

Crowle CE First School

Science Curriculum Document

2022

**Overview of Substantive Knowledge across EYFS – Year 4**

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|  | **Biology** | | | **Chemistry** | | | **Physics** | | | | |
| Plants | Animals, including humans | Living things and their habitats | States of matter | Materials and their properties | Rocks | Seasonal changes | Electricity | Light | Sound | Forces and magnets |
| EYFS |  |  |  |  |  |  |  |  |  |  |  |
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**Overview of Disciplinary Knowledge across Key Stage One and Lower Key Stage Two**

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|  | **Methods of Scientific Enquiry** | **Apparatus and Techniques** | **Analysis, Presentation and Evaluation of Scientific Data** | **Development of Scientific Knowledge** |
| **KS1** | * Asking simple questions and recognising that they can be answered in different ways. * Identifying and classifying. * Performing simple tests. | * Observing closely, using simple equipment. * Gathering and recording data to help answer questions. | * Using their observations and ideas to suggest answers to questions |  |
| **KS2** | * Asking relevant questions and using different types of scientific enquiries to answer them. * Setting up simple practical enquiries, comparative and fair tests. | * Making systematic and careful observations. * Taking accurate measurements using standard units, using a range of equipment. | * Gathering, recording, classifying and presenting data in a variety of ways. * Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. * Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. * Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. | * Identifying differences, similarities or changes related to simple scientific ideas and processes. * Using straightforward scientific evidence to answer questions or to support their findings. |

**Key Concepts in Biology**

Plants Page. 4

Animals, including humans Page. 8

Living things and their habitats Page. 12

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|  | **Plants** | | | | | | | |
|  | EYFS | Year 1 | | Year 2 | | Year 3 | | Year 4 |
| National Curriculum | * Make simple observations about plants and can explain why some things occur. | * Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees * Identify and describe the basic structure of a variety of common flowering plants, including trees. | | * Observe and describe how seeds and bulbs grow into mature plants. * Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. | | * Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers * Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant * Investigate the way in which water is transported within plants * Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. | |  |
| Key Substantive Knowledge | * There are plants in the immediate environment. * Plants grow and should be treated with care. * Know that plants are living but artificial plants are not living. * Care for the environment. | * There are a range of garden plants, wild plants and trees. * Trees can be deciduous or evergreen. * Flowering plants have many parts including roots, stem/trunk, leaves and flowers. * Fruit and vegetables are also plants/part of a plant. | | * Plants usually grow from seeds and bulbs. * Plants need warmth, light and water to grow and survive. * Flowering plants make seeds to reproduce and make more plants. Some plants die after producing seeds and others live for many generations | | * Plants make their own food in their leaves to provide them with energy, growth, repair and reproduce. * Leaves absorb sunlight and carbon dioxide. * Plants have roots to provide support and to draw moisture from the soil, through stems to take water to the rest of the plant. * The plant makes its food from water and carbon dioxide, using sunlight as energy, in the green parts of plants (mainly leaves). * Flowering plants have evolved specific parts to carry out pollination, fertilization and seed growth. Seed dispersal improves chances of enough seeds germinating and growing to mature. * Seeds and bulbs need the right conditions to germinate. They contain a food store for the first stages of growth (ie until the plant is able to produce its own food). | |  |
| Disciplinary Knowledge |  | * Observing closely, perhaps using magnifying glasses. * Comparing and contrasting familiar plants. * Describing how they were able to identify and group them. * Drawing diagrams showing the parts of different plants including trees. * Keeping records of how plants have changed over time, for example the leaves falling off trees and buds opening. * Comparing and contrasting what they have found out about different plants. | | * Observing and recording, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb. * Observing similar plants at different stages of growth. * Setting up a comparative test to show that plants need light and water to stay healthy. | | * Comparing the effect of different factors on plant growth, for example the amount of light, the amount of fertiliser. * Discovering (research and modelling) how seeds are formed by: * Observing the different stages of plant cycles over a period of time; * Looking for patterns in the structure of fruits that relate to how the seeds are dispersed. * Observing how water is transported in plants, for example, by putting cut, white carnations into coloured water. * Observing how water travels up the stem to the flowers. | |  |
| Key Vocabulary | plant  leaf  stem  flower  grow  rain  sun  water  soil  seed  tree | leaf  leaves  flower  blossom  petal  fruit  berry  roots  seed  trunk  branch  stem  bark  stalk  bud  blossom | soil  deciduous  evergreen  rose  poppy  sunflower  dandelion  daisy  buttercup  clover  oak  yew  beech  horse chestnut  sycamore  ash | leaf  flower  blossom  petal  fruit  berry  root  seed  trunk  branch  stem  bark  stalk  blossom  soil  germination | bud  bulb  mature plant  light  shade  sunlight  warn  cool  water  grow  healthy  temperature  oxygen  carbon dioxide  nutrients  minerals | roots  stem  trunk  leaves  petal  stamen  anther  filament  style  carpel  sepal  ovary  ovule  temperature  oxygen  carbon dioxide | fertilisation  seed dispersal  seed formation  pollen  pollination  nectar  nutrients  minerals  seed explosion  absorb  reproduce  germination  photosynthesis |  |
| Common Misconceptions |  | Some children may think:   * 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. | | 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. | | 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. | |  |
| Possible Application of Knowledge and Skills |  | * Make close observations of leaves, seeds, flowers etc. * Compare two leaves, seeds, flowers etc. * Classify leaves, seeds, flowers etc. using a range of characteristics. * Identify plants by matching them to named images. * Make observations of how plants change over a period of time. * When further afield, spot plants that are the same as those in the local area studied regularly, describing the key features that helped them. | | * Make close observations of seeds and bulbs. * Classify seeds and bulbs. * Research and plan when and how to plant a range of seeds and bulbs. * Look after the plants as they grow – weeding, thinning, watering etc. * Make close observations and measurements of their plants growing from seeds and bulbs. * Make comparisons between plants as they grow. | | * Observe what happens to plants over time when the leaves or roots are removed. * Observe the effect of putting cut white carnations or celery in coloured water. * Investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space. * Spot flowers, seeds, berries and fruits outside throughout the year. * Observe flowers carefully to identify the pollen. * Observe flowers being visited by pollinators e.g. bees and butterflies in the summer. * Observe seeds being blown from the trees e.g. sycamore seeds. * Research different types of seed dispersal. * Classify seeds in a range of ways, including by how they are dispersed. * Create a new species of flowering plant. | |  |
| Assessment Opportunities |  | Pupils:   * Can name trees and other plants that they see regularly * Can describe some of the key features of these trees and plants e.g. the shape of the leaves, the colour of the flower/blossom * Can point out trees which lost their leaves and those that kept them the whole year * Can point to and name the parts of a plant, recognising that they are not always the same e.g. leaves and stems may not be green * Can sort and group parts of plants using similarities and differences * Can use simple charts etc. to identify plants * Can collect information on features that change during the year * Can use photographs to talk about how plants change over time | | Pupils:   * Can describe how plants that they have grown from seeds and bulbs have developed over time * Can identify plants that grew well in different conditions * Can spot similarities and difference between bulbs and seeds * Can nurture seeds and bulbs into mature plants identifying the different requirements of different plants | | Pupils:   * Can explain the function of the parts of a flowering plant * Can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal, and germination * Can give different methods of pollination and seed dispersal, including examples * Can explain observations made during investigations * Can look at the features of seeds to decide on their method of dispersal * Can draw and label a diagram of their created flowering plant to show its parts, their role and the method of pollination and seed dispersal | |  |
| Science Capital | * Farmer * Agronomist * Botanist * Horticultural scientist * Pathologist * Plant breeder * Garden designer * Propagation scientist * Conservationist * Nature warden/ranger * Environmental scientist * Ecotourism   Researcher   * Field survey worker * Entomologist * Biologist | | | | | | |  |

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|  | **Animals, including humans** | | | | | | | | |
|  | EYFS | Year 1 | | Year 2 | | Year 3 | | Year 4 | |
| National Curriculum | * Children notice changes in their bodies after exercise such as heart beating faster. * Children understand the importance of handwashing. | * Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. * Identify and name a variety of common animals that are carnivores, herbivores and omnivores. * Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). * Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. | | * Notice that animals, including humans, have offspring which grow into adults. * Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) * Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. | | * Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. * Identify that humans and some other animals have skeletons and muscles for support, protection and movement. | | * Describe the simple functions of the basic parts of the digestive system in humans * Identify the different types of teeth in humans and their simple functions * Construct and interpret a variety of food chains, identifying producers, predators and prey. | |
| Key Substantive Knowledge | * Know the names of some animals and match the adults to their young. * Sort and group animals in different ways, e.g. number of legs, colour, furry, scaly etc. * Identify the different parts of the body and find out what they do. | * Animals can be birds, fish,   amphibians, reptiles, mammals.   * Animals can be carnivores,   herbivores or omnivores.   * The structure of common animals can differ, e.g. wings, tail, beak. feathers, skin. * The human body has different parts. | | * Animals, including humans, have offspring which grow into adults. * Humans resemble their parents in many ways. * Animals, including humans, have basic needs for survival. (water, food, air, shelter). * To stay healthy, humans need to exercise, eat the right amounts of different types of food, and stay clean. | | * Different animals are adapted to eat different foods. * Humans and many animals have skeletons to support their bodies and protect vital organs. * Muscles are connected to bones and move them when they contract. * Movable joints connect bones together. | | * Animals have teeth to help them eat. * Different types of teeth do different jobs * Humans have a digestive system that is made up of different functions. * Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood. * The blood takes nutrients around the body * Food chains are used to interpret producers, predators and prey. * Nutrients produced by plants move to primary consumers then to secondary consumers through food chains. | |
| Disciplinary Knowledge |  | * Compare and contrast animals and humans at first hand or through videos and photographs. * Using their senses to compare different textures, sounds and smells. * Describing how they identify and group them. * Grouping animals according to what they eat. | | * Observing, through video or first-hand observation and measurement, how different animals/humans grow * Recording their findings using charts * Asking questions about what things animals/humans need for survival suggesting ways to find answers to their questions. * Describing the main changes as young animal offspring grow into adults (at least: between egg and adult bird; between egg and adult insect; between baby and adult mammal) | | * Comparing and contrasting the diets of different animals (including their pets). * Decide ways of grouping them according to what they eat. * Researching different food groups and how they keep us healthy. * Designing meals based (Create /Invent/ Design) on what they find out. * Identifying and grouping animals with and without skeletons. * Observing and comparing their movement. * Exploring ideas about what would happen if humans did not have skeletons. | | * Comparing the teeth of carnivores and herbivores. * Suggesting reasons for differences [grouping & classifying]. * Finding out [testing and/or researching] what damages teeth and how to look after them. * Drawing and discussing their ideas about the digestive system. * Comparing them uasing models or images. | |
| Key Vocabulary | head  body  eyes  ears  mouth  teeth  leg  tail  wing  claw  fin  scales  feathers  fur  beak  paws  hooves  heart | head  body  eyes  ears  mouth  teeth  leg  tail  wing  claw  fin  scales  feathers  fur  beak  paws  hooves | fish  bird  reptile  amphibian  mammal  omnivore  carnivore  herbivore  sight  hearing  smell  taste  touch  invertebrate  diet  predator  prey | offspring  grow  adults  baby  toddler  child  teenager  nutrition  reproduce  survival  water  food  air  shelter | exercise  hygiene  survival  exercise  female  male  life cycle  balanced diet | nutrition  nutrients  carbohydrates  sugars  protein  vitamin  minerals  fibre  fats  dairy  sugars  oxygen  water  harvest  forage  omnivore  carnivore  herbivore | skeleton  bones  muscles  tissue  support  protect  skull  ribs  spine  joints  contracts  relaxed | Digestive system  digestion  mouth  teeth  tongue  saliva  oesophagus  stomach  liver  rectum  anus  small intestine  large intestine  pharynx  gall bladder  pancreas  faeces  urine | energy  waste  nutrients  bloodstream  incisors  canines  molars  premolars  food chain  herbivore  omnivore  carnivore  producers  consumers  predator  prey |
| 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. | | 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. | | 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. | | 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”. | |
| Possible Application of Knowledge and Skills |  | * Make first-hand, close observations of animals from each of the groups. * Compare two animals from the same or different groups. * Classify animals using a range of features. * Identify animals by matching them to named images. * Classify animals according to what they eat. * Make first-hand close observations of parts of the body e.g. hands, eyes. * Compare two people. * Take measurements of parts of their body. * Compare parts of their own body. * Look for patterns between people e.g. Do people with big hands have big feet? * Classify people according to their features. * Investigate human senses e.g. Which part of my body is good for feeling, which is not? Which food/flavours can I identify by taste? Which smells can I match? | | * Ask people questions and use secondary sources to find out about the life cycles of some animals. * Observe animals growing over a period of time e.g. chicks, caterpillars, a baby. * Ask questions of a parent about how they look after their baby. * Ask pet owners questions about how they look after their pet. * Explore the effect of exercise on their bodies. * Classify food in a range of ways, including using the Eatwell Guide. * Investigate washing hands, using glitter gel. | | * Classify food in a range of ways. * Use food labels to explore the nutritional content of a range of food items. * Use secondary sources to find out the types of food that contain the different nutrients. * Use food labels to answer enquiry questions e.g. How much fat do different types of pizza contain? How much sugar is in soft drinks? * Plan a daily diet to contain a good balance of nutrients. * Explore the nutrients contained in fast food. * Use secondary sources to research the parts and functions of the skeleton. * Investigate patterns asking questions such as:   + Can people with longer legs run faster?   + Can people with bigger hands catch a ball better? * Compare, contrast and classify skeletons of different animals | | * Research the function of the parts of the digestive system. * Create a model of the digestive system using household objects. * Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing). * Classify animals as herbivores, carnivores or omnivores according to the type of teeth they have in their skulls. * Use food chains to identify producers, predators and prey within a habitat. * Use secondary sources to identify animals in a habitat and find out what they eat. | |
| Assessment Opportunities |  | Pupils:   * Can name a range of animals which includes animals from each of the vertebrate groups * Can describe the key features of these named animals * Can label key features on a picture/diagram * Can write descriptively about an animal * Can write a What am I? riddle about an animal * Can describe what a range of animals eat * Can play and lead ‘Simon says’ * During PE lessons, can follow instructions involving parts of the body * Can label parts of the body on pictures and diagrams * Can explore objects using different senses | | Pupils:   * Can describe how animals, including humans, have offspring which grow into adults, using the appropriate names for the stages * Can state the basic needs of animals, including humans, for survival * Can state the importance for humans of exercise, eating the right amounts of different types of food, and hygiene * Can name foods in each section of the Eatwell Guide * Can describe, including using diagrams, the life cycle of some animals, including humans, and their growth to adults e.g. by creating a life cycle book for a younger child * Can measure/observe how animals, including humans, grow. * Show what they know about looking after a baby/animal by creating a parenting/pet owners’ guide * Explain how development and health might be affected by differing conditions and needs being met/not met | | Pupils:   * Can name the nutrients found in food * Can state that to be healthy we need to eat the right types of food to give us the correct amount of these nutrients * Can name some bones that make up their skeleton, giving examples that support, help them move or provide protection * Can describe how muscles and joints help them to move * Can classify food into those that are high or low in particular nutrients * Can answer their questions about nutrients in food, based on their gathered evidence * Can talk about the nutrient content of their daily plan * Use their data to look for patterns (or lack of them) when answering their enquiry question * Can give similarities e.g. they all have joints to help the animal move, and differences between skeletons | | Pupils:   * Can sequence the main parts of the digestive system * Can draw the main parts of the digestive system onto a human outline   Can describe what happens in each part of the digestive system   * Can point to the three different types of teeth in their mouth and talk about their shape and what they are used for * Can name producers, predators and prey within a habitat * Can construct food chains * Can use diagrams or a model to describe the journey of food through the body explaining what happens in each part * Can record the teeth in their mouth (make a dental record) * Can explain the role of the different types of teeth * Can explain how the teeth in animal skulls show they are carnivores, herbivores or omnivores * Can create food chains based on research | |
| Science Capital | * Doctor * Vet * Physiotherapist * Physiologist * Ophthalmologist * Zoologist * Conservationist * Sports scientist * pathologist * Nutritionist (humans or other animals) | | | | | | | | |

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|  | **Living things and their habitats** | | | | | | |
|  | EYFS | Year 1 | Year 2 | | Year 3 | Year 4 | |
| National Curriculum | * They know about similarities and differences between themselves and others, and among families, communities and traditions. * They can talk about their own environment * Show care and concern for living things and the environment |  | * Explore and compare the differences between things that are living, dead, and things that have never been alive. * Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. * Identify and name a variety of plants and animals in their habitats, including micro-habitats. * Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food. | |  | * Recognise that living things can be grouped in a variety of ways. * Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. * Recognise that environments can change and that this can sometimes pose dangers to living things. | |
| Key Substantive Knowledge | * Know the names of some animals and match the adults to their young. * Sort and group animals in different ways, e.g. number of legs, colour, furry, scaly etc. * Identify the different parts of the body and find out what they do. |  | * There are differences between things that are living, things that are dead and things that have never been alive. * Living things survive in different habitats. * Most living things live in habitats to which they are suited. * Different habitats provide for the basic needs of different kinds of animals and plants. * Environmental change can affect plants and animals that live there. * Animals get their food from plants and other animals. | |  | * Living things can be divided into groups based upon their characteristics. * Classification keys can be used for identifying plants and animals. * Specific environments can change habitats and cause dangers. * Different food chains occur in different habitats. * Human activity significantly affects the environment. | |
| Disciplinary Knowledge |  |  | * Sorting and classifying things as to whether they are living, dead or were never alive. * Recording their findings using charts * Describing how they decided where to place things, * Exploring questions such as: ‘Is a flame alive? Is a deciduous tree dead in winter?’ * Talking about ways of answering their questions. * Constructing a simple food chain that includes humans (e.g. grass, cow, human); * Describing the conditions in different habitats and micro-habitats (under log, on stony path, under bushes); * Finding out how the conditions affect the number and type(s) of plants and animals that live there. | |  | * Using and making simple guides or keys [grouping & classifying] to explore and identify local plants and animals. * Making a guide [grouping & classifying] to local living things. * Raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched. | |
| Key Vocabulary | needs  food  water  exercise  garden  forest  wood  water |  | habitat  biomes  microhabitat  suited  suitable  basic need  depend  food  shelter  move  feed  minibeast  ocean  mountain  forest  desert  beach | bushes  pond  woodland  meadow  under logs  stony path  living  dead  never been alive  food chain  source  herbivore  omnivore  carnivore  predator  prey  under/inside bushes |  | classification  classification keys  invertebrates  vertebrates  mammals  fish  birds  reptiles  amphibians  insects  arachnids  molluscs | environment  habitat  human impact  positive  negative  migrate  hibernate  movement  respiration  sensitivity  growth  excretion  reproduction  nutrition |
| Common Misconceptions |  |  | Some children may think:   * an animal’s habitat is like its ‘home’ * plants and seeds are not alive as they cannot be seen to move * fire is living * arrows in a food chain mean ‘eats’. | |  | 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. | |
| Possible Application of Knowledge and Skills |  |  | * Explore the outside environment regularly to find objects that are living, dead and have never lived. * Classify objects found in the local environment. * Observe animals and plants carefully, drawing and labelling diagrams. * Create simple food chains for a familiar local habitat from first-hand observation and research. * Create simple food chains from information given e.g. in picture books (Gruffalo etc.). | |  | * Observe plants and animals in different habitats throughout the year. * Compare and contrast the living things observed. * Use classification keys to name unknown living things. * Classify living things found in different habitats based on their features. * Create a simple identification key based on observable features. * Use fieldwork to explore human impact on the local environment e.g. litter, tree planting. * Use secondary sources to find out about how environments may naturally change. * Use secondary sources to find out about human impact, both positive and negative, on environments. | |
| Assessment Opportunities |  |  | Pupils:   * Can find a range of items outside that are living, dead and never lived * Can name a range of animals and plants that live in a habitat and micro-habitats that they have studied * Can talk about how the features of these animals and plants make them suitable to the habitat * Can talk about what the animals eat in a habitat and how the plants provide shelter for them * Can construct a food chain that starts with a plant and has the arrows pointing in the correct direction | |  | Pupils:   * Can name living things living in a range of habitats, giving the key features that helped them to identify them * Can give examples of how an environment may change both naturally and due to human impact * Can keep a careful record of living things found in different habitats throughout the year (diagrams, tally charts etc.) * Can use classification keys to identify unknown plants and animals * Can present their learning about changes to the environment in different ways e.g. campaign video, persuasive letter | |
| Science Capital | * Farmer * Agronomist * Botanist * Horticultural scientist * Pathologist * Plant breeder * Garden designer * Propagation scientist * Conservationist * Nature warden/ranger * Environmental scientist * Water quality officer * Ecotourism Researcher * Field survey worker * Entomologist * Marine biologist | | | | | | |

**Key Concepts in Chemistry**

Materials and their properties Page. 16

Rocks Page. 19

States of Matter Page. 21

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|  | **Materials and their properties** | | | | | | | | |
|  | EYFS | Year 1 | | | | Year 2 | | Year 3 | Year 4 |
| National Curriculum | * Introduce and encourage children to use the vocabulary of manipulation, e.g. squeeze and prod. | * Distinguish between an object and the material from which it is made. * Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. * Describe the simple physical properties of a variety of everyday materials. * Compare and group together a variety of everyday materials on the basis of their simple physical properties. | | | | * Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. * Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. | |  |  |
| Key Substantive Knowledge | * Recognise some everyday materials, e.g. wood, glass, plastic. * Compare and group together some everyday objects made from wood, plastic and glass. * Use vocabulary to describe different media and materials. | * There are lots of different materials, including wood, plastic, glass, metal, water and rock. * Objects can be made from different materials. * Materials have describable properties. * Different materials have different properties. * Materials have similarities and differences. | | | | * Everyday materials are suitable for particular uses. * You have to study the properties of a material to decide if it is useful for a particular job. * Some solid objects can be changed by squashing, bending, twisting and stretching. * Some materials are found in nature (natural) and other are made by humans (mad-made). | |  |  |
| Disciplinary Knowledge |  | * Performing simple tests to explore questions, for example: ‘What is the best material for an umbrella? * Record results in a table. * Compare materials using scientific vocabulary. * Group and sort materials according to their properties. | | | | * Comparing the uses of everyday materials in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs). * Observing different materials closely. * Identifying and classifying the uses of different materials. * Recording their observations. * Thinking about unusual and creative uses for everyday materials. | |  |  |
| Key Vocabulary | wood  paper  glass  plastic  metal  wet  dry  shiny  bendy  squashy  hard  soft  lumpy  wrinkly  smooth | | object  material  wood  plastic  glass  metal  water  rock  brick  paper  fabric  elastic  foil  cardboard  rubber  wool  clay | properties  hard  soft  stretchy  stiff  bendy  floppy  waterproof  absorbent  rough  smooth  shiny  dull  opaque  transparent | object  material  wood  plastic  glass  metal  water  rock  brick  paper  fabric  elastic  foil  cardboard  rubber  wool  clay | | suitable  useful  hard/soft  stretchy/stiff  rigid/flexible  waterproof/absorbent  strong/weak  rough/smooth  transparent/opaque  shape  push  pull  twist  squash  bend  stretch  natural  man-made |  |  |
| 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. | | 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. | | |  |  |
| Possible Application of Knowledge and Skills |  | | * Classify objects made of one material in different ways e.g. a group of object made of metal. * Classify in different ways one type of object made from a range of materials e.g. a collection of spoons made of different materials. * Classify materials based on their properties. * Test the properties of objects e.g. absorbency of cloths, strength of party hats made of different papers, stiffness of paper plates, waterproofness of shelters. | | * Classify materials. * Make suggestions about alternative materials for a purpose that are both suitable and unsuitable * Test the properties of materials for particular uses e.g. compare the stretchiness of fabrics to select the most appropriate for Elastigirl’s costume, test materials for waterproofness to select the most appropriate for a rain hat | | |  |  |
| Assessment Opportunities |  | | Pupils:   * Can label a picture or diagram of an object made from different materials * Can describe the properties of different materials | | Pupils:   * Can name an object, say what material it is made from, identify its properties and make a link between the properties and a particular use * Can label a picture or diagram of an object made from different materials * For a given object can identify what properties a suitable material needs to have * Whilst changing the shape of an object can describe the action used * Can use the words flexible and/or stretchy to describe materials that can be changed in shape and stiff and/or rigid for those that cannot * Can recognise that a material may come in different forms which have different properties * Can sort materials using a range of properties * Can explain using the key properties why a material is suitable or not suitable for a purpose * Can begin to choose an appropriate method for testing a material for a particular property * Can use their test evidence to select appropriate material for a purpose e.g. Which material is the best for a rain hat? | | |  |  |
| Science Capital | * Research scientist * Inventor * Quality manager * Project manager * Analytical scientist * CAD technician * Design engineer * Materials engineer | | | | | | |  |  |

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|  | **Rocks** | | | | | | |
|  | EYFS | Year 1 | Year 2 | Year 3 | | | Year 4 |
| National Curriculum |  |  |  | * Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. * Describe in simple terms how fossils are formed when things that have lived are trapped within rock. * Recognise that soils are made from rocks and organic matter. | | |  |
| Key Substantive Knowledge |  |  |  | * Rocks have different physical properties and can be compared and grouped. * Simple physical properties of some rocks can be related to their formations. * There are igneous and sedimentary rocks. * Fossils are formed when living things are trapped within sedimentary rocks. * Fossils provide evidence that living things have changed over time. * Soil is made from rocks and organic matter. | | |  |
| Disciplinary Knowledge |  |  |  | * Observing rocks, including those used in buildings and gravestones. * Exploring how and why they might have changed over time. * Using (equipment) a hand lens or microscope to help them. * Identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. * Research and discuss the different kinds of living things whose fossils are found in sedimentary rock. * Compare different soils and fossils by identifying similarities and differences between them. * Investigate what happens when rocks are rubbed together (classify according to hardness) or what changes occur when they are in water. * Raise and answer questions about the way soils are formed. | | |  |
| Key Vocabulary |  |  |  | rock  stone  pebble  boulder  grain  crystals  layers  sedimentary  metamorphic  igneous  organic matter  decay | hard  soft  texture  absorb  water  soil  fossil  magma  erosion  tectonic plates  solidify  dissolve | marble  chalk  granite  sandstone  slate  soil  peat,  sandy soil  chalk soil  clay soil  peat |  |
| 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. | | |  |
| Possible Application of Knowledge and Skills |  |  |  | * Observe rocks closely. * Classify rocks in a range of ways, based on their appearance. * Devise a test to investigate the hardness of a range of rocks. * Devise a test to investigate how much water different rocks absorb. * Observe how rocks change over time e.g. gravestones or old building. * Research using secondary sources how fossils are formed. * Observe soils closely. * Classify soils in a range of ways based on their appearance. * Devise a test to investigate the water retention of soils. * Observe how soil can be separated through sedimentation. * Research the work of Mary Anning. | | |  |
| Assessment Opportunities |  |  |  | Pupils:   * Can name some types of rock and give physical features of each * Can explain how a fossil is formed * Can explain that soils are made from rocks and also contain living/dead matter * Can classify rocks in a range of different ways, using appropriate vocabulary * Can devise tests to explore the properties of rocks and use data to rank the rocks * Can link rocks changing over time with their properties e.g. soft rocks get worn away more easily * Can present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc. * Can identify plant/animal matter and rocks in samples of soil   Can devise a test to explore the water retention of soils | | |  |
| Science Capital |  |  |  | * Research scientist * Inventor * Quality manager * Project manager * Analytical scientist * CAD technician * Design engineer * Materials engineer. | | |  |

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|  | **States of Matter** | | | | | | |
|  | EYFS | Year 1 | Year 2 | Year 3 | Year 4 | | |
| National Curriculum | * Exploring media and materials- notice changes in properties as they are transformed through becoming wet, dry, flaky or fixed. * Think about cause and effect. * Observe and interact with natural processes, such as ice melting. |  |  |  | * Compare and group materials together, according to whether they are solids, liquids or gases. * Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). * Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. | | |
| Key Substantive Knowledge | * Heat dries materials/objects that are wet. * Rain comes from the clouds in the sky. * Water will get us wet. * Materials melt in the Sun, like ice, and materials dry in the Sun, like puddles. |  |  |  | * Solids, liquids and gases are described by observable properties. * Materials can be divided into solids, liquids and gases. * Materials change state when heated or cooled. * Heating causes solids to melt into liquids and liquids evaporate into gases. * Cooling causes gases to condense into liquids and liquids to freeze into solids. * The temperature at which given substances change state are always the same. * Measuring temperature change is recorded using degrees Celsius (°C). * Evaporation and condensation are key parts of the water cycle. * Evaporation is associated with temperature. | | |
| Disciplinary Knowledge |  |  |  |  | * Grouping and classifying a variety of different materials. * Exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). * Researching the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. * Observing and recording evaporation over a period of time, such as a puddle in the playground or washing on a line. * Investigating the effect of temperature on washing drying or snowmen melting. * Using data logging equipment to detect/measure and compare temperatures. | | |
| Key Vocabulary | water  Sun  wet  dry  melt  pour  rain  sunlight  clouds  puddles  ice |  |  |  | solid  liquid  gas  changes of state  states of matter  melting  freezing  boiling  melting point  freezing point  boiling point | temperature  Celsius  thermometer  particles  molecules  container  volume  shape  rigid  squashed  vibrations | solidify  crystals  reversible  irreversible  evaporation  condensation  water cycle  precipitation  water vapour |
| Common Misconceptions |  |  |  |  | Some children may think:   * ‘solid’ is another word for hard or opaque * solids are hard and cannot break or change shape easily and are often in one piece * substances made of very small particles like sugar or sand cannot be solids * particles in liquids are further apart than in solids and they take up more space * when air is pumped into balloons, they become lighter * water in different forms – steam, water, ice – are all different substances * all liquids boil at the same temperature as water (100 degrees) * melting, as a change of state, is the same as dissolving * steam is visible water vapour (only the condensing water droplets can be seen) * clouds are made of water vapour or steam * the substance on windows etc. is condensation rather than water * the changing states of water (illustrated by the water cycle) are irreversible * evaporating or boiling water makes it vanish * evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material. | | |
| Possible Application of Knowledge and Skills |  |  |  |  | * Observe closely and classify a range of solids. Observe closely and classify a range of liquids. * Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. * Classify materials according to whether they are solids, liquids and gases. * Observe a range of materials melting e.g. ice, chocolate, butter. * Investigate how to melt ice more quickly. * Observe the changes when making rocky road cakes or ice-cream. * Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. * Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. * Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration). * Observe water evaporating and condensing e.g. on cups of icy water and hot water. * Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers. * Use secondary sources to find out about the water cycle. | | |
| Assessment Opportunities |  |  |  |  | Pupils:   * Can create a concept map, including arrows linking the key vocabulary * Can name properties of solids, liquids and gases * Can give everyday examples of melting and freezing * Can give everyday examples of evaporation and condensation * Can describe the water cycle * Can give reasons to justify why something is a solid liquid or gas * Can give examples of things that melt/freeze and how their melting points vary * From their observations, can give the melting points of some materials * Using their data, can explain what affects how quickly a solid melts * Can measure temperatures using a thermometer * Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup * From their data, can explain how to speed up or slow down evaporation * Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet | | |
| Science Capital | * Research scientist * Inventor * Quality manager * Project manager * Analytical scientist * CAD technician * Design engineer * Materials engineer. | | | | | | |

**Key Concepts in Physics**

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|  | **Seasonal Changes** | | | | | |
|  | EYFS | Year 1 | | Year 2 | Year 3 | Year 4 |
| National Curriculum | * They show concern and care for the environment and   can notice changes and differences.   * Develops an understanding of decay and changing over time. | * Observe changes across the four seasons. * Observe and describe weather associated with the seasons and how day length varies. | |  |  |  |
| Key Substantive Knowledge | * Observe the changes in the school playground, building with the natural materials available and exploring the changes in colour on the trees and plants. * Make seasonal collections of leaves and plants and look for similarities and differences. | * The sun appears to move during the day, creating sunrise and sunset. * There are four seasons (autumn, winter, spring, summer). * Each season is different. The weather, temperature and number of daylight hours changes with each season. * As the seasons change the weather and the length of the day changes. | |  |  |  |
| Disciplinary Knowledge |  | * Observe changes over time. * Compare and contrast each season. * Recording data in tables and charts about the weather. * Making displays of what happens in the world around them, including day length, as the seasons change. * Using data logging equipment to record temperatures. * Using a rain gauge to investigate the amount of rainfall. * Create a chart to record the daylight hours. | |  |  |  |
| Key Vocabulary | snow  wind  rain  sun  day  night  stormy  cloudy  hot  cold  foggy | weather  sunny  rain  wind  snow  seasons  winter  summer  spring  autumn  day  night | daylight  sun  sunrise  sunset  *Months of the Year*  temperature  climate  warm  cold  freezing  rain gauge  wind vane |  |  |  |
| 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. | |  |  |  |
| Possible Application of Knowledge and Skills |  | * Collect information about the weather regularly throughout the year. * Present this information in tables and charts to compare the weather across the seasons. * Collect information, regularly throughout the year, of features that change with the seasons e.g. plants, animals, humans. * Present this information in different ways to compare the seasons. * Gather data about day length regularly throughout the year and present this to compare the seasons. | |  |  |  |
| Assessment Opportunities |  | Pupils:   * Can name the four seasons and identify when in the year they occur * Can describe weather in different seasons over a year * Can describe days as being longer (in time) in the summer and shorter in the winter * Can describe other features that change through the year * Use the evidence gathered to describe the general types of weather and changes in day length over the seasons. * Use their evidence to describe some other features of their surroundings, e.g. themselves, animals, plants that change over the seasons * Demonstrate their knowledge in different ways e.g. making a weather forecast video, writing seasonal poetry, creating seasonal artwork | |  |  |  |
| Science Capital | * Meteorologist * Climatologist * Environmental scientist | | |  |  |  |

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|  | **Electricity** | | | | | | | | | | |
|  | EYFS | Year 1 | Year 2 | | Year 3 | | Year 4 | | | | |
| National Curriculum |  |  |  | |  | | * Identify common appliances that run on electricity. * Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. * Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. * Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. * Recognise some common conductors and insulators, and associate metals with being good conductors. | | | | |
| Key Substantive Knowledge |  |  |  | |  | | * Common appliances run on electricity. * A source of electricity (mains of battery) is needed for electrical devices to work. * Electricity sources push electricity round a circuit. * More batteries will push the electricity round the circuit faster. * Devices work harder when more electricity goes through them. * A complete circuit is needed for electricity to flow and devices to work. * A ‘simple series’ electrical circuit has basic parts: cells, wires, bulbs, switches and buzzers. * A lamp can be turned on and off in a complete loop with a battery in a ‘simple series’ circuit. * A switch is used to open and close a circuit. * A lamp can be turned on and off using a switch in a ‘simple series’ circuit. * Some materials allow electricity to flow easily and these are called conductors. * Materials that don’t allow electricity to flow easily are called insulators. | | | | |
| Disciplinary Knowledge |  |  |  | |  | | * Observing/noticing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit. * Drawing a labelled diagram of s ‘simple series’ circuit. * Creating a ‘simple series’ circuit using the correct equipment. * Investigate which materials are conductors and which are insulators. * Record data using appropriate charts/graphs. | | | | |
| Key Vocabulary |  |  |  | |  | | electricity  energy  generator  electrical  appliance  mains  plug  power source  series circuit  component | | current  circuit  component  cell  battery  positive  negative  connect  connectors  loose connection | short circuit  crocodile clip  bulb  switch  buzzer  motor conductor  insulator  metal  non-metal  symbol | |
| 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. | | | | |
| Possible Application of Knowledge and Skills |  |  |  | |  | | * Construct a range of circuits. * Explore which materials can be used instead of wires to make a circuit. * Classify the materials that were suitable/not suitable for wires. * Explore how to connect a range of different switches and investigate how they function in different ways. * Choose switches to add to circuits to solve particular problems, such as a pressure switch for a burglar alarm. * Apply their knowledge of conductors and insulators to design and make different types of switch. * Make circuits that can be controlled as part of a DT project. | | | | |
| Assessment Opportunities |  |  |  | |  | | * Can name the components in a circuit * Can make electric circuits * Can control a circuit using a switch * Can name some metals that are conductors * Can name materials that are insulators * Can communicate structures of circuits using drawings which show how the components are connected * Use classification evidence to identify that metals are good conductors and non-metals are insulators * Can incorporate a switch into a circuit to turn it on and off * Can connect a range of different switches identifying the parts that are insulators and conductors * Can add a circuit with a switch to a DT project and can demonstrate how it works * Can give reasons for choice of materials for making different parts of a switch * Can describe how their switch work | | | | |
| Science Capital |  |  |  | |  | | * Electrical scientist * Cardiovascular Technologists and Technicians * Acoustic consultant. * Aerospace engineer. * Broadcast engineer. * CAD technician. * Control and instrumentation engineer. * Design engineer. * Electrical engineer. * Electronics engineer. | | | | |
|  | **Light** | | | | | | | | | | |
|  | EYFS | Year 1 | | Year 2 | | Year 3 | | | | | Year 4 |
| National Curriculum |  |  | |  | | * Recognise that they need light in order to see things and that dark is the absence of light. * Notice that light is reflected from surfaces. * Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. * Recognise that shadows are formed when the light from a light source is blocked by a solid object. * Find patterns in the way that the size of shadows change. | | | | |  |
| Key Substantive Knowledge |  |  | |  | | * Light is required to see things and darkness is when light is absent. * Transparent materials let light through them and opaque materials don’t let light through. * Beams of light bounce off some materials and this is called reflection. * Shiny materials reflect light beams better than non-shiny materials. * A source of light is something that makes its own light. * Examples of light sources are: the Sun, stars, fire, electric lights, fireflies and glow-worms. * Light travels directly from a light source into your eyes. * Looking at the sun can be dangerous and eye protection is needed. * Shadows are formed when the light from a light source is blocked by a solid object. * Shadow sizes vary depending on the position of a light source. | | | | |  |
| Disciplinary Knowledge |  |  | |  | | * Investigate what happens to shadows when the light source moves or the distance between the light source and the object changes, looking for patterns and observing closely. * Investigate the best material to make a shadow puppet. * Record how shadows change throughout the day. * Explore how mirrors reflect light. | | | | |  |
| Key Vocabulary |  |  | |  | | light  dark  absent  light source  sunlight  electricity  transparent  translucent  opaque | | shiny  matt  surface  shadow  reflect  reflection  mirror  dangerous  warning | | |  |
| 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. | | | | |  |
| Possible Application of Knowledge and Skills |  |  | |  | | * Explore how different objects are more or less visible in different levels of lighting. * Explore how objects with different surfaces (e.g. shiny vs matt) are more or less visible. * Explore how shadows vary as the distance between a light source and an object or surface is changed. * Explore shadows which are connected to and disconnected from the object e.g. shadows of clouds and children in the playground. * Choose suitable materials to make shadow puppets. * Create artwork using shadows. | | | | |  |
| Assessment Opportunities |  |  | |  | | Pupils:   * Can describe how we see objects in light and can describe dark as the absence of light * Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses * Can define transparent, translucent and opaque * Can describe how shadows are formed * Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change * Can clearly explain, giving examples, that objects are not visible in complete darkness * Can describe and demonstrate how shadows are formed by blocking light * Can describe, demonstrate and make predictions about patterns in how shadows vary | | | | |  |
| Science Capital |  |  | |  | | * Optical scientist * Camera Design Researcher * Laser physicist | | | | |  |

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|  | **Sound** | | | | | |
|  | EYFS | Year 1 | Year 2 | Year 3 | Year 4 | |
| National Curriculum |  |  |  |  | * Identify how sounds are made, associating some of them with something vibrating * Recognise that vibrations from sounds travel through a medium to the ear * Find patterns between the pitch of a sound and features of the object that produced it * Find patterns between the volume of a sound and the strength of the vibrations that produced it * Recognise that sounds get fainter as the distance from the sound source increases. | |
| Key Substantive Knowledge |  |  |  |  | * Sound travels from its source in all directions and we hear it when it travels to our ears. * Sound travel can be blocked. * Sound spreads out as it travels. * Sound is produced when an object vibrates. * Changing the shape, size and material of an object will change the sound it produces. * Sound moves through all materials by making them vibrate. * Sound vibrations travel through a medium to the ear. * Changing the way an object vibrates changes its sound. * Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. * Faster vibrations (higher frequencies) produce higher pitched sounds. | |
| Disciplinary Knowledge |  |  |  |  | * Finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. * Investigate which materials provides the best insulation against sound. * Create and play their own instruments by using what they have found out about pitch and volume. * Using data logging equipment to detect/measure and compare sounds. | |
| Key Vocabulary |  |  |  |  | sound  source  vibrate  vibration  travel  pitch  high  low  volume  faint  loud  quiet | insulation  frequencies  medium  outer ear  middle ear  ear drum  hammer  anvil  stirrup  inner ear  cochlea  nerves |
| Common Misconceptions |  |  |  |  | Pitch and volume are frequently confused, as both can be described as high or low.  Some children may think:   * sound is only heard by the listener * sound only travels in one direction from the source * sound can’t travel through solids and liquids * high sounds are load and low sounds are quiet. | |
| Possible Application of Knowledge and Skills |  |  |  |  | * Classify sound sources. * Explore making sounds with a range of objects, such as musical instruments and other household objects. * Explore how string telephones or ear gongs work. * Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks. * Measure sounds over different distances. * Measure sounds through different insulation materials. | |
| Assessment Opportunities |  |  |  |  | Pupils:   * Can name sound sources and state that sounds are produced by the vibration of the object * Can state that sounds travel through different mediums such as air, water, metal * Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it * Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder * Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases * Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear * Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects * Can use data to identify patterns in pitch and volume * Can explain how loudness can be reduced by moving further from the sound source or by using a sound insulating medium | |
| Science Capital |  |  |  |  | * Audiologist * Acoustic scientist * Acoustic engineer * Sound technician * Music scientist | |

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|  | **Forces and Magnets** | | | | | |
|  | EYFS | Year 1 | Year 2 | Year 3 | | Year 4 |
| National Curriculum | * Introduce and encourage children to use the vocabulary of manipulation, e.g. squeeze and prod. * Shows an interest in technological toys with knobs or pulleys. * Can talk about why things happen and how things work. |  |  | * Compare how things move on different surfaces. * Notice that some forces need contact between two objects, but magnetic forces can act at a distance. * Observe how magnets attract or repel each other and attract some materials and not others. * Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. * Describe magnets as having two poles. * Predict whether two magnets will attract or repel each other, depending on which poles are facing. | |  |
| Key Substantive Knowledge | * Observe and interact with natural processes, e.g. a magnet attracting an object and a boat floating on water. * Explore and play with a range of toys that require a pull or push action. * Begin to describe how to use a range of different toys. * They will develop a basic understand of the concept of forces through twisting, pushing, slotting and playing with magnetic toys * Explore the effects of pushing different buttons to make movements. |  |  | * Objects move differently depending on the surface. * Forces can act upon each other when contact is made between them. * Pushing and pulling can make things move faster or slower or stop them from moving. * Larger masses take a large force (pushes and pulls) to move or stop them. * Pushing and pulling can change the shape of things. * Large forces have bigger effects. * Magnets have two ‘poles’ – North and South. * Magnets exert attractive and repulsive forces on each other. * Magnets exert non-contact forces, which work through some materials. * Magnets exert attractive forces on some materials. * Magnet forces are affected by magnet strength, object mass, distance from object and object material. * Everyday materials can be grouped and compared depending on their attraction to a magnet or not. Not all materials are magnetic. | |  |
| Disciplinary Knowledge |  |  |  | * Comparing how different things move and grouping them. * Raising questions and carrying out tests to find out how far things move on different surfaces. * Gathering and recording data to find answers to their questions. * Exploring the strengths of different magnets and finding a fair way to compare them. * Sorting materials into those that are magnetic and those that are not. * Looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another. * Identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets. | |  |
| Key Vocabulary | push  pull  twist  stretch  turn  open  lift  squeeze  pinch  flick  tap |  |  | force  push  pull  twist  contact  force  non-contact force  magnetic force  magnet  strength  bar magnet  ring magnet  button magnet  horseshoe magnet  wand magnet | attract  repel  poles  North Pole  South Pole  metal  iron  nickel  cobalt  silver  gold  copper  magnesium  platinum  aluminium |  |
| Common Misconceptions |  |  |  | Some children may think:   * the bigger the magnet the stronger it is * all metals are magnetic. | |  |
| Possible Application of Knowledge and Skills |  |  |  | * Carry out investigations to explore how objects move on different surfaces e.g. spinning tops/coins, rolling balls/cars, clockwork toys, soles of shoes etc. * Explore what materials are attracted to a magnet. * Classify materials according to whether they are magnetic. * Explore the way that magnets behave in relation to each other. * Use a marked magnet to find the unmarked poles on other types of magnets. * Explore how magnets work at a distance e.g. through the table, in water, jumping paper clips up off the table. * Devise an investigation to test the strength of magnets. | |  |
| Assessment Opportunities |  |  |  | Pupils:   * Can give examples of forces in everyday life * Can give examples of objects moving differently on different surfaces * Can name a range of types of magnets and show how the poles attract and repel * Can draw diagrams using arrows to show the attraction and repulsion between the poles of magnets * Can use their results to describe how objects move on different surfaces * Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface * Can use classification evidence to identify that some metals, but not all, are magnetic * Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles * Can use test data to rank magnets | |  |
| Science Capital | * Geomagnetist * Magnetic engineer * Electromagnetic engineer * Radiologist | | | | |  |