

Ryhope Junior School

Science Curriculum



Year 3



Year	3	Topic	Rocks
• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. • Recognise that soils are made from rocks and organic matter.			
Key Questions			
1. What types of rock can you name? 2. What are the properties of those rocks? 3. What is the process of a fossil being formed? 4. How long does it take to form a fossil? 5. How are soils made? 6. What do soils contain?			
Prior learning		Future learning	
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials)		• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 - Evolution and inheritance) • The composition of the Earth. (KS3) • The structure of the Earth. (KS3) • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders). Soils are made up of		• 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	

pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.	
Key Vocabulary	
Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil	
Common misconceptions	
Some children may think: • rocks are all hard in nature • rock-like, man-made substances such as concrete or brick are rocks • materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural' • certain found artefacts, like old bits of pottery or coins, are fossils • a fossil is an actual piece of the extinct animal or plant • soil and compost are the same thing.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Observe rocks closely. • Classify rocks in a range of ways, based on their appearance. • Devise a test to investigate the hardness of a range of rocks. • Devise a test to investigate how much water different rocks absorb. • Observe how rocks change over time e.g. gravestones or old building. • Research using secondary sources how fossils are formed. • Observe soils closely. • Classify soils in a range of ways based on their appearance.	• 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

• Devise a test to investigate the water retention of soils. • Observe how soil can be separated through sedimentation. • Research the work of Mary Anning.	• Can devise a test to explore the water retention of soils
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-12 (Rocks) https://nustem.uk/primarycareers/#tab-id-11 (Soils) Geologist; Mineralogist, Mining Geologist, Petroleum Geologist, Botanist, Environmental scientist, Environmental Engineer, Soil Scientist.	Mary Anning James Hutton William Buckland
Resources	
Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-3-science/rocks-rocks-and-fossils/ BBC Bitesize https://www.bbc.co.uk/bitesize/topics/z9bbkqt Outstanding science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=3c	

Year	3	Topic	Animals, Including humans
• Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food – they get nutrition from what they eat. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.			
Key Questions			
1. What are the names of nutrients found in food? 2. How can humans keep themselves healthy with food? 3. Which human bones give support? 4. Which human bones help us move? 5. Which human bones provide protection? 6. How do human joints and muscles help us move?			
Prior learning		Future learning	
• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)		• Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need. Food contains a range of different nutrients – carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water – and fibre that are		• 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	

needed by the body to stay healthy. A piece of food will often provide a range of nutrients. Humans, and some other animals, have skeletons and muscles which help them move and provide protection and support.	• Can name 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
Key Vocabulary Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints	
Common misconceptions	
Some children may think: • certain whole food groups like fats are 'bad' for you • certain specific foods, like cheese are also 'bad' for you • diet and fruit drinks are 'good' for you • snakes are similar to worms, so they must also be invertebrates • invertebrates have no form of skeleton.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Classify food in a range of ways. • Use food labels to explore the nutritional content of a range of food items. • Use secondary sources to find out the types of food that contain the different nutrients. • Use food labels to answer enquiry questions e.g. How much fat do different types of pizza contain? • Plan a daily diet to contain a good balance of nutrients. • Explore the nutrients contained in fast food. • Use secondary sources to research the parts and functions of the skeleton. • Investigate patterns asking questions such as: ▪ Can people with longer legs run faster? ▪ Can people with bigger hands catch a ball better? • Compare, contrast and classify skeletons of different animals.	• Can classify food into those that are high or low in particular nutrients • Can answer their questions about nutrients in food, based on their gathered evidence • Can talk about the nutrient content of their daily plan • Use their data to look for patterns (or lack of them) when answering their enquiry question • Can give similarities e.g. they all have joints to help the animal move, and differences between skeletons
Careers Links	Famous scientists
NUSTEM -https://nustem.uk/primarycareers/#tab-id-2 Nutritionist, Bone specialist, Surgeon, Nurse	Joe Wicks (nutritionist)

Resources

Twinkl unit pack
 Healthy plate examples
 School nurse information
 Hamilton Trust <https://www.hamilton-trust.org.uk/science/year-3-science/animals-including-humans-keeping-healthy/>
 The Association for Science education (ASE) <https://www.ase.org.uk/resources/y3-animals-including-humans-amelie>
 .Young People's Trust for the environment (YPTE) <https://yppte.org.uk/lesson-plans/animals-including-humans-year-3>

Year	3	Topic	Plants
- Identify and describe the functions of different parts of flowering plants: roots; stem/trunk; leaves; and flowers. - Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. - Investigate the way in which water is transported within plants. - Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.			
Key Questions			
- What is the function of roots/ a stem/ leaves/ flowers in a plant? - How are different plants pollinated? - What are different methods of seed dispersal? - How are seeds formed?			
Prior learning		Future learning	
- Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) - Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants)		- Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) - Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	

Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place. The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to reproduce. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination). This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways. Different plants require different conditions for germination and growth.	• Can explain the function of the parts of a flowering plant • Can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal, and germination • Can give different methods of pollination and seed dispersal, including examples
Key Vocabulary	
Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)	
Common misconceptions	
Some children may think: • plants eat food • food comes from the soil via the roots • flowers are merely decorative rather than a vital part of the life cycle in reproduction • plants only need sunlight to keep them warm • roots suck in water which is then sucked up the stem	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Observe what happens to plants over time when the leaves or roots are removed. • Observe the effect of putting cut white carnations or celery in coloured water. • Investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space. • Spot flowers, seeds, berries and fruits outside throughout the year.	• 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

- **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.

Careers Links

NUSTEM - <https://nustem.uk/primarycareers/#tab-id-11>
Plant Geneticist, Conservation Scientist, Botanist

Famous scientists

David Bellamy
Joseph Banks

Resources

Young People's Trust for the environment (YPTE) <https://yppte.org.uk/lesson-plans/plants-year-3>
Twinkl Unit Pack
Hamilton Trust <https://www.hamilton-trust.org.uk/science/year-3-science/plants-roots-and-shoots/>
Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=3a
BBC Teach <https://www.bbc.co.uk/programmes/articles/Mf5rhbTkHLZ3fbJzScyDvC/primary-science-plants>

ear	3	Topic	Light
• Recognise that they need light in order to see things, and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. • Find patterns in the way that the size of shadows change.			
1. How do we see objects when it is light? 2. What is dark? 3. Why is it dangerous to look directly at the sun? 4. How can we protect our eyes from the sun? 5. What do transparent, translucent and opaque mean? 6. How are shadows formed?			
Prior learning		Future learning	
• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)		• Recognise that light appears to travel in straight lines. (Y6 - Light) • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. (Y6 - Light) • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. (Y6 - Light) • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. (Y6 - Light)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness. Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light. Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective.		• 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	

The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light. Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.	
Key Vocabulary	
Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous	
Common misconceptions	
Some children may think: • we can still see even where there is an absence of any light • our eyes 'get used to' the dark • the moon and reflective surfaces are light sources • a transparent object is a light source • shadows contain details of the object, such as facial features on their own shadow • shadows result from objects giving off darkness.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Explore how different objects are more or less visible in different levels of lighting. • Explore how objects with different surfaces, e.g. shiny vs matt, are more or less visible. • Explore how shadows vary as the distance between a light source and an object or surface is changed. • Explore shadows which are connected to and disconnected from the object e.g. shadows of clouds and children in the playground. • Choose suitable materials to make shadow puppets. • Create artwork using shadows.	• Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change • Can clearly explain, giving examples, that objects are not visible in complete darkness • Can describe and demonstrate how shadows are formed by blocking light • Can describe, demonstrate and make predictions about patterns in how shadows vary

Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-9 Lighting Technician, Optometrist, Ophthalmologist, Observatory Scientist, Physicist, Optical Engineer, Laser Engineer, Electrical Engineer	Isaac Newton (studied further in Years 5 & 6)
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-3-science/light-light-and-shadows/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=3d BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zbssgk7 The Association for Science education (ASE) https://www.ase.org.uk/resources/y3-light-johnny	

Year	3	Topic	Forces and magnets
• Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing.			
Key Questions			
1. How might a rough or smooth surface affect an object? 2. What type of objects may be attracted to a magnet? 3. How many poles doe magnets have? 4. Why do magnets repel each other? 5. What type of objects do not need contact to act?			
Prior learning		Future learning	
• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)		• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces) • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces) • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces) • Magnetic fields by plotting with compass, representation by field lines. (KS3) • Earth's magnetism, compass and navigation. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its		• Can give examples of forces in everyday life • Can give examples of objects moving differently on different surfaces	

movement e.g. ice skater compared to walking on ice in normal shoes. A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract. For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.	• 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
Key Vocabulary	
Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole	
Common misconceptions	
Some children may think: • the bigger the magnet the stronger it is • all metals are magnetic.	
Apply knowledge in familiar related contexts, including a range of enquiries	
Activities	Possible evidence
• Carry out investigations to explore how objects move on different surfaces e.g. spinning tops/coins, rolling balls/cars, clockwork toys, soles of shoes etc. • Explore what materials are attracted to a magnet. • Classify materials according to whether they are magnetic. • Explore the way that magnets behave in relation to each other. • Use a marked magnet to find the unmarked poles on other types of magnets.	• 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

• Explore how magnets work at a distance e.g. through the table, in water, jumping paper clips up off the table. • Devise an investigation to test the strength of magnets.	• Can use test data to rank magnets
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-7	William Gilbert (discovered the first magnet)
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-3-science/forces-and-magnets-amazing-magnets/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=3e The Association for Science education (ASE) https://www.ase.org.uk/resources/y3-forces-and-magnets-naithan	

Year 4



Year	4	Topic	States of matter
• Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.			
Key Questions			
1. What is the difference between a solid, liquid and gas? 2. How can objects change state i.e. from solid to liquid or from liquid to gas? 3. At what temperature does water change from a liquid to a gas? 4. At what temperature does water change from a liquid to a solid? 5. In the water cycle, what is evaporation? 6. In the water cycle, what is condensation? 7. In the water cycle, what is precipitation?			
Prior learning		Future learning	
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)		• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials) • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials) • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials) • Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials) • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of	

	acid on bicarbonate of soda. (Y5 - Properties and changes of materials)
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	Possible evidence
A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0oC. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100oC. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	• Can create a concept map, including arrows linking the key vocabulary • Can name properties of solids, liquids and gases • Can give everyday examples of melting and freezing • Can give everyday examples of evaporation and condensation • Can describe the water cycle
Key Vocabulary	
Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle	

Common misconceptions

Some children may think:

- 'solid' is another word for hard or opaque
- solids are hard and cannot break or change shape easily and are often in one piece
- substances made of very small particles like sugar or sand cannot be solids
- particles in liquids are further apart than in solids and they take up more space
- when air is pumped into balloons, they become lighter
- water in different forms – steam, water, ice – are all different substances
- all liquids boil at the same temperature as water (100 degrees)
- melting, as a change of state, is the same as dissolving
- steam is visible water vapour (only the condensing water droplets can be seen)
- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY

Activities	Possible evidence
• Observe closely and classify a range of solids. Observe closely and classify a range of liquids. • Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind. • Classify materials according to whether they are solids, liquids and gases. • Observe a range of materials melting e.g. ice, chocolate, butter. • Investigate how to melt ice more quickly. • Observe the changes when making rocky road cakes or ice-cream. • Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate. • Explore freezing different liquids e.g. tomato ketchup, oil, shampoo. • Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration).	• 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

• 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.	
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-5 (everyday materials) https://nustem.uk/primarycareers/#tab-id-15 (states of matter)	Joseph Priestly
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-4-science/states-matter-states-matter-scientists/ BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zkgg87h Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=4c The Association for Science Education https://www.ase.org.uk/resources/y4-states-of-matter-chaya	

Year	4	Topic	Animals, Including humans
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- 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 Questions

1. What are the main parts of the human digestive system?
2. What role does the mouth play in the digestive system?
3. What happens to food in the small and large intestine?
4. How many different **types of teeth** do humans have?
5. Why do humans have incisors?
6. What are molars and premolars for?
7. What 3 Ps make up a food chain?

Prior learning

- Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans)
- Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans)
- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)
- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)

Future learning

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. (Y6 - Animals, including humans)
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)
- Describe the ways in which nutrients and water are transported within animals, including humans. (Y6 - Animals, including humans)

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE

Show understanding of a concept using scientific vocabulary correctly

Key learning

Food enters the body through the mouth. Digestion starts when the teeth start to break the food down. Saliva is added and the tongue rolls the food into a ball. The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken down further by being churned around and other chemicals are added.

Possible evidence

- 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

The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing). Living things can be classified as producers, predators and prey according to their place in the food chain.	• 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
Key Vocabulary	
Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain	
Common misconceptions	
Some children may think: • arrows in a food chains mean 'eats' • the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain • there is always plenty of food for wild animals • your stomach is where your belly button is • food is digested only in the stomach • when you have a meal, your food goes down one tube and your drink down another • the food you eat becomes "poo" and the drink becomes "wee".	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Research the function of the parts of the digestive system. • Create a model of the digestive system using household objects. • Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing).	• 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

• Classify animals as herbivores, carnivores or omnivores according to the type of teeth they have in their skulls. • Use food chains to identify producers, predators and prey within a habitat. • Use secondary sources to identify animals in a habitat and find out what they eat.	• Can create food chains based on research
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-2 Biologist, Ecologist Dentist, Doctor, Nurse	Charles Elton (UK Biologist/ animal ecologist) Pierre Fauchard (Teeth) William Beaumont (Human Digestion)
Resources	
Twinkl Unit Pack Hamilton trust https://www.hamilton-trust.org.uk/science/year-4-science/animals-including-humans-excuse-me-are-these-your-teeth/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=4b The Association for Science Education https://www.ase.org.uk/resources/y4-animals-including-humans-dougal BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zn22pv4	

Year	4	Topic	Electricity
• Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common conductors and insulators, and associate metals with being good conductors.			
Key Questions			
1. What are the two ways electrical items are powered? (mains or batteries) 2. What are the main components in a simple circuit? 3. How does a switch change a circuit? 4. Why might a lamp not light in a circuit? Give one possible reason. 5. What does a conductor do in a circuit? 6. What does an insulator do in a circuit?			
Prior learning		Future learning	
• Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes. (Early Learning Goal)		• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity) • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. (Y6 - Electricity) • Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off.		• 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	

Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.	
Key Vocabulary	
Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol N.B. Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6.	
Common misconceptions	
Some children may think: • electricity flows to bulbs, not through them • electricity flows out of both ends of a battery • electricity works by simply coming out of one end of a battery into the component.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Construct a range of circuits. • Explore which materials can be used instead of wires to make a circuit. • Classify the materials that were suitable/not suitable for wires. • Explore how to connect a range of different switches and investigate how they function in different ways. • Choose switches to add to circuits to solve particular problems, such as a pressure switch for a burglar alarm. • Apply their knowledge of conductors and insulators to design and make different types of switch. • Make circuits that can be controlled as part of a DT project. N.B. Children should be given one component at a time to add to circuits.	• Can communicate structures of circuits using drawings which show how the components are connected • Use classification evidence to identify that metals are good conductors and non-metals are insulators • Can incorporate a switch into a circuit to turn it on and off • Can connect a range of different switches identifying the parts that are insulators and conductors • Can add a circuit with a switch to a DT project and can demonstrate how it works • Can give reasons for choice of materials for making different parts of a switch • Can describe how their switch works

Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-4 Electrician, Electrical Engineer	Joseph Swan Thomas Edison (mainly studied in year 6 – introduce only)
Resources	
Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-4-science/electricity-its-electric/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=4e BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zj44jxs The Association for Science Education (ASE) https://www.ase.org.uk/resources/y4-electricity-dougal	

Year	4	Topic	Sound
• Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases.			
Key Questions			
1. How are sounds made? 2. How does sound travel? 3. How can the pitch of a sound change? 4. What might affect the volume of a sound? 5. What happens when we get closer to or further away from the source of a sound?			
Prior learning		Future learning	
• Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)		• Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. (KS3) • Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3) • Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3) • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3) • Auditory range of humans and animals. (KS3) • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3) • Waves transferring information for conversion to electrical signals by microphone. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids,		• Can name sound sources and state that sounds are produced by the vibration of the object	

liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	• Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases
Key Vocabulary	
Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation	
Common misconceptions	
Pitch and volume are frequently confused, as both can be described as high or low. Some children may think: • sound is only heard by the listener • sound only travels in one direction from the source • sound can't travel through solids and liquids • high sounds are loud and low sounds are quiet.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Classify sound sources. • Explore making sounds with a range of objects, such as musical instruments and other household objects. • Explore how string telephones or ear gongs work. • Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks.	• 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

• Measure sounds over different distances. • Measure sounds through different insulation materials.	• Can explain how loudness can be reduced by moving further from the sound source or by using a sound insulating medium
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-14 Live sound engineer, Music producer, Acoustics engineer, Medical physicist, sound engineer	Alexander Graham Bell Pythagoras (first vibrations and sounds)
Resources	
Twinkl unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-4-science/sound-listen/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=4d BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zgffr82 ASE https://www.ase.org.uk/resources/y4-sound-hamza	

Year	4	Topic	Living things and their habitats
• Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. • Recognise that environments can change and that this can sometimes pose dangers to living things.			
Key Questions			
1. What is a habitat? 2. Can all living things live in all habitats? Give examples. 3. How might humans cause animal habitats to change? 4. Is human involvement in animal habitats always positive? Give an example. 5. How might a habitat change through natural causes?			
Prior learning		Future learning	
• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 – Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 – Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 – Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 – Living things and their habitats)		• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 – Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 – Living things and their habitats) • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. (Y6 – Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 – Living things and their habitats)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited (Year 2 learning). These environments may		• 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	

change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.	
Key Vocabulary	
Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate	
Common misconceptions	
Some children may think: • the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain • there is always plenty of food for wild animals • animals are only land-living creatures • animals and plants can adapt to their habitats, however they change • all changes to habitats are negative.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Observe plants and animals in different habitats throughout the year. • Compare and contrast the living things observed. • Use classification keys to name unknown living things. • Classify living things found in different habitats based on their features. • Create a simple identification key based on observable features. • Use fieldwork to explore human impact on the local environment e.g. litter, tree planting. • Use secondary sources to find out about how environments may naturally change. • Use secondary sources to find out about human impact, both positive and negative, on environments.	• Can keep a careful record of living things found in different habitats throughout the year (diagrams, tally charts etc.) • Can use classification keys to identify unknown plants and animals • Can present their learning about changes to the environment in different ways e.g. campaign video, persuasive letter

Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-10 WWF jobs https://www.wwf.org.uk/jobs Wildlife technician, Wildlife Biologist, Wetland technician, Naturalist, Habitat restoration engineer, Biostatistician, Animal behaviourist	Rachel Carson (Marine biologist and conservationist) David Attenborough
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-4-science/living-things-and-their-habitats-name-living-thing/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=4a Young People's Trust for the environment (YTPE) https://ypte.org.uk/lesson-plans/living-things-and-their-habitats-year-4 The Association for Science Education (ASE) https://www.ase.org.uk/resources/y4-living-things-and-their-habitats-chaya Natural History Museum https://www.nhm.ac.uk/schools/teaching-resources/living-things-and-their-habitats-resources.html	

Year 5



Year	5	Topic	Materials and their properties
• 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.			
Key Questions			
1. How could different types of materials be grouped? 2. What is dissolving? 3. What materials can be dissolved? 4. What processes can be used to separate materials? 5. What is a process that can be a reversible change? 6. Which type of change is usually not reversible? Give an example.			
Prior learning		Future learning	
• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 - Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials) • Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)		• Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations. (KS3) • Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/alkalinity; and indicators. (KS3)	

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	Possible evidence
Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation. Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.	• Can use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings • Can explain what dissolving means, giving examples • Can name equipment used for filtering and sieving • Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving • Can describe some simple reversible and non-reversible changes to materials, giving examples
Key Vocabulary	
Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	
Common misconceptions	
Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed. Some children may think: • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence

• Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat. • Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate. • Investigate rates of dissolving by carrying out comparative and fair test. • Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture. • Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning. • Carry out comparative and fair tests involving non-reversible changes e.g. What affects the rate of rusting? What affects the amount of gas produced? • Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton).	• Can 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
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-15 Chemist, Solid state physicist, Particle physicist, Condensed matter physicist, crystallographer, Nanotechnologist	Spencer Silver (Post-it notes) Ruth Benerito (Non-wrinkle fabric)
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-5-science/changes-materials-changing-materials-education-pack/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=5c The Association for Science Education https://www.ase.org.uk/resources/y5-properties-and-changes-of-materials-diogjena BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zryycdm	

Year	5	Topic	Forces
• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • Identify the effects of air resistance, water resistance and friction that act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.			
Key Questions			
1. What does a force cause an object to do? 2. How does gravity act on objects? 3. When is it beneficial to have air resistance? 4. How do boats create less water resistance? 5. How did Isaac Newton discover gravity? 6. How does a pulley make it easier to lift an object?			
Prior learning		Future learning	
• Compare how things move on different surfaces. (Y3 - Forces and magnets) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets) • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Describe magnets as having two poles. (Y3 - Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)		• Forces as pushes or pulls, arising from the interaction between two objects. (KS3) • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3) • Moment as the turning effect of a force. (KS3) • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3) • Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.		• Can demonstrate the effect of gravity acting on an unsupported object • Can give examples of friction, water resistance and air resistance	

Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.	• 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
Key Vocabulary	
Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	
Common misconceptions	
Some children may think: • the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction • objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter. • Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water. • Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats. • Explore how levers, pulleys and gears work.	• 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

• 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.	
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-7 Sports scientist, Systems engineer, Mechatronic engineer, Robotic technician, Automotive engineer, Marine engineer, Civil engineer, Structural engineer, Mechanical engineer.	Isaac Newton Galileo Galilei
Resources	
Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-5-science/forces-may-forces-be-you/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=5e BBC Science https://www.bbc.co.uk/bitesize/topics/znmmn39 The Association for Science Education (ASE) https://www.ase.org.uk/resources/y5-forces-jimmy Youtube video https://www.youtube.com/watch?v=7bCHNeNLel8	

Year	5	Topic	Earth and space
- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. - Describe the movement of the Moon relative to the Earth. - Describe the Sun, Earth and Moon as approximately spherical bodies. - Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.			
Key Questions			
- What is at the centre of our solar system? - How many planets are in our solar system? - How do the planets travel and move? - What shapes are the Sun, Earth and Moon? - How long does it take for the Earth to orbit the Sun? - How do we get day and night on Earth? - What determines our seasons on Earth?			
Prior learning		Future learning	
- Observe changes across the four seasons. (Y1 - Seasonal changes) - Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)		- Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). (KS3) - Our Sun as a star, other stars in our galaxy, other galaxies. (KS3) - The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3) - The light year as a unit of astronomical distance. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical.		- Can create a voice over for a video clip or animation - Can show, using diagrams, the movement of the Earth and Moon - Can explain the movement of the Earth and Moon - Can show using diagrams the rotation of the Earth and how this causes day and night - Can explain what causes day and night	
Key Vocabulary			

Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets	
Common misconceptions	
Some children may think: • the Earth is flat • the Sun is a planet • the Sun rotates around the Earth • the Sun moves across the sky during the day • the Sun rises in the morning and sets in the evening • the Moon appears only at night • night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth. • Use secondary sources to help make a model to show why day and night occur. • Make first-hand observations of how shadows caused by the Sun change through the day. • Make a sundial. • Research time zones. • Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth, Moon and planets before space travel.	• Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth • Can demonstrate and explain verbally how day and night occur • Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model • Can explain how a sundial works • Can explain verbally, using a model, why we have time zones • Can describe the arguments and evidence used by scientists in the past
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-3 Astronomer, Solar array manufacturing engineer, Satellite communications engineer, Satellite engineer, Aerospace engineer, Astronaut, Astrophysicist,	Galileo Galilei Tim Peake Helen Sharman (1 st UK female in space) Katherine Johnson, Dorothy Vaughn, Mary Jackson ('Hidden figures' – NASA team) Brian Cox
Resources	
Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-5-science/earth-and-space-space-presenters/	

Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=5d
 BBC Bitesize <https://www.bbc.co.uk/bitesize/topics/zkbbkqt>
 The Association for Science Education <https://www.ase.org.uk/resources/y5-earth-and-space-isabella>

Year	5	Topic	Animals Including humans
Describe the changes as humans develop to old age.			
Key Questions			
- What changes may occur in a girl's body during puberty? - What changes may occur in a boy's body during puberty? - What changes happen between a baby's birth and childhood? - How do humans change as they get older?			
Prior learning		Future learning	
Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)		Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. This needs to be taught alongside PSHE. The new statutory requirements for relationships and health education can be found below: https://www.gov.uk/government/publications/relationships-education-relationships-and-sex-education-rse-and-health-education/physical-health-and-mental-wellbeing-primary-and-secondary Other useful guidance includes:		- 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	

https://www.pshe-association.org.uk/curriculum-and-resources/resources/briefing-human-development-and-reproduction	
Key Vocabulary	
Puberty – the vocabulary to describe sexual characteristics	
Common misconceptions	
Some children may think: • a baby grows in a mother's tummy • a baby is "made".	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
This unit is likely to be taught through direct instruction due to its sensitive nature, although children can carry out a research enquiry by asking an expert e.g. school nurse to provide answers to questions that have been filtered by the teacher.	• Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-2 Midwife, Nurse	N/A
Resources	
School nursing team Twinkl Unit Pack	

Year	5	Topic	Living things and their habitats
- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. - Describe the life process of reproduction in some plants and animals.			
Key Questions			
- How does the life cycle of a bird or amphibian differ from mammals? - What is similar about the life cycles of different creatures? - What is the word used for the change an insect, such as a caterpillar, undergoes? - What are the two different ways a plant can reproduce? - How does seed dispersal and pollination help reproduction of plants?			
Prior learning		Future learning	
- Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) - Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)		- Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. (KS3) - Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction		- 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	

which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects.	
Key Vocabulary	
Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings	
Common misconceptions	
Some children may think: • all plants start out as seeds • all plants have flowers • plants that grow from bulbs do not have seeds • only birds lay eggs.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals. • Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. • Look for patterns between the size of an animal and its expected life span. • Grow and observe plants that reproduce asexually e.g. strawberries, spider plants, potatoes. • Take cuttings from a range of plants e.g. African violet, mint. • Plant bulbs and then harvest to see how they multiply. • Use secondary sources to find out about pollination.	• Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game • Can identify patterns in life cycles • Can compare two or more animal life cycles they have studied • Can explain how a range of plants reproduce asexually
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-10 Wildlife technician, Wildlife biologist, Naturalist, Primatologist, Entomologist, Animal Behaviourist.	Jane Goodall David Attenborough
Resources	
Living eggs (possibly) Butterfly lifecycle kit Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-5-science/living-things-and-their-habitats-art-living/	

Young Peoples Trust for the Environment (YTPE) <https://ypte.org.uk/lesson-plans/living-things-and-their-habitats-year-5-animal-life-cycles-reproduction>

Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=5a

Year 6



Year	6	Topic	Evolution and inheritance
• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.			
Key Questions			
1. What is the meaning of evolution? 2. Where do offspring inherit features from? 3. How do plants and animals become suited to environments? 4. How have camels adapted to their environment? 5. How do fossils tell us about things that lived millions of years ago? 6. How do fossils support the theory of evolution? 7. Which two scientists first wrote about the theory of evolution?			
Prior learning		Future learning	
• Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. (Y2 - Living things and their habitats) • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats)		• Heredity as the process by which genetic information is transmitted from one generation to the next. (KS3) • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. (KS3) • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. (KS3) • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other. Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes		• Can explain the process of evolution • Can give examples of how plants and animals are suited to an environment • Can give examples of how an animal or plant has evolved over time e.g. penguin, peppered moth • Give examples of living things that lived millions of years ago and the fossil evidence we have to support this	

rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution. Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.	• Can give examples of fossil evidence that can be used to support the theory of evolution
Key Vocabulary	
Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils	
Common misconceptions	
Some children may think: • adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life • offspring most resemble their parents of the same sex, so that sons look like fathers • all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited • cavemen and dinosaurs were alive at the same time.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Design a new plant or animal to live in a particular habitat. • Use models to demonstrate evolution e.g. 'Darwin's finches' bird beak activity. • Use secondary sources to find out about how the population of peppered moths changed during the industrial revolution. • Make observations of fossils to identify living things that lived on Earth millions of years ago.	• Can identify characteristics that will make a plant or animal suited or not suited to a particular habitat • Can link the patterns seen in the model to real examples • Can explain why the dominant colour of the peppered moth changed over a very short period of time

• Identify features in animals and plants that are passed on to offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs. • Compare the ideas of Charles Darwin and Alfred Wallace on evolution. • Research the work of Mary Anning and how this provided evidence of evolution.	
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-6 Geneticist, Evolutionary biologist, Ecologist, Biologist, Biological anthropologist	Charles Darwin Alfred Wallace Recap Mary Anning from Year 3
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-6-science/game-survival/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=6c Core Knowledge http://www.coreknowledge.org.uk/resources/Science%20Resource%20Pack-%20Year%206-%20Evolution.pdf Young Peoples Trust for the Environment (YTPE) https://ypte.org.uk/lesson-plans/evolution-and-inheritance-year-6 BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zvhhvcw The Association for Science education (ASE) https://www.ase.org.uk/resources/y6-evolution-and-inheritance-muharem	

Year	6	Topic	Electricity
• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.			
Key Questions			
1. How can we make a bulb in a circuit brighter? 2. How can we make a buzzer in a circuit quieter? 3. How does a switch make a difference to a circuit? 4. Why are recognised circuit symbols used? 5. Draw examples of circuit symbols.			
Prior learning		Future learning	
• Identify common appliances that run on electricity. (Y4 - Electricity) • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity) • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. (Y4 - Electricity) • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity) • Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)		• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. (KS3) • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. (KS3) • Differences in resistance between conducting and insulating components (quantitative). (KS3) • Static electricity. (KS3)	
HAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter.		• Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs, can be changed by increasing or decreasing the number of cells or using cells of different voltages • Can draw circuit diagrams of a range of simple series circuits using recognised symbols	

Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well. You can use recognised circuit symbols to draw simple circuit diagrams.	
Key Vocabulary	
Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage	
N.B. Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words "cells" and "batteries" are now used interchangeably.	
Common misconceptions	
Some children may think: • larger-sized batteries make bulbs brighter • a complete circuit uses up electricity • components in a circuit that are closer to the battery get more electricity.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Explain how a circuit operates to achieve particular operations, such as to control the light from a torch with different brightnesses or make a motor go faster or slower. • Make circuits to solve particular problems, such as a quiet and a loud burglar alarm. • Carry out fair tests exploring changes in circuits. • Make circuits that can be controlled as part of a DT project.	• Can incorporate a switch into a circuit to turn it on and off • Can change cells and components in a circuit to achieve a specific effect • Can communicate structures of circuits using circuit diagrams with recognised symbols • Can devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test • Can predict results and answer questions by drawing on evidence gathered
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-4 Visit to Nissan – link to electric cars	Thomas Edison Joseph Swan (recap from Year 4)
Resources	
Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-6-science/electric-celebrations/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=6e BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zj44jxs	

The Association for Science education (ASE) <https://www.ase.org.uk/resources/y6-electricity-julie>

Year	6	Topic	Light
• Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.			
Key Questions			
1. How does light travel? 2. How do we use light to see objects around us? 3. Why do shadows have the same shape as the object creating them? 4. How does reflection change what we can see? 5. What does it mean when an object is refracted? 6. What are the seven colours in the rainbow? 7. What did Isaac Newton discover about light?			
Prior learning		Future learning	
• Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light) • Notice that light is reflected from surfaces. (Y3 - Light) • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) • Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light) • Find patterns in the way that the size of shadows change. (Y3 - Light)		• The similarities and differences between light waves and waves in matter. (KS3) • Light waves travelling through a vacuum; speed of light. (KS3) • The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. (KS3) • Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. (KS3) • Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. (KS3) • Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen.		• Can describe, with diagrams or models as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes	

Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.	• Can describe, with diagrams or models as appropriate, how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape
Key Vocabulary	
As for Year 3 - Light, plus straight lines, light rays	
Common misconceptions	
Some children may think: • we see objects because light travels from our eyes to the object.	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card. • Explore the uses of the behaviour of light, reflection and shadows, such as in periscope design, rear view mirrors and shadow puppets.	• Can explain how evidence from enquiries shows that light travels in straight lines • Can predict and explain, with diagrams or models as appropriate, how the path of light rays can be directed by reflection to be seen, e.g. the reflection in car rear view mirrors or in a periscope • Can predict and explain, with diagrams or models as appropriate, how the shape of shadows can be varied
Careers Links	Famous scientists
NUSTEM - https://nustem.uk/primarycareers/#tab-id-9 Lighting Technician, Optometrist, Ophthalmologist, Observatory Scientist, Physicist, Optical Engineer, Laser Engineer, Electrical Engineer	Isaac Newton
Resources	
Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-6-science/crime-lab-investigation/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=6d The Association for Science Education (ASE) https://www.ase.org.uk/resources/y6-light-muharem BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zbssgk7	

Year	6	Topic	Animals including humans
• Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. • Describe the ways in which nutrients and water are transported within animals, including humans.			
Key Questions			
1. What are the main parts of the human circulatory system? 2. What is the function of the heart? 3. How do blood vessels work? 4. What is the function of blood in the human body? 5. How does diet and exercise affect the human body? 6. How can prescribed and illegal drugs affect the human body? 7. How are nutrients transported around the body?			
Prior learning		Future learning	
• Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans) • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)		• The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. (KS3) • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. (KS3) • The structure and functions of the gas exchange system in humans, including adaptations to function. (KS3) • The mechanism of breathing to move air in and out of the lungs. (KS3) • The impact of exercise, asthma and smoking on the human gas exchange system. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood		• Can draw a diagram of the circulatory system and label the parts and annotate it to show what the parts do • Produces a piece of writing that demonstrates the key knowledge e.g. explanation text, job description of the heart	

back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system.

Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well our heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE. The new statutory requirements for relationships and health education can be found below:

<https://www.gov.uk/government/publications/relationships-education-relationships-and-sex-education-rse-and-health-education/physical-health-and-mental-wellbeing-primary-and-secondary>

Key Vocabulary

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

Common misconceptions

Some children may think:

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

Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY

Activities

- **Create** a role play model for the circulatory system.
- **Carry out a range of pulse rate investigations:**

Possible evidence

- Use the role play model to **explain** the main parts of the circulatory system and their role

▪ fair test – effect of different activities on my pulse rate ▪ pattern seeking – exploring which groups of people may have higher or lower resting pulse rates ▪ observation over time – how long does it take my pulse rate to return to my resting pulse rate (recovery rate) ▪ pattern seeking – exploring recovery rate for different groups of people. • Research the negative effects of drugs (e.g. tobacco) and the benefits of a healthy diet and regular exercise by asking an expert or using carefully selected secondary sources.	• Can use subject knowledge about the heart whilst writing conclusions for investigations • Can explain both the positive and negative effects of diet, exercise, drugs and lifestyle on the body • Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body
Careers Links	Famous scientists
NUSTEM – https://nustem.uk/primarycareers/#tab-id-2 Nutritionist/ food scientist	William Harvey (1 st accurate circulatory system)
Resources	
Twinkl Unit Pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-6-science/art-being-human/ Outstanding Science https://www.outstandingscience.co.uk/index.php?action=view_page&page=view_unit&unit=6b The Association for Science Education (ASE) https://www.ase.org.uk/resources/y6-animals-including-humans-muharem BBC Bitesize https://www.bbc.co.uk/bitesize/topics/zcyycdm	

Year	6	Topic	Living things and their habitats
- Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. - Give reasons for classifying plants and animals based on specific characteristics.			
Key Questions			
- What main groups can living things be classified into? - What are vertebrates and invertebrates? - What are types of vertebrates and their characteristics? - What are types of invertebrates and their characteristics? - What is an example of a flowering plant? - What is an example of a non-flowering plant? - What are examples of helpful and harmful microorganisms?			
Prior learning		Future learning	
- Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) - Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) - Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) - Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)		Differences between species. (KS3)	
WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE			
Show understanding of a concept using scientific vocabulary correctly			
Key learning		Possible evidence	
Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food whereas animals cannot. Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has		- Can give examples of animals in the five vertebrate groups and some of the invertebrate groups - Can give the key characteristics of the five vertebrate groups and some invertebrate groups - Can compare the characteristics of animals in different groups - Can give examples of flowering and non-flowering plants	

common characteristics. Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.	
Key Vocabulary	
Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering, micro-organisms, bacteria, fungi. yeast	
Common misconceptions	
Some children may think: • all micro-organisms are harmful • mushrooms are plants	
Apply knowledge in familiar related contexts, including WORKING SCIENTIFICALLY	
Activities	Possible evidence
• Use secondary sources to learn about the formal classification system devised by Carl Linnaeus and why it is important. • Use first-hand observation to identify characteristics shared by the animals in a group. • Use secondary sources to research the characteristics of animals that belong to a group. • Use information about the characteristics of an unknown animal or plant to assign it to a group. • Classify plants and animals, presenting this in a range of ways e.g. Venn diagrams, Carroll diagrams and keys. • Create an imaginary animal which has features from one or more groups.	• Can use classification materials to identify unknown plants and animals • Can create classification keys for plants and animals • Can give a number of characteristics that explain why an animal belongs to a particular group
Careers Links	
NUSTEM - https://nustem.uk/primarycareers/#tab-id-10 Zoologist Vet	Famous scientists Carl Linnaeus Aristotle (link to Ancient Greece) Alexander Fleming Joseph Lister Beatrix Potter
Resources	
Natural History Museum https://www.nhm.ac.uk/schools/teaching-resources/living-things-and-their-habitats-resources.html Twinkl Unit pack Hamilton Trust https://www.hamilton-trust.org.uk/science/year-6-science/classification-connoisseurs/ Toung people's trust for the Environment (YTPE) https://ypte.org.uk/lesson-plans/living-things-and-their-habitats-year-6-classification	

