

NURSERY - SCIENCE CURRICULUM

Understanding the World – The Natural World – Animals (including humans)

Prior learning:

- Explore natural materials, indoors and outside. (Birth to three)
- Explore natural materials, indoors and outside. (Birth to three)
- Make connections between the features of their family and other families. (Birth to three)
- Notice differences between people. (Birth to three)

Future learning:

- Recognise some environments that are different to the one in which they live. (Reception)
- 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)
- Talk about members of their immediate family and community. (Reception)
- Name and describe people who are familiar to them. (Reception)
- Describe what they see, hear and feel whilst outside. (Reception)
- 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)

Common misconceptions:

Some children may think:

- all animals lay eggs
- the young animal is fully formed inside an egg and just waiting to hatch
- the young animal is fully formed inside an egg and just grows until it is big enough to hatch
- animals are assembled from body parts within the egg
- all animal young are just small versions of the adult and get bigger
- animals such as cows and hens “make” milk and lay eggs for us [humans]
- humans are not animals

Key Vocabulary:

egg, chick, bird, caterpillar, cocoon, chrysalis, butterfly, frog spawn, tadpole, froglet, frog, grow, change, die, names of animals and their young, fur, feathers, scales, tail, wings, beak, claws, paws, hooves, swim, walk, run, jump, jump, fly, patterns, spots, stripes, baby, toddler, child, adult, old person, smell, taste, touch, feel, hear, see

Enrichment: Tadpoles/butterflies in classroom, invite parent with new baby in, invite grandparents in

Science through stories:

The Very Hungry Caterpillar & The Mixed-Up Chameleon by Eric Carle, Monkey Puzzle by Julia Donaldson, The Odd Egg by Emily Gravett, Owl Babies by Martin Waddell, Za-za's Baby Brother by Lucy Cousins, My Grandpa by Marta Altés, I Want My Potty! by Tony Ross, Once There Were Giants by Martin Waddell

Linked careers (role-play opportunities): Farmer, zookeeper, vet, pet shop, animal hospital, baby clinic, nurse, doctor

Cross-curricular: Communication and Language, Literacy, Maths, Expressive Arts and Design

Appropriate activities to initiate learning:**Understand the key features of the life cycle of a plant and an animal.**

- Sharing books with information about animal life cycles (fiction and non-fiction)
- Looking at and matching pictures of animals and their young
- Watching videos of animals and their young and how they change over time
- Playing games involving matching or describing animals and their young
- Playing with small world animals, matching adults to their young
- Talking about the sounds adult and young animals make and comparing them
- Drawing adult animals and their young

Begin to understand the need to respect and care for the natural environment and all living things.

- Caring for eggs and the young animals that emerge, such as chicks, caterpillars, frogs

Use all their senses in hands-on exploration of natural materials.

- Exploring the natural environment with their senses
- Exploring objects using their senses e.g. smelling pots, feely bags, listening pots etc.
- Sorting collections of natural objects using their senses e.g. bark, pebbles, feathers, seeds, cones, leaves, sticks
- Looking closely at natural objects using a magnifying glass or app on a tablet
- Going on a sound walk
- Playing guessing games where children pick an object and either describe it or are asked questions in order to identify it
- Playing listening games
- Sharing books about senses and sensory impairments
- Tasting food
- Talking about how they look after their own health and hygiene
- Noticing when they feel hot and cold and how to respond to this

Understand the key features of the life cycle of a plant and an animal.

- Looking at photographs of the children as babies
- Sharing books about how to look after a baby
- Talking to an expectant mother, parent with a baby and elderly person
- Talking to adults about photographs of the adults at different ages
- Identifying pictures of babies, toddlers, children, adults and old people in magazines or other media

Understanding the World – The Natural World – Plants

Prior learning:

- Explore natural materials, indoors and outside. (Birth to three)

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)
- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 – Plants)

Common misconceptions:

Some children may think:

- trees are not plants
- there is a young plant inside a seed or bulb
- bulbs are big seeds
- big plants grow from big seeds and big bulbs
- fruit and vegetables come from the supermarket
- plants grow at night or when we are not watching them

Key Vocabulary:

plant, leaf, stem, trunk, branch, root, bark, flower, petal, seed, berry, fruit, vegetable, bulb, plant, hole, dig, water, weed, grow, shoot, die, dead, soil

Enrichment: Explore field and wooded area, gardening, mud kitchen

Science through stories:

Jim and the Beanstalk by Raymond Briggs, Titch by Pat Hutchins, Oliver's Vegetables by Alison Bartlett & Vivian French

Linked careers (role-play opportunities):

Greengrocer/farm shop, Gardener/allotment owner, Farmer

Cross-curricular:

Maths, Expressive Arts and Design

Appropriate activities to initiate learning:

Use all their senses in hands-on exploration of natural materials.

- Gathering seeds from the surrounding natural environment
- Gathering seeds from fruit
- Drawing seeds and bulbs

Explore collections of materials with similar and/or different properties.

- Observing collections of seeds and bulbs using a magnifying glass or an app on a tablet

Plant seeds and care for growing plants.

- Planting and caring for seeds and bulbs
- Growing vegetable tops

Understand the key features of the life cycle of a plant and an animal.

- Observing and photographing/drawing how plants grow and die
- Observing and photographing/drawing what happens when fruit, vegetables and flowers are left to decay

Begin to understand the need to respect and care for the natural environment and all living things.

- Using what they grow to make food to eat
- Sharing books about plants and growing plants

Understanding the World – The Natural World – Materials

Prior learning:

- Explore materials with different properties. (Birth to three)
- Explore natural materials, indoors and outside. (Birth to three)

Future learning:

- Explore the natural world around them. (Reception)
- Describe what they see, hear and feel whilst outside. (Reception)
- 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)

Common misconceptions:

Some children may think that:

- a material is better to use because it is 'bigger' not thicker, rigid, etc
- the material is 'box' not cardboard

Key Vocabulary:

mix, stir, cook, hot, oven, microwave, change, burn, melt, hard, runny, set, freeze, freezer, cold, blended, hard, soft, bendy, stiff, wobbly, wood, plastic, paper, card, fabric

Enrichment: Baking

Science through stories: Gingerbread Man, Little Red Hen

Linked careers (role-play opportunities): Baker

Cross-curricular: EAD

Appropriate activities to initiate learning:

Talk about what they see, using a wide vocabulary.

- Exploring cornflour and water, gellibaff, shaving foam, play dough, cloud dough, etc.
- Encourage children to talk about the materials they explore, using their senses.

Talk about the differences between materials and changes they notice.

- Support children to name the material they have used.
- Encourage children to talk about why they have chosen a particular material, naming at least one property.
- Building junk models using a range of materials
- Shaping and joining materials using equipment e.g. scissors, hole punch, including when using wood e.g. a hammer and nail
- Mixing ingredients to make playdough, cakes, biscuits, bread, jelly etc.
- Melting chocolate for decorating bakes/biscuits or to combine with other ingredients e.g. refrigerator cake, chocolate crispy cakes
- Comparing cooked and uncooked pasta, noodles, rice or potatoes
- Cooking cakes, biscuits, bread etc.
- Removing toys from ice

RECEPTION - SCIENCE CURRICULUM

Understanding the World – The Natural World – Animals and Humans

Prior learning:

- Understand the key features of the life cycle of a plant and an animal. (Nursery)
- Begin to understand the need to respect and care for the natural environment and all living things. (Nursery)
- Use all their senses in hands-on exploration of natural materials. (Nursery)
- Begin to make sense of their own life-story and family's history. (Nursery)

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)
- 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)

Common misconceptions:

Some children may think:

- animals are furry and have four legs
- a bee is not an animal because it is an insect
- animals adapt to their surroundings, e.g. a brown bear turns white and becomes a polar bear
- animals living in the soil breathe by coming to the surface
- dragons and other mythical creatures are real animals

Key Vocabulary:

names of animals, live, on land, in water, jungle, desert, North Pole, South Pole, sea, hot, cold, wet, dry, snow, ice, hair (black, brown, dark, light, blonde, ginger, grey, white, long, short, straight, curly), eyes (blue, brown, green, grey), skin (black, brown, white), big/tall, small/short, bigger/smaller, baby, toddler, child, adult, old person, old, young, brother, sister, mother, father, aunt, uncle, grandmother, grandfather, cousin, friend, family, boy, girl, man, woman

Science through stories: Lost and Found by Oliver Jeffers, Shark in the Park by Nick Sharratt, We're Going on a Bear Hunt by Michael Rosen, I Love My Hair by Natasha Anastasia Tarpley, What I Like About Me by Alia Zobel-Nolan

Linked careers (role-play opportunities):

Zookeeper, Safari centre, Aquarium, Explorer/Naturalist, Doctor, Nurse, Dentist, Optician

Cross-curricular: PSED, EAD, Maths

Appropriate activities to initiate learning:**Recognise some environments that are different to the one in which they live.**

- Sharing books about animals in the local area and animals in other countries e.g. jungle, polar regions, desert, ocean
- Looking at pictures of animals in different habitats
- Watching videos of animals in different habitats
- Playing games involving matching animals to their habitats
- Playing with small world animals in different habitats
- Creating pictures of animals in their habitats
- Pretending to be animals
- Naming and describing animals they see in books, pictures, videos or while on a trip
- Describing different habitats

Talk about members of their immediate family and community.

- Talking about themselves, friends, family and community using photographs
- Using mirrors to look at their faces
- Creating pictures or collages of themselves, friends, family and community
- Making hand and footprints using paint
- Making fingerprints using ink pads
- Sharing books about different types of families

Name and describe people who are familiar to them.

- Talking about other people that look after them
- Talking to a dentist, nurse, meal supervisor/school cook, road crossing supervisor etc.
- Sharing videos of people who care for us and how we look after ourselves

Understanding the World – The Natural World – Living Things and their Habitats

Prior learning:

- Use all their senses in hands-on exploration of natural materials.
- Explore collections of materials with similar and/or different properties.
- Begin to understand the need to respect and care for the natural environment and all living things.

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)
- Explore and compare the differences between things that are living, dead, and things that have never been alive. (Y2 – Living things in their habitat)
- Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 – Living things in their habitat)

Common misconceptions:

Some children may think:

- trees are not plants
- trees are not living as they do not seem to change or grow
- weeds are bad plants

Key Vocabulary:

plant, tree, bush, flower, vegetable, herb, weed, animal, names of plants and animals they see, name of a contrasting environment e.g. beach, forest

Enrichment:

Visits to field, pond area

Science through stories:

Bad-Tempered Ladybird by Eric Carle, Mad About Minibeasts by David Wojtowycz & Giles Andreae, Aargh a Spider by Lydia Monks

Linked careers (role-play opportunities):

Beekeeper, botanist

Cross-curricular:

EAD, Literacy

Appropriate activities to initiate learning:**Draw information from a simple map.**

- Looking at aerial views to count the number of trees in the school grounds
- Using a map of the school grounds, with pictures of where specific plants can be found, to find those plants
- Creating a map to show how to find their favourite plants in the school grounds
- Creating a map to show where they found each type of minibeast

Explore the natural world around them.

- Sharing books about minibeasts
- Playing with small world minibeasts
- Building minibeast homes
- Taking photographs of the plants they find in the school grounds
- Finding plants in the school grounds to match with photographs of them
- Matching the minibeasts they find to pictures that identify them
- Drawing pictures of the minibeasts

Describe what they see, hear and feel whilst outside.

- Observing closely and drawing the plants in the school grounds
- Observing the minibeasts closely, using a magnifying glass or app on a tablet
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Recognise some environments that are different to the one in which they live.

- Stories about contrasting environments
- Encourage children to talk about different countries they may have visited

Understanding the World – The Natural World – Materials

Prior learning:

- Use all their senses in hands-on exploration of natural materials. (Nursery)
- Explore collections of materials with similar and/or different properties. (Nursery)
- Talk about the differences between materials and changes they notice. (Nursery)

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)

Common misconceptions:

Some children may think:

- material only means fabric
- all plastic/wood etc. is the same

Key Vocabulary:

ice, water, frozen, icicle, snow, melt, wet, cold, slippery, smooth, big, bigger, biggest, smaller, smaller, smallest, hard, soft, bendy, rigid, wood, plastic, paper, card, metal, strong, weak, hot, apply heat, waterproof, soggy, not waterproof, best, change, change back

Enrichment:

Science through stories:

The Three Little Pigs, The Little Red Hen

Linked careers (role-play opportunities):

Recycling centre worker, Builder, Chef

Cross-curricular:

Literacy, EAD

Appropriate activities to initiate learning:**Explore the natural world around them.**

- Looking for dew, ice, icicles and frost in the playground
- Using their senses to explore natural materials in the environment, such as stones, twigs, leaves, feathers, seeds, flowers etc.
- Gathering natural materials to make collections
- Making pictures using natural materials they have gathered from the environment
- Making dens, nests, bug hotels etc. using natural materials

Describe what they see, hear and feel whilst outside.

- Choosing where to put ice cubes in the playground and observing how quickly they melt
- Observing how a large block of ice changes over time, using string to measure around it
- Putting wax crayons in different areas of the playground and observing how they change
- Making a snowman and observing how it changes over time

Understanding the World – The Natural World – Forces

Prior learning:

- Explore how things work. (Nursery)
- Explore and talk about different forces they can feel. (Nursery)
- Talk about the differences between materials and changes they notice. (Nursery)

Future learning:

- Compare how things move on different surfaces. (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)
- 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)

Common misconceptions:

Some children may think:

- all light objects float and all heavy objects sink
- objects made of the same material will always float or sink

Key Vocabulary:

float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest, wind, air, water, blow, bounce

Enrichment:

Science through stories:

Mr Gumpy's Outing by John Burningham, Mr Archimedes' Bath by Pamela Allen, Who sank the boat? by Pamela Allen, Stickman by Julia Donaldson, Flotsam by David Wiesner

Linked careers (role-play opportunities):

Boat builder, Aircraft engineer, Rocket designer, Engineer

Cross-curricular:

Physical Development

Appropriate activities to initiate learning:**Explore the world around them.**

- Identifying objects being blown around outdoors
- Playing with wind-up toys
- Playing with magnetic toys e.g. train carriages joined by magnets, magnetic construction kits etc.

Describe what they see, hear and feel whilst outside.

- Testing how toy cars move down ramps and gutters
- Testing how wheels turn when sand or water is poured through them
- Testing how different balls bounce
- Making and testing paper aeroplanes
- Designing different marble runs or routes for water/sand to travel down gutters or pipes
- Observing how different objects fall e.g. scarves, feathers
- Observing how toys/objects move in the wind e.g. streamers, balloons, pinwheels, bubbles etc.
- Comparing the movements of a ball and a balloon when bouncing or throwing and catching
- Exploring magnets of different shapes and sizes
- Pushing, pulling, twisting and bending malleable (e.g. modelling clay, playdough, springs, pipe cleaners, elastics, sponges etc.) and non-malleable objects/materials
- Cutting and joining objects/materials e.g. wood, building kits with nuts and bolts etc.

Understanding the World – The Natural World – Humans

Prior learning:

- Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans)

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)

Common misconceptions:

Some children may think:

- it always snows in winter
- it is always hot in the summer
- all babies and young animals are born in spring
- plants only have flowers in the spring and summer
- animals sleep during winter
- it rains to help the plants grow
- when it is hotter, it is because the Sun is closer
- God controls the weather.

Key Vocabulary:

spring, summer, autumn, winter, seasons, sunny, cloudy, hot, warm, cold, shower, raining, storm, thunder, lightning, hail, sleet, snow, icy, frost, puddles, windy, rainbow, animals, young, plants, flowers

Enrichment:

Seasonal walks around school grounds

Science through stories:

Seasons by Anna Pang, Autumn is Here by Heidi Pross Gray, Spring is Here by Will Hillenbrand, One Springy Day by Nick Butterworth, WOW! It's Night-time by Tim Hopgood, Tree - Seasons Come, Seasons Go by Britta Teckentup

Linked careers (role-play opportunities):

Meteorologist, Weather presenter

Cross-curricular:

EAD, Literacy

Appropriate activities to initiate learning:

Explore the natural world around them.

- Playing in the rain and snow
- Matching animals and plants they find to pictures that identify them

Describe what they see, hear and feel whilst outside.

- Drawing around puddles
- Catching rain and hail in buckets
- Catching snowflakes on frozen black paper and looking at them with magnifying glasses or an app on a tablet
- Making icicles
- Using scarves or pinwheels to explore the strength and direction of the wind

Understand the effect of changing seasons on the natural world around them.

- Looking at photographs of different seasons and types of weather
- Sharing books about different seasons and types of weather
- Looking for birds and other animals throughout the year using binoculars
- Sharing books and videos about animals that migrate or hibernate over winter, gather food in autumn, build nests and lay eggs in spring etc.
- Observing closely and drawing the plants in the school grounds at different times in the year

YEAR 1 - SCIENCE CURRICULUM

Year 1 Plants (Biology)	
Prior learning: <ul style="list-style-type: none"> Plant seeds and care for growing plants. (Nursery – Plants) Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants) Begin to understand the need to respect and care for the natural environment and all living things. (Nursery – Plants) Explore the natural world around them. (Reception – Living things and their habitats) Recognise some environments that are different to the one in which they live. (Reception – Living things and their habitats) 	Future learning: <ul style="list-style-type: none"> 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)
Common misconceptions: Some children may think: <ul style="list-style-type: none"> plants are flowering plants grown in pots with coloured 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 	
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	
Enrichment:	
Science through stories: Jasper’s Beanstalk	
Scientist: Beatrix Potter-Author and botanist	
Profession or person of interest: Gardener	
Cross-curricular: English, Art	

Knowledge and skills:**Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.**

- Explore the local environment throughout the year to explore and answer questions about plants growing in their habitat.
- Use photographs and their own observations to talk about how plants change over time (e.g. seed to sapling to tree) and over the year (deciduous and fruit bearing trees)
- Observe the growth of flowers and vegetables that they have planted
- Use magnifying glasses to observe, compare and contrast familiar plants
- Sort and group parts of plants using similarities and differences e.g. the shape of leaves, the colour of the flower/blossom
- Use simple charts and Venn diagrams etc. to identify and classify plants
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Identify and describe the basic structure of a variety of common flowering plants, including trees.

- Draw and label pictures to show the parts of different plants including trees
- Make close observations of plants, including trees - leaves, seeds, flowers etc.
- Keep a record of how plants change over time, for example bean or sunflower diary
- Compare and contrast what they have found out about different plants
- 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, the leaves are different shapes

Year 1 Animals Including Humans (Biology)

Prior learning:

- Use all their senses in hands-on exploration of natural materials. (Nursery - Humans)
- Name and describe people who are familiar to them. (Reception - Humans)

Future learning:

- 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)

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

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

Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue

Enrichment:

Science through stories: Rainbow Fish, Snow Bears, Mad about Minibeasts

Scientist: Chris Packham-Animal Conservationist

Cross-curricular: PE, Art, Maths

Knowledge and skills:**Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.**

- Explore the features of fish, amphibians, reptiles, birds and mammals
- Classify common animal into groups - fish, amphibians, reptiles, birds and mammals
- Identify animals by matching statements to named images
- Use first-hand close observations to make detailed drawings

Identify and name a variety of common animals that are carnivores, herbivores and omnivores.

- Explore the diet of a variety of common animals.
- Classify animals into carnivores, herbivores and omnivores.

Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets).

- Label the features of a variety of animals
- Describe the features of each animal group
- Compare the structure of two animals from the same or different group e.g. wings, feathers, vertebrates/ invertebrates
- Create a drawing of an imaginary animal labelling its key features

Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

- Label the parts of the body
- Take measurements of parts of the body and present results in a table to interpret
- Explore the 5 senses – listening games, smell test, taste test, feely boxes, I Spy
- Label the body parts associated with each sense
- Conduct simple sense experiments. 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?

Year 1 Everyday Materials (Physics)

Prior learning:

- Use all their senses in hands-on exploration of natural materials. (Nursery - Materials, including changing materials)
- Explore collections of materials with similar and/or different properties. (Nursery - Materials, including changing materials)
- Talk about the differences between materials and changes they notice. (Nursery - Materials, including changing materials)

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)

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.

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

Enrichment:

Science through stories: The three little pigs

Scientists: William Addis-Toothbrush Inventor, Charles Mackintosh (Waterproof coat), John MacAdam- roads, Chester Greenwood-Earmuffs

Cross-curricular: Music, English, Art

Knowledge and skills:

Distinguish between an object and the material from which it is made.

- Discuss, identify, label and record the materials they spot in the classroom
- Sort the objects according to properties (what material is this made of? What is its useful property?)
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Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.

- Play Material Snap, placing objects on the table and seeing if their properties are the same
- Discuss the differences between an object and the material from which it is made
- Use scientific words to identify the materials: wood, plastic, glass and metal
- Write songs about materials and their properties (to the tune of *Frere Jacques*)

Describe the simple physical properties of a variety of everyday materials.

- Explore a variety of different magnets and objects (both magnetic and non-magnetic), including paperclips in jars/bowls of water
- Consider challenges such as: Can you get the paperclip out of the water without getting your hands wet? Are different magnets able to hold the same amount of paper clips?
- Discuss the properties of metal objects and why some metals stick to magnets
- Choose an appropriate method for testing an object for a particular property
- 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.
- Use their test evidence to answer the questions about properties e.g. Which cloth is the most absorbent
- Consider the questions: What would the classroom be like if the tables were made of jelly? Or the chairs were chocolate? Why are certain materials used to make these items?

Compare and group together a variety of everyday materials on the basis of their simple physical properties.

- Classify objects made of one material in different ways e.g. a group of objects made of metal
- Classify one type of object made from a range of materials e.g. a collection of spoons made of different materials

Year 1 Seasonal Changes (Biology/Physics)

Prior learning:

- Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans)
- Explore the natural world around them. (Reception – Seasonal changes)
- Describe what they see, hear and feel whilst outside. (Reception – Seasonal changes)
- Understand the effect of changing seasons on the natural world around them. (Reception – Seasonal changes)

Future learning:

- 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)

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

Key Vocabulary:

Weather (sunny, rainy, windy, snowy, etc.)

Seasons (winter, summer, spring, autumn)

Sun, sunrise, sunset, day length

Enrichment:

Science through stories: Mr Wolf's Week

Scientists: Dr Steve Lyons (Extreme Weather), Holly Green (Meteorologist)

Profession or person of interest:

Cross-curricular: Art, Maths

Knowledge and skills:**Observe changes across the four seasons.**

- Can name the four seasons and identify when in the year they occur
- Make observations of the changes they see throughout the year
- 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
- Discuss what they see in the outdoor environment.
- 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
-

Observe and describe weather associated with the seasons and how day length varies

- Make a weather forecast for each of the four seasons
- Collect information about the weather regularly throughout the year
- Present this information in tables and charts to compare the weather across the seasons
- Can describe weather in different seasons over a year
- Design an outfit for a particular season and give reasons for your choice.
- Record these changes throughout the year in photos
- Compare the photos at the end of the year

YEAR 2 - SCIENCE CURRICULUM

Year 2 Living Things and Their Habitats (Biology)

Prior 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)

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)
- 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)

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

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.

Enrichment: Woodland walk, pond visit

Science through stories: The Gruffalo by Julia Donaldson

Scientists/People of Interest: Rachel Carson- Marine Pollution, Liz Bonnin- Conservationist

Cross-curricular: Art, Geography

Knowledge and skills:**Explore and compare the differences between things that are living, dead, and things that have never been alive**

- Knows and can explain the differences between things that are living, dead, and things that have never been alive.
- Classify objects by whether they are living, dead or have never been alive.
- Explore the outside environment regularly to find objects that are living, dead and have never lived.
- Know the seven life processes which all living things do (MRS GREN).

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

- Can give key features that mean the animal or plant is suited to its habitat.
- Can explain in simple terms why an animal or plant is suited to a habitat.
- Identify why certain insects and minibeasts live in particular micro-habitats.

Identify and name a variety of plants and animals in their habitats, including micro-habitats

- Observe and identify living things around the pond and look closely at the micro-habitats.
- Observe animals and plants carefully, drawing and labelling diagrams.
- Use research to answer questions.

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

- Use a food chain to explain what animals eat.
- Name some sources of food.
- Give examples of carnivores, herbivores and omnivores.
- Order living things in a food chain.
- 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 books such as The Gruffalo.

Year 2 Plants (Biology)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud, light, shade, sun, warm, cool, water, grow, healthy

Names of trees in the local area

Names of garden and wild flowering plants in the local area

Enrichment:

Growing vegetables to eat

Science through stories: The Enormous Turnip

Scientists/People of Interest: Captain Cook – botanist, Agnes Arber – botanist, Alan Titchmarsh – botanist and gardener

Cross-curricular: DT

Knowledge and skills:**Observe and describe how seeds and bulbs grow into mature plants.**

- Understand that plants may grow from either seeds or bulbs.
- Know that seeds and bulbs can germinate and then grow into seedlings and then continue to grow into mature plants.
- Know that mature plants may have flowers which then develop into seeds, berries, fruits, etc.
- Know that seeds and bulbs need to be planted at particular times of the year and will germinate and grow at different rates.
- Know that some plants are better suited to growing in full sun and some grow better in partial and full shade.
- Follow instructions to plant a seed and a bulb.
- Suggest how to care for a plant so it grows well.

Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.

- Set up a comparative test to show that plants need light and water to stay healthy.
- Predict which plants will grow well and which will not.
- Record what they see by writing, drawing and measuring.
- Explain what plants need to grow well.
- Explain that different plants have different needs.
- Give reasons for their answers.
- Measure the growth of plants with a ruler.
- Record the growth of plants by drawing or writing.

Year 2 Animals Including Humans (Biology)

Prior 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)

Future learning:

- 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)

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.

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)

Enrichment: Butterfly net in classroom to observe life-cycle

Science through stories: Monkey Puzzle by Julia Donaldson, Tadpole's Promise by Jeanne Willis

Scientists/People of Interest: Florence Nightingale - Pioneer of modern nursing in GB, Elizabeth Garrett Anderson - First British female physician and surgeon, Steve Irwin - Wildlife expert, Robert Winston Human Scientist

Cross-curricular: Art, PE

Knowledge and skills:**Notice that animals, including humans, have offspring which grow into adults.**

- Use the correct names for adult and baby animals.
- Classify animals according to how they are born, e.g. mammals, reptiles, etc.
- Match animals to their offspring.
- Ask 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.
- Draw and label the stages of the life-cycle of a butterfly.

Find out about and describe the basic needs of animals, including humans, for survival (water, food and air).

- Think about what the needs of animals might be.
- Know that to survive, animals need sunlight, water, air, food and a suitable habitat (including shelter for protection from predators and the environment).
- Draw and write what an animal needs.
- Create a factfile showing the needs of an animal.
- Ask questions of a parent about how they look after their baby.
- Ask pet owners questions about how they look after their pet.
- Explain how development and health might be affected by differing conditions and needs being met/not met

Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.

- Understand why exercise is important.
- Draw a favourite way of keeping fit.
- Investigate the effect of exercise on their bodies
- Knows the different food groups and the benefits of each as part of a healthy, balanced diet.
- Classify food in a range of ways, including using the Eatwell guide.
- Knows which food groups common foods belong to.
- Knows about general hygiene and its importance and can state examples of hygienic practice.
- Investigate washing hands, using glitter gel.

Year 2 Uses of Everyday Materials (Physics)

Prior 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)

Future learning:

- 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)

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.

Key Vocabulary:

Names of materials – wood, metal, plastic, glass, brick, rock, paper, cardboard

Properties of materials – hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching

Enrichment:

Science through Stories: The Three Little Pigs –Traditional

Scientists/People of Interest: Charles Macintosh-Waterproof material, John MacAdam- Tarmac

Cross-curricular: History, DT

Knowledge and skills:**Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.**

- Go on a materials hunt indoors and outdoors.
- Sort objects by material they are made from.
- Find out about natural and man-made materials.
- Identify and sort materials that can be recycled from those that cannot be recycled.
- Explore different materials and choose words to describe them using vocabulary above.
- Decide which materials would be most suitable for making a garment, e.g. cloak/coat and give reasons for choices.
- Plan an experiment to test different materials.
- Carry out a scientific investigation to test the materials and record results.
- Write a conclusion based on the results of the investigation.

Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

- Understand that materials can be changed.
- Observe how ice changes when it is warmed up.
- Squash, bend, twist and stretch a sock to become familiar with the actions.
- To perform these actions on different materials and record results in a table.
- Make observations and simple comparisons of different sized rubber bands as they are stretched.
- Understand the meaning of a fair test.
- Make a prediction about which rubber band will be the stretchiest.

YEAR 3 - SCIENCE CURRICULUM

Year 3 Plants (Biology)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

ground, transport, attract bees, catch sunshine, green, air, nutrients, growth, pollen pollination, seed formation, seed dispersal, nutrition, support, anchor, reproduction

Enrichment:

Planting and growing vegetables, gardening

Scientist/People of Interest: George Washington Carver-agricultural scientist and inventor, Joseph Banks- Botanist, Ahmed Mumin Warfa - Botanist

Profession or person of interest: Gardeners, botanists, farmers

Cross-curricular: D & T, Cooking, Gardening

Knowledge and skills:**Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers**

- Recognise that plants need light, water, warmth, healthy leaves, roots and stems in order to grow well.
- Describe why healthy roots and a healthy stem are needed for plants to grow
- Recognise that the leaves of a plant are associated with healthy growth and more specifically nutrition
- Know that water travels from the roots up the stem.
- Compare the roots of different plants (e.g. desert plants or rainforest trees)
- Observe what happens to plants over time when the leaves or roots are removed.

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.

- Know that plants make their own food
- Know that fertilisers contain minerals
- Understand that plants absorb minerals from the soil.
- Describe how changes to light and fertiliser affect plant growth
- Explain that differences in plant growth are due to the amount of light and/or 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

Investigate the way in which water is transported within plants.

- Describe how the stem has a role in support and nutrition (transport water)
- Explain why healthy roots and a healthy stem are needed for plants to grow.
- Observe the effect of putting cut white carnations or celery in coloured water
-

Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

- Describe why plants need flowers
- Describe how pollen and seeds are dispersed.
- Describe the processes of pollination, seed formation and seed dispersal.
- Explain the role of bees and insects in pollination
- Sequence pictures to show the life cycle of a plant.

Year 3 Animals Including humans: Healthy Eating and Healthy Bodies (Biology)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

Balanced diet, carbohydrates, protein, fats, fibre, fruit and vegetables, bones, muscles, femur, ribs, spine, tibia, shoulder blade, hollow, relax and contract, protect, support, internal skeleton, exoskeleton

Enrichment: Owl Pellets or Zoo or Tring or visit from a zoologist

Science through stories: Beetle Boy by MG Leonard

Scientists/People of Interest: David Attenborough-natural historian, Jane Goodall-primatologist and anthropologist, Joe Wicks-nutritionist/fitness, Marie Curie- Radiation, Wilhelm Rontgen - X rays, Adelle Davis -Nutritionist

Professions: Dietician, doctor,

Cross-curricular:

Knowledge and skills:

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 some foods needed for a healthy varied diet
- Name the components of a healthy and varied diet
- Describe how their diet is balanced
- Describe the role of different food groups
- Compare and contrast diets of animals including pets.
- Describe an adequate and varied diet for humans, recognising that there are many ways of achieving this.
- 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 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 contain a good balance of nutrients and record and present findings
- Explore the nutrients contained in fast food
-

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

- Know they have bones and muscles in their body
- State that they and other animals have skeletons
- Describe the main functions of their skeletons
- Identify animals that do not have an internal skeleton (invertebrates)
- Group animals with and without an internal skeleton
- Describe some advantages of having an internal skeleton over no skeleton or an exoskeleton
- Describe some observable characteristics of bones
- State that movement depends on both skeleton and muscles
- State that when one muscle contracts another relaxes
- Recognise that their skeletons grow as they grow
- Describe problems associated with broken bones or bones diseases
- Use secondary sources to research the parts and functions of the skeleton
- Investigate pattern-seeking 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

Year 3: Materials: Rocks, Fossils and Soil (Physics)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

Rock, soil, marble, granite, sand, stone, slate, chalk, clay, texture, absorbed, permeable, pebble, characteristic, surface, organic, impermeable, crystal, grains, crumbly, igneous, sedimentary, metamorphic, fossil

Enrichment: Stone Age Day

Science through stories: Stone Girl Bone Girl by Laurence Anholt, A Pebble in my Pocket by Meredith Hooper and Chris Coady

Scientists: Mary Anning – Fossil hunter, Dr Anjana Khatwa - Geologist, William Smith –Fossils, strata, Inge Lehrmasn -Earth's Mantle, Katia Krafft - Geologist and Volcanologist

Profession or person of interest: Geologists

Cross-curricular: Literacy, History, Geography

Knowledge and skills:**Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties**

- Observe the characteristics of a variety of rocks
- Name and describe the characteristics of several rocks
- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
- Devise tests to explore the properties of rocks and use data to rank the rocks
- Classify rocks from the evidence of investigations
- Explain that rocks are used for different purposes dependent on their physical properties
- Explain why certain rocks are used for different purposes and why some rocks could be used for these jobs E.g. Marble – kitchen worktops or statues / Slate – roof tiles / Granite – walls.
- Understand that there are rocks under the Earth's surface.
- Relate the simple physical properties of some rocks to their formation
- Explain how a model (e.g. biscuits, chocolate bars) can be used to represent sedimentary, metamorphic and igneous rock.
- Explain why we might find lots of the same rock types in one place

Describe in simple terms how fossils are formed when things that have lived are trapped within rock.

- Identify fossils in rocks
- Describe how Mary Anning discovered fossils
- Explain why we do not see the soft parts of animals in the fossils
- Present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc

Recognise that soils are made from rocks and organic matter.

- Recognise that soil is a mixture of different materials and living things.
- Recognise that soil contains dead plants and animals.
- Recognise that there is rock under all surfaces and that soils come from rocks.
- Identify plant/animal matter and rocks in samples of soil.
- Devise a test to explore the water retention of soils.

Year 3 Light (Physics)

Prior learning:

- Explore how things work. (Nursery – Light)
- Talk about the differences in materials and changes they notice. (Nursery – Light)
- Describe what they see, hear and feel whilst outside. (Reception – Light)
- 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)

Future learning:

- 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)

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.

Key Vocabulary:

Shadow, light, flames, opaque, block, direction, light, travels, shortest, longest, highest, torch, shape, similar, transparent, translucent, light source, sun, object daytime, night-time, reflect, shine, shiny, absorb, reflective surface, surface, mirror, sundial, block, lamp

Enrichment:

Science through stories: Keesha's Bright Idea by Eleanor May

Scientists/People of Interest: Justus Von Liebig –Mirrors, James Clerk Maxwell -Visible and invisible waves of light

Person or profession of interest: Percy Shaw –invented “cat’s eyes”, lighting engineers,

Cross-curricular: Art, DT

Progression of Knowledge and skills:

Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.

- Name a number of light sources, including the sun
- Describe and compare some light sources.
- State that light sources are seen when light from them enters the eyes.

Recognised that they need light in order to see things and that dark is the absence of light.

- Recognise that they cannot see in the dark
- 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.
- Explain that places are dark because there is no light and a light source is needed to help us see in such places.
- Describe how nocturnal animals are adapted to use what little light there is or their other senses in the dark (e.g. cats, aye-aye, lemurs)

Notice that light is reflected from surfaces

- State that reflections can be seen in shiny surfaces
- Make generalisations about shiny surfaces (e.g. smooth)
- Demonstrate light travelling using a torch and record light bouncing off a mirror
- Identify suitable reflective clothing for travelling in the dark
- Explain that they cannot see shiny objects in the dark because there are no light sources.
- Describe how Percy Shaw invented cat's eyes and explain their importance to road safety.

Recognise that shadows are formed when a solid object blocks the light from a light source.

- Recognised that when light is blocked a shadow is formed
- Recognise that shadows are similar in shape to the objects forming them
- Make observations of changes in shadows
- Explain that shadows are formed when light from a source is blocked
- Describe the difference in shadows cast by opaque, translucent and transparent materials
- Explore how to make shadows of different shapes and sizes

Find patterns in the way that the size of shadows change.

- Use ideas about shadows to make predictions about the shadows formed by different objects or materials
- Describe how the length of a shadow changes throughout the day as the sun moves across the sky
- 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

Year 3 Forces: Forces and Magnets (Physics)

Prior learning:

- Explore how things work. (Nursery – Forces)
- Explore and talk about different forces they can feel. (Nursery – Forces)
- Talk about the differences between materials and changes they notice. (Nursery – Forces)
- Explore the natural world around them. (Reception – Forces)
- Describe what they see, hear and feel whilst outside. (Reception – Forces)
- 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)

Future learning:

- 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)

Common misconceptions:

Some children may think:

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

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

Enrichment:

Science through stories:

Mrs Armitage Queen of the Road by Quentin Blake, The Iron Man by Ted Hughes

Scientists:

Andre Marie Ampere-Electro-magnetism, The Wright Brothers-Airplanes, Henry Ford- Cars

Person or profession of interest:

Maglev trains, explorers, tyre designers

Cross-curricular:

Progression of knowledge and skills:**Compare how things move on different surfaces.**

- Observe and explore how friction affects the movement of objects
- Describe some ways in which friction between solid surfaces can be increased or decreased
- 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
- Record and report on findings from investigations, involving how things move on different surfaces
- Give examples of objects moving differently on different surfaces

Notice that some forces need contact between two objects but magnetic forces can act at a distance.

- Give examples of forces in everyday life
- Explore how magnets work at a distance e.g. through the table, in water, jumping paper clips up off the table
-

Observe how magnets attract or repel each other and attract some materials and not others.

- Explore what materials are attracted to a magnet
- Explore the way that magnets behave in relation to each other
- Classify materials as magnetic or non-magnetic
- Describe what happens when some materials are put near a magnet

Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic behaviours

- Describe the difference between a magnet and a magnetic material
- Compare and group materials following magnetic testing, recording findings and use the outcome to answer questions about which materials are magnetic

Describe magnets as having two poles.

- Recall that magnets have a north and a south pole.
- Describe the direction of forces between magnets
- Name a range of types of magnets and show how the poles attract and repel
- Draw diagrams using arrows to show the attraction and repulsion between the poles of magnets

Predict whether two magnets will attract or repel each other, depending on which poles are facing.

- Describe some everyday use of magnets
- Explain that a compass works by lining up with the Earth's magnetic field
- Describe how lodestone was found to be a naturally occurring magnet and was used as the first compass for navigation.

YEAR 4 - SCIENCE CURRICULUM

Year 4 Animals including humans – teeth and digestion (Biology)

Prior 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)

Future learning:

- 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)

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"

Key Vocabulary:

Teeth and eating: incisor, molar, canine, diet, decay, healthy, teeth, acids, sugars, mouth, rip, tear, chew, grind

Digestive system: saliva tongue, toilet waste, nutrients energy, stomach, large/small intestine, brain, lungs, movement, acids, urine, faeces, oesophagus

Enrichment:

Science through stories: The Demon Dentist by David Walliams, The Story of the Little Mole who knew it was None of his Business by Werner Holzwarth & Wolf Erlbruch

Scientists: Joseph Lister-Antiseptic, Ivan Pavlov- Digestive System Mechanisms, Washington & Lucius Sheffield- Toothpaste in a tube

Person or profession of interest: Dentist, Dietitian

Cross-Curricular: PE

Progression of knowledge and skills:**Describe the simple functions of the basic parts of the digestive system in humans.**

- Identify a wide range of body parts including some internal organs (large intestine, small intestine, brain, lungs, heart, stomach, oesophagus)
- Locate and name the different organs in the digestive system
- Label the different parts of the digestive system
- Describe the role of each organ in the digestive system
- Can use diagrams or a model to describe the journey of food through the body explaining what happens in each part
- Explain why food needs to be broken down

Identify the different types of teeth in humans and their simple functions:

- Name the different types of teeth
- Describe the role of each type of teeth in digestion
- Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing).
- Recognise they need to take care of their teeth
- Explain how they should look after their teeth and recognise why they need to do so.
- Explain why dentists are concerned about the amount of sugar children have
- State that animals have different diets and may have different kinds of teeth
- Classify animals as herbivores, carnivores or omnivores according to the type of teeth they have in their skulls.
- Explain how fossilised teeth give us clues about an animals' diet
- Explain why humans do not have a full set of adult teeth at birth

Construct and interpret a variety of food chains, identifying producers, predators and prey

- Knows which organisms are producers, predators and prey and apply to the construction and interpretation of food chains
- 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 create food chains based on research

Year 4 – Living things and their habitats (Biology)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

Predator, prey, producer, river, ocean, desert, arctic, rainforest, mountain, farmland, wood, dry, wet, vegetation, shelter, vertebrate, invertebrate, classify, characteristic, flowering plant, non-flowering plant (fern, moss), migrate, hibernate, environment, habitat, human impact, positive, negative, classification key

Enrichment:

Science through stories: The great Kapok Tree by Lynne Cherry, The Vanishing Rainforest by Richard Platt

Scientists: Jacques Cousteau -Marine Biology, Cindy Looy-Environmental Change and Extinction, Joean Beauchamp Procter -Zoologist

Person or profession of interest: David Attenborough, zookeepers, zoologists

Cross-curricular: Literacy, Geography

Progression of knowledge and skills:**Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment**

- 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.

Recognise that living things can be grouped in a variety of ways

- Explore ways of grouping living things including animals and plants (flowering and non-flowering)
- Recognise that animals can be grouped into vertebrates and invertebrates
- Describe some of the characteristics of the vertebrate (fish, mammals, amphibians, reptiles, and birds)
- Group animals into vertebrate (fish, mammals, amphibians, reptiles and birds) and invertebrates groups (snails, slugs, spiders, worms and insects)
- Explain why some animals are hard to classify (e.g. platypus, echidna, bat, flightless birds)

Recognise that environments can change and that this can sometimes pose dangers to living things.

- Knows and can name living things in a range of habitats.
- Knows and can relate the key adaptational features of an organism to the known features of its habitat.
- Knows and can give examples of how an environment may change both naturally and due to human impact.
- Explain why it is necessary to use a reasonably large sample when investigating the preferences of small invertebrates
- Explain that different organisms are found in different habitats because of differences in environmental factors
- Describe how humans have negatively affected environments (e.g. pollution, deforestation, introduction of invasive species)
- Observe plants and animals in different habitats throughout the year
- Compare and contrast the living things observed
- 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.

Year 4 – States of Matter (Physics)

Prior 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)

Future learning:

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity, 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)

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)

Key Vocabulary: Water, air, ice, milk, lemonade, juice, metal, solid, gas, pour, flow, change shape, squash, heat, cool, grain/granular, temperature, thermometer, freeze, melt, boil, evaporate, condense, steam, smoke, sea water, properties, melting point, degrees Celsius

Enrichment:

Science through stories: Charlie and the Chocolate Factory/George’s Marvellous Medicine by Roald Dahl

Scientist: Joseph Priestly – Discovered oxygen, Lord Kelvin -Absolute zero (temperature), Anders Celsius -Temperature Scale, Daniel Fahrenheit -Temperature Scale / Invention of the Thermometer, George Washington Carver - Chemist

Person or profession of interest: Chefs (Gastronomy – Heston Blumenthal), Steam engines

Cross-curricular:

Progression of knowledge and skills:**Compare and group materials together according to whether they are solids, liquids or gases**

- Name some solids and liquids
- State that air is a gas
- State some differences between solids, liquids and gases
- Recognise everyday substances as mixtures of solids, liquids and/or gases
- Recognise that air is a material and that it is one of a range of gases which have important uses.
- Recognise that gases flow from place to place
- Know that gases can be easily compressed
- Compare simple solids and liquids (e.g. in terms of ease of squashing or pouring)
- Make clear distinctions between the properties of solids, liquids and gases
- Explain why granular solids have some of the properties associated with liquids
- Explain why some substances are hard to classify as solids, liquids and gases (e.g. whipped cream, mousse, mayonnaise, muddy water, fizzy drinks, cornflour and water)

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)

- Observe what happens to a variety of materials when they are heated (e.g. chocolate, ice cream, butter, water)
- Identify a wide range of contexts in which changes of state take place and describe a few examples where these changes occur
- Recognise that for a substance to be detected by smell, some of it must be in the gas state
- Compare the boiling point of different liquids
- State that ice, water and steam are the same material
- Identify the processes of melting, freezing, evaporation and condensation
- Describe what happens to water when it heated and cooled
- Describe how when ice melts it turns to liquid and how when water freezes it becomes ice
- Describe how these processes can be reversed.

Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature

- Describe how liquids evaporate to form gases and how gases condense to form liquids
- Sequence the changes that happen in the water cycle
- Describe the water cycle in terms of these processes
- Explain the relationship between liquids and solids in terms of melting and freezing
- Know that temperature can affect the rate of evaporation or condensation
- Describe the effect of temperature on evaporation
- Explain how changing conditions affects processes such as evaporation and condensation
- Identify a range of contexts in which changes takes place (e.g. evaporation of puddles in the school playground or from clothes on a washing line, condensation in the bathroom)
- Explore the effect of salt on ice
- Explain why salt is put on the roads in winter

Year 4 – Sound (Physics)

Prior learning:

- Explore how things work. (Nursery – Sound)
- Describe what they see, hear and feel whilst outside. (Reception – Sound)
- 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)

Future learning:

- 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)

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 loud and low sounds are quiet.

Key Vocabulary:

Sound, pitch, volume, vibrations, medium, insulation, travel, instrument, source, faint, loud

Enrichment:

Science through stories: Moonbird by Joyce Dunbar

Scientists: Alexander Graham Bell -Invented the telephone, Aristotle - Sound Waves, Galileo Galilei - Frequency and Pitch of Sound Waves

Person or profession of interest: Musicians, sound engineers

Cross-curricular:

Progression of knowledge and skills:

Identify how sounds are made, associating some of them with something vibrating

- Recognise and describe many sounds and sound sources
- State that they hear sounds through their ears
- Recognise that when sounds are generated by objects, something moves or vibrates
- Identify what is vibrating in a range of musical instruments
- Group instruments independently by the way sounds are produced
- Generalise that sounds are produced when objects vibrate
- Describe how sounds are generated by specific objects
- Suggest ways of producing sounds
- Identify suitable materials to use for sound insulation

Recognise that vibrations from sounds travel through a medium to the ear

- Recognise that sounds travel through solids, water and air
- Explore how sound travels through a variety of materials
- Recognise that sound can be reflected from a surface which can cause an echo
- Describe how some animals use echo-location

Find patterns between the pitch of a sound and features of the object that produced it

- Distinguish between pitch and volume (loudness)
- Describe differences in pitch and volume
- Know that altering vibrations alters the pitch or volume
- Describe ways in which the pitch of a sound made by a particular instrument or vibrating object can be raised or lowered
- Generalise the effects of changes on sound (e.g. the tighter the tension the higher the pitch)
- Explore how to vary the pitch and volume of sounds from a variety of objects or instruments
- Experiment with at least three different instruments to observe and explore volume and pitch
- Make predictions and draw conclusions about the pitch and volume of sounds

Find patterns between the volume of a sound and the strength of the vibrations that produced it

- Suggest how to change the loudness of the sounds produced by a range of musical instruments

Recognise that sounds get fainter as the distance from the sound source increases

- Describe what they observe when they move further away from a source of sound

Year 4 – Electricity (Physics)

Prior learning:

- Explore how things work. (Nursery - Electricity)

Future learning:

- 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)

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.

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

Enrichment:

Science through stories:

Scientists: Michael Faraday- Discovered relationship between magnets and electricity, Thomas Edison- Lightbulb, Joseph Swan- Incandescent Light Bulb

Person or profession of interest: Electricians

Cross-curricular:

Progression of knowledge and skills:

Identify common appliances that run on electricity

- Identify mains operated and battery-operated devices
- Describe some of the dangers associated with mains electricity

Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers

- Name some of the components of a simple electrical circuit
- Know that batteries are sources of electricity
- Recognise that for a circuit to work it must be complete
- Construct a working circuit
- Make drawings of simple working circuits
- Make circuits from drawings provided

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

- Be methodical in tracing faults in simple circuits
- Explain why some circuits work and others do not

Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit

- Describe the effect of making and breaking one of the contacts on a circuit
- Describe how switches work
- Construct a home-made switch

Recognise some common conductors and insulators, and associate metals with being good conductors

- Identify materials as conductors or insulators
- Construct simple circuits and use them to test whether materials are electrical conductors or insulators
- Relate knowledge about metals and non-metals to their use in electrical appliances
- Describe the use of conductors and insulators in components including connecting wires
- Identify playdough and graphite as non-metal conductors and explain why this is unusual

N.B.

Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6.

YEAR 5 - SCIENCE CURRICULUM

Year 5 Animals including humans (Biology) Human change from birth to old age – RSE	
Prior learning: <ul style="list-style-type: none"> Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) 	Future learning: <ul style="list-style-type: none"> 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)
Common misconceptions: Some children may think: <ul style="list-style-type: none"> a baby grows in a mother's tummy a baby is "made". 	
Key Vocabulary: New born, infant, child, teenager, puberty, adult, wrinkles, grey hair, height, weight	
Enrichment:	
Science through stories:	
Scientist: Alexander Fleming- Penicillin, Louis Pasteur- Vaccination, Eva Crane -Reproduction in Bees, Virginia Apgar- obstetrical anaesthesiologist	
Person or profession of interest: Doctors	
Cross-Curricular: PSHE	
Progression of knowledge and skills:	
Describe the changes as humans develop to old age <ul style="list-style-type: none"> Identify ways in which the appearance of humans changes as they get older Identify some characteristics that will not change with age Recognise stages in growth and development of humans including puberty. RSE Statements Explain how a girl's body changes during puberty and the importance of looking after myself physically and emotionally. Understand that puberty is a natural process that happens to everybody and that it will be ok for me. Describe how boys' and girls' bodies change during puberty Express how I feel about the changes that will happen to me during puberty. Describe how a baby develops from conception through the 9 months of pregnancy and how it is born Recognise how I feel when I reflect on the development and birth of a baby	

Year 5 – Living things and their habitats (Biology)

Prior 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)

Future learning:

- 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)
-

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

Key Vocabulary:

Live young, hatch, tadpole, caterpillar, butterfly, ladybird, pupae, larvae, chrysalis, reproduction, asexual, sexual, life cycle, pollination, seed dispersal, pollen, stamen, stigma, life cycle, reproduce, sperm, fertilises, egg, metamorphosis, asexual, plantlets, runners, bulbs, cuttings

Enrichment:

Science through stories: Charlotte's Web by E B White

Scientists:

Jane Goodall- naturalist, Sylvia Earle - Marine biologist, Dr Paula Kahumbu-wildlife conservationist, Mangala Mani – Antarctic scientist, Sir David Attenborough- Animal Behaviourist

Person or profession of interest: zookeepers, veterinarians

Cross-Curricular:

Progression of knowledge and skills:**Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird**

- Sequence the life cycles of a variety of plants and animals
- Recognise the similarities in the life cycles of plants, animals and humans
- Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles
- Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals.

Describe the life process of reproduction in some plants and animals.

- Name the parts of a flower
- Describe the functions of some parts of a flower
- Describe the main functions of parts of a plant involved in reproduction
- Describe the processes of sexual and asexual reproduction in plants
- Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways
- Name the parts of the human reproductive system,
- Compare methods of seed dispersal
- Know that most animals reproduce by sexual by sexual reproduction
- Compare internal and external fertilisation in animals
- Explain that living things need to reproduce if the species is to survive
- 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.

Year 5 – Properties of materials (Physics)

Prior 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)

Future learning:

- 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)

Common misconceptions:

Many 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

Key Vocabulary:

Hardness, solubility, transparency, conductivity, thermal, insulation, dissolve, solution, separation, polymers, reversible, irreversible, evaporating, melting, evaporation, filtering, sieving, dissolving, burning, rusting, vinegar, bicarbonate of soda, magnetism, insulators, conductors, soluble, insoluble

Enrichment:

Science through stories:

Scientists: Sir Humphrey Davy- Separating gases, Jamie Garcia (BP website)- Invention of a new plastic, Becky Schroeder - fluorescence material, Spencer Silver, Arthur Fry and Alan Amron - Post-It Notes, Ruth Benerito - Wrinkle-Free Cotton

Person or profession of interest: Inventors

Cross-Curricular

Progression of knowledge and skills:

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.

- Observe and explore the properties of materials (e.g. hardness, transparency, magnetism, electrical and thermal conductivity)
- Identify some materials that are good thermal insulators and some everyday uses of these
- Recognise that metals are both good thermal and good electrical conductors
- Suggest why particular materials are used for different jobs depending on their properties.
- Describe the properties of new materials (e.g. aerogel, silly putty, wrinkle-free cotton)
- Explain why some materials are good thermal insulators

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

- Recognise that salt or sugar dissolves in water but sand won't
- Name some materials that will and some that will not dissolve in water
- Recognise that although it is not possible to see a dissolved solid it remains in the solution
- Describe melting and dissolving and give everyday examples of each
- Identify and explore factors that affect the rate at which a solid dissolves
- Recognise that dissolving is a reversible change

Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating

- Recognise that an undissolved solid can be separated from a liquid by filtering
- Recognise that a solid can be recovered from a solution by evaporation
- Describe the properties of mixtures which can be separated by filtration
- Describe some methods that are used to separate simple mixtures
- Explain that when solids dissolve they break up so small they can pass through the holes in the filter paper
- Recognise that inks and dyes are often mixtures of different colours and these can be separated by chromatography
- Explain why ink or dye moves up the paper in chromatography

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.

- Recognise that some changes can be reversed and some cannot
- Observe and explore a variety of chemical changes (e.g. burning)
- Identify whether some changes are reversible or not
- Classify some changes as reversible (e.g. dissolving) and others as irreversible (e.g. burning)
- Recognise that irreversible changes often make new and useful materials
- Recognise the hazards of burning materials
- Describe what happens when acid and bicarbonate of soda are mixed
- Explain that in some cases the new materials made are gases and identify some evidence for the production of gases (e.g. vigorous bubbling)

Year 5 – Earth and Space

Prior learning:

- Explore the natural world around them. (Reception – Earth and space)
- Describe what they see, hear and feel whilst outside. (Reception – Earth and space)
- 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)

Future learning:

- 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)

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.

Key Vocabulary:

Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets

Enrichment: Stargazing evening

Science through stories: Fortunately the Milk by Neil Gaiman, The Terrible Thing that Happened to Barnaby Brocket by John Boyne, George's Secret Key to the Universe by Lucy and Stephen Hawking

Scientist: Brian Cox – particle physicist, Margaret Hamilton- Computer scientist (Moon Landings), Stephen Hawking- Black Holes, Mae Jemison – Astronaut, Claudius Ptolemy and Nicolaus Copernicus - Heliocentric vs Geocentric Universe, Neil Armstrong- First man on the Moon, Helen Sharman- GB astronaut, *Caroline Herschel- First to find a comet*, Valentina Tereshkova-Cosmonaut

Person or profession of interest: Tim Peake, Elon Musk, Space X, Dara O'Briain, Astronomers, Astronauts

Cross-Curricular:

Progression of knowledge and skills:

Describe the movement of the Earth, and other planets, relative to the Sun in the solar system

- Identify and name the components of the solar system (i.e. Sun, Moon, Earth and other planets)
- Locate the Sun, Earth and other planets in the solar system
- Recognise that the Earth and other planets orbit the sun
- Recall that the Earth takes one year to orbit the Sun
- Recall the Earth rotates on its axis and this takes one day
- Use simple models to explain effects that are caused by the movement of the Earth

Describe the movement of the Moon relative to the Earth

- Recognise that the moon orbits the Earth
- Explain that gravity is a force of attraction and it is what holds the planets in orbit around the Sun and the Moon in orbit around the Earth
- Explain that the changes in the appearance of the Moon over a period of 28 days arise from the Moon orbiting the Earth once every 28 days

Describe the Sun, Earth and Moon as approximately spherical bodies

- Recognise that the Earth, Sun and Moon are spherical and support this with some evidence

Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky

- Recognise that it is daylight in the part of the Earth facing the Sun
- Recall that a shadow from the Sun changes over the course of a day
- Explore and describe how a shadow from the Sun changes over the course of a day
- Explain in terms of the rotation of the Earth why shadows change and the Sun appears to move across the sky during the course of the day.
- Explain why it is night time in Australia when it is day time in England,
- Explain how ideas about the solar system have changed over time.

Year 5 – Forces

Prior 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)

Future learning:

- 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)

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.

Key Vocabulary:

Force, air resistance, water resistance, magnetic attraction, gravitational attraction, direction, force, motion, weight, upthrust, Newton, force meter, stationary, surface area, force applied, pulley, lever, gear

Enrichment:

Science through stories: Clockwork by Philip Pullman, The Tin Snail by Cameron McAllister

Scientists: Isaac Newton- Gravity, Albert Einstein- The Theory of Relativity, Galileo Galilei - Gravity and Acceleration, Archimedes of Syracuse- Levers

Person or profession of interest: Vehicle designers (air resistance), Olympic cyclists and swimmers (air and water resistance)

Cross-Curricular:

Progression of knowledge and skills:**Identify the effects of air resistance, water resistance and friction, that act between moving surfaces**

- Identify weight as a force
- Identify that force is measured in Newtons
- Name simple forces such as gravity, friction and air resistance
- Recognise that more than one force can act on an object
- Draw force diagrams with arrows showing the direction of forces acting on an object
- Observe and explore the effect of several forces on objects
- Recognise that air resistance slows things down
- Recognise that friction can be useful or not useful
- Understand that air resistance is the frictional force of air on objects moving through it
- Describe some of the factors that increase friction between solid surfaces and increase air and water resistance
- Describe situation in which frictional forces are helpful as well as those in which frictional forces are unhelpful
- Compare the tread on bicycle tires according to how much friction they need
- Identify streamlined objects and describe why they have been designed in this way (e.g. cycling helmets, formula 1 cars, dolphins)

Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object

- Describe some situations in which there is more than one force acting on an object
- Describe and explain the motion of some familiar objects in terms of several forces acting on them
- Identify forces on an object as either balance or unbalanced
- Use the terms 'balanced' and 'unbalanced' when describing several forces on an object
- Explain that balanced forces on an object cause it to remain stationary or travel at the same speed
- Explain that unbalanced forces on an object cause it to speed up, change shape or slow down

Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect

- Describe how levers, pulleys and gears are used in everyday life (e.g. describe how having gears can make it easier to pedal a bike, how a bottle opener makes it easier to open a bottle lid)
- Explain how introducing gears onto bikes has changed cycling

YEAR 6 CURRICULUM

Year 6 Animals including humans (Biology)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

Heart, veins, arteries, capillaries, blood, pulse, beats, oxygen, carbon dioxide, nutrients, organs, drugs, medicines, minerals, vitamins, lungs, caffeine, medical, legal, illegal

Enrichment:

Science through stories:

Scientists: Leonardo Da Vinci- anatomy, Santorio Santorio-Anatomist, Dr Katherine Dibb – Expert in Cardiovascular Sciences, Justus von Liebig- Theories of Nutrition and Metabolism, Sir Richard Doll- Linking Smoking and Health Problems

Person or profession of interest: Joe Wicks, Doctors, Personal trainers, dieticians

Cross-curricular:

Progression of knowledge and skills

Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.

- Identify and name the parts of the circulatory system
- Know that the heart is made of muscle
- Describe what the heart and blood vessels do
- Describe the different functions of the blood (e.g. transporting and protecting)
- Know that the blood comes from the heart in arteries and returns to the heart in veins
- Know that blood carries oxygen and other essential materials around the body
- Explain how ideas about the circulatory system have changed over time

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

- State how to measure pulse rate
- Recognise that pulse rate is a measure of how fast the heart is beating
- Discover that during exercise the heart beats faster to take blood more rapidly to the muscles
- Make careful measurements of pulse rate
- Identify some of the harmful effects of smoking
- Recognise that care needs to be taken with medicines and that they can be dangerous
- Give several reasons why it is sometimes necessary to take medicines
- Identify some harmful effects of drugs
- Identify food as a fuel for the body
- Name the major food groups into which food is categorised and identify sources for each group
- Describe the main function of organs of the human body
- Explain the effect of diet on particular organs of the body/aspects of health
- Explain the effect of exercise on particular organs of the body/aspects of health
- Explain how ideas about smoking have changed over time
- Explain why advice on diet changes (e.g. butter vs. margarine, five a day, tax on sugary drinks)
- Predict what will happen to the heart during exercise.
- Construct and analyse the variables that make a fair test.
- Conduct a fair investigation on the effects of exercise on the heart.
- Use scientific equipment to track results and record data using tables and graphs.
- Analyse whole class data after investigation to compare and reflect on findings and draw conclusions.
- Use information acquired to write a scientific report on how the human circulatory system works.

Year 6 – Living things and their habitats – Classification (Biology)

Prior 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)

Future learning:

- Differences between species. (KS3)

Common misconceptions:

Some children may think:

- all micro-organisms are harmful
- mushrooms are plants

Key Vocabulary:

Micro-organism, microbe, fungus, bacteria, virus, classified, classification key, yeast, characteristic, microscope, vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering

Enrichment:

Science through stories:

Scientists: Carl Linnaeus-classification, Edward Jenner-vaccinations, Libby Hyman –classification invertebrates

Person or profession of interest: Microbiologists, Virologists, Zoologists

Cross-curricular:

Progression of knowledge and skills

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

- Recognise that there is a wide variety of living things
- Plants can be divided broadly into two main groups – flowering plants and non-flowering plants
- Living things can be formally grouped according to characteristics
- Animals can be divided into two main groups – vertebrates and invertebrates
- Each group has common characteristics
- Understand why classification is important
- Identify vertebrates and invertebrates
- Name and describe the five vertebrate groups
- Describe early ideas about classification (e.g. Aristotle)
- Understand there are living things that are too small to be seen and these can affect our lives
- Recognise that there are many micro-organisms, some which can be used in food production
- Describe how micro-organisms feed, grow and reproduce like other organisms
- Describe evidence, from investigations, that yeast is living
- Explain how micro-organisms can move from one food source to another or from one animal to another
- Compare the rate of reproduction in microorganisms to other animals
- Describe how the development of the microscope has contributed to our understanding of microorganisms
- Describe how ideas about hygiene have changed over time (e.g. Semmelweis)

Give reasons for classifying plants and animals based on specific characteristics

- Devise own ways to classify organisms and objects
- Classify plants and animals and record conclusions from the use of classification keys
- Use information about the characteristics of an unknown animal or plant to assign it to a group
- Use secondary sources to learn about the formal classification system devised by Carl Linnaeus and why it is important
- Research an unfamiliar animal or plant using its characteristics to establish where it belongs in the classification system

Year 6 – Living things and their habitats - Evolution and Inheritance (Biology)

Prior 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)

Future learning:

- 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)

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

Key Vocabulary:

Variety, variation, offspring, species, competition, adapt, adaptation, reproduce, survive, evolve, fossil record, gills, blubber, moulting, long neck, hooves, eyelashes, tails, generation

Enrichment:

Science through stories: Warrior Cats by Erin Hunter, Our Family Tree by Lisa Westberg Peters

Scientist: Hippocrates -The Father of Medicine, Charles Darwin- Evolution, Alfred Russell Wallace – naturalist, Rosalind Franklin – DNA, Nettie Stevens – Geneticist, Professor Alice Roberts - Evolutionary biologist

Person or profession of interest: Geneticist

Cross-curricular: History

Progression of knowledge and skills

Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents

- Recognise variation in different species (e.g. dogs, horses)
- Recognise that offspring have some of the features of their parents
- Explain that animals which are better adapted to an environment are more likely to survive, reproduce and pass on characteristics to their offspring meaning the animals species will gradually change and evolve (giraffe with the tallest neck could reach more leaves to feed on)
- 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

Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

- Recognise that animals have to compete for food
- Describe how animals avoid predators (e.g. speed, camouflage)
- Describe how animals and plants are adapted to their environments
- Explain how being well adapted to an environment means an organism is more likely to survive
- Describe the story of the peppered moth and how this provides evidence for natural selection
- Explain how antibiotic resistant bacteria provide evidence for natural selection
- Explain why we can see evidence for natural selection in fast reproducing organisms like bacteria (e.g. antibiotic resistant bacteria and pesticide resistant insects)
- Explain how the introduction of a new species to isolated environment can effect native species (e.g. Dodo, Kakapo or Stephen's island wren)
- Compare the ideas of Charles Darwin and Alfred Wallace on evolution.

Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago

- Explain why we do not have a complete fossil record
- Make observations of fossils to identify living things that lived on Earth millions of years ago
- Research the work of Mary Anning and how this provided evidence of evolution

Year 6 – Light (Physics)

Prior 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)

Future learning:

- 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)

Common misconceptions:

Some children may think:

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

Key Vocabulary:

Reflection, transparent, translucent, opaque, periscope, luminous, non-luminous, absorb, direction

Enrichment:

Science through stories:

Harry Potter and the Philosopher's Stone by JK Rowling

Scientists:

Thomas Edison -Invented electric light bulb, Patricia Bath (BP website)- saving sight, Thomas Young (Wave Theory of Light), Ibn al-Haytham -Light and our Eye, Percy Shaw - The Cats Eye

Person or profession of interest: Photographer

Cross-curricular: History -World War Two – Spot Lights, Periscopes (U-Boats)

Progression of knowledge and skills

Recognise that light appears to travel in straight lines

- Explore how light travels using torches and periscopes
- 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

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

- Describe reflection as light 'bouncing off' objects
- Knows and can explain that objects are seen because they give out or reflect light into the eye
- Understand that in order to be seen, all non-luminous objects must reflect light
- Diagrammatically represent light from sources and bouncing off reflective surfaces using arrows
- Knows and can 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
- Draw diagrams to illustrate how light is travelling from the source to the eye
- Know that, when sunlight passes through some objects, coloured light is produced (e.g. rainbows, soap bubbles and prisms)
- Describe how curved mirrors distort a reflection
-

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

- Plan and conduct a test to investigate how light travels and explain/present the findings
- Investigate the use of mirrors to reflect light and record using straight line diagrams to indicate the direction of light
- Use mirrors, torches and protractors to demonstrate and record how light is reflected in a mirror and how we see ourselves in a mirror
- Measure and record the angle of incidence and angle of reflection using a protractor and detailed diagram.

Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

- Describe a variety of ways of changing the size of the shadow produced by an object
- Describe the relationship between the size of a shadow and the distance between the light source and an object
- Diagrammatically represent the formation of shadows using arrow convention

Year 6 – Electricity (Physics)

Prior 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)

Future learning:

- 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)

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

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.

Enrichment:

Science through stories:

Scientists:

Nikola Tesla -AC electric system, Alessandro Volta- Electrical Battery, Nicola Tesla- Alternating Currents, Edith Clarke -Electrical engineer

Person or profession of interest: Electricians, Lighting engineers, LED TVs,

Cross-curricular:

Progression of knowledge and skills

Use recognised symbols when representing a simple circuit in a diagram

- Construct some working series circuits with specified components
- Recognise conventional circuit symbols
- Draw circuit diagrams and construct circuits from diagrams using conventional symbols

Associate the brightness of a lamp or the volume of buzzer with the number and voltage of cells used in the circuit

- Know that the 'amount' of electricity (voltage) depends on the number of batteries
- Understand that the brightness of a bulb, or the volume of a buzzer, correlates with the voltage of cells used in the circuit
- Explore how to change the brightness of bulbs and the volume of a buzzer
- Describe ways of changing the brightness of a bulb in a circuit or the volume of a buzzer
- Compare different circuits (e.g. for brightness of bulb)
- Recall that the amount of electricity is measured in voltage

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

- Explore the thickness of a wire in a circuit
- Describe the differences between wires usually used for circuits and fuse wires
- Describe what would happen if all the lights in a home were connected the same circuit and one broke
- Explain the current in circuits using simple models and analogies (e.g. piped water, bicycle chain, children and sweets)
- Plan and select resources for a fair scientific enquiry, deciding which variables to control.
- Record results from an experiment using tables and graphs
- Evaluate and explain their investigation, results and conclusions.

WORKING SCIENTIFICALLY SKILLS

Skill	Key Stage 1	Lower Key Stage 2	Upper Key Stage 2
Asking questions and recognising that they can be answered in different ways	<ul style="list-style-type: none"> • Asking simple questions and recognising that they can be answered in different ways • While exploring the world, the children develop their ability to ask questions. Where appropriate, they answer these questions. • The children answer questions developed with the teacher often through a scenario. • The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered 	<ul style="list-style-type: none"> • Asks relevant questions and using different types of scientific enquiries to answer them • Explains the purpose of a variety of scientific and technological developments 	<ul style="list-style-type: none"> • Uses their scientific experiences to explore ideas and raise different types of questions • Talks about how scientific ideas have developed over time • Recognises the applications of specific scientific ideas
Making observations and taking measurements	<p>Observing closely, using simple equipment</p> <ul style="list-style-type: none"> • Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. • They begin to take measurements, initially by comparisons, then using non-standard units. 	<p>Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</p> <ul style="list-style-type: none"> • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements. 	<p>Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</p> <ul style="list-style-type: none"> • The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale. • During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data

<p>Engaging in practical enquiry to answer questions</p>	<p>Performing simple tests</p> <ul style="list-style-type: none"> • The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time. <p>Identifying and classifying</p> <ul style="list-style-type: none"> • Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting. • They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing. 	<p>Setting up simple practical enquiries, comparative and fair tests</p> <ul style="list-style-type: none"> • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking. 	<p>Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <ul style="list-style-type: none"> • The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.
<p>Recording and presenting evidence</p>	<p>Gathering and recording data to help in answering questions</p> <ul style="list-style-type: none"> • The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • They classify using simple prepared tables and sorting rings. 	<p>Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p> <p>Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</p> <ul style="list-style-type: none"> • The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts They record classifications e.g. using tables, Venn diagrams, Carroll diagrams. • Children are supported to present the same data in different ways in order to help with answering the question. 	<p>Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</p> <ul style="list-style-type: none"> • The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys. • Children present the same data in different ways in order to help with answering the question.

Answering questions and concluding	<p><i>Using their observations and ideas to suggest answers to questions</i></p> <ul style="list-style-type: none"> • Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources. 	<p>Using straightforward scientific evidence to answer questions or to support their findings</p> <ul style="list-style-type: none"> • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence. 	<p>Identifying scientific evidence that has been used to support or refute ideas or arguments</p> <ul style="list-style-type: none"> • Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding.
Evaluating and raising further questions and predictions		<p>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <ul style="list-style-type: none"> • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. 	<p>Using test results to make predictions to set up further comparative and fair tests</p> <ul style="list-style-type: none"> • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.
Communicating their findings		<p>Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</p> <ul style="list-style-type: none"> • They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary. 	<p>Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations</p> <ul style="list-style-type: none"> • They communicate their findings to an audience using relevant scientific language and illustrations.