WMAT Science Curriculum Intent

Curriculum vision

The purpose of the WMAT cross-phase Science curriculum is to help students understand and question the world around them. It gives them the scientific knowledge and skills that they need in order to be successful in their future lives and make a contribution to the wider community. Students are empowered with a strong knowledge base that they can then use to evaluate important issues, analyse evidence and problem solve. They develop the confidence to form their own opinions and articulate themselves effectively. Our engaging and challenging curriculum means that students who have studied Science at a WMAT school will continue to enjoy learning about Science and how the world works throughout their lives.

Curriculum structure

Our cross phase science curriculum is not explicitly split into key stages, but fully covers the National Curriculum. *It focuses on 10 big ideas that are spiralled in increasing complexity over the course of the 9 years (Forces; Electricity and electromagnets; Energy; Waves; Matter; Reactions; Earth; Organisms; Ecosystems; Genes).* Scientific skills are developed throughout a student's time with us, focusing on 4 key areas that develop pupils scientific competences; planning investigations, investigate, analyse and thinking like a scientist.

EYFS

All areas of learning and development at the Foundation Stage are inter-connected. Through engaging in science activities, children not only learn about the world around them but develop disciplinary skills in all areas.

Characteristics of Effective Learning

The ways in which a child engages with other people and their environment - playing and exploring, active learning, and creating and thinking critically – underpin learning and development across all areas and support the child to remain an effective and motivated learner.

'**Understanding the World'**

This is a specific area of the Early Years Curriculum that includes essential skills and knowledge about the world and provides firm foundations on which children can build their scientific understanding. Early Years children will be actively involved in play and exploration and be encouraged to be creative. They will be supported to think critically and ask questions, which will help them to make sense of their world through well-planned play opportunities.

ELG 2 Understanding: Children follow instructions involving several ideas or actions. They answer 'how' and 'why' questions about their experiences and in response to stories or events.

ELG 3 Speaking: Children express themselves effectively, showing awareness of listeners' needs. They use past, present and future forms accurately when talking about events that have happened or are to happen in the future. They develop their own narratives and explanations by connecting ideas or events.

ELG 5 Physical development health and self care: Children know the importance for good health of physical exercise, and a healthy diet, and talk about ways to keep healthy and safe. They manage their own basic hygiene and personal needs successfully, including dressing and going to the toilet independently

Early learning goal 12 Shape, space and measures: Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.

ELG 14 The World: Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur and talk about changes.

Enquiry Skills taken from EYFS Curriculum

Question why things happen.
Show curiosity.
Find ways to **solve problems** and **test** ideas.
Develop ideas of **grouping.**

Know about **similarities and differences** in relation to objects, materials and living things.
Comments and ask **question** about aspects of their familiar world or the natural world.
Closely **observes** what animals, people and vehicles do.
Use senses to **observe** the world.
Make links and notice **patterns.**
Handle **equipment and tools** effectively.
Answer how and why **questions.**
Makes **observations** of animals and plants and explain why things occur, and talk about changes.
Develop their own narratives and **explanations** by connecting ideas or events.

First hand experiences and pupil offer:

Science at Foundation Stage is introduced indirectly through activities that encourage children to explore, problem solve, observe, predict, think, make decisions and talk about the world around them. Children will have opportunities to explore creatures, people, plants and objects in their natural environments. They will observe and manipulate objects and materials to identify differences and similarities. For example, they may look at an egg whisk, sand, paper and water to learn about things that are natural and manmade and their different functions. Children will also learn to use their senses, for example by feeling dough or listening to sounds in the environment, such as sirens or farm animals. They will be encouraged to ask questions about why things happen and how things work. They might do activities such as increasing the incline of a slope to observe how fast a vehicle travels, or opening a mechanical toy to see how it works. They will also be asked questions about what they think will happen to help them communicate, plan, investigate, record and evaluate findings

Key Vocabulary
What, where, how, why, who, when, weather, body, pets, baby, family, animals, the world, hot, cold, clothes, light, dark, wet, dry

Substantive knowledge

Year Group	Substantive Knowledge - Biology	Substantive Knowledge - Chemistry	Substantive Knowledge - Physics
The 10 big ideas			
	Forces		**Matter**
	Electricity and electromagnets:		**Reactions**
	Energy		**Earth**
	Waves		**Organisms**
	Ecosystems		**Genes**
1	Identifying Plants and structures Naming and grouping animals and humans	Naming properties of materials	Seasonal changes
2	Plant Growth & requirements of life Lifecycles & habitat & requirements for life Food Chains Exercise, food & hygiene	Suitability of materials and changing solids	
3	Functions of parts of plants, inc. water transport Skeleton & muscles Diet including nutrition	Rocks	Magnets & forces Light Waves

4	Habitat changes Comparing plant requirements Food webs Teeth and digestion	States of Matter Water Cycles	Sound Electricity
5	Comparing life cycles Impact of drugs, lack of exercise and poor Nutrition - non-communicable diseases Circulatory and respiratory system	Complex properties and testing materials	Earth & Space Forces, including gravity & resistance mechanisms
6	Classification of plants and animals Reproduction & changes to old age	Dissolving & separating materials Reversible and irreversible reactions Basic particle theory	Evolution Electricity Light
7	Cells and organisation Skeletal and Muscular Systems Animal reproduction Plant reproduction (including fruit formation and seed dispersal) Health Relationships in an ecosystem Inheritance, chromosomes, DNA and genes	The particulate nature of matter Atoms, elements and compounds Pure and impure substances Chemical Reactions The Periodic Table Physical change Particle Model	Energy Changes and transfers Changes in Systems Describing motion Forces Pressure in fluids Balanced Forces and Motion Energy in matter Space Physics
8	Nutrition and digestion Gas exchange Systems Plants and Photosynthesis Respiration Natural Selection and evolution	Chemical Reactions continued The Periodic Table continued Earth structure - Earth and rocks Earth atmosphere- Climate Chemical energy	Calculations of fuel uses and costs in the domestic context Observed Waves Sound Waves Energy and Waves Light Waves Current electricity Static electricity Magnetism

9	**Biology A (Year 9)** Plant and animal cell organelles Microscopy including Required Practical prokaryotic cells DNA, chromosomes introduction specialised cells mitosis asexual reproduction stem cells diffusion osmosis including required practical active transport **Biology B (Year 9)** Types of pathogen bacterial diseases viral diseases protist and fungal diseases physical and chemical defences the immune response vaccinations antibiotics culturing microrganisms - SEPARATE ONLY BU Required practical - antibiotics SEPARATE ONL ANYWAY drug testing pain killers and drug discovery	**Chemistry A (Year 9)** Atoms, elements, compounds and mixtures Models of the atom Atomic structure. Isotopes History of the Periodic Table Electronic structure The periodic table Group 1 Group 7 Reactions of the halogens Noble Gases Solids liquids and Gases. Separating mixtures. CORE PRAC - seperation techniques **Chemistry B (Year 9)** Early Atmosphere Changing Atmosphere Greenhouse effect Climate Change Carbon Footprint Pollutants Impact of pollutants Using the Earth's resources Water treatment (making potable water) Core Practical Water treatment (making potable water) Treating waste water Phytomining and bioleaching (HIGHER TIER O	**Physics A (Year 9)** Energy stores Energy transfers Efficiency Conduction, convection and radiation Wasted energy and insulation Non-renewable energy Renewable energy Contact and non-contact forces Weight and gravitational fields Free body diagrams and resultant forces Springs required practical Springs required practical **Physics B (Year 9)** Describing atoms How our model of the atom has changed The nature and properties of radiation Half life Irradiation and contamination Background radiation (triple) Uses of radiation (triple) Density required practical The particle model (new lesson) The particle model and changes in state Internal energy

		Life Cycle Assessment	
		Recycling and Reuse	
10	Biology C (Year 10)	Chemistry C (Year 10)	Physics C (Year 10)
	Chains, webs and pyramids - SEPARATE ONLY	Ionic Bonds	Work done
	Communties, biotic and abiotic	Ionic structures and properties	Power
	predator prey relationships	Covalent bonding	Calculating work done and energy transfer
	adaptations	Covalent structures and properties	Kinetic energy calculations
	competition	Diamond graphite and graphene	GPE calculations
	sampling including required practical	Polymers	Elastic potential energy
	deforestation and changes in land use	Metallic structure and properties	Energy changes calculations
	peat bogs	Alloys	Investigating energy (triple)
	water cycle	Ionic equations - HT	Specific heat capacity
	air pollution	Ceramics and polymers - Triple Only	Specific heat - required practical
	land and water pollution	composites - Triple ONLY	Specific latent heat
	carbon cycle	nanoparticles - Triple only	Gas pressure
	climate change	Transition metals - Triple only	Expanding and compressing gases
	maintaining biodiversity		
		Chemistry D (Year 10)	Physics D (Year 10)
	Biology D (Year 10)	Balancing equations	Distance and displacement
	Hierachy	Realtivefomula mass	Speed
	structure and adaptations of the digestive system	Exothermic and endothermic reactions	Distance time graphs
	Food tests required practical	Core PRAC - Exo/Endo Temp change	Velocity and acceleration
	Properties of enzymes	Energy Change in reactions	Moving in a circle
	enzymes of the digestive system	Bond Enthalpy - HT	Equations of uniform acceleration
	Enzymes required practical	Identifying Gases	Falling under gravity
	Respiratory system in context of exchange surfaces	Reaction with Oxygen	Stopping distances
	blood vessels and blood	Reactivity Series	Energy changing when stopping
	heart structure and function	Extraction with Carbon	
	diseases of the heart and treatments	REDOX - HT	Physics E (Year 10)

non - communicable diseases and data strengths			Electric circuits
cancer	Chemistry E (Year 10)		Current and charge
	Acid and Metal Reactions		Electrical resistance
Biology E (Year 10)	Neutralisation		Investigating resistance required practical
Photosynthesis overview	CORE PRAC - preparing soluble salts		Ohm's law - ohmic conductors
limiting factors required practical	pH		Current voltage charactertics - filament lamps
factors affecting photosynthesis	Strong and weak acids - HT		Investigation I-V graphs - required practical
uses of glucose	acid reactions making salts		LDR's and thermistors
plant tissues organs and systems	Titration - TRIPLE ONLY		Resistors in series and parallel
plant transport including linking to active transport	Electrolysis		Resistance and sensors
speeding up photosynthesis - farming	Metal extraction and electrolysis		AC and DC
aerobic respiration	Reactions at electrodes		Mains electricity
anaerobic respiration	ionic equations and Half Equations - HT		Electrical power
respiration investigation - exercise	Core Practicals - Electrolysis		Electrical energy transfer
metabolism			National grid
	Chemistry F (Year 10)		Transformers (triple)
Biology F (Year 10)	Moles - HT		Transformer calculations (triple)
Nervous system	Gas calculations - TRIPLE ONLY		Static electricity (triple)
reflexes and reflex arc	Masses of reactants and products		Effect of static (triple)
reaction times required practical	Moles of balanced equations - HT		Electric fields and static safety (triple)
The brain - SEPARATE ONLY	Limiting Factors - HT		
The eye - SEPARATE ONLY	Concentration of solutions		
Endocrine system overview	Emprical formula		
Thermoregulation - SEPARATE ONLY	Percentage yield - TRIPLE ONLY		
Glucoregulation	Atom economy - TRIPLE ONLY		
Importance of water and nitrogen balance - SEPA ONLY	Cells and Fuel Cells - TRIPLE ONLY		
kidneys structure and function - SEPARATE ONLY	Crude Oil and hydrocarbons		
kidneys - ADH and dialysis -SEPARATE ONLY	Alkanes and alkenes		
kidney failure - SEPARATE ONLY	Fractional distillation		
Hormones and the menstrual cycle	Combustion		

	contraception	Cracking	
	fertility treatments		
	plant hormones - SEPARATE ONLY		
	Tropisms required practical -SEPARATE ONLY		
	Plant diseases and defences - SEPARATE ONLY		
11	Biology G (Year 11)	Chemistry G (Year 11)	Physics F (year 11)
	Recap of interdependence and carbon cycle	Measuring Rates	Radiactivity revision
	Decomposition - SEPARATE ONLY	Collison Theory	Radioactive sources
	Decay required practical - SEPARATE ONLY	Temperatures and rates of reaction	Radioactive decay equations
	Food security - SEPARATE ONLY	Surface areas and rates of reaction	Nuclear fission (triple)
	Biotechnology - SEPARATE ONLY	CORE PRACTICAL - concentration and rates of reaction	Nuclear fusion (triple)
	Variation/adaption & competition recap	Catalysts	Transverse and longitudinal waves
	evidence for evolution	Pure substances and melting Points	Properties of waves
	natural selection	Formulations	Required practical waves
	theory of evolution - SEPARATE ONLY	Chromatography	Types of electromagnetic waves
	Evolution - bacteria resistance	Reversible reactions.	Properties of electromagnetic waves
	Speciation - SEPARATE ONLY	Le Chatelier's principle (HIGHER TIER ONLY)	Infra-red radiation required practical
	Selective breeding	Applying Le Chatelier's principle (HIGHER TIER ONLY)	Properties of electromagnetic waves 2
			Effects of electromagnetic waves
	Biology H (Year 11)		Uses of electomagnetic waves
	DNA and chromosomes recap and structure of DN	Chemistry H (Year 11) TRIPLE ONLY	
	Meiosis	Combustion and hydration of alkenes - TRIPLE O	Physics G (Year 10)
	comparison of asexual and sexual reproduction	Addition reactions of alkenes - Triple only	Permanent and induced magnets
	Protein synthesis - SEPARATE ONLY	Alcohols - Triple only	Magnetic fields
	variation	Fermentation - Triple only	Using electromagnets
	Inheritance 1 including sex determination	Alcohol Reactions - triple Only	FLHR
	Mendel's work - SEPARATE ONLY	Carboxyllic reactions - triple only	The motor
	Inheritance of genetic diseases	Addition polymerisation - Triple only	The loudspeaker
	Stem cells recap	Condensation polymerisation - triple only	The generator (triple)
	Cloning - SEPARATE ONLY	Organic polymers - triple only	Uses of generators

	monoclonal antibodies - SEPARATE ONLY	Corrosion and Rusting (TRIPLE ONLY)	Newton's first law
	genetic engineering	Alloys (TRIPLE ONLY)	Acceleration required practical
		Glass & plastics (TRIPLE ONLY)	Acceleration required practical skills
		The Haber Process (TRIPLE ONLY)	Inertial mass and Newton's second law
		NPK Fertilisers - TRIPLE ONLY	Newton's third law
		Flame tests - Triple ONLY	Momentum
		Positive ion tests - triple only	Change in momentum
		Testing for negative ions - triple only	Moments (triple)
		Testing ions - core practical - triple only	Pressure in fluids (triple)
			Atmospheric pressure (triple)
			Pressure in depth (triple)
			Physics H (Year 11)
			Ultrasound
			Seismic waves (triple)
			Reflection (triple)
			Lenses (triple)
			Visible light (triple)
			Emission and absorption (triple)
			Black body radiation (triple)
			The solar system (triple)
			The life cycle of a star (triple)
			Orbital motion and satellites (triple)
			Red shift (triple)
			The big bang theory (triple)

Disciplinary knowledge / scientific skills

Year Group	**Planning investigations** devise questions, estimate risk, plan variables	**Investigate** Using appropriate techniques test hypothesis and collect data	**Analyse** Present data, analyse patterns, draw conclusion and discuss limitations	**Thinking like a scientist** Construct explanations, review theories, critique claims, justify opinions	**Possible Context**
1	Ask simple questions.	Observe closely.			
2	Ask simple questions and recognise that they can be answered in different ways.	Observe closely using simple equipment to perform simple tests.	Use observations and ideas to suggest answers to questions.		
3	Ask relevant questions and use different types of scientific enquiries to answer them.	Gather data to help in answering questions.	Record data in a table and draw simple bar graphs.	Explain what is meant by a theory.	
4	Use results in a variety of ways to help in answering questions.	Set up simple practical enquiries which are fair tests.	Report on findings from enquiries including oral and written explanations, based on graphical data.	Use straightforward scientific evidence to state whether it supports a theory.	
5	Plan different types of scientific enquiries to answer questions.	Make systematic and careful observations, taking accurate measurements usinga range of equipment. Make simple predictions.	Report and present findings from enquiries in line graphs and use these to describe patterns.	Use scientific words to report findings and suggest scientific ideas.	

6	Plan different types of scientific enquiries to answer questions.	Make predictions for results. Record data and resultswith increasing complexity.	Present findings from enquiries and comment on the degree of trust in the results.	Identify scientific evidence that has been used to support or refute ideas or arguments.	
7	Write an investigative question. Use variable terms: independent; dependant and control with confidence. Identify hazards and how to reduce the risk. List all the variables and focus on ones that effect the dependent variable. e.g. Chemistry – Reaction of Mg and Acid. Physics – Heat loss of different objects	Gather sufficient data for the investigation and repeat if appropriate, calculating means. Prepare a table for spaces to record all measurements. e.g. Biology - sampling Chemistry – pH of different substance	Decide a suitable chart or graph type based on the type of data collected and correctly label the independent and dependent variables. Describe the pattern found in a conclusion. e.g. Biology - Continuous and discontinuous variation Chemistry – Cooling curve	List all the facts, scientific ideas, data or conclusions that support an idea. Comment on the strength of the data in support of a claim. e.g. Chemistry – particle model Physics – energy in food	
8	Identify how to control each variable and ones that cannot be controlled. e.g. Biology – effects of exercise Biology – photosynthesis	See if repeated measurements are close. Design tables with space for further calculations. e.g. Chemistry – speed of chemical reaction Physics – resistance in a wire	Draw appropriate curve or straight line of best fit. Comment on the strength of the findings. Suggest ways to improve the method. e.g. Chemistry – speed of a chemical reaction Biology - Photosynthesis	Evaluate scientific methods and identify the reasoning behind a conclusion. e.g. Biology – Food tests Chemistry – reactivity series through experiment	
9	1 - Explain how to investigate a given question. 2 - Weigh up benefits and risks of a particular investigation. 3 - Explain why some variables are difficult to control. e.g. 1-Physics – ionising radiation	Carry out the method carefully and consistently, taking precise measurements to minimise error and be able to identify and remove anomalies. e.g. Physics – energy in a spring/elastic band	Explain the choice of type of graph and line of best fit, identifying any outliers. Justify whether anomalous results can be explained or ignored. Suggest ways to reduce measurement errors. e.g.	Comment on whether the evidence is scientifically accurate and relevant to the claim. Identify secondary sources which would improve or justify the conclusion. Be able to explain how you a	

	2-Biology – data for non-communicable diseases 3-Chemistry – pollution/acid rain experiment	Physics – weight/mass calculations	Physics – energy in a spring/elastic band	conclusion can be defended under criticism. e.g. Biology – non-communicable diseases	

Key Stage 1 Contexts for Disciplinary Knowledge

Disciplinary Knowledge

In science, disciplinary knowledge is the knowledge needed to collect, understand and evaluate scientific evidence. In Key Stage 1 the focus is on three key areas that develop pupils scientific competences; planning investigations, investigating and analysing.

Planning investigations	**Questions** Pupils should explore the world around them and be given opportunities to devise their own questions through a variety of different types of scientific enquiry and recognise that questions can be answered in different ways. They should begin to use secondary sources to find answers.
Investigate	**Observe closely using simple equipment to perform simple tests and use appropriate techniques to test hypothesis and collect data.** Pupils should have opportunities to observe closely, use simple features to compare objects, materials and living things. They should begin to identify, sort and group objects, materials and living things giving reasons for their choices. Pupils should use simple measurements and scientific equipment to gather data, carry out simple tests and record simple data.
Analyse	**Present data, analyse patterns, draw conclusion.**

	Pupils should be supported to identify patterns and relationships in their results and given opportunities to discuss their results and how they found them out. They should record and communicate their findings in a range of ways and begin to use simple scientific language to express their conclusions.

Substantive Knowledge and Contexts

Scientific knowledge and conceptual understanding is developed through the disciplines of biology, chemistry and physics. It is essential that pupils develop secure understanding of knowledge and concepts in order to progress to the next stage. Pupils are given opportunities to experience different types of scientific enquiries to help them answer scientific questions about the world around them.

Year 1

Children should be given the opportunity to **ask questions** throughout each subject area		
Substantive Knowledge	**Disciplinary Knowledge**	**Possible contexts**
Biology - **Organisms**.		
Identifying Plants and structures	**Observe** plants in the surrounding environment. **Identify** and **classify** types of trees and flowering plant.	Observe a variety of plants growing in the school environment. Pupils use a camera/Ipad to take photographs and group photographs identifying and labelling common features. Look closely at a variety of different wild and garden plants, including deciduous and evergreen trees. Draw a detailed picture of a plant and label basic structure. Give children the opportunity to grow flowers and vegetables, recording through photographs, labels and captions how they have changed over time.
Naming and grouping animals and humans	**Recognise** and **label** basic parts of animals including humans.	**Humans** Name and label a diagram of the human body including parts of the body associated with each sense.

	Identify, name, sort and group different types of animals. **Observe** differences between animals.	Give pupils opportunities to use their senses: * Identify common smells in scent pots e.g. herbs * Taste a variety of fruits and describe the taste (be aware of allergies) *Use feely bags and describe what is inside the bag *Identify various common recorded sounds *Work in pairs, one child describes a picture the other draws it, then look at the picture and draw. Was it easy to draw a picture without seeing it? **<u>Animals</u>** Using photographs or toy animals label and sort into groups: amphibians, fish, reptiles, birds and mammals identifying similarities and differences. Learn about looking after different types of pets from the 5 animal groups and what they need to survive: food, water, warmth, shelter. Make a class pet book to display work. Identify and group carnivores, herbivores and omnivores. Identify some features of each eg, carnivores have sharper teeth for tearing meat.
Chemistry - **Matter**		
Naming properties of materials	Interact with and **compare** a variety of materials, recognising their properties. **Use** materials in different real-life contexts Begin to **test** different materials.	Explore and name everyday materials and their properties – use feely bags for different materials and pupils use their sense of touch to describe. Write material property labels and display with materials for children to sort and group. Give pupils the opportunity to explore materials independently suggesting what they could be used for. Make a pet bed using suitable materials describing why they have chosen each material.

Physics - **Earth**		
Seasonal changes	**Observe** changes in the environment and weather throughout the year. **Monitor** and **record** simple weather data.	**Seasons** Look at a variety of photographs, including photographs of the school playground showing the four seasons. Observe and list changes that occur in the 4 four seasons including weather, day length, deciduous plants. Make a season wheel. Draw and label the four seasons including observations recorded on the list. **Weather** Record the weather in a chart in terms 1, 3, 4, 6 (four seasons) and compare similarities and differences.
Key Vocabulary Year 1		
Plants tree, leaves, flowers, blossoms, buds, petals, fruit, roots, bulb, seed, trunk, branches, stem, deciduous, evergreen, habitat, vegetables. Animals inc humans Fish, amphibians, reptiles, birds, mammals, carnivores, herbivores, omnivores, pets, wild, habitats Head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth, senses, touch, smell, taste, hearing, sight **Naming materials** Wood, plastic, glass, metal, water, rock, hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy, waterproof, absorbent, opaque, transparent, floating, sinking, brick, fabric, paper, elastic, foil **Seasonal changes** Season, autumn, spring, summer, winter, weather, Sun, Earth, day, night, wind, rain, sunny, snow, cloudy, hot, cold **Working Scientifically** Question, equipment, test, name, sort, same, similar, different		

Year 2

Substantive Knowledge	Disciplinary Knowledge	Possible Context
Children should be given the opportunity to ask questions throughout each subject area and recognise different ways of answering them.		
Biology - **Organisms**		
Plant Growth and requirements of life	**Observe** plants growing from seeds, **recording** changes over time. **Test** the impact of different conditions on plants.	Pupils grow a variety of seeds and bulbs including sunflowers and beans which germinate and grow quickly so that children can record each stage as it happens. Pupils use the local environment throughout the year to identify plants that grow and identify the changes that occur. Identify that plants need light and water to stay healthy. Pupils investigate what happens to plants, seeds or bulbs when one of the variables (light or water) are changed. Discuss the importance of a fair test. Pupils measure growth and record in a chart/graph. Discuss their findings.
Biology - Ecosystems		
Lifecycles and Requirements for life	**Observe** changes over time in living things.	Pupils look at a variety of life cycles, human, animal, insect and plant. Understand that each stage shows growth. Identify the main stages of each and draw, label and discuss what happens at each stage. Identify the basic needs of humans for survival: food, water, air/oxygen and discuss what would happen if one of these requirements was missing. Pupils sort photographs/objects into groups labelled living, dead or never alive and give reasons for their groupings. Pupils investigate a variety of habitats including microhabitats on the school grounds.

Habitats	**Observe** habitats in the surrounding environment. **Identify** and **compare** different habitats.	**Habitats** Pupils investigate a variety of habitats including desert, rainforest, ocean, woodland, polar, woodland, meadow. Describe each habitat specifically looking at climate, plants and animals. Give pupils the opportunity to look at secondary sources to research information. Identify adaptations of plants and animals which allow them to survive in their habitat and how their requirements for life are met in their habitat. **Microhabitats** Pupils identify different microhabitats in the school grounds and take photographs/video clips, recording in a tally chart the minibeasts which live there and describe the conditions of the habitat. Pupils draw pictures/take photographs of two microhabitats and compare similarities and differences and discuss whether the conditions of the microhabitat affect the number and type of plants and animals that live there.
Food Chains	**Identify** and **compare** the different parts of food chains and their dependency on one another.	Look at a variety of food chains of animals in different habitats. Identify that the animals and plants in a habitat are linked together through their food chain and depend on one another for survival. Play games giving pupils the opportunity to sort photographs or objects into food chains and describe them ensuring they use the scientific vocabulary ‘producer’ to describe plants and ‘consumers’ to describe animals which eat the plants and other animals in the food chain. Ensure pupils understand the role of the sun in the food chain and that plants need sunlight in order to make food and grow. Challenge pupils to make the longest food chain they can and label. Pupils create a food chain with humans as a consumer and discuss.

Exercise, food and hygiene	**Identify** different sources of food. **Collect data** on nutritional value of different foods. **Test** the effects of physical activity on the human body. **Identify** ways to stay clean and healthy.	**How do we keep our bodies healthy?** Identify the basic needs of humans for survival: food, water, air/oxygen and discuss what would happen if one of these requirements was missing. Investigate further by looking at the Eatwell Guide (NHS) food wheel and identify different types of foods that make up a balanced diet: Carbohydrates, fruit and vegetables, proteins, dairy, fats, oils and spreads. Create a healthy meal/lunchbox and give reasons for choices. Discuss and identify food/drink with healthy/unhealthy sugars. Compare amounts of sugar in different food/drink by weighing sugar and sorting from least sugar/most healthy to most sugar/unhealthiest food/drink. Make a healthy cereal bar using the Eatwell guide and choosing healthy options/healthy sugars. What happens to your body when you exercise?. Children take part in physical activity and list changes to their body. Identify why it is important for us to exercise focusing on the role of the heart, lungs and muscles. Discuss the importance of hygiene to keep your body healthy. Look at the way germs/viruses are spread through not washing your hands. Glitter experiment. Pupils put glitter on their hands and touch objects to show how germs can be transferred easily. Pupils use a cloth, water then soap to clean glitter off their hands and decide the best method to clean their hands describing reasons for ideas.
Chemistry- Matter		
Suitability of materials and changing solids	**Identify** more complex features of materials **Test** the suitability of materials in different contexts.	Pupils identify the suitability of materials for various jobs through creating investigations to test a variety of materials and their properties, e.g. the most suitable material to make a visor to test whether a material is transparent, translucent or opaque.

	Gather and **record** data about the effectiveness of materials in different contexts. Used **gathered data** and **observations** to **predict** the suitability of a material.	Pupils predict and reason why one material is more suitable than another based on simple tests carried out e.g.to investigate which materials are suitable to make a boat they will test materials which are waterproof and will float.

Key Vocabulary Year 2

Plant Growth and requirements of life
Seed, bulb, young, mature, healthy, growth, water, light, temperature, storing food, stage

Lifecycles and habitats
Living, dead, healthy, adult, young, baby, toddler, child, teenage, egg, chick, chicken, pupa, caterpillar, butterfly, spawn, tadpole, frog, lamb, sheep, lifecycle, habitat, micro-habitat, environment, shelter, seashore, ocean, woodland, rainforest

Food chains
Consumer, producer, predator, prey, herbivores, carnivores, omnivores

Exercise and nutrition
Hygiene, food, food groups, carbohydrate, protein, fat, sugar, dairy, fruit, vegetable, healthy, unhealthy, muscles, energy, teeth

Suitability of materials
Wood, plastic, glass, metal, water, cardboard, rock, hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy, waterproof, absorbent, opaque, transparent, translucent, floating, sinking, brick, fabric, paper, elastic, foil, squashing, bending, twisting, stretching, suitable

Working Scientifically
Question, equipment, test, name, sort, same, similar, different, record, results, table, predict

Key Stage 2 Contexts for Disciplinary Knowledge

Disciplinary Knowledge

In science, disciplinary knowledge is the knowledge needed to collect, understand and evaluate scientific evidence. In Key Stage 2 the focus is on four key areas that develop pupils' scientific competences; planning investigations, investigating, analysing and thinking like a scientist.

Key stage 2

Planning investigations	**Questions** Pupils should develop their ability to ask scientific questions and use scientific enquiries to answer them. They should begin to plan their own different types of enquiries, taking variables into consideration.
Investigate	**Observe closely using simple equipment to perform simple tests and use appropriate techniques to test hypothesis and collect data.** Pupils should have opportunities to gather data from practical enquiries, becoming more systematic and ensuring measurements are accurate, while recording data effectively. They should be aware of fair testing principles and begin to apply these when they are carrying out enquiries. They should make predictions based on their scientific understanding.
Analyse	**Present data, analyse patterns, draw conclusions.** Pupils should be supported to present their results using increasingly complex methods. Bar graphs should be used before they progress onto line graphs. They should explain their results both orally and in writing. Pupils should also begin to comment on how trustworthy their results are and explain why this is.
Thinking Like a Scientist	**Construct explanations, review theories, critique claims, justify opinions** Pupils should be taught what a theory is and to recognise when straightforward scientific evidence supports a theory. They should be able to use scientific vocabulary to report the findings of investigations and use their findings to suggest, support and refute their own ideas and arguments.

Substantive Knowledge and Contexts

Scientific knowledge and conceptual understanding is developed through the disciplines of biology, chemistry and physics. It is essential that pupils develop secure understanding of knowledge and concepts in order to progress to the next stage. Pupils are given opportunities to experience different types of scientific enquiries to help them answer scientific questions about the world around them. All possible contexts for KS2 taken from PSST Focused Assessments found at: https://pstt.org.uk/resources/curriculum-materials/assessment

Year 3

Children should be given the opportunity to **ask questions** and **perform enquiries** throughout each subject area. They should begin **recognise scientific theories** and the evidence used by scientists to support these.		
Substantive Knowledge	**Disciplinary Knowledge**	**Possible context**
Biology - **Organisms**		
Functions of parts of plants, inc. water transport	**Identify** parts of the process for pollination, water transport and seed dispersal.	**Celery / Carnation Experiment** Put a piece of celery or a carnation in food-coloured water. Predict what will happen and record results. What will happen if the stalk is split and put in two separate containers with differently coloured water sources? Discuss the part of the plant that allows the water to be transported.
Skeleton & muscles	**Identify** the different muscles and parts of the skeleton. **Compare** the functions of different muscles. **Compare** the muscles and skeletons of different animals.	**Human skeleton investigation** Discuss differences between human skeletons, taking care when discussing differences between children in class. Consider which bones can be more easily measured e.g. skull, foot, part of arm/leg etc. Ask children to use these ideas to create a question to be investigated, e.g. Are adult heads bigger than children's heads? Do taller children have longer arms/bigger feet etc? Am I/Are you a square? (look at arm span versus height) Ask children to explain how they will answer their question. Support them to carry out their pattern seeking enquiries to answer their own questions.

Diet including nutrition	**Identify** the impact of different food groups on the body. **Compare** nutritional information of different foods. **Identify** nutritional needs for different animals.	**What is on Your Plate?** Using resources such as the Eatwell guide, discuss what each food group does for a body, introducing a full range of vocabulary by examining the nutritional information on food products. Make links between each food group and how they affect / are used by the human body.
Physics – Earth, Magnets and forces, Light		
Rocks	**Observe** different types of rocks and soils. **Identify and classify** different types of rocks. **Identify** composition of soil layers . **Test** the properties of rocks. **Identify** how fossils are formed.	**Rock Reports** Provide a purpose for the investigation e.g. to find the best material for a new paved area in school. Suggest that you would like to find out which rock would last the longest/be the least wearing/the strongest. Decide whether to do a rub test and/or a scratch test etc. Rub: Children to rub rocks on sandpaper and collect scrapings onto white paper. Scratch: Try scratching the rocks with e.g. a fingernail, a matchstick, a metal nail etc. Ask children to order the rocks and justify their selection of strongest rock. How will you report your findings (to persuade), e.g. draw, write, present?
Magnets and forces	**Test** the magnetic properties of various materials. **Record results** of tests in simple tables.	**Magnet Tests** Provide the children with a collection of magnets and other materials (e.g. card, fabric, tissue, thin wood, aluminium foil, paperclips) to explore. Ask them to find out ways to test whether the magnets are all equally strong e.g. through paper/card or layers of each, how close magnet needs to be before it attracts a paper clip etc. Ask the children to report their findings verbally, e.g. explaining how they carried out their investigation to their peers. As a class, discuss the different ways of testing magnet strength and talk about the advantages and disadvantages of each approach. Discuss why it is a good idea to try different ways of answering a question (to get a more reliable answer).

Light	**Observe** shadows and reflections and the effect of the absence of light. **Identify** the dangers of direct sunlight. **Record data** on shadows and reflection.	**Shadow Making** Provide the children with a collection of materials to explore (some transparent, some translucent and some opaque). Ask the children to investigate which materials form shadows when a torch is shone on them (e.g. colour, darkness, no shadow?) Ask them to record their observations to answer the question about which materials form a shadow (e.g. draw, write, sort, photo, order, table). Can they categorise or order the materials and/or shadows in some way?

Key Vocabulary Year 3

Functions of parts of plants, inc. water transport
Roots, stem, trunk, leaves, fruit, flowers, structure, flowering, transport, support, nutrition, reproduction, life cycle, pollination, seed formation, seed dispersal, pollinators, fertiliser

Skeleton & muscles
Bones, limbs, movement, support, function, nutrition, growth

Diet including nutrition
nutrition, growth, healthy, unhealthy, hygiene, food, food groups, carbohydrate, protein, fat, sugar, dairy, fruit, vegetable, healthy, unhealthy, muscles, energy, teeth

Rocks
Fossils, soil, organic, grains, crystals, sedimentary, layers

Magnets & forces
Surfaces, attract, repel, poles, magnetic, strength

Light
Dark, reflective, shadow, opaque, translucent, transparent, mirror, light source, Sun

WS
Compare, microscope, investigate, pattern, measure, enquiry, gather, data, tables, bar charts, similarities, differences, changes, record, scientific idea

Year 4

Substantive Knowledge	Disciplinary Knowledge	Possible Context
Children should be given the opportunity to **ask questions** and **perform enquiries** throughout each subject area. They should begin **recognise scientific theories** and the evidence used by scientists to support these.		
Biology –Ecosystems, Organisms		
Comparing Plant Requirements	**Identify** requirements for life and growth of plants. **Test and observe** the effect of not having one or more of the requirements for growth. **Draw bar graphs** based the data.	**Plant Growing** Choose a relatively fast-growing plant suitable for indoor growth. Discuss the different requirements for growth and talk about how we can control these by planting and placing our plants in different places. Get the children to label and place the plants in as many different places as possible, perhaps also placing one that will not be watered. Have the children make predictions about how the plants will grow and get them to collect measurements regularly before presenting these results in a bar graph.
Habitat Changes	**Observe and identify** changes in the environment, particularly those that pose a danger to living things. **Identify** ways in which the environment can be protected.	**Local Survey** Recap previous work on classifying and habitats. Consider school grounds/local area as a habitat and go on a search for living things (incl. plants) in the grounds. Take a camera/draw/make lists of larger things and collect smaller things. Classify the living things into groups e.g. vertebrates / invertebrates / plants. Create subsets within groups e.g. flowering / non-flowering plants, birds / mammals/ invertebrates etc. Ensure the habitat for each creature or plant is recorded and discuss whether there a relationship between a habitat and the types of living thing found there.

Food Webs	**Identify and record** different parts of a food web and their dependency on one another. **Identify** the impact of removing part of the food web.	**Local Survey Continued** If a local survey has already been carried out for habitats, use the same information, otherwise go out into the school grounds or local area and search for living things. Use this to compile a food web, describing the relationships or producers and consumers and how these are linked to one another.
Teeth and Digestion	**Identify** different parts of the digestive system and their functions. **Observe and model** the process of digestion using simple equipment. **Identify** different teeth and their functions.	**Teeth (Eggs) in Liquid** Discuss how children look after their teeth. Explain that we will be using hard boiled eggs to represent teeth to investigate tooth decay. As a class set up a fair test to investigate the effects that different liquids have on teeth e.g. cola, water, vinegar, milk, sports drink and orange juice. Discuss how they can make the comparison fair, i.e. as to quantity of liquid, types of containers, time and location (if using milk do they all need to be in the fridge?) Leave for one week, although children can check on the experiment daily to see if they can notice and changes. After one week, unveil the eggs by tipping into a white bowl and photograph. Children to record their observations (look, feel, smell, etc.) and rate the eggs in order of damage to shell observed. Children to consider how they could improve the test and what further questions arise that they could investigate.

Chemistry- Matter, Earth		
States of Matter	**Identify and compare** materials based on their state. **Observe** changes in materials as they change state. **Test and measure** the effect of temperature on materials. **Record results** of testing in tables and bar graphs.	**Dunking Biscuits** Discuss context/problem e.g. dunk breaktime biscuit in tea and leave in too long. Discuss possible questions to investigate, e.g. Which is the best biscuit type/brand/shape? Which is the best cup/temperature for dunking? Share ideas for how to test the biscuits e.g. time how long to fall, count dunks before falls etc. Different groups could investigate different things to pool evidence for recommendations. Discuss practicalities: kit/time available etc. Work in groups to carry out dunking investigations. Pause to share ideas and discuss problems. Discuss findings across the class and consider fairness and accuracy of methods. Ask children to talk about / draw a diagram / write about their findings, with a focus on suggesting improvements to their method.
Water Cycles	**Identify** different parts of the water cycle and relate them to states of matter.	**Drying Day** Plan an investigation to reach a conclusion within a real-life context, e.g. Where is the best place to dry your washing? Which conditions are the best to dry materials by evaporation? Make a list of different places/conditions (e.g. temperature or draughtiness). Discuss how to know if it is dry e.g. dry to touch, handprint no longer visible, no imprint on tissue. In small groups, children to decide on the type of material (cloth/paper towels), quantity of water, locations to test evaporation (e.g. could arrange washing lines in different locations around the school) and how often to observe/check. Provide measuring equipment including thermometers, jugs, rulers. Pupils could record their method before/after set up. N.B. Paper towels can dry in an afternoon, heavy fabric will take longer.

Physics – Waves, Electricity		
Sound	**Identify** the way sound is made, including the strength of vibrations, and how this enables humans to hear. **Observe and compare** different objects and the sounds they produce. **Test** materials, measuring their insulation against sound.	**Investigating Pitch** Show children some homemade 'musical instruments': elastic bands over shoe box, 'straw flute/pan pipes', 'sound sandwich' (lolly stick and straw harmonica), stretched balloon 'drum skin' over tube, glass bottle containing water to blow or tap. Explore how to play them to make a sound and ask the children to suggest which parts are vibrating. Ask children to record a range of questions that they could investigate, focusing on changing pitch (e.g. How does the width of the elastic band affect pitch?) Children then work in small groups investigating their questions, considering different ways to alter pitch.
Electricity	**Identify** the function of various components by constructing simple circuits. **Test** complete and incomplete circuits. **Identify** appliances which run on electricity. **Test** different materials for conductivity. **Record results** of tests in a table.	**Does it Conduct Electricity?** Introduce the terms conductors and insulators. Example context: soldiers wear 'smart' clothing which conducts electricity: http://www.bbc.co.uk/news/technology-17580666 E.g. a soldier in the desert that has ripped part of 'smart' clothing losing part of the GPS circuit, so unable to provide location for rescue. Explain that the soldier has a pack containing a variety of objects: which could be used to complete a circuit to activate the GPS? Provide each group with a 'soldier's backpack' containing a collection of objects/ materials (including different metals and plastics). Discuss how to find out whether electricity can pass through the materials. Groups test by putting materials into a gap in a circuit with a bulb/buzzer. Focus pupil recording/presenting on explaining what the results show. E.g. they could produce a radio or video message to send to the soldier explaining how to produce a working circuit and why they are confident that this will work, providing scientific evidence and a list of all possible conductors (in case some are damaged). Recap on the terms insulators and conductors.

Key Vocabulary Year 4

Living things and habitat changes
Environment, classification key, local, wider, negative effect, positive effect, population, pollution, deforestation, pollinators, impact, nature reserves, recycling, vertebrates, invertebrates, fish, amphibians, reptiles, birds, mammals, snails, slugs, worms, spiders, insects

Comparing plant requirements
Growth, light, water, air, nutrients, soil, space

Food webs
Food chains, consumer, producer, predator, prey, herbivores, carnivores, omnivores

Teeth and digestion
Digestive system, mouth, tongue, teeth, incisors, molars, canine, chewing, biting, tearing, oesophagus, stomach, small intestine, large intestine, damage, plaque, decay

States of Matter
Solid, liquid, gas, state, heated, cooled, melting, freezing, temperature, degrees Celsius, thermometer, evaporation, condensation, pool, shape, container, substance, material, properties

Water Cycles
evaporation, condensation, precipitation, temperature, vapour, clouds, rain, snow

Sound
Vibration, volume, pitch, travel, medium, insulation, soundproof, particles

Electricity
Conductors, insulators, circuit, components, cell, wire, bulb, switch, buzzer, lamp, battery, motor, loop, series

WS
Enquiry, investigation, conclusion, prediction, record, report, compare, data, chart, table, key, fair tests, scientific ideas, measure, equipment, evidence, findings

Year 5

Substantive Knowledge	Disciplinary Knowledge	Possible Context
Children should be given the opportunity to **ask questions** and **perform enquiries** throughout each subject area. They should begin **recognise scientific theories** and the evidence used by scientists to support these.		
Biology –Ecosystems, Organisms		
Comparing life cycles	**Identify** similarities and differences between lifecycles of mammals, amphibians, insects and birds.	**Lifecycle Research** Ask children to research the life cycles of two different species using a range of secondary sources. This could be in small groups or individually. Discuss possibilities for presenting their research (if possible, provide a purpose e.g. presenting to younger children/parents etc.) For example, different children could choose to make a model, a mime/drama, a rap/song or a poster/book. Agree on criteria for successful presentation of research e.g. clear order to life cycle, comparison between two life cycles, use of scientific vocabulary etc. Children present their research to the intended audience. Groups could peer assess against agreed success criteria.
Impact of drugs, lack of exercise and poor nutrition and non-communicable diseases	**Identify** how these factors might affect specific parts of the body or general health.	**Drugs Education** Using an appropriate scheme of work, discuss how various legal and illegal drugs can affect the human body.

Circulatory and respiratory system	**Identify** different parts of the circulatory and respiratory system and their functions.	**Heart Rate Poses** Previous lesson: measuring pulse rate at rest and after exercise (measuring and recording focus). This lesson: Discuss previous findings about pulse rate: can be hard to measure, but generally found that pulse rate increases after exercise. Recap why: blood carries oxygen around the body, the muscles need more oxygen during exercise, so your heart works harder to supply more oxygen. But what if your body is still e.g. headstand, raised arms, balance, yoga pose, plank? Focus individual recording on predictions and explanations. Discuss with the children how to plan and carry out a test into a stationary exercise. Consider how long the pose should last, comparison with resting pulse rate, whether one child or several children should be tested, how to carry out the tests safely. Ask the children to carry out the test and record results as in a group. Discuss findings.

Chemistry- Matter, Earth		
Complex properties and testing materials	**Use fair testing** to demonstrate the suitability of various materials for a range of everyday purposes.	**Insulation Layers** You want to see which cup will keep your tea warm for longer. Show different cups of hot water, e.g. paper cup, stacked paper cups, thermos mug. Measure the temperature of the water, repeat after about one hour (e.g. at the beginning and end of lunchtime). Activity Use the results of the pre-activity to make predictions about insulation (e.g. a good insulator has more layers / traps air / made of….). Provide a collection of different materials and invite the children to discuss their ideas about which might be good for keeping the drink warm. The children could order the materials according to which will be best insulators or select one to test for layering and record their predictions, giving reasoning based on the previous test results. Children plan and carry out an investigation to test their predictions.
Earth & Space	**Record** the observable effects of the movement of the Moon around the Earth and the Earth around the Sun. **Identify** the objects in the Solar System and their movement around the Sun.	**Solar System Research** Use an animation, photo or video clip to begin a discussion about our solar system. Raise questions about different planets in our solar system e.g. movement, relative movement, size etc. Provide books or access to the internet. Help to phrase search questions. How will you share your research? Agree options e.g. labelled diagram or model, information leaflet, drama, animation, presentation etc. Small groups could research different planets or different features. Present/share outcomes with rest of the class. Groups could peer assess against agreed success criteria e.g. clarity.

Physics – Forces		
Forces, including gravity & resistance mechanisms	**Observe and test** the effects of water resistance, air resistance, friction and gravity. **Test** the impact that levers and pulleys have on the amount of force required to move objects.	**Aqua dynamics** Challenge pairs to make a ball of plasticine or blue-tack fall as slowly as possible through water (size will depend on how big your container is e.g. a large transparent plastic box or tall measuring cylinder – if using cylinder, put plasticine on string for retrieval). Ask children to explain why they think it will fall more slowly e.g. draw and label design or hold up and explain. Ask children to identify the control variables e.g. depth of water, mass of plasticine, position of drop. Test designs e.g. repeating in groups or as a whole class with a number of the children timing. Discuss test results and their trustworthiness. Use the test results to predict which shapes will fall fastest. If time, challenge pairs to change the shape so that it falls quickly through the water.

Key Vocabulary Year 5

Comparing life cycles
Food chains, consumer, producer, predator, prey, herbivores, carnivores, omnivores

Impact of drugs, lack of exercise and poor nutrition, non-communicable diseases
Diet, exercise, drugs, lifestyle, function, internal organs, substances

Circulatory and respiratory system
Blood, heart, vessels, arteries, veins, chambers, red blood cells, white blood cells, platelets, lungs, pressure, oxygen, carbon dioxide, transport

Complex properties and testing materials
Properties, hardness, solubility, transparency, conductivity, electrical, thermal, magnetic, insulation, heat loss

Earth & Space
Sun, Moon, Earth, hemisphere, solar system, axis, orbit, planets, stars, spherical, rotation, waning, waxing, gibbous, crescent

Forces, including gravity & resistance mechanisms
Gravity, air resistance, water resistance, friction, mechanisms, levers, pulleys, gears, effect, movement, acting in pairs

WS
Planning, enquiries, investigation, variables, accuracy, precision, repeat readings, recording, conclusions, fair test, compare, evidence, control

Year 6

Substantive Knowledge	Disciplinary Knowledge	Possible Context
Children should be given the opportunity to **ask questions** and **perform enquiries** throughout each subject area. They should begin **recognise scientific theories** and the evidence used by scientists to support these.		
Biology –Organisms, Genes		
Classification of plants and animals	**Identify** the broad scientific categories that living things can be sorted into by observing similarities and differences in their characteristics.	**Invertebrate Research** (To be completed after some input on animal classification). Show children some invertebrate film clips (e.g. David Attenborough). Explain that their task is to research different invertebrates (show egs). Discuss: how will you share what you have found out? Agree options e.g. poster, labelled diagram or model (playdough), written report, information leaflet, drama, animation etc. Give small groups a different invertebrate group to focus on (annelids, molluscs, insects, arachnids, crustaceans and myriapods). Each group must give an example and describe the features which make it a member of its classification group. Present/share with rest of the class. Groups peer assess against agreed success criteria.
Reproduction and changes to old age	**Observe** the changes in humans to old age. **Identify and compare** the reproductive process in some animals, including humans, and plants.	**Growth Survey** What could we measure to show how humans develop as they grow older? Groups decide e.g. forearm length, arm span, foot length, etc. Discuss how we could measure this and the number of children/adults we would need to measure. How accurate do our measurements need to be? Decide on how many decimal places or unit. Ensure that children understand that they also need to record the age of the person. Children go to different year groups to measure specified number of children. Bring data together to create class table. Ask groups to create scatter graphs to present the data, can use ICT to do this.

Evolution	**Identify** the way that offspring vary from their parents. **Observe** how variation leads to adaptation in different environments. **Identify** the changes in living things over long period of time, observing fossils to understand how scientists use these as evidence.	**Fossil Habitats** Show a picture of a fossilised skeleton/creature and discuss the children's ideas about fossils, what it was, what it ate, where it lived etc. (Could provide only one part to start with, or parts to different groups, to show how we only have part of the information). Discuss strong/weak evidence e.g. strong evidence that has skeleton/teeth etc, place where fossil was found suggests habitat, similarities with modern creatures suggest colour etc. Provide children with photos or real/resin fossils (trilobite, ammonite, ichthyosaurus etc, plus any found locally or linked/displayed at local museums). Ask them to use the fossils and their own research to develop ideas about the creatures e.g. labelled drawing with size, possible appearance, diet, habitat, what other fossils could exist eg what prints could be left behind. Could colour code or star ideas for which there is the strongest evidence.
Chemistry- Reactions		
Dissolving & separating materials **Reversible and irreversible reactions** **Basic particle theory**	**Investigate** reversible changes including dissolving and mixing. **Observe** irreversible changes and identify the formation of new materials.	**Dissolving Investigation** Ask children to think of everyday example of dissolving solids in water (e.g. sugar in tea, salt in cooking water). Ask them to suggest ways of making the sugar dissolve faster (e.g. stirring, temperature of the water, size of sugar grains, volume of water). Ask them to choose a factor to investigate and to plan a fair test. Post it planners or planning boards could be used to focus on types of variable. Carry out tests and discuss outcomes.

Physics – Electricity, Waves		
Electricity	**Identify** circuit symbols. **Record** simple circuits in diagrams. **Test** the effect of various components, particularly cells, on the operation of other components, such as lamps or buzzers. **Record results** of tests in tables.	**Bulb Brightness** Provide a mix of basic circuit components and challenge pairs or trios to make a quick simple circuit. Compare and discuss the differences in bulb brightness and how to measure/observe this e.g. light seen through layers of paper, datalogger, observation. Main task: to investigate how they can change the brightness of the bulb choosing from the available equipment (to include different lamps, cells and different thickness/length of high resistance/fuse wires). Each pair/trio to generate a list of variables which could be changed in their circuit and how they will observe/measure the effect of this change. Create a scientific question which identifies the 'change' and 'measure'. Record their plan e.g. question, variables and diagram of test circuit. Carry out and discuss investigations.
Light	**Identify** the way light travels and reflects off of objects. **Identify** the way humans see by reflected light entering the eye. **Test** the effect of light brightness and position on the size and position of shadows**.** **Record** measurements in tables and graphs.	**Light Questions** Provide a discussion-starting stimulus e.g. pictures of light in different contexts: shining through clouds, shadow puppets, headlights, eye. Explore children's ideas around light. Challenge small groups to raise questions about light e.g. 20. Then ask them to sort these into groups for how they could be answered e.g. research, direct observation, testing, we may never know... Share questions from different groups, supporting children to turn some into a form which could be investigated. Select questions which could be: answered now by research; answered in a later lesson by observation or investigation; placed on the class 'Wonder Wall' to consider at the end of term. (Before the children can plan different types of enquiries, they need to recognise how they might find out the answer to questions. Once able to recognise the different types they will then be able to independently choose an appropriate enquiry type and plan accordingly).

Key Vocabulary Year 6

Classification of plants and animals
Kingdom, phylum, class, order, family, genus, species, characteristics, organisms, micro-organisms, subdivide, classifying

Reproduction & changes to old age
Sexual, asexual, cells, puberty, adolescent, gestation

Dissolving & separating materials inc. reversible and irreversible reactions
dissolving, filtering, sieving, evaporating, reversible, irreversible, particles, reaction

Evolution
Inheritance, adaptation, characteristics, variation, reproduction, survival, extinction, endangered, gene

Electricity
Conductors, insulators, circuit, components, cell, wire, bulb, switch, buzzer, lamp, battery, motor, loop, series, symbols, parallel, voltage

Light
Dark, reflection, shadow, opaque, translucent, transparent, mirror, light source, Sun, spectrum, optical

WS
Planning, enquiries, investigation, variables, accuracy, precision, repeat readings, recording, conclusions, fair test, compare, evidence, control, predict, scatter graph, line graph, bar chart, table, relationship