



SCIENCE CURRICULUM

AUTUMN 1: EYFS - YEAR 6



SCIENCE CURRICULUM INTENT

The Aims of the National Curriculum for Science:

The national curriculum for Science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Autumn 1

| EYFS | Focus of Study Marvellous Me Outside |
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| <p>FS 1 – Nursery</p> <p>Milestones</p> <ul style="list-style-type: none"> • FM Children will talk about what they notice about the weather on a daily basis and how this impacts them. (need a coat, gloves, sunhat etc.) (Geog/sci) • FM Children will describe what they see, hear and feel whilst outside (sci) • FM Children will describe what they see, hear and feel whilst outside (sci) | <p>Context for study: Children will become familiar with exploring the outside.</p> <p>Knowledge Content: That children will become familiar with the outdoor environment including local sounds and the nature within the grounds.</p> <p>Key vocab will include <u>nature, tree, trunk, branch, leaves, bushes, flowers, listen, sounds, cold and wet</u></p> <p>I know that we have trees in the school grounds. I know that I need to wear a coat if it's cold. I know that I need to wear wellies if it's wet.</p> <p>I can listen to the different sounds outside. I can spy trees, bushes, leaves and flowers.</p> |

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| F2 - Reception | <p>Context for study: Children will be familiar with exploring the outside and use their senses to explore the outside.</p> <p>Knowledge Content: That children will become familiar with the characteristics of the outdoor environment including local sounds and the nature. This will include the trees and wildlife within the school grounds.</p> <p>Key vocab will include <u>smell, sight, touch, senses, care, natural, nature, living, sort and features, tree, trunk, branch, roots, leaves, smooth, rough.</u></p> <p>I know that leaves have different features and can talk about the shape and colours they see. I know that the sounds outside will be different to the sounds inside. I can sort leaves. I can identify different sounds. I can see patterns on tree trunks.</p> |
| Year 1 | Focus of Study: Animals, including humans |
| NC Objectives | Key Explicit Knowledge and Vocabulary |
| <p>Pupils will be taught to:</p> <ul style="list-style-type: none"> • identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • identify and name a variety of common animals that are carnivores, herbivores and omnivores | <p>Context for study:</p> <p>This unit is the first of many science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. From Reception, pupils can name common animals and their babies. Pupils also know the animals that live in particular habitats and know some common features of mini beasts. In Year 1, pupils further develop their knowledge of animals as they are introduced to the concept of 'families' and how animals are grouped according to their shared properties including fish, amphibians, reptiles, birds and mammals. Pupils learn the key features of each animal family and group them into their correct families. New learning includes identifying and naming a variety of common animals that are carnivores, herbivores and omnivores. Pupils identify, name, draw and label the basic parts of the human body. Pupils also learn about the</p> |

- 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.

Common Misconceptions:

- All ocean creatures are fish
- All fish lay eggs
- Differences between vertebrates and invertebrates
- All mammals give birth to live young
- Spiders are insects or any creepy crawly is an insect
- Only large land mammals are animals
- Male animals are always bigger and stronger than females

senses. This unit is the precursor to work studied in Year 2 where pupils learn about how animals, and humans, grow and change. Pupils study life cycles of humans and animals such as butterflies, chickens and frogs.

Begin with a re-visit of elements of animals inc. humans from EYFS.

Key Vocabulary: **Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves**, reptile, amphibian, mammal, omnivore, carnivore, herbivore, **all senses.**

Knowledge Content:

The study of animals, including **humans** is part of the discipline of **biology** - the study of living **organisms**.

Pupils will know that animals are grouped together in 'families' based on shared properties. They will name the groups fish, **amphibians, reptiles, birds** and **mammals**.

Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone.

Understand the difference between a pet and a wild animal

Know the features of a fish - **gills, scales, fins**, water dwelling,

Know the features of mammals - hair or fur, babies drink mother's milk, live on land or water

Know the features of amphibians - live on land or water when adults, soft skin, lay eggs in water, live in water when young

Know the features of reptiles - dry **scaly** skin, lay eggs on land,

Know the features of birds - wings, feathers, **beak/bill, hatch** from eggs, most can fly but some can't (e.g., **ostrich, penguin, kiwi**)

Know why we need the following body parts - ears, mouth, eyes, nose, tongue.

Know that the brain controls the body and is where you think and remember things.

Know the location of the brain.

Know that we have five senses - smell, taste, touch, sight, hearing

Know that the following body parts are linked to the senses

| Sense | Part of the body |
|---------|-----------------------------|
| sight | eyes |
| smell | nose |
| touch | hands, feet, arms, legs etc |
| hearing | ears |
| taste | tongue |

Know that herbivorous animals eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants

Know examples of a carnivore; that a rabbit is an example of a herbivore; know that many humans are examples of omnivores (though not vegetarians)

Working Scientifically

I can observe features of the human body.

I can carry out simple tests to compare and classify.

I can make predictions when using my senses.

I can ask questions to identify, sort and classify.

I can make comparisons between animals and give my reasons.

I can use sorting rings and Venn diagrams to record my findings.

I can complete a simple table.

I can record my findings using drawings, writing or symbols.

I can observe closely the structure of different minibeasts.

I can closely observe bird characteristics.

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| | <p>I can interpret my results and make simple conclusions.</p> <p><u>Scientific Enquiry</u></p> <p>I can identify different parts of the human body</p> <p>I can identify each taste and categorise them</p> <p>I can carry out a comparative test</p> <p>I can classify animals based on their characteristics.</p> <p>I can spot patterns between different groups of animals.</p> <p>I can identify and sort animals according to what they eat.</p> <p>I can identify how my body moves.</p> <p>I can identify my 5 senses when exploring the outdoor environment.</p> <p>I can identify different mini beasts based on observations.</p> <p>I can research facts about different birds.</p> <p>I can look for patterns in my data.</p> |
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YEAR 2

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| Year 2 | Focus of Study: Living Things and their habitats |
| NC Objectives | Key Explicit Knowledge and Vocabulary |
| <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> • explore and compare the differences between things that are living, dead, and things that have never been alive | <p><u>Context for study:</u></p> <p>Prior to this unit pupils will have already started to study habitats by looking at minibeasts in Reception. In year 2 pupils will learn about the food chains of animals in varying habitats and will look at microhabitats and the animals that live there. They will also learn how to determine if something is alive, was once alive or never lived,</p> |

- identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other

- identify and name a variety of plants and animals in their habitats, including microhabitats

- describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.

Maths – Statistics NC objectives

- Interpret and construct simple pictograms, tally charts, block diagrams and simple tables

Common Misconceptions:

- Fire is living
- Plants and seeds are not alive because they don't move
- Arrows in a food chain means 'eat'
- An animals habitat is like its home

using the acronym MRS NERG. This unit comes before work in year 4 where pupils will continue learning about habitats by grouping animals into categories, such as vertebrates/invertebrates, before moving onto work in year 6, studying adaptation and eco-systems. **Begin with a re-visit of elements of living things and their habitats from Year 1.**

Key Vocabulary: **Living, dead, never been alive**, suited, suitable, basic need, **food, food chain, shelter, move, feed, names of local habitats**, biome, organism, names of micro habitats

Knowledge Content:

The study of animals, including **humans** is part of the discipline of **biology** - the study of living **organisms**.

To know which items, including those made from a variety of materials, fit into each category and place them in a table under the headings **living, dead, and things that have **never been alive**.**

Understand that a flame is not alive and that a deciduous tree is not dead in Winter.

Know that living things move, grow, consume nutrients and reproduce; that dead things used to do these things but no longer do; and that things that never lived have never done these things.

Know the acronym **MRS NERG (Movement, Respiratory, Sensitivity, Nutrition, Excretion, Reproduction and Growth)** to teach about how to organise objects into each category.

Know the meaning of these terms from this table –

| | | |
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| M | Movement | All living things move, even plants. |
| R | Respiration | Getting energy from food. |
| S | Sensitivity | Detecting changes in the surroundings. |
| G | Growth | All living things grow. |
| R | Reproduction | Making more living things |
| E | Excretion | Getting rid of waste. |
| N | Nutrition | Taking in and using food. |

Know that a species of animal or plant that is **extinct** no longer has any living members in the world. e.g. dinosaurs, dodo.

Know that all creatures need air, food, shelter and water to survive

Know that animals and plants survive in a habitat because of each other and that different plants and animals live in different places because of their needs.

Link to food chains for how they depend on each other to survive.

Know the terms **omnivore**, **carnivore** and **herbivore** to describe the eating habits of animals in the food chain.

Know that the arrows on a food chain show the direction that the energy travels.

Recognise and name these larger habitats - **ocean**, **tropical rainforest**, **desert**, **woodland**, **tundra** and **polar ice**.

Know the names of plants in these habitats such as **cactus**, **tumbleweed (desert)**, **orchid**, **coffee plant (rainforest)** **dandelion**, **moss**, **clover**, **grass**, **shrub**, **conifer (woodland/grassland)**.

Know the names of minibeasts - **caterpillar**, **spider**, **woodlouse**, **beetle**, **worm**, **slug**, **water boatman**, **pond skater** and observe where they live. Know that an insect has 6 legs. Know that a spider has 8 legs and is an arachnid. Know that a worm and a slug are not insects.

Understand the term **microhabitat** (a small habitat specific to minibeasts within larger habitats) and name some examples

Know that Charles Darwin helped us to understand more about evolution

Know that Jane Goodall was an expert on chimpanzees and worked on conservation.

Working Scientifically

I can ask questions about where the object came from.

I can draw basic conclusions using own scientific knowledge, observations and comparisons.

I can record my observations using labelled drawings

I can record my findings using tables and pictograms.

I can interpret my results and create an environment suitable for my animal.

I can communicate my findings using relevant scientific language and illustrations.

Scientific Enquiry

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| | <p>I can identify and classify objects that are alive, dead and never been alive.</p> <p>I can identify which habitat each animal lives in.</p> <p>I can research facts about my animal using observations and secondary resources.</p> <p>I can look for patterns in my data as to where different minibeasts live.</p> <p>I can use secondary sources to find out what animals eat to make a food chain.</p> <p>Statistics – Construct simple tally charts and pictograms (Represent data to show living things within a given habitat) Power Maths, unit 7, lessons 1-3.</p> |
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YEAR 3

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| Year 3 | Focus of Study: Rocks and Soils |
| NC Objectives | Key Explicit Knowledge and Vocabulary |
| <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> • compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • describe in simple terms how fossils are formed when things that have lived are trapped within rock • recognise that soils are made from rocks and organic matter <p>Maths – Statistics NC objectives</p> | <p>Context for study:</p> <p>This unit is the third of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses. Previous learning includes comparing how things move on different surfaces. Pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects. Pupils have studied the work of John Dunlop and John MacAdam.</p> <p>This year 3 unit builds on pupils’ knowledge of properties of materials as pupils learn about rocks and soils. New learning includes comparing and grouping together different kinds of rocks on the basis of their appearance and simple physical properties. Pupils describe how fossils are formed when things that have lived are trapped within rock and recognise that soils are made from rocks and organic matter. The knowledge acquired of rocks and soils during this unit will help pupils understand the significance of the life and works of palaeontologist Mary Anning. Later in the year, during a separate Year 3 forces unit, pupils further develop their knowledge as</p> |

- Interpret and present data using bar charts, pictograms and tables
- Solve one-step questions using information presented in scaled bar charts, pictograms and tables

Common Misconceptions:

- 'Stones' and 'pebbles' are small pieces of rock
- The word 'stone' can be used instead of 'rock'
- That permeable means waterproof
- Soil and compost are the same thing
- A fossil is an actual piece of the extinct animal or plant
- Rocks are all hard
- Concrete and bricks are rock
- Any artefacts, e.g old coins are fossils

they 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.

This unit is the precursor to work studied in Year 4 as pupils study materials in terms of solids, liquids and gases. Year 5 pupils learn about dissolving, mixing and changes of state, and reversible and irreversible changes. Pupils also build on previous knowledge of magnetic and non-magnetic metals. **Begin with a re-visit of elements of materials from Year 2.**

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

Knowledge Content:

The study of rocks, fossils and soils is part of the discipline of **physics** - the study of the processes that shape our world and how we use it. It is also part of the discipline of **Chemistry** - the identification of the properties a substance is made from.

Know the three natural types of rocks: igneous, sedimentary and metamorphic. Know that the Earth has a solid **crust** made up of **tectonic plates** with **molten rock** beneath.

Igneous rocks are formed from the heat of **lava or magma**. They have large crystals. e.g. **Granite and basalt**

Sedimentary rocks are formed from **sediment** (small pieces of rock and earth that settle at the bottom of a liquid i.e. water) being **compressed** by the weight of the liquid above and **cementing** over time. They are made of small grains. e.g. **Limestone (chalk), coal and sandstone.**

Metamorphic rocks are formerly igneous or sedimentary rocks that have been **changed** at a chemical level due to intense heat from magma. e.g. **Marble and slate.**

Know how to use a **magnifying glass** to identify features of the rock types. Identify if the rocks have **grains** or **crystals.**

Know how to test a range of rocks for **density** (use comparative weight of similar sized rocks), **permeability/impermeability** (waterproof - pour a small amount of water and observe it is absorbed or runs off) and **strength** (hard or soft - use a coin or similar object to scratch the rock and observe whether particles are easily dislodged). They will then decide which rock group the rock belongs to, based on the properties.

Teacher note - do not test durability but teach that igneous rocks are very durable, sedimentary rocks are not durable and metamorphic rocks are durable)

FOSSILS

Know that a fossil is the hard **remains of a prehistoric animal or plant that are found inside a rock**

Know that fossils are comprised of **body fossils** (animal bones) and **chemical fossils** (that contain **carbon** and prove life once existed such as imprints in the ground and leave **trace fossils** behind) and understand how fossils are formed.

Know that fossils are only found in **sedimentary** rock and go through the same process of **compression** and **cementation** in the ground over long periods of time.

Know that it is very rare for living things to become fossilised. Usually after most animals die their bodies just rot away and nothing is left behind. However, under certain special conditions, a fossil can form.

Know the sequence of fossil formation as –

1. Animal dies and is buried by sediment
2. Soft parts of the animal decay or decompose
3. More sediment builds up around the animal and is compressed to form rock
4. Bones start to be dissolved by water underground
5. Minerals in the water then turn to rock.

Know that **Mary Anning** is famous for finding many important fossils.

Know that she was born in 1799 in Lyme Regis, **Dorset** which is near the coast.

Know that 200 million years ago Dorset was beneath the sea.

Know that her fossils helped us to understand more about **prehistoric** animals.

Know the term **palaeontology** means 'a person who studies fossils'

Know the term dinosaur comes from the Greek word deinos (terrible) and sauros (lizard) which, put together, makes 'terrible lizard.'

Know that dinosaurs are actually **reptiles** not lizards.

Learn about the discovery of the **ichthyosaur** skull and a complete **plesiosaur** and how this changed the view of the **prehistoric** (pre-written history) natural world.

Know that previously people did not believe in dinosaurs as real, as there was no evidence. It also helped people realise the world was much older than previously thought.

SOIL

Know that soil is a **mixture** of air, water, broken down rock **matter** and other **organic** material (dead or living animal **tissue**)

Know the names of common soil types: sand, clay and silt.

Know that sandy soil is dry and gritty, and does not hold onto water.

Silty soil is richer in nutrients and smoother to the touch. It has smaller **particles** (a tiny piece of matter) and it can retain water for longer but will eventually start to lose this.

Clay soil has the smallest **particles** and so absorbs more water. It is **silky** when wet but smooth and solid when dry. It contains the most nutrients as they cannot escape in water.

Know that topsoil is dark in colour and high in **organic** matter

Know that **subsoil** usually appears to be lighter in colour and has a sticky texture

Know that **bedrock** is the solid rock in the ground which supports all the soil above it.

Working Scientifically

I can make careful observations and identify similarities and differences.

I can record my classifications in a table, Venn diagram or Carroll diagram.

I can record my results in a table and rank my rocks to answer enquiries.

I can interpret the process of fossilisation using a model and pictures.

I can ask questions to deepen my learning about rock formation

I can set up tests to answer questions.

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| | <p><u>Scientific Enquiry</u></p> <p>I can compare and group materials together depending on their properties.</p> <p>I can classify rocks using their properties</p> <p>I can sort and classify materials into magnetic and non-magnetic.</p> <p>I can research and learn about significant scientists in history. (Mary Anning)</p> <p>I use research and models to help demonstrate my learning.</p> <p>I can make systematic and careful observations over time.</p> <p>Statistics – Interpret tables (Learn about the properties of rocks by interpreting tables of information) Power Maths, unit 7, lesson 5.</p> <p>Solve one-step and two-step questions [for example, ‘How many more?’ and ‘How many fewer?’] using information presented in tables. Power Maths, unit 7, lesson 5.</p> |
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YEAR 4

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| Year 4 | Focus of Study: Living things and their habitats |
| NC Objectives | Key Explicit Knowledge and Vocabulary |
| Pupils should be taught to: <ul style="list-style-type: none"> • recognise that living things can be grouped in a variety of ways • explore and use classification keys to help group identify and name a | <p>Context for Study:</p> <p>This unit is the fourth of six science units where pupils learn about plants and animals as part of the discipline of biology- the study of living organisms. Pupils have a secure knowledge of the functions of the different parts of flowering plants and the requirements of plants for life and growth. They know how water is transported within plants 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</p> |

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| <p>variety of living things in their local and wider environment</p> <ul style="list-style-type: none"> recognise that environments can change and that this can sometimes pose dangers to living things. <p>Maths – Statistics NC objectives</p> <ul style="list-style-type: none"> interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs <p><u>Common Misconceptions:</u></p> <ul style="list-style-type: none"> the death of one of the parts of a food chain has no or limited consequence on the rest of the chain there is plenty of food for wild animals animals are only land-living creatures animals and plants can adapt to their habitat; however, they change all changes to habitats are negative | <p>living things. and the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</p> <p>This Year 4 unit builds upon pupils’ prior knowledge of plants as they identify and name a variety of living things in their local and wider environment. Pupils group living things and begin to use classification keys for flowers (flowering and nonflowering). Animals are classified into warm blooded and cold-blooded, vertebrates and invertebrates. Pupils learn that environments can change and that this can sometimes pose dangers to living things. The knowledge of plants acquired in this unit will help pupils at the end of Year 4 to construct and interpret a variety of food chains, identifying producers, predators and prey. This is the precursor to work studied in Year 5 as pupils identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. They will also describe the life process of reproduction in some plants and animals. This links to work studied in Year 5 and 6 when pupils study classification, adaptations and sexual reproduction in plants. Begin with a re-visit of elements of living things and their habitats from Year 3.</p> <p>Key vocabulary: Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate, fish, amphibian, reptile, bird, mammal, vertebrate, invertebrate, shelter, food, protection, endangered</p> <p><u>Knowledge Content:</u></p> <p><u>Grouping plants and animals</u></p> <p>Know that animals and plants can be put into different groups this is called classification.</p> <p>Know that classification is the arrangement of things into groups according to their observed similarities.</p> <p>Know the features of living things; movement, respire (breathe), sensitivity to environment, nutrients, excrete, reproduce, grow</p> <p><u>Warm Blooded vs Cold Blooded</u></p> <p>Know that animals can be divided into warm and cold blooded</p> |
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| Type | Definition | Example |
|--------------|---|----------------------------|
| Warm Blooded | Animals that can make their own body heat even when it is cold outside | Humans, mammals, birds |
| Cold Blooded | Animals that cannot make their own heat. They need the sun's warmth to heat their bodies. | reptiles, amphibians, fish |

Vertebrates and Invertebrates

Know that animals can be classified into **vertebrates and invertebrates**.

Know that vertebrates are animals with a backbone and that invertebrates have no backbone and can be hard bodied or soft bodied.

Know that vertebrates will include **fish, amphibians, reptiles, birds and mammals**.

Invertebrates into **molluscs, worms, arachnids and insects**.

Mammals are warm blooded, have fur or hair, usually give birth to live young and typically feed their young milk.

Fish are cold blooded, breathe using gills, lay eggs and have fins.

Reptiles are cold blooded, have dry scaly skin and lay their eggs on land.

Birds are warm blooded, have feathers and lay eggs.

Amphibians are cold blooded, breathe air but lay eggs underwater as their young use gills to breathe.

Molluscs have soft, **unsegmented** bodies but use shells for protection. They live in damp, wet habitats.

Worms are long, slender unsegmented animals that burrow underground and have no additional limbs. (Know that limb is a word used to mean arms and legs)

Arachnids usually have **segmented** body parts and eight legs.

Insects have six legs, 3 **segmented** body parts and generally have one or two sets of wings.

Know that insects have 3 parts to their body structure head, thorax and abdomen

Know how to identify these in a range of different insects (real and from pictures)

Know the names of these common UK Woodland animals, the classification groups they are members of and identify pictures of them –

Mammals: **Weasel, badger, rabbit, bat, deer, fox, mole**

Fish: **Salmon, brown trout**

Birds: **Barn owls, blackbird, kestrel, cuckoo, great spotted woodpecker, kingfisher**

Reptiles: **Adder, Grass Snake, Common lizard**

Amphibians: **Common frog, Common toad, Smooth newt**

Molluscs: **Slug, Garden Snail,**

Arachnids: **Harvestman, Garden Spider**

Worms: **Common earthworm**

Insect: **Peacock Butterfly, wood ant, wasp, bee, cricket, centipede, millipede, woodlouse, grasshopper**

Know that Carl Linnaeus created a system for naming organisms

Know that David Attenborough observes endangered species.

Classifying Flowers

Know that plants can be classified into **flowering and non-flowering plants**. Flowering plants such as **grasses** and non-flowering plants such as **ferns, mosses**. Discuss the key features of each plant group.

Know how to identify grass and moss in the local environment

Know that deciduous trees lose leaves after the growing season

Know that evergreen trees stay green all year

Flowering plants will have a flower head or fruit.

Non flowering plants do not produce flowers or fruit.

Flowering plants: dandelion, buttercup, daisy, bluebell

Non-flowering plants: fern and moss

Changing Environments

Know that humans can impact positively and negatively on the environment.

Know that negative impacts include cutting down trees (deforestation), building roads/houses, growing population, littering, plastic in oceans.

Know some examples of endangered species

Know that positive impacts include building nature reserves, protecting land, introducing different species e.g. reintroduction of Beavers. Conservation groups such as the Royal Society for the Protection of Birds (RSPB)

Working Scientifically

I can observe the features of living things.

I can identify similarities and differences in human characteristics.

I can gather, record and classify data.

I can ask relevant questions.

I can use evidence to answer questions.

I can record my findings from investigations using scientific language.

Scientific Enquiry

I can identify different animals and classify them into different groups.

I can identify and classify based on human characteristics.

I can identify patterns by finding and identifying mini beast habitats.

I can identify and classify living things.

I can use research about endangered animals to show how environments can change.

I can research the effects of changing environments on animals.

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| | <p>Statistics: Interpret and present discrete data using appropriate graphical methods, including bar charts. (Bar charts could be used to interpret or present data about changes to environments or living things found within certain habitats) Power Maths, unit 14, lesson 1 & 2.</p> <p>Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs (Children could interpret information about living things/environments from a range of graphs) Power Maths, unit 14.</p> |
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YEAR 5

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| Year 5 | Focus of Study: Forces |
| NC Objectives | Key Explicit Knowledge and Vocabulary |
| <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. <p>Maths – Statistics NC objectives</p> | <p>Context for study:</p> <p>This unit is the second of three science units where pupils study forces as part of the discipline of physics - the study of the processes that shape our world and how we use it. There are also many links to the discipline of chemistry - the identification of the properties a substance is made from. Pupils have a secure knowledge of resistance and friction, are able to compare how things move on different surfaces and know that applying forces to objects can change their shape. Previous learning includes studying the work of scientist John MacAdam and his invention of the tarmac road.</p> <p>In Year 5, pupils revise and build upon previous learning on magnetism. They know some forces need contact between two objects, but magnetic forces can act at a distance. Pupils know magnets have two poles and that they attract or repel each other. Pupils further develop their knowledge of magnetic and non-magnetic materials with thermal and electrical conductivity. New learning in this unit includes knowing that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Pupils study the effects of air resistance, water resistance and friction, that act between moving surfaces. By the end of the unit, pupils will know that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. The knowledge acquired in this unit will help pupils as they learn more about materials and their properties. This unit is the precursor to further work in year 5 as pupils study the movement of the Earth in space. Begin with a re-visit of elements of forces from Year 3.</p> |

- interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs (Y4)
- complete, read and interpret information in tables, including timetables

Common Misconceptions:

- 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
- 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 force acting on it
- heavy objects sink and light objects float

Key Vocabulary: **Force, Gravity, Earth, air resistance, water resistance, friction**, mechanisms, simple machines, **levers, pulleys, gears, Newton**, up thrust, opposing, streamline, brake, cog, weight, mass.

Knowledge Content

The study of **forces** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that the **force** that pulls things to the ground on Earth (and other planets) is called **gravity**.

Know that gravity acts as a pull force making **unsupported** objects fall towards Earth. Know that gravity pulls towards earth wherever you are on Earth.

Know that gravity holds Earth and the other planets in their **orbits** around the Sun.

Know that the force of gravity also exists on the Moon but it is not as strong as it is on Earth. This is because the Moon is much smaller than our planet. Know that objects appear to float in space because of the lack of gravity. Astronauts experience **weightlessness** in space.

Know that objects with greater **mass** have a stronger force of gravity. As the earth is bigger than the Moon the force of gravity is stronger. **Understand the difference between mass and weight. Know that mass is constant** (never changes regardless of whether you are, for example, on Earth or in space). Know that weight is the force of gravity on an object and therefore changes depending on where you are. Your weight on the moon is about $\frac{1}{6}$ of your weight on earth although your mass does not change.

Know that this means astronauts move differently when walking on the moon.

Galileo Galilei

Know that **Galileo Galilei** (1564 - 1642) was a scientist from Italy. He discovered that when you drop two objects of similar shape and size but of different mass they will fall at the same rate. This went against the common-sense idea at the time from Aristotle who believed that heavier objects fell faster.

He is said to have dropped objects from the **Leaning Tower of Pisa** to demonstrate this. Most scientists and historians believe this was a '**thought experiment**' and did not actually happen. A thought experiment is when you imagine the outcome of an experiment rather than carry it out directly.



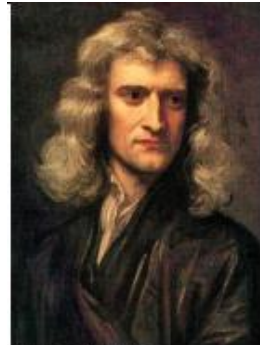
Leaning Tower of Pisa



Galileo Galilei

Isaac Newton

To know that **Sir Isaac Newton** (1642 - 1726) was an English mathematician and scientist. He is known as one of the most **influential** scientists of all time. He developed Newton's law of **universal gravitation**. **Know that he is said to have 'discovered' the concept of gravity** when sitting under a tree and an apple fell to the ground near him. There is a common myth that the apple landed on his head which is generally considered to be untrue.



Sir Isaac Newton

Friction, Air Resistance and Water Resistance

Know that friction occurs when objects move through water or air. Air resistance is a type of friction between air and another material (this is sometimes called **drag**). Know that **air resistance** is the frictional force air **exerts** against a moving object. As an object moves, air resistance slows it down. The faster the object's motion, the greater the air resistance exerted against it. Air resistance affects all moving objects. For example, when an

aeroplane flies through the air, air particles hit the aeroplane making it more difficult for it to move through the air.

It's the same for an object moving through water. If you go swimming, there is friction between your skin and the water particles. This is known as **water resistance**.

When something is in water, there are two forces acting on it. Its weight and the force of the water pushing up, the **upthrust**.

If the weight is equal to or less than the upthrust, it floats. Things that float are '**buoyant**'. Know that '**buoyancy**' is the ability of an object to float in liquid or the air. Know that a **buoy** is a floating object that is used to show ships and boats where they can go and to warn them of danger.

Know that if the weight of an object is greater than the upthrust, it sinks.

Know how to use arrows on diagrams to show the forces at work in given situations e.g. submarine in water, parachute falling, car moving on the road.

Levers, Pulleys and Gears

Know that **levers, pulleys and gears** are mechanisms that allow a small force to have a greater effect.

Levers

Know that a lever is a simple **mechanism** used to move or lift objects.

Know how to label a diagram showing a lever, **load, effort and a fulcrum or pivot**.

Know that the nearer the fulcrum/pivot to the load then the less effort is needed. Know that a seesaw works because the fulcrum is in the middle. Consider what would happen if a seesaw had the fulcrum closer to one end.

Gears

Know that **gears** are toothed wheels that lock together and turn each other.

Know that gears are often different sizes.

A number of gears connected together are called a **gear train**

Small gears rotate faster than large ones and need less effort to move.

Know that gears on a bike enable us to go faster than we could normally move without using up a lot of energy.

For further information - <https://www.dkfindout.com/uk/science/simple-machines/gears/>

Watch examples of gears - https://www.youtube.com/watch?v=D_i3PJYtuY

Pulley

Know that a **pulley** is a device consisting of a wheel over which a rope or chain is pulled in order to lift heavy objects. Know that when someone raises a flag up a flagpole a pulley system is used.

Working Scientifically

I can observe different forces and measure the force using scientific equipment.

I can set up a test which answers a scientific enquiry

I can interpret and communicate results, from my data using scientific vocabulary.

I can plan different types of enquiries to answer questions.

I can take measurements using a range of scientific equipment with increasing accuracy and precision taking repeat readings.

I can record my results in a table.

Scientific Enquiry

I can research the effects of gravity and research Sir Isaac Newton's theories.

I can observe over time

I can conduct a fair test to explore the effects of air resistance on a falling object.

I can conduct a comparative test to investigate water resistance.

I can look for patterns in my results.

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| | <p>Statistics: (Y4) interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs (Using data relating to different forces) Power Maths, unit 14 (Y4)</p> <p>Solve comparison, sum and difference problems using information presented in a line graph (This could be linked to different forces which act upon a n object over time) Power Maths, unit 4, lesson 3 & 4.</p> <p>Complete, read and interpret information in tables (This could relate to investigations involving different forces) Power Maths, unit 4, lesson 1 and 2</p> |
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YEAR 6

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| Year 6 | Focus of Study: Light |
| NC Objectives | Key Explicit Knowledge and Vocabulary |
| <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> recognise that light appears to travel in straight lines use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes use the idea that light travels in straight lines to explain why | <p>Context for study:</p> <p>This unit is the second of two science units where pupils learn about light as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the terms opaque, transparent and translucent; what plants need, including light, to grow well and how energy from light is the start of a food chain. Previous learning includes knowing that light from the sun can be dangerous and that there are ways to protect their eyes. Pupils also know we need light in order to see things and that dark is the absence of light.</p> <p>This unit builds upon pupils' prior knowledge that shadows form when the light from a light source is blocked by an opaque object. Pupils already know that light is reflected from surfaces and it can be separated into a prism of colours. New learning includes knowing how light appears to travel in straight lines. Pupils learn that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. This new knowledge acquired in Year 6 is used to explain why shadows have the same shape as the objects that cast them and that those objects are seen because they give out or reflect light into the eye. This is the precursor to work studied in KS3 as pupils continue to learn about how light can be reflected, refracted and dispersed as part of the discipline of physics. Begin with a re-visit of elements of light from Year 3.</p> |

shadows have the same shape as the objects that cast them.

Common Misconceptions:

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

Key Vocabulary: Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous, refraction, medium, dense.

Knowledge Content

The study of light is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that **light travels in straight lines** from its source. Know that some light sources are **natural** (stars, sun, fire, lightning, bioluminescence) and some are **man-made** (torch, light bulb, digital screen, laser pointer)

Know that light either travels in a straight line **directly** from the source or by **reflecting** off a **surface** into our eye.

Know how to draw arrows to show light entering the eye from a light source or reflection.

Know that **reflection** is when light bounces off a surface, changing the direction of a **ray** of light.

Know that all objects reflect light; smooth and shiny surfaces reflect all the rays of light at the same angle, rather than **scattering** the rays of light like rough or dull surfaces.

Know that when rays of light reflect, they obey the law of reflection: The angle of **incidence** always equals the angle of **reflection**. Demonstrate with a laser pointer and mirror. Predict where the laser will point given a change in angle.

Know that light appears colourless (or white) when produced by natural light sources e.g the sun or artificial light sources such as light bulbs.

Know what white light is made up of a spectrum of colours with different wavelengths.

Know examples of mirrors used in real life e.g. car wing mirror, cameras,

Shadows

Know that a shadow is formed when light is blocked by an **opaque** object. Know that opaque means light cannot pass through, **translucent** means some light can pass through but it is difficult to see through and that **transparent** means light can pass easily through and it is easy to see through.

Understand that as light travels in straight lines shadows have the same shape as the objects that cast them.
Understand that if something **casts** a light or shadow somewhere, it causes it to appear there.

Know that the further the light source from the opaque object the bigger the shadow.

Know that the nearer the light source from the opaque object the smaller the shadow.

Know that the shadow of an object can be moved by moving the light source.

Know that a silhouette is different from a shadow because a silhouette is the solid dark shape that you see when someone or something has a bright light or pale background behind them.

The Eye

Know that the amount of light entering the eye is controlled by the **pupil**, which is surrounded by the **iris** – the coloured part of the eye. Know that the pupil **dilates** when it is darker to let more light into the eye. The pupil **constricts** when it is bright to reduce the amount light entering the eye.

Know how the eyes see an image

Working Scientifically

I can use scientific diagrams, models and labels.

I can use labelled diagrams to support my explanation.

I can make careful observations about how the eye works.

I can draw diagrams to represent concepts with accuracy

I can make predictions based on scientific knowledge and use tests to gather evidence to support my predictions.

I can evaluate, using scientific language, how my enquiry answers the question.

Scientific Enquiry

I can look for patterns in how light reflects from surfaces.

I can use subject knowledge and research to make a periscope

I can identify different parts of the eye and explain how each part works.

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| | <p>I can look for patterns in my observations. I can use subject knowledge about refraction to make predictions. I can look for patterns in how we see things.</p> |
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