Curriculum Plan – (Science)

Called as God's family,
we strive to achieve our personal best,
by living and learning in Christ.

Department Mission Statement:
The science department is passionate in its mission to empower every student with the appropriate knowledge and skills needed to become scientifically literate, and technologically capable problem solvers. We aim to guide and encourage students along their learning journey to becoming informed individuals who are well versed in the methods and ideas of science. At the end of their learning journey students will use scientific reasoning and thinking skills to problem solve, communicate effectively, work cooperatively and use technology to work towards the goals of becoming lifelong learners and functioning in a global environment. This will enable them to leave school being able to make an invaluable contribution in so many ways to society and the world.

Key Stage 2

Knowledge Gained	**Skills Developed**
(National Curriculum Guidance and SNOMAC Collaboration Used) Living things and their habitats Pupils should be taught to: • describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird • describe the life process of reproduction in some plants and animals • 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 • give reasons for classifying plants and animals based on specific characteristics	(National Curriculum Guidance and SNOMAC Collaboration Used) Working scientifically During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

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Animals, including humans • describe the changes as humans develop to old age • identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • describe the ways in which nutrients and water are transported within animals, including humans Evolution and inheritance • recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution Properties and changes of materials • compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating	• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs • using test results to make predictions to set up further comparative and fair tests • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support or refute ideas or arguments .

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• give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • demonstrate that dissolving, mixing and changes of state are reversible changes • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda Light • recognise that light appears to travel in straight lines • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them • 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 Earth and space • describe the movement of the Earth and other planets relative to the sun in the solar system • describe the movement of the moon relative to the Earth • describe the sun, Earth and moon as approximately spherical bodies • use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky	

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Forces • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	

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Key Stage 3 Knowledge and Skills Requirement

Knowledge To Be Built	Skills To Be Developed
Biology Pupils should be taught about: **<u>Structure and function of living organisms</u>** **Cells and organisation** • cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope • the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts • the similarities and differences between plant and animal cells • the role of diffusion in the movement of materials in and between cells • the structural adaptations of some unicellular organisms • the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms **The skeletal and muscular systems** • the structure and functions of the human skeleton, to include support, protection, movement and making blood cells • biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles • the function of muscles and examples of antagonistic muscles	Through the content across all three disciplines, pupils should be taught to: **Scientific attitudes** • pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility • understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review • evaluate risks **Experimental skills and investigations** • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience • make predictions using scientific knowledge and understanding • select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables

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Nutrition and digestion • the content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed • calculations of energy requirements in a healthy daily diet • the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) • the importance of bacteria in the human digestive system • plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots **Gas exchange systems** • the structure and functions of the gas exchange system in humans, including adaptations to function • the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume • the impact of exercise, asthma and smoking on the human gas exchange system • the role of leaf stomata in gas exchange in plants **Reproduction** • reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta	• use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety • make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements • apply sampling techniques **Analysis and evaluation** • apply mathematical concepts and calculate results • present observations and data using appropriate methods, including tables and graphs • interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions • present reasoned explanations, including explaining data in relation to predictions and hypotheses • evaluate data, showing awareness of potential sources of random and systematic error • identify further questions arising from their results **Measurement** • understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature • use and derive simple equations and carry out appropriate calculations

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• reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms **Health** • the effects of recreational drugs (including substance misuse) on behaviour, health and life processes **<u>Material cycles and energy</u>** **Photosynthesis** • 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 **Cellular 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 • 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 **<u>Interactions and interdependencies</u>**	• undertake basic data analysis including simple statistical techniques

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Relationships in an ecosystem • 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 **<u>Genetics and evolution</u>** **Inheritance, chromosomes, DNA and genes** • heredity as the process by which genetic information is transmitted from one generation to the next • a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model • 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 meaning some organisms compete more successfully, which can drive natural selection • changes in the environment which 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 Chemistry	

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Pupils should be taught about: **The particulate nature of matter** • the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure • changes of state in terms of the particle model **Atoms, elements and compounds** • a simple (Dalton) atomic model • differences between atoms, elements and compounds • chemical symbols and formulae for elements and compounds • conservation of mass changes of state and chemical reactions **Pure and impure substances** • the concept of a pure substance • mixtures, including dissolving • diffusion in terms of the particle model • simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography • the identification of pure substances **Chemical reactions** • chemical reactions as the rearrangement of atoms • representing chemical reactions using formulae and using equations • combustion, thermal decomposition, oxidation and displacement reactions • 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	

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• reactions of acids with alkalis to produce a salt plus water • what catalysts do **Energetics** • energy changes on changes of state (qualitative) • exothermic and endothermic chemical reactions (qualitative) **The periodic table** • the varying physical and chemical properties of different elements • the principles underpinning the Mendeleev periodic table • the periodic table: periods and groups; metals and non-metals • how patterns in reactions can be predicted with reference to the periodic table • the properties of metals and non-metals • the chemical properties of metal and non-metal oxides with respect to acidity **Materials** • the order of metals and carbon in the reactivity series • the use of carbon in obtaining metals from metal oxides • properties of ceramics, polymers and composites (qualitative) **Earth and atmosphere** • 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 composition of the atmosphere • the production of carbon dioxide by human activity and the impact on climate Physics	

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Pupils should be taught about: **<u>Energy</u>** **Calculation of fuel uses and costs in the domestic context** • comparing energy values of different foods (from labels) (kJ) • 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 • fuels and energy resources **Energy changes and transfers** • simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged • heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators • other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels **Changes in systems** • 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	

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• using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes **<u>Motion and forces</u>** **Describing motion** • speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) • the representation of a journey on a distance-time graph • relative motion: trains and cars passing one another **Forces** • forces as pushes or pulls, arising from the interaction between 2 objects • using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces • moment as the turning effect of a force • forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water • forces measured in newtons, measurements of stretch or compression as force is changed • force-extension linear relation; Hooke's Law as a special case • work done and energy changes on deformation • non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets, and forces due to static electricity **Pressure in fluids** • atmospheric pressure, decreases with increase of height as weight of air above decreases with height • pressure in liquids, increasing with depth; upthrust effects, floating and sinking	

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• pressure measured by ratio of force over area – acting normal to any surface **Balanced forces** • opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface **Forces and motion** • forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • change depending on direction of force and its size **<u>Waves</u>** **Observed waves** • waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition **Sound waves** • frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound • sound needs a medium to travel, the speed of sound in air, in water, in solids • sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • the auditory range of humans and animals **Energy and waves**	

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• pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound; waves transferring information for conversion to electrical signals by microphone **Light waves** • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light • the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface • use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye • light transferring energy from source to absorber, leading to chemical and electrical effects; photosensitive 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 **<u>Electricity and electromagnetism</u>** **Current electricity** • electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • differences in resistance between conducting and insulating components (quantitative) **Static electricity** • separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects	

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• the idea of electric field, forces acting across the space between objects not in contact **Magnetism** • 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, DC motors (principles only) **<u>Matter</u>** **Physical changes** • conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving • similarities and differences, including density differences, between solids, liquids and gases • Brownian motion in gases • diffusion in liquids and gases driven by differences in concentration • the difference between chemical and physical changes **Particle model** • the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density; the anomaly of ice-water transition • atoms and molecules as particles **Energy in matter** • changes with temperature in motion and spacing of particles	

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• internal energy stored in materials **Space physics** • 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	

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Key Stage 4 Knowledge and Skills Requirement

Knowledge To Be Built	Skills To Be Developed
BIOLOGY **Cell biology** • cells as the basic structural unit of all organisms; adaptations of cells related to their functions; the main sub-cellular structures of eukaryotic and prokaryotic cells • stem cells in animals and meristems in plants • enzymes • factors affecting the rate of enzymatic reactions • the importance of cellular respiration; the processes of aerobic and anaerobic respiration • carbohydrates, proteins, nucleic acids and lipids as key biological molecules **Transport systems** • the need for transport systems in multicellular organisms, including plants • the relationship between the structure and functions of the human circulatory system **Health, disease and the development of medicines** • the relationship between health and disease • communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) • non-communicable diseases • bacteria, viruses and fungi as pathogens in animals and plants • body defences against pathogens and the role of the immune system against disease • reducing and preventing the spread of infectious diseases in animals and plants • the process of discovery and development of new medicines • the impact of lifestyle factors on the incidence of non-communicable diseases	**1. The development of scientific thinking common to all three subjects.** • the ways in which scientific methods and theories develop over time • using a variety of concepts and models to develop scientific explanations and understanding • appreciating the power and limitations of science and considering ethical issues which may arise • explaining everyday and technological applications of science; evaluating associated personal, social, economic and environmental implications; and making decisions based on the evaluation of evidence and arguments • evaluating risks both in practical science and the wider societal context, including perception of risk • recognising the importance of peer review of results and of communication of results to a range of audiences **2. Experimental skills and strategies** • using scientific theories and explanations to develop hypotheses

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Coordination and control

- principles of nervous coordination and control in humans
- the relationship between the structure and function of the human nervous system
- the relationship between structure and function in a reflex arc
- principles of hormonal coordination and control in humans
- hormones in human reproduction, hormonal and non-hormonal methods of contraception
- homeostasis

Photosynthesis

- photosynthesis as the key process for food production and therefore biomass for life
- the process of photosynthesis
- factors affecting the rate of photosynthesis

Ecosystems

- levels of organisation within an ecosystem
- some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community
- how materials cycle through abiotic and biotic components of ecosystems
- the role of microorganisms (decomposers) in the cycling of materials through an ecosystem
- organisms are interdependent and are adapted to their environment
- the importance of biodiversity
- methods of identifying species and measuring distribution, frequency and abundance of species within a habitat
- positive and negative human interactions with ecosystems

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

3. Analysis and evaluation

- applying the cycle of collecting, presenting and analysing data, including:
  - presenting observations and other data using appropriate methods
  - translating data from one form to another
  - carrying out and representing mathematical and statistical analysis
  - representing distributions of results and making estimations of uncertainty

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Evolution, inheritance and variation

- the genome as the entire genetic material of an organism
- how the genome, and its interaction with the environment, influence the development of the phenotype of an organism
- the potential impact of genomics on medicine
- most phenotypic features being the result of multiple, rather than single, genes
- single gene inheritance and single gene crosses with dominant and recessive phenotypes
- sex determination in humans
- genetic variation in populations of a species
- the process of natural selection leading to evolution
- the evidence for evolution
- developments in biology affecting classification
- the importance of selective breeding of plants and animals in agriculture
- the uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology

- interpreting observations and other data, including identifying patterns and trends, making inferences and drawing conclusions
- presenting reasoned explanations, including relating data to hypotheses
- being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error

- communicating the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations

4. Vocabulary, units, symbols and nomenclature

- developing their use of scientific vocabulary and nomenclature
- recognising the importance of scientific quantities and understanding how they are determined
- using SI units and IUPAC chemical nomenclature unless inappropriate
- using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano)
- interconverting units
- using an appropriate number of significant figures in calculations

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CHEMISTRY **Atomic structure and the Periodic Table** • a simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes • the number of particles in a given mass of a substance • the modern Periodic Table, showing elements arranged in order of atomic number • position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons • properties and trends in properties of elements in the same group • characteristic properties of metals and non-metals • chemical reactivity of elements in relation to their position in the Periodic Table **Structure, bonding and the properties of matter** • changes of state of matter in terms of particle kinetics, energy transfers and the relative strength of chemical bonds and intermolecular forces • types of chemical bonding: ionic, covalent, and metallic • bulk properties of materials related to bonding and intermolecular forces • bonding of carbon leading to the vast array of natural and synthetic organic compounds that occur due to the ability of carbon to form families of similar compounds, chains and rings • structures, bonding and properties of diamond, graphite, fullerenes and graphene **Chemical changes** • determination of empirical formulae from the ratio of atoms of different kinds • balanced chemical equations, ionic equations and state symbols	

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• identification of common gases • the chemistry of acids; reactions with some metals and carbonates • pH as a measure of hydrogen ion concentration and its numerical scale • electrolysis of molten ionic liquids and aqueous ionic solutions • reduction and oxidation in terms of loss or gain of oxygen. **Energy changes in chemistry** • Measurement of energy changes in chemical reactions (qualitative) • Bond breaking, bond making, activation energy and reaction profiles (qualitative) **Rate and extent of chemical change** • factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst • factors affecting reversible reactions **Chemical analysis** • distinguishing between pure and impure substances • separation techniques for mixtures of substances: filtration, crystallisation, chromatography, simple and fractional distillation • quantitative interpretation of balanced equations • concentrations of solutions in relation to mass of solute and volume of solvent **Chemical and allied industries** • life cycle assessment and recycling to assess environmental impacts associated with all the stages of a product's life • the viability of recycling of certain materials	

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• carbon compounds, both as fuels and feedstock, and the competing demands for limited resources • fractional distillation of crude oil and cracking to make more useful materials • extraction and purification of metals related to the position of carbon in a reactivity series **Earth and atmospheric science** • evidence for composition and evolution of the Earth's atmosphere since its formation • evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change • potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate • common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources • the Earth's water resources and obtaining potable water	
PHYSICS **Energy** • energy changes in a system involving heating, doing work using forces, or doing work using an electric current: calculating the stored energies and energy changes involved • power as the rate of transfer of energy • conservation of energy in a closed system, dissipation • calculating energy efficiency for any energy transfers • renewable and non-renewable energy sources used on Earth, changes in how these are used **Forces** • forces and fields: electrostatic, magnetic, gravity • forces as vectors	

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• calculating work done as force x distance; elastic and inelastic stretching • pressure in fluids acts in all directions: variation in Earth's atmosphere with height, with depth for liquids, up-thrust force (qualitative) **Forces and motion** • speed of sound, estimating speeds and accelerations in everyday contexts • interpreting quantitatively graphs of distance, time, and speed • acceleration caused by forces; Newton's First Law • weight and gravitational field strength • decelerations and braking distances involved on roads, safety **Wave motion** • amplitude, wavelength, frequency, relating velocity to frequency and wavelength • transverse and longitudinal waves • electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays • velocities differing between media: absorption, reflection, refraction effects • production and detection, by electrical circuits, or by changes in atoms and nuclei • uses in the radio, microwave, infra-red, visible, ultra-violet, X-ray and gamma-ray regions, hazardous effects on bodily tissues **Electricity** • measuring resistance using p.d. and current measurements • exploring current, resistance and voltage relationships for different circuit elements; including their graphical representations • quantity of charge flowing as the product of current and time	

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• drawing circuit diagrams; exploring equivalent resistance for resistors in series • the domestic a.c. supply; live, neutral and earth mains wires, safety measures • power transfer related to p.d. and current, or current and resistance **Magnetism and electromagnetism** • exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass • magnetic effects of currents, how solenoids enhance the effect • how transformers are used in the national grid and the reasons for their use **The structure of matter** • relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities • melting, evaporation, and sublimation as reversible changes • calculating energy changes involved on heating, using specific heat capacity; and those involved in changes of state, using specific latent heat • links between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative) **Atomic structure** • the nuclear model and its development in the light of changing evidence • masses and sizes of nuclei, atoms and small molecules • differences in numbers of protons, and neutrons related to masses and identities of nuclei, isotope characteristics and equations to represent changes • ionisation; absorption or emission of radiation related to changes in electron orbits • radioactive nuclei: emission of alpha or beta particles, neutrons, or gamma-rays, related to changes in the nuclear mass and/or charge	

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• radioactive materials, half-life, irradiation, contamination and their associated hazardous effects, waste disposal • nuclear fission, nuclear fusion and our sun's energy **Space physics** • the main features of the solar system.	

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Key Stage 5 Knowledge and Skills Requirement

Knowledge To Be Built	Skills To Be Developed
APPLIED SCIENCE CONTENT TO BE COVERED <u>Certificate</u> ASC 1 Key Concepts in Science ASC 2 Applied Experimental Techniques ASC 3 Science in the Modern World <u>Extended Certificate</u> ASC 4 The Human Body ASC 5 Investigating Science ASC 6c Organic Chemistry	The skills developed are similar to A level Biology Chemistry and Physics apart from. ASC2 - the scientific basis of a range of analytical and experimental techniques - the use of standard procedures to ensure that the results of analysis can be replicated - the production and application of risk assessments - how to analyse errors quantitatively and use this analysis to determine whether experimental results are within tolerance of theoretical or expected values - correct recording of observations made and data obtained - how to analyse results and complete relevant calculations - how to apply graphical skills correctly and accurately - how to draw conclusions, complete error analyses and evaluations. ASC 3 - analyse and evaluate scientific information - develop critical thinking skills - understand the use of the media to communicate scientific ideas and theories. - be able to make balanced judgements on scientific issues - data manipulation and interpretation - summarising skills, when working with a range of sources ASC 4 - practical skills associated with biological sciences and their application to the human body ASC 5 - use secondary sources to research a scientific topic and develop an outline for the practical investigation

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	- plan the practical investigation and justify the approaches suggested - prepare risk assessments and carry out the practical investigation - record data in an appropriate format - analyse data to draw conclusions - evaluate the techniques used and the outcomes achieved - produce a scientific report on their investigation - prepare a presentation of their investigation for an appropriate audience. ASC 6c - following standard procedures - applying practical techniques - using safely a range of practical equipment and materials including hazard identification and risk assessment - making and recording observations and measurements - researching, referencing sources and producing reports (including evaluation of results and practical methodologies).
BIOLOGY CONTENT TO BE COVERED 3.1 Biological molecules 3.2 Cells 3.3. Organisms exchange substances with their environment 3.4 Genetic information, variation and relationships between organisms 3.5 Energy transfers in and between organisms (A-level only) 3.6 Organisms respond to changes in their internal and external environments (A-level only)	<u>Mathematical skills to be developed</u>. • Recognise and make use of appropriate units in calculation • Recognise and use expressions in decimal and standard form • Use ratios, fractions and percentages • Estimate results. • **Use calculators to find and use power, exponential and logarithmic functions (A level)** <u>Handling Data Skills</u> • Use an appropriate number of significant figures • Find arithmetic means • Construct and interpret frequency tables and diagrams, bar charts and histograms • Understand simple probability • Understand the principles of sampling as applied to scientific data. • Understand the terms mean, median and mode

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3.7 Genetics, populations, evolution and ecosystems (A-level only) 3.8 The control of gene expression (A-level only)	• Use a scatter diagram to identify a correlation between two variables • Make order of magnitude calculations • Select and use a statistical test • Understand measures of dispersion, including standard deviation and range • Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined • Change the subject of an equation • Substitute numerical values into algebraic equations using appropriate units for physical quantities • Solve algebraic equations • Use logarithms in relation to quantities that range over several orders of magnitude <u>Graph Skills</u> • Translate information between graphical, numerical and algebraic forms • Plot two variables from experimental or other data • Determine the intercept of a graph • Calculate rate of change from a graph showing a linear relationship • Draw and use the slope of a tangent to a curve as a measure of rate of change <u>Geometry and Trigonometric Skills</u> • Calculate the circumferences, surface areas and volumes of regular shapes <u>Use of Apparatus and Techniques</u> • use appropriate apparatus to record a range of quantitative measurements • use appropriate instrumentation to record quantitative measurements • use laboratory glassware apparatus for a variety of experimental techniques • use of light microscope at high power and low power • produce scientific drawing from observation with annotations • use qualitative reagents to identify biological molecules • separate biological compounds using thin layer/paper chromatography or electrophoresis

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	• safely and ethically use organisms • use microbiological aseptic techniques. • safely use instruments for dissection of an animal organ, or plant organ • use sampling techniques in fieldwork • use ICT such as computer modelling, or data logger to collect data, or use software to process data
CHEMISTRY CONTENT TO BE COVERED 3.1 Physical chemistry 3.1.1 Atomic structure 3.1.2 Amount of substance 3.1.3 Bonding 3.1.4 Energetics 3.1.5 Kinetics 3.1.6 Chemical equilibria 3.1.7 Oxidation, reduction and redox equations 3.1.8 Thermodynamics (A-level only) 3.1.9 Rate equations (A-level only) 3.1.10 Equilibrium constant Kp for homogeneous systems (A-level only) 3.1.11 Electrode potentials and electrochemical cells (A-level only) 3.1.12 Acids and bases (A-level only) 3.2 Inorganic chemistry 3.2.1 Periodicity 3.2.2 Group 2, the alkaline earth metals 3.2.3 Group 7(17), the halogens 3.2.4 Properties of Period 3 elements and their oxides (A-level only) 3.2.5 Transition metals (A-level only) 3.2.6 Reactions of ions in aqueous solution (A-level only) 3.3 Organic chemistry 3.3.1 Introduction to organic chemistry	skills developed are similar to A level Biology apart from. <u>Handling Data Skills</u> • No sampling techniques • No probability statistics <u>Geometry and Trigonometric Skills</u> • Use angles and shapes in regular 2D and 3D structures • Visualise and represent 2D and 3D forms including two-dimensional representations of 3D objects • Understand the symmetry of 2D and 3D shapes <u>Use of Apparatus and Techniques</u> • Use appropriate apparatus to record a range of measurement • Use water bath or electric heater or sand bath for heating • Measure pH using pH charts, or pH meter, or pH probe on a data logger • Use laboratory apparatus for a variety of experimental techniques • Use acid–base indicators in titrations of weak/strong acids with weak/strong alkali • Purify: • a solid product by recrystallisation • a liquid product, including use of separating funnel • Use melting point apparatus • Use thin-layer or paper chromatography • Set up electrochemical cells and measuring voltages

Curriculum Plan – (Science)

3.3.2 Alkanes 3.3.3 Halogenoalkanes 3.3.4 Alkenes 3.3.5 Alcohols 3.3.6 Organic analysis 3.3.7 Optical isomerism (A-level only) 3.3.8 Aldehydes and ketones (A-level only) 3.3.9 Carboxylic acids and derivatives (A-level only) 3.3.10 Aromatic chemistry (A-level only) 3.3.11 Amines (A-level only) 3.3.12 Polymers (A-level only) 3.3.13 Amino acids, proteins and DNA (A-level only) 3.3.14 Organic synthesis (A-level only) 3.3.15 Nuclear magnetic resonance spectroscopy (A-level only) 3.3.16 Chromatography (A-level only)	• Safely and carefully handle solids and liquids, including corrosive, irritant, flammable and toxic substances • Measure rates of reaction by at least two different methods, for example: • an initial rate method such as a clock reaction • a continuous monitoring method
PHYSICS CONTENT TO BE COVERED 3.1 Measurements and their errors 3.2 Particles and radiation 3.3 Waves 3.4 Mechanics and materials 3.5 Electricity 3.6 Further mechanics and thermal physics 3.7 Fields and their consequences 3.8 Nuclear physics 3.8 Astrophysics (Option Unit)	The skills developed are similar to A level Biology apart from. <u>Mathematical skills to be developed</u>. • Use calculators to handle vectors and radians <u>Handling Data Skills</u> • Simple probability • Make orders of magnitude calculations • Identify uncertainty in measurements and use simple techniques to profess this uncertainty <u>Algebra</u> • Solve algebraic equations including quadratic equations. <u>Graphs</u> • Solve algebraic equations including quadratic equations. • Distinguish between instantaneous rate of change and average rate of change

	• Understand the possible physical significance of the area between a curve • Apply the concepts underlying calculus <u>Geometry and Trigonometry</u> • Similar to Chemistry plus • Calculate areas of triangles etc, • Use Pythagoras' theorem, and the angle sum of a triangle • Calculate the magnitude of a resultant vector, resolving forces into components to solve problems • Use sin, cos and tan in physical problems • Use small angle approximation • Understand the relationship between degrees and radians <u>Apparatus and Techniques</u> • use appropriate analogue apparatus to record a range of measurements • use appropriate digital instruments • use methods to increase accuracy of measurements • use stopwatch or light gates for timing • use callipers and micrometers for small distances • correctly construct circuits from circuit diagrams • design, construct and check circuits using DC power supplies, cells, and a range of circuit components • use signal generator and oscilloscope, • generate and measure waves use laser or light source to investigate characteristics of light

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
7	Classes are taught different topics at different times due to the demand on equipment and lab resources. The Big Ideas and Topics are: **Cells** **Interdependence** **Variation** **Particle model** **Separating mixtures** **Earth structure** **Speed** **Voltage and Resistance** **Energy costs** **Sound**	We follow the AQA KS3 Specification with builds on the KS2 National Curriculum's Program of Study. It takes the main Key Ideas and, throughout Ks3 revisits each topic to add an extra layer of content and an extra finesse of skills **Cells** Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes. There are many types of cell. Each has a different structure or feature so it can do a specific job. **Interdependence** Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population leads to changes in others. The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients. **Variation** There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment and some is a combination. Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment. **Particle model** Properties of solids, liquids and gases can be described in terms of particles in motion but with differences in	Some skills are introduced for the first time (e.g. Risk Assessments in a laboratory atmosphere) whilst other skills are developed from their use throughout primary school (e.g. comprehension of a fair test and how an awareness of a need have control variables produces a more valid result). **For a full breakdown of which skills are developed please see the separate document KS3 skills mapping in science** A Summary of skills is as follows Analyse Patterns Discuss Limitations Draw conclusions Present Data Communicate Ideas Construct Explanations Critique Claims Justify Opinions Collect Data Devise Questions Plan variables Test hypotheses Estimate Risks	Through 3 main End Of Unit tests (one per term). Skills are assessed on more informal frequent formative assessment basis when appropriate practical work presents a good opportunity. Students and Staff monitor the skill development and the records are kept centrally. **For a full breakdown of the success criteria for skill assessment are developed please see the separate document; Success Criteria and of Skills.**

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		the arrangement and movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas). Observations where substances change temperature or state can be described in terms of particles gaining or losing energy. **Separating mixtures** A pure substance consists of only one type of element or compound and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties. The method chosen to separate a mixture depends on which physical properties of the individual substances are different. **Earth structure** Sedimentary, igneous and metamorphic rocks can be inter converted over millions of years through weathering and erosion, heat and pressure, and melting and cooling. **Speed** If the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. **Voltage and Resistance** We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway.	These skills will be introduced at a depth and time suitable to the ability of the student.	

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		In a series circuit, voltage is shared between each component. In a parallel circuit, voltage is the same across each loop. Components with resistance reduce the current flowing and shift energy to the surroundings. **Energy costs** We pay for our domestic electricity usage based on the amount of energy transferred. Electricity is generated by a combination of resources which each have advantages and disadvantages. **Sound** Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels. The greater the amplitude of the waveform, the louder the sound. The greater the frequency (and therefore the shorter the wavelength), the higher the pitch.		
8	Classes are taught different topics at different times due to the demand on equipment and lab resources. **Movement**	Year 8 takes the same main Key Ideas from Year 7 and adds to the information that the students have been taught (e.g. Movement follow on from Cells in the Organisms Big Idea) **Movement (builds on cells)** The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells.	Some of the same skills polished in Year 7 are further developed in Year 8 (e.g. as students mature their awareness of Hazard and Risk becomes greater and these Risk Assessment skills become an integral part of planning experiments). As students' literacy skills improve a greater emphasis is placed on the skills of Communicating Ideas and Constructing Explanations.	Through 3 main End Of Unit tests (one per term). Skills are assessed on more informal frequent formative assessment basis when appropriate practical work presents a good opportunity.

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
	Plant reproduction **Human reproduction** **Breathing** **Respiration** **Periodic table** **Acids and alkalis** **Chemical Energy** **Metals and non-metals** **Gravity +Universe** **Contact forces** **Current** **Energy transfer** **Light**	Antagonistic pairs of muscles create movement when one contracts and the other relaxes. **Plant reproduction (builds on interdependence)** Plants have adaptations to disperse seeds using wind, water or animals. Plants reproduce sexually to produce seeds, which are formed following fertilisation in the ovary. **Human reproduction (builds on variation)** The menstrual cycle prepares the female for pregnancy and stops if the egg is fertilised by a sperm. The developing foetus relies on the mother to provide it with oxygen and nutrients, to remove waste and protect it against harmful substances. **Breathing (builds on movement)** In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. Oxygen is transported to cells for aerobic respiration and carbon dioxide, a waste product of respiration, is removed from the body. Breathing occurs through the action of muscles in the ribcage and diaphragm. The amount of oxygen required by body cells determines the rate of breathing. **Respiration (builds on plant reproduction and cells)** Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable. **Periodic table (builds on particles)**	**For a full breakdown of which skills are developed please see the separate document KS3 skills mapping in science** A Summary of skill topics is as follows Analyse Patterns Discuss Limitations Draw conclusions Present Data Communicate Ideas Construct Explanations Critique Claims Justify Opinions Collect Data Devise Questions Plan variables Test hypotheses Estimate Risks These skills will be introduced at a depth and time suitable to the ability of the student.	Students and Staff monitor the skill development and the records are kept centrally. **For a full breakdown of the success criteria for skill assessment are developed please see the separate document; Success Criteria and of Skills**

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		The elements in a group all react in a similar way and sometimes show a pattern in reactivity. As you go down a group and across a period the elements show patterns in physical properties. **Acids and alkalis (builds on Reactions)** The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids. Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water. **Chemical Energy (builds on Reactions)** During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the reverse, it is endothermic. **Metals and non-metals** Metals and non-metals react with oxygen to form oxides which are either bases or acids. Metals can be arranged as a reactivity series in order of how readily they react with other substances. Some metals react with acids to produce salts and hydrogen. **Gravity +Universe (builds on speed)** Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength. Every object exerts a gravitational force on every other object. The force increases with mass and decreases		

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		with distance. Gravity holds planets and moons in orbit around larger bodies. Universe….. The solar system can be modelled as planets rotating on tilted axes while orbiting the Sun, moons orbiting planets and sunlight spreading out and being reflected. This explains day and year length, seasons and the visibility of objects from Earth. Our solar system is a tiny part of a galaxy, one of many billions in the Universe. Light takes minutes to reach Earth from the Sun, four years from our nearest star and billions of years from other galaxies. **Contact forces (builds on speed)** When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied. **Current (Builds on voltage and resistance)** Current is a movement of electrons and is the same everywhere in a series circuit. Current divides between loops in a parallel circuit, combines when loops meet, lights up bulbs and makes components work. Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled. The field strength decreases with distance. **Energy transfer (builds on energy costs)**		

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end. When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy. **Light (builds on Sound)** When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours. When light enters a denser medium, it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model.		
9	Classes are taught different topics at different times due to the demand on equipment and lab resources. **Digestion** **Photosynthesis** **Evolution** **Inheritance** **Elements**	Year 9 takes the same main Key Ideas from Year 8 and adds to the information that the students have been taught (e.g. Digestions follow on from Movement in the Organisms Big Idea) **Digestion (builds on cells and movement)** The body needs a balanced diet with carbohydrates, lipids, proteins, vitamins, minerals, dietary fibre and water, for its cells' energy, growth and maintenance. Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes.	Some of the same skills polished in Year 8 are further developed in Year 9 (e.g. their ability to graphically analyse data is developed to a point where students can confidently predict mathematical patterns between dependent and independent variables). As students become more passionate about the world in which they live, Critiquing Claims and Justifying Opinions are just two of the skills that become more important.	Through 3 main End Of Unit tests (one per term). Skills are assessed on more informal frequent formative assessment basis when appropriate practical work presents a good opportunity. Students and Staff monitor the skill development and the

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
	Types of reaction **Climate** **Earth resources** **Pressure** **Magnetism** **Electromagnets** **Work** **Heating and Cooling** **Wave effects** **Wave properties**	**Photosynthesis (builds on plant respiration)** Plants and algae do not eat, but use energy from light, together with carbon dioxide and water to make glucose (food) through photosynthesis. They either use the glucose as an energy source, to build new tissue, or store it for later use. Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis. **Evolution** **Inheritance** **Elements (builds on periodic table)** Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain. **Types of reaction** Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved. **Climate** Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust	A Summary of skill topics is as follows Analyse Patterns Discuss Limitations Draw conclusions Present Data Communicate Ideas Construct Explanations Critique Claims Justify Opinions Collect Data Devise Questions Plan variables Test hypotheses Estimate Risks These skills will be introduce at a depth and time suitable to the ability of the student .	records are kept centrally. **For a full breakdown of the success criteria for skill assessment are developed please see the separate document; Success Criteria and of Skills**

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		(such as photosynthesis and respiration) as well as human activities (burning fuels). Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen. Scientists have evidence that global warming caused by human activity is causing changes in climate. **Earth resources (builds on Climate)** There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources. Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals. **Pressure (builds on contact forces)** Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces. **Magnetism (builds on current)**		

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		Magnetic materials, electromagnets and the Earth create magnetic fields which can be described by drawing field lines to show the strength and direction. The stronger the magnet, and the smaller the distance from it, the greater the force a magnetic object in the field experiences. **Electromagnets (builds on current and magnetism)** An electromagnet uses the principle that a current through a wire causes a magnetic field. Its strength depends on the current, the core and the number of coils in the solenoid. **Work (builds on energy transfers)** Work is done and energy transferred when a force moves an object. The bigger the force or distance, the greater the work. Machines make work easier by reducing the force needed. Levers and pulleys do this by increasing the distance moved, and wheels reduce friction. **Heating and Cooling (builds on energy transfers)** The thermal energy of an object depends upon its mass, temperature and what it's made of. When there is a temperature difference, energy transfers from the hotter to the cooler object. Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation. **Wave effects (builds on Light and sound)** When a wave travels through a substance,		

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		particles move to and fro. Energy is transferred in the direction of movement of wave. Wave of higher amplitude or higher frequency transfer more energy. **Wave properties (builds on Wave effects)** A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, an describes the properties of speed, wavelength and reflection.		
10	Classes are taught different topics at different times due to the demand on equipment and lab resources.	At GCSE we follow the AQA Combined Science Trilogy Specification which naturally follow on from their AQA KS3 Specification The content for the GCSE is split into two papers for each of the subjects. With Yr. 10 focussing on the teaching of Paper 1 and Yr. 11 focussing on the teaching of paper 2. **BIOLOGY** The content covered in Biology in Paper 1 is Cell Biology, Organisation, Infection and Response, and Bioenergetics. Topics are taught in order as follows: Cell Biology- topic 4.1 Organisation- topic 4.2 Infection and Response- topic 4.3 Bioenergetics- topic 4.4 Ecology- topic 4.7	The skills honed and perfected in Year 7-9 are put to good use in the Required Practicals. These practicals are common to all schools across the country and their methods and outcomes are assessed in the exam and comprises 15% of the final mark. **BIOLOGY** **RP1=** Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included. **RP2=** Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. **Organisation-**	There is regular rigorous summative assessment end of topic tests (each topic will normally last about 6-10 lessons). The End of Year Exam covers the topics taught in Year 10 Which is, mainly, the content for the Paper1 The students track their progress through the Required Practicals on their assessment sheets and these are kept centrally.

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		CHEMISTRY The content covered in Chemistry in Paper 1 is Atomic structure, Bonding, Quantitative Chemistry, Chemical Changes and Energy Changes. One topic from paper 2, Chemical Analysis is also studied. The topic are taught through year 10, in the following order. **T**he topics taught are: 5.1 Atomic Structure and Periodic Table 5.2 Bonding, structure and the properties of matter 5.3 Quantitative Chemistry 5.4 Chemical Changes 5.5 Energy Changes 5.8 Chemical Analysis (paper 2 topic) **PHYSICS** The content covered in Physics in Paper 1 is Energy, Electricity, Matter and Atomic Physics. Autumn Term first half • 6.4 Atomic Structure Autumn Term seconds half • 6.3 Particle Nature of Matter Spring Term first half • 6.1 Energy Spring Second half	**RP4=** Investigate the effect of pH on the rate of reaction of amylase enzyme **RP3=** Use qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein. **Bioenergetics-** **RP5=** Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed. **Ecology-** **RP7=** Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species. **CHEMISTRY** **Required Practical 8:** Preparation of a pure, dry sample of a soluble salt from an insoluble oxide **Required Practical 9:**	

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		• 6.2 Electricity Revision for End of Year Exam Start of Year 11 content	Investigate what happens when aqueous solutions are electrolysed using inert electrodes **Required Practical 10:** **I**nvestigate the variables that affect temperature changes in reacting solutions **Required Practical 12:** Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. **PHYSICS** Required practical activity 17 Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids covered in 6.3 Required practical activity 15 Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits covered in 6.2	

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
			Required practical activity 14 An investigation to determine the specific heat capacity of one or more material covered in 6.1	
11	Classes are taught different topics at different times due to the demand on equipment and lab resources.	In Year 11 we cover the Year 11 content as well as holistic revision of the Paper 1 content through a focus on Exam Technique and Revision Techniques **BIOLOGY** The content covered in Biology in Paper 2 is Homostasis and Response; Inheritance, variation and evolution; and Ecology. **Ecology (finish from end of year 10)- topic 4.7** **Homeostasis and Response- topic 4.5** **Inheritance, Variation and Evolution- topic 4.6** **CHEMISTRY** The content covered in Chemistry in Paper 2 is Chemical Change, Organic chemistry, Chemical analysis, Chemistry of the Atmosphere and Using Resources. 5.6 The Rate and Extent of Chemical Change 5.7 Organic Chemistry 5.9 Chemistry of the Atmosphere 5.10 Using resources	The second half of the Required Practicals are covered in Year 11. Exam Technique and Revision Technique become an increasingly important part of the lesson. **BIOLOGY** **Homeostasis and Response-** **RP6=** Plan and carry out an investigation into the effect of a factor on human reaction time **CHEMISTRY** **Required Practical 11:** **I**nvestigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity **Required Practical 13:** Analysis and purification of water samples from different sources,	There is regular rigorous summative assessment end of topic tests (each topic will normally last about 6-10 lessons). The mock (PREP exam) will cover content and skills from both the Year 10 and Year 11 course The students track their progress through the Required Practicals on their assessment sheets and these are kept centrally.

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Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		PHYSICS The content covered in Physics in Paper 2 is Forces, Waves, Magnetism and electromagnetism, and (for Triple Award students) Space physics. Autumn first half • 6.5 Forces Autumn second half • 6.6 Waves Spring first half • 6.7 Magnetism Revision	including pH, dissolved solids and distillation **PHYSICS** Required practical activity 18 Investigate the relationship between force and extension for a spring covered in 6.5 Required practical activity 19 Investigate the effect of varying the force on the acceleration of an object of constant mass and the effect of varying the mass of an object on the acceleration produced by a constant force covered in 6.5 Required practical activity 20 Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurement covered in 6.6 Required practical activity 21 Investigate how the amount of	

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<table>
<tr><th colspan="2">Curriculum Plan</th><th></th><th></th><th></th></tr>
<tr><th>Year Group</th><th>Scheme of Work</th><th>Knowledge Gained (Including How It Builds on Previous Knowledge Gained)</th><th>Skills Developed (Including How It Builds on Previous Skills Gained)</th><th>Assessment of knowledge and skills</th></tr>
<tr><td></td><td></td><td></td><td>infrared radiation absorbed or radiated by a surface depends on the nature of that surface. Covered in waves 6.6</td><td></td></tr>
<tr><td>12APP SCI</td><td></td><td>The content is taught in this order
We use the AQA Applied General specification. In year 12 students are entered for the Applied Science Certificate (1776).
<table>
<tr><th></th><th>Biology Teacher</th><th>Chemistry Teacher</th><th>Physics Teacher</th></tr>
<tr><td>ASC1
Taught from September until May</td><td>1(a) Cell Structure
1(b) Transport Mechanisms
1(c) The Heart
1(d) Homeostasis
1(e) Breathing and Cellular Respiration
1(f) Photosynthesis and Food Chain Productivity</td><td>2(a) Atomic Structure
2(b) The Periodic Table
2(c) Amount of Substance
2(d) Bonding and Structure
2(e) Enthalpy change</td><td>3(a) Useful Energy and Efficiency
3(b) Electricity and Circuits
3(c) Dynamics</td></tr>
<tr><td>ASC2
Integrated into ASC1 teaching</td><td>1(a) Rate of Respiration
1(b) Light dependent</td><td>2(a) Volumetric Analysis
2(b) Colorimetric Analysis</td><td>3(a) Resistivity
3(b) Specific Heat Capacity</td></tr>
</table></td><td></td><td>ASC1
Assessment takes place after each topic using past exam questions. Students are graded as Pass, Merit or Distinction in line with the AQA grade boundaries. Students take the ASC1 exam in June of year 12.

ASC2
Students submit one draft and receive feedback before submitting their final piece of coursework for marking. All 6 pieces of coursework contribute to one final grade for this unit. A witness confirmation is signed by the lead teacher to</td></tr>
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<tr><td></td><td></td><td>
<table>
<tr><td></td><td>Reaction in Photosynthesis</td><td></td><td></td></tr>
<tr><td>ASC3 Integrated throughout the year, but predominantly taught from March until May.</td><td colspan="3">1(a) Topical scientific issues obtained from a variety of media sources
1(b) The public perception of science and the influence that the media have
1(c) The ethical, moral, commercial, environmental, political and social issues involved in scientific advances, and how these are represented in the media
1(d) The roles and responsibilities that science personnel carry out in the science industry</td></tr>
</table>
</td><td></td><td>confirm that each student has safely carried out each practical investigation. Coursework is submitted to the exam board for moderation on May 15th.

ASC3
Students sit a mock paper which is created using past paper questions. Students take the ASC3 exam in June of year 12.</td></tr>
<tr><td>12BIO</td><td></td><td>We use the AQA A level Specification and as such there is a spiral revisit of KS4 curriculum content which is covered with an extra layer of new content added. The A level is taught as a linear subject with final assessment being in at the end of Year 13, there is no formal.

The content is taught in this order
<table>
<tr><th>Teacher A</th><th>Teacher B</th></tr>
<tr><td>Biological Molecules- topic 3.1

Genetic Information, Variation, and</td><td>Cells- topic 3.2

Organisms Exchange Substances with The Environment- topic 3.3</td></tr>
</table>
</td><td></td><td>Assessment is regular and based on past exam papers so that students have an awareness of attainment and progress on an absolute scale from the start.

There is a separate endorsement of practical skills which is taken alongside A level Physics. This results in the students achieving a ‘PASS’ if they have</td></tr>
</table>

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		Relationships Between Organisms- topic 3.4		shown enough competency on all the twelve. Required Practical activities
12 CHEM		**We use the AQA A level Specification and as such there is a spiral revisit of KS4 curriculum content which is covered with an extra layer of new content added. The A level is taught as a linear subject with final assessment being in at the end of Year 13, there is no formal.** **The content is taught in this order** **Teacher A** **3.1.1 Atomic Structure** 3.1.1.1 Fundamental Particles 3.1.1.2 Mass Numbers and Isotopes 3.1.1.3 Electron Configuration **3.1.3 Bonding** 3.1.3.1 Ionic bonding 3.1.3.2 Covalent and Dative bonds 3.1.3.3 Metallic Bonding 3.1.3.4 Bonding and Properties **Teacher B** **3.1.2 Amount of Substance** 3.1.2.1 Relative Atomic and Molecular Mass 3.1.2.2 The Mole <u>Required Practical 1:</u> Make up a volumetric solution and carry out a simple acid–base titration 3.1.2.3 The Ideal Gas Equation 3.1.2.4 Empirical and Molecular Formulas		Assessment is regular and based on past exam papers so that students have an awareness of attainment and progress on an absolute scale from the start. There is a separate endorsement of practical skills which is taken alongside A level Physics. This results in the students achieving a 'PASS' if they have shown enough competency on all the twelve. Required Practical activities

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		3.1.3.5 Shapes of molecule and Ions 3.1.3.6 Bond Polarity 3.1.3.7 Forces between molecules **3.2.1 Periodicity** 3.2.1.1 Classification 3.2.1.2 Physical Properties **3.1.5 Kinetics** 3.1.5.1 Collision Theory 3.1.5.2 Maxwell-Boltzmann 3.1.5.3 Effect of Temperature on Rate <u>Required practical 3:</u> Investigation of how the rate of a reaction changes with temperature 3.1.5.4 Effect of concentration and pressure 3.1.5.5 Catalysts **3.2.2 Group 2 Metals** <u>Required Practical 4:</u> Tests for ions 3.1.2.5 Balanced Equations **3.1.4 Energetics** 3.1.4.1 Enthalpy change 3.1.4.2 Calorimetry <u>Required practical 2:</u> Measurement of an enthalpy change. 3.1.4.3 Hess's Law 3.1.4.4 Bond Enthalpy **3.1.7 Oxidation, reduction and redox** **3.2.3 Group 7 the halogens** 3.2.3.1 Trends in properties 3.2.3.2 Use of chlorine and chlorate <u>Required practical 4:</u> Tests for ions **3.1.6 Chemical equilibria, Le Chatelier's principle and Kc** 3.1.6.1 Chemical equilibria and Le Chatelier		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		3.3.1 Introduction to Organic Chemistry 3.3.1.1 Nomenclature 3.3.1.2 Mechanisms 3.3.1.3 Isomers **3.3.2 Alkanes** 3.3.2.1 Fractional Distillation of Crude Oil 3.3.2.2 Modification by cracking 3.3.2.3 Combustion of alkanes 3.3.2.4 Chlorination of alkanes **3.3.3 Halogenoalkanes** 3.3.3.1 Nucleophilic Substitution 3.3.3.2 Elimination 3.3.3.3 Ozone depletion **3.3.4 Alkenes** 3.3.4.1 Structure, bonding and reactivity 3.3.4.2 Addition reactions 3.3.4.3 Addition polymers 3.1.6.2 Equilibrium constant Kc for homogenous systems **3.1.9 Rate equations** 3.1.9.1 Rate equations 3.1.9.2 Determination of rate equation <u>Required practical 7:</u> Measuring rate of reaction		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		3.3.5 Alcohols 3.3.5.1 Alcohol production 3.3.5.2 Oxidation 3.3.5.3 Elimination **<u>Required Practical 5:</u>** Distillation **3.3.6 Organic Analysis** 3.3.6.1 Identification by test tube reactions <u>Required practical 6:</u> Test tube tests 3.3.6.2 Mass Spectrometry 3.3.6.3 Infrared Spectrometry **3.3.7 Optical Isomers**		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
12 PHYS		**We use the AQA A level Specification and as such there is a spiral revisit of KS4 curriculum content which is covered with an extra layer of new content added. The A level is taught as a linear subject with final assessment being in at the end of Year 13, there is no formal.** **The subjects are taught by one teacher in this order.** **3.5 Electricity (builds upon GCSE)** 3.5.1.1. Charge and Charge Carriers 3.5.1.1 ii. Potential and Potential Difference 3.5.1.1. iii. Current and Charge 3.5.1.3. Resistance, Current and Potential Difference (Required practical 5) 3.5.1.4/5. Analysing Series Circuits 3.5.1.6. Internal Resistance (Required practical 6) 3.5.1.4/5. Analysing Parallel Circuits 3.5.1.2. Current versus voltage characteristics 3.5.1.3 iii Thermistors and Light Dependent Resistors **3.2 Particles** 3.2.1.1. Nomenclature of Nuclear and Particle Physics 3.2.1.2. Stability and the Strong Nuclear Force 3.2.1.2i. Alpha Decay (builds upon GCSE) 3.2.1.2ii Beta Decay (builds upon GCSE) 3.2.1.3 Particles and Antiparticles 3.2.1.5 The Classification of Particles 3.2.1.6. The Quark Model 3.2.1.4 The Four Fundamental Forces	The skills developed in A level physics are embedded into the teaching of content, such that **3.1.2 Limitation of physical measurements** builds upon the mastery of skills and knowledge of working scientifically gained at GCSE	Assessment is regular and based on past exam papers so that students have an awareness of attainment and progress on an absolute scale from the start. There is a separate endorsement of practical skills which is taken alongside A level Physics. This results in the students achieving a 'PASS' if they have shown enough competency on all the twelve. Required Practical activities

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		3.2.1.4. ii Particle Interactions **3.2.2 Electromagnetic Radiation and Quantum Nature of light** 3.2.2.1. The Particulate Nature of Electromagnetic Radiation 3.2.2.3. Energy Levels 3.2.2.2 Collisions of Electrons with Atoms 3.2.2.3 ii. Emission 3.2.2.4. Wave-Particle Duality of Matter **3.3 Waves** 3.3.1 Section 1/2 – Introduction and Definitions in Waves and Progressive Waves 3.3.1.1 Progressive waves 3.3.1.2 Longitudinal and transverse waves (builds upon GCSE) 3.3.1.3 Principle of superposition of waves and formation of stationary waves 3.3.2 Refraction, diffraction and interference 3.3.2.1 Interference 3.3.2.2 Diffraction 3.3.2.3 Refraction at a plane surface (builds upon GCSE) **3.4 Mechanics (builds upon Forces at GCSE)** 3.4.1.1i. Scalars and Vectors 3.4.1.1ii. Resolving Vectors 3.4.1.2. Moments 3.4.1.3. Displacement/Distance and Velocity/Speed 3.4.1.3ii. Displacement-time graphs		

Curriculum Plan – (Science)

<table>
<tr><th colspan="2">Curriculum Plan</th><th></th><th></th><th></th></tr>
<tr><th>Year Group</th><th>Scheme of Work</th><th>Knowledge Gained (Including How It Builds on Previous Knowledge Gained)</th><th>Skills Developed (Including How It Builds on Previous Skills Gained)</th><th>Assessment of knowledge and skills</th></tr>
<tr><td></td><td></td><td>3.4.1.3iii Acceleration
3.4.1.3 iv. Velocity-time graphs
3.4.1.1v. Equations of motion in 1-dimension
3.4.1.3vi. Acceleration due to gravity
3.4.1.4. Equations of motion in 2-dimensions
3.4.1.4ii. Non-uniform acceleration
3.4.1.5. Newton’s Laws
3.4.1.4/5 Weight and Mass, and Acceleration due to Gravity
3.4.1.4 Air Resistance and Terminal Velocity
3.4.1.7. Work and Energy
3.4.1.8. Kinetic Energy and Gravitational Potential Energy
3.4.1.6 Momentum
3.4.1.6ii The Conservation of Momentum
3.4.1.6iii Elastic and inelastic collisions.</td><td></td><td></td></tr>
<tr><td>13APP SCI</td><td></td><td>The content is taught in this order<table><tr><th>Teacher 1</th><th>Teacher 2</th></tr><tr><td>ASC5 Investigating Science
- Prepare for a scientific investigation
- Carry out the investigation and record results</td><td>ASC6c Organic Chemistry
- Molecular structure, functional groups and isomerism
- Reactions of functional groups</td></tr></table></td><td></td><td>ASC4
Assessment takes place after each topic using past exam questions. Students are graded as Pass, Merit or Distinction in line with the AQA grade boundaries.</td></tr>
</table>

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		- Analyse results, draw conclusions and evaluate the investigation - Present the findings of the investigation to a suitable audience - Prepare organic compounds **ASC4 Human Biology** - The musculoskeletal system and movement - How oxygen is transported in the blood and how physiological measurements can be applied - The structure and function of the nervous system and brain - Nerve Impulses **ASC4 Human Biology** - The digestive system and diet		Students take the ASC4 exam in June of year 13. **ASC5** The coursework is divided into 3 sections and students receive feedback for their drafts before submitting 1 final piece of work. Students must also present their investigation to their peers and staff. An observation record is written by the teacher to record skills and safety demonstrated during practical work. **ASC6c** The coursework is divided into 3 sections and students receive feedback for their drafts before submitting 1 final piece of work. All coursework is submitted to the exam

Curriculum Plan – (Science)

<table>
<tr><th colspan="2">Curriculum Plan</th><th></th><th></th><th></th></tr>
<tr><th>Year Group</th><th>Scheme of Work</th><th>Knowledge Gained (Including How It Builds on Previous Knowledge Gained)</th><th>Skills Developed (Including How It Builds on Previous Skills Gained)</th><th>Assessment of knowledge and skills</th></tr>
<tr><td></td><td></td><td></td><td></td><td>board for moderation on May 15th.</td></tr>
<tr><td>13BIO</td><td></td><td>The A level is taught is a linear fashion with no AS modules being taken in Year 12.

The content is taught in this order<table><tr><th>Teacher A</th><th>Teacher B</th></tr><tr><td>Organisms Respond To Changes In Their Internal and External Environments- topic 3.6

Genetics, Populations, Evolution and Ecosystems- topic 3.7</td><td>Energy Transfers In and between Organisms- topic 3.5

The Control Of Gene Expression- topic 3.8</td></tr></table></td><td></td><td></td></tr>
<tr><td>13 CHEM</td><td></td><td>The A level is taught is a linear fashion with no AS modules being taken in Year 12.

The content is taught in this order<table><tr><th>Teacher A</th><th>Teacher B</th></tr><tr><td>3.3.8 Aldehydes and Ketones

3.3.9 Carboxylic acids and derivatives</td><td>3.2.4 Properties of Group III and their oxides

3.1.12 Acids and Bases</td></tr></table></td><td></td><td></td></tr>
</table>

Curriculum Plan – (Science)

Curriculum Plan					
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**		**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		3.3.9.1 Carboxylic acids and esters 3.3.9.2 Acylation <u>Required practical 10:</u> Making organic compounds 3.3.10 Aromatics 3.3.10.1 Bonding 3.3.10.2 Electrophilic substitution **3.3.11 Amines** 3.3.11.1 Preparation 3.3.11.2 Base Properties 3.3.11.3 Nucleophilic properties **3.3.12 Polymers** 3.3.12.1 Condensation polymers 3.3.12.2 Biodegradable and disposal **3.3.13 Amino acids, proteins and DNA** 3.3.13.1 Amino acids 3.3.13.2 Proteins 3.3.13.3 Enzymes 3.3.13.4 DNA	3.1.12.1 Bronsted-Lowry acid-base equilibria 3.1.12.2 Definition and determination of pH 3.1.12.3 The ionic product of water 3.1.12.4 Weak acids and bases Ka for weak acids 3.1.12.5 pH curve, titration and indicators <u>Required practical 9:</u> Investigate changes in pH 3.1.12.6 Buffer action **3.1.10 EQM constant Kp for homogenous systems** **3.1.8 Thermodynamics** 3.1.8.1 Born-Haber Cycles 3.1.8.2 Gibbs free energy and entropy changes **3.1.11 Electrode Potentials and electrochemistry** 3.1.11.1 Electrode potential and cells <u>Required practical 8:</u>		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		3.3.13.5 Action of ant-cancer drugs **3.3.16 Chromatography** <u>Required practical 12:</u> Thin layer chromatography 3.3.14 Organic synthesis 3.3.15 Nuclear Magnetic Resonance (NMR) Measuring the EMF in an electrochemical cell 3.1.11.2 Commercial applications of electrochemical cells **3.2.5 Transition Metals** 3.2.5.1 General Properties 3.2.5.2 Substitution reactions 3.2.5.3 Shapes of complex ions 3.2.5.4 Formation of coloured ions 3.2.5.5 Variable oxidation state 3.2.5.6 Catalysts **3.2.4 Reactions of Ions in Aqueous Solution** <u>Required practical 11:</u> Simple test tube reactions to identify transition metals		
13 PHYS		**The A level is taught is a linear fashion with no AS modules being taken in Year 12. The option module builds on Separate Science content and this is considered when teaching this topics (Astrophysics)**		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		The content is taught in this order **3.6. Further Mechanics** 1. Introduction of Circular Motion 2. Centripetal Force and Acceleration 3. Introduction to Simple Harmonic Motion 4. Equations of Motion for Simple Harmonic Oscillators 5. Displacement, Velocity and Acceleration – time graphs for Simple Harmonic Oscillators 6. The Mass-Spring System 7. The Simple Pendulum 8. The Energy in an Oscillator 9. Damping 10. Resonance **3.6.2 – Thermal Physics** 1. Describing the Physical State of a Gas (builds on GCSE) 2. Gas Laws (builds on GCSE) 3. Molecular Kinetic Theory (builds on GCSE) 4. Further Gas Laws 5. Heat Capacity (builds on GCSE) 6. Latent Heat (builds on GCSE) **3.7 Fields and their consequences** 1. Gravitational Fields 2. Gravitational Potential 3. Orbits of Planets and Satellites 4. Electric Fields 5. Electric Potential		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		6. Capacitors 7. Capacitors in Series and Parallel 8. The Energy Stored in a Capacitor 9. Charging and Discharging a Capacitor 10. Introduction to Magnetic Fields, Flux and Flux Density 11. Forces on Current Carrying Conductors (builds on GCSE) 12. Forces on Moving Charges 13. Cyclotron Accelerators 14. Electromagnetic Induction 15. Lenz's Law 16. Transformers (builds on GCSE) **3.8 – Nuclear Physics** 1. Rutherford Scattering (builds on GCSE) 2. Nuclear Radius and Further Scattering Experiments 3. Nuclear Instability 4. Alpha Radiation (builds on GCSE) 5. Beta Radiation (builds on GCSE) 6. Positron Decay and Electron Capture 7. Excited Nuclei and Gamma Radiation 8. Background Radiation (builds on GCSE) 9. Properties of Alpha, Beta and Gamma Radiation (ionisation and penetration power and inverse square law) (builds on GCSE) 10. Applications of Alpha, Beta and Gamma Radiation (strongly linking back to the above properties) (builds on GCSE) 11. Radioactive Decay (builds on GCSE)		

Curriculum Plan – (Science)

Curriculum Plan				
Year Group	**Scheme of Work**	**Knowledge Gained (Including How It Builds on Previous Knowledge Gained)**	**Skills Developed (Including How It Builds on Previous Skills Gained)**	**Assessment of knowledge and skills**
		12. Binding Energy 13. Energy and Matter 14. Binding Energy per Nucleon 15. Fission 16. Fusion		