Quwwat-Ul-Islam Girls' School



Science

Knowledge and Skills Progression Map

School Motto
Together we can achieve more
School Values
Respect . Aspiration . Responsibility
Learning Drivers
Caring for Ourselves, Our World, Our Education, Our Rights

School Vision Statement

To establish a school of excellence both **Islamically** and **Academically** - Provide a **holistic** education which is inspired by:

Taqwa: God consciousness **morals and values** inspired by the prophet (SAW) coupled with **academic excellence.**

At Quwwat-Ul-Islam girls' school we adhere to the following:

- **Mutual respect and tolerance -** We respect and care for everybody.
- **Democracy -** We promote the right of every individual to have their opinions and voices heard.
- **The rule of the law -** We understand that laws and rules protect us and at the same time provide us with responsibilities, by breaking them there are consequences.

National Curriculum Expectations

Level Expected at the End of EYFS

Explore the natural world around them, making observations and drawing pictures of animals and plants.
Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class
Understand the effect of the changing seasons on the natural world around them.

Primary students should be taught

Key Stage 1 National Curriculum Expectations
Pupils should be taught to use the following scientific methods, processes, and skills:

- Asking simple questions and recognising that they can be answered in different ways.
- Observing closely, using simple equipment.
- Performing simple tests.
- Identifying and classifying.
- Using their observations and ideas to suggest answers to questions.
- Gathering and recording data to help in answering questions.

Key Stage 2 National Curriculum Expectations
Pupils should be taught:

- Asking relevant questions and using different types of scientific enquiries to answer them.
- Setting up simple practical enquiries, comparative, and fair tests.
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment including thermometers and data loggers.
- Gathering, recording, classifying, and presenting data in a variety of ways to help in answering questions.
- Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.
- Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
- Using results to draw simple conclusions, make predictions for new values, suggest improvements, and raise further questions.
- Identifying differences, similarities or changes related to simple scientific ideas and processes.
- Using straightforward scientific evidence to answer questions or to support their findings.

Secondary students should be taught

KS3 Pupils should be taught:

Scientific attitudes

- pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility
- understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review
- evaluate risks.

Experimental skills and 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
- select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety
- make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements
- apply sampling techniques.
- pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility

Analysis and evaluation

- apply mathematical concepts and calculate results
- present observations and data using appropriate methods, including tables and graphs
- interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
- present reasoned explanations, including explaining data in relation to predictions and hypotheses
- evaluate data, showing awareness of potential sources of random and systematic error
- identify further questions arising from their results

KS4 Pupils should be taught:

Development of scientific thinking

- the ways in which scientific methods and theories develop over time
- using a variety of concepts and models to develop scientific explanations and understanding
- appreciating the power and limitations of science and considering ethical issues which may arise
- explaining every day and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments
- evaluating risks both in practical science and the wider societal context, including perception of risk
- recognising the importance of peer review of results and of communication of results to a range of audiences.

Experimental skills and strategies

- using scientific theories and explanations to develop hypotheses
- planning experiments to make observations, test hypotheses or explore phenomena
- applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments
- carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations
- recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative
- making and recording observations and measurements using a range of apparatus and methods • evaluating methods and suggesting possible improvements and further investigations.

Analysis and evaluation

- applying the cycle of collecting, presenting and analysing data, including:
- presenting observations and other data using appropriate methods
- translating data from one form to another
- carrying out and representing mathematical and statistical analysis
- representing distributions of results and making estimations of uncertainty • interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions
- presenting reasoned explanations, including relating data to hypotheses
- being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error
- communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations.

Science						
Year Group	**Autumn 1.1**	**Autumn 1.2**	**Spring 2.1**	**Spring 2.2**	**Summer 3.1**	**Summer 3.2**
Year 1	My Body	Identifying Animals	What are toys made from?	Identifying Plants	Everyday Materials	Seasonal Changes
Year 2	Living in Habitats	Growing Plants	Growth and Survival	Exploring Materials	Super Scientists	Secret world of plants
Year 3	How Plants grow	Health and movement	Rocks, fossils and soil	Light and Shadow	Forces and Magnets	Tombs, torches and timekeepers
Year 4	Living in Environments	Eating and Digestion	States of matter	Changing sound	Circuits and Conductors	Prehistoric world
Year 5	Lifecycles	British Scientists	Properties and changes of materials	Earth and Space	Me, Myself and I	Forces
Year 6	Viking Science	Scientists and Inventors	Classifying Organisms	Seeing Light	Changing Circuits	Evolution and Inheritance
Year7	**7A** Cells, tissues and organ systems **7E** Mixtures and separation	**7F** Acids and alkalis **7I** Energy	**7J** Current and electricity **7C** Muscles of bones	**7D** Ecosystem **7G** The Particle Model	**7H** Atoms, elements and molecules **7K** Forces	**7L** Sound **7B** Sexual reproduction in animals
Year 8	**8A** Food and nutrition **8B** Plants and their reproduction	**8** Combustion **8F** The periodic table	**8I** Fluids **8J** Light	**8C** Breathing and respiration **8D** Unicellular organisms	**8G** Metals and their uses **8H** Rocks	**8K** Energy Transfers **8L** Earth and Space
Year 9 **GCSE**	**CB1** key concepts in Biology Core practical microscope Core practical Ph and enzyme **CB2** Cells and Control	**CC1** States of Matter **CC2** Methods of separating and purifying substances **CC3** Atomic Structure **CC4** The Periodic Table	**CP3** Conservation of Energy **CP4** Waves **CP5** Light and the EM	**CB3** Genetics **CC5** Ionic Bonding	**CC5** Ionic bonding continued **CC6** Covalent Bonding **CC7** Types of substances	**CP6** Radioactivity
Year 10 **GCSE**	**CP1** Motion **CP2** Forces and Motion **CB5** Health and disease & the Development of Medicine	**CB5** Health and Disease **CB4** Natural selection **CC8** Acid and alkali	**CC8 & CC9** Acid and Alkaline Calculation involving masses **CC10** Electrolysis **CC11** Obtaining and using metals **CC12** Reversible Reactions and equilibrium	**CP7** Energy/Forces doing work **CP8** Forces and their effect	**CP8** Forces and their effect **CP9** Electricity and Circuits	**CP10** Magnetism and the Motor effect **CP11** Electromagnetic Induction
Year 11 **GCSE**	**CB6** Plant Structure and Functions **CB7** Animal coordination, control and homeostasis **CB8** Exchange and Transport System **CB9** Ecosystem and Material Cycles	**CC16** Fuels **CC17** Earth and atmospheric science	**CP12** Particle model **CP13** Forces and matter	**CC13** Groups in the periodic table **CC14** Rates of reaction **CC15** Heat energy changes in chemical reactions		

Intent

At Quwwatul Islam girls school, we have designed our science curriculum with the intent that our children will develop an in-depth understanding of the world around them and an understanding of how major scientific ideas have played a vital role in society, preparing them for life in an increasingly scientific and technological world. Our aim is to build science capital for all our children, regardless of their background and starting point so that they are inspired to continue to use science in their everyday life, future education and careers.

We will deliver a Science Curriculum that:

· Builds upon prior knowledge and a progression of skills to ensure all children have a secure understanding and knowledge of key science concepts
· Develops creativity and challenges all of our learners through outstanding and inclusive teaching practice
· Inspires and excites our children through engaging practical sessions
· Will develop aspirational learners with an awareness of the key role that science plays within our community and the world and the opportunities that this creates for future careers
· Encourages our children to be self-motivated, independent, curious and resilient learners by developing inquiry–based skills and sessions
· Encompasses outdoor learning to create meaningful experiences within their natural environment

Implementation

The science curriculum leader and SLT are in charge of leading and supervising the curriculum. They frequently monitor, assess, and review science teaching and learning while recognising and exchanging best practises. Teachers will plan science lessons using the LTP and MTP of science curriculum which develops progression of skills allowing children to build upon prior knowledge and understanding. To ensure that teachers have a thorough understanding of the students' learning and to guide them in taking the appropriate next steps, formative evaluations will be incorporated into daily scientific instruction. Summative evaluations following each topic will also inform term assessments, aid in the formation of long-term memory, and guarantee a firm grasp of abilities.

Impact

Children will become resilient, independent and curious scientists who ask questions and find things out for themselves.
· Children will be enthusiastic and motivated scientific learners.
· Outdoor learning will be utilised where appropriate for science lessons.
· STEM ambassadors and the wider community will support science learning through trips and visits on a regular basis.
· Children will have an awareness of the full range of scientific careers and pathways available to them and will be keen to pursue STEM subjects at secondary school.

Science
Knowledge and Skills Progression Map

		Autumn 1.1	Autumn 1.2	Spring 2.1	Spring 2.2	Summer 3.1	Summer 3.2
Year 1	Knowledge	**My Body**	**Identifying Animals**	**What are toys made from**	**Identifying Plants**	**Everyday Materials**	**Seasonal Changes**
	Skills I can… Key Vocabulary body arms legs head wrist fingernails mammals, birds reptiles fish amphibians sunlight seeds water flower tree deciduous materials waterproof	name the different parts of my body, such as arms, legs, head, wrist, fingernails, etc describe which parts of my body I use for different activities. name the five senses describe why each of the five senses is important, and how we use each one I know that the senses of smell and taste are very closely linked. **Working Scientifically** carry out a blind test to identify familiar smells. gather facts about the sense of smell to answer	identify and name a variety of common UK pets identify a variety of UK mammals, birds, reptiles, fish and amphibians I know that mammals have backbones, feed their young with milk and have fur find a similarity or difference between pairs of mammals I know that birds have feathers, wings and a beak I know that lizards are cold-blooded vertebrates that lay eggs identify differences in the features of birds and lizards	I know what a material is I know the difference between a material and an object name a variety of materials describe a material's properties using adjectives explain why some materials are better suited for different purposes than others **Working Scientifically** follow instructions to perform a simple test to see whether a material is waterproof or not use my observations to suggest which materials would be	I know that a plant is a living thing that grows I know that plants need sunlight, air and water I know that plants have seeds that grow into new plants recognise where the seeds are in a variety of plants plant a seed and describe what I expect it to look like in a few weeks' time identify and describe a variety of garden plants identify the difference between a flower and a tree identify a variety of wild plants	I know what a material is I know the difference between a material and an object name a variety of materials describe a material's properties using adjectives explain why some materials are better suited for different purposes than others **Working Scientifically** follow instructions to perform a simple test to see whether a material is waterproof or not use my observations to suggest which materials would be best for an umbrella	I know that the weather is always changing and that we have many different types of weather I know that there are four seasons in the UK name the months each season occurs in identify the main features of each of the different seasons describe different clothing that is appropriate to wear during each season I can identify differences between each of the four seasons describe how animals are affected by each of the four

		questions. taste different fruits and use appropriate vocabulary to describe them	I know that fish and amphibians lay eggs I know the steps in the life cycles of amphibians and fish, and spot similarities and differences I know what a herbivore, carnivore and omnivore are identify common animals that are herbivores carnivores and omnivores explain some of the ways in which people need to look after pets **Working Scientifically** use a Venn diagram to sort animals to show which are herbivores, carnivores and omnivores use a tally chart to gather data about our class's favourite pet use a tally chart to gather information about minibeasts I spot	best for an umbrella	identify and describe a variety of trees I know the difference between an evergreen and a deciduous tree identify the roots, stem, leaves, flower and petals of a flower I know what roots are and why they are important describe the changes a seed goes through as it becomes a plant **Working Scientifically** observe plants closely and draw my findings use a simple classification key to identify wild flowers use close observation to explain how a seed changes to a plant		seasons, and how their behaviour changes during each one describe some of the ways humans adapt to the different seasons, e.g. by what we wear, eat and do I know that some foods are seasonal

			use information I have gathered in tally charts to answer simple questions				
Year 2	Knowledge	**Living in Habitats**	**Growing Plants**	**Growth and Survival**	**Exploring Everyday Materials**	**Super Scientists**	**Secret world of plants**
	Skills I can… Key Vocabulary habitat life cycle seed plant gills carbohydrates fish Eggs predator animals gills protein dairy flexible apparatus gravity force isaac newton apparatus	I know the difference between things that are living, things that are dead and things that have never been alive name the seven life processes that all living things need to be able to do to stay alive I know that all living things will eventually die I know what a habitat is I know that all living things need to live in a habitat that can provide them with the things they need to stay alive suggest what type of animals might live in a variety of different habitats	I know that different seeds grow into different plants. use information on a seed packet to tell me when a seed should be planted, how to plant it and how to care for the seed as it grows into a plant follow the instructions on a seed packet to plant a seed I know that seeds can be eaten by humans and animals I know that some plants grow from bulbs explain the life cycle of a plant grown from a bulb, such as a tulip I know that the bulb provides a store of food for the plant while it is in the	I know that all species of animals have babies, including humans, and that if they didn't the species would become extinct match a variety of baby animals to their parents I know that some baby animals look very similar to their parents and some look very different I know that mammals give birth to live young and birds, reptiles and fish lay eggs I know that different animals are pregnant for different lengths of time, and that this is often dependent on the size of the animal	use a range of appropriate vocabulary to describe the properties of different materials I know the difference between a natural and a man-made material I know that the same product, e.g. a table, can be made from a variety of different materials, and can suggest suitable materials for each object explain how glass, pottery and paper are made I know that some materials can change shape permanently, some can change shape and go back to their original shape, and some can't change	I know that Isaac Newton was the first person to identify gravity as a force I know that gravity is a force that makes things fall to the ground and stops things from floating around in the air **Working Scientifically** I can carry out an investigation to explore the effect adding paper clips to a spinner has on the length of time it takes the spinner to reach the ground I can design a marble run with the intention of it taking the longest possible time for the marble to reach the ground	identify the things most plants need to germinate and mature suggest reasons why we cultivate plants devise a simple comparative test to determine how light affects germination explain why many seeds and bulbs are able to germinate without light begin to explain, in simple terms, how plants make their own food select appropriate locations where plants will grow well, giving reasons identify some observable life processes of animals and plants

		match animals to their correct habitat I can identify and name some of the plants and animals that live in a seaside habitat I know that the plants and animals in a habitat are all dependent on each other for survival describe some habitats and their features in other parts of the world, such as rainforest, desert and Arctic habitats describe why some animals are well suited to their rainforest, desert or Arctic habitats describe what a microhabitat is identify some of the minibeasts that live in microhabitats I know that plants and animals in a habitat are linked to each other through food	ground during the winter months I know that the fruit of the plant is the part that carries the seeds explain why most plants grow lots of seeds instead of just one explain some of the ways in which seeds are dispersed I know that not all seeds will grow into a new plant and can explain reasons for this I know that the term 'germination' refers to the process when a seed starts to grow and produce shoots. **Working Scientifically** carry out an experiment to observe how the roots of a bulb grow use close observation to examine different fruits to see how many seeds they have, making	I know that the eggs animals lay are vulnerable to predators and other dangers, which is why the parent animal often builds a nest to keep them safe and lays several eggs at once I know that some eggs have hard shells and some eggs have soft shells identify a variety of animals that give birth to live young and those that lay eggs explain the stages a human goes through to grow from a baby to an adult I know that all animals need food, water and air to stay alive, and that some animals breathe oxygen with their lungs while fish that live under water take in oxygen through their gills I know that	shape name a variety of materials that can change shape, can change shape temporarily and cannot change shape I know that there are lots of different types of plastic that can be used for different purposes explore the suitability of plastic and metal for different purposes, and explain why each material has been chosen for each different purpose I know that paper and cardboard are made from wood and can describe the benefits of using paper and cardboard over wood for different purposes name some objects that can all be made from and metal, e.g. chairs suggest appropriate materials for an		consider when, and why, plants start to die once harvested identify ways in which harvested plants can be kept alive, or helped to reproduce, by humans describe how the roots of plants grow, and why describe some ways in which plants grow above ground, and why suggest reasons why plant growth may be negatively affected identify common features of mature Plants identify some ways in which mature plants can disperse their seeds identify ways in which some mature crop plants may be harvested

		chains I know that plants get their energy from the sun construct some simple food chains for a variety of habitats	predictions beforehand plan and set up an experiment to find out which conditions are best for seed germination suggest how to make an experiment a fair test use the results of my experiment to draw a diagram explaining the best conditions for seed germination use observation to explain how a seed changes over time	animals need to live in different environments to get the food, water and oxygen they need I know that it is important to eat a healthy balance of foods because different foods are useful to our bodies for different things use the food pyramid and balanced plate model to find out how much carbohydrate, fruits and vegetables, protein, dairy, fats and sugars I should eat plan a healthy, balanced meal I know that exercise is important to keep our heart and lungs healthy, and that it keeps our muscles strong and flexible I know that exercise is important to keep	object to be made from, based on what the object will be used for and who will use it **Working Scientifically** suggest different ways of sorting materials based on their properties and characteristics sort materials into those that are natural and those that are man-made experiment with what happens to different materials when you bend, twist, stretch and squash them, recording my observations make predictions about how materials will behave experiment with ways of making a paper bridge that is strong enough to hold a toy car		

				us from getting overweight design an exercise to work my whole body using different apparatus **Working Scientifically** carry out my own research using simple sources to find out what a particular animal needs in order to survive			
Year 3	Knowledge	**How Plants Grow**	**Health and movement**	**Rocks, fossils and soil**	**Light and Shadow**	**Forces and Magnets**	**Tombs, torches and timekeepers**
	Skills I can… Key Vocabulary stamen stigma ovary nectar Petals photosynthesiss fats sugars dusk dawn force metre chlorophyll pollination backbone vertebrates invertebrates	identify and describe the functions of the roots, stem, leaf and flower of flowering plants I know that the root is the first part of the plant to grow from the seed and that the young root absorbs water and minerals from the soil to help the seed sprout describe each step in the growth of roots describe the	I know that animals, including humans, get the nutrition they need from what they eat I know that the two main reasons humans need food is for growth and energy I know that we need proteins for growth and to help repair our bodies when we are ill or injured I know that starches, fats and sugars are good foods for energy I can explain how to	I know that most of our planet is made up of rock and that rocks are made up of a mixture of minerals that are pressed tightly together distinguish between rocks that are naturally occurring and those that are not I know that erosion is the process when something is worn away by water, wind or other natural materials	I know that we need light in order to see I can name a variety of natural and man-made light sources I know that the Sun is the most powerful light source I know that we have night and day because the Earth rotates on its axis once every 24 hours describe the difference between dawn and dusk	know that a force is a push or a pull on an object, and that a force needs two objects where one pushes or pulls the other to make it move describe whether a push or a pull is being used to move an object, and describe which direction the forces are acting in I know what a force metre is and can use one to measure forces in newtons	know that we need light in order to see things know that dark is the absence of light identify a variety of light sources know that light travels in a straight Line know that we need light in order to See know that we see when light is reflected from a surface

	internal skeleton allergies horizon opaque translucent investigations conclusions fossils Palaeontology minerals erosion metamorphic sedimentary pictogram	process of water transportation in plants explain what the process of photosynthesis is I know that the plant uses minerals from the soil to make chlorophyll in its leaves explain what The process of pollination is explain some of the ways pollen grains get from the male stamen to the female part of the plant order the stages in the life cycle of flowering plants identify the ways in which a variety of different plants disperse their seeds I know that seeds have an outer coat to protect them that starts to absorb water and soften when it	eat a healthy, balanced diet design healthy, balanced meals for people who have dietary restrictions, e.g. vegetarians or people with wheat/dairy allergies I know that we have skeletons to support our bodies, protect our internal organs and to help us move name and locate some of the major bones in the human body describe similarities and differences between human and animal skeletons I know that all vertebrates have a backbone explain how invertebrates without an internal skeleton protect themselves I know that we need muscles to help us move explain the difference between	over time I know that a pedologist is a scientist that studies soil explain why soil is so important to our planet I know that there are different layers of soil and that each layer is known as a horizon describe the features of each different soil horizon I know that the three main types of soil are clay, sand and silt I know that scientists split rocks into three main groups: igneous rock, sedimentary rock and metamorphic rock I know that igneous, sedimentary and metamorphic rock can change over millions of years in	I know that shadows are formed when light is blocked by an object I know that we have more shadows on a a sunny day is better than on a cloudy day and can explain why I know the difference between transparent, translucent and opaque objects I know that opaque objects will cast a shadow, translucent objects will cast a faint shadow, and transparent objects will not cast a shadow I know that we can see objects because light is reflected from their surfaces; light travels in a straight line from the source to the objects, then bounces off the object to our eyes I know that some objects reflect more light than others	I know that some forces, like gravity and magnetism, do not need contact between two objects to make things move I know that magnets have a north pole and a south pole describe lots of different uses for magnets. **Working Scientifically** carry out a fair test to explore whether objects need the same force to move them across different surfaces make predictions about the results of my investigation use my results to draw conclusions explore whether magnets attract or repel when north poles and south poles are put together draw diagrams to show the results of my findings	define the difference between night and day know why the Sun rises and sets each Day know that we need light to see and that darkness is the absence of light know that shadows are formed when light is blocked know the difference between objects that are transparent, translucent and opaque explore shadows using torches and express their findings Can children explain why shadows created by the Sun change position during the course of a day plan and carry out an investigation find patterns in the way the size of shadows change

		lands in soil I know that seeds can have one, two or three seed leaves that store food I know that seeds are an important source of food for animals **Working Scientifically** observe root growth over a period of time and record my observations in a table generate ideas for an experiment to test water transportation in plants plan, set up and carry out an experiment to show how water is transported in plants, making a prediction and recording my observations make a comic strip to explain the process of pollination, using vocabulary such as stamen, stigma, ovary, nectar and	smooth muscles, cardiac muscles and skeletal muscles explain the role of flexors and extensors in making our bones move **Working Scientifically** classify a variety of foods into different food groups carry out my own research to find out what foods different animals eat, and record my findings generate questions to investigate to find out what pets eat gather data in a tally chart and convert the results into a pictogram use data to draw conclusions and find the answer to my question label a diagram of the human skeleton use a variety of sources of information to find out how invertebrates protect themselves and	a process known as the rock cycle I know that a fossil is the petrified remains of plants and animals from more than 10,000 years ago explain how fossils are formed I know that palaeontology is a scientist who studies fossils I know that some fossils are common and some fossils are very rare identify some organisms from their fossils	I know that when a surface is very smooth, like a mirror, it reflects a lot of light which is why we can see a reflection **Working Scientifically** identify a variety of light sources around my school predict which light sources would be strongest, comparing my predictions with a partner and discussing any differences explain in my own words why we have night and day, using appropriate vocabulary test whether an object is transparent, translucent or opaque by testing what kind of shadow it casts explain which shadow diagram is correct, using what I know about how shadows are formed shadows behave,	predict which materials will be magnetic and which will not, then test my hypothesis carry out my own research to find out about uses for magnets and report my findings	

		petals classify plants according to their seed dispersal method taste test a variety of different seeds. gather data about our class's favourite seeds in a chart ask and answer questions about the seed data I have gathered experiment to show how water is transported in plants, making a prediction and recording my observations make a comic strip to explain the process of pollination, using vocabulary such as stamen, stigma, ovary, nectar and petals classify plants according to their seed dispersal method. taste test a variety of different seeds	report my findings ask and answer questions about muscles make different movements with my body and explain which muscles I am using		finding ways to make shadows move and make them longer and shorter record results from my shadow experiments using diagrams predict what I think will happen to a shadow throughout the day carry out an experiment to find out what happens to shadows throughout the day, recording my results in a table draw conclusions from my shadow investigation to say what I have found out experiment with using mirrors to see around corners		

		gather data about our class's favourite seeds in a chart ask and answer questions about the seed data I have gathered.					
Year 4	Knowledge	**Living in Environments**	**Eating and Digestion**	**States of matter**	**Changing sound**	**Circuits and Conductors**	**Prehistoric world**
	Skills I can… Key Vocabulary vertebrates, invertebrates mammals birds insects fish reptiles amphibians insects annelids crustaceans arachnids echinoderms molluscs milk teeth adult teeth molars canines incisors liquid solid gases food chain	give a definition for the term 'habitat' suggest in which habitat you would find a variety of animals explain why it is important to be able to classify organisms identify animals that are vertebrates, invertebrates, mammals, birds, insects, fish, reptiles, amphibians, insects, annelids, crustaceans, arachnids, echinoderms and molluscs identify and classify	suggest similarities and differences in the diets of a variety of different animals identify herbivores, carnivores and omnivores in a variety of different habitats interpret and construct a variety of food chains with both producers and consumers suggest what might happen if one or more organisms was taken out of a food chain identify where canines, incisors and molars are in the human mouth explain the function	I know the difference between a liquid and a solid I know how to tell if a material is a liquid or a solid. I know that gases have mass. I can describe the properties of a solid, liquid and gas explain what would happen if a solid, liquid and gas were poured into a container I know that solids, liquids and gases behave differently because the particles of each behave differently	I know that sound travels through the air in waves and that sound waves are caused by vibrations in the air I know that sound waves pass through some materials more easily than others. I know that sometimes sound needs to be muffled for safety or convenience can name a variety of musical instruments, describe what they sound like and explain how the sound is made I know what the	I know that atoms generate electricity when they are rubbed together I can explain the difference between static electricity and current electricity I know that current electricity needs a complete circuit in order to work properly use diagrams to explain which circuits will and won't work I can explain the difference between mains and battery-powered electricity describe some of the ways in which people can stay safe when using mains	understand how fossils are formed describe how a fossil is formed know how fossils can help palaeontologists find out about the past understand that dinosaurs inhabited the Earth millions of years ago and over a period of millions of years describe the features of a variety of different dinosaurs identify a variety of different dinosaurs Can children describe the features of different

	pitch volume soundproofing glockenspiel conductor circuit insulator	a variety of British plants I know that changing just one thing in a habitat can have a big impact on all the organisms living there describe what deforestation is and why it is causing a big problem around the world describe some of the ways in which humans can both help sustain environment and ways in which they harm environments explain the negative impact draining a pond would have on the local environment, stating my case through a letter **Working Scientifically** explore my local area to see how many different habitats there are use a variety of clues in riddles to	of canines, incisors and molars I know that teeth have roots that hold the teeth in place in the gums I can suggest why different animals have different types of teeth I know that young children have 20 milk teeth that start growing through when they are around six months old I know that milk teeth fall out and are replaced by 32 adult teeth, which are permanent I know that tooth decay can cause teeth to rot and fall out suggest some ways of making sure my teeth stay healthy name the organs associated with the digestive system describe the	I know that water turns from a liquid to a solid at 0°C and from a liquid to a gas at 100°C I know that metals all have different melting points and that these are usually very high temperatures I know that the process of a liquid turning into a gas is called evaporation I know that the process of a gas cooling and turning into a liquid is called condensation explain how evaporation and condensation are part of the water cycle **Working Scientifically** compare and classify materials according to whether they are solids or liquids. carry out an investigation to see if air weighs	terms 'pitch' and 'volume' mean I can identify when the pitch and volume of a sound changes, and explain what has happened I can explain how the length, thickness and tightness of a string affects its pitch I can explain how the length of the air column in wind instruments changes the pitch. Working Scientifically I can investigate a range of objects that show visible vibrations to help me understand how sound waves work predict how well sound will travel through a variety of different materials plan, set up and carry out an experiment to answer the	electricity distinguish between objects that use mains electricity and those that use battery-powered electricity write a definition for the words 'conductor' and 'insulator' explain why some appliances are made with conductors on the inside and insulators on the outside explain how switches work to complete a circuit **Working Scientifically** test different materials using a simple circuit to see whether they are conductors or insulators use what I found out about conductors and insulators to draw conclusions classify objects into those that are conductors and those that are	Dinosaurs sort dinosaurs into groups depending on different criteria choose their own way of sorting dinosaurs into different groups according to their features Can children suggest some of the possible factors that caused the extinction of dinosaurs identify and describe some of the environmental factors that cause animals to become endangered today suggest some ways in which humans can act to protect endangered species

		help me identify different animals classify a variety of organisms using my own and given criteria, sorting the results into tables and Carroll diagrams use a classification key to identify which group an animal belongs to use a classification key to identify unfamiliar organisms	functions of the basic parts of the digestive system **Working Scientifically** classify a wide variety of animals to show whether they are herbivores, carnivores or omnivores present information about how to keep teeth healthy draw a diagram to show what I think the digestive system looks like and how it works ask a variety of questions about the digestive system and use different sources to find out the answers label a diagram of the digestive system and describe how it works plan and carry out an experiment (making sure it is a fair test) to explore how acid affects	anything and report on my findings draw diagrams to show how the particles in solids, liquids and gases behave differently experiment with pneumatics and make observations about what I'm doing research the melting points of a variety of materials plan and carry out an experiment to see the different melting points of chocolate and evaluate the fairness of my experiment give different everyday processes which involve melting and freezing draw diagrams and use written examples to show the processes of evaporation and condensation	question, 'Do sound waves travel through all materials equally?' generate questions to investigate what happens to a sound as you get further away from it plan, set up and carry out an experiment to see which materials are best for soundproofing draw conclusions from my investigations to answer a question make predictions about the pitch and volume an instrument will produce, using my knowledge of how sound works draw a diagram to show how and why the pitch changes on a glockenspiel investigate a variety of stringed instruments to explore how the	insulators draw diagrams to show appliances that have conductors on the inside and insulators on the outside experiment with a variety of objects and materials in a simple circuit to create a working switch incorporate a buzzer into a circuit that makes a sound when the switch is on plan, set up and carry out an investigation to find out how you can change the brightness of a bulb, making sure it is a fair test	

			the food in our stomachs	label a diagram of the water cycle to show what is happening	pitch changes according to the length, thickness and tightness of the string, and record my findings predict which bottle would produce the highest pitch when different amounts of water are inside, then test my prediction and record my results		
Year 5	Knowledge	**Lifecycles**	**British Scientists**	**Properties and changes of materials**	**Earth and Space**	**Me, Myself and I**	**Forces**
	Skills I can… Key Vocabulary sexual reproduction asexual reproduction axis gravitational force orbit moon sugar friction resistance gravity hormones puberty insoluble filtering zones hermaphrodit	describe the process of sexual reproduction in flowering plants, using each of these terms: petal, anther, carpel, filament, ovary, stamen, stigma, sepal and style describe the process of asexual reproduction in plants, giving some examples of plants that reproduce asexually describe how and why humans clone plants describe the	name at least one of Newton's three laws using scientific language explain at least one of Newton's three laws of motion using scientific Vocabulary use a model or diagram to exemplify or describe one of the three laws of motion describe what white light is name the seven colours Newton identified within	I know that some materials will dissolve in water to form a solution I know that not all materials react the same way when mixed with water; some will float, sink, dissolve or react I know that dissolving is a reversible change I know that soluble materials, such as sugar, are able to be separated from water through evaporation I know that	I know that the Sun, Earth and Moon are roughly spherical in shape I can describe what the Sun, Earth and Moon are using appropriate vocabulary I know that Earth orbits the Sun and the Moon orbits the Earth describe how the rotation of the Earth creates night and day I know that as well as orbiting the Sun, the Earth rotates on its axis, and that it	describe some of the ways our bodies change as we grow I know that our rate of growth is dependent on many different factors name the different stages in the human life cycle and put them in order describe the stages in the gestation period of humans and compare this to other animals describe the growth and development of children from age 0 to 11	I know that the Earth's gravitational force causes objects to have weight, and that gravity pulls objects towards the centre of the Earth I know that friction is the force that acts as resistance between two objects when moving over one another explain examples of friction using photographs I know that air resistance is the force that occurs when air pushes against a moving object, making it

	es organisms habitats Irreversible solar system geocentric heliocentric	process of sexual reproduction in animals I know that some animals reproduce externally and others reproduce internally, giving examples for each describe how the environment in which an animal lives affects the way it reproduces I know that hermaphrodites are animals that have both male and female reproductive organs, such as snails identify animals that live in a British woodland environment compare different habitats around the world with a British woodland environment and suggest ways in which the living conditions may be more or less challenging for the organisms living there	white light use scientific vocabulary in their explanations and descriptions define the words mass, weight and gravity describe the effects of gravity and how it changes in different places in our solar system calculate the weight of an object on Earth in newtons describe the works of Anning, Darwin and/or Wallace and how their work contributed to scientific understanding describe the process of natural selection name an advantageous and disadvantageous characteristic or feature of a living organism plan an investigation to	filtering is a good way to separate water from insoluble materials, such as sand I can identify a range of mixing processes, dissolving processes or changes of state that are reversible I know that an irreversible change occurs when two materials react with each other to form a new substance explain what would happen to a variety of materials when they were heated and cooled, and explain whether these are reversible or irreversible changes I know that some materials change state when they are heated or cooled I know that when a material is burned, it produces a new	takes one full day (24 hours) for a complete rotation I understand why there are different time zones in the world describe why the length of daylight changes throughout the year I know that the tilt of the Earth's axis is what causes the four seasons of the year I know that the Northern and Southern Hemispheres experience seasons at different times of year and can explain the reason for this I can describe why the Moon appears to change shape throughout a lunar month describe the different phases of the Moon using appropriate vocabulary. describe what a solar eclipse is and why it occurs.	I understand the role of hormones in puberty I can describe the changes that occur to both boys and girls during puberty describe some of the ways teenagers can keep fit and healthy during all the changes that take place during puberty I know that a human is fully grown by the time they reach the age of around 20 I know that the human body starts to deteriorate as it enters old age describe some of the ways in which humans can make sure they stay fit and healthy as they get older **Working Scientifically** create a bar chart to show the gestation period of a range of animals, and use this to answer questions compare gestation	slow down explain examples of how air resistance is used I know that water resistance is the force that pushes against objects as they pass through the water I know that the shape of an object dictates how much water resistance it will meet as it moves through the water I know that pulleys and levers make heavy objects easier to lift and can explain why I know that gears allow a smaller force to have a greater effect I know that two or more gears working together are called a transmission explain which direction a follower gear will turn based on the movement of the driver gear when two or more gears

		suggest ways in which the life cycles of different animals might vary in different environments around the world describe and compare the life cycles of a variety of mammals, reptiles, fish and other animals describe what a naturalist does explain the contribution of some famous naturalists to our understanding of nature and the importance of humans looking after the environment **Working Scientifically** label the parts of a flowering plant correctly using their scientific names dissect a flower to explore the male and female parts of the plant write scientifically	test a hypothesis identify control variables in an Investigation identify the dependent and independent variables in an investigation make and record detailed observations of a Mechanism describe how using a smaller or larger gear to power another gear will affect the movement make observations about the direction of a gear's movement	product (e.g. gas or ash), which makes burning an irreversible change I identify the properties of a variety of everyday materials, such as whether it is magnetic, conductive, soluble, flexible, etc **Working Scientifically** mix a variety of materials with water to see whether they will dissolve, float, sink or react, recording the results in a table classify materials depending on whether they dissolve, float, sink or react when mixed with water investigate different irreversible changes by mixing different materials together, observing the results and explaining what has happened	describe how theories about our solar system have changed over time, explaining the difference between geocentric and heliocentric models I know that we are in a galaxy called the Milky Way that there are three main types of planets in our solar system and can describe the difference between terrestrial, gas giant and ice giant planets name the planets in our solar system and order them by their distance from the Sun I know that the length of a year is different on each planet because of the time it takes each one to orbit the Sun **Working Scientifically** draw a labelled diagram of the Sun, Earth and Moon to show how they are related to one	periods in animals with the female animal's weight, and use this to draw conclusions write a report about the development of children from age 0 to 11 label diagrams of boys and girls to show the changes that take place during puberty	are used in a transmission I know that the force transmitted by gears in a transmission is called torque I can give some examples of how gears and transmissions are used in everyday life recognise some different types of gears, such as worm gears, rack gears and bevel gears **Working Scientifically** carry out an investigation to explore the effect of gravity on falling objects, taking careful measurements and observations to draw conclusions carry out independent research to find out about the roles Newton and Galileo played in helping our understanding of gravity, presenting my findings appropriately

		accurate descriptions of asexual reproductions in plants using 100 words or less follow instructions to grow a new plant from cuttings classify a variety of animals according to how they reproduce I can create a scatter graph to show animal gestation and incubation periods, using the information to generate statements and answer questions research and present data and information about the organisms living in a variety of environments around the world compare the life cycles of a variety of animals carry out		compare and classify a variety of everyday materials based on their properties carry out a variety of investigations to explore the properties of materials to see if they e.g. conduct electricity, are magnetic, are soluble, etc give reasons, based on evidence from comparative and fair tests, for uses of everyday materials plan, set up and carry out a fair test, drawing conclusions and presenting the results.	another create a moving model of the Sun, Earth and Moon, and write a description to describe what is happening make a simple sundial and set it up to observe how shadows change throughout the day record my observations and use these to draw conclusions use the internet to research which time zones different cities around the world are in label diagrams to show which season both the Northern and Southern Hemispheres will be experiencing depending on the Earth's position and tilt create a graph to show the average day length by month, and use the data to answer questions		suggest ways to plan an experiment to find out which surface has the most friction when an object is moved across it carry out a fair test to explore the friction of different surfaces, recording my results accurately and using them to draw conclusions analyse a variety of statements, explaining which I agree with and why plan, set up and carry out an investigation to explore how the size of a parachute affects the speed at which it falls to the ground, recording my results appropriately and using them to draw conclusions make predictions about which shape of plasticine would fall quickest in a pot of water, giving scientific explanations for my choices

		independent research to find out about the life and achievements			create a labelled diagram of the phases of the moon sort fact cards to show which apply to the geocentric and which apply to the heliocentric explanations of the solar system use the internet to explore the night sky, stating which planets and constellations will be visible on a given day carry out my own research to find out key facts about each planet in the solar system create a 3D model of the solar system		carry out an experiment to test my predictions, recording my results using a stopwatch and using evidence to draw conclusions create some simple pulleys, exploring the different forces needed to pull the same object and drawing conclusions from my findings use card or construction toys to create different transmissions, exploring the movement and torque of the driver and follower gears
Year 6	Knowledge	**Viking Science**	**Scientists and Inventors**	**Classifying Organisms**	**Seeing Light**	**Changing Circuits**	**Evolution and Inheritance**
	Skills I can… Key Vocabulary scurvy james lind volt component	use prior knowledge and/or secondary sources to suggest ways in which foods are produced make observations and record data accurately present findings from enquiries or	report and present findings from enquiries, including causal relationships, in oral and written forms such as displays and other presentations in the context of Stephen Hawking	match organisms to their correct group (plant, mammal, amphibian, reptile, bird, fish, insect, crustacean, arachnid or mollusc, as well as echinoderm,	name the different parts of the eye and describe their function I know that light can only travel in a straight line explain how mirrors	define each of these terms: circuit, current, conductor, insulator, volt, component, battery, motor I know the difference between a series circuit and a	I know that living things produce offspring of the same kind, but that normally offspring vary and are not identical to their parents suggest some

	battery motor parallel circuit carbohydrates simple sugars periscopes series circuit charles darwin evolution theory linnaeus variation reflection taxonomy minerals bulbs environmental adapted mammal amphibian reptile bird fish insect crustacean arachnid mollusc echinoderm myriapod and annelid	secondary sources share prior knowledge about micro-organisms theorise, formulating answers to questions about micro-organisms present findings about micro-organisms, based on their scientific enquiries devise and conduct a test of the Effectiveness of glue? interpret their results, reporting Findings suggest ways of improving a test, or altering a variable, to learn more ask scientific questions about the properties of a product devise scientific enquiries to answer scientific questions interpret and present their findings in a way that others can understand devise scientific enquiries to try and answer a question improve their	and his findings on black holes. give reasons for classifying plants and animals based on specific characteristics in the context of Libbie Hyman's work on classifying vertebrates and invertebrates. recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function in the context of exploring Marie Maynard Daly's findings on diet and circulatory system Health. record data using scatter graphs in the context of Fleming's discovery of penicillin. recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago	myriapod and annelid) using what I know about the features of each group explain why it is important to be able to classify organisms I know the difference between vascular and nonvascular plants I describe the difference between flowering and non-flowering plants I know that Carl Linnaeus is known as the Father of Taxonomy because of the system he developed to help classify organisms I know that the Linnaeus system uses Latin names for organisms so that there was a globally recognised naming system describe what each of the seven levels on the classification system are: kingdom, phylum,	can be used to reflect light explain how objects such as periscopes and rear-view mirrors work and why they are useful I know that the angle the light lands on the mirror will affect which angle the light changes direction to, and I know that this is called the angle of reflection I know that some surfaces reflect more light than others explain the difference between a shadow and a reflection explain how a mirror could make a shadow and a reflection at the same time **Working Scientifically** draw on my previous knowledge of light and shadow to answer a variety of questions use careful	parallel circuit I know that if there are too many volts running through a circuit, it will blow the component recognise and use conventional symbols used in circuit diagrams <u>Working Scientifically</u> work independently to create a series and a parallel circuit create series and parallel circuits to match a circuit diagram use what I know about voltage to predict the brightness of a bulb or bulbs in a variety of different circuits experiment with the best way to make the bulb in a circuit as bright as possible, recording my results on a scale draw a circuit diagram that includes conventional circuit symbols	common inherited characteristics, e.g. hair colour, eye colour, height, etc I know that 'variation' occurs from generation to generation in a species identify examples of variation in animals that are cross-bred identify the features of the environment an animal lives in and can explain some of the ways in which the animal has adapted to suit its environment I know that some inherited features are advantageous and some are not I know that, over many generations, advantageous features may be spread across a whole species, making them better adapted to their environment I understand how the adaptation of

		methods of enquiry based on observations interpret and present their findings?	in the context of Mary Leakey's fossil findings in the Olduvai Gorge. identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood in the context of finding out about Dr Daniel Hale Williams, then labelling the parts and functions of the circulatory system. use recognised symbols when representing a simple circuit in a diagram in the context of the invention of Apple computers and the life of Steve Jobs.	class, order, family, genus and species describe what a microorganism is I know that microorganisms can be classified into the kingdoms of protists, bacteria and fungi describe some examples of microorganisms, such as in food production and illnesses **Working Scientifically** classify a variety of organisms into groups according to their features use a classification key to help me identify which group unfamiliar animals belong to create a presentation with labelled diagrams to show the features of each group of animals use a variety of criteria to classify animals that belong to the same group,	observation to identify the pupil, cornea, iris and sclera of the human eye use arrows to draw the direction light travels label a cross-section diagram of the human eye, explaining the function of each part present information about how the eye works in a variety of different ways use what I know about the angle of reflection to draw the angle light will reflect off a mirror use what I know about the angle of reflection to shine a light beam to a goal using mirrors make predictions about which surfaces will reflect a lot of light and which won't investigate a variety of surfaces to see which reflect a lot of	create series and parallel circuits to match a circuit diagram that uses conventional circuit symbols plan, set up and carry out a fair test to see how changing the wire in a circuit affects the brightness of a bulb use the results of my experiment to answer questions ask questions about circuits I would like to find the answer to, and decide how to find the answers design and create a circuit for a particular purpose.	plants and animals to suit their environment may lead to evolution explain Darwin's theory of evolution and the process of natural selection I know that Darwin explained each step in the Linnaeus classification system to show where part of a population developed a new variation and eventually formed a new species I know that some variations are caused by mutations, and that some of these are harmless, some are advantageous and some are disadvantageous I know that changes to an environment can affect the evolutionary process I know that palaeontologists study fossils to explore how species have evolved over time

				e.g.mammals create a classification key to help identify a variety of flowering and non- flowering plants gather plant samples (or photographs of plants) from the local area, then create a classification key to identify them find a variety of different ways to classify different plants I can use the Linnaeus classification system to identify the kingdom, phylum, class, order, family, genus and species of a variety of organisms use the Linnaeus classification system to answer questions about different organisms carry out my own research to create	light and which don't, noting similarities and differences between the two groups suggest a variety of investigations to explore how shadows behave carry out an investigation to explore what happens to the size and shape of a shadow when an object is moved further away from a light source, recording my results in graphs and tables		I understand how humans have evolved over time, and how human behaviour can affect changes in other species over time **Working Scientifically** identify features I have inherited from my parents and note variations As a class, we can arrange ourselves in different ways according to our inherited characteristics carry out my own research to find animals that live in a particular environment around the world, recording the features that make it advantageous for its habitat compare and contrast the features of two animals living in the same environment, explaining why each of their features are advantageous for that particular species I understand that

				a report about a particular family of animals, including pictures, diagrams and information ask questions about micro-organisms and use my own research to answer them carry out a fair test to explore which foods yeast most likes to eat, recording the results and drawing conclusions gather samples of organisms in the local area (or take photos) to identify and classify organisms found in the local area carry out my own research to find out about different groups of organisms in a different part of the world, presenting my findings appropriately			scientists are always refining, changing and developing the ideas of other scientists, and that ideas can be refuted when further evidence is uncovered ask questions about evolution and use my own research to find the answers, presenting my findings. create a fact file about Charles Darwin, using known facts and my own research read statements and write persuasive arguments to show whether I agree or disagree, drawing on my knowledge of evolution and inheritance

Year 7	Knowledge	**7A Cells, tissues and organ systems** **7E Mixtures and separation**	**7F Acids and Alkalis** **7I Energy**	**7J Current and electricity.** **7C Muscles of bones**	**7D Ecosystem.** **7G The Particle Model**	**7H Atoms, elements and molecules** **7K Forces**	**7L Sound** **7B Sexual reproduction in animals**
	Skills I can… Key Vocabulary Compress Condensation Diffusion Dissolve Evaporation Filtrate Solute Solvent Compound element Acid Alkali Cell membrane Cell wall Cytoplasm Organism Osmosis Balance Friction Weight Luminous Opaque Eclipse Gravity Seasons satellite	**7A Cells, tissues and organ systems** Identify things as being alive or not. Describe the life processes. Use life processes to justify whether something is an organism or not. Recall that the heart is an example of an organ. Identify and locate the major organs in humans and plants. Describe the functions of the major human and plant organs. Describe what happens in photosynthesis. Recall some tissues found in the heart and plant roots. Describe how organs and tissues are linked. Describe the functions of different tissues in some animal and plant	**7F Acids and Alkalis** Name something that is an acid. Name something that is an alkali. Recall why some chemicals have hazard symbols. Recognise the common hazards and hazard symbols. Explain why hazard symbols are necessary. Recall the names of at least two everyday acids and alkalis. Describe how risks from some hazards can be reduced. Plan a safe investigation. Explain the safety precautions that need to be taken when carrying out	**7C Muscles of bones** State some things that the body needs. Identify the main organs in the human gas exchange system. Recall what happens in respiration. Describe how breathing movements occur. Describe what happens when muscles contract and relax. Explain how muscles are adapted to their function. State a reason why someone might start breathing faster. State what the pulse rate measures and where it is measured.	**7D Ecosystem** Identify variation between organisms of the same and different types. Identify continuous and discontinuous variation. Correctly use the terms ‘habitat’ and ‘species’. Present information using bar charts and scatter graphs. Choose an appropriate bar chart or a scatter graph to present data. Identify relationships using scatter graphs. List some physical environmental factors in an environment. Describe how organisms are adapted to their	**7H Atoms, elements and molecules** Identify and draw tables, pie charts, bar charts and scatter graphs. Interpret tables, pie charts, bar charts and scatter graphs. Identify the difference between qualitative and quantitative data. Describe the benefits of organising data in particular ways. State what is meant by an element and recall some examples. Describe the difference between elements and compounds by their properties. Use particle diagrams to describe	**7B Sexual reproduction in animals** State what is meant by the scientific method. Identify steps often used in the scientific method. Explain why we use the scientific method. Describe how some animals care for their offspring. State what sexual reproduction is. Recall what gametes (sex cells) are. Describe what happens in fertilisation. Describe some differences in how animals reproduce. Name and identify the main reproductive organs in humans.

		organs. Identify and name some parts of a microscope. Describe how to make a slide and explain what the coverslip is for. Explain how the parts of a microscope work. Describe how to use a microscope to look at a specimen on a slide. Work out microscope magnifications. Estimate the sizes of specimens seen under a microscope. Identify a cell as an animal cell or a plant cell. Name some of the parts of cells. Name the parts of animal and plant cells and describe their functions. Identify and name some specialised cells and describe what they do. Explain how and why certain cells are specialised. Describe how cells, tissues, organs and	an investigation. Describe how indicators can be used to identify acids and alkalis. Identify acids, alkalis and neutral solutions using litmus. Explain why litmus is purple in neutral solutions. Identify acids, alkalis and neutral solutions using universal indicators. Describe the pH scale. Describe how to measure the pH of a solution. Recall the name of the reaction that occurs between acids and alkalis. Explain the difference between a physical and a chemical change. Identify the reactants and products in a word equation. Write a word	Explain how the circulatory system gets blood around the body. Describe the functions of red blood cells, white blood cells and plasma. Explain how capillaries are adapted to their function. Explain how red blood cells are adapted to their function. Describe the role of scientific questions in the scientific method. Identify scientific, non-scientific and ethical questions. Recall the functions of the skeleton. Identify and recall the functions of some bones in the skeleton. Describe the basic parts of joints. Describe how muscles and bones	habitats. Identify and give examples of inherited variation. Correctly use the terms 'ecosystem' and 'community'. Explain how inherited variation is caused. Explain how adaptations increase the chances of survival for organisms. Describe daily and seasonal changes. Identify and give examples of environmental variation. Describe how organisms respond to daily and seasonal changes. Explain how daily and seasonal changes affect populations and communities. Explain how environmental variation is caused.	the difference between atoms and molecules. State the proportions of different gases in the air. Use particle diagrams to describe the difference between elements, compounds and mixtures. Use diagrams to explain the difference between a mixture of elements and a compound. Describe the properties of two elements and link them to their uses. Represent elements using chemical symbols. Explain why some elements are found in their native states and have been known about for a long time. Describe two advantages of recycling materials.	Describe the functions of the reproductive organs in humans. Explain how sperm and egg cells are adapted to their functions. Describe how sexual intercourse leads to fertilisation. Describe what happens in implantation. Describe how fertilisation leads to the forming of an embryo. Explain how identical and non-identical twins occur. Describe how materials are supplied and removed from the foetus. Describe how a foetus is protected in the uterus. Identify the stages of growth during the gestation period. Describe what

		organ systems are linked. Recall some of the organ systems in plants and animals and what they do. Recall the organs in some plant and animal organ systems. **7E Mixtures and separation** State the meaning of sieving and filtering. Describe and identify mixtures. Describe how insoluble solids can be separated from a liquid. Classify mixtures. Describe what is seen when a solid dissolves. State the meaning of soluble, solution, solvent and solute. Describe how some solids can be used to form a solution and what is meant by a saturated solution.	equation for a reaction. Recall the names of the salts produced by hydrochloric, sulfuric and nitric acids. Describe how to produce a pure solution of a salt from an acid and a base or an alkali. Recall some uses of neutralisation. Recall the meaning of the term base. Explain some uses of neutralisation. **7I Energy** Explain why different people need different amounts of food. Use ratios to compare the energy released by different foods or fuels. Name some ways in which energy is stored. Name some ways in which energy is	work together to allow movement. Explain why antagonistic muscles are needed in many joints. Describe how muscle action is controlled by the nervous system. Recall what drugs are and describe some problems they can cause. Recall the effects and side-effects of some drugs, including the effects of stimulants and depressants on reaction time. Classify drugs as legal, illegal, medical and recreational. Explain the short- and long-term effects of some drugs, including depressants (such as alcohol) and stimulants (such as caffeine). **7J Current and electricity**	Use food chains to make food webs and spot food chains in food webs. State the resources organisms need from their habitats. Explain why organisms are in competition in a habitat. Explain how changes in a population or community in an ecosystem affect other populations. Use food webs to predict changes in populations. Explain how energy is lost in food chains. Interpret and draw pyramids of numbers. Explain the effects of some persistent pesticides on ecosystems. **7G The Particle Model** Recall some	Identify different metal and non-metal elements. Use evidence to classify a material as a metal or non-metal. State what happens in all chemical reactions. Describe how elements can be changed into compounds. Describe how a compound and its elements' properties are different. Use the chemical names for different 2- and 3-element compounds. Recall examples of chemical reactions in everyday life. Write word equations to describe chemical reactions and identify the products and reactants in the reactions. Identify and describe what happens in thermal	happens during labour and birth. Describe the changes in diet needed by a baby. Describe how a foetus can be harmed inside the mother. Explain why breast milk is best for newborn babies. Compare the life cycles of different animals. Describe the changes that occur during puberty and adolescence. Describe what happens in the menstrual cycle. Explain the purpose of the menstrual cycle. **7L Sound** State the meaning of: pitch, volume, frequency and amplitude. Describe how to make different

		Identify the solute and solvent in a solution. State the meaning of solubility. Describe how temperature can affect solubility. Identify hazards and risks. Justify methods of risk reduction. Plan appropriate safety precautions in experiments. Describe how soluble solids can be separated from a solution. Describe the difference between evaporation and boiling. Describe how chromatography can be used to separate mixtures. Explain how chromatography works. Describe how distillation can be used to separate	transferred. Identify energy stores and transfers in real-life situations. Recall some examples of non-renewable fuels. Name some fuels used in transport or in the home. Describe how fossil fuels were formed. Recall some examples of renewable energy resources. Explain how the Sun is the original source of energy for fossil fuels, biofuels and food. Explain how the Sun is the original source of energy for wind, waves and hydroelectric resources. Suggest and explain suitable renewable energy resources to use in different situations. Describe some	Measure the current in part of a circuit using an ammeter. State what is meant by current. Describe the effect of adding more bulbs to a series circuit. Describe what the current is like at different points in a series circuit. Identify physical and abstract models. Evaluate simple circuit models. Describe how to make a simple circuit. Model circuits using circuit diagrams and standard symbols. Construct simple electrical circuits. Describe the strengths and weaknesses of some of the models used to explain electricity. Describe the effect of adding more	properties of materials. Classify materials as solid, liquid or gas. Describe the properties of the three states of matter. Recognise that solids, liquids and gases need to be handled in different ways because of their different properties. Identify and explain what a scientific question, hypothesis, theory, prediction and observation are. Make a prediction that is explained using scientific knowledge. Describe how evidence and observations are used to develop a hypothesis into a theory. Explain how evidence and observations support or do not support a	decomposition reactions. Explain the different ways energy can play a part in some reactions. **7K Forces** Recall that a force is a push or a pull. Name and identify some different forces. State the meanings of contact force, non-contact force, weight and mass. Recall the effects of forces on an object. Recall how to measure forces and masses, and their units. Explain the difference between mass and weight. Represent the size and direction of forces using arrows. State the meanings of elastic and plastic.	sources of sound louder or quieter. Describe how to use different objects to make sounds with different pitches. Relate the volume (intensity) of a sound to the size of the vibrations producing it. Describe the connections between amplitude and loudness, and between frequency and pitch. Compare how sounds travel through different materials. Describe how a sound changes as you get further from the source. Describe how sound gets from a source to our ears. State what is meant by: ultrasound, infrasound. Recall how the speed of sound varies in solids, liquids and gases, and how fast

		mixtures. State examples of where distillation is used. Explain how distillation works. Use a knowledge of separation techniques to decide how a mixture should be separated. Justify a decision to separate a mixture in a certain way.	advantages and disadvantages of renewable energy resources. Suggest some ways in which we can reduce our use of fossil fuels. Describe what is meant by 'efficiency'. Explain how certain gases cause the greenhouse effect. Identify useful and wasted energies.	bulbs to a parallel circuit. Describe how current divides between the branches in a parallel circuit. Compare series and parallel circuits. Predict what the currents will be in different parts of series and parallel circuits. State what is meant by voltage. Describe how current and voltage are measured. Explain what resistance is. Use models to help to explain the idea of voltage. Describe some uses and dangers of electricity. Recall why fuses are used. Describe some of the technological developments made possible by	certain theory. Recall that all materials are made out of tiny particles. Identify solids, liquids and gases from descriptions and particle diagrams. Use particle theory to explain the basic properties of solids, liquids and gases. Suggest explanations for observations using particle theory. Draw particle diagrams to describe solids, liquids and gases. Describe Brownian motion. State where Brownian motion can be observed. Use particle theory to explain how Brownian motion occurs. State what is meant by diffusion. Recall some	Describe how the extension of a spring depends on the force applied. Explain what is meant by elastic limit and limit of proportionality. Describe some effects of friction, and how friction forces can be changed. Identify situations in which friction is helpful or not helpful. Describe the different ways in which friction forces can affect an object, and how they can be changed. Calculate pressure and recall its units. Describe the effects of high and low pressure in simple situations, and how the pressure can be changed. Use units in the SI system, including prefixes. Explain why	it travels compared to light. Recall that waves transfer energy by vibrations, and they do this without transferring matter. Explain why the intensity of a sound decreases with increasing distance from a source. Describe what line and scatter graphs show. Identify relationships using scatter graphs. Recall that sounds can be detected by microphones and sound meters. Name the parts of the ear. Recall that different animals have different hearing ranges. Describe the functions of different parts of the ear. Describe how microphones convert sound into electrical

				electricity. Use electricity safely. Explain how fuses work. Wire a plug correctly. Describe some ways in which electricity is used safely in homes.	everyday examples of diffusion. Use particle theory to explain how diffusion occurs. State what is meant by gas pressure. Recognise some effects of gas pressure. Use particle theory to explain gas pressure. Describe how gas pressure can be changed.	scientists use SI units. Explain the effects of balanced and unbalanced forces in simple situations.	signals. Recall the units for loudness. Explain how ultrasound is used in physiotherapy and for cleaning. Explain how sonar and echolocation work. State the meaning of: transverse wave, longitudinal wave. Recall what sort of waves sound waves and waves on water are. Identify the parts of a wave on a model. State the meaning of superposition. Describe how two waves in the same place can affect each other. Compare longitudinal and transverse waves in terms of the way the particles move.

Year 8	Knowledge	8A Food and nutrition 8B Plants and their reproduction	8ECombustion 8F The periodic table	8I Fluids 8J Light	8C Breathing and respiration 8D Unicellular organisms	8G Metals and their uses 8H Rocks	8K Energy transfers 8L Earth and space
	Skills I can… Key Vocabulary Bacteria Carbohydrates Deficiency Digestion Drugs enzyme lipase Lipids malnourished Protease Acid Chromatography Dissolve Distillation Fossil fuels Mixture Reactive Solution Solvent metamorphic Pollution Porous Sedimentary Ammeter Voltmeter Electricity Current magnetic parallel Potential	**8A Food and nutrition** Recall why we need food. Recall the nutrients we need in our diets. Describe why our bodies need fibre and water. Interpret food information labels. Recall the tests used to detect some nutrients. Recall some good sources of the different nutrients and fibre. Describe how factors change the amount of energy we need from food. Describe what our bodies use the different nutrients for.	**8ECombustion** State the meaning of fuel and combustion. Describe the reactants and products in the combustion of hydrocarbons. Name the fuel used in a fuel cell. Describe the tests for carbon dioxide and water. Write word equations to model reactions. State the meaning of oxidation. Describe the reactions of metals with oxygen. Identify reactants and products of oxidation using word equations. State what happens	**8I Fluids** Describe the properties of the three states of matter and explain them using ideas about particles. Describe how particles move in solids, liquids and gases, how this changes with temperature and what effects this has. Explain what density is. Use a formula to calculate density. Use the particle model to explain density changes at different temperatures. Describe how to measure the volume of regular and irregular objects. Explain how	**8C Breathing and respiration** Recall what happens in aerobic respiration. Model aerobic respiration using a word equation. Compare burning (combustion) and aerobic respiration. Recall the functions of the organs in the gas exchange system. Explain how the structure of the lungs allows efficient gas exchange. Describe how muscles cause breathing, and how this causes pressure differences that allow ventilation. Explain how the lungs are adapted for efficient gas	**8G Metals and their uses** Describe the physical and chemical properties of metals and relate them to their uses. Recall some reactions that happen slowly and some that happen quickly. Describe what catalysts do and some applications of catalysts. Write word equations for reactions between metals and non-metals. Describe what happens when metals react with oxygen. State the meaning of corrosion and rusting. Explain how barrier	**8K Energy transfers** Recall that energy will be transferred from hotter to cooler objects or materials. Explain how thermal (or internal) energy and temperature are different, and recall the factors that affect the temperature of an object. Recall that evaporation can cool a liquid, and ways of reducing this. Use the particle model of matter to explain cooling by evaporation. Describe how energy is transferred in conduction, convection and radiation. Recall some examples of thermal

	difference Reflection renewable	Describe the benefits of a balanced diet. Explain how different types of malnutrition are caused and their effects. Interpret Reference Intake (RI) information. Identify and recall the main organs in the human digestive system. Describe the functions of the organs in the digestive system. Explain how food is moved through the digestive system. Describe how enzymes work as catalysts in digestion. Recall some benefits and drawbacks of bacteria in the digestive system. Recall what happens in respiration. Explain how diffusion occurs in	to mass in a chemical reaction. Explain changes in mass seen in reactions. Compare and contrast the oxygen and phlogiston theories. Name the three sides of a fire triangle and recognise hazard symbols. Describe what is meant by an exothermic change. Explain why different types of fire need to be put out in different ways. Evaluate data on burning fuels. Identify variables that need to be controlled in an experiment. Plan ways in which to control variables in an experiment. Recall examples of pollutants formed by	chemical changes are different to physical changes, and recall some examples of each type. Recall that ice is less dense than water, and why this is unusual. Describe what happens to particles during changes of state, in terms of energy and bonds, and why there is no change in temperature while a substance is changing state. Use the particle model to describe the causes of pressure in fluids. Explain why pressure in a fluid increases with depth. Explain some effects caused by fluid pressure using ideas about forces. Use the particle model to explain why gas pressure changes with temperature,	exchange. Explain how specialised cells keep the lungs clean. Calculate ranges and explain their use. Calculate means and explain their use. Describe ways that oxygen supply to tissues can be reduced, and the effect of this. Describe the effects of smoking tobacco. Describe the transfer of substances between blood and tissues. Explain the changes in pulse and breathing rate during exercise. Recall how to detect aerobic respiration. Describe how gas exchange occurs in different organisms including plants. Compare the human gaseous exchange system with those of	methods (e.g. painting) can be used to stop rusting. Model reactions using word equations. Show the products or reactants in a reaction as formulae. Describe the test for hydrogen. Write word equations for the reactions of metals with water. Use the reactions of metals with water to create an order of reactivity. Explain how to improve the accuracy of an investigation. Identify repeated measurements and explain the importance of repeatable, reproducible and reliable data. Describe what happens when metals react with	conductors and insulators, and explain why certain materials are used for given purposes. Use the particle model to explain how energy is transferred in conduction and convection. Explain which energy transfer processes are taking place in given situations. Describe ways of reducing energy transfers by conduction, convection and radiation. Recall which colours are good and poor emitters and absorbers of radiation. Evaluate ways of increasing or decreasing energy transfers. State the meaning of accuracy and precision. Explain how to avoid systematic and

		terms of movement of particles. Explain how diffusion allows absorption by the small intestine. Explain how the small intestine is adapted to its function. Calculate surface areas of rectangles and cuboids. Explain the importance of surface area in science (e.g. in absorption). **8B Plants and their reproduction** Describe the characteristics of organisms in the five kingdoms. Describe how organisms are further classified in their kingdoms. Identify the genus and species names from a scientific	burning fossil fuels. Describe the reactions of non-metals with oxygen. Explain the products of complete and incomplete combustion of fossil fuels. Explain how sulfur dioxide and nitrogen can cause acid rain. Explain how pollution from fossil fuel combustion can be reduced. Evaluate measures for reducing pollution from fossil fuel combustion. State the meaning of greenhouse effect, global warming and climate change. Explain how human activities are affecting global warming. Explain how methods of controlling carbon dioxide emissions	number of particles and volume. Use the idea of upthrust to explain why an object does or does not float. Recall the factors that affect the amount of upthrust on an object. Use ideas about density changes to explain how a hot air balloon flies or how the depth of a submarine is controlled. Describe the ways in which the size of drag forces can be changed. Describe the causes of air and water resistance. Explain why a vehicle needs a force from the engine to keep moving at a constant speed. **8J Light** Recall the meanings of words that describe materials	other animals. Recall what happens in anaerobic respiration in humans. Explain when aerobic respiration and anaerobic respiration occur. Describe how lactic acid is removed from tissues. Explain the cause of excess post-exercise oxygen consumption (EPOC). **8D Unicellular organisms** Recall the five kingdoms of organisms. Explain why multicellular organisms need efficient transport systems. Explain how materials enter and leave unicellular organisms. Use the characteristics of microorganisms to	acids. Write word equations for the reactions of metals with different acids. Use the reactions of metals with acids to create an order of reactivity. Model simple reactions using symbol equations. Describe what happens at a material's melting, freezing and boiling point. Describe what is meant by a pure substance and how melting and boiling points can identify pure substances. State, with examples, the meaning of an alloy and explain why alloys are made. Use models to explain why alloys are stronger than the pure metal. **8H Rocks**	random errors. Interpret Sankey diagrams. Explain what efficiency means, and identify useful and wasted energies. Describe what power means, and how to find the power rating of an appliance. Calculate energy efficiencies. Recall how electricity and natural gas bills are calculated and the units used. Calculate payback times. **8L Earth and space** Describe the positions and movements of the Earth, Moon and planets. Describe some ways of investigating the Solar System. Compare different

		name. Explain why biodiversity is important. Describe how a quadrat is used to collect samples. Use a sample to calculate an estimate. Explain the effects of too small and too big a sample size. State the difference between asexual and sexual reproduction. Recall ways in which plants reproduce asexually. Describe what happens during fertilisation. Identify and give examples of inherited variation. Explain how inherited variation is caused. Identify the main parts of a flower and describe their	work. **8F The periodic table** Write and identify the chemical symbols for elements. Describe Dalton's ideas on atoms, molecules, elements and compounds. Write word equations for simple and complex chemical reactions. Describe elements using physical properties. Explain the difference between physical and chemical changes and properties. Use observations to decide whether a chemical reaction has taken place. Write and interpret chemical formulae for compounds. Explain what happens during	and how they affect light (transparent, translucent, opaque, transmit, absorb). Describe how light travels. Use the ray model of light, in diagrams, to explain how we see things. Describe some similarities and differences between light and sound. Represent rays of light as straight lines with arrows showing the direction of travel. Describe some uses of plane mirrors. State the meanings of words connected with reflection (such as angle of incidence, normal, etc). Describe the difference between specular reflection and scattering. Recall the law of reflection and use it to make predictions.	classify them into kingdoms. Recall the conditions under which yeast grow quickly. Recall what happens in aerobic and anaerobic respiration in yeast. Explain how yeast can be used to make both alcoholic drinks and bread. Describe how yeast reproduce asexually by budding. Explain what is happening in the different parts of a growth curve. Recall the conditions under which bacteria grow quickly. Explain why bacteria are used to make yoghurt. Describe, identify and state the basic functions of the parts of a bacterial cell (soft cell wall, flagella, cytoplasm, cell membrane,	Recall some uses for rocks. State what minerals are. Describe the textures of some rocks. Explain why some rocks are porous. Relate features of a landscape to the wearing away of different rocks. Name some igneous rocks and describe how igneous rocks are formed. Explain how the crystal size in igneous rocks depends on cooling rate. Explain where you might find igneous rocks with small or large crystals. Name some metamorphic rocks and describe how metamorphic rocks are formed. Describe the textures and	models of the Solar System, and explain why we use our current model. Use a model to explain why we see phases of the Moon. Describe differences in the seasons. Use a model to explain the differences in the seasons. Explain the effect of the Earth's tilt on the energy received from the Sun. Recall the shape and direction of the magnetic field of a bar magnet. Use a plotting compass to show the shape and direction of a magnetic field. Explain how to arrange two magnets so that they attract or repel each other. Describe the Earth's magnetic field and explain why a compass needle

		functions. Use flower shape or pollen type to work out how a plant is pollinated. Describe how the parts of a flower are adapted to their functions. Explain how and why plants avoid self-pollination. Identify the different parts of a seed. Identify different kinds of fruits and describe how they disperse seeds. Describe what happens after pollination and before fertilisation. Describe how a fertilised egg cell grows into an embryo. Explain the importance of seed dispersal. Describe the life cycle of a flowering plant. Recall the resources	chemical reactions using atomic theory. Carry out calculations involving the masses of reactants and products. Use the periodic table to find symbols and elements with similar properties. Identify alkali metals, halogens and noble gases in the periodic table and describe their typical properties. Describe how Mendeleev arranged the elements in the periodic table and made predictions about elements. Describe how the modern periodic table is arranged. Explain what is meant by an anomalous result (outlier). Identify anomalous results and the range of readings in data. Suggest scientific	Use ray diagrams to explain the formation of an image in a plane mirror. Describe some uses of lenses. Recall that light travels at different speeds in different materials. Explain why refraction occurs, and use ray diagrams to describe the refraction of light as it passes into and out of different materials. Describe the effects of convex lenses on parallel beams of light. State the meaning of focal length, focus and principal axis and relate the power of a lens to its shape. State the parts of the eye and cameras, and explain their functions. Describe similarities and differences	chromosome). Describe how bacteria reproduce asexually by binary fission. Explain why bacteria grow well in certain conditions. Extract simple information from pie charts. Present data in pie charts. Identify when to use a pie chart. Recall the conditions under which algae grows quickly. Describe, identify and state the basic functions of common parts of protoctist cells (cell wall, flagella, cilia, pseudopods, cytoplasm, cell surface membrane, mitochondria, chloroplasts, nucleus). Explain the functions of light and chlorophyll in photosynthesis.	properties of igneous and metamorphic rocks. Explain how the three types of weathering break up rocks. Recall how weathered rocks are eroded and abraded. Explain why different rock fragment sizes are carried by water and wind. Describe the textures and properties of sedimentary rocks. Name some sedimentary rocks and describe how sedimentary rocks and fossils are formed. Use the rock cycle model to link the formation of different types of rock. Describe how the scientific method is used for sciences such as geology. Recall that some	points north. Recall the direction in which gravity acts and the factors that affect it. Say what gravitational field strength means. Explain why the weight of an object changes if taken to the Moon but not its mass. Recall that planets and natural satellites are kept in orbit by gravity. Describe how mass and distance affect the strength of gravity. Use gravitational field strength to calculate weight. Make comparisons using ratios and percentages. Explain what these words mean: Sun, star, galaxy, Universe, constellation. Describe the Milky

		needed for germination and how this occurs. Describe what happens in photosynthesis and respiration. Describe examples of interdependence and how changes in a population or community affect other populations.	reasons for anomalous results (outliers). State what happens at the melting/freezing/boiling point of a substance. Use melting, freezing and boiling points to predict state. Identify metals and non-metals by their properties and position in the periodic table. Describe and identify trends in physical properties in the periodic table. Describe the reactions of metals and non-metals with oxygen and water. Compare the properties of metal and non-metal oxides. Identify trends in chemical properties within a group. Make predictions about chemical properties and	between eyes and cameras. Describe the way our eyes detect different colours, and recall the primary and secondary colours of light. Prepare effective presentations. Describe how to split light into different colours using a prism, and recall the colours of the spectrum, in order. Explain how filters can be used to make coloured light. Explain why coloured objects appear coloured and why they look different in light of different colours.	Give examples of decomposer microorganisms. State the names of compounds in which carbon is held in an ecosystem. Explain the importance of decomposers in an ecosystem. Model the recycling of carbon in an ecosystem using the carbon cycle.	metals are found in their native states. Recall how metals are extracted from ores taken from the Earth's crust. Explain the advantages of recycling metals. Describe some of the environmental effects of mining.	Way. Compare the relative sizes and distances of objects in space.

			reactivity in a group.				
Year 9	Knowledge	**CB1 key concepts in Biology** **Core practical - microscope** **Core practical Ph and enzyme** **CB2 Cells and Control**	**CC1 States of matter** **CC2 Methods of separating and purifying substances** **CC3 Atomic structure** **CC4 The periodic table**	**CP3 Conservation of energy** **CP4 Waves** **CP5 Light and the EM**	**CB3 Genetics** **CC5 Ionic bonding**	**CC5 Ionic bonding continued** **CC6 Covalent Bonding** **CC7 Types of substances**	**CP6 Radioactivity**
	Skills I can… Key Vocabulary Animal cell Plant cell Nucleus Mitochondria Ribosomes Sperm cells Red blood cells Microscope Magnification Focus Enzyme Amylase Active site Optimum temperature Diffusion Osmosis Mitosis AProton Neutron Electron Mass number Isotope Electron shells	**CB1 key concepts in Biology** **Core practical - microscope** **Core practical Ph and enzyme** Recall what an electron microscope is. Recall what is meant by an instrument's resolution. Explain why some cell structures can be seen with an electron microscope but not with a light microscope. Calculate total magnification using	**CC1 States of matter** Describe the arrangements and movement of particles in the different states of matter. Describe the relative energies of particles in the different states of matter. Name the three states of matter, and the physical changes that occur between them. Explain why the movement and arrangement of particles change during changes of state. Explain why the energy of particles	**CP3 Conservation of energy** Interpret diagrams that represent energy transfers. Represent energy transfers using diagrams. Explain, using examples, that energy is conserved. Give examples of energy being moved between different stores. Describe what happens to wasted energy in energy transfers. Explain that mechanical processes become wasteful when they	**CB3 Genetics** Recall that gametes are produced by meiosis. Describe what happens in meiosis (without details of the stages). Explain why haploid gametes are needed for sexual reproduction. Recall what an organism's genome is. Describe where genes are found. Recall the function of genes. Recall where DNA is found in a	**CC5 Ionic bonding continued** **CC6 Covalent Bonding** Explain how covalent bonds are formed. Recall the names of some common molecular elements. Recall the names of some common molecular compounds. State the bonding that is found in molecules. State the approximate size (order or magnitude) of atoms and small	**CP6 Radioactivity** Describe the structure of an atom (in terms of nucleus and electrons). State where most of the mass of an atom is found. State the sizes of atoms and small molecules. Describe an early model of the atom. Describe how and why our model of the atom has changed over time, including the plum pudding model and Rutherford alpha particle scattering. State what is meant

	Ionic bond Covalent bond Empirical formula Solution Filtering Distillation naphase	a formula. Calculate sizes using magnifications. Interpret the SI prefixes milli-, micro-, nano- and pico-. Identify the parts of plant and animal cells. Recall the parts of plant and animal cells. Make drawings of plant and animal cells using a light microscope and identify their parts. Describe the functions of the sub-cellular structures commonly found in eukaryotic cells (nucleus, cell membrane, cell wall, chloroplasts, mitochondria and ribosomes). Estimate sizes using microscope fields of	changes during changes of state. Use information to predict the state of a substance. **CC2 Methods of separating and purifying substances** Describe the differences between a pure substance and a mixture. Use melting point information to decide whether a substance is pure or is a mixture. Describe what happens to atoms at a pure substance's melting point. Interpret a heating curve to identify a melting point. Explain why the temperature does not change as a pure substance melts. Explain ways of reducing risk when separating mixtures by filtration and	cause a rise in temperature so dissipating energy in heating the surroundings. Explain ways of reducing unwanted energy transfer including through lubrication, thermal insulation. Recall and use the equation: efficiency = [H] Explain how efficiency can be increased. Describe the ways in which energy can be transferred by heating. Describe ways of reducing unwanted energy transfers using thermal insulation. Explain different ways of reducing energy transfer by heating work. Define the meaning of thermal conductivity. Describe the effects of the thickness and	eukaryotic cell. Name the bases in DNA. Recall the pairing of bases in DNA. Describe how DNA strands are held together. Describe the overall structure of DNA. Describe how DNA can be extracted from fruit. Describe the difference between a gene and an allele. Explain the effects of alleles on inherited characteristics. Describe the relationship between a genotype and a phenotype. Identify homozygous and heterozygous genotypes. Use genetic diagrams to work out possible combinations of alleles in the	molecules. Explain the formation of covalent bonds using dot and cross diagrams. **CC7 Types of substances** Recall examples of common covalent, simple molecular compounds. Describe the general properties of covalent, simple molecular compounds. Explain why covalent, simple molecular compounds have low melting and boiling points. Explain why covalent, simple molecular compounds are poor conductors of electricity. Describe the structure of a polymer. Recall some	by an isotope. Represent isotopes using symbols. Explain how atoms of different elements are different (in terms of numbers of electrons and protons). Recall the charges and relative masses of the three subatomic particles. Explain why all atoms have no overall charge. Describe where electrons are found inside atoms (in terms of shells or distance from the nucleus and energy levels). Describe when electrons can change energy level or orbit. Recall what an ion is. Describe how ionisation occurs. Describe some of the evidence for the Bohr model of the

		view. Estimate sizes using scale bars. Describe how sperm cells are adapted to their function. Describe how egg cells are adapted to their function. Describe how ciliated epithelial cells are adapted to their function. Draw conclusions about a cell's function from its adaptations. Identify the common parts of bacteria. Describe the functions of common parts of bacteria. Describe why bacteria are classified as being prokaryotic. Compare eukaryotic	crystallisation. State some mixtures that can be separated by filtration. State some mixtures that can be separated by crystallisation. Draw and interpret diagrams showing how filtration and crystallisation are done. Explain the formation of crystals during crystallisation. Explain how mixtures are separated by filtration. Describe how some mixtures can be separated by chromatography. Draw and interpret diagrams showing how chromatography is done. Explain how substances can be separated by	thermal conductivity of the walls of a building on its rate of cooling. Describe how different factors affect the gravitational potential energy stored in an object. Recall and use the equation for gravitational potential energy. Describe how different factors affect the kinetic energy stored in an object. Recall and use the equation for kinetic energy. List the non-renewable energy resources in use today. Describe the advantages and disadvantages of non-renewable energy resources. Compare the advantages and disadvantages of non-renewable	offspring of parents. Explain why the effects of some alleles in an organism's genotype are not seen in its phenotype. Use Punnett squares to work out possible combinations of alleles in the offspring of parents. Interpret family pedigree charts to work out possible inherited genotypes and phenotypes. Describe how sex is determined in humans. Calculate ratios of phenotypes (controlled by alleles of a single gene) when organisms are crossed. Calculate probabilities of certain phenotypes occurring when organisms are crossed. Give examples of characteristics controlled by	allotropes of carbon. Describe the basic differences between covalent, simple molecules and giant covalent structures. Describe the structures of diamond, graphite, fullerenes and graphene. Describe the properties of diamond, graphite, fullerenes and graphene. Explain the properties and uses of diamond and graphite in terms of their structure and bonding. Explain the properties of fullerenes and graphene in terms of their structure and bonding. Describe the particles and how they are arranged in metals. Explain why metals are malleable. Explain why metals	atom. Explain what background radiation is. Describe how radiation measurements need to be corrected for background radiation. List some sources of background radiation. Describe how photographic film can be used to detect radioactivity. Describe how a Geiger–Müller tube works. Describe how the amount of radioactivity can be measured (in terms of the darkness of photographic film or by attaching a counter to a GM tube). Recall the relative masses and relative electrical charges of protons, neutrons, electrons and positrons.

		and prokaryotic cells. [H] Change numbers to and from standard form. State that enzymes are proteins. Give examples of enzymes and where they are found in the human body and in other species. Recall the subunits from which carbohydrates, proteins and lipids are formed (sugars, amino acids, fatty acids and glycerol). Describe what enzymes do (catalyse the synthesis and breakdown of substances, such as carbohydrates, proteins and lipids, by speeding up the rate of reaction). Define an enzyme as	chromatography. Identify pure substances and mixtures on chromatograms. Identify substances that are identical on chromatograms. Calculate Rf values and use them to identify substances. Investigate the composition of inks using paper chromatography. Describe how to carry out, and explain what happens in, simple distillation. Distinguish between simple distillation and fractional distillation. Identify when fractional distillation should be used to separate a mixture. Describe how to carry out fractional distillation. Explain how the products of fractional distillation	energy resources. Explain how the use of non-renewable energy resources is changing. List the renewable energy resources in use today. Describe the source of energy for different renewable resources. Describe the ways in which the different energy resources are used. Explain why we cannot use only renewable energy resources. Explain how the use of renewable energy resources is changing. **CP4 Waves** Recall that waves transfer energy and information but do not transfer matter. Describe waves using the terms frequency,	multiple genes. Define the term mutation. Describe some potential applications of mapping human genomes. Explain how a mutation can cause variation (limited to changes in the protein formed, which can affect processes in which that protein is needed). Give examples of mutations in human genes that affect the phenotype, and examples of those that have little or no obvious effect. Explain why many mutations have no effect on the phenotype. Distinguish between genetic variation and environmental variation. Distinguish between continuous and discontinuous	conduct electricity. Describe the typical properties of metals. Describe the typical properties of non-metals. Give examples of ionic; covalent, simple molecular; covalent, giant molecular; and metallic substances. Describe how the different types of bonds and structures are formed. Explain how the structure and bonding of a substance is linked to its physical properties. (Relative melting point and boiling point, relative solubility in water and ability to conduct electricity, as solids and in solution.) Explain why we use models to represent structure and bonding. Represent structures and bonding using a	List the types of radiation that are emitted in random processes from unstable nuclei. State that the five types of radiation are ionising radiations. Describe what alpha and beta particles are. Describe the nature of gamma radiation. Compare the penetrating abilities of alpha, beta and gamma radiation. Compare the ionisation abilities of alpha, beta and gamma radiation. Describe the process of β− decay. Describe the process of β+ decay. Explain how the proton and mass numbers are affected by different kinds of radioactive decay. Describe what happens during

		a biological catalyst. Explain why catalysis by enzymes is important for life processes (because reactions happen much faster). State what enzyme specificity means. State that an enzyme's action is due to its active site. Describe the role of the active site in enzyme function (including specificity). Explain why enzymes have a particular shape, as a result of the sequence of amino acids in the chain. Use the lock-and-key model to develop explanations for enzyme activity. Explain how enzymes become	are linked to the boiling points of the components. Explain what precautions are needed to reduce risk in a distillation experiment. Investigate the composition of inks using simple distillation Evaluate the hazards and control the risks present when purifying water. Suggest how to purify water when you know what it contains. Describe the steps needed to make fresh water suitable for drinking. Describe how fresh water can be produced from seawater. Explain why water used in chemical analysis must not contain dissolved salts. **CC3 Atomic**	wavelength, amplitude, period and velocity. Describe the differences between longitudinal and transverse waves. Give examples of transverse and longitudinal waves. Recall and use the equation relating wave speed, frequency and wavelength. Recall and use the equation relating wave speed, distance and time. Describe how to measure the velocity of sound in air. Describe how to measure the velocity of waves on the surface of water. Investigate the suitability of equipment to measure the speed/frequency/wavelength of a wave in a solid and a fluid. Describe what	variation. Describe the causes of genetic variation (mutation and sexual reproduction). Describe the causes of environmental variation (differences in the environment, acquired characteristics). Analyse the contribution of genes and environment to the variation in a characteristic. **CC5 Ionic bonding** Calculate the numbers of protons, neutrons and electrons in simple ions. Explain the difference between an atom and an ion. Use dot and cross diagrams to explain how ionic bonds are formed. Explain how cations and anions are	variety of different models (dot and cross, ball and stick, 2D, 3D).	nuclear rearrangement after radioactive decay. Balance nuclear equations for mass and charge. Describe how the activity of a substance changes over time. State how half-life can be used to describe the changing activity of a substance. Recall the unit of activity. Describe how half-life can be used to work out how much of a substance will decay in a certain time. Carry out calculations involving half-life. [H] Carry out calculations involving net decline. Describe the hazards of ionising radiation in terms of tissue damage and

		denatured. Describe the effect of temperature on enzyme activity. Describe the effect of substrate concentration on enzyme activity. Describe the effect of pH on enzyme activity. Explain what is meant by the optimum pH/temperature of an enzyme. Explain why temperature, substrate concentration and pH affect enzyme activity. Calculate the rate of enzyme activity from experimental data. Investigate the effect of pH on enzyme activity. State that	**structure** Describe how Dalton's ideas about atoms have changed. Describe how the subatomic particles are arranged in an atom. Explain how atoms of different elements are different. Recall the charges and relative masses of the three subatomic particles. Explain why all atoms have no overall charge. Describe how the size of an atom compares to the size of its nucleus. State where most of the mass of an atom is found. State the meaning of mass number. Describe how the atoms of different elements vary. State the number of	refraction is. Describe how the direction of a wave changes when it goes from one material to another. Explain some effects of the refraction of light (explanations in terms of changing speeds are not expected). [H] Explain how a change in wave speed can cause a change in direction. **CP5 Light and the EM** Recall examples of electromagnetic waves. Describe the common features of electromagnetic waves. Describe the transfer of energy by electromagnetic waves. Describe the range of electromagnetic waves that our eyes	formed. Explain the formation of ions in groups 1, 2, 6 and 7 of the periodic table. Recall the formulae of simple ions. Recall the formulae of common polyatomic ions, and the charges on them. Interpret the use of –ide and –ate endings in the names of compounds. Name ionic compounds using –ide and –ate endings. Work out the formula of an ionic compound from the formulae of its ions. Describe the structure of ionic compounds. Explain how ionic compounds are held together. Describe the properties of ionic		possible mutations. Explain how the dangers of ionising radiation depend on the half-life. Explain the precautions taken to reduce the risks from radiation and ensure the safety of patients exposed to radiation. Explain the precautions taken to reduce the risks from radiation and protect people who work with radiation. Describe the differences between contamination and irradiation effects. Compare the hazards of contamination and irradiation.

		substances are transported by diffusion, osmosis and active transport. Describe how substances are transported by active transport (including the need for energy). Explain how substances are transported by diffusion. Explain how substances are transported by osmosis. Explain the effects of osmosis on cells and tissues. Investigate osmosis in potatoes. Calculate percentage gain and loss of mass in osmosis. **CB2 Cells and Control** List the names and	electrons in an atom from its atomic number. Calculate the numbers of protons, neutrons and electrons using atomic and mass numbers. State the meaning of atomic number. State what is meant by an isotope. Identify isotopes from information about the structure of atoms. Calculate the numbers of protons, neutrons and electrons using atomic numbers and mass numbers. Explain why the relative atomic mass of many elements is not a whole number. [H] Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes. **CC4 The periodic**	can detect. [H] Describe an effect caused by the different velocities of electromagnetic waves in different substances. Describe the effects of refraction of waves at material interfaces. Explain how waves will be refracted at a boundary in terms of the change of direction and speed. Explain, with the aid of ray diagrams refraction including the law of reflection and critical angle. Investigate refraction in rectangular glass blocks. Recall the groups of waves in the electromagnetic spectrum in order. Recall the colours of the visible spectrum in order. Describe how the waves in the electromagnetic	compounds. Explain why ionic compounds have high melting points and high boiling points. Explain why ionic compounds conduct electricity when they are molten and in aqueous solution. Explain why ionic compounds do not conduct electricity as solids. Identify ionic compounds from data about their properties.		

		order of the stages of the cell cycle, including mitosis. Describe what happens in each stage of the cell cycle, including mitosis. Describe why mitosis is important for a multicellular organism (growth, repair, asexual reproduction). Explain why organisms may rely on asexual reproduction. Describe how mitosis produces genetically identical, diploid cells. Describe how cancers grow. Define growth in animals as an increase in cell number and size. Give examples of specialised animal cells. Describe how structure of specialised animal cells is related to	**table** Describe how Mendeleev arranged elements in a periodic table. Describe how Mendeleev predicted the existence and properties of some elements yet to be discovered. Explain how Mendeleev's early ideas were supported by later evidence. Recall the chemical symbols of some common elements. Describe how Mendeleev arranged elements in a periodic table. Describe how Mendeleev predicted the existence and properties of some elements yet to be discovered. Explain how Mendeleev's early ideas were supported by later evidence.	spectrum are grouped. [H] Describe some differences in the ways that different parts of the electromagnetic spectrum are absorbed and transmitted [H] Describe some differences in the ways that different parts of the electromagnetic spectrum and refracted and reflected [H] Describe how long wavelength electromagnetic waves are affected by different substances. [H] Explain the effects caused by long wavelength electromagnetic waves travelling at different velocities in different substances. Describe some uses of radio waves. Describe some uses of microwaves. Describe some uses			

		their function. Explain why cell differentiation is important in the development of specialised cells. Use percentile growth curves to interpret growth in children. Describe the stages of growth in plants (cell division/mitosis, elongation and differentiation). Give examples of specialised plant cells. Describe how the structures of specialised plant cells are related to their functions. Explain why cell differentiation is important in the development of specialised cells in plants. Describe where stem cells are found. Describe the function of stem cells in plants and	Recall the positions of metals and non-metals in the periodic table. State what the term 'electronic configuration' means. Show electronic configurations in the form 2.8.1 and as diagrams. Predict the electronic configurations of the elements hydrogen to calcium. Explain the links between an element's position in the periodic table and its electronic configuration.	of infrared. Describe some uses of visible light. [H] Describe how radio waves are produced and detected by electrical circuits. [H] Describe how short wavelength electromagnetic waves are affected by different substances. [H] Explain the effects caused by short wavelength electromagnetic waves travelling at different velocities in different substances. Describe some uses of ultraviolet radiation. Describe some uses of X-rays. Describe some uses of gamma-rays. Describe how the potential danger of electromagnetic radiation depends on its frequency. Describe the harmful			

		animals. Compare embryonic and adult stem cells in animals. Give examples of where stem cells may be used in medicine. Identify benefits and risks of using stem cells in medicine. Evaluate the use of stem cells in medicine (by comparing their benefits and risks). List the parts of the nervous system. Describe how the nervous system detects stimuli. Describe the structure of sensory neurones. Describe the routes that impulses take to and from the brain. Explain how sensory neurones are adapted to their functions (including the myelin sheath).		effects of microwave and infrared radiation. Describe the harmful effects of ultraviolet radiation, X-rays and gamma-rays. Recall the nature of radiation produced by changes in atoms and their nuclei. Recall that absorption of radiation can cause changes in atoms and their nuclei.			

		Describe how the nervous system responds to stimuli. Describe the structures of motor neurones and relay neurones. Explain how motor neurones are adapted to their functions. Explain the action and function of synapses. Describe the structure and function of the reflex arc. Explain how the structure of the reflex arc allows a faster response.					

Year 10	Knowledge	**CP1 Motion CP2 Forces and motion CB5 Health and disease & the development of medicine**	**CB5 health and disease CB4 Natural selection CC8 Acid and alkali**	**CC8 & CC9 Acid and alkaline Calculation involving masses CC10 Electrolysis CC11 Obtaining and using metals CC12 Reversible and reactions and equilibrium**	**CP7 Energy/Forces doing work CP8 Forces and their effect**	**CP8 Forces and their effect CP9 Electricity and Circuits**	**CP10 Magnetism and the motor effect CP11 Electromagnetic Induction**
	Skills I can… Key Vocabulary Scaler Vector Acceleration Resultant force Newtons 1st law Newtons 2nd law Newtons 3rd law Reaction time Stopping distance Thinking distance Breaking distance Kinetic energy Efficiency Transverse waves Longitudinal wave Wavelength Infra red Gamma rays	**CP1** Motion Describe the difference between weight and mass. Explain the difference between a vector and a scalar quantity. Describe the difference between displacement and distance. Describe the difference between velocity and speed. Define the terms: acceleration, force, momentum, energy. Recall and use equations relating distance, speed and time. Interpret distance/time	**CB5** health and disease Define the term health. Define the term disease. Describe how communicable and non-communicable diseases differ. Outline the role of the immune system in protecting against disease. Explain how disease can affect the immune system. Give examples of non-communicable diseases. Define the term malnutrition.	**CC8 & CC9** Acid and alkaline Calculation involving masses Describe what the main hazard symbols mean. Describe the safety precautions that should be observed when handling different acids and alkalis. Name the ions present in all acidic and all alkaline solutions. State the pH values associated with acidic, alkaline and neutral solutions. Describe the effect of acids and alkalis on common	**CP7** Energy/Forces doing work Describe some ways in which the energy of a system can be changed. Measure the work done by a force. Recall and use the equation linking work done, force and distance. Explain what power means. Recall and use the equation linking power, work done and time. **CP8** Forces and their effect	**CP8** Forces and their effect Describe the effect of a gravitational field on objects. Describe the effects of magnetic fields on objects. Describe the forces that can occur when objects are in contact with each other, including friction, air resistance, tension and the normal contact force. Describe the effects of electrostatic fields on objects. Describe how pairs of forces occur when objects affect each other.	**CP10** Magnetism and the motor effect Describe how magnets affect each other. Explain the difference between permanent and induced magnets. Describe the uses of permanent and temporary magnetic materials. Describe the shapes of magnetic fields, including variations in strength. Describe how the shape of magnetic fields can be shown using plotting compasses.

	Geiger counter Alpha particle Beta particle Half-life Contamination Irradiation	graphs (including recognising what the steepness of the line tells you). Represent journeys on distance/time graphs. Determine speed from the gradient of a distance/time graph. Describe how speed can be measured in a school laboratory. Recall typical speeds for walking, running, cycling and travelling by car. Recall the equation relating acceleration, velocity and time. Use the equation relating acceleration, velocity and time. Recall the equation relating acceleration, velocity and distance. Use the equation relating acceleration, velocity and distance. Recall the acceleration in free	Explain how diet can lead to malnutrition. Describe the link between alcohol and liver disease. Explain the effect of alcohol consumption on liver disease at local, national and global levels. Describe how obesity is measured (BMI and waist : hip calculations). Describe how obesity correlates with cardiovascular disease. Describe how smoking correlates with cardiovascular disease. Explain why exercise and diet affect obesity. Compare how cardiovascular diseases are treated. Describe some problems and diseases caused by bacteria. Describe a disease	indicators. [H] Explain the link between pH and the concentration of ions in acids and alkalis. [H] Describe the relationship between hydrogen ion concentration and pH. [H] Explain the difference between a dilute and concentrated solution (in terms of the amount of solute present). [H] Explain the difference between strong and weak acids (in terms of the degree of dissociation of the acid molecules). [H] Explain how the pH and reactivity of an acid depend on the concentration and the strength of the acid. Describe how a base reacts in a neutralisation reaction. Describe what		Use examples to explain the difference between vector and scalar quantities. [H] Describe how to resolve forces. [H] Use scale drawings to work out the net force on an object. [H] Draw free body diagrams to represent the forces on an object. [H] Explain what happens in situations where several forces are acting on an object. **CP9** Electricity and Circuits Describe the basic structure of an atom (positions, relative masses and relative charges of protons, neutrons and electrons). Recognise the circuit symbols for a range of common electrical	Explain how a magnetic compass can be used as evidence for the Earth's magnetic core. Recall that a current can create a magnetic effect. Relate the shape and direction of the magnetic field around a straight wire to the direction of the current. Recall the factors that affect the strength of the magnetic field around a wire. Describe the magnetic field inside and outside a coil of wire carrying a current. Explain the shape and strength of the magnetic field around a solenoid. [H] Recall that forces are produced when a current flows in a magnetic field. [H] Explain what causes the forces

		fall. Estimate the magnitudes of some everyday accelerations. Represent journeys on velocity/time graphs. Interpret velocity/time graphs qualitatively. Calculate uniform accelerations from the gradients of velocity/time graphs. Determine the distance travelled from the area under a velocity/time graph. **CP2** Forces and motion Explain the difference between scalar and vector quantities. Use arrows to represent the direction and magnitude of forces. Define a resultant	caused by a virus. Describe a disease caused by a protist. Describe a disease caused by a fungus. Explain how signs of a disease can be used to identify the pathogen. State the ways in which pathogens can be spread. Give examples of pathogens that are spread in different ways (e.g. cholera bacteria by water, tuberculosis bacteria and chalara dieback fungi by air, malaria protist by vector, Helicobacter by mouth, Ebola by body fluids). Explain how the spread of different pathogens can be reduced or prevented. Explain how the spread of the STIs Chlamydia and HIV can be reduced or prevented.	happens when an acid reacts with a metal oxide. Write word and symbol equations for the reactions of acids and metal oxides. Explain what happens during a neutralisation reaction. Describe the steps involved in preparing a soluble salt from an acid and an insoluble reactant. Explain why an excess of insoluble reactant is used when preparing a soluble salt Explain why the excess reactant is removed when preparing a soluble salt Explain why the remaining solution contains only a salt and water, when preparing a soluble salt from an acid and an insoluble reactant.		components (cells, including batteries, switches, voltmeters, ammeters and lamps). Draw diagrams for circuits containing common electrical components, using conventions for positive and negative terminals. Describe and explain the effects of different numbers of identical lamps, cells and switches in series and parallel circuits. Describe how to measure potential difference. Define the term 'potential difference'. Describe how to measure current. Describe the conditions needed to produce an electric current. (A complete circuit and a source of voltage/potential difference.) Describe the behaviour of current	produced when a current flows in a magnetic field. [H] Recall Fleming's left-hand rule. [H] Use Fleming's left-hand rule. [H] Use the formula relating force, magnetic field strength, current and length. **CP11** Electromagnetic Induction Recall the law of conservation of energy. Recall that the power of an electrical current is given by the current multiplied by the voltage. Use the equation/formula relating the input and output current and voltage for a transformer. [H] Recall the factors

		force. Calculate resultant forces. Explain whether forces on an object are balanced or unbalanced. Describe the effect of balanced forces on moving and stationary objects. Describe the effect of a non-zero resultant force on moving and stationary objects. [H] Describe circular motion at constant speed as a changing velocity and hence as an acceleration. [H] Describe the force needed to keep an object moving in a circular path. [H] Give some examples of objects moving in circular paths and the type of centripetal force involved. Describe the difference between	Give examples of physical barriers. Give examples of chemical barriers. Describe how physical barriers protect the body (e.g. skin, mucus and cilia). Describe how chemical barriers protect the body (e.g. lysozymes, hydrochloric acid). State that the immune system protects the body by attacking pathogens. Describe how antigens trigger the release of antibodies and the production of memory lymphocytes. Describe the role of antibodies in the immune response. Describe the role of memory lymphocytes in triggering a secondary response. Explain how immunisation	Recall the chemical formulae of some common compounds. Recall and use state symbols. Balance chemical equations. Recall that alkalis are soluble bases. Describe the reactions of alkalis with acids. Investigate the change in pH on adding powdered calcium hydroxide to a fixed volume of dilute hydrochloric acid. Explain what happens to the ions from acids and alkalis during neutralisation. Explain why titration is used to prepare soluble salts. Describe how to carry out acid-alkali titration. [H] Write balanced ionic equations.		at a junction. Explain the link between the potential difference (voltage) across a battery or a component, the charge passing through it and the amount of energy transferred. Recall that the unit of potential difference is the volt and explain it in terms of units of energy and charge (a potential difference of one joule per coulomb). Recall and use the equation to calculate the energy transferred, the charge that flows or the potential difference. $E = Q \times V$ Explain the link between electric current and electric charge. Explain electric current in metals in terms of electrons. Recall and use the	that affect the size and direction of an induced potential difference. [H] Describe how the magnetic field produced by an induced potential difference opposes the original change. [H] Explain how a transformer works. Recall that transformers can change the voltage of an alternating current. Describe how the national grid transmits electricity around the country. Explain why step-up and step-down transformers are used in the national grid.

		mass and weight. List the factors that determine the weight of an object. Recall the equation for calculating weight. Use the equation relating weight, mass and gravitational field strength. Describe how weight is measured. Describe how the weight of an object is affected by gravitational field strength. Describe what an acceleration is. List the factors that affect the acceleration of an object. Recall the equation that relates the factors affecting acceleration. Use the equation relating force, mass and acceleration. Change the subject	protects against infection by a pathogen. Define the term antibiotic (as medicines that inhibit cell processes in bacteria). Explain why antibiotics are useful for treating bacterial infections (because they do not damage human cell processes). Explain why antibiotics cannot be used to treat infections by pathogens other than bacteria. Describe the stages of development of new medicines. Explain why each stage of the development of a new medicine is needed. **CB4** Natural selection	Explain the general reaction between an acid and a metal to produce a salt and hydrogen. Explain the general reaction between an acid and a metal carbonate to produce a salt, water and carbon dioxide. Describe the test for hydrogen. Describe the test for carbon dioxide. Recall the general rules for the solubility of common substances in water. Predict whether or not a precipitate will form from two solutions. Name the precipitate formed in a reaction. Describe how to prepare a pure, dry sample of an insoluble salt. Calculate the relative formula		equation to calculate the charge that flows, the current or the time the current flows. $Q = I \times t$. Explain the link between resistance and current in a circuit. Define the resistance of a component or circuit ($R = V / I$) Recall and use the equation to calculate the potential difference, the current or the resistance, ($V = I \times R$) Explain the difference in resistance when two resistors are connected in series or in parallel. Calculate the currents, potential differences and resistances in series circuits. Explain the design and construction of series circuits for testing and measuring.	

		of the equation relating force, mass and acceleration. [H] Explain what inertial mass means. Describe what Newton's Third Law says. Recall the meaning of 'equilibrium situation'. Identify action–reaction pairs in familiar situations. Distinguish between action–reaction pairs and balanced forces. [H] Describe how objects affect each other when they collide. [H] Describe the factors that affect the momentum of an object. [H] Calculate the momentum of moving objects. [H] Use the idea of conservation of momentum to calculate velocities of objects after	Define 'evolution'. Recognise binomial species names. Explain how evidence from fossils and stone tools supports current ideas about human evolution. Recall how stone tools are dated from their environment. Describe how stone tools created by human-like species have developed over time. Describe the fossil evidence for human-like species that lived 4.4, 3.2 and 1.6 million years ago. Recall the cause of genetic variation. Describe how adaptations allow organisms to survive. Explain how natural selection allows some members of a species to survive	mass of a substance from relative atomic masses. Calculate the empirical formula of a compound from the masses of the elements it contains. Explain the difference between an empirical formula and a molecular formula. Deduce the empirical formula from a molecular formula. Deduce the molecular formula for a compound from its empirical formula and its relative formula mass. Describe an experiment to determine the empirical formula for a compound. Explain the law of conservation of mass in a closed system. Explain the law of conservation of mass in a		Explain how current changes with potential difference in fixed resistors. Explain how current and resistance change with potential difference in filament lamps. Explain how current and resistance change with potential difference in diodes, including light-emitting diodes (LEDs). Describe how the resistance of a light-dependent resistor (LDR) varies with changing light intensity. Describe how the resistance of a thermistor varies with changing temperature. (negative temperature coefficient only). Use circuit diagrams to construct and check circuits. Describe the energy transfer that occurs when a current	

		collisions. [H] Describe examples of momentum in collisions. [H] Calculate the force needed to produce a change in momentum in a given time. Describe how human reaction times are measured. Recall typical human reaction times. Describe the link between stopping distance, thinking distance and braking distance. Recall the factors that affect stopping distances. Describe how different factors affect stopping distances. Describe the factors that affect a driver's reaction time, including drugs and distractions. [H] Calculate the force needed to	better than others when conditions change. Explain how natural selection can lead to the evolution of a new species. Explain how the development of resistance in organisms supports Darwin's theory. Describe how organisms are classified into smaller and smaller groups (based on their characteristics). Identify genus and species from a binomial name. Identify an organism as a member of one of the five kingdoms. Describe what genetic analysis is. Explain why biologists often now classify organisms into three domains. Describe why new breeds and varieties are created.	non-enclosed system. Calculate the mass of product formed from a given mass of reactant, using a balanced equation. Calculate the mass of a reactant needed to produce a given amount of product, using a balanced equation. Calculate the concentration of a solution in g dm−3. [H] Describe what is meant by a mole of particles. [H] Calculate the number of moles of particles in a given mass of a certain substance and vice versa. [H] Calculate the number of particles in a given number of moles or mass of a substance and vice versa. [H] Deduce the balanced equation for a reaction from the masses of reactants and/or		passes through a resistor. Use the electron and ion model and the idea of electrical work to explain the energy transfer in a resistor and the resulting dissipation of energy in the surroundings. [H] Explain how unwanted energy transfers in wires can be avoided. Recall the advantages of the heating effect of an electric current. Recall the disadvantages of the heating effect of an electric current. Use the equation $E = I \times V \times t$ to calculate the energy transferred, the current, the potential difference or the time. Define power and the units used to measure it (energy transferred per second in watts).	

		produce a change in momentum in a given time. Explain the meaning of a 'large deceleration'. Describe the dangers caused by large decelerations. Explain why large decelerations cause dangers. [H] Recall some typical forces involved in road collisions. [H] Use knowledge of changes in momentum to estimate the forces involved in road collisions. **CB5** Health and disease & the development of medicine	Describe what is meant by a 'genetically modified organism'. Describe how selective breeding is carried out. Explain the impact of selective breeding on domesticated plants and animals. [H] Describe the main stages of genetic engineering. Recall some uses of selectively bred organisms (in agriculture). Recall some uses of genetically engineered organisms (in agriculture, in medicine). Evaluate the benefits and risks of using selective breeding and genetic engineering to produce new varieties and breeds. **CC8** Acid and alkali	products. [H] Calculate the mass of product formed from a given mass of reactant, using a balanced equation. [H] Calculate the mass of a reactant needed to produce a given amount of product, using a balanced equation. [H] Explain that the mass of a product formed in a reaction is controlled by the mass of reactant that is not in excess. **CC10** Electrolysis State the meaning of the term 'electrolyte'. Outline what happens during electrolysis. Explain the movement of the ions during electrolysis. [H] Write half equations for the reactions at the		Recall and use the equation to calculate the power, the energy transferred or the time taken: P = E / t Explain how power transfer depends on the potential difference across a device and the current through it. Recall and use the equation to calculate power, the current or the potential difference: P = I × V Recall and use the equation to calculate power, the current or the resistance: P = I2 × R. Describe energy transfers from d.c. batteries and the a.c. mains supply to motors and heaters. Explain the difference between direct and alternating voltage. Compare alternating and direct current (in terms of movement of charge).	

				electrodes. [H] Explain the meaning of oxidation and reduction in terms of the movement of electrons. [H] State the electrodes at which oxidation and reduction occur. Predict the products when copper sulfate undergoes electrolysis using copper electrodes. Predict the products when copper sulfate undergoes electrolysis using inert (graphite) electrodes. Recall the apparatus used in electrolysis of solutions. Recall the products formed from the electrolysis of a variety of common compounds and solutions (copper chloride solution, sodium chloride solution, sodium sulfate solution, acidified water, molten lead		Recall the frequency and voltage of the UK domestic supply. Describe the power ratings of some domestic electrical appliances and changes in stored energy when they are in use. Explain the difference between the functions of the live and the neutral wires. Explain how the earth wire and the fuse make circuits safer. Explain why switches and fuses are connected in the live wire. Explain the danger of a connection between the live wire and earth. Explain how circuit breakers make circuits safer.	

				bromide). Explain the formation of the products in the electrolysis of a variety of common compounds and solutions (copper chloride solution, sodium chloride solution, sodium sulfate solution, acidified water, molten lead bromide). Predict the products formed from the electrolysis of a molten, binary, ionic compound. Explain how the electrolysis of copper sulfate solution using copper electrodes can be used to purify copper. **CC11** Obtaining and using metals Describe the reactions of common metals with water and acids. Describe the			

				reactions of metals with salt solutions. [H] Explain why displacement reactions are redox reactions. Deduce the order of metals in the reactivity series from their reactions with water, acids and salt solutions. Explain the reactivity series in terms of the tendency of different metal atoms to form cations. Recall the meaning of the term 'ore'. Recall some metals that are found un-combined in the Earth's crust. Explain how and why some metals are extracted from their ores by heating with carbon. Explain how and why some metals are extracted from their ores by electrolysis. [H] Describe two			

				biological methods of metal extraction. [H] Evaluate biological methods of metal extraction. [H] Explain why reactions occurring at the electrodes during electrolysis are redox reactions. Describe the meanings of oxidation and reduction in terms of oxygen. Explain which substance has been oxidised and which substance has been reduced in a reaction. Recall that all metals are extracted by reduction of their ores. Explain how the position of a metal in the reactivity series is related to its resistance to oxidation. State the advantages and disadvantages of recycling a metal.			

				Describe a process where a material or product is recycled for a different use. Evaluate the advantages and disadvantages of recycling a material or product to decide whether recycling is a viable option. Describe the four stages in carrying out a life cycle assessment (LCA) of a material or product. Evaluate data from a life cycle assessment of a material or product. **CC12** Reversible and reactions and equilibrium Describe what happens in reversible reactions. Explain the use of the symbol ⇌ in chemical equations. Explain what is meant by dynamic			

				equilibrium. Describe the formation of ammonia. State the conditions used for the Haber process. [H] Describe how changing the temperature affects the relative amount of substances in an equilibrium mixture. [H] Describe how changing the pressure affects the relative amount of substances in an equilibrium mixture. [H] Describe how changing the concentration affects the relative amount of substances in an equilibrium mixture.		

Year 11	Knowledge	**CB6 Plant structure and functions** **CB7 Animal coordination, control and homeostasis** **CB8 Exchange and transport system** **CB9 Ecosystem and material cycles**	**CC16 Fuels** **CC17 Earth and atmospheric science**	**CP12 Particle model** **CP13 Forces and matter**	**CC13 Groups in the periodic table** **CC14 Rates of reaction** **CC15 Heat energy changes in chemical reactions**	
	Skills I can… Key Vocabulary Photosynthesis Carbon dioxide Chloroplast Palisade cell Stoma Phloem xylem translocation Hormones Menstrual cycle Insulin Pancreas Glycogen Nealkali metal halogens rate of reaction concentration	**CB6** Plant structure and functions Explain why photosynthetic organisms are producers of biomass. Summarise what happens in photosynthesis (including the use of a word equation). Explain why photosynthesis is an endothermic reaction. Recall some substances produced from glucose and their	**CC16** Fuels Recall the meaning of the term hydrocarbon. Describe the components of crude oil. Describe the importance of crude oil for the petrochemical industry. Explain why crude oil is a finite resource. Recall the names of some common fossil fuels. Describe how crude	**CP12** Particle model Describe the arrangements of particles in solids, liquids and gases. Use the particle model to explain the different properties of solids, liquids and gases. Recall and use the formula relating density, mass and volume. Use the particle model to explain why solids, liquids and gases have different densities.	**CC13** Groups in the periodic table Explain the classification of alkali metals, halogens and noble gases, into groups in the periodic table. Describe the main physical properties of alkali metals. Describe the reactions of lithium, sodium and potassium with water. Write word and balanced equations (including state symbols) for the reactions of alkali	

	temperature catalyst collision theory exothermic Endothermic Crude oil Hydrocarbon Alkane Fractional distillation urine	roles in the plant. Explain how a leaf and its cells are adapted for photosynthesis. Recall what is meant by a rate of reaction. Describe the effects of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis. Explain the effects of limiting factors of photosynthesis. Core practical: Investigate the effect of light intensity on the rate of photosynthesis. Explain the effects of more than one factor on the rate of photosynthesis. Describe how light intensity and rate of photosynthesis are related. Explain why the rate of photosynthesis is inversely proportional to the	oil is separated by fractional distillation. Explain how fractional distillation of crude oil works. Recall the names and uses of fractions from crude oil. Describe how fractions differ from each other. Explain why the properties of different fractions differ. Describe that oil fractions mostly contain alkanes. Describe the main features of an homologous series. Explain why alkanes form an homologous series. Describe the complete combustion of hydrocarbon fuels. Explain the production of harmful products during the incomplete	Describe what happens to the mass of a substance when it changes state. Recall that changes of state are physical changes. Investigate the densities of solids and liquids. Calculate the density of a liquid. Explain how heating affects the particles in a substance or object, including changes of state. Describe how the temperature of an object changes with time while being heated or cooled to make it change state. Define the term specific heat capacity. Define the term specific latent heat. Explain the difference between specific heat capacity and specific latent heat.	metals with water and oxygen. Describe the pattern of reactivity of the alkali metals. Explain how the electronic configurations of the atoms of alkali metals affect their reactivity. Recall the appearance of chlorine, bromine and iodine at room temperature. Describe the trends in colour, melting point and boiling point of chlorine, bromine and iodine down the group; and use these to predict the physical properties of other halogens. Describe the chemical test for chlorine gas. Describe the trends in the reactions of halogens with metals; and use this to predict reactions of other halogens. Write word and	

		distance of a light source. Explain how root hair cells are adapted to taking in water and mineral ions. Recall that substances can be transported by diffusion, osmosis and active transport. Describe what is meant by a concentration gradient. Explain why active transport is needed to transport some molecules. Explain how xylem tissue is adapted to its functions. Explain how phloem tissue is adapted to its function. Describe how transpiration occurs. Describe how translocation occurs. Explain the effects of environmental factors on the rate of transpiration	combustion of hydrocarbon fuels. Explain why carbon monoxide is toxic. Describe the problems caused by incomplete combustion. Explain how some hydrocarbon fuels produce sulfur dioxide in use. Recall the names of the pollutants responsible for acid rain. Describe some effects of acid rain. Explain why oxides of nitrogen are produced when fuels are burned in engines. Evaluate hydrogen as an alternative fuel to petrol for cars. Describe what happens during cracking. Explain why alkanes are saturated and alkenes are	Explain some ways of reducing unwanted energy transfers. Use the formula relating change in thermal energy, mass, temperature change and specific heat capacity. Use the formula relating thermal energy, mass and specific latent heat. Recall that the value of specific latent heat for a substance is different for melting/solidifying and for evaporating/condensing. Plot a graph of temperature-time for melting ice. Use two different methods to investigate the properties of water. Explain how changing the temperature of a gas affects the speed of its particles. Explain how	balanced chemical equations, including state symbols, for the reactions of halogens with metals. Describe hydrogen halides and their chemical properties. Describe the relative reactivity of halogens. Explain how the reactivity of halogens can be worked out from displacement reactions. Write balanced chemical equations, including state symbols, for the displacement reactions of halogens. [H] Explain how displacement reactions are examples of redox reactions. [H] Write ionic equations, including state symbols, for displacement reactions of halogens.	

		(light intensity, air movement, temperature, humidity). Describe how to measure the rate of transpiration. **CB7** Animal coordination, control and homeostasis State where hormones are produced (in endocrine glands). Describe the general role of hormones in the body. Describe how hormones are transported around the body. Describe the production and release of some common hormones from their endocrine glands (pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes). Identify the target	unsaturated. Explain why cracking is necessary. **CC17** Earth and atmospheric science Describe how the Earth's early atmosphere was formed. State the names and relative amounts of the gases found in the Earth's early atmosphere. Draw conclusions from evidence about the Earth's early atmosphere. Explain how the oceans are thought to have formed. Describe how the formation of the oceans influenced the composition of the atmosphere. Explain how photosynthetic organisms (including plants) changed the	temperature affects the pressure of a fixed mass of gas at constant volume. Explain the significance of absolute zero. Convert temperatures between the Kelvin and Celsius temperature scales. **CP13** Forces and Matter Explain that more than one force is needed to distort an object. Describe the difference between elastic and inelastic distortion/deformation. Describe the relationship between force and extension for a spring. Describe the relationship between force and extension for a rubber band. Compare the	Explain the order of reactivity of halogens (using electronic configurations). Explain why noble gases are chemically inert by referring to their electronic configuration. Describe the uses of noble gases linked with their properties. Describe the trends in the physical properties of noble gases. Use trends in physical properties to predict the physical properties of other noble gases **CC14** Rates of reaction Describe different changes that can occur as a reaction proceeds. Suggest different experimental methods to investigate rates of reaction (e.g.	

		organs of some common hormones. Explain the importance of hormones. Describe the effects of adrenalin on the body. Explain how adrenalin prepares the body for fight or flight. Define metabolic rate. Describe the effect of thyroxine on metabolic rate. Describe how a negative feedback mechanism works. Explain how negative feedback controls the production of thyroxine. Explain why negative feedback mechanisms are important in living organisms. Describe what happens during the menstrual cycle.	composition of the atmosphere. State the chemical test for oxygen. Recall the names of significant greenhouse gases. Describe the processes involved in the greenhouse effect. Describe how human activity increases the concentration of greenhouse gases. Evaluate the correlation between atmospheric carbon dioxide concentrations and fossil fuel use. Evaluate the evidence for increased atmospheric greenhouse gas concentrations being part of the cause of global warming and climate change. Suggest possible effects on the climate of increased levels of carbon dioxide and	force–extension relationship for different objects. Recall the equation/formula that links force, extension and the spring constant. Use the equation/formula relating force, extension and spring constant. Recall that work has to be done to stretch a spring. Use the equation/formula relating the energy transferred to the extension of a spring. Plot a graph of force against extension	measurements of mass of reactants against time, volume of gas released against time, concentration of reactant or product against time). Use graphs of changes (in mass, volume or concentration of reactant or product) against time, to interpret what is happening during reactions. Explain what has to happen for reactions to take place. Explain why changes in the energy of particles affect rates of reaction. Explain why changes in the frequency of collisions between particles affect the rate of reaction. Explain why changes in temperature, concentration, surface area and pressure affect the rate of reaction (surface area for solids, pressure for	

		Describe the function of oestrogen in the menstrual cycle. Describe the function of progesterone in the menstrual cycle. Explain how barrier methods can be used as contraception. Explain how hormones can be used as contraception. Compare, contrast and evaluate hormonal and barrier methods of contraception. Describe how changes in hormones affect the uterus wall lining, ovulation and menstruation. Explain how oestrogen, progesterone, FSH and LH interact in the menstrual cycle. Describe examples of Assisted Reproductive	methane. Describe how human activity leads to increased carbon dioxide levels. Describe how human activity leads to increased methane levels. Describe the projected effects of climate change. Describe how the potential harmful effects of climate change can be addressed and limited.		gases only). Describe ways of speeding up or slowing down chemical reactions. Investigate the rate of a reaction by measuring the production of a gas. Investigate the rate of a reaction by observing a colour. Plot and interpret a rate of reaction graph to obtain initial rate of reaction. Select a method to monitor the rate of reaction. Describe what a catalyst does. Explain how catalysts are useful. Explain what the activation energy of a reaction is. Explain how catalysts speed up chemical reactions. Describe what enzymes are.	

		Technology (ART). Explain how clomifene is used to stimulate ovulation. Explain how hormones are used in IVF treatment. Define homeostasis. Explain why a constant internal environment is important. Explain the role of insulin in regulating blood glucose concentration. Explain the role of glucagon in regulating blood glucose concentration. Explain how type 1 diabetes is caused. Explain how type 1 diabetes can be controlled. Explain how type 2 diabetes is caused. Explain how type 2 diabetes can be controlled. Describe the			Name one or more uses of enzymes. **CC15** Heat energy changes in chemical reactions Recall some examples of exothermic and endothermic changes. Describe how heat changes in solution may be determined. Describe the differences between exothermic and endothermic changes. Describe exothermic and endothermic reactions in terms of energy changes when bonds are broken and formed. [H] Use bond energies to calculate energy changes in reactions. Explain the meaning of activation energy. Draw and label	

		correlation between body mass and type 2 diabetes. Explain how BMI and waist : hip ratio are related to body mass. Evaluate the correlation between body mass and type 2 diabetes. **CB8** Exchange and transport system Recall the names of substances that need to be transported into and out of the body. Describe the functions of the substances that are transported into the body. Describe the adaptations of the lungs for gas exchange. Calculate surface area : volume ratios. Explain the importance of			reaction profiles.	

		surface area : volume ratios in transport systems. Recall the components and function of the circulatory system. Recall the functions of the different types of blood vessels. Describe the functions of the different types of blood cells (erythrocytes, phagocytes, lymphocytes). Describe the functions of blood platelets and plasma. Describe how the different blood vessels are adapted to their functions. Recall the parts of the heart. Describe the flow of blood through the heart. Explain how the heart is adapted for its function (valves, differing ventricle				

		muscle thicknesses). Recall and use the equation that relates cardiac output, stroke volume and heart rate. Explain why organisms need to respire. Recall the word equation for aerobic respiration. Recall the word equation for anaerobic respiration in humans. Explain why respiration is an exothermic process. Compare aerobic and anaerobic respiration. Investigate the rate of respiration in living organisms. **CB9** Ecosystem and material cycles State what is meant by the ecological terms: community,				

		population and habitat. Give examples of an ecosystem, a community, a population and a habitat. Describe the organisation of the components of an ecosystem (including populations, communities, habitats and abiotic factors). Describe how the interdependence of organisms in an ecosystem allows their survival. Explain how to estimate population size, including the use of quadrats. Give examples of abiotic factors. Explain how communities are affected by abiotic factors (temperature, light, water, pollutants). Explain how to investigate the effect of abiotic factors on the distribution of organisms using belt transects. Use a transect line and a quadrat to investigate the effect of light				

		intensity on the number of plants in a survey area. Give examples of biotic factors (such as availability of food, new predators, new pathogens, competition). Describe how competition can affect communities. Describe how predation can affect communities. Explain how predator–prey cycles affect communities. Explain how the structure of a community can affect biodiversity. Define the term 'parasitism'. Define the term 'mutualism'. Describe how parasites are dependent on their hosts. Describe how hosts are harmed by parasites. Identify parasites and mutualists in examples. Explain how mutualists benefit from their				

		relationship. Define the term eutrophication. Describe examples of the introduction of non-indigenous species. Describe the advantages of fish farming. Explain how fish farming can affect ecosystems and biodiversity. Explain how the introduction of species can affect ecosystems and biodiversity. Explain how eutrophication can affect ecosystems and biodiversity. Define the term conservation. Explain what is meant by reforestation. Give examples of animal conservation. Explain how animal conservation can benefit biodiversity. Explain how reforestation can benefit biodiversity. Give examples of materials that cycle				

		through ecosystems. Describe the process by which water cycles through abiotic parts of an ecosystem. Describe the process by which water cycles through living organisms. Describe how drinking water is produced where water is plentiful. Explain how drinking water can be produced by desalination in areas of drought. Explain why water is important to living organisms. Give examples of decomposers. Define the term decomposer. Describe the carbon cycle. Identify the key processes in the carbon cycle. Explain how carbon is cycled through the biotic and abiotic components of an ecosystem. Explain the importance of the carbon cycle (in balancing				

		photosynthesis and respiration, and removal of wastes by decomposition). Describe how plants use nitrates. Describe the different roles of bacteria in the nitrogen cycle. Explain how fertilisers increase the nitrate content of the soil. Explain why bacteria are important for soil fertility. Explain how crop rotation can increase the nitrogen content of the soil.				