasons), **Plants** (growing seeds and bulbs outside)	**Animals, including humans** (basic needs and keeping healthy) **Animals, including humans** (offspring) **Materials** (changing shapes of materials) Ongoing: **Living things and their habitats** (observations across seasons), **Plants** (growing seeds and bulbs outside)	**Living things and their habitats** (summarise observations) Ongoing: **Living things and their habitats** (observations across seasons), **Plants** (growing seeds and bulbs outside)
Year 3	**Light** **Rocks** Ongoing: **Plants** (gathering evidence of life cycles)	**Forces and magnets** Ongoing: **Plants** (gathering evidence of life cycles)	**Plants** (parts and their functions, and investigating growth statements) **Animals, including humans**
Year 4	**Electricity** **States of matter** Ongoing: **Living things and their habitats** (naming and identifying living things in their environment)	**States of matter** **Sound** Ongoing: **Living things and their habitats** (naming and identifying living things in their environment)	**Animals, including humans** **Living things and their habitats** (classification and human impact statements
Year 5	**Properties and changes of materials** (properties of materials statements) **Living things and their habitats**	**Forces** **Earth and Space**	**Properties and changes of materials** (changes of materials statements) **Living things and their habitats** (life cycles and reproduction of animals statements) **Animals, including humans** (linked to PSHE)
Year 6	**Living things and their habitats** **Animals, including humans**	**Electricity** **Evolution**	**Evolution** **Light**

SUBJECT: Science

Link to pdf documents (with working links): https://kenderlewishamschuk.sharepoint.com/:f:/s/Planning/ElNaT3SRcPVDpaDQoPkNTqUBOHEEQFoGjNCgHRXoi3Igng?e=UMJsmd

Summary of Science in EYFS

Topic	Nursery	Reception
Animals, excluding humans	• Learn about the life cycles of animals • Compare adult animals to their babies • Observe how baby animals change over time	• Name and describe animals that live in different habitats. • Describe different habitats
Humans	• Learn about the life cycles of humans • Learn about how to take care of themselves • Learn about their senses	• Describe people who are familiar to them • Learn about how to take care of themselves
Living things and their habitats	• Explore the surrounding natural environment • Explore natural objects from the surrounding environment	• Explore the plants in the surrounding natural environment • Explore the animals in the surrounding natural environment • Explore plants and animals in a contrasting natural environment
Plants	• Grow plants	
Seasonal changes		• Play and explore outside in all seasons and in different weather • Observe living things throughout the year
Materials, including changing materials	• Explore a range of materials • Shape and join materials • Combine and mix ingredients • Change materials by heating and cooling, including cooking	• Explore a range of materials, including natural materials • Make objects from different materials, including natural materials • Observe, measure and record how materials change when heated and cooled • Compare how materials change over time and in different conditions
Electricity	• Identify electrical devices • Use battery-powered devices	
Light	• Explore light sources • Shine light on or through different materials	• Explore shadows • Explore rainbows
Forces	• Feel forces • Explore how things work • Explore how objects/materials are affected by forces	• Explore how to change how things work • Explore how the wind can move objects • Explore how objects move in water
Sound	• Listen to sounds • Make sounds	• Listen to sounds outside and identify the source • Make sounds
Earth and space		• Learn about the Earth, Sun, Moon, planets and stars • Learn about space travel

Opportunities for science in the common EYFS themes

Click on the links in the table below to be taken to the relevant matrix.

Theme	Nursery	Reception
Dinosaurs	Animals, excluding humans	Animals, excluding humans
Farms	Animals, excluding humans Plants	
Food	Materials, including changing materials Plants	
People who help us	Humans Plants	Humans
Pirates	Materials, including changing materials Forces	Materials, including changing materials Forces
Robots	Materials, including changing materials Electricity Light Sound	Materials, including changing materials Earth and space
Space and the planets	Materials, including changing materials	Materials, including changing materials Earth and space Forces
Superheroes	Materials, including changing materials Humans	Materials, including changing materials Earth and space
Vehicles	Materials, including changing materials Electricity Light	Materials, including changing materials Forces Earth and space

	Forces Sound	
Building and construction	Materials, including changing material Electricity Forces Light	Forces Sound
All about me	Humans	Humans
The high street	Humans Materials, including changing materials Electricity Light	Humans
Holidays	Materials, including changing materials	Animals, excluding humans
Castles	Materials, including changing materials	
In the garden	Animals, excluding humans Living things and their habitats Plants	Living things and their habitats Animals, excluding humans
At the seaside	Animals, excluding humans	Animals, excluding humans Living things and their habitats
Under the sea	Animals, excluding humans	Animals, excluding humans
In the woods	Animals, excluding humans	Animals, excluding humans Living things and their habitats
Weather and seasons	Living things and their habitats	Seasonal changes Materials, including changing materials Living things and their habitats Sound Light
Animals	Animals, excluding humans	Animals, excluding humans Living things and their habitats Seasonal changes
Magic, witches and wizards	Materials, including changing materials Light	

SUBJECT: Science

Link to pdf document(with working links): https://kenderlewishamschuk.sharepoint.com/:b:/s/Planning/ER5m2vQviGVLr9w5U3HI6tsBge0nl70wVxiaRb-B_jgftQ?e=f1bmLq

Science Long Term Plan - Year 1

Collated by Viktor Bengtsson, July 2022

Science LTP – Year 1	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Further information and resources
Blocked topics *The half-term blocks are recommendations only, as each topic varies in complexity and knowledge requirements. As long as you follow the sequence, you may move on to the next topic whenever the children are ready.* *Rationale for the sequencing can be found here. If you decide you wish to move things around, please read this document and then speak with the science lead.*	**Everyday materials*** **Key vocabulary** Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through **L.Os:** *To tell the difference between an object and a material (OS1) *To name some everyday materials (OS2) *To identify the materials that some objects are made from (OS3) *To explain some properties of objects and materials (OS4) *To investigate wether an object floats or sinks (OS5) *To group objects and materials by their properties (OS6) *To choose a good material for a purpose (OS7) *To investigate the best material for a purpose (OS8)	**Animals, including humans** (Human body parts statement) **Key vocabulary** Head, body, eyes, ears, mouth, teeth, leg, senses, touch, see, smell, taste, hear, fingers, skin, eyes, nose, ear, tongue **L.O:s** *To label the main parts of the human body (OS7) *To explain what part of the body is to do with each sense (OS8)	**Everyday materials*** ***NB:** Everyday materials can be spaced out across the year as appropriate, depending on themes taught. It is important that the children experience a range of materials used in different ways and contexts. Some L.Os may be used repeatedly and as an inspiration for different areas of the curriculum.*	**Animals, including humans** (Animal statements) **Key vocabulary** Wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians (+ examples of each) **L.O:s** *To identify some mammals (OS1) *To group animals into fish, amphibian, reptile, bird and mammals group (OS2) *To match animals to what they eat (OS3) *To identify carnivores, herbivores and omnivores (OS4) *To label the main parts of animal's bodies (OS5) *To group animals by their body type (OS6)	**Everyday materials*** ***NB:** Everyday materials can be spaced out across the year as appropriate, depending on themes taught. It is important that the children experience a range of materials used in different ways and contexts. Some L.Os may be used repeatedly and as an inspiration for different areas of the curriculum.*	**Plants** **Key vocabulary** Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud **L.O:s** *To label the main parts of a flowering plant (OS5) *To identify bulbs and seeds (OS6) *To explain what the different parts of a plant do (OS7) *To label the main parts of different plants (OS8) **Seasonal changes** **Key vocabulary** Weather (sunny, rainy, windy, snowy etc.), seasons (Winter, Summer, Spring, Autumn), sun, sunrise, sunset, day length **L.O:s** *(Spend this time to summarise the learning from the ongoing data gathering across the year.)* *To create a pictogram of the number of hours of daylight in different seasons (OS8)	**Core links** ***ASE PLAN documents** (link - knowledge matrices for each year group, attached below. Also some slides of example lesson sequences, as well as pitch of learning) ***Kender Primary Science Grid** (link) **Supporting media** ***Explorify** (link) ***BBC Bitesize Science** (link) **Supporting SoW:** ***Switched on Science** (link) ***Hamilton Trust** (link) **Further reading and CPD** ***Reach Out CPD** (link) ***ASE Primary Science journal** (link)
Ongoing *These are not linked to a particular half term, but should be spaced out across the year and repeated as appropriate*	**Seasonal changes** **Key vocabulary** Weather (sunny, rainy, windy, snowy etc.), seasons (Winter, Summer, Spring, Autumn), sun, sunrise, sunset, day length ***NB:** The following L.O:s should be used across the year to gain an understanding of the seasonal changes.*	**L.Os:** *To place the months and seasons in order (OS1) *To match some events to their seasons (OS2) *To explain why we need to wear different clothes in different seasons (OS3) *To describe plants in different seasons (OS4) *To describe different types of weather (OS5) *To explain what the weather is like in different seasons (OS6) *To explain how much daylight we get in different seasons (OS7)	**Plants** **Key vocabulary** Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud, (names of trees, garden and flowering plants in the local area) ***NB:** The following L.O:s should be used across the year to identify plants in an area across the seasons. Adapt the sheets as appropriate, using common local plants.*	**L.Os:** *To identify some common garden plants (OS1) *To identify some common wild plants (OS2) *To identify some common trees from their shapes, leaves and seeds (OS3) *To identify plants in our local area (OS4)			

NB: The different L.Os are there to support core learning. Some lessons will need to be adapted appropriately, some added to deepen the children's learning, and some stretched over numerous lessons.

Year	1	Topic	Plants

- 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.

Prior learning	Future learning
• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)	• Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats) • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 Plants)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Growing locally, there will be a vast array of plants which all have specific names. These can be identified by looking at the key characteristics of the plant. Plants have common parts, but they vary between the different types of plants. Some trees keep their leaves all year while other trees drop their leaves during autumn and grow them again during spring. **Key vocabulary** Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud Names of trees in the local area Names of garden and wild flowering plants in the local area	• Can name trees and other plants that they see regularly • Can describe some of the key features of these trees and plants e.g. the shape of the leaves, the colour of the flower/blossom • Can point out trees which lost their leaves and those that kept them the whole year • Can point to and name the parts of a plant, recognising that they are not always the same e.g. leaves and stems may not be green

Common misconceptions

Some children may think:

- plants are flowering plants grown in pots with colored petals and leaves and a stem
- trees are not plants
- all leaves are green
- all stems are green
- a trunk is not a stem
- blossom is not a flower.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Make close observations of leaves, seeds, flowers etc. • Compare two leaves, seeds, flowers etc. • Classify leaves, seeds, flowers etc. using a range of characteristics. • Identify plants by matching them to named images. • Make observations of how plants change over a period of time. • When further afield, spot plants that are the same as those in the local area studied regularly, describing the key features that helped them.	• Can sort and group parts of plants using similarities and differences • Can use simple charts etc. to identify plants • Can collect information on features that change during the year • Can use photographs to talk about how plants change over time

Year	1	Topic	Animals, including humans

- 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.

Prior learning	Future learning
• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)	• 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. (Y2 - Living things and their habitats) • 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. (Y6 - Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Animals vary in many ways having different structures e.g. wings, tails, ears etc. They also have different skin coverings e.g. scales, feathers, hair. These key features can be used to identify them. Animals eat certain things - some eat other animals, some eat plants, some eat both plants and animals. Humans have key parts in common, but these vary from person to person. Humans (and other animals) find out about the world using their senses. Humans have five senses – sight, touch, taste, hearing and smelling. These senses are linked to particular parts of the body.	• Can name a range of animals which includes animals from each of the vertebrate groups • Can describe the key features of these named animals • Can label key features on a picture/diagram • Can write descriptively about an animal • Can write a What am I? riddle about an animal • Can describe what a range of animals eat • Can play and lead 'Simon says' • During PE lessons, can follow instructions involving parts of the body

Key vocabulary	
• Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves • Names of animals experienced first-hand from each vertebrate group • Parts of the body including those linked to PSHE teaching (see joint document produced by the ASE and PSHE Association) • Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue **N.B.** The children need to be able to name and identify a range of animals in each group e.g. name specific birds and fish. They do not need to use the terms mammal, reptiles etc. or know the key characteristics of each, although they will probably be able to identify birds and fish, based on their characteristics. The children also do not need to use the words carnivore, herbivore and omnivore. If they do, ensure that they understand that carnivores eat other animals, not just meat. Although we often use our fingers and hands to feel objects, the children should understand that we can feel with many parts of our body.	• Can label parts of the body on pictures and diagrams • Can explore objects using different senses

Common misconceptions

Some children may think:

- only four-legged mammals, such as pets, are animals
- humans are not animals
- insects are not animals
- all 'bugs' or 'creepy crawlies', such as spiders, are part of the insect group
- amphibians and reptiles are the same.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Make first-hand, close observations of animals from each of the groups. • Compare two animals from the same or different groups. • Classify animals using a range of features. • Identify animals by matching them to named images. • Classify animals according to what they eat. • Make first-hand close observations of parts of the body e.g. hands, eyes. • Compare two people. • Take measurements of parts of their body. • Compare parts of their own body. • Look for patterns between people e.g. Do people with big hands have big feet? • Classify people according to their features. • Investigate human senses e.g. Which part of my body is good for feeling, which is not? Which food/flavours can I identify by taste? Which smells can I match?	• Can sort and group animals using similarities and differences • Can use simple charts etc. to identify unknown animals • Can create a drawing of an imaginary animal labelling its key features • Can use secondary resources to find out what animals eat, including talking to experts e.g. pet owners, zookeepers etc. • Can use first-hand close observations to make detailed drawings • Can name body parts correctly when talking about measurements and comparisons e.g. "My arm is x straws long." "My arm is x straws long and my leg is y straws long. My leg is longer than my arm." "We both have hands, but his are bigger than mine." "These people have brown eyes and these have blue." • Can talk about their findings from investigations using appropriate vocabulary e.g. "My fingers are much better at feeling than my toes" "We found that the crisps all taste the same."

Year	1	Topic	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.
- 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.

Prior learning	Future learning
• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)	• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
All objects are made of one or more materials. Some objects can be made from different materials e.g. plastic, metal or wooden spoons. Materials can be described by their properties e.g. shiny, stretchy, rough etc. Some materials e.g. plastic can be in different forms with very different properties. **Key vocabulary** Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through	• Can label a picture or diagram of an object made from different materials • Can describe the properties of different materials

Common misconceptions

Some children may think:

- only fabrics are materials
- only building materials are materials
- only writing materials are materials
- the word 'rock' describes an object rather than a material
- 'solid' is another word for hard.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Classify objects made of one material in different ways e.g. a group of object made of metal. • Classify in different ways one type of object made from a range of materials e.g. a collection of spoons made of different materials. • Classify materials based on their properties. • Test the properties of objects e.g. absorbency of cloths, strength of party hats made of different papers, stiffness of paper plates, waterproofness of shelters.	• Can sort objects and materials using a range of properties • Can choose an appropriate method for testing an object for a particular property • Can use their test evidence to answer the questions about properties e.g. "Which cloth is the most absorbent?"

Year	1	Topic	Seasonal changes

- Observe changes across the four seasons.
- Observe and describe weather associated with the seasons and how day length varies.

Prior learning	Future learning
• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)	• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) • Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. (Y5 - Earth and space) • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
In the UK, the day length is longest at mid-summer (about 16 hours) and gets shorter each day until mid-winter (about 8 hours) before getting longer again. The weather also changes with the seasons. In the UK, it is usually colder and rainier in winter, and hotter and dryer in the summer. The change in weather causes many other changes. Some examples are: numbers of minibeasts found outside; seed and plant growth; leaves on trees; and type of clothes worn by people.	• Can name the four seasons and identify when in the year they occur • Can describe weather in different seasons over a year • Can describe days as being longer (in time) in the summer and shorter in the winter • Can describe other features that change through the year

Key vocabulary	
• Weather (sunny, rainy, windy, snowy etc.) • Seasons (winter, summer, spring, autumn) • Sun, sunrise, sunset, day length	

Common misconceptions

Some children may think:

- it always snows in winter
- it is always sunny in the summer
- there are only flowers in spring and summer
- it rains most in the winter.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Collect information about the weather regularly throughout the year. • Present this information in tables and charts to compare the weather across the seasons. • Collect information, regularly throughout the year, of features that change with the seasons e.g. plants, animals, humans. • Present this information in different ways to compare the seasons. • Gather data about day length regularly throughout the year and present this to compare the seasons.	• Use the evidence gathered to describe the general types of weather and changes in day length over the seasons. • Use their evidence to describe some other features of their surroundings, e.g. themselves, animals, plants that change over the seasons • Demonstrate their knowledge in different ways e.g. making a weather forecast video, writing seasonal poetry, creating seasonal artwork

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians** (+ examples of each) **Senses, touch, see, smell, taste, hear, fingers** (skin), **eyes, nose, ear, tongue**	**Animals including humans** **Offspring, reproduction, growth, child, young/old stages** (examples - chick/hen, baby/child/adult, caterpillar/butterfly), **exercise, heartbeat, breathing, hygiene, germs, disease, food types** (examples – meat, fish, vegetables, bread, rice, pasta)	**Animals including humans** **Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints**	**Animals including humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain**	**Animals including humans** **Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty**	**Animals including humans** **Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle**
Plants **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud** Names of trees in the local area Names of garden and wild flowering plants in the local area	**Plants** As Y1 + **light, shade, sun, warm, cool, water, grow, healthy**	**Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal** – wind dispersal, animal dispersal, water dispersal	**Living things and their habitats** **Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate**	**Living things and their habitats** **Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings**	**Living things and their habitats** **Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering**
Everyday materials **Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through**	**Living things and their habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil**	**States of matter** **Solid, liquid, gas, matter, particle, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle**	**Properties and changes of materials** **Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material**	**Evolution and inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils**

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasonal changes **Weather** (sunny, rainy, windy, snowy etc.), **seasons** (Winter, Summer, Spring, Autumn), **sun, sunrise, sunset, day length**	**Everyday materials and their uses** Names of materials – increased range from year 1 Properties of materials - as for year 1 plus **opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/puling, twist/twisting, squash/squashing, Bend/bending, stretch/stretching**	**Light** **Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous**	**Sound** **Sound, source, vibrate, vibration, travel, pitch** (high, low), **volume, faint, loud, insulation**	**Earth and Space** **Earth, Sun, Moon,** (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) **spherical, solar system, rotates, star, orbit, planets**	**Light** As for year 3 + **straight lines, light rays.**
		Forces and magnets **Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	**Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol**	**Forces** **Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears**	**Electricity** **Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage**

Working Scientifically Skills Progression

Primary Science Education Consultancy

KS1	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a Yes/No questions to aid sorting	Identify the headings for the two groups (it is ...., it is not ....)	Be able to compare objects based on obvious, observable features e.g. size, shape, colour, texture etc.			Sort objects and living things into two group using a basic Venn diagram or simple table	Talk about the number of objects in each group i.e. which has more or less	Children in KS1 are not expected to draw conclusions. They are expected to make observations which will help them to answer questions. They do not have the subject knowledge to give reasons for what they observe so they cannot draw scientific conclusions.	Children in KS1 are not expected to make scientific predictions as they do not have the subject knowledge to do this. That does not mean that you should not ask children what they think may happen, but this will be based on experience or may simply be a guess.	Children in KS1 are not expected to evaluate. However, children should be encouraged to consider their method and adapt this where necessary.
Researching	Ask one or two simple questions linked to a topic					Present what they have learnt verbally or using pictures	Be able to answer their questions using simple sentences			
Comparative/fair testing	Identify the question to investigate from a scenario or choose a question from a range provided	Choose equipment to use and decide what to do and what to observe or measure in order to answer the question	Make observations linked to answering the question	When appropriate, measure using standard units where all the numbers are marked on the scale	Record data in simple prepared tables, pictorially or by taking photographs	Present what they learnt verbally, using pictures or block diagrams	Answer their question in simple sentences using their observations or measurements			
Observing over time	Ask a question about what might happen in the future based on an observation				Record data in simple prepared tables, pictorially or by taking photographs	Present what they learnt verbally or using pictures				
Pattern seeking	Ask a question that is looking for a pattern based on observations				Record data in simple, prepared tables and tally charts	Present what they learnt verbally				

SUBJECT: Science

Link to pdf document(with working links): https://kenderlewishamschuk.sharepoint.com/:b:/s/Planning/EaqjHEZhgiJBvoAN0gCIUiBwOZiIFEYy0Sh51iHK9oy7w?e=eP52Je

Science Long Term Plan - Year 2

Collated by Viktor Bengtsson, July 2022

Science LTP – Year 2	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Further information and resources
Blocked topics *The half-term blocks are recommendations only, as each topic varies in complexity and knowledge requirements. As long as you follow the sequence, you may move on to the next topic whenever the children are ready.* *Rationale for the sequencing can be found here. If you decide you wish to move things around, please read this document and then speak with the science lead.*	**Living things and their habitats** ***NB:*** *Refer to the Y2 rationale (link)before planning and teaching this topic. It is beneficial to spread out across the year.* **Key vocabulary** living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats (eg. pond, woodland etc) and micro-habitats (eg. under logs, in bushes) **L.Os:** *To group things according to whether they are living or non-living (OS1) *To group objects according to whether they are alive, dead, or have never been alive (OS2) *To match animals to their habitats (OS3) *To explain how some animals are adapted to their habitats (OS4) *To create and describe a food-chain (OS7) *To show different sources of food using a food chain (OS8) **Plants** (Planning for growing seeds and bulbs outside) ***NB:*** *Refer to the Y2 rationale (link)before planning and teaching this topic.*	**Materials** (Properties and uses of materials) ***NB:*** *This topic may be spread out across the year, as it lends itself well to different themes and contexts* **Key vocabulary** names of materials (wood, metal, plastic, glass, brick, rock, paper, cardboard), properties of materials (Y1 + opaque, transparent, translucent, reflective, non-reflective, flexible, rigid) **L.Os:** *To identify the materials from which different objects are made (OS1) *To investigate the properties of different materials (OS2) *To explain how materials are useful in different situations (OS3) *To suggest suitable materials for new situations (OS4) *To group objects by the material they are made from (OS5) *To investigate and compare the properties of different metal objects (OS6) *To explain how inventors have made new materials (OS7)	**Animals, including humans** (Basic needs and keeping healthy) **Key vocabulary** exercise, heartbeat, breathing, hygiene, germs, disease, food types (ex. meat, fish, vegetables, bread, rice, pasta) **L.Os:** *To explain what humans need to survive (OS4) *To explain what animals need to survive (OS5) *To explain why it is important to be clean when eating food (OS6) *To investigate how exercise produces changes in the body (OS7) *To explain how the different food groups help us to stay healthy (OS8)	**Animals, including humans** (Offspring) **Key vocabulary** offspring, reproduction, growth, child, young/old stages (ex. chick/hen, baby/child/adult, caterpillar/butterfly) **L.Os:** *To sequence the stages of a human life (OS1) *To sequence and describe the life cycle of different animals (OS2) *To match the young of different animals to their adult form (OS3) **Materials** (Changing shapes of materials) **Key vocabulary** shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching **L.Os:** *To investigate how I can change the shape of different objects (OS8) ***NB:*** *This can take place over several lessons in different contexts*	**Living things and their habitats** ***NB:*** *Refer to the Y2 rationale (link)before planning and teaching this topic. It is beneficial to spread out across the year. Check 'Autumn 1' and 'Ongoing' for L.Os.*	**Living things and their habitat** ***NB:*** *Refer to the Y2 rationale (link)before planning and teaching this topic. It is beneficial to spread out across the year. Check 'Autumn 1' and 'Ongoing' for L.Os.* **Plants** (harvesting and cooking)	**Core links** ***ASE PLAN documents** (link - knowledge matrices for each year group, attached below. Also some slides of example lesson sequences, as well as pitch of learning) ***Kender Primary Science Grid** (link) **Supporting media** ***Explorify** (link) ***BBC Bitesize Science** (link) **Supporting SoW:** ***Switched on Science** (link) ***Hamilton Trust** (link) **Further reading and CPD** ***Reach Out CPD** (link) ***ASE Primary Science journal** (link)
Ongoing *These are not linked to a particular half term, but should be spaced out across the year and repeated as appropriate*	**Living things and their habitats** ***NB:*** *Refer to the Y2 rationale (link)before planning and teaching this topic.* **Key vocabulary** (See above)	**L.Os:** *To name common animals and plants (OS5) *To identify and name some animals and plants in local micro-habitats (OS6)		**Plants** (Growing seeds and bulbs outside) ***NB:*** *Refer to the Y2 rationale (link)before planning and teaching this topic* **Key vocabulary** As year 1 (leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud, names of trees, garden, wild plants) + light, shade, sun, warm, cool, water, grow, healthy	**L.Os:** *To label the main parts of a plant and explain their function (OS1) *To sequence the different stages of a plant's life (OS2) *To explain how flowering plants reproduce (OS3) *To record how the height of a plant changes over time (OS4)	*To investigate what seeds need to germinate (OS5) *To investigate what bulbs need to start growing again (OS6) *To investigate what plants need to grow well (OS7) *To investigate the needs of different plants (OS8)	

NB: The different L.Os are there to support core learning. Some lessons will need to be adapted appropriately, some added to deepen the children's learning, and some stretched over numerous lessons.

Year	2	Topic	Living things and their habitat

- 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 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

Prior learning	Future learning
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Observe changes across the four seasons. (Y1 - Seasonal changes)	• Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
All objects are either living, dead or have never been alive. Living things are plants (including seeds) and animals. Dead things include dead animals and parts of plants and animals that are no longer attached e.g. leaves and twigs, shells, fur, hair and feathers (This is a simplification, but appropriate for Year 2 children.) An object made of wood is classed as dead. Objects made of rock, metal and plastic have never been alive (again ignoring that plastics are made of fossil fuels). Animals and plants live in a habitat to which they are suited, which means that animals have suitable features that help them move and find food and plants have suitable features that help them to grow well. The habitat provides the basic needs of the animals and plants – shelter, food and water. Within a habitat there are different micro-habitats e.g. in a woodland – in the leaf litter, on the bark of trees, on the leaves. These micro-habitats have different conditions e.g. light or dark, damp or dry. These conditions affect which plants and animals live there. The plants and animals in a habitat depend on each other for food and shelter etc. The way that animals obtain their food from plants and other animals can be shown in a food chain.	• Can find a range of items outside that are living, dead and never lived • Can name a range of animals and plants that live in a habitat and micro-habitats that they have studied • Can talk about how the features of these animals and plants make them suitable to the habitat • Can talk about what the animals eat in a habitat and how the plants provide shelter for them • Can construct a food chain that starts with a plant and has the arrows pointing in the correct direction
Key vocabulary	
• Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed • Names of local habitats e.g. pond, woodland etc. • Names of micro-habitats e.g. under logs, in bushes etc.	

Common misconceptions

Some children may think:

- an animal's habitat is like its 'home'
- plants and seeds are not alive as they cannot be seen to move
- fire is living
- arrows in a food chain mean 'eats'.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Explore the outside environment regularly to find objects that are living, dead and have never lived. • Classify objects found in the local environment. • Observe animals and plants carefully, drawing and labelling diagrams. • Create simple food chains for a familiar local habitat from first-hand observation and research. • Create simple food chains from information given e.g. in picture books (Gruffalo etc.).	• Can sort into living, dead and never lived • Can give key features that mean the animal or plant is suited to its micro-habitat • Using a food chain can explain what animals eat • Can explain in simple terms why an animal or plant is suited to a habitat e.g. the caterpillar cannot live under the soil like a worm as it needs fresh leaves to eat; the seaweed we found on the beach cannot live in our pond because it is not salty

Year	2	Topic	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.

Prior learning	Future learning
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)	• Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • 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. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 - Plants) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Plants may grow from either seeds or bulbs. These then germinate and grow into seedlings which then continue to grow into mature plants. These mature plants may have flowers which then develop into seeds, berries, fruits etc. Seeds and bulbs need to be planted outside at particular times of year and they will germinate and grow at different rates. Some plants are better suited to growing in full sun and some grow better in partial or full shade. Plants also need different amounts of water and space to grow well and stay healthy.	• Can describe how plants that they have grown from seeds and bulbs have developed over time • Can identify plants that grew well in different conditions
Key vocabulary	
As for Year 1 plus light, shade, sun, warm, cool, water, grow, healthy	

Common misconceptions

Some children may think:

- plants are not alive as they cannot be seen to move
- seeds are not alive
- all plants start out as seeds
- seeds and bulbs need sunlight to germinate.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Make close observations of seeds and bulbs. • Classify seeds and bulbs. • Research and plan when and how to plant a range of seeds and bulbs. • Look after the plants as they grow – weeding, thinning, watering etc. • Make close observations and measurements of their plants growing from seeds and bulbs. • Make comparisons between plants as they grow.	• Can spot similarities and difference between bulbs and seeds • Can nurture seeds and bulbs into mature plants identifying the different requirements of different plants

Year	2	Topic	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.

Prior learning	Future learning
• Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - 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. (Y1 - 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. (Y3 - Animals, including humans) • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be young, such as babies or kittens, that grow into adults. In other animals, such as chickens or insects, there may be eggs laid that hatch to young or other stages which then grow to adults. The young of some animals do not look like their parents e.g. tadpoles. All animals, including humans, have the basic needs of feeding, drinking and breathing that must be satisfied in order to survive. To grow into healthy adults, they also need the right amounts and types of food and exercise. Good hygiene is also important in preventing infections and illnesses.	• Can describe how animals, including humans, have offspring which grow into adults, using the appropriate names for the stages • Can state the basic needs of animals, including humans, for survival • Can state the importance for humans of exercise, eating the right amounts of different types of food, and hygiene • Can name foods in each section of the Eatwell Guide

Key vocabulary	
Offspring, reproduction, growth, child, young/old stages (examples - chick/hen, baby/child/adult, caterpillar/butterfly), exercise, heartbeat, breathing, hygiene, germs, disease, food types (examples – meat, fish, vegetables, bread, rice, pasta)	

Common misconceptions

Some children may think:

- an animal's habitat is like its 'home'
- all animals that live in the sea are fish
- respiration is breathing
- breathing is respiration.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Ask people questions and use secondary sources to find out about the life cycles of some animals. • Observe animals growing over a period of time e.g. chicks, caterpillars, a baby. • Ask questions of a parent about how they look after their baby. • Ask pet owners questions about how they look after their pet. • Explore the effect of exercise on their bodies. • Classify food in a range of ways, including using the Eatwell Guide. • Investigate washing hands, using glitter gel.	• Can describe, including using diagrams, the life cycle of some animals, including humans, and their growth to adults e.g. by creating a life cycle book for a younger child • Can measure/observe how animals, including humans, grow. • Show what they know about looking after a baby/animal by creating a parenting/pet owners' guide • Explain how development and health might be affected by differing conditions and needs being met/not met

Year	2	Topic	Uses of everyday materials

- 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.

Prior learning	Future learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)	• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Y3 - Rocks) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • 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. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
All objects are made of one or more materials that are chosen specifically because they have suitable properties for the task. For example, a water bottle is made of plastic because it is transparent allowing you to see the drink inside and waterproof so that it holds the water. When choosing what to make an object from, the properties needed are compared with the properties of the possible materials, identified through simple tests and classifying activities. A material can be suitable for different purposes and an object can be made of different materials. Objects made of some materials can be changed in shape by bending, stretching, squashing and twisting. For example, clay can be shaped by squashing, stretching, rolling, pressing etc. This can be a property of the material or depend on how the material has been processed e.g. thickness.	• Can name an object, say what material it is made from, identify its properties and make a link between the properties and a particular use • Can label a picture or diagram of an object made from different materials • For a given object can identify what properties a suitable material needs to have

Key vocabulary	
Names of materials – wood, metal, plastic, glass, brick, rock, paper, cardboard Properties of materials – as for Year 1 plus opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching	• Whilst changing the shape of an object can describe the action used • Can use the words flexible and/or stretchy to describe materials that can be changed in shape and stiff and/or rigid for those that cannot • Can recognise that a material may come in different forms which have different properties

Common misconceptions

Some children may think:

- only fabrics are materials
- only building materials are materials
- only writing materials are materials
- the word rock describes an object rather than a material
- solid is another word for hard.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Classify materials. • Make suggestions about alternative materials for a purpose that are both suitable and unsuitable • Test the properties of materials for particular uses e.g. compare the stretchiness of fabrics to select the most appropriate for Elastigirl's costume, test materials for waterproofness to select the most appropriate for a rain hat	• Can sort materials using a range of properties • Can explain using the key properties why a material is suitable or not suitable for a purpose • Can begin to choose an appropriate method for testing a material for a particular property • Can use their test evidence to select appropriate material for a purpose e.g. Which material is the best for a rain hat?

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians** (+ examples of each) **Senses, touch, see, smell, taste, hear, fingers** (skin), **eyes, nose, ear, tongue**	**Animals including humans** **Offspring, reproduction, growth, child, young/old stages** (examples - chick/hen, baby/child/adult, caterpillar/butterfly), **exercise, heartbeat, breathing, hygiene, germs, disease, food types** (examples – meat, fish, vegetables, bread, rice, pasta)	**Animals including humans** **Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints**	**Animals including humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain**	**Animals including humans** **Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty**	**Animals including humans** **Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle**
Plants **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud** Names of trees in the local area Names of garden and wild flowering plants in the local area	**Plants** As Y1 + **light, shade, sun, warm, cool, water, grow, healthy**	**Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal** – wind dispersal, animal dispersal, water dispersal	**Living things and their habitats** **Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate**	**Living things and their habitats** **Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings**	**Living things and their habitats** **Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering**
Everyday materials **Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through**	**Living things and their habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil**	**States of matter** **Solid, liquid, gas, matter, particle, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle**	**Properties and changes of materials** **Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material**	**Evolution and inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils**

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasonal changes **Weather** (sunny, rainy, windy, snowy etc.), **seasons** (Winter, Summer, Spring, Autumn), **sun, sunrise, sunset, day length**	**Everyday materials and their uses** Names of materials – increased range from year 1 Properties of materials - as for year 1 plus **opaque, transparent and translucent, reflective, non-reflective, flexible, rigid** **Shape, push/pushing, pull/puling, twist/twisting, squash/squashing, Bend/bending, stretch/stretching**	**Light** **Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous**	**Sound** **Sound, source, vibrate, vibration, travel, pitch** (high, low), **volume, faint, loud, insulation**	**Earth and Space** **Earth, Sun, Moon,** (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) **spherical, solar system, rotates, star, orbit, planets**	**Light** As for year 3 + **straight lines, light rays.**
		Forces and magnets **Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	**Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol**	**Forces** **Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears**	**Electricity** **Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage**

Working Scientifically Skills Progression

Primary Science Education Consultancy

KS1	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a Yes/No questions to aid sorting	Identify the headings for the two groups (it is ….., it is not ….)	Be able to compare objects based on obvious, observable features e.g. size, shape, colour, texture etc.			Sort objects and living things into two group using a basic Venn diagram or simple table	Talk about the number of objects in each group i.e. which has more or less	Children in KS1 are not expected to draw conclusions. They are expected to make observations which will help them to answer questions. They do not have the subject knowledge to give reasons for what they observe so they cannot draw scientific conclusions.	Children in KS1 are not expected to make scientific predictions as they do not have the subject knowledge to do this. That does not mean that you should not ask children what they think may happen, but this will be based on experience or may simply be a guess.	Children in KS1 are not expected to evaluate. However, children should be encouraged to consider their method and adapt this where necessary.
Researching	Ask one or two simple questions linked to a topic					Present what they have learnt verbally or using pictures	Be able to answer their questions using simple sentences			
Comparative/fair testing	Identify the question to investigate from a scenario or choose a question from a range provided	Choose equipment to use and decide what to do and what to observe or measure in order to answer the question	Make observations linked to answering the question	When appropriate, measure using standard units where all the numbers are marked on the scale	Record data in simple prepared tables, pictorially or by taking photographs	Present what they learnt verbally, using pictures or block diagrams	Answer their question in simple sentences using their observations or measurements			
Observing over time	Ask a question about what might happen in the future based on an observation				Record data in simple prepared tables, pictorially or by taking photographs	Present what they learnt verbally or using pictures				
Pattern seeking	Ask a question that is looking for a pattern based on observations				Record data in simple, prepared tables and tally charts	Present what they learnt verbally				

SUBJECT: Science

Link to pdf document(with working links): https://kenderlewishamschuk.sharepoint.com/:b:/s/Planning/Eb4Nn48bkZNPh_JImgu8BvwBcaQU3YRr5U_dyUY_7Cg7_Q?e=3hXtIq

Science Long Term Plan - Year 3

Collated by Viktor Bengtsson, July 2022

Science LTP – Year 3	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Further information and resources
Blocked topics *The half-term blocks are recommendations only, as each topic varies in complexity and knowledge requirements. As long as you follow the sequence, you may move on to the next topic whenever the children are ready.* *Rationale for the sequencing can be found here. If you decide you wish to move things around, please read this document and then speak with the science lead.*	**Light** **Key vocabulary** Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, Matt, surface, shadow, reflect, mirror, sunlight, dangerous **L.Os:** *To identify life sources (OS1) *To identify light sources in our school (OS2) *To identify whether an object is a light source or a reflector (OS3) *To explain how the Sun can be dangerous and ways we can protect ourselves (OS4) *To explain how shadows are formed (OS5) *To group objects according to whether they are transparent, translucent or opaque (OS6) *To investigate how moving a light source changes the site of an object's window (OS7) *To make a sundial and explain how it works (OS8)	**Rocks** **Key vocabulary** Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil **L.Os:** *To observe and describe the properties of rocks (OS1) *To test and compare rocks based on their hardness (OS2) *To investigate the properties of rocks (OS3) *To explain how fossils are formed (OS4) *To describe fossils and guess how they were formed (OS5) *To investigate what soils are made from (OS6) *To examine what a soil sample is made from (OS7) *To match rocks to their properties and suggest uses for them (OS8)	**Forces and magnets** **Key vocabulary** Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, North Pole, south pole **L.Os:** *To investigate how magnets can make things move on different surfaces (OS1) *To investigate how magnetic forces act at a distance (OS2) *To investigate how magnetic forces act through different materials (OS3) *To investigate which materials are magnetic (OS4) *To investigate which metals are magnetic (OS5) *To investigate which magnet is the most powerful (OS6) *To investigate how magnets interact with one another (OS7) *To describe the function of magnets in different situations (OS8)	**Forces and magnets** ***NB:** Proceed with topic from last half term. When finished, move on to next topic.*	**Plants** (Parts and their functions, and investigating growth statements) **Key vocabulary** Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal) **L.Os:** *To identify the main parts of different flowering plants (OS1) *To explain the functions of the different parts of a flowering plant (OS2) *To investigate how competition for resources affects plant growth (OS3) *To investigate the needs of different plants (OS4) *To investigate how water is transported in plants (OS5)	**Animals, including humans** **Key vocabulary** Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine **L.Os:** *To explain how many portions of food from different food groups we should eat in a day (OS1) *To match animals to their food (OS2) *To create a food chain and explain what it shows (OS3) *To create a food web and explain what it shows (OS4) *To explain the functions of the human skeleton and identify its main bones (OS5) *To explain how muscles work (OS6) *To match animals to their skeletons (OS7) *To identify which type of skeleton an animal has (OS8) **Plants** (Life cycle statements) ***NB:** Refer to 'Ongoing' for further vocabulary and L.Os. Collect evidence across the year, then tie it together here.*	**Core links** ***ASE PLAN documents** (link - knowledge matrices for each year group, attached below. Also some slides of example lesson sequences, as well as pitch of learning) ***Kender Primary Science Grid** (link) **Supporting media** ***Explorify** (link) ***BBC Bitesize Science** (link) **Supporting SoW:** ***Switched on Science** (link) ***Hamilton Trust** (link) **Further reading and CPD** ***Reach Out CPD** (link) ***ASE Primary Science journal** (link)
Ongoing *These are not linked to a particular half term, but should be spaced out across the year and repeated as appropriate*	**Plants** (gathering evidence of life cycles) **Key vocabulary** Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)	**L.Os:** *To describe the life cycle of a flowering plant (OS6) *To explain different methods of pollination in flowering plants (OS7) *To explain different methods of seed dispersal in flowering plants (OS8)					

NB: The different L.Os are there to support core learning. Some lessons will need to be adapted appropriately, some added to deepen the children's learning, and some stretched over numerous lessons.

Year	3	Topic	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.
- 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.

Prior learning	Future learning
• Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants)	• Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place. The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to reproduce. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination). This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways. Different plants require different conditions for germination and growth.	• Can explain the function of the parts of a flowering plant • Can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal, and germination • Can give different methods of pollination and seed dispersal, including examples
Key vocabulary	
Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)	

Common misconceptions

Some children may think:

- plants eat food
- food comes from the soil via the roots
- flowers are merely decorative rather than a vital part of the life cycle in reproduction
- plants only need sunlight to keep them warm
- roots suck in water which is then sucked up the stem.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe what happens to plants over time when the leaves or roots are removed. • Observe the effect of putting cut white carnations or celery in coloured water. • Investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space. • Spot flowers, seeds, berries and fruits outside throughout the year. • Observe flowers carefully to identify the pollen. • Observe flowers being visited by pollinators e.g. bees and butterflies in the summer. • Observe seeds being blown from the trees e.g. sycamore seeds. • Research different types of seed dispersal. • Classify seeds in a range of ways, including by how they are dispersed. • Create a new species of flowering plant.	• Can explain observations made during investigations • Can look at the features of seeds to decide on their method of dispersal • Can draw and label a diagram of their created flowering plant to show its parts, their role and the method of pollination and seed dispersal

Year	3	Topic	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.
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Prior learning	Future learning
• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)	• Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need. Food contains a range of different nutrients – carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water – and fibre that are needed by the body to stay healthy. A piece of food will often provide a range of nutrients. Humans, and some other animals, have skeletons and muscles which help them move and provide protection and support.	• Can name the nutrients found in food • Can state that to be healthy we need to eat the right types of food to give us the correct amount of these nutrients

Key vocabulary	
Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine	• Can name some bones that make up their skeleton, giving examples that support, help them move or provide protection • Can describe how muscles and joints help them to move

Common misconceptions

Some children may think:

- certain whole food groups like fats are 'bad' for you
- certain specific foods, like cheese are also 'bad' for you
- diet and fruit drinks are 'good' for you
- snakes are similar to worms, so they must also be invertebrates
- invertebrates have no form of skeleton.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Classify food in a range of ways. • Use food labels to explore the nutritional content of a range of food items. • Use secondary sources to find out the types of food that contain the different nutrients. • Use food labels to answer enquiry questions e.g. How much fat do different types of pizza contain? How much sugar is in soft drinks? • Plan a daily diet to contain a good balance of nutrients. • Explore the nutrients contained in fast food. • Use secondary sources to research the parts and functions of the skeleton. • Investigate patterns asking questions such as: ▪ Can people with longer legs run faster? ▪ Can people with bigger hands catch a ball better? • Compare, contrast and classify skeletons of different animals.	• Can classify food into those that are high or low in particular nutrients • Can answer their questions about nutrients in food, based on their gathered evidence • Can talk about the nutrient content of their daily plan • Use their data to look for patterns (or lack of them) when answering their enquiry question • Can give similarities e.g. they all have joints to help the animal move, and differences between skeletons

Year	3	Topic	Rocks

- 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.

Prior learning	Future learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)	• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 - Evolution and inheritance) • The composition of the Earth. (KS3) • The structure of the Earth. (KS3) • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders). Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.	• Can name some types of rock and give physical features of each • Can explain how a fossil is formed • Can explain that soils are made from rocks and also contain living/dead matter

Key vocabulary	
Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil	

Common misconceptions

Some children may think:

- rocks are all hard in nature
- rock-like, man-made substances such as concrete or brick are rocks
- materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'
- certain found artefacts, like old bits of pottery or coins, are fossils
- a fossil is an actual piece of the extinct animal or plant
- soil and compost are the same thing.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe rocks closely. • Classify rocks in a range of ways, based on their appearance. • Devise a test to investigate the hardness of a range of rocks. • Devise a test to investigate how much water different rocks absorb. • Observe how rocks change over time e.g. gravestones or old building. • Research using secondary sources how fossils are formed. • Observe soils closely. • Classify soils in a range of ways based on their appearance. • Devise a test to investigate the water retention of soils. • Observe how soil can be separated through sedimentation. • Research the work of Mary Anning.	• Can classify rocks in a range of different ways, using appropriate vocabulary • Can devise tests to explore the properties of rocks and use data to rank the rocks • Can link rocks changing over time with their properties e.g. soft rocks get worn away more easily • Can present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc. • Can identify plant/animal matter and rocks in samples of soil • Can devise a test to explore the water retention of soils

Year	3	Topic	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.

Prior learning	Future learning
• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)	• Recognise that light appears to travel in straight lines. (Y6 - Light) • 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. (Y6 - Light) • 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. (Y6 - Light) • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. (Y6 - Light)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness. Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light. Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective. The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light. Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.	• Can describe how we see objects in light and can describe dark as the absence of light • Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses • Can define transparent, translucent and opaque • Can describe how shadows are formed

Key vocabulary	
Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous	

Common misconceptions

Some children may think:

- we can still see even where there is an absence of any light
- our eyes 'get used to' the dark
- the moon and reflective surfaces are light sources
- a transparent object is a light source
- shadows contain details of the object, such as facial features on their own shadow
- shadows result from objects giving off darkness.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Explore how different objects are more or less visible in different levels of lighting. • Explore how objects with different surfaces, e.g. shiny vs matt, are more or less visible. • Explore how shadows vary as the distance between a light source and an object or surface is changed. • Explore shadows which are connected to and disconnected from the object e.g. shadows of clouds and children in the playground. • Choose suitable materials to make shadow puppets. • Create artwork using shadows.	• Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change • Can clearly explain, giving examples, that objects are not visible in complete darkness • Can describe and demonstrate how shadows are formed by blocking light • Can describe, demonstrate and make predictions about patterns in how shadows vary

Year	3	Topic	Forces and magnets

- Compare how things move on different surfaces.
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- Observe how magnets attract or repel each other and attract some materials and not others.
- Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.
- Describe magnets as having two poles.
- Predict whether two magnets will attract or repel each other, depending on which poles are facing.

Prior learning	Future learning
• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces) • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces) • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces) • Magnetic fields by plotting with compass, representation by field lines. (KS3) • Earth's magnetism, compass and navigation. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes. A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.	• Can give examples of forces in everyday life • Can give examples of objects moving differently on different surfaces • Can name a range of types of magnets and show how the poles attract and repel • Can draw diagrams using arrows to show the attraction and repulsion between the poles of magnets

For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.	
Key vocabulary	
Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole	

Common misconceptions

Some children may think:

- the bigger the magnet the stronger it is
- all metals are magnetic.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Carry out investigations to explore how objects move on different surfaces e.g. spinning tops/coins, rolling balls/cars, clockwork toys, soles of shoes etc. • Explore what materials are attracted to a magnet. • Classify materials according to whether they are magnetic. • Explore the way that magnets behave in relation to each other. • Use a marked magnet to find the unmarked poles on other types of magnets. • Explore how magnets work at a distance e.g. through the table, in water, jumping paper clips up off the table. • Devise an investigation to test the strength of magnets.	• Can use their results to describe how objects move on different surfaces • Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface • Can use classification evidence to identify that some metals, but not all, are magnetic • Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles • Can use test data to rank magnets

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians** (+ examples of each) **Senses, touch, see, smell, taste, hear, fingers** (skin), **eyes, nose, ear, tongue**	**Animals including humans** **Offspring, reproduction, growth, child, young/old stages** (examples - chick/hen, baby/child/adult, caterpillar/butterfly), **exercise, heartbeat, breathing, hygiene, germs, disease, food types** (examples – meat, fish, vegetables, bread, rice, pasta)	**Animals including humans** **Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints**	**Animals including humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain**	**Animals including humans** **Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty**	**Animals including humans** **Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle**
Plants **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud** Names of trees in the local area Names of garden and wild flowering plants in the local area	**Plants** As Y1 + **light, shade, sun, warm, cool, water, grow, healthy**	**Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal** – wind dispersal, animal dispersal, water dispersal	**Living things and their habitats** **Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate**	**Living things and their habitats** **Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings**	**Living things and their habitats** **Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering**
Everyday materials **Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through**	**Living things and their habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil**	**States of matter** **Solid, liquid, gas, matter, particle, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle**	**Properties and changes of materials** **Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material**	**Evolution and inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils**

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasonal changes **Weather** (sunny, rainy, windy, snowy etc.), **seasons** (Winter, Summer, Spring, Autumn), **sun, sunrise, sunset, day length**	**Everyday materials and their uses** Names of materials – increased range from year 1 Properties of materials - as for year 1 plus **opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/puling, twist/twisting, squash/squashing, Bend/bending, stretch/stretching**	**Light** **Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous**	**Sound** **Sound, source, vibrate, vibration, travel, pitch** (high, low), **volume, faint, loud, insulation**	**Earth and Space** **Earth, Sun, Moon,** (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) **spherical, solar system, rotates, star, orbit, planets**	**Light** As for year 3 + **straight lines, light rays.**
		Forces and magnets **Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	**Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol**	**Forces** **Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears**	**Electricity** **Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage**

Working Scientifically Skills Progression

Primary Science Education Consultancy

LKS2	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a range of Yes/No questions to aid sorting	Be able to put appropriate headings onto intersecting Venn and Carroll diagrams	Be able to compare objects based on more sophisticated, observable features. Present observations in labelled diagrams.			Sort objects and living things into groups using intersecting Venn and Carroll diagrams	Spot patterns in the data particularly two criteria with no examples e.g. there are no living things with wings and no legs	Draw simple conclusions, when appropriate, for patterns e.g. a flying insect with no legs might always crash land		Suggest improvement e.g. a wider range of objects – only looked at British trees. Suggest new questions arising from the investigation.
Researching	Ask a range of questions linked to a topic	Choose a source from a range provided				Present what they learnt verbally or using labelled diagrams	Be able to answer their questions using simple scientific language			Suggest limitations e.g. only had one book. Suggest new questions arising from the investigation.
Comparative/fair testing		Decide what to change and what to measure or observe	As for KS1 (Make observations linked to answering the question)	Measure using standard units where not all the numbers are marked on the scale, and take repeat readings where necessary	Prepare own tables to record data	Present data in bar charts	Refer directly to their evidence when answering their question	Where appropriate provide oral or written explanations for their findings	Use results from an investigation to make a prediction about a further result	Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation.
Observing over time		Decide what to measure or observe. Decide how often to take a measurement.	Make a range of relevant observations	Measure using standard units where not all the numbers are marked on the scale. Use dataloggers to measure over time.		Present data in time graphs				
Pattern seeking		Decide what to measure or observe	As for KS1 (Make observations linked to answering the question)	Measure using standard units where not all the numbers are marked on the scale.		Use ICT package to present data as a scattergram				

SUBJECT: Science

Link to pdf document(with working links): https://kenderlewishamschuk.sharepoint.com/:b:/s/Planning/EcP0XHiQbsNHhwVTFrWakgcBv37GizMWgzMJxbQAUs_SMA?e=SsdBuJ

Science Long Term Plan - Year 4

Collated by Viktor Bengtsson, July 2022

Science LTP – Year 4	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Further information and resources
Blocked topics *The half-term blocks are recommendations only, as each topic varies in complexity and knowledge requirements. As long as you follow the sequence, you may move on to the next topic whenever the children are ready.* *Rationale for the sequencing can be found here. If you decide you wish to move things around, please read this document and then speak with the science lead.*	**Electricity** **Key vocabulary** electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol **LOs:** *To identify machines which needs electricity to work (OS1) *To identify electrical components and their symbols (OS2) *To create a simple electrical circuit (OS3) *To predict whether a circuit will work and how it can be fixed (OS4) *To explain how an electrical switch works (OS5) *To investigate which objects are conductors and which are insulators (OS6) *To identify situations when electricity can be dangerous (OS7)	**States of matter** **Key vocabulary** solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle **LOs:** *To group substances according to whether they are solids, liquids and gases (OS1) *To explain how materials change state (OS2) *To research the melting and boiling points of different materials (OS3) *To investigate the melting point of different materials (OS4) *To investigate how effective different materials are as thermal insulators (OS5) *To explain the water cycle (OS6) *To make a solar still and explain how it works (OS7) *To investigate how temperature impacts evaporation rates (OS8)	**States of matter** *Continue from last half term. When finished, move on to next topic.*	**Sound** **Key vocabulary** Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation **LOs:** *To explain how sounds are made and how we hear things (OS1) *To investigate how well sound travels through different materials (OS2) *To place different sounds in order of pitch (OS3) *To make a tuned string instrument (OS4) *To place sounds in order of pitch (OS5) *To investigate how to affect the volume of a percussion instrument (OS6) *To investigate how distance affects how well we can hear any sound (OS7) *To investigate the relationship between distance and volume (OS8)	**Animals, including humans** **Key vocabulary** digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain **LOs:** *To identify the different types of human teeth and explain their functions (OS3) *To explain the structure of a tooth (OS4) *To explain how we look after our teeth (OS5) *To identify and locate the main organs of the human digestive systems (OS1) *To explain how the human digestive system works (OS2) *To create a food chain and explain what it shows (OS6) *To create a food web and explain what it shows (OS7) ***NB:*** *When teaching teeth, make sure to explain differences between carnivores, omnivores and herbivores, as this then helps children identify these animals for their food chains.*	**Living things and their habitats** (classification and human impact statements) **Key vocabulary** classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate **LOs:** *To group animals according to whether they are fish, amphibians, reptiles, birds or mammals (OS1) *To identify whether an animal is a vertebrate or an invertebrate (OS2) *To group organisms in different ways (OS3) *To use a classification key to identify similar organisms (OS4) *To use a classification key to identify invertebrates (OS5) *To create a classification key for a group of organisms from the local environment (OS6) *To explain the reasons for deforestation and its negative effects (OS8)	**Core links** ***ASE PLAN documents** (link - knowledge matrices for each year group, attached below. Also some slides of example lesson sequences, as well as pitch of learning) ***Kender Primary Science Grid** (link) **Supporting media** ***Explorify** (link) ***BBC Bitesize Science** (link) **Supporting SoW:** ***Switched on Science** (link) ***Hamilton Trust** (link) **Further reading and CPD** ***Reach Out CPD** (link) ***ASE Primary Science Journal** (link)
Ongoing *These are not linked to a particular half term, but should be spaced out across the year and repeated as appropriate*	**Living things and their habitats** (naming and identifying living things in their environment) ***NB:*** *This builds on the children's knowledge of local plants and animals from KS1, so refer to that learning too.*	**Key vocabulary** environment, habitat, migrate, hibernate **LOs:** To investigate how a habitat changes throughout the year (OS7)					

NB: The different L.Os are there to support core learning. Some lessons will need to be adapted appropriately, some added to deepen the children's learning, and some stretched over numerous lessons.

Year	4	Topic	Living things and their habitats

- 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.

Prior learning	Future learning
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)	• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • 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. (Y6 - Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited (Year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.	• Can name living things living in a range of habitats, giving the key features that helped them to identify them • Can give examples of how an environment may change both naturally and due to human impact

Key vocabulary	
Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate	

Common misconceptions

Some children may think:

- the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain
- there is always plenty of food for wild animals
- animals are only land-living creatures
- animals and plants can adapt to their habitats, however they change
- all changes to habitats are negative.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe plants and animals in different habitats throughout the year. • Compare and contrast the living things observed. • Use classification keys to name unknown living things. • Classify living things found in different habitats based on their features. • Create a simple identification key based on observable features. • Use fieldwork to explore human impact on the local environment e.g. litter, tree planting. • Use secondary sources to find out about how environments may naturally change. • Use secondary sources to find out about human impact, both positive and negative, on environments.	• Can keep a careful record of living things found in different habitats throughout the year (diagrams, tally charts etc.) • Can use classification keys to identify unknown plants and animals • Can present their learning about changes to the environment in different ways e.g. campaign video, persuasive letter

Year	4	Topic	Animals, including humans

- 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.

Prior learning	Future learning
• Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - 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. (Y3 - 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. (Y6 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans) • Describe the ways in which nutrients and water are transported within animals, including humans. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Food enters the body through the mouth. Digestion starts when the teeth start to break the food down. Saliva is added and the tongue rolls the food into a ball. The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken down further by being churned around and other chemicals are added. The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing).	• Can sequence the main parts of the digestive system • Can draw the main parts of the digestive system onto a human outline • Can describe what happens in each part of the digestive system • Can point to the three different types of teeth in their mouth and talk about their shape and what they are used for • Can name producers, predators and prey within a habitat

Living things can be classified as producers, predators and prey according to their place in the food chain.	• Can construct food chains
Key vocabulary	
Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain	

Common misconceptions

Some children may think:

- arrows in a food chains mean 'eats'
- the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain
- there is always plenty of food for wild animals
- your stomach is where your belly button is
- food is digested only in the stomach
- when you have a meal, your food goes down one tube and your drink down another
- the food you eat becomes "poo" and the drink becomes "wee".

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Research the function of the parts of the digestive system. • Create a model of the digestive system using household objects. • Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing). • Classify animals as herbivores, carnivores or omnivores according to the type of teeth they have in their skulls. • Use food chains to identify producers, predators and prey within a habitat. • Use secondary sources to identify animals in a habitat and find out what they eat.	• Can use diagrams or a model to describe the journey of food through the body explaining what happens in each part • Can record the teeth in their mouth (make a dental record) • Can explain the role of the different types of teeth • Can explain how the teeth in animal skulls show they are carnivores, herbivores or omnivores • Can create food chains based on research

Year	4	Topic	States of 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.

Prior learning	Future learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	• 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. (Y5 - Properties and changes of materials) • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials) • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials) • Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials) • 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. (Y5 - Properties and changes of materials)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0ºC. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100ºC. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	• Can create a concept map, including arrows linking the key vocabulary • Can name properties of solids, liquids and gases • Can give everyday examples of melting and freezing • Can give everyday examples of evaporation and condensation • Can describe the water cycle
Key vocabulary	
Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle	

Common misconceptions

Some children may think:

- 'solid' is another word for hard or opaque
- solids are hard and cannot break or change shape easily and are often in one piece
- substances made of very small particles like sugar or sand cannot be solids
- particles in liquids are further apart than in solids and they take up more space
- when air is pumped into balloons, they become lighter
- water in different forms – steam, water, ice – are all different substances
- all liquids boil at the same temperature as water (100 degrees)
- melting, as a change of state, is the same as dissolving
- steam is visible water vapour (only the condensing water droplets can be seen)

- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe closely and classify a range of solids. Observe closely and classify a range of liquids. • Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. • Classify materials according to whether they are solids, liquids and gases. • Observe a range of materials melting e.g. ice, chocolate, butter. • Investigate how to melt ice more quickly. • Observe the changes when making rocky road cakes or ice-cream. • Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. • Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. • Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration). • Observe water evaporating and condensing e.g. on cups of icy water and hot water. • Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. • Use secondary sources to find out about the water cycle.	• Can give reasons to justify why something is a solid liquid or gas • Can give examples of things that melt/freeze and how their melting points vary • From their observations, can give the melting points of some materials • Using their data, can explain what affects how quickly a solid melts • Can measure temperatures using a thermometer • Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup • From their data, can explain how to speed up or slow down evaporation • Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet

- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Observe closely and classify a range of solids. Observe closely and classify a range of liquids. • Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. • Classify materials according to whether they are solids, liquids and gases. • Observe a range of materials melting e.g. ice, chocolate, butter. • Investigate how to melt ice more quickly. • Observe the changes when making rocky road cakes or ice-cream. • Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. • Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. • Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration). • Observe water evaporating and condensing e.g. on cups of icy water and hot water. • Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. • Use secondary sources to find out about the water cycle.	• Can give reasons to justify why something is a solid liquid or gas • Can give examples of things that melt/freeze and how their melting points vary • From their observations, can give the melting points of some materials • Using their data, can explain what affects how quickly a solid melts • Can measure temperatures using a thermometer • Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup • From their data, can explain how to speed up or slow down evaporation • Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet

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Year	4	Topic	Sound

- 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.

Prior learning	Future learning
• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)	• Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. (KS3) • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3) • Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3) • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3) • Auditory range of humans and animals. (KS3) • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3) • Waves transferring information for conversion to electrical signals by microphone. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	• Can name sound sources and state that sounds are produced by the vibration of the object • Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases
Key vocabulary	
Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation	

Common misconceptions

Pitch and volume are frequently confused, as both can be described as high or low.

Some children may think:

- sound is only heard by the listener
- sound only travels in one direction from the source
- sound can't travel through solids and liquids
- high sounds are load and low sounds are quiet.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Classify sound sources. • Explore making sounds with a range of objects, such as musical instruments and other household objects. • Explore how string telephones or ear gongs work. • Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks. • Measure sounds over different distances. • Measure sounds through different insulation materials.	• Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear • Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects • Can use data to identify patterns in pitch and volume

	• Can explain how loudness can be reduced by moving further from the sound source or by using a sound insulating medium

Year	4	Topic	Electricity

- 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.

Prior learning	Future learning
• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)	• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity) • 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. (Y6 - Electricity) • Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off. Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.	• Can name the components in a circuit • Can make electric circuits • Can control a circuit using a switch • Can name some metals that are conductors • Can name materials that are insulators

Key vocabulary	
Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol **N.B.** Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6.	

Common misconceptions

Some children may think:

- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- electricity works by simply coming out of one end of a battery into the component.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Construct a range of circuits. • Explore which materials can be used instead of wires to make a circuit. • Classify the materials that were suitable/not suitable for wires. • Explore how to connect a range of different switches and investigate how they function in different ways. • Choose switches to add to circuits to solve particular problems, such as a pressure switch for a burglar alarm. • Apply their knowledge of conductors and insulators to design and make different types of switch. • Make circuits that can be controlled as part of a DT project. **N.B.** Children should be given one component at a time to add to circuits.	• Can communicate structures of circuits using drawings which show how the components are connected • Use classification evidence to identify that metals are good conductors and non-metals are insulators • Can incorporate a switch into a circuit to turn it on and off • Can connect a range of different switches identifying the parts that are insulators and conductors • Can add a circuit with a switch to a DT project and can demonstrate how it works • Can give reasons for choice of materials for making different parts of a switch • Can describe how their switch works

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians** (+ examples of each) **Senses, touch, see, smell, taste, hear, fingers** (skin), **eyes, nose, ear, tongue**	**Animals including humans** **Offspring, reproduction, growth, child, young/old stages** (examples - chick/hen, baby/child/adult, caterpillar/butterfly), **exercise, heartbeat, breathing, hygiene, germs, disease, food types** (examples – meat, fish, vegetables, bread, rice, pasta)	**Animals including humans** **Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints**	**Animals including humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain**	**Animals including humans** **Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty**	**Animals including humans** **Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle**
Plants **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud** Names of trees in the local area Names of garden and wild flowering plants in the local area	**Plants** As Y1 + **light, shade, sun, warm, cool, water, grow, healthy**	**Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal** – wind dispersal, animal dispersal, water dispersal	**Living things and their habitats** **Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate**	**Living things and their habitats** **Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings**	**Living things and their habitats** **Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering**
Everyday materials **Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through**	**Living things and their habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil**	**States of matter** **Solid, liquid, gas, matter, particle, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle**	**Properties and changes of materials** **Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material**	**Evolution and inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils**

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasonal changes **Weather** (sunny, rainy, windy, snowy etc.), **seasons** (Winter, Summer, Spring, Autumn), **sun, sunrise, sunset, day length**	**Everyday materials and their uses** Names of materials – increased range from year 1 Properties of materials - as for year 1 plus **opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/puling, twist/twisting, squash/squashing, Bend/bending, stretch/stretching**	**Light** **Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous**	**Sound** **Sound, source, vibrate, vibration, travel, pitch** (high, low), **volume, faint, loud, insulation**	**Earth and Space** **Earth, Sun, Moon,** (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) **spherical, solar system, rotates, star, orbit, planets**	**Light** As for year 3 + **straight lines, light rays.**
		Forces and magnets **Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	**Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol**	**Forces** **Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears**	**Electricity** **Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage**

Working Scientifically Skills Progression

Primary Science Education Consultancy

LKS2	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a range of Yes/No questions to aid sorting	Be able to put appropriate headings onto intersecting Venn and Carroll diagrams	Be able to compare objects based on more sophisticated, observable features. Present observations in labelled diagrams.			Sort objects and living things into groups using intersecting Venn and Carroll diagrams	Spot patterns in the data particularly two criteria with no examples e.g. there are no living things with wings and no legs	Draw simple conclusions, when appropriate, for patterns e.g. a flying insect with no legs might always crash land		Suggest improvement e.g. a wider range of objects – only looked at British trees. Suggest new questions arising from the investigation.
Researching	Ask a range of questions linked to a topic	Choose a source from a range provided				Present what they learnt verbally or using labelled diagrams	Be able to answer their questions using simple scientific language			Suggest limitations e.g. only had one book. Suggest new questions arising from the investigation.
Comparative/fair testing		Decide what to change and what to measure or observe	As for KS1 (Make observations linked to answering the question)	Measure using standard units where not all the numbers are marked on the scale, and take repeat readings where necessary	Prepare own tables to record data	Present data in bar charts	Refer directly to their evidence when answering their question	Where appropriate provide oral or written explanations for their findings	Use results from an investigation to make a prediction about a further result	Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation.
Observing over time		Decide what to measure or observe. Decide how often to take a measurement.	Make a range of relevant observations	Measure using standard units where not all the numbers are marked on the scale. Use dataloggers to measure over time.		Present data in time graphs				
Pattern seeking		Decide what to measure or observe	As for KS1 (Make observations linked to answering the question)	Measure using standard units where not all the numbers are marked on the scale.		Use ICT package to present data as a scattergram				

SUBJECT: Science

Link to pdf document(with working links): https://kenderlewishamschuk.sharepoint.com/:b:/s/Planning/EeQw87zRiupBvPZw3DvFV_wB0sQ9cBF5BKjkAwwYN4wU0g?e=hZ2Z5L

Science Long Term Plan - Year 5

Collated by Viktor Bengtsson, July 2022

Science LTP – Year 5	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Further information and resources
Blocked topics *The half-term blocks are recommendations only, as each topic varies in complexity and knowledge requirements. As long as you follow the sequence, you may move on to the next topic whenever the children are ready.* *Rationale for the sequencing can be found here. If you decide you wish to move things around, please read this document and then speak with the science lead.*	**Properties and changes of materials** (properties of materials statements) **Key vocabulary:** Thermal/electrical insulator/conductor, new material **L.Os:** *To group materials according to their properties (OS1) *To investigate which materials are soluble in water (OS2) *To place materials in order of hardness (OS3) *To explain why materials are used for different purposes (OS6) *To explain the advantages and disadvantages of new materials and how they were invented (OS7)	**Living things and their habitats** (life cycles and reproduction of animals statements) **Key vocabulary:** life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis **L.Os:** *To compare the life cycles of different mammals (OS1) *To compare the life cycles of different amphibians (OS2) *To compare the life cycles of different insects (OS3) *Compare the life cycles of different birds (OS4) *Compare the life cycles of mammals, amphibians, insects and birds (OS5) *To explain how animals reproduce sexually (OS8)	**Forces** **Key vocabulary:** Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears **L.Os:** *To explain why objects fall to Earth (OS1) *To make and calibrate a force meter and explain how it works (OS2) *To investigate the effects of air resistance (OS3) *To identify when objects are experiencing high or low water resistance (OS4) *To investigate the effects of friction on different materials (OS5) *To explain how a lever works (OS6) *To explain how a pulley works (OS7) *To explain how a gear train works (OS8)	**Earth and Space** **Key vocabulary:** Earth, Sun, Moon, spherical, solar system, rotates, star, orbit, planets (Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune) **L.Os:** *To explain how the Earth and other planets in the solar system move (OS1) *To research and compare the different planets in the solar system (OS2) *To explain how the moon moves (OS3) *To explain how the Moon's appearance appears to change when viewed from Earth (OS4) *To explain how the solar system was formed (OS5) *To compare the sizes of planets in the solar system (OS6) *To explain how day and night are caused (OS7) *To make a sundial and explain how it works (OS8)	**Properties and changes of materials** (changes of materials statements) Key vocabulary: change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting **L.Os:** *To explain how to recover a substance from a solution (OS4) *To suggest ways in which different mixtures can be separated (OS5) *To identify if a change is easily reversible and how to reverse it (OS8)	**Living things and their habitats** (life cycles and reproduction of animals statements) **Key vocabulary:** life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, bulbs, cuttings **L.Os:** *To describe how flowering plants reproduce (OS6) *To investigate whether a new plant will grow from cuttings (OS7) **Animals, including humans** **NB:** this topic is covered in the RSE curriculum. The following optional L.Os may provide extensions linked to other topics and data handling: *To explain how a human foetus develops (OS1) *To compare the gestation period of different mammals (OS2)	**Core links** ***ASE PLAN documents** (link - knowledge matrices for each year group, attached below. Also some slides of example lesson sequences, as well as pitch of learning) ***Kender Primary Science Grid** (link) **Supporting media** ***Explorify** (link) ***BBC Bitesize Science** (link) **Supporting SoW:** ***Switched on Science** (link) ***Hamilton Trust** (link) **Further reading and CPD** ***Reach Out CPD** (link) ***ASE Primary Science Journal** (link)
Ongoing *These are not linked to a particular half term, but should be spaced out across the year and repeated as appropriate*	N/A						

NB: The different L.Os are there to support core learning. Some lessons will need to be adapted appropriately, some added to deepen the children's learning, and some stretched over numerous lessons.

Year	5	Topic	Living things and their habitats

- 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.

Prior learning	Future learning
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects.	• Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles • Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways

Key vocabulary	
Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings	

Common misconceptions

Some children may think:

- all plants start out as seeds
- all plants have flowers
- plants that grow from bulbs do not have seeds
- only birds lay eggs.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals. • Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. • Look for patterns between the size of an animal and its expected life span. • Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes. • Take cuttings from a range of plants e.g. African violet, mint. • Plant bulbs and then harvest to see how they multiply. • Use secondary sources to find out about pollination.	• Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game • Can identify patterns in life cycles • Can compare two or more animal life cycles they have studied • Can explain how a range of plants reproduce asexually

Year	5	Topic	Animals, including humans

- Describe the changes as humans develop to old age.

Prior learning	Future learning
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)	• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. This needs to be taught alongside PSHE. The new statutory requirements for relationships and health education can be found below: • statutory guidance on Physical health and mental wellbeing (primary and secondary). Other useful guidance includes: • Joint briefing on teaching about puberty in KS2 from PHSE Association and Association for Science Education • Briefing on humans development and reproduction in the Primary Curriculum from PHSE Association and Association for Science Education.	• Can explain the changes that takes place in boys and girls during puberty • Can explain how a baby changes physically as it grows, and also what it is able to do

Key vocabulary	
Puberty – the vocabulary to describe sexual characteristics	

Common misconceptions

Some children may think:

- a baby grows in a mother's tummy
- a baby is "made".

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
This unit is likely to be taught through direct instruction due to its sensitive nature, although children can carry out a research enquiry by asking an expert e.g. school nurse to provide answers to questions that have been filtered by the teacher.	• Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions'

Year	5	Topic	Properties and changes of materials

- 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.

Prior learning	Future learning
• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials) • 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. (Y3 - Forces and magnets) • Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • 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). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)	• Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations. (KS3) • Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/alkalinity; and indicators. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation. Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.	• Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings • Can explain what dissolving means, giving examples • Can name equipment used for filtering and sieving • Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving • Can describe some simple reversible and non-reversible changes to materials, giving examples
Key vocabulary	
Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	

Common misconceptions

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat. • Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate. • Investigate rates of dissolving by carrying out comparative and fair test.	• Can create a chart or table grouping/comparing everyday materials by different properties • Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose

• Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture. • Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning. • Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced? • Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton).	• Can group solids based on their observations when mixing them with water • Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water • Can explain the results from their investigations

Year	5	Topic	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, Earth and Moon as approximately spherical bodies.
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.

Prior learning	Future learning
• Observe changes across the four seasons. (Y1 - Seasonal changes) • Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)	• Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). (KS3) • Our Sun as a star, other stars in our galaxy, other galaxies. (KS3) • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3) • The light year as a unit of astronomical distance. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical.	• Can create a voice over for a video clip or animation • Can show, using diagrams, the movement of the Earth and Moon • Can explain the movement of the Earth and Moon • Can show using diagrams the rotation of the Earth and how this causes day and night • Can explain what causes day and night
Key vocabulary	
Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets	

Common misconceptions

Some children may think:

- the Earth is flat
- the Sun is a planet
- the Sun rotates around the Earth
- the Sun moves across the sky during the day
- the Sun rises in the morning and sets in the evening
- the Moon appears only at night
- night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth. • Use secondary sources to help make a model to show why day and night occur. • Make first-hand observations of how shadows caused by the Sun change through the day. • Make a sundial. • Research time zones. • Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel.	• Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth • Can demonstrate and explain verbally how day and night occur • Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model • Can explain how a sundial works • Can explain verbally, using a model, why we have time zones • Can describe the arguments and evidence used by scientists in the past

Year	5	Topic	Forces

- 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.

Prior learning	Future learning
• Compare how things move on different surfaces. (Y3 - Forces and magnets) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets) • 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. (Y3 - Forces and magnets) • Describe magnets as having two poles. (Y3 - Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)	• Forces as pushes or pulls, arising from the interaction between two objects. (KS3) • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3) • Moment as the turning effect of a force. (KS3) • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3) • Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall. Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long	• Can demonstrate the effect of gravity acting on an unsupported object • Can give examples of friction, water resistance and air resistance • Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance • Can demonstrate how pulleys, levers and gears work

distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.	
Key vocabulary	
Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	

Common misconceptions

Some children may think:

- the heavier the object the faster it falls, because it has more gravity acting on it
- forces always act in pairs which are equal and opposite
- smooth surfaces have no friction
- objects always travel better on smooth surfaces
- a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
- a non-moving object has no forces acting on it
- heavy objects sink and light objects float.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter. • Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water. • Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats. • Explore how levers, pulleys and gears work. • Make a product that involves a lever, pulley or gear. • Create a timer that uses gravity to move a ball. • Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.	• Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down • Can demonstrate clearly the effects of using levers, pulleys and gears

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians** (+ examples of each) **Senses, touch, see, smell, taste, hear, fingers** (skin), **eyes, nose, ear, tongue**	**Animals including humans** **Offspring, reproduction, growth, child, young/old stages** (examples - chick/hen, baby/child/adult, caterpillar/butterfly), **exercise, heartbeat, breathing, hygiene, germs, disease, food types** (examples – meat, fish, vegetables, bread, rice, pasta)	**Animals including humans** **Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints**	**Animals including humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain**	**Animals including humans** **Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty**	**Animals including humans** **Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle**
Plants **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud** Names of trees in the local area Names of garden and wild flowering plants in the local area	**Plants** As Y1 + **light, shade, sun, warm, cool, water, grow, healthy**	**Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal** – wind dispersal, animal dispersal, water dispersal	**Living things and their habitats** **Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate**	**Living things and their habitats** **Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings**	**Living things and their habitats** **Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering**
Everyday materials **Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through**	**Living things and their habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil**	**States of matter** **Solid, liquid, gas, matter, particle, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle**	**Properties and changes of materials** **Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material**	**Evolution and inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils**

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasonal changes **Weather** (sunny, rainy, windy, snowy etc.), **seasons** (Winter, Summer, Spring, Autumn), **sun, sunrise, sunset, day length**	**Everyday materials and their uses** Names of materials – increased range from year 1 Properties of materials - as for year 1 plus **opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching**	**Light** **Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous**	**Sound** **Sound, source, vibrate, vibration, travel, pitch** (high, low), **volume, faint, loud, insulation**	**Earth and Space** **Earth, Sun, Moon,** (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) **spherical, solar system, rotates, star, orbit, planets**	**Light** As for year 3 + **straight lines, light rays.**
		Forces and magnets **Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	**Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol**	**Forces** **Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears**	**Electricity** **Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage**

Working Scientifically Skills Progression

Primary Science Education Consultancy

UKS2	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a range of Yes/No questions to aid sorting and decide which ways of sorting will give useful information	Identify specific clear questions that will help to sort without ambiguity	Be able to compare not only based on physical properties but also on knowledge gained through previous enquiry			Create branching databases (tree diagrams) and keys to enable others to name livings things and objects	Be able to talk about the features that objects and living things share and do not share based on the information in the key etc.	Be able to use data to show that livings things and materials that are grouped together have more things in common than with things in other groups		Be able to explain using evidence that the branching database or classification key will only work for the living things or materials it was created for
Researching	Ask a range of questions recognising that some can be answered through research and others may not	Choose suitable sources to use				Present what they learnt in a range of ways e.g. different graphic organisers	Be able to answer their questions using scientific evidence gained from a range of sources			Be able to talk about their degree of trust in the sources they used
Comparative/fair testing	Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results.	Recognise and control variables where necessary	As for KS1 (Make observations linked to answering the question)	Measure using standard units using equipment that has scales involving decimals	Prepare own tables to record data, including columns for taking repeat readings	Choose an appropriate form of presentation, including line graphs	Be able to answer their question, describing causal relationships	Provide oral or written explanations for their findings	Use test results to make predictions for further investigations	Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results
Observing over time					As for LKS2 (Prepare own tables to record data)		Be able to answer their questions, describing the change over time			
Pattern seeking						Choose an appropriate form of presentation, including scatter graphs	Be able to answer their questions identifying patterns			

SUBJECT: Science

Link to pdf document(with working links): https://kenderlewishamschuk.sharepoint.com/:b:/s/Planning/ESaGiz7vhTVFiLpJnKKAKyEBOxp2FNxtqq7Q1_2YkYDzCw?e=3mXYTm

Science Long Term Plan - Year 6

Collated by Viktor Bengtsson, July 2022

Science LTP – Year 6	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Further information and resources
Blocked topics *The half-term blocks are recommendations only, as each topic varies in complexity and knowledge requirements. As long as you follow the sequence, you may move on to the next topic whenever the children are ready.* *Rationale for the sequencing can be found here. If you decide you wish to move things around, please read this document and then speak with the science lead.*	**Living things and their habitats** **Key vocabulary** vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering **L.Os:** *To make a dichotomous key and use it to classify organisms (OS1) *To explain how Linnaeus developed a classification system (OS2) *To use taxonomy to explain how organisms are related to each other (OS3) *To classify animals as vertebrates and invertebrates (OS4) *To identify familiar arthropods using a classification key (OS5) *To identify some common British trees using a classification key (OS6) *To identify invertebrates in the local environment (OS7) *To identify trees in the local environment (OS8)	**Animals, including humans** **Key vocabulary** heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle **L.Os:** *To identify the main parts of the human circulatory system and explain their functions (OS1) *To explain how the human heart works (OS2) *To describe the functions of blood and blood vessels (OS3) *To investigate the effect of exercise on heart rate (OS4) *To calculate how much alcohol it in different alcoholic beverages (OS5) *To describe the effects of smoking (OS6) *To explain how diet and exercise affect body weight (OS7) *To research the preferred forms of exercise in our class (OS8)	**Electricity** **Key vocabulary** circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage **L.Os:** *To investigate the effect of changing the number and voltage of cells in an electrical circuit (OS1) *To investigate the effect of changing the number of bulbs and the voltage of cells in a circuit (OS2) *To create a wire loop game and explain how it works (OS3) *To create an electrical burglar alarm and explain how it functions (OS4) *To create a set of electrical traffic lights and explain how they function (OS5) *To predict whether an electrical circuit will function and suggest ways of improving it (OS6) *To describe the function of electrical components and match them to their symbols (OS7) *To use symbols to create circuit diagrams to represent electrical circuits (OS8)	**Evolution** **Key vocabulary** offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils **L.Os:** *To explain how Mary Anning contributed to our understanding of fossils (OS1) *To explain what the fossil record tells us about the past (OS2) *To explain how Darwin developed the theory of natural selection (OS3) *To explain the process of evolution by natural selection (OS4) *To model the process of evolution by natural selection (OS5) *To identify features that individuals have inherited from their parents (OS6) *To explain how some animals are adapted to their environment (OS7) *To explain how some plants are adapted to their environment (OS8)	**Evolution** ***NB:*** *Proceed with topic from last half term. When finished, move on to next topic.*	**Light** **Key vocabulary** Y3 (light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous) + straight lines, light rays **L.Os:** *To make a periscope and explain how it works (OS1) *To calculate the best position for a rear-view mirror (OS2) *To label the main parts of the human eye and explain their functions (OS3) *To use my knowledge of reflection to place mirrors to make light follow a path (OS4) *To explain how we see light sources and non-light sources (OS5) *To explain how white light is made up of a spectrum of different colours (OS6) *To explain how moving an object changes the size of its shadow (OS7) *To explain how the shape and size of a shadow are determined (OS8)	**Core links** ***ASE PLAN documents** (link - knowledge matrices for each year group, attached below. Also some slides of example lesson sequences, as well as pitch of learning) ***Kender Primary Science Grid** (link) **Supporting media** ***Explorify** (link) ***BBC Bitesize Science** (link) **Supporting SoW:** ***Switched on Science** (link) ***Hamilton Trust** (link) **Further reading and CPD** ***Reach Out CPD** (link) *** ASE Primary Science Journal** (link)
Ongoing *These are not linked to a particular half term, but should be spaced out across the year and repeated as appropriate.*	N/A						

NB: The different L.Os are there to support core learning. Some lessons will need to be adapted appropriately, some added to deepen the children's learning, and some stretched over numerous lessons.

Year	6	Topic	Living things and their habitats

- 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.

Prior learning	Future learning
• Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)	• Differences between species. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other livings things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food whereas animals cannot. Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics. Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.	• Can give examples of animals in the five vertebrate groups and some of the invertebrate groups • Can give the key characteristics of the five vertebrate groups and some invertebrate groups • Can compare the characteristics of animals in different groups

Key vocabulary	
Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering	• Can give examples of flowering and non-flowering plants

Common misconceptions

Some children may think:

- all micro-organisms are harmful
- mushrooms are plants.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Use secondary sources to learn about the formal classification system devised by Carl Linnaeus and why it is important. • Use first-hand observation to identify characteristics shared by the animals in a group. • Use secondary sources to research the characteristics of animals that belong to a group. • Use information about the characteristics of an unknown animal or plant to assign it to a group. • Classify plants and animals, presenting this in a range of ways e.g. Venn diagrams, Carroll diagrams and keys. • Create an imaginary animal which has features from one or more groups.	• Can use classification materials to identify unknown plants and animals • Can create classification keys for plants and animals • Can give a number of characteristics that explain why an animal belongs to a particular group

Year	6	Topic	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.

Prior learning	Future learning
• Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - 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. (Y3 - Animals, including humans) • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)	• The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. (KS3) • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. (KS3) • The structure and functions of the gas exchange system in humans, including adaptations to function. (KS3) • The mechanism of breathing to move air in and out of the lungs. (KS3) • The impact of exercise, asthma and smoking on the human gas exchange system. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system. Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well out heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE. The new statutory requirements for relationships and health education can be found below:	• Can draw a diagram of the circulatory system and label the parts and annotate it to show what the parts do • Produces a piece of writing that demonstrates the key knowledge e.g. explanation text, job description of the heart

- statutory guidance on Physical health and mental wellbeing (primary and secondary).

Key vocabulary	
Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle	

Common misconceptions

Some children may think:

- your heart is on the left side of your chest
- the heart makes blood
- the blood travels in one loop from the heart to the lungs and around the body
- when we exercise, our heart beats faster to work the muscles more
- some blood in our bodies is blue and some blood is red
- we just eat food for energy
- all fat is bad for you
- all dairy is good for you
- protein is good for you, so you can eat as much as you want
- foods only contain fat if you can see it
- all drugs are bad for you.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence

• Create a role play model for the circulatory system.
• Carry out a range of pulse rate investigations:
  ▪ fair test – effect of different activities on my pulse rate
  ▪ pattern seeking – exploring which groups of people may have higher or lower resting pulse rates
  ▪ observation over time - how long does it take my pulse rate to return to my resting pulse rate (recovery rate)
  ▪ pattern seeking – exploring recovery rate for different groups of people.
• Research the negative effects of drugs (e.g. tobacco) and the benefits of a healthy diet and regular exercise by asking an expert or using carefully selected secondary sources.
	• Use the role play model to explain the main parts of the circulatory system and their role
	• Can use subject knowledge about the heart whilst writing conclusions for investigations
	• Can explain both the positive and negative effects of diet, exercise, drugs and lifestyle on the body
	• Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body

Year	6	Topic	Evolution and inheritance

- 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.

Prior learning	Future learning
• 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. (Y2 - Living things and their habitats) • Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Living things and their habitats - Y5)	• Heredity as the process by which genetic information is transmitted from one generation to the next. (KS3) • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. (KS3) • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. (KS3) • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other. Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited	• Can explain the process of evolution • Can give examples of how plants and animals are suited to an environment • Can give examples of how an animal or plant has evolved over time e.g. penguin, peppered moth

characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution. Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.	• Give examples of living things that lived millions of years ago and the fossil evidence we have to support this • Can give examples of fossil evidence that can be used to support the theory of evolution
Key vocabulary	
Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils	

Common misconceptions

Some children may think:

- adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life
- offspring most resemble their parents of the same sex, so that sons look like fathers
- all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited
- cavemen and dinosaurs were alive at the same time.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Design a new plant or animal to live in a particular habitat. • Use models to demonstrate evolution e.g. 'Darwin's finches' bird beak activity. • Use secondary sources to find out about how the population of peppered moths changed during the industrial revolution. • Make observations of fossils to identify living things that lived on Earth millions of years ago. • Identify features in animals and plants that are passed on to offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs. • Compare the ideas of Charles Darwin and Alfred Wallace on evolution. • Research the work of Mary Anning and how this provided evidence of evolution.	• Can identify characteristics that will make a plant or animal suited or not suited to a particular habitat • Can link the patterns seen in the model to real examples • Can explain why the dominant colour of the peppered moth changed over a very short period of time

Year	6	Topic	Light

- Recognise that light appears to travel in straight lines.
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Prior learning	Future learning
• Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light) • Notice that light is reflected from surfaces. (Y3 - Light) • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light) • Find patterns in the way that the size of shadows change. (Y3 - Light) • 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. (Y5 - Properties and changes of materials)	• The similarities and differences between light waves and waves in matter. (KS3) • Light waves travelling through a vacuum; speed of light. (KS3) • The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. (KS3) • Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. (KS3) • Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. (KS3) • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.	• Can describe, with diagrams or models as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes • Can describe, with diagrams or models as appropriate, how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape

Key vocabulary	
As for Year 3 - Light, plus straight lines, light rays	

Common misconceptions

Some children may think:

- we see objects because light travels from our eyes to the object.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card. • Explore the uses of the behaviour of light, reflection and shadows, such as in periscope design, rear view mirrors and shadow puppets.	• Can explain how evidence from enquiries shows that light travels in straight lines • Can predict and explain, with diagrams or models as appropriate, how the path of light rays can be directed by reflection to be seen, e.g. the reflection in car rear view mirrors or in a periscope • Can predict and explain, with diagrams or models as appropriate, how the shape of shadows can be varied

Year	6	Topic	Electricity

- 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.

Prior learning	Future learning
• Identify common appliances that run on electricity. (Y4 - Electricity) • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity) • 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. (Y4 - Electricity) • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity) • Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)	• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. (KS3) • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. (KS3) • Differences in resistance between conducting and insulating components (quantitative). (KS3) • Static electricity. (KS3)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning	Possible evidence
Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well. You can use recognised circuit symbols to draw simple circuit diagrams.	• Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs, can be changed by increasing or decreasing the number of cells or using cells of different voltages • Can draw circuit diagrams of a range of simple series circuits using recognised symbols

Key vocabulary	
Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage **N.B.** Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words "cells" and "batteries" are now used interchangeably.	

Common misconceptions

Some children may think:

- larger-sized batteries make bulbs brighter
- a complete circuit uses up electricity
- components in a circuit that are closer to the battery get more electricity.

Apply knowledge in familiar related contexts, including a range of enquiries

Activities	Possible evidence
• Explain how a circuit operates to achieve particular operations, such as to control the light from a torch with different brightnesses or make a motor go faster or slower. • Make circuits to solve particular problems, such as a quiet and a loud burglar alarm. • Carry out fair tests exploring changes in circuits. • Make circuits that can be controlled as part of a DT project.	• Can incorporate a switch into a circuit to turn it on and off • Can change cells and components in a circuit to achieve a specific effect • Can communicate structures of circuits using circuit diagrams with recognised symbols • Can devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test • Can predict results and answer questions by drawing on evidence gathered

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals including humans **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, fish, reptiles, mammals, birds, amphibians** (+ examples of each) **Senses, touch, see, smell, taste, hear, fingers** (skin), **eyes, nose, ear, tongue**	**Animals including humans** **Offspring, reproduction, growth, child, young/old stages** (examples - chick/hen, baby/child/adult, caterpillar/butterfly), **exercise, heartbeat, breathing, hygiene, germs, disease, food types** (examples – meat, fish, vegetables, bread, rice, pasta)	**Animals including humans** **Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints**	**Animals including humans** **Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain**	**Animals including humans** **Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty**	**Animals including humans** **Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs and lifestyle**
Plants **Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud** Names of trees in the local area Names of garden and wild flowering plants in the local area	**Plants** As Y1 + **light, shade, sun, warm, cool, water, grow, healthy**	**Plants** **Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal** – wind dispersal, animal dispersal, water dispersal	**Living things and their habitats** **Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate**	**Living things and their habitats** **Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings**	**Living things and their habitats** **Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering and non-flowering**
Everyday materials **Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see through, not see through**	**Living things and their habitats** **Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed, names of local habitats e.g. pond, woodland etc., names of micro-habitats e.g. under logs, in bushes etc.**	**Rocks** **Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil**	**States of matter** **Solid, liquid, gas, matter, particle, state change, melting, freezing, melting point, boiling point, evaporation, condensation, temperature, water cycle**	**Properties and changes of materials** **Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve reversible/non-reversible change, burning, rusting, new material**	**Evolution and inheritance** **Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils**

Science Curriculum Key Vocabulary (adapted from ASE PLAN documents)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasonal changes **Weather** (sunny, rainy, windy, snowy etc.), **seasons** (Winter, Summer, Spring, Autumn), **sun, sunrise, sunset, day length**	**Everyday materials and their uses** Names of materials – increased range from year 1 Properties of materials - as for year 1 plus **opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, Bend/bending, stretch/stretching**	**Light** **Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous**	**Sound** **Sound, source, vibrate, vibration, travel, pitch** (high, low), **volume, faint, loud, insulation**	**Earth and Space** **Earth, Sun, Moon,** (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune) **spherical, solar system, rotates, star, orbit, planets**	**Light** As for year 3 + **straight lines, light rays.**
		Forces and magnets **Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	**Electricity** **Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol**	**Forces** **Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears**	**Electricity** **Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage**

Working Scientifically Skills Progression

Primary Science Education Consultancy

UKS2	To ask scientific questions	To plan an enquiry	To observe closely	To take measurements	To gather/record results	To present results	To interpret results	To draw conclusions	To make a prediction	To evaluate an enquiry
Classifying	Be able to ask a range of Yes/No questions to aid sorting and decide which ways of sorting will give useful information	Identify specific clear questions that will help to sort without ambiguity	Be able to compare not only based on physical properties but also on knowledge gained through previous enquiry			Create branching databases (tree diagrams) and keys to enable others to name livings things and objects	Be able to talk about the features that objects and living things share and do not share based on the information in the key etc.	Be able to use data to show that livings things and materials that are grouped together have more things in common than with things in other groups		Be able to explain using evidence that the branching database or classification key will only work for the living things or materials it was created for
Researching	Ask a range of questions recognising that some can be answered through research and others may not	Choose suitable sources to use				Present what they learnt in a range of ways e.g. different graphic organisers	Be able to answer their questions using scientific evidence gained from a range of sources			Be able to talk about their degree of trust in the sources they used
Comparative/fair testing	Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results.	Recognise and control variables where necessary	As for KS1 (Make observations linked to answering the question)	Measure using standard units using equipment that has scales involving decimals	Prepare own tables to record data, including columns for taking repeat readings	Choose an appropriate form of presentation, including line graphs	Be able to answer their question, describing causal relationships	Provide oral or written explanations for their findings	Use test results to make predictions for further investigations	Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results
Observing over time					As for LKS2 (Prepare own tables to record data)		Be able to answer their questions, describing the change over time			
Pattern seeking						Choose an appropriate form of presentation, including scatter graphs	Be able to answer their questions identifying patterns			