Programme of study for Year 11 Science

Autumn (1st half term)	Autumn (2nd half term)	Spring (1st half term)	Spring (2nd half term)	Summer (1st half term)	Summer (2nd half term)
Topics: • B12 Reproduction • B11 Hormonal Coordination • B15 Adaptations, interdependence and competition	Topics: • C11 Chemistry of the atmosphere • B16 Organising an ecosystem • B17 Biodiversity and ecosystems • C9 Crude Oil and Fuels	Topics: • C12 Using resources • C10 Chemical analysis • P13 Electromagnetism • P11 Waves • P8 Forces in Balance • P9 Motion	Topics: • P12 Electromagnetic Spectrum • P10 Force and Motion • B13 Variation and Evolution	Topics: • B14 Genetics and evolution	Topics: This half term is for revising, improving exam technique, completing any outstanding required practicals, to prepare for the GCSE exams.
Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgments and draw conclusions; develop and improve experimental procedures					
Key learning outcomes (Students should know): Reproduction: - Know the importance of reproduction for the survival of species and the process of sexual reproduction in plants and animals.	Key learning outcomes (Students should know): Chemistry of the atmosphere: - Understand the composition and structure of the Earth's atmosphere - Explain the importance of the greenhouse effect and its impact on climate change	Key learning outcomes (Students should know): Using resources: - Understanding the importance of natural resources and the need for sustainability. - Knowledge of the extraction and purification processes of Earth's resources. - Understanding the social, economic, and	Key learning outcomes (Students should know): Electromagnetic Spectrum: - Understand the different types of electromagnetic waves and their properties. - Describe the uses and dangers of different parts of the electromagnetic spectrum. - Explain the concept of	Key learning outcomes (Students should know): Genetics and Evolution: - Understand the structure and function of DNA and genes. - Demonstrate knowledge of the principles of inheritance and genetic variation. - Describe the processes of DNA	Key learning outcomes (Students should know): This half term is for revising, improving exam technique, completing any outstanding required practicals, to prepare for the GCSE exams.

- Understand the structure and function of male and female reproductive systems in humans and plants. - Learn about the menstrual cycle, fertilization, contraception, and the importance of the placenta in pregnancy. - Recognize the role of hormones in controlling the menstrual cycle and understand the importance of IVF. Hormonal Coordination: - Understand the importance of hormones as chemical messengers in coordinating and regulating bodily functions. - Identify and describe the main endocrine glands	- Describe the sources and effects of air pollutants, such as carbon monoxide, nitrogen oxides, and particulates - Understand the role of the ozone layer and the causes and effects of its depletion - Describe the impacts of acid rain and measures to reduce its formation Organising an ecosystem: - Explain the interdependence of living organisms within an ecosystem - Understand the flow of energy through ecosystems and the roles of producers, consumers, and decomposers - Describe and compare different types of ecological relationships, such as predation,	environmental implications of resource extraction and use. - Knowledge of alternative sources of energy and their advantages and disadvantages. Chemical analysis: - Understanding the principles of chemical analysis. - Knowledge of different methods of chemical analysis such as chromatography and spectroscopy. - Ability to interpret and evaluate data obtained from chemical analysis. - Understanding the application of chemical analysis in various industries and research. Electromagnetism: - Understanding the relationship between magnets and electricity. - Knowledge of electromagnetic induction and how it is used in devices such as generators and transformers. - Understanding the principles of electromagnetic waves and	wave-particle duality and the photoelectric effect. - Understand how waves transfer energy and information. - Demonstrate knowledge of the principles of reflection, refraction, and diffraction. Forces and Motion: - Understand the concepts of speed, velocity, and acceleration. - Describe the relationship between forces, mass, and acceleration using Newton's Laws of Motion. - Demonstrate an understanding of balanced and unbalanced forces. - Describe and explain the effects of different forces, including gravitational, frictional, and electrostatic forces. - Understand the principles of momentum and conservation of momentum. - Describe the motion of objects in different contexts Variation and Evolution:	replication, transcription, and translation. - Explain the importance of meiosis and independent assortment in genetic variation. - Understand the principles of genetic engineering and its applications. - Describe the ethical and social implications of genetic engineering and the use of genetic information.	

and their hormones, including the roles of insulin, glucagon, adrenaline, and thyroxine. - Explain the negative feedback mechanism in hormone regulation and the conditions of type 1 and type 2 diabetes. - Learn about the role of plant hormones in controlling growth and asexual reproduction. Adaptations, Interdependence, and Competition: - Understand the concepts and importance of adaptation, interdependence, and competition in ecosystems. - Describe and identify structural and behavioral adaptations in organisms for	competition, and mutualism - Understand the factors that affect population size and growth, including birth rate, death rate, immigration, and emigration - Describe how food chains and food webs are constructed and the importance of trophic levels in an ecosystem Biodiversity and ecosystems: - Define biodiversity and explain its importance in maintaining ecosystems - Understand the factors that contribute to biodiversity loss, including habitat destruction, pollution, and climate change - Describe the impacts of deforestation and desertification on biodiversity	their properties. - Knowledge of the applications of electromagnetism in various technologies. Waves: - Understanding the properties and behaviour of waves, including reflection, refraction, and diffraction. - Knowledge of the different types of waves such as sound waves, electromagnetic waves, and seismic waves. - Understanding the principles of wave interference and superposition. - Understanding the application of waves in technologies such as telecommunications and medical imaging. Forces in balance: - Understanding the concept of forces and their effects on objects. - Knowledge of vector quantities and how to calculate resultant forces. - Understanding the principles of balanced forces and equilibrium.	- Understand the concept of variation within species. - Describe the causes and types of variation, including genetic and environmental factors. - Explain the importance of variation for natural selection. - Demonstrate knowledge of the principles of adaptation and survival of the fittest. - Explain the process of speciation and the formation of new species. - Describe the evidence for evolution and the different mechanisms of evolutionary change.		

survival, including camouflage, mimicry, and contest behaviour. - Learn about the different types of symbiotic relationships, such as mutualism, commensalism, and parasitism. - Recognize the concept of competition for resources and how it affects the distribution and abundance of organisms in ecosystems.	- Understand the concept of sustainable development and its role in conserving biodiversity - Explain the roles of conservation strategies, such as protected areas, captive breeding programs, and habitat restoration, in preserving biodiversity Crude oil and fuels: - Describe the formation of crude oil and its extraction from the Earth - Understand the composition of crude oil and the process of fractional distillation - Explain the formation and impacts of pollutants emitted from burning fossil fuels - Understand the concept of	- Knowledge of the factors affecting friction and the application of friction in everyday life. Motion: - Understanding the concept of motion and the different types of motion. - Knowledge of speed, velocity, and acceleration, and how to calculate them. - Understanding the principles of Newton's laws of motion. - Knowledge of the factors affecting motion, such as mass and forces, and their relationship.			

	sustainable energy and the alternatives to fossil fuels, such as biofuels, wind power, and solar energy - Describe the environmental and economic considerations of using different types of fuels and energy sources.				

Assessments: 2 linear assessments, 3 other assessed pieces of work which may be carried out in class or as home learning

Building understanding: Rationale / breakdown for your sequence of lessons:
The chosen topic sequence for AQA Combined Science Trilogy follows a logical and conceptual progression that allows for a comprehensive understanding of the key principles in biology, chemistry, and physics. By rotating the teaching of these subjects, students benefit from distributed practice, reinforcing their learning over time, as well as fostering cohesion between the three sciences.

These topics expand upon and further develop the concepts explored in the previous year.

In biology, the first topic, Reproduction, is a fundamental concept that introduces students to the processes of reproduction in both plants and animals. This builds on the topics from previous years of cells and biological processes. This topic lays the foundation for understanding the subsequent areas of study, such as Hormonal Coordination. By studying how hormones control various physiological processes in organisms, students begin to appreciate the complex interplay between different systems within the body.

The next biology topic, Adaptations, Interdependence, and Competition, builds upon the understanding of hormonal coordination by exploring how organisms interact with their environment. This topic emphasizes the importance of adaptations for survival and how living organisms rely on each other for resources.

Organising an Ecosystem is a natural progression from the previous topic, as it allows students to delve deeper into the complexities and interactions within habitats and ecosystems. This topic encourages students to think critically about the roles and relationships of different organisms within an ecosystem and the factors that influence population dynamics.

The final biology topic, Biodiversity and Ecosystems, brings together the knowledge gained from previous topics by exploring the role of biodiversity in maintaining healthy ecosystems. Students study the importance of preserving biodiversity and the potential consequences of its decline, including the impact on ecosystems and human activities. This topic also introduces students to the concept of evolution and how genetic variation contributes to biodiversity.

In chemistry, the first topic, Chemistry of the Atmosphere, introduces students to the composition and properties of Earth's atmosphere. This topic explores the impact of human activities on the atmosphere, including the causes and consequences of climate change. Students learn about the importance of sustainable practices and the role of chemistry in addressing global environmental challenges.

The following topic, Crude Oil and Fuels, focuses on the extraction, processing, and utilization of crude oil as a source of energy. Students study the various fractions obtained from crude oil and their use in fuels and other products. This topic also introduces students to the environmental and sustainability issues associated with the extraction and combustion of fossil fuels.

Using Resources expands on the previous topic by exploring the sustainable use and management of Earth's resources. Students gain an understanding of the importance of reducing waste, recycling, and conserving resources for future generations. This topic also touches on the role of chemistry in developing alternative materials and energy sources.

The final chemistry topic, Chemical Analysis, provides students with the skills and knowledge necessary to carry out qualitative and quantitative analysis of substances. Students learn about different analytical techniques and how these methods contribute to various fields such as forensic science and environmental monitoring. This topic encourages critical thinking and problem-solving skills.

In physics, the first topic, Waves, introduces students to the principles and properties of waves, including their propagation, reflection, and refraction. This topic provides a foundation for understanding the behaviour of waves in various contexts, such as sound and light waves.

Forces in Balance builds upon the topic of waves by exploring the fundamental concepts of forces and their effects on objects. Students study forces in equilibrium and how they act on different objects, preparing them for further exploration in the topic of motion.

Motion delves into the study of motion, including speed, velocity, and acceleration. Students learn about the equations that govern motion and how to analyze graphs showing the relationship between these variables. This topic enables students to apply their understanding to real-life scenarios and reinforces the concept of forces and their role in motion.

The next physics topic, Electromagnetic Spectrum, introduces students to the different types of electromagnetic waves and their applications in various technological fields. Students study the properties and uses of these waves, including radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays.

The final physics topic, Force and Motion, consolidates the knowledge gained in previous topics by exploring the relationship between force, mass, and acceleration through Newton's laws of motion. Students also investigate the concepts of momentum and energy and how they relate to force and motion.

By teaching biology, chemistry, and physics in a rotational basis, students are exposed to the three sciences throughout the academic year. This approach promotes distributed practice, allowing students to revisit and reinforce their knowledge of the sciences over time. It also encourages the development of cross-disciplinary connections, fostering a holistic understanding of scientific principles and their applications in the real world. The students are then able to hone in on their exam technique in preparation for their exams.
Home – Learning: Teachers will set home learning using lesson materials. Some of these will be assessed. This will be indicated.
Reading / literacy: Students are encouraged to prior reading on topics. In lessons students are taught how to construct answers through use of writing frames and exemplar answers where extended writing is required and command words and keywords that are relevant to the topic are consistently assessed in lessons through questioning and written question practice.
Numeracy: • Recognise and use expressions in decimal form: Recognise and use expressions in standard form; Use ratios, fractions and percentages; Make estimates of the results of simple calculations • Handling data: Use an appropriate number of significant figures; Find arithmetic means; Construct and interpret frequency tables and diagrams, bar charts and histograms; Make order of magnitude calculations • Algebra: Understand and use the symbols: $=$, $<>$, $>$, $\propto$, $\sim$;Change the subject of an equation; Substitute numerical values into algebraic equations using appropriate units for physical quantities • Graphs: Translate information between graphical and numeric form; Understand that $y = mx + c$ represents a linear relationship; Plot two variables from experimental or other data; Determine the slope and intercept of a linear graph; Draw and use the slope of a tangent to a curve as a measure of rate of change • Geometry and trigonometry: Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects; Calculate areas of triangles and rectangles, surface areas and volumes of cubes
Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC): • Trips during science week • Science week • Science club • STEM club