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

	1	Have an arrest to		
		How energy is		
		stored and		
Veri	D2 O	transferred.	NA - dell'	Tions
Year	B3 Organisation and the	How complex	Modelling the	Tissue
10	Digestive System	life is organised,	digestive	Organ
Term	B4 Organising Plants and	the components	system and	Organ system
1	Animals	of the human	analysing data	Enzyme
	B5 Communicable	body and how	regarding	Blood vessels
	Diseases	food is digested.	absorption.	Transpiration
	B6 Preventing and	Develop an	Modelling the	Pathogen
	Treating disease	understanding	spread of	Virus
	C3 Structure and	of different	disease and	Bacteria
	bonding	pathogens and	representing	Protists
	C4 Chemical Calculations	the methods of	data regarding	Vaccination
	C5 Chemical Changes	treatment and	human	Herd immunity
	P3 Energy Resources	prevention.	response to	Antibiotics
	P4 Electric Circuits	Describe how	disease.	lons
	P5 Electricity in the	atoms are held	Deduce the	Ionic
	home	together.	bonding in a	Covalent
	P6 Molecules and Matter	Use values to	metals based	Metallic
	P7 Radioactivity	determine	on physical	Electrostatic
		expected results	properties.	Intermolecular
		of experiments.	Calculate	Mole
		Explore the	unknown	Yield
		reactions of	quantities of	Concentration
		acids and how	reactions	Displacement
		they interact	along with	Reactivity series
		with different	yield. Explore	Acid Base
		compounds	the reaction of	Tidal
		based on	metals with	Geothermal
		metals.	acids.	Solar
		Explore how	Calculate	Component
		electricity can	resistance	Thermistor
		be generated in	across a	Diode
		a renewable	variety of	Specific Latent Heat
		way.	components.	Alpha
		Explore	Model the	Beta
		electricity use in	internal	Gamma
		the home, its	energy of	Ionising
		efficiency and	materials.	Half life
		the power that	Model the half	
		is used.	life of different	
		Describe how	materials.	
		particles behave		
		at different		
		temperatures.		
		Provide an		
		overview of the		
		three main		
		types of ionising		
<u> </u>	<u> </u>	71	l .	<u>L</u>

		radiation their	<u> </u>	
		radiation, their risks and uses.		
Year	B7 Non Communicable	Explore the	Analysing data	Carcinogens
10	Diseases	effect of non	regarding	Non communicable
Term	B8 Photosynthesis	communicable	causal	Risk factor
2	B9 Respiration	diseases on the	mechanisms.	Limiting factor
2	B10 Nervous system	body and other	Produce data	Photosynthesis
	B11 Hormonal	factors that can	relating to	Respiration
	Coordination	affect health.	photosynthesis	Anaerobic
	C6 Electrolysis	Factors that	and measure	Aliaerobic
	C7 Energy Changes	affect	the effect of	Fermentation
		photosynthesis.	different	Metabolism
	C8 Rates and Equilibrium P8 Forces in Balance	Describe the	conditions.	Effectors
	P9 Motion	process of	Applying	Receptors
	P10 Forces and Motion	respiration in	knowledge to	Coordination centre
		different guises.	unseen	Homeostasis
		Explore the	examples of	Glucagon
		human nervous	hormones and	Diabetes
		system and how	the responses	Fertility
		it is governed by	they trigger.	Asexual
		hormones in the	Test products	Electrolysis
		body. Describe	to ascertain	Electrode
		how humans	their identity.	Anode
		reproduce and	Be able to	Cathode
		the factors that	justify whether	Electrolyte
		can affect	a reaction is	Exothermic
		fertility.	endo or	Endothermic
		Describe how	exothermic	Balanced
		ionic	based on	Unbalanced
		compounds can	primary and	Centre of mass
		be separated	secondary	Terminal velocity
		into component	data. Calculate	Momentum
		atoms using	bond energies.	
		electrolysis.	Calculate	
		Describe how	resultant	
		forces interact	forces across 2	
		with one	dimensions.	
		another.	Construct a	
		Explain how	terminal	
		forces and	velocity graph	
		motion are	for different	
		interlinked.	scenarios.	
Year	R12 Paproduction	Describe the	Produce	Meiosis
rear 10	B12 Reproduction C9 Crude oil and Fuels	differences		Fertilisation
			punnet	
Term	C10 Chemical Analysis	between sexual	squares that	Screening
3	P10 Forces and Motion	and asexual	predict the	Disorder
		reproduction.	prevalence of	Genetics
1		Link this to	genes in	Hydrocarbons
		protein	offspring.	Alkanes
	<u>l</u>			Alkenes

Year	B13 Variation and	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 Natural Selection
Term 1	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	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.	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 &	The many / May Overstiens	1/ n a val a diga	Skills	A codomic Longue
	Themes / Key Questions	Knowledge	SKIIIS	Academic Language
Term	D1 0 H C1	I:cc	5 ·· 1 1···	
Year 9	B1 Cell Structure and	The differences	Practical skills-	Osmosis
Term	Transport	between	producing	Diffusion
3	B2 Cell Division	Eukaryotic and	microscope	Eukaryote
	C1 Atomic Structure	Prokaryotic	slides, scale of	Prokaryote
	C2 The Periodic Table	cells, how stem	small objects.	Stem Cells
	P1 Conservation and	cells can be		
	Dissipation of Energy	used.	Modelling of	Sub atomic particles
	P2 Energy Transfer by	Describe how	atoms and the	Protons
	heating	the model of	Periodic Table	Neutrons
		the atom has	along with	Electrons
		changed over	trends data to	
		time, the	be analysed.	Dissipation
		development of	Calculations of	Gravitational potential
		the Periodic	energy	energy
		Table. Describe	transfer and	Power
		the properties	efficiency	Specific heat capacity
		of the transition	·	Absorption
		elements.		Emission
		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.		
Year	B3 Organisation and the		Modelling the	Tissue
10	_	·	_	
Term	,	_	•	_
1	9	· ·	l	
10 Term	B3 Organisation and the Digestive System B4 Organising Plants and Animals	transferred. 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 lons 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		
Vaar	D7 Non Communicable		Analysisa data	Carainagana
Year	B7 Non Communicable	Explore the	Analysing data	Carcinogens
10	Diseases	effect of non	regarding	Non communicable
Term	B8 Photosynthesis	communicable	causal	Risk factor
2	B9 Respiration	diseases on the	mechanisms.	Limiting factor
	B10 Nervous system	body and other	Produce data	Photosynthesis
	B11 Hormonal	factors that can	relating to	Respiration
	Coordination	affect health.	photosynthesis	Anaerobic
	C6 Electrolysis	Factors that	and measure	Aerobic
	C7 Energy Changes	affect	the effect of	Fermentation
	C8 Rates and Equilibrium	photosynthesis.	different	Metabolism
	C9 Crude oil and Fuels	Describe the	conditions.	Effectors
	P8 Forces in Balance	process of	Applying	Receptors
	P9 Motion	respiration in	knowledge to	Coordination centre
	P10 Forces and Motion	different guises.	unseen	Homeostasis
		Explain how the	examples of	Glucagon
		eye works.	hormones and	Diabetes
		Explore the	the responses	Fertility
		human nervous	they trigger.	Asexual
		system and how	Test products	Electrolysis
		it is governed by	to ascertain	Electrode
		hormones in the	their identity.	Anode
		body. Describe	Be able to	Cathode
		how humans	justify whether	Electrolyte
		reproduce and	a reaction is	Exothermic
		the factors that	endo or	Endothermic
		can affect	exothermic	Hydrocarbons
		fertility.	based on	Alkanes

		Decertible is	mulma e e . e .	Allegage
		Describe how	primary and	Alkenes
		ionic	secondary	Fractional distillation
		compounds can	data. Calculate	Balanced
		be separated	bond energies.	Unbalanced
		into component	Calculate	Centre of mass
		atoms using	resultant	Terminal velocity
		electrolysis.	forces across 2	Momentum
		Explain how	dimensions.	Lever
		chemical cells	Construct a	Moment
		work.	terminal	
		Describe how	velocity graph	
		crude oil can be	for different	
		processed into	scenarios.	
		useful fractions		
		Describe how		
		forces interact		
		with one		
		another.		
		Describe the		
		effect of levers		
		on closed		
		systems.		
		Explain how		
		forces and		
		motion are		
		interlinked.		
Year	B12 Hormones in action	Explain how	Evaluate	Dialysis
10	B13 Reproduction	hormones in the	human	Meiosis
Term	C10 Organic Reactions	body act and	intervention in	Fertilisation
3	C11 Polymers	their purpose.	organ	Screening
	C12 Chemical Analysis	Describe the	functions.	Disorder
	P10 Forces and Motion	differences	Produce	Genetics
	P11 Forces and pressure	between sexual	punnet	Alkene
	-	and asexual	squares that	Carboxylic acid
		reproduction.	predict the	Ester
		Link this to	prevalence of	Alcohol
		protein	genes in	Emission spectroscopy
		synthesis and	offspring.	Precipitate
		DNA structure.	Use patterns in	Elastic
		Describe the	structure to	Thinking time
		organic	predict	Braking time
		reactions of	reactivity and	
		alkenes,	function.	
		carboxylic acids,	Use data to	
		alcohols and	explain the	
		esters.	boiling points	
		Describe how	of different	
		addition,	materials.	
		condensation	Use data to	
		and natural	test for purity	
		polymers form.		
		PO.7CIO (OIII)	Ì	i l

		Use	and justify	
		chromatography	answers.	
		and melting	Explore	
		point data to	Hooke's law	
		•	HOOKE 5 law	
		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.		
Year	B14 Variation and	Explain the	Ethical debate	Natural Selection
11	Evolution	process of	on the use of	Selective Breeding
Term	B15 Genetics and	evolution in	genetic	Genetic Engineering
1	Evolution	organisms.	technologies.	Communities
	B16 Adaptations,	Explain	Produce	Abiotic
	Interdependence and	Darwinism.	models to	Quadrats
	Competition	Describe how	sample a large	Sampling
	B17 Organising an	plants and	area.	Transect
		animals exist in	Evaluate the	
	Ecosystem			Competition
	B18 Biodiversity and	an environment	potential	Adaptation
	Ecosystems	and how they	threat that	Ecosystem
	C13 Earth's Atmosphere	compete for	global	Carbon cycle
	C14 Earth's Resources	various things	warming can	Materials cycle
	C15 Using our Resources	within it.	cause.	Biodiversity
	P12 Wave Properties	Describe how an	Analyse data	Greenhouse gas
	P13 Electromagnetic	ecosystem is	to evaluate the	Climate change
	Waves	kept in balance	likely lifespan	Life cycle assessment
	P14 Light	by the	of materials on	Recycle
	P15 Electromagnetism	organisms that	the Earth.	Glass
	P16 Space	live within it.	Link the wave	Ceramic
		Explain how	properties to	Composite
		decomposition	the energy	Haber
		is affected by	they have.	Alloy
			-,	Sustainability
L	<u> </u>	l		Sastaniasinty

		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	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 Seismic Concave Convex Magnetic Flux Orbit Satellite Cosmic microwave background radiation Red shift
		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		
Year 11	Preparation for exams	that can be made.		

Term			
2			
Year	Preparation for exams		
11			
Term			
3			