Long Term Plan: Year 8 (Updated January 2023)

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

The programme for years 7 – 11 has staff teaching a single class, with rotating topics/subjects. There is varied order of topics for classes to allow for the rotation of practical equipment. Students will complete a biology, chemistry and then physics topic followed by an assessment. This process will then repeat again.
Staff are to use the **Curriculum Road Map** in the Science Drive to ensure that they rotate at the appropriate times.

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	Working cooperatively Working safely in a laboratory setting						
Cultural Capital	Scientist throughout history						
Career Link	Any science based career will utilise these skills						
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Two	**Forces 2**	Contact forces Investigate factors that affect the size of frictional or drag forces Pressure Investigate how pressure from your foot onto the ground varies with different footwear	Drawing and labelling forces Carrying out practical work Recording and interpreting results Drawing graphs and using these to generate conclusions Calculations for resultant forces and pressure	Students need to have a grasp of density to understand why objects float or sink – not because they are heavier or lighter	Basic forces will have been covered at KS2. This unit leads directly on from the Forces 1 topic covered in Y7	This information leads into the forces unit studied at GCSE	Effect of drag forces on moving objects Use of turning forces as leavers Pressure at depth under water Pressure used in hydraulics
SMSC & British Values	Working collaboratively Use of drag forces in sports and vehicles						
Cultural Capital	Variety of shoes from around the world & how they are designed for specific uses – include skis, snowshoes, shoes from history (e.g. China and the controversial historic foot binding)						
Career Link	This is a fundamental physics concept that links to many STEM career opportunities						
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	**Matter 2**	Periodic Table Sort elements using chemical data and relate this to their position in the periodic table Elements Compare the properties of elements with the properties of compounds formed from them	Use data to identify patterns/trends Accurately record observations from demonstrations and draw conclusions from these Use symbols to represent elements and use these to generate basic equations that represent a chemical reaction Draw accurate particle diagrams to represent elements, mixture and compounds Be able to compare and contrast – with justification	Element is the simplest particle	Students should know examples of solids, liquids and gases from KS2 and should be able to explain these in terms of particle location This unit leads directly on from the matter 1 topic covered in Y7	This information leads into atomic structure and periodic table unit studied at GCSE	Use provided data on elements to establish patterns & anomalies Describe and explain the properties of ceramics and composites
SMSC & British	Opportunity to look at the British manufacturing industry Environmental impact of obtaining raw materials and processing materials						

Values	
Cultural Capital	Investigate/research the design and use of nanoparticles, biodegradable plastics, thermochromic materials, alloys etc
Career Link	This is a fundamental chemistry concept that links to many STEM career opportunities

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Four	**Organisms 2**	Breathing Investigate a claim linking height to lung volume Digestion Evaluate how well a model represents the key features of the digestive system	Draw and label accurate scientific diagrams Generate a model lung and use it to support an explanation on pressure changes Investigate how food is processed as it passes through the digestive system Use of data to analyse healthy diets	Gas exchange and respiration are the same thing	At KS2 students will have learnt about the human body and the basics of keeping it healthy This unit leads directly on from the organisms 1 topic covered in Y7	This information leads into the organisation unit studied at GCSE	Predict how an issue with the gas exchange system could affect other processes in the body Design a diet for a person with a specific requirement How is gut health linked to mental health?
SMSC & British Values	Impact on health of smoking, asthma & exercise What constitutes a healthy diet and how much is a portion of each food type? Challenge – can you eat 30 (or more) different types of plant material in a week?						
Cultural Capital	Which is worse – smoking cigarettes or vaping? Why everyone should switch to a vegan or vegetarian diet						
Career Link	This is a fundamental biology concept that links to many STEM career opportunities						

Following a full curriculum review, the programme of study for year 8 has been revised and updated. From January 2023 all students in year 8 will follow our newly designed scheme of learning.

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

Five	**Acids & Alkalis**	Representing chemical reactions using formulae and using equations Defining acids and alkalis in terms of neutralisation reactions The pH scale for measuring acidity/alkalinity; and indicators Reactions of acids with metals to produce a salt plus hydrogen Reactions of acids with alkalis to produce a salt plus water	**Practical skills** 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 **Scientific skills** Carrying out observations Analysing and evaluating Recording observations in a table Skills lesson focusing on calculating average and rate of reaction Making conclusions Drawing a graph	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 topic builds directly into the AQA Chemical Changes and Rates of Reaction Topics that students will encounter in year 10	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	**Community –** working collaboratively to complete practical tasks						
Cultural Capital	Experience "being a scientist" and developing their working scientifically skills.						
Career Link	Research & Development work in Laboratories Quality Assurance Processes in the Manufacturing, Pharmaceutical or Food Industry Water Agencies Hair Colourist or Beauty Technician						

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Six	**Human Lifestyle & Health**	Content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals,	**Practical skills** • Using a Bunsen Burner	A diet is made up of all the food and drink that a person takes in. It does	In Key Stage 2, students will have learned about the basic needs of animals, including	This unit links to other units that are delivered in year 7 and year 8 including "Cells,	Students will practice the art of converting values into the standard units that are required

		dietary fibre and water, and why each is needed Calculations of energy requirements in a healthy daily diet for different people Comparing energy values of different foods (from labels) (kJ) The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases The impact of exercise, asthma and smoking on the human gas exchange system The effects of recreational drugs (including substance misuse) on behaviour, health and life processes.	• Measuring accurately using a stop clock • Measuring volumes accurately using a measuring cylinder • Identifying equipment • Following a method • Carrying out practical work safely **<u>Scientific skills</u>**: • Drawing Conclusions from graphs • Analysing data and drawing conclusions	not refer to 'being on a diet' to lose weight, for example. A food group is a set of foods that share similar nutritional properties. A common approach is to group foods as carbohydrates, proteins, fats, vitamins, minerals, fibre and water. A healthy diet includes all the food groups. An 'eatwell plate' gives an indication of the relative proportions of each required. The amount of energy needed from food varies with age, gender and activity. When working out how to meet energy requirements, data about the food groups and the nutrients needs to be looked at to ensure a balanced diet and to avoid deficiency diseases. Water is not a food or a food group Foods are made up of only one food group. We only need energy when we are moving. Obesity is linked only with overeating. Hunger and starvation are the same things.	humans, for survival (water, food and air), and the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. They will have identified that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. They will have recognised the impact of diet, exercise, drugs and lifestyle on the way their bodies function, and described the ways in which nutrients and water are transported within animals, including humans.	organs and Systems" and "How organisms get Energy. The content of this topic directly relates to the AQA units on Organisation and Infection & Response.	for calculations in science. Use of multiple graph and data formats from which to draw conclusions. Independent research projects on various drugs – potential for small group work & presentations here. Designing a diet and lifestyle that could be promoted to their peers

				Obese people cannot be deficient. Malnutrition does not occur in developed countries. Eating is the same as digestion All microbes cause disease. Microbes cannot make useful products. All drugs are illegal. All drugs are bad for us. You will not be charged by the police for possessing drugs for your own use. Overcoming addiction requires only willpower. If recovery from addiction has failed in the past, it will never work. Everyone who smokes will get cancer. Non-smokers cannot be harmed by smoking. Smoking cannabis is not as harmful as smoking cigarettes. Cannabis isn't addictive. Only alcoholics damage their bodies with alcohol. All diseases are infectious. All diseases show symptoms.			
SMSC & British Values	**Social impact** of addiction, use of drugs and obesity (viewed as impact on the individual, families, communities and health services) Social impact of UK recession on the ability for families to obtain sufficient food and what we as a community can do to support these families Moral obligation to ensure that everyone across the world has sufficient food and access to clean drinking water Community – working collaboratively on practical tasks						
Cultural Capital	Impact of pandemics on global health and methods of preventing these from occurring						

Career Link	Dietician or nutritionist Caterer or chef Nurse Doctor Counsellor Personal Trainer Food Technology Medical nutrition therapy Community education officer World Health Organisation

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Seven	**Sound & Hearing**	Experimental skills and investigations Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions Frequencies of sound waves, measured in Hertz (Hz), echoes, reflection and absorption of sound	**<u>Practical Skills</u>**: • Observing demo of an Oscilloscope • Identifying equipment • Observing demo of a Bell Jar **<u>Scientific Skills:</u>** • Analysing Secondary Data to make comparisons • 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.	The content delivered in this topic will lead directly into the Light, images and Waves topic which features in year 8 . The AQA units of Waves (which includes EM waves) builds on the fundamental knowledge gained in this unit. Aspects of wave travel is also studied in the year 11 topic of Space.	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

		Sounds need a medium to travel, the speed of sound in air, water and solids Sound produced by vibrations of objects in loudspeakers detected by their effects on microphone diaphragm and the ear drum. Sound waves are longitudinal Auditory range of humans and animals Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone.					
SMSC & British Values	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	Physiotherapist Sound technician Musician or music producer Composer Game & Audio designer Audio Broadcaster Fishing Industry Marine navigator Environmental Scientist Oceanographer Mining & Oil exploration Seismologist Electronic Engineering Medical Imaging						

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Eight	**Light, Images & Waves**	Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. The similarities and differences between light waves and waves in matter. Light waves travelling through a vacuum; speed of light. The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.	**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 a fair test • 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 topic build directly into the AQA Waves Topic that students will encounter in Year 11. Students will also use the concept of energy transfer by light in the year 9 Energy Topic. Students will also encounter the human eye in the AQA Homeostasis & Response Topic Aspects of waves also appear in the AQA Space topic	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
SMSC & British Values	**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	Art & Photography Optician or Optometrist Lighting Technician – stage or screen Medical Imaging Research Navigation Systems – Fishery industry or Naval Industry Lighting Designer Communications – intra/extra planetary Energy Research & Transportation

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Nine	**Variation & Classification**	The differences between species The variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection	**<u>Practical Skills:</u>** • Measuring each other's height using meter rulers • Collecting data on eye colour and recording these results **<u>Scientific Skills:</u>** • 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 • 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	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 that Catholics are forbidden to believe in it.	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 about living things that inhabited the Earth millions of years ago	The subject knowledge development work undertaken in this unit build directly into the AQA topics on Inheritance, Variation & Evolution and Ecology Students will investigate further the idea of how variation occurs when they move onto the Cell Biology unit in year 9	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

			• Using evidence to explain ideas		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	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	Geneticist Zoologist Botanist Environmentalist or Climate Change researcher Clinical Research Biotechnologist Agriculture, Fisheries & Farming Development Medical Research on Genetic Disorders STEM Cell Research or Human Genome Project						
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Ten	**Metals & Materials**	The order of metals and carbon in the reactivity series The use of carbon in obtaining metals from metal oxides	**<u>Practical Skills:</u>** • Using a thermometer • Measuring accurately using a stop clock	Ores - Some students may think of ores simply as rocks and minerals. Thermal decomposition - Students may be unaware	This topic builds on the elements and the periodic table unit where students have experience of:	The content from this topic links directly to the AQA Chemistry topics of Chemical Changes (studied in year 10) as well as	Construction of balanced symbol equations Justification of equipment choice during

		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).	• Measuring volumes accurately using a measuring cylinder • Identifying equipment • Following a method • Carrying out practical work safely **<u>Scientific skills</u>**: • Focus on identifying variables. • Carrying out a fair test	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. 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. Catalysts - Many students will automatically think of a catalyst as a reactant and that it is used up during a chemical reaction.	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 Explaining changes + symbol equations	Atmosphere and Using Resources that feature in the year 11 programme of study.	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 .

				Ceramics, polymers and composites - Students are likely to think that all these materials are human-made			
SMSC & British Values	**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	Geologists Metallurgist Potters Material & Composite Research Industrial Chemist Manufacture of Metals from Raw materials Environmental Scientist Engineering Building Materials of the Future Recycling Schemes Welder or Fabricator Model Maker, carpenter, machinist						
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Eleven	**Ecosystems & Biodiversity**	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,	**<u>Practical Skills:</u>** Using a range of tools to model different bird beaks to demonstrate adaptations and niches **<u>Scientific Skills:</u>** • Identifying a range of living organisms within local habitats • Constructing food chains and food webs, and using these to explain the interdependence of organisms	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	This topic directly links with the AQA the Ecology topic and the topic on Inheritance, Variation and Evolution topic that are both studied in year 11.	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

		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.	• 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		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.		rain etc)
SMSC & British Values	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	Geneticist Zoologist Botanist Environmentalist or Climate Change researcher Clinical Research Biotechnologist Agriculture, Fisheries & Farming Development						
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	**<u>Practical skills</u>** • Carrying out detailed observations of rock samples using a hand lens • Following a method	Carbon dioxide is the most abundant gas in the atmosphere.	Students will have limited previous exposure to this topic other than learning about the Earth, fossils	This topic provides a basis on which students can apply their understanding to several future units	Use of multiple data sets to evaluate the impact of carbon dioxide on climate change.

		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 The chemical properties of metal and non-metal oxides with respect to acidity	• Working safely **<u>Scientific skills</u>** • Carrying out observations • Taking measurements • Recording measurements in a table • Evaluating models for the structure of the Earth • Modelling of the rock cycle.	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.	and the solar system in KS2.	including: AQA Ecology Topic studied in year 11, Atmosphere and Using Resources – both Chemistry units are completed in year 11 Properties of metals and non-metals leads into the Periodic Table unit that is studied in year 9 while acidity links closely with a year 10 topic on chemical changes. This unit also provides a basis level of understanding that is required for anyone who studies GCSE Geography	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
SMSC & British Values	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	Geologists Metallurgist Industrial Chemist Manufacture of Metals from Raw materials Environmental Scientist or Activist Building Materials of the Future Recycling Schemes Model Maker, carpenter, machinist						
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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 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.	**<u>Practical skills</u>** • 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 **<u>Scientific skills</u>** • Carrying out a fair test • Drawing results tables • Concluding from results • Calculating averages • Calculating gravity and weight • Calculating the acceleration of a falling object	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 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.	The contents of this unit lead into the AQA Forces unit that is studied in year 10 and is of course a direct link to the Space unit that is delivered in year 11. The energy aspects of the unit provide building steps for the Energy topic that students meet in year 9 as well as the AQA Organisation unit in year 10 and Atmosphere unit in year 11.	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

		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.					
SMSC & British Values	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	Astrophysics Astronomy SETI Astronaut NASA Communications Industry Atmospheric Scientists Plasma Physicists Engineers Photographers Avionics Technicians						

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**
Fourteen	**Electrical Circuits**	Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects	**<u>Practical skills</u>** • Carrying out observations • Making circuits – using various pieces of equipment e.g. voltmeter, ammeter etc • Plotting magnetic field lines • Making a compass	All metals are magnetic. An object cannot lose or gain magnetism.	From KS2, students should know the following: Associate the brightness of a lamp or the volume of a buzzer with the	This topic provides the building blocks of knowledge that lead directly into the AQA Electricity Unit which is studied in year 10 and the Magnetism	Opportunity for the rearrangement of an equation to identify an unknown quantity. Students will practice the art of converting

		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 Differences in resistance between conducting and insulating components. Magnetic poles, attraction and repulsion Magnetic fields by plotting with compass, representation by field lines Earth's magnetism, compass and navigation The magnetic effect of a current, electromagnets, D.C. motors Comparing power ratings of appliances in watts (W, kW) Comparing amounts of energy transferred (J, kJ, kW hour) Domestic fuel bills, fuel use and costs	• Making an electromagnet • Making a motor **<u>Scientific skills</u>** • 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	The strength of a magnet is related to its size. The Earth is a very strong magnet. The Earth's gravity and magnetism are the same. Voltage and current are the same thing. Voltage and current get used up by the circuit	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.	Unit that is taught in year 11. The aspects of energy transfer are revisited in the Energy topic that students will meet in year 9.	values into the standard units that are required for calculations in physics. Introduction to the use of standard form Designing energy efficient homes and offices in order to reduce energy costs for the bill payer
SMSC & British Values	**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	Value of energy and domestic fuel bills – how to make your household energy go further
Career Link	Electrician Electrical Engineer Domestic Heating & Electrical Supplies Renewable Energy Resources Metallurgist Civil Engineer Robotics Engineer Computer Engineer – particularly computer data storage sector Geomagnetist

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
Fifteen	**How Organisms Get Energy**	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 The adaptations of leaves for photosynthesis including the role of the stomata. The role of leaf stomata in gas exchange in plants.	**<u>Practical Skills</u>** • Using scientific equipment e.g., Microscope, testing for starch, • Following a method • Carrying out practical work safely **<u>Scientific skills</u>** • 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.	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:	The contents of this topic are built upon when the students encounter the Organisation topic in year 9 and the AQA units of Bioenergetics in year 10 and Ecology in year 11.	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 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 The process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration The differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism.		Guard cells close when they fill with water. Plants do not respire. 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.	roots, stem/trunk, leaves and flowers Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant Investigate the way in which water is transported within plants Describe the ways in which nutrients and water are transported within animals, including humans.		
SMSC & British Values	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	Microbrewers Sports Scientists Agricultural Research						

	Microbiologist Biomedical Science Food Technologist Clinical Research Water Quality Scientist Pharmacologist Botanist