KS4 Curriculum overview

Combined Science

The combined science course is designed to allow students to study a wide range of science. Through biology, chemistry and physics they will discover the ways in which scientific knowledge impacts upon the world around them. Combined science is made up of theory work and practical work. Students will complete required practicals to help them to develop the skills needed. In order to understand and evaluate scientific information, students need to develop good language and maths skills.

At the end of Y11 there are six exam papers: two biology, two chemistry and two physics. Questions are a combination of multiple choice, closed short answer, and open extended response questions.

Each of the papers will assess knowledge and understanding from the course and include assessment of practical and investigative skills. Each of the six combined science papers will be 1 hour 15 minutes, 70 Marks, 16.7% of the final GCSE grade per paper.

Students can sit **Higher Tier (Grades 4-9)** or **Foundation Tier (Grades 1-5)**

This is a dual award and students will receive 2 GCSE grades.

In addition, students will have to complete 21 required practicals over the 2 years within their lessons.

There is a large maths element within lessons and exams, especially in the physics component.

Skills –
Develop practical and investigative skills to enable you to understand science. Use maths skills in context and language skills to get to grips with the scientific terminology you will come across.

Knowledge/ understanding –
Learn about the world around you. How your body works, what everything is made of and how things work.

Progression/ Careers –
Good grades in combined science enable progression to a wide range of careers from nursing to sound engineering to construction. People with qualifications in STEM subjects (Science, Technology, Engineering and Maths) are in demand in today's workplace. See

Separate Sciences

Essentially you will study some of the same units as GCSE Combined Science, but you will go into more breadth and depth, as well as covering extra content and skill. You will find you're better prepared if you want to take Science A Levels.

If you love Science and consistently achieving above age related expectations in school Science and Maths assessments, then you should definitely consider the Triple Award. Everyone does their best in subjects they enjoy. And you might find that there's a certain area of Science you excel in.

For each individual GCSE in Biology, Chemistry and Physics, students sit two exams for EACH qualification as outlined below:

Two papers: each paper (2x Biology, 2x Chemistry, 2X Physics) will assess knowledge and understanding from different topics.

Duration: both papers are 1 hour 45 minutes.

Tier: Foundation and Higher although it expected that all students will sit the higher tier (grades 4-9).

Weighting: the papers are equally weighted. Each is worth 50% of the grade and has 100 marks available.

Question types: multiple choice, closed short answer and open extended response. There is a heavy focus on application of knowledge and working scientifically.

Practical work
Students will do eight practicals for each of Biology, Chemistry and Physics. Students will be assessed on their practical skills in their exams with at least 40% of the marks coming from questions relating to practicals.

Skills-
Develop practical and investigative skills to enable you to understand science. Use maths skills in context and language skills to get to grips with the scientific terminology you will come across.

Knowledge/ Understanding -
Learn about the world around you. How your body works, what everything is made of and how things work. Develop an understanding of the environmental and ethical issues in science. Develop a high level of understanding of complex science.

Progression/ Careers –
This course provides a sound foundation for students intending taking A Levels in Biology, Chemistry and/or Physics and would like to study a science subject at university. Separate sciences would be recommended for students who wish to study:

- Medicine, Dentistry, Pharmaceuticals or Veterinary Sciences.
- Engineering such as chemical, structural or mechanical that require a degree.
- Science with the view to a career in research in that field

Combined Science Curriculum overview

Year & Term	Themes / Key Questions	Knowledge	Skills	Academic Language
Year 9 Term 3	B1 Cell Structure and Transport B2 Cell Division C1 Atomic Structure C2 The Periodic Table P1 Conservation and Dissipation of Energy P2 Energy Transfer by heating	The differences between Eukaryotic and Prokaryotic cells, how stem cells can be used. Describe how the model of the atom has changed over time, the development of the Periodic Table. Separating techniques for mixtures and solutions.	Practical skills- producing microscope slides, scale of small objects. Modelling of atoms and the Periodic Table along with trends data to be analysed. Calculations of energy transfer and efficiency	Osmosis Diffusion Eukaryote Prokaryote Stem Cells Sub atomic particles Protons Neutrons Electrons Dissipation Gravitational potential energy Power Specific heat capacity

		How energy is stored and transferred.		
Year 10 Term 1	B3 Organisation and the Digestive System B4 Organising Plants and Animals B5 Communicable Diseases B6 Preventing and Treating disease C3 Structure and bonding C4 Chemical Calculations C5 Chemical Changes P3 Energy Resources P4 Electric Circuits P5 Electricity in the home P6 Molecules and Matter P7 Radioactivity	How complex life is organised, the components of the human body and how food is digested. Develop an understanding of different pathogens and the methods of treatment and prevention. Describe how atoms are held together. Use values to determine expected results of experiments. Explore the reactions of acids and how they interact with different compounds based on metals. Explore how electricity can be generated in a renewable way. Explore electricity use in the home, its efficiency and the power that is used. Describe how particles behave at different temperatures. Provide an overview of the three main types of ionising	Modelling the digestive system and analysing data regarding absorption. Modelling the spread of disease and representing data regarding human response to disease. Deduce the bonding in a metals based on physical properties. Calculate unknown quantities of reactions along with yield. Explore the reaction of metals with acids. Calculate resistance across a variety of components. Model the internal energy of materials. Model the half life of different materials.	Tissue Organ Organ system Enzyme Blood vessels Transpiration Pathogen Virus Bacteria Protists Vaccination Herd immunity Antibiotics Ions Ionic Covalent Metallic Electrostatic Intermolecular Mole Yield Concentration Displacement Reactivity series Acid Base Tidal Geothermal Solar Component Thermistor Diode Specific Latent Heat Alpha Beta Gamma Ionising Half life

		radiation, their risks and uses.		
Year 10 Term 2	B7 Non Communicable Diseases B8 Photosynthesis B9 Respiration B10 Nervous system B11 Hormonal Coordination C6 Electrolysis C7 Energy Changes C8 Rates and Equilibrium P8 Forces in Balance P9 Motion P10 Forces and Motion	Explore the effect of non communicable diseases on the body and other factors that can affect health. Factors that affect photosynthesis. Describe the process of respiration in different guises. Explore the human nervous system and how it is governed by hormones in the body. Describe how humans reproduce and the factors that can affect fertility. Describe how ionic compounds can be separated into component atoms using electrolysis. Describe how forces interact with one another. Explain how forces and motion are interlinked.	Analysing data regarding causal mechanisms. Produce data relating to photosynthesis and measure the effect of different conditions. Applying knowledge to unseen examples of hormones and the responses they trigger. Test products to ascertain their identity. Be able to justify whether a reaction is endo or exothermic based on primary and secondary data. Calculate bond energies. Calculate resultant forces across 2 dimensions. Construct a terminal velocity graph for different scenarios.	Carcinogens Non communicable Risk factor Limiting factor Photosynthesis Respiration Anaerobic Aerobic Fermentation Metabolism Effectors Receptors Coordination centre Homeostasis Glucagon Diabetes Fertility Asexual Electrolysis Electrode Anode Cathode Electrolyte Exothermic Endothermic Balanced Unbalanced Centre of mass Terminal velocity Momentum
Year 10 Term 3	B12 Reproduction C9 Crude oil and Fuels C10 Chemical Analysis P10 Forces and Motion	Describe the differences between sexual and asexual reproduction. Link this to protein	Produce punnet squares that predict the prevalence of genes in offspring.	Meiosis Fertilisation Screening Disorder Genetics Hydrocarbons Alkanes Alkenes

		synthesis and DNA structure. Describe how crude oil can be processed into useful fractions. Use chromatography and melting point data to successfully identify compounds. Describe how forces can interact with elastic objects.	Use data to explain the boiling points of different materials. Use data to test for purity and justify answers. Explore Hooke's law	Fractional distillation Elastic
Year 11 Term 1	B13 Variation and Evolution B14 Genetics and Evolution B15 Adaptations, Interdependence and Competition B16 Organising an Ecosystem B17 Biodiversity and Ecosystems C10 Chemical Analysis C11 Earth's Atmosphere C12 Earth's Resources P11 Wave Properties P12 Electromagnetic Waves P13 Electromagnetism	Explain the process of evolution in organisms. Describe how plants and animals exist in an environment and how they compete for various things within it. Describe how an ecosystem is kept in balance by the organisms that live within it. Describe how the Earth's atmosphere has changed over the past 4.5 billion years. Explore the Earth's resources the threats to them and how to prolong their life. Describe how physical waves interact and	Ethical debate on the use of genetic technologies. Produce models to sample a large area. Evaluate the potential threat that global warming can cause. Analyse data to evaluate the likely lifespan of materials on the Earth. Link the wave properties to the energy they have.	Natural Selection Selective Breeding Genetic Engineering Communities Abiotic Quadrats Sampling Transect Competition Adaptation Ecosystem Carbon cycle Materials cycle Biodiversity Greenhouse gas Climate change Life cycle assessment Recycle Sustainability Transverse Longitudinal

		how electromagnetic waves transfer.		
Year 11 Term 2	Preparation for exams			
Year 11 Term 3	Preparation for exams			

Separate Science curriculum overview

Year & Term	Themes / Key Questions	Knowledge	Skills	Academic Language
Year 9 Term 3	B1 Cell Structure and Transport B2 Cell Division C1 Atomic Structure C2 The Periodic Table P1 Conservation and Dissipation of Energy P2 Energy Transfer by heating	The differences between Eukaryotic and Prokaryotic cells, how stem cells can be used. Describe how the model of the atom has changed over time, the development of the Periodic Table. Describe the properties of the transition elements. Separating techniques for mixtures and solutions. Explain how infrared radiation is used in the home and on the planet. How energy is stored and transferred.	Practical skills- producing microscope slides, scale of small objects. Modelling of atoms and the Periodic Table along with trends data to be analysed. Calculations of energy transfer and efficiency	Osmosis Diffusion Eukaryote Prokaryote Stem Cells Sub atomic particles Protons Neutrons Electrons Dissipation Gravitational potential energy Power Specific heat capacity Absorption Emission
Year 10 Term 1	B3 Organisation and the Digestive System B4 Organising Plants and Animals	How complex life is organised, the components of the human	Modelling the digestive system and analysing data	Tissue Organ Organ system Enzyme

	B5 Communicable Diseases B6 Preventing and Treating disease C3 Structure and bonding C4 Chemical Calculations C5 Chemical Changes P3 Energy Resources P4 Electric Circuits P5 Electricity in the home P6 Molecules and Matter P7 Radioactivity	body and how food is digested. Develop an understanding of different pathogens and the methods of treatment and prevention. Describe how to prevent bacterial growth. Describe how diseases affect plants. Explain how monoclonal antibodies are made and can be used. Describe how atoms are held together. Use values to determine expected results of experiments. Explore the reactions of acids and how they interact with different compounds based on metals. Describe the function of different nanoparticles. Explore how electricity can be generated in a renewable way. Use titration calculations to predict the yield of experiments and calculate the atom	regarding absorption. Modelling the spread of disease and representing data regarding human response to disease. Calculate the growth of bacteria. Deduce the bonding in a metals based on physical properties. Calculate unknown quantities of reactions along with yield. Conduct titration experiments to determine the composition of unknown chemicals. Explore the reaction of metals with acids. Calculate resistance across a variety of components. Model the internal energy of materials. Model the half life of different materials. Model the radioactive decay of isotopes.	Blood vessels Transpiration Pathogen Virus Bacteria Protists Vaccination Herd immunity Antibiotics Monclonal antibodies Ions Ionic Covalent Metallic Electrostatic Nanoparticles Intermolecular Mole Yield Concentration Titration Displacement Reactivity series Acid Base Tidal Geothermal Solar Component Thermistor Diode Specific Latent Heat Alpha Beta Gamma Ionising Half life Fission Fusion

		economy of them. Explore electricity use in the home, its efficiency and the power that is used. Describe how particles behave at different temperatures. Explain gas pressure in relation to Boyle's law Provide an overview of the three main types of ionising radiation, their risks and uses. Explain fission and fusion		
Year 10 Term 2	B7 Non Communicable Diseases B8 Photosynthesis B9 Respiration B10 Nervous system B11 Hormonal Coordination C6 Electrolysis C7 Energy Changes C8 Rates and Equilibrium C9 Crude oil and Fuels P8 Forces in Balance P9 Motion P10 Forces and Motion	Explore the effect of non communicable diseases on the body and other factors that can affect health. Factors that affect photosynthesis. Describe the process of respiration in different guises. Explain how the eye works. Explore the human nervous system and how it is governed by hormones in the body. Describe how humans reproduce and the factors that can affect fertility.	Analysing data regarding causal mechanisms. Produce data relating to photosynthesis and measure the effect of different conditions. Applying knowledge to unseen examples of hormones and the responses they trigger. Test products to ascertain their identity. Be able to justify whether a reaction is endo or exothermic based on	Carcinogens Non communicable Risk factor Limiting factor Photosynthesis Respiration Anaerobic Aerobic Fermentation Metabolism Effectors Receptors Coordination centre Homeostasis Glucagon Diabetes Fertility Asexual Electrolysis Electrode Anode Cathode Electrolyte Exothermic Endothermic Hydrocarbons Alkanes

		Describe how ionic compounds can be separated into component atoms using electrolysis. Explain how chemical cells work. Describe how crude oil can be processed into useful fractions Describe how forces interact with one another. Describe the effect of levers on closed systems. Explain how forces and motion are interlinked.	primary and secondary data. Calculate bond energies. Calculate resultant forces across 2 dimensions. Construct a terminal velocity graph for different scenarios.	Alkenes Fractional distillation Balanced Unbalanced Centre of mass Terminal velocity Momentum Lever Moment
Year 10 Term 3	B12 Hormones in action B13 Reproduction C10 Organic Reactions C11 Polymers C12 Chemical Analysis P10 Forces and Motion P11 Forces and pressure	Explain how hormones in the body act and their purpose. Describe the differences between sexual and asexual reproduction. Link this to protein synthesis and DNA structure. Describe the organic reactions of alkenes, carboxylic acids, alcohols and esters. Describe how addition, condensation and natural polymers form.	Evaluate human intervention in organ functions. Produce punnet squares that predict the prevalence of genes in offspring. Use patterns in structure to predict reactivity and function. Use data to explain the boiling points of different materials. Use data to test for purity	Dialysis Meiosis Fertilisation Screening Disorder Genetics Alkene Carboxylic acid Ester Alcohol Emission spectroscopy Precipitate Elastic Thinking time Braking time

		Use chromatography and melting point data to successfully identify compounds. Evaluate the use of positive ion test coupled with emissions spectroscopy to identify substances. Describe how forces can interact with elastic objects. Explain the safety features that are present in cars. Describe the pressure in a liquid at rest and explain how objects float.	and justify answers. Explore Hooke's law	
Year 11 Term 1	B14 Variation and Evolution B15 Genetics and Evolution B16 Adaptations, Interdependence and Competition B17 Organising an Ecosystem B18 Biodiversity and Ecosystems C13 Earth's Atmosphere C14 Earth's Resources C15 Using our Resources P12 Wave Properties P13 Electromagnetic Waves P14 Light P15 Electromagnetism P16 Space	Explain the process of evolution in organisms. Explain Darwinism. Describe how plants and animals exist in an environment and how they compete for various things within it. Describe how an ecosystem is kept in balance by the organisms that live within it. Explain how decomposition is affected by	Ethical debate on the use of genetic technologies. Produce models to sample a large area. Evaluate the potential threat that global warming can cause. Analyse data to evaluate the likely lifespan of materials on the Earth. Link the wave properties to the energy they have.	Natural Selection Selective Breeding Genetic Engineering Communities Abiotic Quadrats Sampling Transect Competition Adaptation Ecosystem Carbon cycle Materials cycle Biodiversity Greenhouse gas Climate change Life cycle assessment Recycle Glass Ceramic Composite Haber Alloy Sustainability

		different microorganisms. Describe how the Earth's atmosphere has changed over the past 4.5 billion years. Explore the Earth's resources the threats to them and how to prolong their life. Explain how fertilisers are produced and used. Describe how different resources including alloys are made. Describe how physical waves interact and how electromagnetic waves transfer. Describe how ultrasound and seismic waves transfer energy. Describe how light transfers energy and how it can be manipulated. Describe the electromotive effect and how it can be used. Explore the solar system and describe observations that can be made.	Explore the use of lenses and link their shape to their function. Use models to predict the outcomes of motor effects. Provide evidence of scientific theories for the big bang.	Transverse Longitudinal Reflection Rarefaction Refraction Seismic Concave Convex Magnetic Flux Orbit Satellite Cosmic microwave background radiation Red shift
Year 11	Preparation for exams			

Term 2				
Year 11 Term 3	Preparation for exams			