Long Term Plan: Year 8 2023-2024

“Science is simply the word we use to describe a method of organising our curiosity.”

TThe programme for KS3 (years 7-9) sees a single* teacher following the curriculum roadmap for each class. All teachers teach the same unit to aid sequencing and consistency with teaching and learning.

*There are few classes which are split between staff - but again, the same unit is delivered by both staff.

There are two data collection points for all KS3 students, which will then be analysed with a subsequent KS3 Standardisation Meeting.

Topic	Unit title	Key knowledge/ Content to learn and retain	Essential skills to acquire (subject & generic)	Anticipated misconceptions	Links to previous KS	Links to future KS	Opportunity for stretch for high prior attainers
One	**Scientific Skills**	Introduction to practical work at ASA Short series of lessons to embed the requirements of the practical aspects of our programmes Complete the GL Assessment	Naming & drawing equipment Introduction to health & safety in the laboratory Writing Methods Recording Observations Bunsen Burner Licence	Names of equipment Students attempting to draw in 3D	Students will have used very basic equipment at KS2	All our course programmes depend upon this knowledge	Introduction of variables & values Accuracy & validity of results
SMSC & British Values	British values in science Working cooperatively Working safely in a laboratory setting						
Cultural Capital	Scientist throughout history						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

Topic	Unit title	Key knowledge/ Content to learn and retain	Essential skills to acquire (subject & generic)	Anticipated misconceptions	Links to previous KS	Links to future KS	Opportunity for stretch for high prior attainers
Two	**Sound and Hearing**	Describing sound - Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions How sound travels- frequencies of sound waves, measured in Hertz (Hz), Sounds need a medium to travel, the speed of sound in air, water and solids Reflection & absorption of sound - echoes, reflection and absorption of sound Hearing sounds - auditory range of humans and animals. Sound produced by vibrations of objects in loudspeakers detected by their effects on microphone diaphragm and the ear drum. Sound waves are longitudinal	**Practical Skills**: • Observing demo of an Oscilloscope • Identifying equipment **Scientific Skills:** • Understanding ranges when looking at data • Observing models to deepen understanding • Analysing and Interpreting graphs • Introduced to a hypothesis and designing an experiment	That material objects are not needed to make sounds, pitch and loudness mean the same thing and that ultrasound is simply very loud noise. That sound travels instantaneously, or is faster than light, and that sound cannot travel through solids and liquids, or can pass through a vacuum. All materials reflect sound equally. The ear is simply the part outside our head that we can see.	In Key Stage 2, students will have learned about how sounds are produced and how they travel to the ear, and ideas relating to pitch and volume of sounds. The content of this topic leads directly on from the Forces and energy topic covered in year 7.	This information leads into: Y8 - Light Y11 - Waves	Calculation of wave speed using $v = f \times \lambda$ Students will practice the art of converting values into the standard units that are required for calculations in physics. Investigate the impact of ear size on ability to hear a sound Building a speaker in order to observe the vibration of particles needed for sound to travel
SMSC & British Values	British values in science Community – working collaboratively to complete practical tasks Moral application - Use of high pitched noise as a deterrent for younger people in community areas that have high rate of anti-social behaviour						

Cultural Capital	Use of infra/ultrasound by other organisms for hearing/communication Use of ultrasound as a medical tool Use of sonar to navigate by fishing industry, navy, whales/dolphins/bats *et al*
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.

Topic	Unit title	Key knowledge/ Content to learn and retain	Essential skills to acquire (subject & generic)	Anticipated misconceptions	Links to previous KS	Links to future KS	Opportunity for stretch for high prior attainers
Three	**Energy in living organisms**	Plants and food – Plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots. The reactants in, and products of, photosynthesis, and a word summary for photosynthesis. The dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere Structure of a leaf – The adaptations of leaves for photosynthesis including the role of the stomata. Stomata- The role of leaf stomata in gas exchange in plants.	**Practical Skills** • Using scientific equipment e.g., Microscope, testing for starch, • Following a method • Carrying out practical work safely **Scientific skills** • Carrying out observations • Recording observations in a table • Making conclusions • Writing word equations • Analysing data in graphs to draw a conclusion • Identifying adaptations and explaining their function • Using evidence to explain ideas	Plants get their food from the soil. Plant food is added to the soil. Light is a reactant in photosynthesis. Minerals are plant food. Some students may confuse photosynthesis with respiration or think that plants breathe in carbon dioxide. Leaf structure and stomata. Cells are like particles or atoms. Cells are two-dimensional. All cells are the same shape. All plant cells contain chloroplasts. Guard cells close when they fill with water. Plants do not respire.	At KS2 should be able to Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees Identify and describe the basic structure of a variety of common flowering plants, including trees. Observe and describe how seeds and bulbs grow into mature plants Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers Explore the requirements of plants	This information leads into: Y8 – Ecosystems Y9 – Cell Structure Y9 – Transport systems Y9 – Plants and Photosynthesise Y9 – Respiration Y10 – Plant tissues Y11 – Ecology	Practice at the art of creating balanced symbol equations Research hydrothermal vents and the processes by which organisms living deep in the ocean can obtain the initial energy transfer Investigate factors affecting the transpiration stream through plants Investigate the impact of mineral solutions on plant growth

		Aerobic / anaerobic respiration - Aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life, A word summary for aerobic respiration Fermentation - the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration		Movement of water - Water enters the leaf through stomata Respiration is the same as breathing. Plants don't respire – they only photosynthesise. Energy is 'made' during respiration, just like another product of the reaction. Anaerobic respiration doesn't release any energy. Anaerobic respiration only takes place when you hold your breath. During reactions, new products are made that may not contain the same atoms as any of the reactants. All microbes cause disease. Microbes cannot make useful products.	for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant Investigate the way in which water is transported within plants Describe the ways in which nutrients and water are transported within animals, including humans.		
SMSC & British Values	British values in science Spiritual aspects of where our food comes from and the importance of all life on Earth being linked together						
Cultural Capital	Respiration and Photosynthesis are processes that are fundamental to like on Earth How do organisms living in habitats at great depths in the ocean obtain their initial energy transfer? Experience being a scientist						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						
Topic	**Unit title**	**Key knowledge/**	**Essential skills to acquire (subject &**	**Anticipated**	**Links to previous KS**	**Links to future KS**	**Opportunity for**

		Content to learn and retain	generic)	misconceptions			stretch for high prior attainers
Four	**Acids & Alkalis**	Acids & alkalis – difference between the two, common examples of each. Looking at neutralisation reactions and writing equations for them. pH scale – the use of the pH scale to measure acidity and alkalinity Making and using indicators – practical investigations using different types of indicators for comparative work. Making salts Acids and metals – reactions between metals and acids, writing word and potentially symbol equations Acids and carbonates- reactions between metals and carbonates, comparing observations, writing word and potentially symbol equations	**<u>Practical skills</u>** • Using scientific equipment e.g., measuring cylinders, dropping pipettes, stop clocks, universal indicators etc. • Using a pH scale • Making an indicator • Following a method • Carrying out practical work safely **<u>Scientific skills</u>** • Construction of balanced symbol equations • Justification of equipment choice during practical work • Construction of risk assessments • Analysing and evaluating practical methods to suggest improvements	Not all acids are dangerous – we use, and even consume, many acids. However, many acids in a laboratory need to be handled with care. Conversely, not all alkalis are safe. There are many salts, not only table salt (sodium chloride). Reactions can create new products, but these depend on the atoms present in the reactants – new substances do not just 'appear', and reactants do not 'disappear'. When carbonates react with acids, carbon dioxide is released from the carbonate. All neutralisation reactions result in a solution of pH 7	From KS2 students should be able to explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and e.g. the action of acid on bicarbonate of soda.	This information leads into: Y8 – chemical reactions Y10 – Chemical changes Y11 – Rates of reaction Y11 – Chemical analysis	Construction of balanced symbol equations Justification of equipment choice during practical work Construction of risk assessments Analysing and evaluating practical methods to suggest improvements
SMSC & British Values	British values in science **Community –** working collaboratively to complete practical tasks						
Cultural Capital	Experience "being a scientist" and developing their working scientifically skills.						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

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Five	**Light**	Light waves - the similarities and differences between light waves and waves in matter. Light waves travelling through a vacuum; speed of light. Coloured light - colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. Reflection - the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. Refraction - Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. Lenses - light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. Waves and water - waves on water as undulations which travel through water with transverse motion; these	**Practical skills** • Using ray boxes • Using a protractor • Measuring angles of incidence & reflection • Using converging and diverging lenses • Measuring the energy produced by a solar cell with a multi-meter • Identifying equipment required • Following a method • Carrying out practical work safely **Scientific skills** • Carrying out reproducible tests • Drawing results tables • Concluding from results • Calculating the speeds of light and sound	Waves and ripples carry water in the direction in which they move (transfer matter as well as energy) Light goes around things, not just in straight lines. Air is empty space. Light can only be reflected from shiny surfaces (such as a mirror). An object either absorbs or reflects light, and cannot do both. White light is made up of discrete colours. Colour is a property of objects rather than of reflected light. Sound travels instantaneously.	At key stage 2 students will have begun to recognise that light appears to travel in straight lines, this idea is then used to explain that objects are seen because they give out or reflect light into the eye and that light travels from light sources to our eyes or from light sources to objects and then to our eyes. Also, this can be used to explain why shadows have the same shape as the objects that cast them.	This information leads into: Y9 – Energy Y11 - Waves	Opportunity for the rearrangement of an equation to identify an unknown quantity. Students will practice the art of converting values into the standard units that are required for calculations in physics. Accurate drawing of ray diagrams with lens that will lead to the calculation of focal length

		waves can be reflected, and add or cancel – superposition.					
SMSC & British Values	British values in science **Community –** working collaboratively to complete practical tasks						
Cultural Capital	Opportunities to discuss the future of energy transportation, communication, and off-world travel Awe and wonder of the world around them – including how we as humans see things using our eyes (and potential issues with vision) Historical experiments looking at the dispersion of light						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

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Six	**Variation**	Classification - the differences between species Chromosomes – the need for chromosomes, where they are found, who they come from and how they drive variation Inheritance – understanding where genetics come from. Introducing key terminology Variation - the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation	**Practical Skills:** • Measuring each other's height using meter rulers • Collecting data on eye colour and recording these results **Scientific Skills:** • Using key questions and flowcharts to classify different organisms • Classifying features into inherited and environmental variation • Classifying features into continuous and discontinuous variation • Collecting data on variation within a class	Acquired characteristics may be passed on to offspring. Natural selection is a completely random process. Evolutionary change in a species happens during a single lifetime. Species evolve "into" another leaving no trace of the original Changes always make a "better" organism Humans evolved directly from monkeys/apes in the space of a generation The Catholic Church does not accept evolutionary theory or	Pupils should have be able to describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals Pupils should have be able to give reasons for classifying plants and animals based on specific characteristics. Pupils should have been taught to recognise that living things change over time and that fossils provide information	This information leads into: Y9 – Cell structure Y11 – Inheritance, variation and evolution Y11 – ecology	Independent research or case study on an organism that shows natural selection has taking place as conditions in the habitat have changed Review of the historical changes to theories of evolution. Opportunity to work with the RE Team on varied viewpoints on the starting points of life, as seen through different cultures and faiths

		Adaptations Natural selection - the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection Fossils Extinction	• Using data to draw bar charts for continuous and discontinuous variation • Analysing data in graphs to draw a conclusion • Identifying adaptations and explaining their function • Using evidence to explain ideas	that Catholics are forbidden to believe in it.	about living things that inhabited the Earth millions of years ago Pupils should recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents Pupils should be able to identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.		
SMSC & British Values	British values in science Not all organisms can adapt fast enough to the changes in their habitat/environment. Example – rising global sea temperatures are producing habitat changes that some coral reefs cannot adapt to fast enough to ensure their survival, or polar bears invading towns in the arctic circle, in the search for food						
Cultural Capital	Review of the historical changes to theories of evolution (example Darwin, Lamark *et al*) Opportunity to work with the RE Team on varied viewpoints on the starting points of life, as seen through different cultures and faiths						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						
Topic	**Unit title**	**Key knowledge/ Content to learn and retain**	**Essential skills to acquire (subject & generic)**	**Anticipated misconceptions**	**Links to previous KS**	**Links to future KS**	**Opportunity for stretch for high prior attainers**

Seven	**Chemical Reactions**	Combustion – explore complete and incomplete combustion, the fire triangle and health and safety Conservation of mass – describe the law of conservation of mass, investigate the law. Illustrate using article diagrams Oxidation and word equations – identifying reactants and products, describing what oxidation is and giving examples, writing equations Investigating carbonates – what is a carbonate, what is produced with carbonate reactions Endothermic and exothermic reactions – differences between the two, examples of each, investigations of each type of reactions	**<u>Practical skills</u>** • Using scientific equipment e.g. spirit burners, stopclocks etc • Following a method • Working safely **<u>Scientific skills</u>** • Carrying out observations • Taking measurements • Writing conclusions • Analysing and evaluating • Recording measurements in a table • Using models to represent atoms in formulae	Reactions can create new products, but these depend on the atoms present in the reactants – new substances do not just 'appear', and reactants do not 'disappear'. Mass is lost when we burn things is another common misconception. Students also often think that heating and burning are the same, and things 'disappear' when they burn. Exothermic and endothermic reactions - Students may be familiar with the idea that energy is given out in reactions, resulting in an increase in temperature. However, the idea that some reactions take in energy causing the temperature to fall may cause cognitive conflict. They may think that because energy is being taken in (during an endothermic change) it should cause the reactants to become hotter, and so the temperature should rise.	Year 7 – Atoms elements and compounds Y7 – Particles and behaviour	This information leads into: Y9 – Chemical bonding Y10 – Energy changes Y11 – Rates of reactions	
SMSC & British Values	British values in science						
Cultural	Cultural capital in science is about providing students with scientific literacy, familiarity of science, and the experience of being a scientist. Within the topic there are numerous opportunities to experience being a						

Capital	scientist. For example using equipment to and investigate different types of chemical reactions. This topic also help pupils to understand the world around them as they learn about the dangers of incomplete combustion and the role of carbon monoxide detectors. The catalyst lessons also provides pupils with an appreciation of the use of catalytic converters on cars in preventing pollution.
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.

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Eight	Magnetism and Electromagnetism	Bar magnets and the magnetic field around them. Magnetic attraction and repulsion The Earth's magnetic field Electromagnets - the uses and understanding of how they work	Record accurate experimental data Present and interpret data in tabular and graphical form. Extended writing Change the subject of, and evaluate equations with four terms.	That all metals are magnetic, rather than just iron, nickel and cobalt.		Y11 - will look at magnetism in much greater detail including the use of electric motors and flemings left hand rule In the second year of A-Level students will study these concepts in even greater depth, taking a mathematical approach.	Multi Step calculations drawing on equations from multiple units.

SMSC & British Values	British values in science Developments in technologies using magnetism and electromagnetism How the Earth's magnetic field "flips" periodically and the vulnerability the Earth experiences during this short period of time when the switch happens
Cultural Capital	Use of waves for global and intergalactic communication The ubiquity of magnetism means that problems can be framed in a variety of familiar and unfamiliar contexts
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here. This programme opens doors to a wide range of STEM field careers; particularly those in engineering, architecture and mechanical sciences

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Nine	**Ecosystems**	The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops The importance of plant reproduction through insect pollination in human food security How organisms affect, and are affected by, their environment, including the accumulation of toxic materials Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.	**Practical Skills:** • Using a range of tools to model different bird beaks to demonstrate adaptations and niches **Scientific Skills:** • Identifying a range of living organisms within local habitats • Constructing food chains and food webs, and using these to explain the interdependence of organisms • Interpreting graphs and using these to infer information about ecosystems and ecological relationships • Using scientific models to model competition and develop ideas about natural selection • Understanding arguments for and against the use of fertilisers, arguing their points and debating scientific ideas	Plants get their food from the soil The arrows in a food chain go from consumer to consumed. The arrows represent "what eats what." Dinosaurs are fictional, or lived alongside humans.	Pupils should recognise that environments can change and that this can sometimes pose dangers to living things. Pupils should be able to construct and interpret a variety of food chains, identifying producers, predators and prey. Pupils have previously learned how and why organisms can vary and how they are classified by scientists. Pupils should be able to describe the features of a variety of habitats that exist across our globe.	This information leads into: Y9 – Plants and photosynthesis Y11 – Ecology	Independent research or case study on an organism detailing how it is being impacted by it's environment. Construct pyramids of biomass and be able to explain the design. Investigate the impact of habitat conditions on the growth of plants. (e.g. drought, flooding, acid rain etc)
SMSC & British Values	British values in science Moral viewpoint on protecting the range of biodiversity across our planet and ensuring that organisms do not become extinct due to the impact of Humans on ecosystems						
Cultural Capital	Diversity of flora & fauna in the UK Migratory birds and insects that now visit the UK due to global warming. Balance between producing sufficient food (and habitats) to sustain he World's population without causing the extinction of other organisms Impact of Human activity on the natural world Are we investigating the possibility of being able to live on the Moon/Mars etc purely because our own planet is being destroyed and can no longer support us?						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

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Ten	**Resources from Earth**	The order of metals and carbon in the reactivity series The use of carbon in obtaining metals from metal oxides Combustion, thermal decomposition, oxidation and displacement reactions Chemical symbols and formulae for elements and compounds Representing chemical reactions using formulae and using equations Properties of ceramics, polymers and composites (qualitative).	**Practical Skills:** • Using a thermometer • Measuring accurately using a stop clock • Measuring volumes accurately using a measuring cylinder • Identifying equipment • Following a method • Carrying out practical work safely **Scientific skills**: • Focus on identifying variables. • Carrying out a fair test	Ores - Some students may think of ores simply as rocks and minerals. Thermal decomposition - Students may be unaware that not all metal carbonates can be thermally decomposed easily. They may believe that compounds with similar groups behave in the same way. Displacement – Students may think that all metals react in the same way and have difficulty with the idea that some are more reactive than others. Catalysts - Many students will automatically think of a catalyst as a reactant and that it is used up during a chemical reaction. Ceramics, polymers and composites - Students are likely to think that all these materials are human-made	This topic builds on the elements and the periodic table unit where students have experience of: The difference between atoms, elements and compounds Using symbols to represent elements Using models/diagrams to represent the atoms during a chemical reaction This topic builds on a previous Y8 topic understanding chemical reactions, where students have experience of: Complete and Incomplete combustion Oxidation and word equations Investigating carbonates Conservation of mass	This information leads into: Y10 – Chemical Changes Y10 – Earth's atmosphere Y11 – Using resources	Construction of balanced symbol equations Justification of equipment choice during practical work Construction of risk assessments Analysing and evaluating practical methods to suggest improvements. Study of the structure and function of monomers and the corresponding polymers that they form via chemical reactions .

					Explaining changes + symbol equations		
SMSC & British Values	British values in science **Community –** working collaboratively to complete practical tasks Moral obligation to ensure that the resources that we use from the Earth are sustainable (i.e. that we have enough for our own use, but leave sufficient for future generations)						
Cultural Capital	The impact of human activity on the climate - with particular regard to the production of carbon dioxide gas during industrial processes. Earth as a source of limited resources and the need for everyone to play their part in reduce, reuse & recycle schemes						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						
Topic	**Unit title**	**Key knowledge/ Content to learn and retain**	**Essential skills to acquire (subject & generic)**	**Anticipated misconceptions**	**Links to previous KS**	**Links to future KS**	**Opportunity for stretch for high prior attainers**
Eleven	**Electricity**	Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects The idea of electric field, forces acting across the space between objects not in contact. Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference to current	**Practical skills** • Carrying out observations • Making circuits – using various pieces of equipment e.g. voltmeter, ammeter etc **Scientific skills** • Writing conclusions • Recording measurements e.g. current in a circuit • Using models to explain abstract ideas e.g. current in a circuit • Identifying trends and relationships e.g. Resistance= Voltage/ Current • Plotting a line graph • Using mathematical formula	Voltage and current are the same thing. Voltage and current get used up by the circuit	From KS2, students should know the following: Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches Use recognised symbols when representing a simple circuit in a diagram.	This information leads into: Y9 – Energy Y10 – Electricity Y10 – Electrolysis	Opportunity for the rearrangement of an equation to identify an unknown quantity. Students will practice the art of converting values into the standard units that are required for calculations in physics. Introduction to the use of standard form

		Differences in resistance between conducting and insulating components.					
SMSC & British Values	British values in science **Community –** working collaboratively to complete practical tasks Social aspects of not all homes having electricity or being able to afford energy/heating costs						
Cultural Capital	The ubiquity of electricity means that problems can be framed in a variety of familiar and unfamiliar context The safety aspects of electricity use in the home In the current climate the production of sufficient electricity, across the globe, to meet customer demand						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						
Topic	**Unit title**	**Key knowledge/ Content to learn and retain**	**Essential skills to acquire (subject & generic)**	**Anticipated misconceptions**	**Links to previous KS**	**Links to future KS**	**Opportunity for stretch for high prior attainers**
Twelve	**Earth Science & Geology**	The composition of the Earth The structure of the Earth The rock cycle and the formation of igneous, sedimentary and metamorphic rocks Earth as a source of limited resources and the efficacy of recycling The carbon cycle The composition of the atmosphere The production of carbon dioxide by human activity and the impact on climate	**Practical skills** • Carrying out detailed observations of rock samples using a hand lens • Following a method • Working safely **Scientific skills** • Carrying out observations • Taking measurements • Recording measurements in a table • Evaluating models for the structure of the Earth • Modelling of the rock cycle.	Carbon dioxide is the most abundant gas in the atmosphere. All intrusive rocks cooled more slowly than extrusive rocks, They may think that the greenhouse effect is caused entirely by humans, The Earth is indestructible; Natural resources are unlimited.	Students will have limited previous exposure to this topic other than learning about the Earth, fossils and the solar system in KS2.	This information leads into: Y9 – The periodic table Y19 Chemical changes Y10 – Earth's Atmosphere Y11 – Using resources Y11 – Ecology Y1 This unit also provides a basis level of understanding that is required for anyone who studies GCSE Geography	Use of multiple data sets to evaluate the impact of carbon dioxide on climate change. Model the production of sedimentary, metamorphic and igneous rocks using sugar. Generate a model of Pangaea and investigate how continental plates move. Investigate constructive and destructive plate margins Research project on the ocean floor

		The chemical properties of metal and non-metal oxides with respect to acidity					
SMSC & British Values	British values in science Moral viewpoint on protecting the range of biodiversity across our planet and ensuring that organisms do not become extinct due to the impact of Humans on ecosystems Social impact around the world of the effect that Humans are having on the climate. (litter, pollution of waterways, global warming etc)						
Cultural Capital	Awe and wonder of the science behind the planet upon which they live Opportunity to review some of the most recent press & social media stories about climate change and the impact of humans on the planet Global warming is a global problem requiring global solutions Impact on Humans of natural disasters – including tsunami, earthquake and volcanic eruptions Why do we know less about the ocean floor than we do about Mars?						
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

Topic	**Unit title**	**Key knowledge/ Content to learn and retain**	**Essential skills to acquire (subject & generic)**	**Anticipated misconceptions**	**Links to previous KS**	**Links to future KS**	**Opportunity for stretch for high prior attainers**
Thirteen	**Solar System & Beyond**	Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). Our Sun as a star, other stars in our galaxy, other galaxies. The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. The light year as a unit of astronomical distance. Other processes that involve energy transfer: changing	**Practical skills** • Using a force meter / Newton meter • Measuring mass using a balance • Measuring weight using scales • Measuring time to an appropriate degree of accuracy • Identifying equipment required • Following a method • Carrying out practical work safely **Scientific skills** • Carrying out a fair test • Drawing results tables • Concluding from results • Calculating averages • Calculating gravity and weight	Our Solar System is at the centre of the Universe. Seasonal changes are due to the varying distance of the Earth from the Sun. Only objects that are moving can have energy. Heavy objects fall faster than lighter objects. Gravity is linked to the Earth's rotation. If the force holding an object in circular motion is removed, the object will fly away at 180° to the force.	At key stage 2 students will have studied: The movement of the Earth and other planets relative to the sun in the solar system, The movement of the moon relative to the Earth To describe the sun, Earth and moon as approximately spherical bodies. They will also have used the idea of the Earth's	This information leads into: Y10 – Forces and interactions Y11 – Forces and motion	Opportunity for the rearrangement of an equation to identify an unknown quantity. Students will practice the art of converting values into the standard units that are required for calculations in physics. Introduction to the use of standard form and the concept of light years, in order to manage the huge distance values needed when considering the magnitude of the Universe

		motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. Energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change. Comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions. Using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes. Forces as pushes or pulls, arising from the interaction between two objects. Non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity.	• Calculating the acceleration of a falling object		rotation to explain day and night and the apparent movement of the sun across the sky, They will have recognised that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.		
SMSC & British Values	British values in science Spirituality – the magnitude comparison of a single individual V the Universe Historically changing viewpoints as a result of developing technologies (e.g Geocentric V Heliocentric solar system models) Light reaching us from distant Stars, commenced it's journey while dinosaurs were still alive on Earth						
Cultural Capital	Every culture in the world, and throughout time, has had some connection with the skies, the Sun and Astronomy Awe and wonder of the world and Universe around us Looking out at the universe allows students to gain a sense of scale, a sense of motion and a sense of regularity in what can appear a chaotic and unpredictable universe. The importance of the roles played by gravity and kinetic and gravitational potential energies is also highlighted.						

	By studying the solar system and universe, beyond our own planet, we can understand where we came from, where we are going, and how physics works under conditions which are impossible to recreate on Earth.
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.