



Year	5	Topic	Living things and their habitats
National Curriculum aims			
<ul style="list-style-type: none"> Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals. 			

Prior learning	Key vocabulary
<ul style="list-style-type: none"> Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) 	life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, bulbs, cuttings

Key vocabulary including definitions

life cycle	A series of stages a living thing goes through during its life.	plantlets	A young plant.
reproduce	To make babies.	runners	A side shoot to create a new plantlet.
sexual	A way of reproducing involving a male and female.	tubers	A thickened part of an underground stem of a plant, such as the potato.
asexual	Reproduction that happens from one producer.	bulbs	An underground seed.
fertilises	When sex cells fuse together to reproduce to make more species.	cuttings	A cut part of a plant capable of reproducing into a new plant.

Common misconceptions

Some children may think: <ul style="list-style-type: none"> all plants start out as seeds all plants have flowers 	<ul style="list-style-type: none"> plants that grow from bulbs do not have seeds only birds lay eggs.
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WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Key learning

Reproduction means living things creating other living things. Animals have babies. Plants have seeds which turn into new plants. The life cycle of mammals, amphibians, insects and birds.

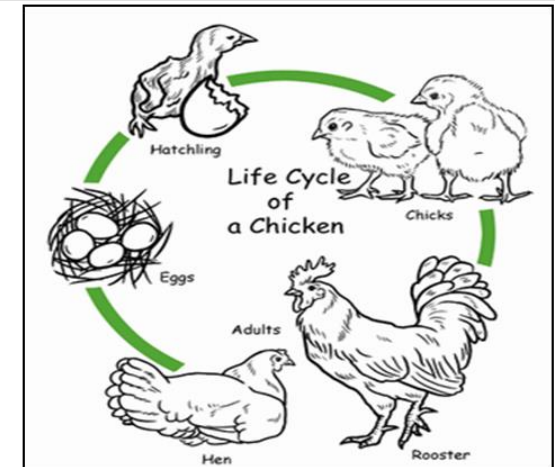
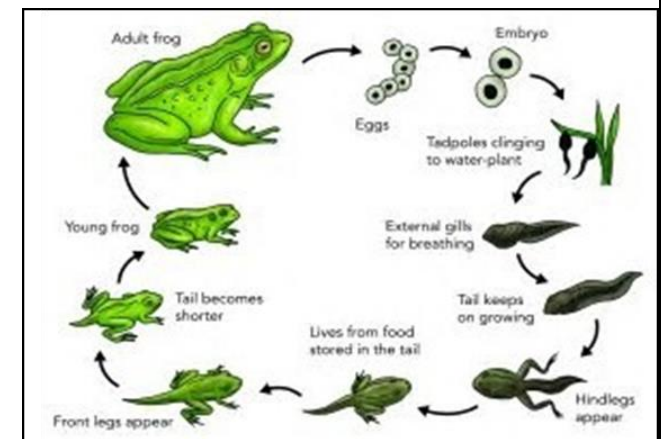
As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis.

Plants reproduce both sexually and asexually. Sexual reproduction in plants (two parents)-When the pollen from one flower joins the egg of the new flower and a seed or many seeds are formed. Sexual reproduction occurs through pollination, usually involving wind, insects, animals (through their fur or faeces) or explosion. An example of this is the apple tree.

Asexual reproduction (one parent) - This is when a small part of a plant breaks off and it starts to grow until it is the same size as the plant it came from and this is repeated. (Flowers are not needed). Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. An example of this is the spider plant.

Facts about David Attenborough- Born 8th May 1926; famous wildlife film maker; knighted in 1985; he is the only person to have won BAFTAs for programmes in each of black and white, colour, HD and 3D.

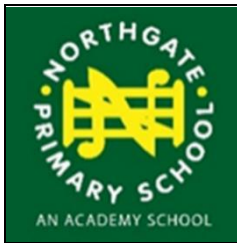
Facts about Jane Goodall- Born 3rd April 1934; considered to be the world's foremost expert on chimpanzees; has studied chimpanzees for 45 years in Gambe Stream National Park.



Activities	Possible evidence
<ul style="list-style-type: none"> • Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals. • Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. • Look for patterns between the size of an animal and its expected life span. • Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes. • Take cuttings from a range of plants e.g. African violet, mint. • Plant bulbs and then harvest to see how they multiply. 	<p>For ARE</p> <ul style="list-style-type: none"> • Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles • Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways • Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game • Can identify patterns in life cycles • Can compare two or more animal life cycles they have studied • Can explain how a range of plants reproduce asexually
Future learning	<p>For GD</p> <ul style="list-style-type: none"> • Compare internal and external fertilisation in animals • Explain that living things need to reproduce if the species is to survive • Compare gestation periods (pregnancy) of different animals • Explain what is unusual about the life cycle of a kangaroo or koala
<ul style="list-style-type: none"> • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3) 	

Working scientifically skills covered in this topic

Observing	<ul style="list-style-type: none"> ➤ Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes. ➤
Using sources of information	<ul style="list-style-type: none"> ➤ Use secondary sources to find out about pollination.
Recording	<ul style="list-style-type: none"> ➤ Recording the gestation time in different mammals on a scatter graph.
Identifying and classifying using	<ul style="list-style-type: none"> ➤ Identify the life process of reproduction in vertebrates and plants. ➤ Compare the life cycles of vertebrates and plants.



Year	5	Topic	Animals, including humans
<ul style="list-style-type: none"> Describe the changes as humans develop to old age. 			

Prior learning	Key vocabulary
<ul style="list-style-type: none"> Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) 	puberty, gestation, adulthood, reproduce, lifecycle, adolescence, life expectancy, hormones

Key vocabulary including definitions			
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puberty	The physical stage of development between childhood and adulthood	lifecycle	A series of stages a living thing goes through during its life.
gestation	The process in which a foetus grows before it is born	adolescence	The stage a life when your body changes to prepare for adulthood
adulthood	The stage of life when a human is fully grown and mature	life expectancy	The length of time , on average, that something is expected to live for
reproduce	When an animal or plant produces young	hormones	Chemicals that tell cells and body parts to do certain things

Common misconceptions			
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<p>Some children may think:</p> <ul style="list-style-type: none"> a baby grows in a mother's tummy a baby is "made". 			
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Key learning

The 6 stages of human development- infancy, childhood, adolescence, early adulthood, middle adulthood, late adulthood.

When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. The length and mass of babies and how this changes over a period of time making comparisons between the different genders.

At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. Puberty is when the body develops.

Puberty usually happens between the ages of 10 and 18. During puberty, the bodies of boys and girls begin to change. Changes for girls are: Hair starts to grow on their bodies. Breasts develop and hips widen. Periods start. Changes for boys are: Hair starts to grow on their bodies. Hair starts to grow on their faces. Testicles start to produce sperm.

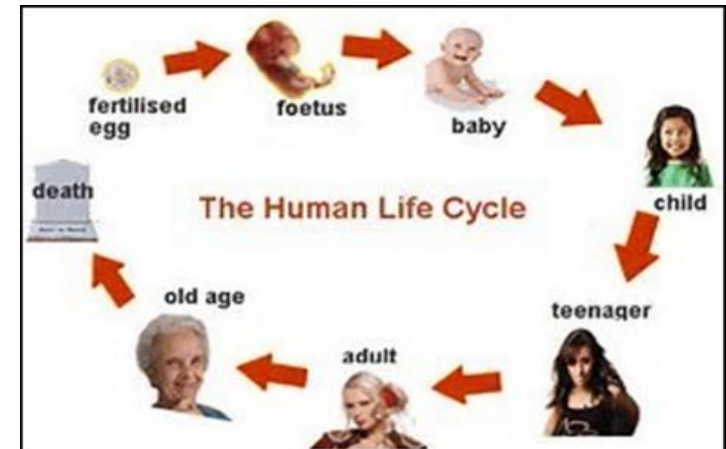
The gestation periods of mammals in comparison to that of a human gestation period.

- This needs to be taught alongside PSHE. The new statutory requirements for relationships and health education can be found below: [statutory guidance on Physical health and mental wellbeing \(primary and secondary\)](#).

Other useful guidance includes:

- [Joint briefing on teaching about puberty in KS2 from PHSE Association and Association for Science Education](#)

[Briefing on humans development and reproduction in the Primary Curriculum from PHSE Association and Association for Science Education.](#)



Activities	Possible evidence
<p>This unit is likely to be taught through direct instruction due to its sensitive nature, although children can carry out a research enquiry by asking an expert e.g. school nurse to provide answers to questions that have been filtered by the teacher.</p>	<p>For ARE</p> <ul style="list-style-type: none"> • Can explain the changes that takes place in boys and girls during puberty • Can explain how a baby changes physically as it grows, and also what it is able to do • Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions'
Future learning	
<p>Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)</p>	

Working scientifically skills covered in this topic

Planning and setting up enquiries	➤ Do children who are taller have larger feet?
Using equipment	➤ Using metre sticks / rulers to measure height.
Measuring	➤ Measuring height and shoe size.
Recording	<ul style="list-style-type: none"> ➤ Recording the growth of a baby over time in a bar chart. ➤ Recording the growth of boys and girls on a scatter graph. ➤ Recording children's height and shoe size in a table. ➤ Recording changes that happen to boys and girls in a venn diagram.
Identifying and classifying using	<ul style="list-style-type: none"> ➤ Identify the different stages of human development. ➤ Identify the main changes that happen during puberty.
Conclusions	➤ Concluding whether taller children have larger feet or not.



Year	5	Topic	Properties and changes of materials
<p>National Curriculum aims</p> <ul style="list-style-type: none"> • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. 			

Prior learning	Key vocabulary
<ul style="list-style-type: none"> • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter) 	<p>Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material</p>

Key vocabulary with definitions

insulator	A material that doesn't allow heat or electricity to easily pass through it.	filter	A device to remove unwanted parts from something.
conductor	A material that does allow heat or electricity to easily pass through it.	sieve	A piece of equipment with a mesh or holes to separate materials.
mixture	A substance in which two or more substances are mixed but not chemically joined together.	reversible	Something that can be changed back.
dissolve	The process that occurs when a solute is added to a solvent and the solute mixes.	irreversible	Something that can't be changed back.
soluble	The ability to dissolve (become part of another substance).	burning	A process in which a substance reacts with oxygen to give heat and light.
insoluble	A material that does not dissolve in water.	rusting	How iron oxidises by the presence of water. It turns a red, brown and orange colour.

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Key learning

Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures are substances that are mixed together, but dissolving hasn't taken place. For example, mixing, cucumber slices, egg slices and tomato slices to make a salad. Some substances dissolve in a liquid. When this happens the liquid is called a solution. For example, when gravy granules dissolve in water, this is a solution.

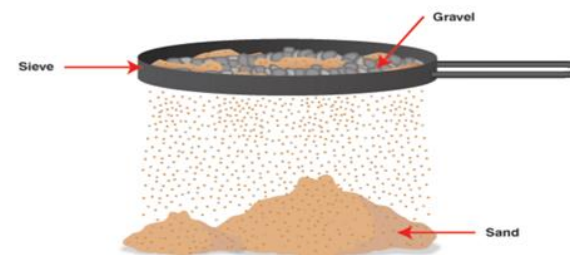
Mixtures can be separated by filtering, sieving and evaporation. Evaporation is when a liquid evaporates into a gas when it is heated. This removes the liquid and leaves the substance behind. Evaporation is used when the soluble substance is too mixed into the water, it can't be removed by sieving or filtering. Filtering- a mixture of water and an insoluble substance like sand can be separated by filtering. The mixture is passed through filter paper. The sand particles cannot pass and will be separated from the water.

Sieving- A mixture of solid particles of different sizes can be separated by sieving. For example: sand and gravel.

Reversible and irreversible changes- Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible. Thermal conductors let heat pass through easily (like a metal kettle). Thermal insulators do not let heat pass through them easily (a wooden pan handle).

Sieving

A mixture made of solid particles of different sizes, for example sand and gravel, can be separated by sieving.



Filtering

A mixture of water and an insoluble substance like sand can be separated by filtering.

The mixture of sand and water is poured into the filter funnel, which is lined with filter paper. The water can pass through the paper to collect in the beaker. The sand particles cannot pass through the filter paper and collect in the filter funnel.



Common misconceptions

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

Some children may think:

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

Activities	Possible evidence
<ul style="list-style-type: none"> Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat. Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate. Investigate rates of dissolving by carrying out comparative and fair test. Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture. Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning. Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced? Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton). 	<p>For ARE</p> <ul style="list-style-type: none"> Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings Can explain what dissolving means, giving examples Can name equipment used for filtering and sieving Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving Can describe some simple reversible and non-reversible changes to materials, giving examples Can create a chart or table grouping/comparing everyday materials by different properties Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose Can group solids based on their observations when mixing them with water Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water Can explain the results from their investigations
<p style="text-align: center;">Future learning</p> <ul style="list-style-type: none"> Chemical reactions as the rearrangement of atoms. (KS3) Representing chemical reactions using formulae and using equations. (KS3) Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) Defining acids and alkalis in terms of neutralisation reactions. (KS3) The pH scale for measuring acidity/alkalinity; and indicators. (KS3) 	<p>For GD</p> <ul style="list-style-type: none"> Describe the difference between melting and dissolving Recognise that inks and dyes are often mixtures of different colours and these can be separated by chromatography Explain why ink or dye moves up the paper in chromatography Describe the properties of new materials (e.g. aerogel, silly putty, wrinkle-free cotton) Explain why some materials are good thermal insulators

Working scientifically skills covered in this topic

Planning and setting up enquiries	<ul style="list-style-type: none">➤ Investigating and testing the properties of different materials.➤ What is the best material for a lunch box?➤ Testing which materials dissolve in water.➤ Investigating which electrical conductors make a bulb shine brightest.
Using equipment	<ul style="list-style-type: none">➤ Using magnets to test magnetism of materials.➤ Using thermometers to measure temperature of ice.➤ Using bulbs, batteries and wires to test electrical conductors.
Observing	<ul style="list-style-type: none">➤ Observing which materials dissolve in water.➤ Observe what happens when vinegar is mixed with warm milk.
Measuring	<ul style="list-style-type: none">➤ Measuring temperature at different times.
Recording	<ul style="list-style-type: none">➤ Recording properties of different materials in a table.➤ Recording temperature at different times on a line graph.
Identifying and classifying using	<ul style="list-style-type: none">➤ Group materials based on whether they are soluble or insoluble.➤ Identify and group reversible and irreversible changes



Year	5	Topic	Earth and space
<u>National Curriculum aims</u> <ul style="list-style-type: none"> Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Describe the movement of the Moon relative to the Earth. Describe the Sun, Earth and Moon as approximately spherical bodies. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. 			

Prior learning	Key vocabulary
<ul style="list-style-type: none"> Explore the natural world around them. (Reception - Earth and space) Describe what they see, hear and feel whilst outside. (Reception - Earth and space) Observe changes across the four seasons. (Y1 - Seasonal changes) Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes) 	Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit

Key vocabulary with definitions			
sun	A star at the centre of the solar system.	solar system	The Sun and everything that orbits, or travels around, the Sun.
moon	A large natural object that orbits the earth.	rotate	To turn an object around a centre point.
earth	The third planet from the sun which we live on.	star	An exploding ball of burning gas held together by gravity.
planets	A large natural object that orbits around a star.	orbit	The path of an object around a particular point in space.
spherical	Ball shaped.		

Key learning

The Sun is a star. It is at the centre of our solar system.

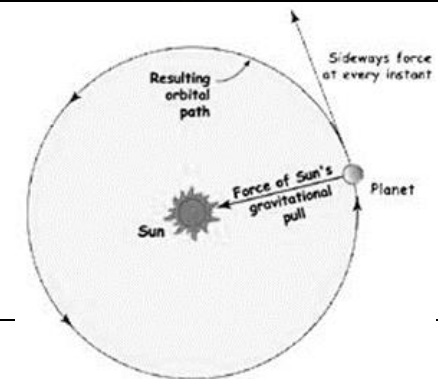
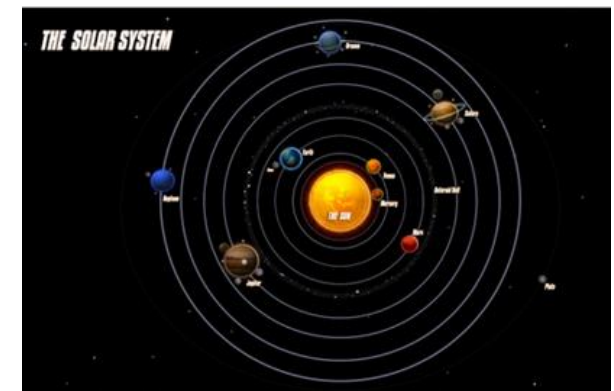
The sun, Earth and moon are approximately spherical bodies and there are 8 planets (can choose to name them- Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet in 2006- but not essential). Planets are lighter than the sun, therefore they orbit the sun rather than the sun orbiting the planets. The sun is 1000 times heavier than the largest planet, Jupiter.

The movement of the Earth and other planets relative to the sun in the solar system- understand that planets travel around the Sun in fixed orbits.

Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. Earth takes $365\frac{1}{4}$ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky.

The moon is a celestial body that orbits a planet (earth has one moon; Jupiter has 4 large moon and numerous smaller ones. The movement of the moon relative to the Earth. The Moon orbits the Earth. It takes about 28 days to complete its orbit.

Ideas about the solar system have developed- the geocentric model of the solar system gave way to the heliocentric model by considering the work of Scientists such as Ptolemy, Alhazen and Copernicus.



Common misconceptions

Some children may think:

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

Activities

- Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth.
- Use secondary sources to help make a model to show why day and night occur.
- Make first-hand observations of how shadows caused by the Sun change through the day.
- Make a sundial.
- Research time zones.
- Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel.

Possible evidence

For ARE

- Can create a voice over for a video clip or animation
- Can show, using diagrams, the movement of the Earth and Moon
- Can explain the movement of the Earth and Moon
- Can show using diagrams the rotation of the Earth and how this causes day and night
- Can explain what causes day and night
- Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth
- Can demonstrate and explain verbally how day and night occur
- Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model
- Can explain how a sundial works
- Can explain verbally, using a model, why we have time zones
- Can describe the arguments and evidence used by scientists

Future learning

- Gravity force, weight = mass x gravitational field strength (g), on Earth $g=10 \text{ N/kg}$, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). (KS3)
- Our Sun as a star, other stars in our galaxy, other galaxies. (KS3)
- The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)
- The light year as a unit of astronomical distance. (KS3)

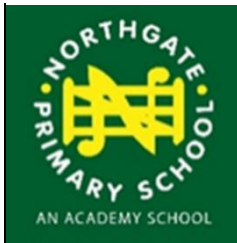
in the past

For GD

- Explain that gravity is a force of attraction and it is what holds the planets in orbit around the Sun and the Moon in orbit around the Earth
- Explain that the changes in the appearance of the Moon over a period of 28 days arise from the Moon orbiting the Earth once every 28 days
- Use simple physical models to explain effects that are caused by the movement of the Earth
- Explain how ideas about the solar system have changed over time

Working scientifically skills covered in this topic

Using other sources of information	<ul style="list-style-type: none"> ➤ Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth. ➤ Use secondary sources to help make a model to show why day and night occur.
Recording	<ul style="list-style-type: none"> ➤ Recording data about the planets in a bar chart.
Identifying and classifying	<ul style="list-style-type: none"> ➤ Identify the different planets in the solar system.



Year	5	Topic	Forces
<p><u>National Curriculum aims</u></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. 			

Prior learning	Key vocabulary
<ul style="list-style-type: none"> • Compare how things move on different surfaces. (Y3 - Forces and magnets) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Describe magnets as having two poles. (Y3 - Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets) 	<p>Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears</p>

Key vocabulary with definitions			
force	An action that changes or maintains the motion of a body or object.	mechanisms	Any tool used to convert or control motion or transmit control or power.
gravity	An invisible force that pulls objects toward each other.	levers	A long rigid body with a fulcrum along its length.
air resistance	A force that acts in the opposite direction of moving objects.	pulleys	They are often used to lift heavy objects by looping a rope over one or more wheels.
water resistance	A type of force that uses friction to slow things down that are moving through water.	gears	Wheels with teeth that slot together. When one gear is turned the other one turns as well.

friction

A force between two surfaces that are sliding, or trying to slide, across each other.

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Key learning

Forces are measured in Newtons using a newton meter and that there can be more than one force acting on an object.

A force causes an object to start moving, stop moving, speed up, slow down or change direction. Balanced forces on an object cause it to remain stationary or travel at the same speed. Unbalanced forces causes an object to sped up, change shape or slow down.

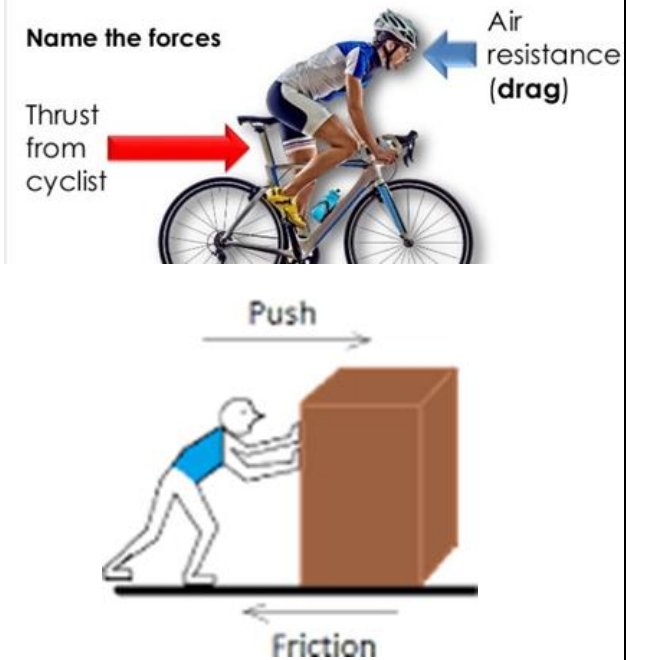
Mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater force- these mechanisms are also known as simple machines. Examples of this are a crowbar, bottle top remover.

Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall. Gravity stops things from floating away into space.

Types of forces- Magnetism, Air resistance, water resistance and friction. Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. To move faster through water or air an object should be streamlined.

Magnets attract or repel each other or other objects. North and south attract. But north and north or south and south will repel.

Friction happens when two surfaces touch each other. Friction gives us grip. Friction produces heat. Rougher surfaces slow things down a lot and smoother surfaces produce less friction and therefore allow objects to move faster.



Common misconceptions

Some children may think:

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

Activities	Possible evidence
<ul style="list-style-type: none"> • Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter. • Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water. • Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats. • Explore how levers, pulleys and gears work. • Make a product that involves a lever, pulley or gear. • Create a timer that uses gravity to move a ball. • Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation. 	<p>For ARE</p> <ul style="list-style-type: none"> • Can demonstrate the effect of gravity acting on an unsupported object • Can give examples of friction, water resistance and air resistance • Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance • Can demonstrate how pulleys, levers and gears work • Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down • Can demonstrate clearly the effects of using levers, pulleys and gears
<p style="text-align: center;">Future learning</p>	<p>For GD</p> <ul style="list-style-type: none"> • Describe how levers, pulleys and gears are used in everyday life (e.g. having gears can make it easier to pedal a bike, a bottle opener makes it easier to open a bottle lid) • Explain how introducing gears onto bikes has changed cycling • Compare the tread on bicycle tyres according to how much friction they need • Identify streamlined objects and describe why they have been designed in this way (e.g. cycling helmets, formula 1 cars, dolphins)

Working scientifically skills covered in this topic

Planning and setting up enquiries	<ul style="list-style-type: none"> ➤ Exploring the effects of air resistance. ➤ Exploring the effects of water resistance. ➤ Exploring the effects of friction. ➤ Explore how levers, pulleys and gears work.
Using equipment	<ul style="list-style-type: none"> ➤ Using Newton meters. ➤ Using stopwatches.
Observing	<ul style="list-style-type: none"> ➤ Observing which objects sink quickest (water resistance).
Measuring	<ul style="list-style-type: none"> ➤ Measure mass in kg and weight in Newtons. ➤ Measuring time taken - water resistance, air resistance and friction.
Recording	<ul style="list-style-type: none"> ➤ Recording the time it takes objects to sink. ➤ Recording the time different materials take to fall. ➤ Recording the time it takes materials to stop on different surfaces.
Identifying and classifying using	<ul style="list-style-type: none"> ➤ Identify different forces.

