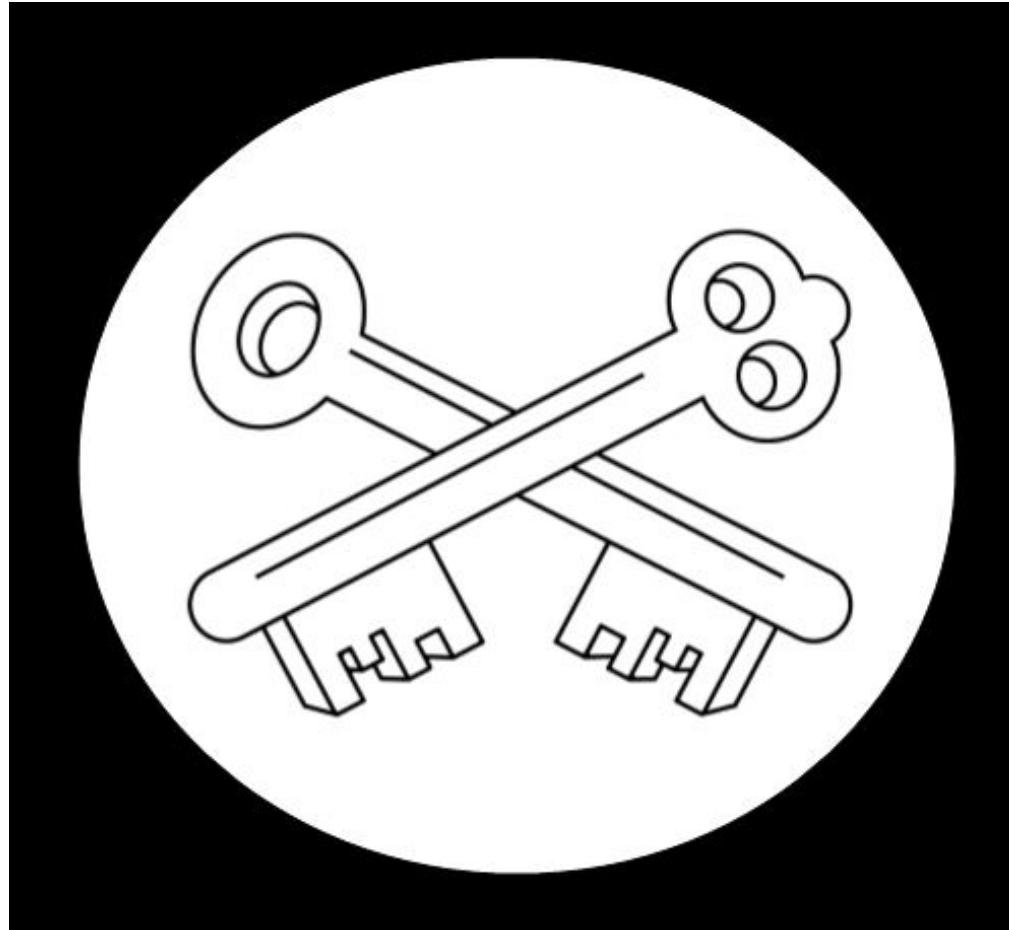


ST PETER'S COFE JUNIOR SCHOOL



SCIENCE CURRICULUM

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ST PETER'S CURRICULUM

In order for our pupils to truly flourish, we believe in providing an education for the head (academic excellence), heart (character and wellbeing) and hands (making a difference). As a result, our curriculum aims to bring together powerful and culturally-rich knowledge, real opportunities to shape the world alongside developing and growing our pupils as happy and virtuous individuals.



		
Head	Heart	Hands
We believe that knowledge and cultural literacy matters; creating a better world, starts with understanding this one. Our curriculum introduces the 'great conversations of	Heart is about ensuring our pupils are not only happy, but are able to fulfil one's potential. This requires the acquisition and development of virtues: the traits that sustain a well-rounded	The Hand is where pupils can do meaningful work. The world needs leaders who can change the world for the better. Our curriculum will empower and inspire our children to go out

humanity' - knowing who we are and where we have come from - our rich history, the foundations of scientific discovery, the great ideas of the past. However, we do not believe in simply passing on knowledge; it is also about empowering knowledge, making meaning of knowledge, using it, applying it and challenging it.	life and a thriving society. As a result, we aim to develop confident and compassionate students, who are effective contributors to society, successful learners, and responsible citizens.	into the world and make a difference in their own life and to others. For if we want our young people to shape the world rather than just accept it the way it is, they need to be provided with problems to solve, projects to work on and learn how to be active citizens.
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In order to fulfil these curriculum aims, we have eight key principles that underpin the design of our curriculum:

			
Broad and Balanced	Big ideas	Clear progression	Meaningful
In order for all our pupils to flourish, the curriculum at St Peter's will promote intellectual, moral, spiritual, aesthetic, creative, emotional and physical development as equally important.	Our curriculum will be designed to enable our pupils to begin developing an understanding of the big ideas and concepts which shape the world. There will be a subject specific rationale for all content choices.	Each subject domain will be carefully planned out, structured and sequenced to ensure progression and clarity over what 'getting better' at the subject means. As a result, our curriculum will become our progression model.	Our curriculum aims to be engaging, interesting and motivating for our pupils. We want our curriculum to get pupils interested in things they never knew they were interested in.

		
Memory in Mind	Vocabulary-rich	Empowering Knowledge
Our curriculum will take into account how children learn. To this end, we will place particular importance on ensuring that it supports pupils to retain core knowledge.	The brain does not make much of a distinction between reading about an experience and encountering it in real life; the same neurological regions are stimulated. As a result, a focus on reading and vocabulary is key to learning and remembering.	Our curriculum will be built around powerful, culturally-rich knowledge. However, it will not just focus on the passing on of this knowledge but will also be about making meaning of this knowledge, using it, applying it, and challenging it.

PURPOSE AND RATIONALE



At St Peter's, we view Science as the foundation for understanding the world around us, and a subject which should be driven by curiosity, awe and wonder. We also believe that Science education is key in accelerating a culture of innovation, by which children can grow up to create a better world for future generations.

Science is all about **ideas** and **evidence**. Our '**Big Ideas**' underpin the knowledge element of the Key Stage 2 programme of study; this ensures that our pupils have a strong base knowledge of scientific concepts and principles on which to build and inspire their own points of enquiry. These 'Big Ideas' enable children to connect new learning to what they learned previously, making their learning more meaningful and allowing

children to organise their knowledge. At the start of each new topic, children review their knowledge through various tasks and questions – this informs the teacher and enables any existing misconceptions to be addressed. Common misconceptions are highlighted in the curriculum topic planners and teachers know the importance of correcting these before moving the learning on. **‘Evidence’** relates to the vital importance of exploration and investigation, as highlighted in the ‘Working Scientifically’ component of the Science curriculum. In Science lessons at St Peter’s, we plan to combine ‘ideas’ and ‘evidence’; this means that quality scientific knowledge (substantive content) is taught, with the skills of scientific enquiry (disciplinary knowledge) permeating throughout all learning. As a result, St Peter’s pupils are inquisitive, ready to ask questions, and always seeking to deepen their understanding through experience. Lessons are taught with dual learning objectives, which are discussed during the input; the disciplinary objective is usually displayed as a symbol, which is referenced to on the lesson slides.

At St Peter’s, we deliver a curriculum that capitalises on first-hand experiences. Whilst making connections with other subjects vastly enriches Science learning, Science as a core subject should be independent from themes/topics if not directly relevant. This ensures that children develop a secure understanding of each area of the curriculum. As a Junior School, we have chosen to teach Science through the specific disciplines of Physics, Chemistry and Biology, making explicit references to the terms and encouraging children to understand the value of these distinctions. This is highlighted on the cover sheet in the front of each science book (years 4 to 6), and also includes the five scientific enquiry skills, which can be ticked off at the end of each lesson or topic.

We have made the decision to teach similar areas of the curriculum across the school at similar times. This is so that Science learning can be shared and celebrated across the year groups. Additionally, it allows teachers to support each other in ensuring coherence and clear progression from lower KS2 to upper KS2.

Physics (autumn term)

In Year 3 pupils learn about light, focusing on why we need light to see and how shadows are formed. This is then revisited in Year 6, when pupils explore concepts such as refraction, the eye and how light travels. Forces and magnets are introduced in Year 3, with knowledge of more complex forces being extended in Year 5. Pupils in Year 5 also study Earth and Space, linking their learning to their understanding of chronology and building on KS1 knowledge around seasonal changes. In Year 6, pupils deepen their understanding of electricity by considering voltage and

the functionality of different components in a circuit. In Year 4, pupils learn about solids, liquids and gases and how materials can change from one state to another (this is a Chemistry topic, as the Physics topics in Year 4 (Electricity and Sound) fit well with their DT project during the Spring term).

Chemistry (spring term)

St Peter's pupils begin their Chemistry learning in Year 3 by studying rocks and soils; this knowledge is revisited and extended in Year 6 when considering fossils as an indicator of evolution. This is built upon in Year 5, when pupils explore properties of different materials and consider reversible and irreversible changes. Pupils are taught about Electricity (Physics topic) in Year 4, learning how electricity travels around a circuit and investigating conductors and insulators. Pupils in Year 4 also learn about Sound, exploring the concept of vibrations, volume and pitch.

Biology (summer term)

Under the umbrella term 'Animals, including humans', pupils explore a broad range of topics. These include the human body (including the skeleton and digestive system in lower KS2, the circulatory system and the respiratory system in upper KS2); health (considering nutrition in Year 3 and examining its impact, as well as exercise, on human health by Year 6); and life cycles (for example focusing on reproduction and the development of human life in Year 5).

Pupils also extend their knowledge each year of 'Living things and their habitats'. Pupils explore and examine the functions of different parts of a plant, understand their requirements for growth, and progress to learning about reproduction in plants. Through learning about food webs, classification of species, life cycles, adaptation and microorganisms, pupils develop a respect for the importance of balanced ecosystems and understand why it is vital to protect them.

Lesson Structure and Content

At St. Peter's, the five science topics for each year group are spread across all six terms to ensure pupils benefit from having time to discuss ideas, answer questions and carry out practical work fully. This also ensures they have the time to practise, apply and consolidate their new knowledge, as well as revisit prior learning from previous topics (KS1 and KS2) through the re-remembering activities at the beginning of every science lesson.

When commencing a new science topic, pupils are assessed through various activities, depending on the specific year group. For example, in Year 6, some topics begin with the children creating a thought-shower with all their previous knowledge of the topic; they are given images and vocabulary to help prompt prior learning. At the end of the topic, pupils add to their thought-shower in green pen all their new knowledge, this enables them to see all the progress they have made (this was positively commented on by children during pupil interviews).

As well as the re-remembering activities at the start of each lesson, pupils also review their learning from the previous lesson through quizzes, multiple choice questions, odd one out activities, and other methods. This provides teachers with the opportunity to identify any missed learning or misconceptions, which can be addressed before moving the learning forward. New vocabulary is then introduced; each lesson introduces a maximum of two new words with definitions, to ensure the pupils are not overloaded. These new words are repeated and emphasised throughout the lesson, and throughout the subsequent lessons. This also applies to the lesson content; pupils are introduced to the new concepts or learning and are given the time to explore and deepen their understanding to avoid cognitive overload and the risk of developing misconceptions. Teaching content and activities are continuously assessed and refined prior to or after teaching, depending on the cohort, and adapted accordingly with the support of the science lead.

As previously mentioned, underpinning our curriculum are the processes and methods of 'Working Scientifically': **comparative and fair testing, grouping and classifying, pattern seeking, observation over time and research**. Pupils understand these five key processes, using at least one in

every lesson. By making these processes explicit, pupils are aware of their importance and are encouraged to approach Science learning with an inquisitive, enquiring mind.

At lower KS2, pupils are encouraged to ask their own questions and make some decisions about which type of scientific enquiry is likely to be the best way of answering them. They should draw on simple conclusions and use some scientific language.

During Upper KS2, pupils are guided to talk about their ideas, ask their own questions about scientific phenomena, and analyse functions, relationships and interactions more systematically. As their understanding deepens, they should be aware of more abstract concepts and recognise that scientific ideas change and develop over time. By the end of year 6, children have an extensive and connected knowledge of key scientific concepts, which has developed over their time at St. Peter's in a progressive and logical order.

HOW OUR CURRICULUM SUPPORTS GAPS IN OUR PUPILS' KNOWLEDGE AND SKILLS

Context and demographics	Implications for St Peter's Science curriculum
A considerable number of our pupils join us with significantly higher than average levels of prior attainment.	The Science curriculum is designed to be demanding, knowledge-rich and built upon the highest of expectations so that all pupils are challenged.
Despite the above, there are pockets of deprivation in the catchment (with some pupils coming to the school from one of the 10% most deprived neighbourhoods in the UK) and we have an increasing amount of Disadvantaged Pupils with us.	The curriculum provides the cultural/Science capital these pupils may not receive outside of school and aims to inspire them towards the possibility of a science-related career.
95% of the local population is white with very few residents born outside of the UK.	Our Science curriculum aims to expose our pupils to a diverse range of voices and perspectives.
Historically, our pupils (particularly boys) have had gaps in their knowledge and skills when it comes to Writing.	Our Science curriculum explicitly teaches key vocabulary, provides opportunities for pupils to apply their Writing skills and, because it is knowledge-rich, provides them with background knowledge which is crucial for Literacy.

SPIRITUALITY @ ST PETER'S

At St Peter's, we consider our pupils spiritual development to be a central part of the school's curriculum. At our school, we use the following definition when thinking about Spirituality...

"Spirituality is the concept of exploring the purpose and meaning of life, to develop a sense of awe and wonder at the world we live in, to question our place within it and to work to care for our body, mind and soul. Spirituality is not dependent on religious belief or a particular faith."

Here are some examples of how we promote Spirituality across this curriculum area:

Spirituality across Science
Science lessons at St. Peter's contribute to a child's spiritual development in many ways. Within each topic there are many opportunities for the children to foster a sense of awe and wonder, marvel at the wonders of the universe, as well as develop a deep respect for the natural world. Children are encouraged to have a questioning mindset, this can lead them to pondering profound questions, for example, about existence during the 'Evolution and Inheritance' topic in Year 6. Through our Biology topic 'Humans including Animals' pupils learn about themselves and how they function, as well as how the world functions around them. During the summer term, each year group study 'Living Things and their Habitats' which, through hands-on experiments and observations, enables the children to develop an appreciation for the beauty of nature and their role in respecting and protecting it. This appreciation enables children to develop an understanding of moral development, for example the ability to recognise right from wrong and apply this to their own lives. Exploring their environment and making use of 'natural' links help our children to engage with what is around them and strengthen their spiritual connection with the wider world.

SCIENCE CURRICULUM OVERVIEW

	Aut 1	Aut 2	Spr 1	Spr 2	Sum 1	Sum 2
Year 3	Physics - Light	Physics - Forces and magnets	Chemistry - Rocks and soils Revisit Reremembering slides from previous topics covered		Biology - Animals including humans	Biology - plants
Year 4	Chemistry - States of matter Revisit Reremembering slides from previous topics covered in Year 3		Physics - Sound	Physics - Electricity	Biology - Animals including humans	Biology - All living things (Habitats)
Year 5	Physics - Forces	Physics - Earth and Space	Chemistry - Properties and change of materials Revisit Reremembering slides from previous topics covered in Years 3, 4 and 5		Biology - Animals including animals	Biology - All living things
Year 6	Physics - Electricity	Physics - Light	Biology/ Chemistry - Evolution and inheritance Revisit Reremembering slides from previous topics covered in Years 3, 4, 5 and 6		Biology - Animals including humans	Biology - Living things and their habitats

BIG IDEAS AND CONCEPTS OF SCIENCE

PHYSICS	CHEMISTRY	BIOLOGY
ENERGY Energy comes in lots of different forms. Energy cannot be created or destroyed, but it can be transferred.	MATTER Matter is the name for stuff that everything in the universe is made of. Atoms are the building blocks of all matter.	ORGANISMS Organisms (living things) are special collections of <u>matter</u> called cells. Organisms perform lots of different functions. Organisms need a supply of <u>energy</u> and materials (food) to live.
FORCES To move an object, a force must be used. Forces are different kinds of pushes and pulls that act on all <u>matter</u> in the universe. Objects don't have to touch each other to affect each other.	PROPERTIES OF MATERIALS Materials have different properties depending on how these building blocks are arranged and how they behave. Materials can change if the arrangement of the building blocks changes.	EVOLUTION AND INHERITANCE The diversity of organisms on Earth is the result of evolution. Organisms adapt over time in order to survive in their environment. Characteristics are passed down from one generation of organisms to another.
EARTH AND SPACE The Earth's surface and climate is shaped by its composition (everything it's made up of). Our solar system is a very small part of one of billions of galaxies in the universe.		

COVERAGE OF KEY CONCEPTS AND BIG IDEAS

ENERGY

Energy comes in lots of different forms. Energy cannot be created or destroyed, but it can be transferred.

Year 3	Light
Year 3	Forces & Magnets
Year 4	Sound
Year 4	Electricity
Year 5	Forces
Year 5	Life cycles
Year 6	Light
Year 6	Electricity

FORCES

To move an object, a force must be used. Forces are different kinds of pushes and pulls that act on all matter in the universe.

Year 3	Forces and magnets
Year 5	Forces

Objects don't have to touch each other to affect each other.

Year 3	Forces and magnets
Year 5	Forces (gravity)

EARTH AND SPACE

The Earth's climate is shaped by its composition (everything it's made up of).

Year 3	Rocks, soils and fossils
Year 4	States of matter (water cycle)
Year 6	Evolution

Our solar system is a very small part of one of billions of galaxies in the universe

Year 5	Earth and Space
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MATTER

Matter is the name for stuff that everything in the universe is made of. Atoms are the building blocks of all matter.

Year 3	Rocks, soils and fossils
Year 4	Solids, liquids and gases
Year 5	Properties of materials

PROPERTIES OF MATERIALS

Materials have different properties depending on how these building blocks are arranged and how they behave.

Materials can change if the arrangement of the building blocks changes.

Year 4	Solids, liquids and gases
Year 5	Properties of materials

ORGANISMS

Organisms (living things) are special collections of matter called cells. Organisms perform lots of different functions.

Year 3	Animals (including Humans) - skeleton
Year 3	Plants
Year 4	Animals (including Humans) - digestion and teeth
Year 5	Living things
Year 6	Animals (including Humans)
Year 6	Living things - microorganisms

Organisms need a supply of energy and materials (food) to live.

Year 3	Animals (including Humans) - nutrition
Year 3	Plants
Year 4	Animals (including Humans) - food chains
Year 6	Animals (including Humans)

EVOLUTION AND INHERITANCE

The diversity of organisms on Earth is the result of evolution.

Year 3	Rocks, soils and fossils
Year 4	Living things and their habitats

Year 5	Living things
Year 6	Living things and their habitats
Year 6	Evolution and Inheritance

Organisms adapt over time in order to survive in their environment.

Year 4	Living things and their habitats
Year 6	Living things and their habitats
Year 6	Evolution and Inheritance

Characteristics are passed down from one generation of organisms to another.

Year 3	Plants
Year 5	Living things
Year 6	Living things and their habitats
Year 6	Evolution and Inheritance

END POINTS

By the end of KS2, we expect that all pupils can:

Working scientifically

- use appropriate scientific language from the national curriculum
- describe and evaluate their own and others' scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources
- ask their own questions about the scientific phenomena that they are studying, and select the most appropriate ways to answer these questions, recognising and controlling variables where necessary (i.e. observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests, and finding things out using a wide range of secondary sources)
- use a range of scientific equipment to take accurate and precise measurements or readings, with repeat readings where appropriate
- record data and results using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- draw conclusions, explain and evaluate their methods and findings, communicating these in a variety of ways
- raise further questions that could be investigated, based on their data and observations.

Science content

- name and describe the functions of the main parts of the digestive [year 4], musculoskeletal [year 3] and circulatory systems [year 6]; and describe and compare different reproductive processes and life cycles in animals [year 5]
- describe the effects of diet, exercise, drugs and lifestyle on how the body functions [year 6]
- name, locate and describe the functions of the main parts of plants, including those involved in reproduction [year 5] and transporting water and nutrients [year 3]
- use the observable features of plants, animals and micro-organisms to group, classify and identify them into broad groups, using keys or other methods [year 6]
- construct and interpret food chains [year 4]
- describe the requirements of plants for life and growth [year 3]; and explain how environmental changes may have an impact on living things [year 4]
- use the basic ideas of inheritance, variation and adaptation to describe how living things have changed over time and evolved [year 6]; and describe how fossils are formed [year 3] and provide evidence for evolution [year 6]

- group and identify materials [year 5], including rocks [year 3], in different ways according to their properties, based on first-hand observation; and justify the use of different everyday materials for different uses, based on their properties [year 5]
- describe the characteristics of different states of matter and group materials on this basis; and describe how materials change state at different temperatures, using this to explain everyday phenomena, including the water cycle [year 4]
- identify and describe what happens when dissolving occurs in everyday situations; and describe how to separate mixtures and solutions into their components [year 5]
- identify, with reasons, whether changes in materials are reversible or not [year 5]
- use the idea that light from light sources, or reflected light, travels in straight lines and enters our eyes to explain how we see objects [year 6], and the formation [year 3], shape [year 6] and size of shadows [year 3]
- use the idea that sounds are associated with vibrations, and that they require a medium to travel through, to explain how sounds are made and heard [year 4] • describe the relationship between the pitch of a sound and the features of its source; and between the volume of a sound, the strength of the vibrations and the distance from its source [year 4]
- describe the effects of simple forces that involve contact (air and water resistance, friction) [year 5], that act at a distance (magnetic forces, including those between like and unlike magnetic poles) [year 3], and gravity [year 5]
- identify simple mechanisms, including levers, gears and pulleys, that increase the effect of a force [year 5]
- use simple apparatus to construct and control a series circuit, and describe how the circuit may be affected when changes are made to it; and use recognised symbols to represent simple series circuit diagrams [year 6]
- describe the shapes and relative movements of the Sun, Moon, Earth and other planets in the solar system; and explain the apparent movement of the sun across the sky in terms of the Earth's rotation and that this results in day and night [year 5].

PROGRESSION IN SCIENTIFIC KNOWLEDGE - PHYSICS

Physics				
	Year 3	Year 4	Year 5	Year 6
Forces (& Magnets)	· I can explore and describe how objects move on different surfaces. · I can explain how some forces require contact and some do not. · I can predict and test whether objects will be magnetic. · I can describe how magnets work. · I can explore and explain how objects/magnets attract and repel. · I can predict whether magnets will attract or repel and give a reason.		· I can explain what gravity is and its impact on our lives. · I can identify and explain the effect of air resistance and water resistance. · I can identify and explain the effect of friction. · I can explain how levers, pulleys and gears allow a smaller force to have a greater effect.	
Earth and Space			· I can describe and explain the movement of the Earth and other planets relative to the Sun. · I can describe and explain the movement of the Moon relative to the Earth. · I can explain and demonstrate how night and day are created. · I can describe the Sun, Earth and Moon (using the term spherical).	

Electricity		· I can identify and name appliances that require electricity to function. · I can construct a series circuit and identify its components. · I can draw a circuit diagram. · I can predict and test whether a lamp will light within a circuit. · I can describe the function of a switch in a circuit.		· I can explain how the number & voltage of cells in a circuit links to the brightness of a lamp or the volume of a buzzer. · I can compare and give reasons for why components work or not in a circuit. · I can draw circuit diagrams using correct symbols.
Light	· I can describe what dark is (absence of light). · I can explain that light is needed in order to see. · I can explain that light is reflected from a surface. · I can explain/demonstrate how a shadow is formed and explore shadow size. · I can explain the danger of direct sunlight and how to keep protected.			· I can explain how light travels. · I can explain and demonstrate how we see objects. · I can explain why shadows have the same shape as the object casting them. · I can explain how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.
Sound		· I can describe how sound is made, explaining vibration. · I can explain how sound travels from a source to our ears. · I can explore the link between pitch and the object producing a sound. · I can explore the link between volume of a sound and the object's vibrations. · I can describe what happens to a sound as it travels away from its source.		

PROGRESSION IN SCIENTIFIC KNOWLEDGE - CHEMISTRY

Chemistry				
	Year 3	Year 4	Year 5	Year 6
Rocks, soils and fossils	· I can compare and group together different kinds of rocks on the basis of their appearance and simple physical properties · I can describe in simple terms how fossils are formed when things that have lived are trapped within rock · I can recognise that soils are made from rocks and organic matter.			· I can understand that fossils provide information about living things that inhabited the Earth millions of years ago · I can describe how fossils have been formed in the earth.

States of matter / Properties and changes of materials		· I can compare and group materials together, according to whether they are solids, liquids or gases · I can 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) · I can identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	· I can 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 · I can know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution · I can use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating · I can give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic · I can demonstrate that dissolving, mixing and changes of state are reversible changes · I can 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.	
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PROGRESSION IN SCIENTIFIC KNOWLEDGE - BIOLOGY

Biology				
	Year 3	Year 4	Year 5 <i>(taught as one unit)</i>	Year 6

Animals (including humans)	· I can 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 · I can identify that humans and some other animals have skeletons and muscles for support, protection and movement.	· I can describe the simple functions of the basic parts of the digestive system in humans · I can identify the different types of teeth in humans and their simple functions · I can construct and interpret a variety of food chains, identifying producers, predators and prey.	· I can describe the changes as humans develop to old age.	· I can identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood · I can recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function · I can describe the ways in which nutrients and water are transported within animals, including humans.
Living things and their habitats / Plants	· I can identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers · I can explore the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary from plant to plant · I can investigate the way in which water is transported within plants · I can explore the part that flowers play in the life cycle.	· I can recognise that living things can be grouped in a variety of ways · I can explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment · I can recognise that environments can change and that this can sometimes pose dangers to living things.	· I can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird · I can describe the life process of reproduction in some plants and animals.	· I can 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 · I can give reasons for classifying plants and animals based on specific characteristics.
Evolution and inheritance	(Chemistry: fossils)			· I can recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago · I can recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents · I can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

PROGRESSION IN SCIENTIFIC ENQUIRY

Working Scientifically – Statutory requirements

	Towards LKS2	LKS2	UKS2	Beyond UKS2
PLAN (Asking Questions)	ask simple questions and recognise that they can be answered in different ways	ask relevant questions and use different types of scientific enquiries to answer them	- plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary - use test results to make predictions to set up further investigations	- ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience - make predictions using scientific knowledge and understanding
DO (Carrying out investigations)	- observe closely, using simple equipment - perform simple tests	- set up and carry out simple practical enquiries, comparative and fair tests - make systematic and careful observations, taking accurate measurements and, where appropriate, using standard units - using a range of equipment including thermometers and data loggers	take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate	select, plan and carry out the most appropriate types of scientific enquiries to test predictions
RECORD (Measuring and Recording data)	gather and recording data to help in answering questions	- gather, record, classify and present data in a variety of ways to help in answering questions - record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables	record data and results of increasing complexity using scientific diagrams and labels, tables, bar and line graphs	- make/record observations and measurements using a range of methods for different investigations; evaluate reliability of methods and suggest improvements - present observations and data using appropriate methods.
REVIEW (Evaluating and Concluding)	use their observations and ideas to suggest answers to questions	- report on findings from enquiries, include oral and written explanations, displays or presentations of results and conclusions - use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions - identify differences, similarities or changes related to simple scientific ideas and processes - use straightforward scientific evidence to answer questions or to support their findings	- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations - identify scientific evidence that has been used to support or refute ideas or arguments.	- interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions - present reasoned explanations, including data in relation to predictions and hypotheses - evaluate data, showing awareness of potential sources of error - identify further questions arising from results

Fair testing (non-statutory)

	Towards LKS2	LKS2	UKS2
PLAN	recognise when a simple comparison /test is unfair	- suggest ways of making the test fairer - suggest data needing to be collected	- choose the to carry out a fair test when appropriate - list all the equipment needed

(Asking Questions)	• suggest how to collect the data needed • make a simple prediction when appropriate (based on something they have observed previously)	• from a selection identify what equipment is needed • make predictions based on everyday experiences and knowledge	• decide what and how much data to collect • predict based on scientific knowledge
DO (Carrying out investigations)	• measure using simple measuring equipment in uniform non-standard units (e.g. straws) or simple standard units (Y2) such as metre sticks, kg masses, L jugs and second timers • read scale to the nearest labelled division (Y2)	• use simple standard measures: m, cm, mm, kg, g, cm³, minutes, seconds, Newton measuring to the nearest half unit • read scales to the nearest division even when unlabelled	• select appropriate measuring equipment allowing for accurate measurement • use standard measures including fractions, decimals and mixed units • read scales with precision and accuracy
RECORD (Measuring and Recording data)	• draw pictures/take photos/write simple sentences/complete simple charts such as two column tables • draw or make practical block graphs/pictograms with a 1:1 scale	• choose an appropriate way to record results including choosing a two column table • draw bar charts with simple scales e.g. 1:2, 1:5, 1:10, 1:100 • plot line graphs (Y4)	• record data accurately and appropriately including tables allowing for repeat readings and averages • choose the appropriate type of graph • draw bar and line graphs with complex scales possibly involving fractions or decimal e.g. 1:2 ½ or 1:1.5
REVIEW (Evaluating and Concluding)	• describe observations/data • say what they have found out • if initially predicted say whether what happened was what was expected	• notice links between cause and effect	• use graphs when spotting and interpreting trends and patterns • offer explanations for differences in repeat readings

Grouping and Classifying (non-statutory)

	Towards LKS2	LKS2	UKS2
PLAN	• ask questions designed to help	• ask questions relating to how things/ organisms should be grouped, what things/organisms are and if	• plan to use an identification key to identify an unknown organism

(Asking Questions)	place things in groups based on similar observable or behavioural features	there are similar things/ organisms	- plan what to test and how to test and what evidence to collect in order to classify - predict which phylum (mammal, bird, reptile, amphibian, fish) a vertebrate belongs in from initial observation
DO (Carrying out investigations)	- make comparisons then grouping similar things /organisms together - classify things into two groups one group containing things/organisms that have an observable feature the other doesn't	- use results of simple tests to sort and group things by how they behave (e.g. waterproof or not) - use simple standard measures; m, cm, mm, kg, g, cm³, minutes, seconds, Newton measuring to the nearest half unit - read scales to the nearest division even when unlabelled	- use identification keys to identify unknown organisms - select appropriate measuring equipment allowing for accurate measurement - use standard measures including fractions, decimals and mixed units - read scales with precision and accuracy - use a variety of tests/pieces of evidence to identify and classify materials /organisms
RECORD (Measuring and Recording data)	record appropriately using tables, sorting circles and simple Venn diagrams to help distinguish sets of similar things/organisms	- use Carroll and Venn diagrams to help sort and record groupings - make simple branching data bases/classification keys for a limited number of things (maximum 6) with easily observable differences	make own keys and branching data bases
REVIEW (Evaluating and Concluding)	- can identify which group an additional object / organism should be placed in - describe how things/organisms have been sorted	- describe alternative/ improved ways to sort /group/classify - use simple classification keys/branching data bases to identify unknown items that have easily observable differences in their features	- explain that sorting/grouping/classifying is very useful to help predict where things/ organisms belong and how they will behave - evaluate how well keys work and suggest changes/improvements - Confirm or reject initial predictions around the phylum a vertebrate belongs in based on more detailed observations
Pattern spotting (non-statutory)			
	Towards LKS2	LKS2	UKS2
PLAN	recognise they are looking for a pattern	identify that a fair test isn't the right type of	understand why variables can't be controlled and suggest

(Asking Questions)	• suggest how to collect the identified data needed • when appropriate (based on something similar they have observed) make a simple prediction about a possible pattern	enquiry but a pattern seeking enquiry is possible • suggest which two sets of data need to be collected • from a selection identify what equipment is needed • make prediction about a likely pattern based on everyday experiences and knowledge	using a pattern seeking enquiry • list all the equipment needed • decide types and large amount of data needed to be collected to ensure a reasonable sample size • predict the pattern/trend based on scientific knowledge
DO (Carrying out investigations)	• observe or measure using simple measuring equipment in uniform non-standard units (e.g. straws) or simple standard units (Y2) such as metre sticks, kg masses, L jugs and second timers • read scale to the nearest labelled division	• use simple standard measures; m, cm, mm, kg, g, cm³, minutes, seconds, Newton measuring to the nearest half unit • read scales to the nearest division even when unlabelled	• select appropriate measuring equipment allowing for accurate measurement • use standard measures including fractions, decimals and mixed units • read scales with precision and accuracy
RECORD (Measuring and Recording data)	• draw pictures/take photos/write simple sentences/complete simple charts such as tally charts • make practical scatter graphs /pictograms/ block graphs (Y2) with a 1:1 scale	• choose an appropriate way to record results including choosing a tally chart • draw scatter graphs and bar charts with simple scales e.g. 1:2, 1:5, 1:10, 1:100	• record data accurately and appropriately including tally charts and tables allowing for repeat readings and averages • choose the appropriate type of graph • draw scatter graphs and frequency charts including those with complex scales possibly involving fractions or decimal e.g. 1:2 ½ or 1: 51.
REVIEW (Evaluating and Concluding)	• describe simple patterns • say what they have found out • if initially predicted say whether the pattern found was what was expected	• notice links/patterns between the two sets of data • suggest ways the test could be improved	• use graphs when spotting and interpreting trends and patterns • recognise the effect of sample size on reliability • explain the relationship between two sets of data • suggest improvements in experimental method

Observing and measuring over time (non-statutory)

	Towards LKS2	LKS2	UKS2
PLAN	• recognise they will need to make observations/	• decide to answer a question by observing/	• know why an observation/measurement over time is

(Asking Questions)	measurements over a longer time • suggest how to collect the identified data needed • when appropriate (based on something similar they have observed) make a simple prediction about what will change over time	measuring changes over a longer period of time • suggest how long to make periodic observations or take measurements for • suggest any data needing to be collected • from a selection identify equipment needed • make prediction about a likely observable changes based on everyday experiences and knowledge	appropriate to answer the question • list all the equipment needed • decide types, amount and frequency of data needed to be collected • predict changes expected based on scientific knowledge
DO (Carrying out investigations)	• observe or measure changes using simple measuring equipment in uniform non-standard units (e.g. straws) or simple standard units (Y2) such as metre sticks, kg masses, L jugs and second timers • read scale to the nearest labelled division (Y2)	• use simple standard measures; m, cm, mm, kg, g, cm³, minutes, seconds, Newton measuring to the nearest half unit • read scales to the nearest division even when unlabelled	• select appropriate measuring equipment allowing for accurate measurement • use standard measures including fractions, decimals and mixed units • read scales with precision and accuracy
RECORD (Measuring and Recording data)	• draw pictures/take photos/write simple sentences/complete simple charts such as sequential picture charts • make practical graphs (e.g. ribbon to show height of a sunflower each week) scatter graphs/ pictograms / block graphs with a 1:1 scale	• choose an appropriate way to record results including choosing a table • draw scatter graphs and bar charts with simple scales e.g. 1:2, 1:5, 1:10, 1:100	• record data accurately and appropriately including in tables • recognise line graphs as the appropriate type of graph • draw line graphs including those with complex scales possibly involving fractions or decimal e.g. 1:2 ½ or 1: 1.5
REVIEW (Evaluating and Concluding)	• describe /sequence simple changes • if initially predicted say whether the change was what was expected	• say whether the changes were what was expected explain any differences	• use graphs when spotting and interpreting how things change • explain the effect of changing the time and/or number of observations /measurements • suggest improvements in experimental method

DISCIPLINARY KNOWLEDGE

Within our curriculum, pupils have the opportunity to develop their scientific enquiry skills. We have identified the below areas in our curriculum in which pupils can practise these skills.



Comparative
and fair tests



Research



Observing over
time



Pattern seeking



Grouping and
classifying

Within these areas, we explicitly teach the following scientific enquiry skills, alongside the substantive knowledge, which become more advanced each year:



Asking questions and
using scientific enquiry
to answer them



Setting up and
performing practical
enquiries



Observing closely



Gathering, recording
and presenting data



Make predictions



Draw conclusions

COVERAGE OF WORKING SCIENTIFICALLY AREAS - YEAR 3

	Fair / Comparative Testing	Grouping and Classifying	Pattern Spotting	Observing over time	Researching
Light	Investigate reflective surfaces. Which material would be the best to make a dog coat?	Which materials are opaque? Translucent? Transparent? Predict and test with torches. Classify light sources into natural and artificial.	How does light travel? How can we see objects?	How do our shadows change during the day?	Understand the danger of direct sunlight and how to keep protected.
Forces and Magnets	How do different surfaces affect the movement of a car? Which is the strongest magnet? NEW: How does the mass of an object affect the force needed to move it?	Identify how different things move with force and group them - pushes and pulls. Will magnets attract or repel? Which materials are magnetic?	Does the size of a magnet affect how many paper clips it can attract?		
Rocks and soils	Which soil is the most permeable?	Which types of rock are natural and which are man-made? How can we group rocks based on their properties?	How do soils differ in their properties? Is there a link between these properties?		How are fossils formed? Who was Mary Anning and what did she discover?
Animals including Humans		What food groups can we separate foods into? How do skeletons of different animals compare?	Which muscles do we use to do different activities?		What are the three main purposes of a human skeleton?
Living things and their habitats	Will a plant grow better in the dark or in sunlight? With soil or without soil? With water or without water?			NEW: What happens to celery when it is left in a glass of coloured water? NEW: How do flowers in a vase change over 24 hours?	What are the different parts of a flower and what jobs do they do? How do bees help with pollination?

COVERAGE OF WORKING SCIENTIFICALLY AREAS - YEAR 4

	Fair / Comparative Testing	Grouping and Classifying	Pattern Spotting	Observing over time	Researching
States of Matter	How does the shape/surface area of a container affect the rate of evaporation? Do all types of chocolate melt at the same rate?	Which materials are solid, liquid or gas?	What happens when we squeeze a solid, a liquid or a gas? Dancing raisin experiment	What happens when a chocolate button is left on our hand? Do all types of chocolate melt at the same rate? What happens when a wet paper towel is left out in the classroom?	What are the stages of the water cycle?
Sound	How does distance affect the volume of a clap in decibels?		Does sound travel faster through solids, liquids or gases? Ear gong investigation - length and material of string. How does the frequency of sound waves link to pitch and volume?	What happens when we put a tuning fork in water? When we bang a drum with rice on it? When we put a piece of paper on a guitar string and pluck it?	How the inner ear works.
Animals including Humans	What is the effect of different liquids on an eggshell when left over a week?	Which organisms are producers / consumers? What are the different types of teeth and their functions?	How do teeth differ in carnivores, herbivores and omnivores? How does energy move up a food web?	What is the effect of different liquids on an eggshell when left over a week?	How does each part of the digestive system work?
Electricity		Do these appliances run on mains electricity or battery electricity? Which materials are conductors and which are insulators?	What happens when I add more cells in a circuit? What happens when I add more bulbs to a circuit?		How can we ensure we are using electricity safely?
Living things and their habitats		How are organisms classified? (5 kingdoms, vertebrates/invertebrates, classes) How do we use a classification key	Are there any similarities in the invertebrates we can find in the school grounds?	What is the life cycle of a butterfly?	How do habitats change?

to classify a range of organisms?

COVERAGE OF WORKING SCIENTIFICALLY AREAS - YEAR 5

	Fair / Comparative Testing	Grouping and Classifying	Pattern Spotting	Observing over time	Researching
Forces	How does the number of paperclips attached to a spinner affect the time it takes to fall to the ground? How much force is needed to move a shoe across different surfaces? Is a greater force required to move an object uphill or downhill? How much weight can a boat hold before it sinks?		Which paper spinner will fall to the ground the slowest? Is there a link with how fast we rub our hands together and how hot they become? How do levers change the amount of force required to act upon an object?		
Earth and Space		What are the similarities and differences between the Sun, the Earth and the moon?	How far away from the Sun is each planet in the Solar System?	How does the moon change over the course of a month?	How do day / night / seasons occur? What are the different phases of the moon? What if we had no moon? Independent research - black holes / first moon landing etc.
Properties of Materials		Testing out and grouping materials based upon their similar properties Which materials are thermal conductors / insulators?	Which materials dissolve in water? Is there a link between soluble and insoluble materials? How can we separate different materials?		
Animals Including Humans		How can we classify the stages in human development?	How does the size of an animal link to the gestation period of that species? Is there a pattern in the height of boys compared to girls?	How do humans develop over time?	What factors affect the growth and development of humans through childhood?
Living things and		What are the different life cycles of mammals, amphibians, insects and birds?	How do these life cycles compare with each other?	How do other animal classes develop over time? (amphibians)	What are the seven processes of all organisms? Who are some famous naturalists? What

their habitats					does their job entail? How do plants reproduce?
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COVERAGE OF WORKING SCIENTIFICALLY AREAS - YEAR 6

	Fair / Comparative Testing	Grouping and Classifying	Pattern Spotting	Observing over time	Researching
Electricity	How does the length of a wire affect the brightness of a bulb?		How does voltage affect the brightness of bulbs in a circuit?		How have major discoveries affected our understanding and use of electricity?
Light	NEW: How does the angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface?		How does light travel? How does the distance of an object to a light source affect its size? Why do objects appear different when seen through water?		How has Isaac Newton's discovery of the visible spectrum helped us to understand light?
Evolution and Inheritance		Which are acquired or inherited characteristics?	Is there a link to bird beak shape/size and the type of food it can eat?	Origin and variation of species (vertebrates) Human evolution and genetic variation	How has an animal (e.g. Polar Bear) evolved to survive in its habitat? What happened when Charles Darwin visited the Galapagos islands?
Animals including Humans	How does heart rate change during and after exercise?	Drugs that can positively / negatively affect your health			Animals: How does the heart pump blood around the body? Animals: How does the circulatory system transport nutrients, water and oxygen through the body?
Living things and their habitats		How can we classify all living species? (Linnaean system)		Animals: How does heart rate change during and after exercise?	Living things: What is the difference between different types of microorganisms?

TEACHING & LEARNING IN SCIENCE

At St Peter's, we believe that a 'good' Science lesson will contain the following six elements:



PRIOR
LEARNING



VOCABULARY



TEACH



TALK TASK



TASK



PLENARY

Prior learning	It might be a good year or two since they last learned about this topic! Address any misconceptions about what they already know (if the misconception won't be addressed in the new learning). A good opportunity to introduce the bigger picture. Each lesson has a 'Re Remembering' slide at the beginning covering each topic they have covered in previous years or terms.
Vocabulary	Children need a language for science! Can be built up slowly (one or two new words introduced per lesson, used explicitly throughout). A vocabulary gap can become a knowledge gap -

	especially in KS3.
Teach	Each lesson should have a clear learning objective and clear knowledge goals. New content should be introduced in small, manageable chunks using the school's approach to highly effective teaching.
Talk Task	A chance for children to discuss / predict / explain. Sentence stems can be useful to guide their talk. A range of creative ways to do this: - Concept cartoons - Voice recording - Big questions (a bit like maths word problems) Predictions coming after the teaching of substantive knowledge are much more well-informed. Children aren't just guessing but drawing on their knowledge to make a sensible prediction.
Task	It doesn't always have to be a practical experiment (particularly if the 'Teach' part of the lesson has involved demonstrations). If it is a practical experiment - make sure it's one that will definitely work! The substantive knowledge that they learn from the experiment is the most important. Independent tasks can cover one of the five areas of scientific enquiry, but they can also be an opportunity for children to develop their science literacy (reading and writing about science).

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 3

Unit:	Light	Year:	3	Term:	Autumn 1
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Links to prior learning

In Year 1 children should have:

- Observed changes across the four seasons
- Observed and described weather associated with the seasons and how day length varies.
- Identified, named, drawn and labelled the basic parts of the human body and can say which part of the body is associated with each sense.
- Described the simple physical properties of a variety of everyday materials.

New learning

- **Recognise that they need light in order to see things and that dark is the absence of light.**
- **Notice that light is reflected from surfaces.**
- **Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.**
- **Recognise that shadows are formed when the light from a light source is blocked by a solid object.**
- **Find patterns in the way that the sizes of shadows change.**

Notes and guidance

Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. They should think about why it is important to protect their eyes from bright lights. They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.

Note: pupils should be warned that it is not safe to look directly at the sun, even when wearing dark glasses.

Preparation for future learning

In Year 6 children will:

- 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.
- Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.

Big Ideas of Science

ENERGY

Energy comes in lots of different forms (and this form is light!)

Energy cannot be created or destroyed, but can be transferred. * Greater Depth - only cover if they are ready. Discuss how light energy from the sun can make things warm (heat energy). Electrical energy is used to make light energy in light bulbs.

'Sticky knowledge'

- There must be light for us to see. Darkness is the absence of light.
- We need light to see things, even shiny(reflective) things.
- Transparent materials let light through them and opaque materials don't let light through.
- Beams of light bounce off some materials (reflection).
- Shiny materials reflect light beams better than non-shiny materials.
- Light ALWAYS comes from a source.

Common misconceptions

- We can still see even where there is an absence of any light.
- Our eyes 'get used to' the dark.
- The moon and reflective surfaces are light sources.
- A transparent object is a light source.
- Shadows contain details of the object, such as facial features on their own shadow.
- Shadows result from objects giving off darkness.

Key vocabulary

New vocabulary: energy, light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent.

Working Scientifically opportunities

Fair/comparative testing:

- Investigate how light reflects off different surfaces. Which material would be best to make a dog coat?

Observing over time:

- How does my shadow change over the day?

Identifying/classifying:

- Classify light sources into natural and artificial sources.
- Which materials are opaque, translucent or transparent?

Pattern spotting:

- How does light travel? How do we see things?

Researching:

- Understand the danger of direct sunlight and how to keep protected.

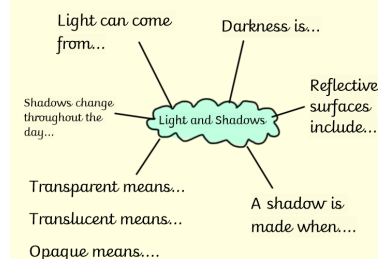
End of unit assessment



Thursday 17th October

WALT: Make a mind map to reflect on our learning about light and shadows.

End of topic mindmap:



Useful links and activities

Explorify (use school login): A range of starter discussions, videos and hands-on activities. <https://explorify.wellcome.ac.uk/en/activities>

BP Science: [https://bpes.bp.com/resources/list?ageGroup\[\]=2&topic\[\]=11](https://bpes.bp.com/resources/list?ageGroup[]=2&topic[]=11) 3 really nice Peter Pan lessons with practical experiments on shadows.

STEM (use school login) : <https://www.stem.org.uk/resources/elibrary/resource/33362/light-light-and-shadows> Hamilton Trust lessons
<https://www.stem.org.uk/resources/elibrary/resource/30645/questions-about-light> Great video starter with questions

BBC Bitesize: <https://www.bbc.co.uk/bitesize/topics/zbssgk7/resources/1>

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 3

Unit:	Forces & Magnets	Year:	3	Term:	Autumn 2
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Links to prior learning

From Year 2 children should:

- Have an awareness of how to make things stop and start, using simple pushes and pulls.
- They may know about floating and sinking.
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

New learning

- **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**

Notes and guidance

Pupils should observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). They should explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe).

Preparation for future learning

In Year 5 children will:

- 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, which act between moving surfaces.
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
- 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
- Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

Big ideas

FORCES

To move an object, a force must be used. Forces are different kinds of pushes and pulls that act on all matter in the universe. Objects don't have to touch each other to affect each other. (magnets)

'Sticky Knowledge'

- Magnets exert attractive and repulsive forces on each other.
- Magnets exert non-contact forces, which work through some materials.
- Magnets exert attractive forces on some materials.
- Magnet forces are affected by magnet strength, object mass, distance from object and object material.

Common misconceptions

- The bigger the magnet the stronger it is.
- All metals are magnetic.

Key vocabulary

Vocabulary from prior learning: Force, push, pull, surface, attract, repel, compass

New vocabulary: matter, friction, magnet, magnetic, magnetic field, pole, north, south

Working Scientifically opportunities

Fair/comparative testing:

- Raising questions and carrying out tests to find out how far things move on different surfaces, and gathering and recording data to find answers to their questions
- How does the mass of an object affect how much force is needed to make it move? (Using Newton meters)
- Which magnet is strongest?
- How far does a toy vehicle travel on different surfaces? **COMPARATIVE**

Observing over time:

- If we magnetise a pin, how long does it stay magnetised for?

Identifying/classifying:

- Will magnetic poles attract or repel?
- Which materials are magnetic?
- Comparing how different things move and grouping them - pushes and pulls.

Pattern spotting:

- looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another
- What is the relationship between North and South poles on magnets?
- Does the size and shape of a magnet affect how strong it is?

Researching:

- How have our ideas about forces changed over time?
- How does a compass work?

End of unit assessment

Forces and Magnets – End of Unit Quiz

1. Circle the correct word from each box:

A force is a sound / push or a smell / pull acting on an object / order.

Forces can make objects start / grow or burn / stop or go

quicker / quieter or slower / quieter.

2. Write **push** or **pull** in each row to finish the table below:

(The first one has been done for you.)

Activity	Push or Pull?
Jumping on a trampoline	push
Hitting a ball with a bat	
Getting ready to fire an arrow	
A car taking a trailer somewhere	
Tying shoe laces	

3. Which force slows down the movement of objects, and makes it difficult for an object to move on a rough surface?

4. Magnets have a North and South _____.

5. Will these magnets attract or repel?

Magnets	Attract or Repel?
	
	
	

6. Who is correct?



7. If we do an investigation on different magnets to see how far away they were before they picked up a paper clip, what would we find out about the magnets?

8. Tick the materials that are magnetic.

- Iron ☐
- Wood ☐
- Paper ☐
- Steel ☐



9. What do newton meters measure?

Useful links and activities

Explorify (use school login): A range of starter discussions, videos and hands-on activities. <https://explorify.wellcome.ac.uk/en/activities>

BP Science: [https://bpes.bp.com/resources/list?ageGroup\[\]=2&topic\[\]=7](https://bpes.bp.com/resources/list?ageGroup[]=2&topic[]=7)

BBC Bitesize: Useful videos on magnets <https://www.bbc.co.uk/bitesize/topics/zyttyrd> and forces <https://www.bbc.co.uk/bitesize/topics/znmmn39>

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 3

Unit:	Rocks & Soils	Year:	3	Term:	Spring 2
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Links to prior learning

From Year 2 children should:

- Identify / compare the suitability of a variety of everyday materials, e.g. wood, metal, plastic, glass, rock, paper and cardboard for particular uses.
- Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Children may:

- Have some understanding of a variety of different rocks in the natural world.
- Have some understanding of what soil is. (how to identify soil etc)
- Have some knowledge of what a fossil is.

New learning

- **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**

Notes and guidance

Linked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment.

Preparation for future learning

In Year 4 children will learn:

- Compare and group materials together, according to whether they are solids, liquids or gases.
- Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius.
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

In Year 6 children will learn:

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

Big ideas

MATTER - Matter is the name for stuff that everything in the universe is made of.

EVOLUTION AND INHERITANCE - The diversity of organisms on Earth is the result of evolution. (Fossils)

'Sticky knowledge'

- There are different types of rock and different types of soil.
- Different types of rock (igneous, sedimentary, metamorphic) have different properties and uses.
- Soils change over time.
- Different plants grow in different soils.
- Paleontologists use Fossils to find out about the past.
- Fossils provide evidence that living things have changed over time.

Common misconceptions

- Rocks are all hard in nature.
- Rock-like, man-made substances such as concrete or brick are rocks.
- Materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'.
- Certain found artefacts, like old bits of pottery or coins, are fossils.
- A fossil is an actual piece of the extinct animal or plant.
- Soil and compost are the same thing.

Key vocabulary

New vocabulary: Matter, rocks, igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, top soil, subsoil, base rock.

Working Scientifically opportunities

Fair/comparative testing:

- How does adding different amounts of sand to soil affect how quickly water drains through it?
- Which soil absorbs the most water (permeability investigation) ?
- Which rock has the best density/durability/permeability?

Observing over time:

- observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time;
- Create A Fossil Activity - how does a fossil form?
- Observe / draw a real fossil

Identifying/classifying:

- Identify rocks in a collection using an identification key.
- Group rocks into igneous, sedimentary and metamorphic.
- using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them.
- Pupils could explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water.

Pattern spotting:

- How do rocks compare in density / durability / permeability? How does this link with rock types? How does this affect what they are used for?

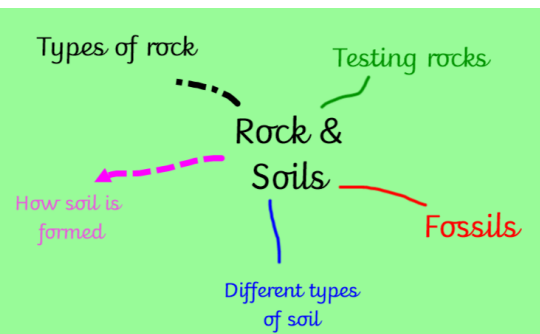
Researching:

- Who was Mary Anning and what did she discover?
- Pupils might research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed.

End of unit assessment

WALT: reflect on our learning about fossils, rocks and soils.

- Write the date and WALT on a plain page in your topic book
- Explain what you have learnt during our topic
- Use words and pictures to help you to explain
- You could present this as a mind-map



Extra subject knowledge for teachers

<https://www.bbc.co.uk/bitesize/guides/zgb9kqt/revision/2> KS3 level information for any difficult questions!

(Also see the STEM link below)

Useful links and activities

Explorify (use school login): A range of starter discussions, videos and hands-on activities. <https://explorify.wellcome.ac.uk/en/activities>

BP Science: [https://bpes.bp.com/resources/list?ageGroup\[\]=2&topic\[\]=6](https://bpes.bp.com/resources/list?ageGroup[]=2&topic[]=6) loads of really nice activities!

STEM: <https://www.stem.org.uk/resources/elibrary/resource/33463/rocks-and-soils> Useful PDF containing diagrams and flowcharts, also detailed subject knowledge for teachers.

BBC Bitesize: <https://www.bbc.co.uk/bitesize/topics/z9bbkqt> Great video clips for starters / discussion

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 3

Unit:	Animals, including Humans	Year:	3	Term:	Summer 1
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Links to prior learning

From Year 2 children should:

- Know that animals, including humans, have offspring which grow into adults
- Know the basic stages in a life cycle for animals, including humans.
- Find out and describe the basic needs of animals, including humans, for survival (water, food and air).
- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene

New learning

- **Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat.**
- **Know how nutrients, water and oxygen are transported within animals and humans.**
- **Know about the importance of a nutritious, balanced diet.**
- **Identify that humans and some other animals have skeletons and muscles for support, protection and movement:**

Notes and guidance

Pupils should continue to learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.

Preparation for future learning

In Year 4 children will learn to:

- 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

In Year 6 children will learn to:

- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)

Big ideas

ORGANISMS

Organisms (living things) are special collections of matter called cells. Organisms perform lots of different functions. Organisms need a supply of energy and materials (food) to live.

'Sticky knowledge'

- Different animals are adapted to eat different foods.
- Blood carries oxygen, water and nutrients around the body.
- Many animals have skeletons to support their bodies and protect vital organs.
- Muscles are connected to bones and move them when they contract.
- Movable joints connect bones.

Common misconceptions

- Certain whole food groups like fats are 'bad' for you.
- Certain specific foods, like cheese are also 'bad' for you.
- Diet and fruit drinks are 'good' for you.
- Snakes are similar to worms, so they must also be invertebrates.
- Invertebrates have no form of skeleton.

Key vocabulary

New vocabulary: Organisms, nutrients, nutrition, carbohydrates, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, joints, endoskeleton, exoskeleton, hydrostatic skeleton, vertebrates, invertebrates, muscles, contract, relax,

Working Scientifically opportunities

Fair/comparative testing:

- How does the angle that your elbow/knee is bent affect the circumference of your upper arm/thigh?
- How does the skull circumference of a girl compare with that of a boy?

Observing over time:

- Observing the change in the human skeleton from birth to death.

Identifying/classifying:

- identifying and grouping animals with and without skeletons and observing and comparing their movement
- They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat.
- Classifying the skeletons of different animals - can they spot the similarities between all bird skeletons, all mammal skeletons etc? Identify why the skeletons of other animals have evolved that way.

Pattern spotting:

- Do male humans have larger skulls than female humans?
- Compare the class - who has the longest legs/arms/spine (sit down height)? Is it the same child or different children?

Researching:

- They might research different food groups and how they keep us healthy, and design meals based on what they find out.
- Research which vitamins are needed to keep us healthy and what foods they can be found in.

End of unit assessment

End of Topic Assessment – Animals Including Humans

1. Match the food to the food group it would be in:

bread	Fruits and vegetables
milk	carbohydrates
apple	dairy

2. Which food group can cause health problems like weight gain, diabetes and heart disease if we eat too much?

a. protein
b. sugars and fats
c. carbohydrate

3. What is a balanced diet?

4. Why do living things need food?

1. _____
2. _____

5. What are nutrients?

6. Why do humans need skeletons?

1. _____
2. _____

6. Match the skeleton type to the description.

exoskeleton	Skeleton on the outside
endoskeleton	This animal has no bones
hydrostatic	Skeleton on the inside

7. How do the muscles in your arm work lift something?



8. Label the skeleton's bones. Use scientific vocabulary where you can.



Extra subject knowledge for teachers

- The differences between human/mammal skeletons and the skeletons of other animal groups. (e.g. some birds have hollow bones so that they are lightweight for flying; frogs have strong hip bones and large back legs for leaping; crocodiles have strong skulls and sharp teeth for hunting).
- Skeletal muscles are held to the bones with the help of tendons. Tendons are cords made of tough tissue, and they work as special connector pieces between bone and muscle. The tendons are attached so well that when you contract one of your muscles, the tendon and bone move along with it.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

STEM:

Primary Upd8:

BBC Bitesize: <https://www.bbc.co.uk/bitesize/topics/z9339j6> Skeletons and Muscles

<https://www.bbc.co.uk/bitesize/topics/zrffr82> Healthy diet

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 3

Unit:	Plants	Year:	3	Term:	Summer 2
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Links to prior learning

From Year 2 children should:

- Observe and describe how seeds and bulbs grow into mature plants.
- Find out and describe how plants need water, light and warmth to grow and stay healthy.

New learning

- **Identify and describe the functions of different parts of the flowering plant: roots, stem/trunk/leaves and flowers**
- **Explore the part flowers play in a flowering plants life cycle, including: pollination, seed formation and seed dispersal**
- **Explain the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary between plants**
- **Know the way in which water is transported between plants**

Notes and guidance

Pupils should be introduced to the relationship between structure and function: the idea that every part has a job to do. They should explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction.

Note: pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens.

Preparation for future learning

In Year 5 children will learn to:

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

In Year 6 children will learn to:

- Recognise that living things have changed over time and that fossils provide information about living things
- 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 can lead to evolution.

Big ideas

ORGANISMS - Organisms (living things) are special collections of matter called cells. Organisms perform lots of different functions. Organisms need a supply of energy and materials (food) to live.

EVOLUTION AND INHERITANCE - Characteristics are passed down from one generation of organisms to another.

Big ideas and key concepts - 'sticky knowledge'

- Plants are producers, they make their own food.
- Their leaves absorb sunlight and carbon dioxide.
- Plants have roots, which provide support and draw water from the soil.
- Flowering plants have specific adaptations which help them to carry out pollination, fertilisation and seed production.
- Seed dispersal improves a plant's chances of successful reproduction.
- Seeds/bulbs require the right conditions to germinate and grow.
- Seeds contain enough food for the plant's initial growth.

Common misconceptions

- Plants eat food.
- Food comes from the soil via the roots.
- Flowers are merely decorative rather than a vital part of the life cycle in reproduction.
- Plants only need sunlight to keep them warm.
- Roots suck in water which is then sucked up the stem.

Key vocabulary

Vocabulary from prior learning: organisms, leaves, trunk, branch, root, seed, bulb, flower, stem, wild, garden, deciduous, evergreen, observe, grow, diagram, germinate, warmth, sunlight.

New vocabulary: Roots, Stem, Leaves, Flowers, Nutrients, Reproduction, Transportation, Seed dispersal, Pollination, Life cycle, Germination

Working Scientifically opportunities

Fair/comparative testing:

- Comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser
- How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?
- Which conditions help seeds germinate faster? (variables of light, water, soil)

Observing over time:

- discovering how seeds are formed by observing the different stages of plant life cycles over a period of time
- they might observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.
- What happens to celery when it is left in a glass of coloured water?
- How do flowers in a vase change over time? How does their direction change during the day?

Identifying/classifying:

- Collecting leaves - how many different ways can you group them?

Pattern spotting:

- looking for patterns in the structure of fruits that relate to how the seeds are dispersed.
- Collecting leaves - spot patterns in their shape, size, edges, colour, veins etc.

Researching:

- What are all the different ways that seeds disperse?

End of unit assessment

End of Topic Quiz

1. Match the part of the plant to its function:

Stem	Bright colours to attract insects for pollination.
Roots	Absorb light and through photosynthesis turn it into food.
flower	Holds up the plant. Water travels through it.
Leaves	Absorbs water and nutrients from the soil. Anchors the plant.

2. Could a sunflower seed grow in a desert? Why?

3. Could a plant survive without its roots? Why?

4. Why do plants have flowers?

- _____
- _____
- _____

6. Draw and label the lifecycle of a flowering plant:

Extra subject knowledge for teachers

- Plants contain both male and female parts. During plant reproduction, pollen grains need to move from the anther of one flower to the stigma of another flower.
- Seeds must be dispersed or spread away from each other and from the parent plant. This is to reduce competition between the parent plant and the new plants, and between the new plants.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 4

Unit:	Sound	Year:	4	Term:	Spring 1
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Links to prior learning

From KS1 children should:

- Have some understanding that objects make different sounds.
- Have some understanding that they use their ears to hear sounds.
- Know about their different senses.

New learning

- 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.

Notes and guidance

Pupils should explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways.

Preparation for future learning

In Key Stage Three children will learn:

- frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound
- sound needs a medium to travel, the speed of sound in air, in water, in solids
- sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal
- auditory range of humans and animals.

Big ideas

ENERGY

Energy comes in lots of different forms. (and this form is sound!)

Energy cannot be created or destroyed, but it can be transferred. (link movement [kinetic] energy to sound vibrations)

'Sticky knowledge'

- Sound travels from its source in all directions and we hear it when it travels to our ears.
- Sound travel can be blocked.
- Sound spreads out as it travels.
- Changing the shape, size and material of an object will change the sound it produces.
- Sound is produced when an object vibrates.
- Sound moves through all materials by making them vibrate.
- Changing the way an object vibrates changes it's sound.
- Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds.
- Faster vibrations (higher frequencies) produce higher pitched sounds.

Common misconceptions

Pitch and volume are frequently confused, as both can be described as high or low.

- Sound is only heard by the listener.
- Sound only travels in one direction from the source.
- Sound can't travel through solids and liquids.
- High sounds are loud and low sounds are quiet.

Key vocabulary

New vocabulary: Amplitude, volume, quiet, loud, ear, pitch, high, low, particles, instruments, wave

Working Scientifically opportunities

Fair/comparative testing:

- Who has the loudest clap? (using Decibel meters on iPads)
- How does the length of a guitar string/tuning fork affect the pitch of the sound?

Observing (over time):

- What happens when you put a tuning fork in water / when you put rice on a drum / when you put a piece of paper on a guitar string?
- How does the weather affect our ability to hear birdsong?

Identifying/classifying:

- Which materials are best for muffling sound? What are their properties?

Pattern spotting:

- finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses.
- When a sound is made on a desk, is there a link between the volume of that sound when you press your ear to the desk and when you don't?
- What is the connection between ear size/shape in animals and their hearing abilities?
- How do we know that light travels faster than sound?

Researching:

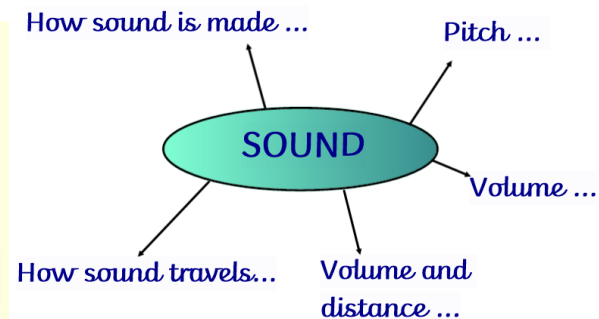
- Research Alexander Graham Bell - inventor of the telephone

Assessment opportunities

End of topic assessment

You are to create a mind map to showcase everything you have learned during our topic on **sound**.

WAGOLL



You can record in sentences or bullet points.

Extra subject knowledge for teachers

- Light travels faster than sound.
- Humans have a larynx (or voice box) that produces sound. Two bands of tissue form vocal chords; muscles pull these cords together when humans speak or sing, and the air passing between the cords makes them vibrate.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 4

Unit:	Electricity	Year:	4	Term:	Spring 2
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Links to prior learning

From Early Years children:

- May have some understanding that objects need electricity to work.
- May understand that a switch will turn something on or off.

New learning

- **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.**
- **Understand precautions for using electricity safely (non-statutory)**

Notes and guidance

Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices. Pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; these will be introduced in year 6.

Note: pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. Pupils should be taught about precautions for working safely with electricity.

Preparation for future learning

In Year 6 children will learn:

- 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, loudness of buzzers and on/off position of switches.
- Use recognised symbols when representing a simple circuit in a diagram.

Big ideas

ENERGY

Energy comes in lots of different forms (and this form is electricity!)

Energy cannot be created or destroyed, but it can be transferred. (Electrical energy is transferred to make light, heat, sound, kinetic, etc)

'Sticky knowledge'

- A source of electricity (mains or battery) is needed for electrical devices to work.
- Electricity sources push electricity round a circuit.
- More batteries will push the electricity round the circuit faster.
- Devices work harder when more electricity goes through them.
- A complete circuit is needed for electricity to flow and devices to work.
- Some materials allow electricity to flow easily and these are called conductors. Materials that don't allow electricity to flow easily are insulators.

Common misconceptions

- Electricity flows to bulbs, not through them.
- Electricity flows out of both ends of a battery.
- Electricity works by simply coming out of one end of a battery into the component.

Key vocabulary

Vocabulary from prior learning: electricity, switch

New vocabulary: electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, conductor, electrical insulator, component.

Working Scientifically opportunities

Fair/comparative testing:

- What happens when more components are added to a circuit? What will cause bulbs to be brighter or dimmer?

Observing over time:

- observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.
- How long does an AA battery last for in a torch? How does this compare to a wind-up torch?

Identifying/classifying:

- Grouping materials into conductors and insulators. What do conductors have in common?

Pattern spotting:

- Is there a link between the amount of cells in a circuit and the brightness of a bulb?

Researching:

- How can we use electricity safely in our homes and in school?

Assessment opportunities

End of Unit Assessment - Electricity

1. For each item tick the appropriate box. The first one has been done for you.

Appliance	Battery- Powered	Battery or Mains Powered	Mains Powered	Non- electrical appliance
 saucepan				☒
 torch				
 microwave				
 potato peeler				
 washing machine				
 alarm clock				

2. The lightbulb is on, what does that tell you about the 10p coin?



3. What should you do if you find some broken or damaged electrical equipment?

Tick **two** boxes.



- ☐ tell an adult
- ☐ continue to use it
- ☐ put it back with the rest of the equipment



4a. These are all what type of component? _____

4b. What is the job of this type of component? _____

5. Can you name each of the following components:











6. Look at the circuit diagrams, **circle** what you think will happen and why.

	I think that the bulb <u>will</u> / <u>will not</u> light up. This is because the circuit is <u>complete</u> / <u>incomplete</u> .
	I think that the bulb <u>will</u> / <u>will not</u> light up. This is because the circuit is <u>complete</u> / <u>incomplete</u> .
	I think that the bulb <u>will</u> / <u>will not</u> light up. This is because the circuit is <u>complete</u> / <u>incomplete</u> .

Extra subject knowledge for teachers

- Electricity terminology:
 - Current** is the measure of the flow of electrons in a circuit. Current is measured in **Amps** or Amperes.
 - Voltage** is the name for the electric force that causes electrons to flow. It's the measure of potential difference between two points in the circuit. Voltage may come from a battery or a power plant.
 - The **power** or energy used by a circuit is measured in **Watts**. You can calculate the number of Watts by multiplying the Voltage times the Current.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 4

Unit:	States of Matter	Year:	4	Term:	Autumn
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Links to prior learning

In KS1 children should:

- Distinguish between an object and the material from which it is made.
- Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.
- Describe the simple physical properties of a variety of everyday materials.
- Compare and group together a variety of everyday materials on the basis of their simple physical properties.
- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

New learning

- **Compare and group materials together, according to whether they are solids, liquids or gases.**
- **Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens (°C).**
- **Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.**

Notes and guidance

Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container).

Pupils should observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled.

Note: teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning.

Preparation for future learning

In Year 5 children will learn:

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity, 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 wood, metals 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 this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Big ideas

MATTER - Matter is the name for stuff that everything in the universe is made of. Atoms are the building blocks of all matter.

PROPERTIES OF MATERIALS

Materials have different properties depending on how these building blocks are arranged and how they behave.

Materials can change if the arrangement of the building blocks changes.

'Sticky knowledge'

- Solids, liquids and gases are described by observable properties.
- Materials can be divided into solids, liquids and gases.
- Heating causes solids to melt into liquids and liquids evaporate into gases. Cooling causes gases to condense into liquids and liquids to freeze into solids.
- The temperature at which given substances change state are always the same.

Common misconceptions

- '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.

Key vocabulary

New vocabulary: Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection.

Working Scientifically opportunities

Fair/comparative testing:

- How does the surface area of water affect how long it takes to evaporate?
- How does the mass of a block of ice affect how long it takes to melt?

Observing over time:

- They might observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting.
- What happens when a water bottle is left in a sunny spot?
- Observe and measure the cooling rate of boiling water

Identifying/classifying:

- grouping and classifying a variety of different materials
- Grouping materials and objects into solids, liquids, and gases

Pattern spotting:

- How does the evaporation rate change as you add more salt to water?
- What happens when you pour salt on ice?
- exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party).

Researching:

- They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid.
- What are the different melting / solidifying temperatures of different materials? How do they compare with water? (e.g. chocolate, olive oil, wax, glass, metal, etc)

Assessment opportunities

Date: _____

Science - States of Matter end of unit quiz

1. Label the objects below with solid (S), liquid (L) or gas (G)



2. Which of the following has a fixed shape and volume? Circle your answer.

Solid

Liquid

Gas

3. Which state/s of matter can be compressed easily?
4. Which state/s of matter can flow easily?
5. What is the name of the process when a liquid turns into a gas?
6. What is the name of the process when a gas turns back into a liquid?
7. What are rain, snow, sleet and hail are all forms of?
8. Explain a factor that can either speed up or slow down a change in state. Discuss how we tested this idea in an experiment.
9. Explain how the particles are arranged differently in a solid compared to a liquid.

Extension Task: Carefully cut out the diagram below.

Write the heading 'Extension Task: The Water Cycle'

Label the diagram and write a paragraph to explain each part of the process.



Extra subject knowledge for teachers

- Water freezes at around 0°C , and boils at around 100°C . Other materials have different boiling / freezing temperatures (for example, chocolate will melt at around 30°C).
- In the **solid** state the vibrating particles form a regular pattern . This explains the fixed shape of a solid and why it can't be compressed or poured.
- In a **liquid** the particles still touch their neighbours but they move around, sliding over each other . This is why you can pour but not compress a liquid.
- In the **gas** state, widely-spaced particles move around randomly . This explains why you can compress gases and why they flow.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 4

Unit:	Animals, including Humans	Year:	4	Term:	Summer 1
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Links to prior learning

From Year 3 children should:

- Identify that animals need the right types and amount of nutrition, and cannot make their own food; they get their nutrition from what they eat.
- Know how nutrients, water and oxygen are transported within animals and humans.
- Know about the importance of a nutritious, balanced diet.
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement

From Year 1 children should:

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

New learning

- **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**

Notes and guidance

Pupils should be introduced to the main body parts associated with the digestive system, for example: mouth, tongue, teeth, oesophagus, stomach, and small and large intestine, and explore questions that help them to understand their special functions.

Preparation for future learning

In Year 5 children will learn to:

- Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird.
- Know the differences between different life cycles.
- Know the process of reproduction in plants.
- Know the process of reproduction in animals

In Year 6 children will learn to:

- 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.

Big ideas

ORGANISMS

Organisms (living things) are special collections of matter called cells. Organisms perform lots of different functions.

Organisms need a supply of energy and materials (food) to live.

'Sticky knowledge'

- Animals have teeth to help them eat.
- Different types of teeth do different jobs.
- Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood.
- The blood takes nutrients around the body.
- Nutrients produced by plants move to primary consumers then to secondary consumers through food chains.

Common misconceptions

- Arrows in a food chain mean 'eats'.
- The death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain.
- There is always plenty of food for wild animals.
- Your stomach is where your belly button is.
- Food is digested only in the stomach.
- When you have a meal, your food goes down one tube and your drink down another.
- The food you eat becomes "poo" and the drink becomes "wee".

Key vocabulary

Vocabulary from prior learning: carnivores, herbivore, omnivore, teeth,

New vocabulary: Digestive system, tongue, mouth, oesophagus, stomach, gallbladder, small intestine, pancreas, large intestine, liver, tooth, canine, incisor, molar, premolar, producer, consumer

Working Scientifically opportunities

Fair/comparative testing:

- Compare the effects of different liquids on eggshells (representing enamel on teeth)

Observing over time:

- (see above)

Identifying/classifying:

- Can you classify animals into herbivores, carnivores and omnivores based on their teeth?

Pattern spotting:

- comparing the teeth of carnivores and herbivores and suggesting reasons for differences
- What similarities and differences can you see in the teeth of different animals, including humans? How do their teeth link to their diet?
- Are foods that are high in energy always high in sugar?

Researching:

- finding out what damages teeth and how to look after them.
- How do dentists fix broken teeth?

Assessment opportunities

Science: Animals, Including Humans - End of Unit Quiz

1. What is the hard, white substance that covers the outside of our teeth? Circle your answer.

- a) Enamel
- b) Pulp
- c) Root



2. What name is given to the teeth at the front of the mouth, used for cutting? Circle your answer.

- a) Molars
- b) Incisors

3. Which teeth will usually be long and pointy in carnivores to hold and tear meat? Circle your answer.

- a) Premolars
- b) Canines

4. Put the following parts of the digestive system in the order that food passes through them. Number them from one to five.

Large intestine Oesophagus Mouth Small intestine Stomach

☐ ☐ ☐ ☐ ☐

5. Which of the following descriptions best describes the function of the small intestine? Tick the box next to the answer.

- ☐ a) Food is broken down into small particles by the teeth and enzymes in saliva.
- ☐ b) Food is squeezed and pushed into the stomach.
- ☐ c) Nutrients are absorbed and passed into the bloodstream.

6. Which of the five main food groups is important for providing our body with vitamins and keeping our digestive system healthy? Circle your answer.

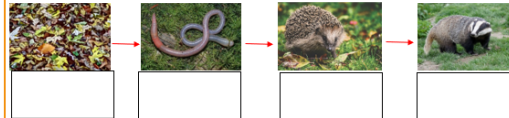
Carbohydrates Proteins Fruit & Vegetables Dairy Fats & Oils

7. Fill in the blank in the following statement:

Food chains show how _____ is transferred from one organism to another.

8. Label the following food chain correctly using the words provided:

Primary consumer Tertiary consumer Producer Secondary consumer



- 9. a) Which of the organisms above are predators? _____
- b) Which of the organisms above are prey? _____

10. An animal that is top of its food chain can also be described as being an a _____ p _____.

During this topic, I have enjoyed learning about _____
because _____

Extra subject knowledge for teachers

- The digestive system is one of a number of systems found in the human body. In Year 6 children will learn about the circulatory and respiratory systems.
- Digestive enzymes are the biological catalysts that break down our food. Different enzymes deal with each different part of food (fats, proteins, carbohydrates, vitamins, minerals).

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 4

Unit:	Living things & their habitats	Year:	4	Term:	Summer 2
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Links to prior learning

From Year 2 children should:

- Explore and compare the difference between things that are living, dead and things that have never been alive.
- Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.
- Identify and name a variety of plants and animals in their habitats, including micro habitats.
- Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name the different sources of food.

From Year 1 children should:

- Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.

New learning

- **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 danger to living things.**

Notes and guidance

Pupils should use the local environment throughout the year to raise and answer questions that help them to identify and study plants and animals in their habitat. They should identify how the habitat changes throughout the year. Pupils should explore possible ways of grouping a wide selection of living things that include animals, flowering plants and non-flowering plants. Pupils could begin to put vertebrate animals into groups, for example: fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects.

Note: plants can be grouped into categories such as flowering plants (including grasses) and non-flowering plants, for example ferns and mosses.

Pupils should explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks, or garden ponds, and the negative effects of population and development, litter or deforestation.

Preparation for future learning

In Year 5 (Animals Including Humans) children will learn to:

- 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.

In Year 6 (Living Things and their Habitats) children will learn to:

- Classify living things into broad groups according to observable characteristics and based on similarities and differences.
- Give reasons for classifying plants and animals based on specific characteristics.

Big ideas

EVOLUTION AND INHERITANCE

The diversity of organisms on Earth is the result of evolution.

Organisms adapt over time in order to survive in their environment

'Sticky knowledge'

- Living things can be divided into groups based upon their characteristics
- Environmental change affects different habitats differently
- Different organisms are affected differently by environmental change
- Different food chains occur in different habitats
- Human activity significantly affects the environment

Common misconceptions

- The death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain.
- There is always plenty of food for wild animals.
- Animals are only land-living creatures.
- Animals and plants can adapt to their habitats, however they change.
- All changes to habitats are negative.

Key vocabulary

Vocabulary from prior learning: Amphibians, birds, fish, mammals, reptiles, insects, plants, animals

New vocabulary: Environment, Characteristics, Habitats, Organisms, Food chain, Classification key, Vertebrate, Invertebrate, Deforestation

Working Scientifically opportunities

Fair/comparative testing:

- Compare different living conditions to investigate which conditions woodlice prefer. (dark/light? dry/damp?)

Observing over time:

- raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched.
- Observe the life cycle of a butterfly using 'Insectlore' butterfly farms - observe the characteristics that classify it as an insect.

Identifying/classifying: *Basically the whole unit!*

- using and making simple guides or keys to explore and identify local plants and animals
- making a guide to local living things;
- Use classification keys to identify organisms found from pond dipping (Perlethorpe trip)

Pattern spotting:

- What insects can you find in the woodland area? Is there a connection between the type of insect found and where it is found?

Researching:

- How have humans impacted the bee population? What bee-friendly flowers could we plant in our grounds / gardens?

Assessment opportunities

End of Topic Assessment: Living Things and their Habitats

1. Circle the habitat that is suitable for a hedgehog.



2. Circle the invertebrate.



3. Complete the sentence.

Deforestation is **clearing trees from a habitat so the land can be used by humans**

4. Humans have a positive impact on plant and animal habitats by creating nature reserves to protect the living things in that area.

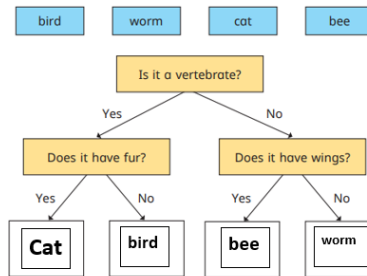


Name another way that humans can have a positive impact on plant and animal habitats.

E.g. **litter picks, making minibeast homes**

Rewilding projects • Planting trees/plants/seeds • No mow zones

5. Use the classification key to sort the animals.



6. If you were writing your own key what question would you use to separate birds and cats?



How many legs? • Fur or feathers? • Beak/teeth? • Wings?

7. What question would you use to separate a bat and a bird?



Mammal or bird? • Feathers or fur? • Anything that separates mammals and birds such as hatching from an egg or drinking mother's milk.

Extra subject knowledge for teachers

- In Year 1 children should have learned about the different classes of common animals: mammals, birds, fish, amphibians, reptiles (vertebrates) and insects (invertebrates). This will need to be revisited.
- Other invertebrates classes include molluscs, crustaceans, arachnids, worms and others. Children do not need to know about these but may ask about them.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 5

Unit:	Earth & Space	Year:	5	Term:	Autumn 1
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Links to prior learning

From KS1 and Year 3, children should:

- Understand changes in weather patterns and seasons.
- Compare how things move on different surfaces.
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing

New learning

- **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**
- **Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.**

Notes and guidance

Pupils should be introduced to a model of the sun and Earth that enables them to explain day and night. Pupils should learn that the sun is a star at the centre of our solar system and that it has 8 planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has 1 moon; Jupiter has 4 large moons and numerous smaller ones).

Note: pupils should be warned that it is not safe to look directly at the sun, even when wearing dark glasses.

Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

Preparation for future learning

In KS3 children will learn:

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

Big ideas

EARTH AND SPACE

Our solar system is a very small part of one of billions of galaxies in the universe.

Big ideas and key concepts - 'sticky knowledge'

- Stars, planets and moons have so much mass they attract other things, including each other due to a force called gravity. Gravity works over distance.
- Objects with larger masses exert bigger gravitational forces.
- Objects like planets, moons and stars spin.
- Smaller mass objects like planets orbit large mass objects like stars.
- Stars produce vast amounts of heat and light.
- All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars.

Key vocabulary

Vocabulary: Earth, Sun, Moon, Axis, Rotation, Day, Night, Phases of the Moon, star, constellation, waxing, waning, crescent, gibbous. Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, planets, solar system, day, night, rotate, orbit, axis, spherical, geocentric, heliocentric.

Working Scientifically opportunities

Fair/comparative testing:

- ...good luck!

Observing over time:

- Can you observe and identify all the phases in the cycle of the Moon? (good opportunity for a full scientific investigation and write-up)

Identifying/classifying:

- How could you organise all the objects in the solar system into groups?

Pattern spotting:

- Is there a pattern between the size of a planet and the time it takes to travel around the Sun?

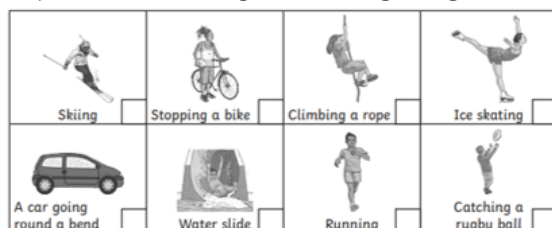
Researching:

- comparing the time of day at different places on the Earth through internet links and direct communication;
- finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks.
- What unusual objects did Jocelyn Bell Burnell discover?
- How do astronomers know what stars are made of?
- How have our ideas about the solar system changed over time?

Assessment opportunities

Forces - End of Unit Quiz

1. Tick all the pictures that show something where friction is a good thing:



2. Label **Gravity** and **one other force** on each of these diagrams, showing the direction of these forces using arrows.

An aeroplane flying



Dropping a stone in water



3. In what units do we measure force? What piece of equipment do we use to measure force?
4. What is the name of the force which pulls an object towards the centre of the Earth?
5. How is friction created?
6. How can you decrease the water resistance felt by an object?
7. Would it be easier for the car to go down or up the ramp? Explain why.
8. Explain how a lever works and why it is helpful.
9. Why do we sometimes repeat our results when conducting an experiment?
10. How can we make sure we are conducting a 'fair test'?



Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 5

Unit:	Forces	Year:	5	Term:	Autumn 2
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Links to prior learning

From Year 3 children should:

- Compare how things move on different surfaces.
- Know how a simple pulley works and use making lifting an object simpler
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- Observe how magnets attract and repel each other and attract some materials and not others.
- Compare and group 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.

New learning

- **Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives.**
- **Identify the effects of air resistance, water resistance and friction, which act between moving surfaces.**
- **Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.**

Notes and guidance

Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Pupils should explore the effects of levers, pulleys and simple machines on movement.

Pupils might find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Preparation for future learning

In KS3 children will learn:

- opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface
- forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)
- change depending on direction of force and its size.

Big ideas

ENERGY - Energy comes in lots of different forms.

FORCES - To move an object, a force must be used. Forces are different kinds of pushes and pulls that act on all matter in the universe.

Objects don't have to touch each other to affect each other. (Gravity)

'Sticky knowledge'

- Air resistance and water resistance are forces against motion caused by objects having to move air and water out of their way.
- Friction is a force against motion caused by two surfaces rubbing against each other.
- Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move

Key vocabulary

Vocabulary from prior learning: force, push, pull

New vocabulary: Air resistance, water resistance, friction, gravity, newton, gears, pulleys, opposing, streamline, brake, mechanism, lever, cog, machine.

Working Scientifically opportunities

Fair/comparative testing:

- exploring falling paper cones or cupcake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective
- How does running with a parachute affect our speed?

Observing over time:

- How long does it take for a pendulum to stop swinging?

Identifying/classifying:

- Can you label and name all the forces acting on the objects in each of these situations?

Pattern spotting:

- Do all objects fall through water in the same way?
- Design a parachute for a raw egg: how does the surface area of the parachute affect the time it takes to fall?

Researching:

- How do submarines sink if they are full of air?
- How do aeroplanes stay in the air?

Assessment opportunities

Space – End of topic Quiz

1. Roughly what shape are the Earth, Sun and Moon?
2. Why does the Sun look like its moving across the sky during the day?
3. What causes day and night?
4. What does 'orbit' mean?
5. What does the Earth orbit? What does the moon orbit?
6. What is at the centre of our solar system?
7. What is the Earth's axis?
8. What causes seasons?
9. How does the moon appear to change shape? Why does this happen?
10. What has been your favourite fact that you have learned in this unit?



Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 5

Unit:	Properties & changes of materials	Year:	5	Term:	Spring 1 (and 2)
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Links to prior learning

From KS1 children should:

- Describe the simple physical properties of a variety of everyday materials.
- Identify / compare the suitability of a variety of everyday materials, e.g. wood, metal, plastic, glass, rock, paper and cardboard for particular uses.
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

From Year 4 children should:

- Compare and group materials together, according to whether they are solids, liquids or gases.
- Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens (°C).
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

New learning

- **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/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.**

Notes and guidance

Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4. They should explore reversible changes, including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes. Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

Note: pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials.

Preparation for future learning

In **Key Stage Three** children will learn:

- the concept of a pure substance
- mixtures, including dissolving
- diffusion in terms of the particle model
- simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography
- the identification of pure substances

Big ideas

MATTER - Matter is the name for stuff that everything in the universe is made of. Atoms are the building blocks of all matter.

PROPERTIES OF MATERIALS

Materials have different properties depending on how these building blocks are arranged and how they behave.

Materials can change if the arrangement of the building blocks changes.

Big ideas and key concepts - 'sticky knowledge'

- All matter (including gas) has mass.
- Sometimes mixed substances react to make a new substance. These changes are usually irreversible.
- Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible.
- Indicators that something new has been made are: properties of the material are different (colour, state, texture, hardness, smell, temperature)
- Some changes can be reversed and some can't.
- If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)
- When two or more substances are mixed and remain present the mixture can be separated.
- Materials change state by heating and cooling.

Key vocabulary

Vocabulary from prior learning: Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection,

New vocabulary: Hardness, Solubility, Transparency, Conductivity, Magnetic, Filter, Evaporation, Dissolving, Mixing Material, conductor, dissolve, insoluble, suspension, chemical, physical, irreversible, solution, reversible, separate, mixture, insulator, transparent, flexible, permeable, soluble

Working Scientifically opportunities

Fair/comparative testing:

- Carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'
- Volcano experiment: how does the amount of bicarbonate of soda, washing up liquid and vinegar affect the reaction? (also pattern spotting)
- How does the temperature of tea affect how long it takes for a sugar cube to dissolve?
- How can we change the 'jellyness' of jelly?

Observing over time:

- They could observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes.
- What happens to a candle as it burns? Which are the reversible / irreversible changes?

Identifying/classifying:

- Identify and classify reactions and changes into reversible and irreversible. Can you describe the groups' similarities and differences?

Pattern spotting:

- Do all stretchy materials stretch in the same way?

Researching:

- They might research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials.
- What are 'smart materials' and how can they help us?

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 5

Unit:	All living things	Year:	5	Term:	Summer 1 and 2
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Links to prior learning

From Year 4 children should:

- 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

New learning

Animals, including humans

- **Describe the changes as humans develop to old age.**

Notes and guidance

Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.

Living things and their habitats

- **Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird.**
- **Know the differences between different life cycles.**
- **Know the process of reproduction in plants AND animals**

Notes and guidance

Building on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.

Note: at this stage, pupils are not expected to understand how genes and chromosomes work.

Preparation for future learning

In Year 6 children will: (evolution and inheritance)

- 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.

(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.

Big ideas

ORGANISMS - Organisms (living things) are special collections of matter called cells. Organisms perform lots of different functions.

EVOLUTION AND INHERITANCE - The diversity of organisms on Earth is the result of evolution.

Characteristics are passed down from one generation of organisms to another.

'Sticky knowledge'

- Different animals mature at different rates and live to different ages.
- Puberty is something we all go through, a process which prepares our bodies for being adults, and reproduction
- Hormones control these changes; which can be physical and/or emotional.
- Some organisms reproduce sexually where offspring inherit information from both parents.
- Some organisms reproduce asexually by making a copy of a single parent.
- Environmental change can affect how well an organism is suited to its environment.
- Different types of organisms have different lifecycles

Key vocabulary

Vocabulary from prior learning: plant, growth, pollination, dispersal, male, female, mammal, amphibian, insect, bird, reptile

New vocabulary: Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, development, puberty, hormone, physical, Emotional, Sexual, Asexual, reproduction, cell, fertilisation, pollination, male, female, pregnancy, young, metamorphosis, insect, egg, embryo,

Working Scientifically opportunities

Fair/comparative testing:

- Brine shrimp experiment: How does the level of salt affect how quickly brine shrimp hatch?

Observing over time:

- observing and raising questions about local animals and how they are adapted to their environment;
- How do brine shrimp change over their lifetime? (Observational drawing opportunity)
- How does a bean change as it germinates?

Identifying/classifying:

- Can you identify all the stages in the human life cycle?
- Compare a collection of animals based on similarities and differences in their lifecycle

Pattern spotting:

- Is there a relationship between a mammal's size and its gestation period?
- comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels
- analyse the advantages and disadvantages of specific adaptations, such as being on 2 feet rather than 4, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.

Researching:

- What are the differences between the life cycle of an insect and a mammal?
- Why do people get grey/white hair when they get older?

Assessment opportunities

All Living Things Assessment

1. What are the **seven** processes of life that all living things require?
2. Name the **five** main groups that vertebrates can be sorted into.
3. Draw the life cycle of a frog. Don't forget to label it!
4. What is the difference between the life cycle of a cat and the life cycle of a butterfly?
You can draw life cycles to compare, if it helps.
5. What is the difference between sexual and asexual reproduction?
6. Name and describe at least **three** ways in which seeds are dispersed.
7. What is a naturalist?
8. Jane Goodall is a naturalist. What did she learn about Chimpanzees?



Thursday 19th May 2022

All Living Things Assessment

1. What are the **seven** processes of life that all living things require?

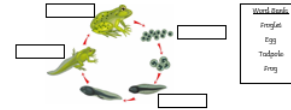
M.....
R.....
S.....
G.....
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N.....



2. Name the **five** main groups that vertebrates can be sorted into:

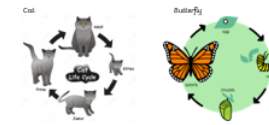
F.....
A.....
R.....
B.....
M.....

3. Draw the life cycle of a frog. Don't forget to label it!



Word Bank
Egglet
Egg
Tadpole
Frog

4. What is the difference between the life cycle of a cat and the life cycle of a butterfly?



4. What is the difference between sexual and asexual reproduction?

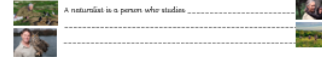
Draw a line to connect the reproduction type to its meaning.



5. Name and describe at least **three** ways in which seeds are dispersed.



6. What is a naturalist?



SEND

Animals Including Humans Assessment

1. Label each stage with the correct term:



prenatal To produce young.
gestation When the female body discharges the lining of the uterus once a month.
reproduce The stage from fertilisation to birth.
menstruation The time when prenatal development takes place before birth.

5. Write **true** or **false** next to each of these statements about puberty:

Statement	True or False
Everyone finishes puberty by the age of 15.	
Boys and girls both grow more hair during puberty.	
Sweat smells.	
Everyone grows and changes the same during puberty.	
Boys become more muscular.	
Girls' breasts and boys penises can be all sorts of sizes.	
Animals also go through puberty.	

6. Choose one of these animals. How is its environment changing, what does this mean for them and how are they going to have to adapt?

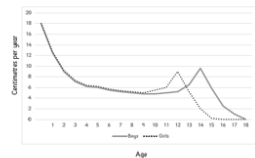


Polar Bear Green Sea Turtle Panda Bear

.....
.....
.....
.....

2. What is the stage before the first stage shown here?

3. The graph shows a comparison of girls and boys and how many centimetres they grow on average each year. Look carefully at the graph and answer these questions:



- a. Who starts growing quicker at an earlier age?
- b. Why do both lines eventually go down to 0?
- c. At what age are boys growing the quickest?
- d. How many centimetres per year are girls growing at age 12?

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 6

Unit:	Electricity	Year:	6	Term:	Autumn 1
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Links to prior learning

From Year 4 children should:

- 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.
- Understand precautions for using electricity safely (non-statutory)

New learning

- **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.**

Notes and guidance (non-statutory)

Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols.

Note: pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity.

Preparation for future learning

In **Key Stage Three** children will learn:

- Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge
- Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current
- Differences in resistance between conducting and insulating components (quantitative).
- Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects
- The idea of electric field; forces acting across the space between objects not in contact.

Key vocabulary

Vocabulary from prior learning: electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, conductor, electrical insulator, component **New vocabulary:** neutrons, protons, electrons, nucleus, atom

Big ideas

ENERGY

Energy comes in lots of different forms (and this form is electricity!).

Energy cannot be created or destroyed, but it can be transferred. (Electrical energy is transferred into heat, light, kinetic, sound energy etc)

'sticky knowledge'

- Batteries are a store of energy. This energy pushes electricity around the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.'
- The greater the current flowing through a device the harder it works.
- Current is how much electricity is flowing round a circuit.
- When current flows through wires heat is released. The greater the current, the more heat is released.

Working Scientifically opportunities

Fair/comparative testing:

- systematically identifying the effect of changing one component at a time in a circuit
- How does the voltage of the batteries in a circuit affect the brightness of the lamp / volume of a buzzer? (*repeat from Year 4?*)

Observing over time:

- How does a bulb work? Carefully observe a bulb (when it's not on / dimly lit!) and discuss how the filament works.

Identifying/classifying:

- How would you group electrical components and appliances based on what electricity makes them do?

Pattern spotting:

- Why do electrical appliances often heat up?
- What is the link between how fast you wind up a mechanical torch with the brightness of the bulb?

Researching:

- How has our understanding of electricity changed over time?

- Research the invention of the lightbulb.

Assessment opportunities

Create a double page spread to showcase all your learning about electricity. Your teacher will use this to assess your understanding of the topic, and we will share them on Seesaw to show your parents what you have learnt!

Extra subject knowledge for teachers

- Electricity terminology:
 - **Current** is the measure of the flow of electrons in a circuit. Current is measured in **Amps** or Amperes.
 - **Voltage** is the name for the electric force that causes electrons to flow. It's the measure of potential difference between two points in the circuit. Voltage may come from a battery or a power plant.
 - The **power** or energy used by a circuit is measured in **Watts**. You can calculate the number of Watts by multiplying the Voltage times the Current.

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 6

Unit:	Light	Year:	6	Term:	Autumn 2
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Links to prior learning

From Year 3 children should:

- Describe what dark is (the absence of light), and recognise that light is needed in order to see.
- Explain that light is reflected from a surface.
- Explain/demonstrate how a shadow is formed and explore shadow size.
- Explain the danger of direct sunlight and how to keep protected.

New learning

- **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.**
- **Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.**

Notes and guidance

Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions.

Preparation for future learning

Key Stage 3: Light waves

- the similarities and differences between light waves and waves in matter; light waves travelling through a vacuum; speed of light
- the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface
- use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing; the human eye
- light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras
- colours and the different frequencies of light, white light and prisms; differential colour effects in absorption and diffuse reflection.

Big ideas

ENERGY

Energy comes in lots of different forms. (And this form is light!)

Energy cannot be created or destroyed, but can be transferred. Discuss how light energy from the sun can transfer to heat energy (make things warm)

Electrical energy is transferred into light energy in bulbs.

'Sticky knowledge'

- Light is a form of energy which travels in straight lines. *Light travels faster than sound.*
- Light bounces (or reflects) off objects and enters the human eye, which sends messages to the brain allowing humans to 'see'. *Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light so we don't see the beam.*
- Light is blocked by objects that have opacity; shadows are formed that take the shape of that object.

Key vocabulary

Vocabulary from prior learning: Light, Shadows, Mirror, Reflection,

New vocabulary: Rainbow, Colour, Spectrum, Refraction, Periscope, Telescope, Binoculars, Magnifying glass, Retina, Pupil, Iris, Lens

Working Scientifically opportunities

Fair/comparative testing:

- Designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works - change different elements of the periscope to investigate their effects (e.g. length, angle of mirrors, material, etc)
- Investigating the effect of distance between light source and object on shadow size and clarity - 'shadow puppets'

Observing over time:

- Observe what happens to the pupil and iris when the eye is suddenly exposed to light
- Observe the 'blind spot' in human vision (dot and cross activity)

Identifying/classifying:

- Can you identify all the colours of light that make white light? What colours do you get if you mix different colours of light together?

Pattern spotting:

- How do we know that light travels faster than sound?

Researching:

- Why do some people need to wear glasses to see clearly?
- How do our eyes adapt to different conditions?

Assessment opportunities

End of Topic Assessment: Light

1. How does light travel? How do you know?
2. Explain how we see objects. Use as many of these words in your explanation as you can:

light rays	light source	travel
object	reflect	eye
pupil	lens	retina

3. Look at the image (also on the whiteboard so you can see it more clearly).



Who is right? Who is wrong? Why?

4. How are shadows formed?
5. Place these labels correctly on your diagram:
 - a. Angle of incidence
 - b. Angle of reflection

6. True or false.

- a. Darkness is the absence of light.
- b. The moon is a light source.
- c. Light enters our eyes through our pupils.
- d. Only shiny surfaces reflect light.

7. Why is retro-reflective material useful on outdoor clothing?
8. Why does the straw look broken?



9. What did Isaac Newton discover about light?
10. Why did this happen?

End of Topic Assessment: Light

10. Name a source of light.
11. What word is missing from this sentence:
Light travels in _____ lines.
12. Glue the image in your book. Draw two lines and arrows on the image to show how the eye sees the apple.
13. How are shadows formed? Use the image to help you explain.



14. True or false.
 - a. Darkness is the absence of light.
 - b. The moon is a light source.
 - c. Light enters our eyes through our pupils.
 - d. Only shiny surfaces reflect light.
15. Why is retro-reflective material useful on outdoor clothing?
16. Which words are missing in this sentence:
When light travels through a transparent object, it changes and .
17. What colour is light?
18. Write down any other facts you can remember about our light topic.

SEND Assessment

Extra subject knowledge for teachers

- Light is a wave of energy that is produced by a light source and then absorbed or reflected by an object. (Hence why you get hotter when you wear black in the sunshine! More light energy is absorbed and that energy changes to heat)
- The imprint of vision on our retina is upside down; our brains flip the view the right way round.
- The closer an object is to the surface its shadow is on, the smaller and more precise the shadow is. If the object is further away from the surface / closer to the light source, the shadow is larger but much less dense and defined

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science: Starter - can you make light bend? <https://bpes.bp.com/light-topic-starter>

Primary Upd8: Light SOS <https://www.ase.org.uk/resources/light-sos>

Switch On <https://www.ase.org.uk/resources/switch>

BBC Bitesize: Video - the human eye and how it works <https://www.bbc.co.uk/bitesize/clips/zf9c87h>

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 6

Unit:	Evolution and Inheritance	Year:	6	Term:	Spring 1
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Links to prior learning

From KS1 and 2 children should:

- Understand there is a variety of life on Earth
- Know that some animals differences are important to their survival
- Know how animals and plants reproduce
- Know how fossils form over time

New learning

- **Recognise that living things have changed over time**
- **Recognise 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.**

Notes and guidance

Building on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.

Note: at this stage, pupils are not expected to understand how genes and chromosomes work.

Preparation for future learning

In **Key Stage Three** children will learn about:

- heredity as the process by which genetic information is transmitted from one generation to the next
- the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation
- the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection
- 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

- the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

Big ideas

EVOLUTION AND INHERITANCE

The diversity of organisms on Earth is the result of evolution.

Organisms adapt over time in order to survive in their environment.

Characteristics are passed down from one generation of organisms to another.

'Sticky knowledge'

- Life cycles have evolved to help organisms survive to adulthood.
- Over time the characteristics that are most suited to the environment become increasingly common.

NB: The following could be duplicated in Year 6 Living things and their habitats.

- Organisms best suited to their environment are more likely to survive long enough to reproduce.
- Organisms are best adapted to reproduce are more likely to do so.
- Organisms reproduce and offspring have similar characteristic patterns.
- Variation exists within a population (and between offspring of some plants)
- Competition exists for resources and mates

Key vocabulary

Vocabulary from prior learning: fossils, reproduction

Vocabulary: adaptation, evolution, characteristics, genetics, variation, inherited, environmental, mutation, competition, survival of the fittest, evidence,

Working Scientifically opportunities

Fair/comparative testing:

- What is the most common eye colour in our class?

Observing over time:

- observing and raising questions about local animals and how they are adapted to their environment
- How has the skeleton of the horse changed over time

Identifying/classifying:

- Compare the skeletons of apes, humans, and Neanderthals – how are they similar, and how are they different?
- Can you classify these observations into evidence for the idea of evolution, and evidence against?

Pattern spotting:

- comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels.
- Is there a pattern between the size and shape of a bird's beak and the food it will eat?

Researching:

- What happened when Charles Darwin visited the Galapagos islands?
- What ideas did American geneticist Barbara McClintock have about genes that won her a Nobel Prize?

Assessment opportunities

Spring 1 Inheritance & Evolution Assessment

1. What is the product of reproduction (children or young of a parent) called? ☐ Offspring ☐ Ofsted ☐ Organism ☐ Original	2. Tick which traits can be inherited from your parents: ☐ height ☐ Scottish accent ☐ scar ☐ tattoo ☐ freckles ☐ tongue rolling
3. The habitat of an animal is ... ☐ a process of evolution ☐ a change in its DNA ☐ where it lives ☐ an inherited characteristic	4. Adaptation is where ... ☐ an animal moves to a habitat that it is suited to. ☐ a mistake in the DNA happens. ☐ an animal moves to a habitat that it likes better. ☐ an evolutionary process where a species becomes better suited to a habitat. ☐ a process where DNA is produced.
5. A mutation is ... ☐ where DNA is changed or damaged accidentally. ☐ where DNA is duplicated. ☐ where DNA is removed from a cell. ☐ where DNA is deleted. ☐ where DNA is added to a gene.	6. When puppies from the same litter inherit different traits from their parents it is called ... ☐ mutation ☐ evolution ☐ species ☐ variation ☐ adaptation

7. Look at the picture, how many species can you see? 	8. Tick all of the animals that are invertebrates. ☐ worm ☐ cow ☐ frog ☐ fish ☐ jellyfish ☐ beetle
9. Tick which groups of animals are warm blooded. ☐ fish ☐ amphibians ☐ reptiles ☐ bird ☐ mammals	10. Tick all the features that apply to all birds. ☐ cold blooded ☐ warm blooded ☐ lay eggs in water ☐ lay hard shelled eggs ☐ can swim ☐ body covered in scales ☐ can fly ☐ body covered in feathers
11. As humans evolved, how have their skulls changed? Tick all that you think are correct. ☐ The space for brain in the skull got bigger ☐ The space for the brain in the skull got smaller ☐ The brow ridge above the eyes got smaller ☐ The brow ridge above the eyes got bigger ☐ The jaw got bigger ☐ The jaw got smaller	12. What other changes can be seen as humans evolved? (Tick all that apply) ☐ The body has more hair ☐ The body has less hair ☐ The legs got shorter ☐ The legs got longer ☐ The toes got shorter ☐ The arms got longer ☐ The feet got bigger

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 6

Unit:	Animals, including Humans	Year:	6	Term:	Summer 1
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Links to prior learning

From Year 5 children should:

- Describe the changes as humans develop to old age.

From Year 4 children should:

- Describe the simple functions of the basic parts of the digestive system in humans.

From Year 3 children should:

- Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat.
- Know how nutrients, water and oxygen are transported within animals and humans.
- Know about the importance of a nutritious, balanced diet.

New learning

- **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.**

Notes and guidance

Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function.

Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.

Preparation for future learning

In Key Stage Three children will learn:

- the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.
- the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts)
- calculations of energy requirements in a healthy daily diet
- the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases
- the structure and functions of the gas exchange system in humans, including adaptations to function
- the effects of recreational drugs (including substance misuse) on behaviour, health and life processes

Big ideas

ORGANISMS

Organisms (living things) are special collections of matter called cells. Organisms perform lots of different functions. Organisms need a supply of energy and materials (food) to live.

'Sticky knowledge'

- The heart pumps blood around the body.
- Oxygen is breathed into the lungs where it is absorbed by the blood.
- Muscles need oxygen to release energy from food to do work. (Oxygen is taken into the blood in the lungs; the heart pumps the blood through blood vessels to the muscles; the muscles take oxygen and nutrients from the blood.)

Key vocabulary

Vocabulary from prior learning: digestive, water, oxygen, heart, nutrients

New vocabulary: oxygenated, deoxygenated, valve, exercise, respiration circulatory system, lungs, blood vessels, blood, artery, vein, pulmonary, alveoli, capillary, transport, gas exchange, villi, alcohol, drugs, tobacco.

Working Scientifically opportunities

Fair/comparative testing:

- How does the length of time we exercise for affect our heart rate?
- Which type of exercise has the greatest effect on our heart rate?

Observing over time:

- How does my heart rate change over the day?
- How much exercise do I do in a week?

Identifying/classifying:

- Which organs of the body make up the circulation system, and where are they found?

Pattern spotting:

- exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.
- How does my breathing change when resting, during exercise and after exercise?
- Is there a link between lung capacity in animals and their size?

Researching:

- How have our ideas about nutrition, diet and exercise changed over time?

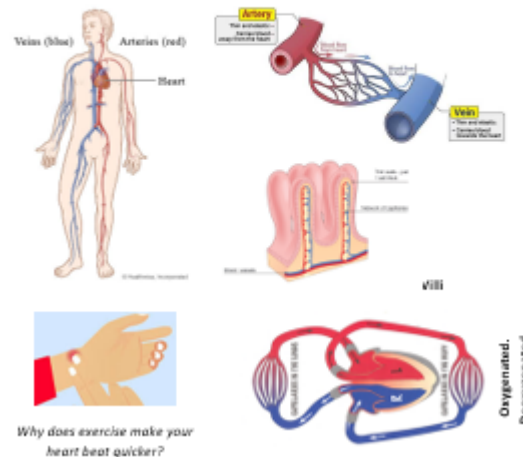
Assessment opportunities

End of Topic Assessment

1. Name the three parts of the body that make up the circulatory system (3 marks).
2. The heart is a powerful _____ which _____ blood around the body and is protected by the _____. (2 marks)
3. Why does blood flow around your body? (2 marks)
4. What are the names of the three different kinds of blood vessels? (3 marks)
5. What is the definition of these two words? (2 marks)
 1. Oxygenated:
 2. Deoxygenated:
6. Explain how the circulatory system works. (3 marks)
7. How are water and nutrients absorbed into the blood stream? (3 marks)
8. What is the diaphragm? (1 mark)
9. What is respiration? (1 mark)
10. How does exercise affect the body? (3 marks)
11. What is a drug? (1 mark)
12. Name one way in which diet, drugs and lifestyle can affect the body (3 marks)

End of Topic Assessment

Use the pictures to help you write about what have learned during our Science topic: The Circulatory System. Stick a picture in your book, then write a sentence, or some key words, next to it. Then choose a different picture and do the same.



SEND Assessment

Extra subject knowledge for teachers

- The four main blood vessels connected to the heart are the pulmonary artery (heart to lungs), the pulmonary vein (lungs to heart), the aorta (heart to rest of body) and the vena cava (rest of body to heart).

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE CURRICULUM UNIT PLANNERS - YEAR 6

Unit:	Living things and their habitats	Year:	6	Term:	Summer 2
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Links to prior learning

From Year 4 children should:

- 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 danger to living things.

New learning

- **Classify living things into broad groups according to observable characteristics and based on similarities and differences.**
- **Give reasons for classifying plants and animals based on specific characteristics.**

Notes and guidance

Pupils should build on their learning about grouping living things in year 4 by looking at the classification system in more detail. They should be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). They should discuss reasons why living things are placed in one group and not another. Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.

Preparation for future learning

In Key Stage Three children will learn about:

- the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere
- the adaptations of leaves for photosynthesis.
- the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops
- the importance of plant reproduction through insect pollination in human food security
- how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

Big ideas

EVOLUTION AND INHERITANCE

The diversity of organisms on Earth is the result of evolution.

Organisms adapt over time in order to survive in their environment.

Characteristics are passed down from one generation of organisms to another.

'Sticky knowledge'

- Variation exists within a population (and between offspring of some plants) – NB: this Key Idea is duplicated in Year 6 Evolution and Inheritance.
- Organisms best suited to their environment are more likely to survive long enough to reproduce.
- Organisms that are best adapted to reproduce are more likely to do so.
- Organisms reproduce and offspring have similar characteristic patterns.
- Competition exists for resources and mates.
- Microorganisms are living things invisible to the naked eye.
- The smallest single living thing is a cell.
- There are two types of cells, animal/plant cells (eukaryotes) and bacteria cells (prokaryotes).

Key vocabulary

Vocabulary from prior learning: classification flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation

New vocabulary: variation, organisms, micro-organism, populations, characteristics, environment, classify, compare, bacteria, adapt, taxonomist

Working Scientifically opportunities

Fair/comparative testing:

- How does the temperature affect how much gas is produced by yeast?
- Which is the most common invertebrate on our school playing field?

Observing over time:

- What happens to a piece of bread if you leave it on the windowsill for two weeks?

Identifying/classifying:

- Examine microscopic images of different cells. Classify them into animal/plant cells and bacteria cells

Pattern spotting:

- Do all flowers have the same number of petals?

Researching:

- Who was Carl Linneaus and how did he create his classification system?
- What do different types of microorganisms do? Are they always harmful?
- What did the scientists Edward Jenner, Alexander Fleming and Louis Pasteur contribute to our understanding of microbiology?

Assessment opportunities

Big question - In what ways can we sort living things?

Extra subject knowledge for teachers

- Eukaryotes and prokaryotes are the two main types of cell.
- Eukaryotic cells make up animals, plants and fungi.
- Prokaryotic cells make up bacteria.
- Eukaryotic cells are more complex. They have a cell wall, and a 'membrane bound nucleus' (which basically means all the genetic information is stored in one place with a nice little membrane around it).

Useful links and activities

Explorify: A range of starter discussions, videos and hands-on activities. (use school login) <https://explorify.wellcome.ac.uk/en/activities>

BP Science:

Primary Upd8:

BBC Bitesize:

SCIENCE WEBSITES - SCHOOL LOGIN DETAILS

Website	Login details
STEM https://www.stem.org.uk/	awalton@stpetersjunior.org.uk , Stpeters123
Explorify https://explorify.wellcome.ac.uk/en/activities	awalton@stpetersjunior.org.uk , Stpeters123
Association For Science Education (ASE) https://www.ase.org.uk/	awalton@stpetersjunior.org.uk , Stpeters123