

Science

Year 10 & 11 Curriculum Intent 2024 - 2025

Combined Science (Trilogy) - Biology

The course is based on the AQA GCSE 9 – 1 Combined Science Trilogy Biology (8464) Specification and is taught across Year 10 and Year 11. It is our intention as Science Department to provide all children, regardless of their prior learning, background, or special needs, with a broad and balanced science curriculum. We aim to promote positive attitudes to science as an interesting and enjoyable subject as well as to develop pupils' awareness of how science impacts on their everyday life.

Students at KS4 have 3 lessons of each science per fortnight.

How can I support my child at home?

- Ensure weekly homework is completed on SatchelOne/Educake
- Use the knowledge organisers to support retention of knowledge and understanding
- Help encourage revision, especially around assessment times: [Revision techniques from BBC Bitesize - BBC Bitesize](#)

How else can my child increase their knowledge and love of science?

While outside reading isn't required for Science, it can be very beneficial to inspire, motivate and help students progress. In addition to books, online videos and journals may be of interest to your child

Websites and journals we recommend:

- BBC Bitesize
- Seneca Learning - www.Senecalearning.com
- TED ED - <https://www.youtube.com/teded/featured>
- In a nutshell - <https://www.youtube.com/user/Kurzgesagt>
- Freescience lessons - https://www.youtube.com/channel/UCqbOeHaAUXw9II7sBVG3_bw

- Primrose Kitten - <https://primrosekitten.org/gcse-science/> or on youtube - <https://www.youtube.com/channel/UCBgvmal8AR4QIK2e0EfJwaA>
- BMJ News - www.bmj.com/new
- Nature - www.nature.com/
- New Scientist - www.newscientist.com/
- RSB Letters & Opinions - royalsocietypublishing.org/journal/rsbl

Books we recommend (some push KS4+ knowledge):

- Adam Kay – This is going to hurt
- Matthew Walker – Why we sleep
- Dean Burnett – The idiot brain
- Adam Nicolson – The sea is not made of water
- Emma Young – Super senses
- Bill Bryson – The body
- Randall Munroe – What if?: Serious scientific questions to absurd hypothetical questions
- Bill Bryson – A short history of nearly everything
- Ben Goldacre – Bad science
- Charles Darwin – Origin of the Species
- Matt Ridley – Genome
- James Watson: DNA
- Daniel Chamovitz – What a plant knows
- Steven Pinker – The language instinct
- Steven Pinker – How the mind works
- Richard Dawkins – The selfish gene
- Jonny Keeling – Seven World One Planet
- Professor Brian Cox – Forces of Nature
- Professor Brian Cox – Wonders of Life
- Sir David Attenborough – Amazing Rare things.

Topic name	Big ideas	Specification & NC Links	Skill Components	Assessment Points	from Key Stage 3 to Key Stage 5
Enquiry Processes	Taught throughout all topics	<ul style="list-style-type: none"> • evaluate risks and alter practice accordingly • 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 variables, where appropriate • use appropriate techniques, apparatus, and materials during 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 improvements • 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. • undertake basic data analysis including simple statistical techniques 	<ul style="list-style-type: none"> • Recall key terminology. • Identify hazard symbols and describe ways to reduce risks • Choose appropriate lab equipment to complete practical activities • Draw labelled scientific diagrams of equipment • Use a Bunsen burner safely • Draw tables to hold data • Draw bar graphs to show discontinuous data • Draw line graphs to show continuous data • Plan a method to test one variable • Complete a practical to obtain valid results • Analyse data gained • Calculate means • Produce extended writing through practical write ups • Collaborate and communicate in completion of practicals 	<ul style="list-style-type: none"> • Bar charts and analysis (Forces) • Line graphs (States of Matter) • Method writing (Reactions) • Educake quizzes • Synoptic Assessments 	<ul style="list-style-type: none"> • planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary • 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 <p>KS4 – All required practicals</p>

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Cells	Cells recap and Transport in Cells	<ul style="list-style-type: none"> Review of cell structure from Year 9 Microscopes and their uses Microscopy required practical Prokaryotic cell structure Comparing types of cells How substances are transported in and out of cells by diffusion (recap) osmosis and active transport. Osmosis required practical Specific examples of where transport of substances processes occur within organisms. 	<ul style="list-style-type: none"> Build on experimental skills with Compulsory Practical 1 (Use a light microscope to observe, draw and label plant and animal cells) - Build on microscopy skills from Yr 7 and Yr 9. Recognise, draw and interpret diagrams modelling diffusion, osmosis and active transport. Calculate SA:Vol Build on experimental skills with Compulsory Practical 2 (Investigate the effect of a range of concentrations of sugar solution on the mass of plant tissue) Recognise and use expressions in decimal form. Calculate percentage change Plot, draw and interpret appropriate graphs on osmosis 	<ul style="list-style-type: none"> Peer and Self Assessment embedded throughout Educake Quizzes Completion of practical Starter tasks which interleave knowledge from previous learning Presenting and Evaluating data Synoptic Assessments End of year mock yr 10 & 11 External GCSE 	<ul style="list-style-type: none"> Year 7 cells – structure & function Year 8 plants and photosynthesis – plant structure Year 8 breathing – respiration & fermentation Year 9 cell #biology topic Year 12 topics 2A – cell structure, 2B – cell membrane, 3A & 3B – exchange and transport systems Year 13 – all topics
Organisation	Enzymes & Food Tests	<ul style="list-style-type: none"> Recap what an enzyme is and the uses of enzymes in digestion Required practical looking into the effect of pH on an enzyme controlled reaction Food tests required practical 	<ul style="list-style-type: none"> Use models to demonstrate enzyme activity and specificity Develop practical skills for enzymes required practical (Investigate the effect of pH on the rate of reaction of amylase) Practice experimental skills with Required Practical 3 (Use qualitative reagents to test for a range of carbohydrates, lipids and proteins) 	<ul style="list-style-type: none"> Peer and Self Assessment embedded throughout Educake Quizzes Completion of practical Starter tasks which interleave knowledge from previous learning Data collection for required practicals Presentation and evaluation of collected data for required practicals Correct interpretation of of results Synoptic Assessments End of year mock yr 10 & 11 External GCSE 	<ul style="list-style-type: none"> Year 7 cells – specialised cells Year 8 digestion Year 9 organisation – enzymes, digestive system Year 12 topics 1A & 1B – biological molecules, 4A – DNA synthesis Year 13 topics 5A – respiration & photosynthesis, 6B nervous co-ordination, 6C - homeostasis

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Bioenergetics	Photosynthesis & Respiration	<ul style="list-style-type: none"> • Photosynthesis – chemical equation, knowledge of reactants and products. • Limiting factors of photosynthesis • Experimental evidence of photosynthesis • Apply knowledge to growing plants in greenhouses. - Use of glucose by plants • Respiration – chemical equation, knowledge of reactants and products. • Process and site of aerobic respiration • Uses of energy • Process of anaerobic respiration in animal cells, yeast and plant cells. • Compare aerobic and anaerobic respiration. • Effects of exercise on the body • What is meant by 'metabolism' 	<ul style="list-style-type: none"> • Build on experimental skills with Compulsory Practical 5 (Effect of light intensity on the rate of photosynthesis) • Plan an experiment from a list of equipment -Measure and calculate rate using appropriate apparatus and technique. • Extract and interpret graphs • Continue to develop graph drawing skills. • Understand and use inverse proportion. • Continue to develop ability to analyse and evaluate data. • Interpret data on heart rate, breathing rate and changes because of exercise and the rate of respiration. 	<ul style="list-style-type: none"> • Peer and Self Assessment embedded throughout • Educake Quizzes • Completion of practical • Starter tasks which interleave knowledge from previous learning • Data collection for required practicals • Presentation and evaluation of collected data for required practicals • Correct interpretation of results • Synoptic Assessments • End of year mock yr 10 & 11 • External GCSE • 	<ul style="list-style-type: none"> • Year 7 cells – structure & specialised cells • Year 8 digestion – energy levels • Year 8 plants & photosynthesis • Year 8 breathing • Year 9 cell biology – cell specialisation • Year 12 topics 1B – More biological molecules, 3A & 3B – mass transport • Year 13 topics 5A – photosynthesis & respiration
Homeostasis and response	Nervous System & Endocrine System	<ul style="list-style-type: none"> • Homeostasis • Structure, function and adaptations of the nervous system • Role of chemicals at the synapse • What is involved in a reflex action and its role • The role of the endocrine system and hormones • How blood glucose is controlled 	<ul style="list-style-type: none"> • Build on experimental skills with Required Practical 6 (the effect of a factor on human reaction time) - Extract and interpret data from graphs and tables. -Translate information on reaction times to numerical and graphical form • Continue to develop understanding of practical terminology • Interpret graphs and data on the effects of insulin on blood glucose levels 	<ul style="list-style-type: none"> • Peer and Self Assessment embedded throughout • Educake Quizzes • Completion of practical • Starter tasks which interleave knowledge from previous learning • Data collection for required practicals • Presentation and evaluation of collected data for required practicals • 	<ul style="list-style-type: none"> • Year 7 cells • Year 7 reproduction • Year 9 cell biology • Year 12 topic 3B – Exchange Systems • Year 13 topics 6A – stimuli, 6B – nervous co-ordination, 6C - homeostasis

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Homeostasis and response cont	Nervous System & Endocrine System	<ul style="list-style-type: none"> • Roles of insulin and glucagon • Causes, effects and treatments of type 1 and 2 diabetes • The role of hormones in human reproduction - Know a variety of contraception methods – hormonal and non-hormonal • Describe the use of hormones in treating infertility and the process of IVF (HT) • Role of adrenaline and thyroxine • Describe the process of negative feedback • 	<ul style="list-style-type: none"> • Consider the social and ethical issues of living with diabetes and the link between type 2 and obesity -Build on skills of interpreting data from tables and graphs in relation to hormones and the menstrual cycle • Build on evaluation skills – pros and cons of contraception method • Evaluate fertility treatments and the ethical issues associated with these (HT) • Improve understanding of how scientific technologies can be used to our advantage • Use of modelling to explain a process of negative feedback mechanisms 	<ul style="list-style-type: none"> • Correct interpretation of of results • Synoptic Assessments • End of year mock yr 10 & 11 • External GCSE • 	
Infection and response	Recap from year 9 & immunity	<ul style="list-style-type: none"> • Review knowledge of communicable diseases with a focus on bacteria and antibiotics • Explain how bacteria multiply and the conditions needed for growth. • The difference between communicable and noncommunicable diseases. • The effect of lifestyle on disease • Risk factors for diseases • Knowledge of what cancer is – types and risk factors • Process involved in drug development and clinical trials. 	<ul style="list-style-type: none"> • Recall knowledge or pathogens and effectiveness of antibiotics • express data in standard form • Identify key hazards in a practical context • Analyse and interpret data on risk factors and make valid judgements • Develop awareness of the difference between correlation and causation • Appreciate the difference between benign and malignant tumours based on localisation or metastasis - Understand the ethical issues associated with drug trials including animal testing as well as the risks - Explain how bias is eliminated in double blind trials and understand the importance of peer review 	<ul style="list-style-type: none"> • Peer and Self Assessment embedded throughout • Educake Quizzes • Completion of practical • Starter tasks which interleave knowledge from previous learning • Data collection for required practicals • Presentation and evaluation of collected data for required practicals • Correct interpretation of of results • Synoptic Assessments • End of year mock yr 10 & 11 • External GCSE • 	<ul style="list-style-type: none"> • Year 7 cells – specialised cells • Year 8 digestion – drugs, energy levels • Year 9 infection • Year 12 topics 2A & 2B – cell structure & cell membranes, 2C – Immunity, 3A – exchange systems • Year 13 topics – 6C – homeostasis, 7A – genetics, 8A mutations, 8B – genome projects

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Inheritance	Genetics, DNA, inheritance patterns & applications	<ul style="list-style-type: none"> Describe the differences between sexual and asexual reproduction Be familiar with the process of meiosis and why it is necessary Compare mitosis and meiosis. Describe DNA structure, human genome and chromosomes as well as identification of genes Use genetic cross diagrams to determine genetic inheritance. Be familiar with genetic disorders – causes, symptoms, treatments How to make informed judgements about the economic, social and ethical issues concerning embryo screening Know that variation can arise from mutation, the causes of variation and examples of variation Describe the process of selective breeding and know advantages/disadvantages it has associated Define genetic engineering and describe the processes involved as well as advantages and disadvantages Understand the theory of evolution by natural selection Apply the concept of natural selection to explain antibiotic resistance and the issues this has The process of classification and the systems that have developed for this purpose and interpret evolutionary trees What are fossils and how can we use the Causes of extinction, awareness of endangerment and some examples 	<ul style="list-style-type: none"> Debate the advantages and disadvantages of studying the human genome Recall key terminology Apply knowledge of inheritance to contextualised examples -Construct and interpret genetic cross diagrams Understand simple probability Categorise variation in terms of genetic or environmentally driven or a combination of both - Recall, in detail, processes for selective breeding and genetic engineering and uses of each in agriculture and industry Evaluation skills Improve understanding of the need to critically review evidence and peer review data and outcomes - Create links between mutations and antibiotic resistance and knowledge of how to avoid this happening more frequently Read and interpret evolutionary trees and use them to identify the closeness of common ancestors -Appreciate problems with the fossil record and reasons for the gaps Consider methods to avoid extinction and relate to the impact of biodiversity of an area leading to our next topic 	<ul style="list-style-type: none"> Peer and Self Assessment embedded throughout Educake Quizzes Completion of practical Starter tasks which interleave knowledge from previous learning Data collection for required practicals Presentation and evaluation of collected data for required practicals Correct interpretation of of results Synoptic Assessments End of year mock yr 10 & 11 External GCSE 	<ul style="list-style-type: none"> Year 7 Genes Year 8 Genes Year 9 Cell biology Year 12 topics – 1B – more biological molecules, 4A – DNA, 4B – diversity & selection, 4C – classification Year 13 topics – 7A – genetics, 8A - mutations

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Ecology	Factors affecting ecosystems, adaptations, interactions between communities and how to evaluate the effects	<ul style="list-style-type: none"> • Be familiar with specific key terms e.g. community, ecosystem, interdependence. • Describe ecosystems in terms of their biotic and abiotic factors. • Describe adaptations of organisms and introduce the idea of competition for a variety of needs and resources • Feeding relationships within a community. • How materials are cycled within the environment. - Biodiversity • Waste management • Types of land, water and air pollution • Land use and deforestation • Causes and consequences • Global warming • Methods for maintaining biodiversity 	<ul style="list-style-type: none"> • Recall key terminology • Add to experimental skills with Required Practical 7 (Measure the population size of a common species in a habitat) • Use of transects and quadrats in the field • Interpret graphs to model predator-prey cycles. • Build on evaluation skills • Understand the terms mean, mode and median • Calculate a mean from data provided on sampling • Build on skill of extracting and interpreting information from graphs, tables, charts. • Evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. • Describe and evaluate, with the help of data, methods that can be used to tackle problems caused by human impacts on the environment. • Build on understanding of the need for data analysis and peer review when studying climate change. • Consider ways to reduce future damaging impacts on the environment 	<ul style="list-style-type: none"> • Peer and Self Assessment embedded throughout • Educake Quizzes • Completion of practical • Starter tasks which interleave knowledge from previous learning • Data collection for required practicals • Presentation and evaluation of collected data for required practicals • Correct interpretation of results • Synoptic Assessments • End of year mock yr 10 & 11 • External GCSE • 	<ul style="list-style-type: none"> • Year 7 Genes • Year 8 Plants & photosynthesis • Year 8 Genes • Year 12 topics – 4B – diversity & selection, 4C – Classification • Year 13 topics – 5B – energy transfers, 7B – populations, 7C – populations in ecosystems

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Consolidation & Exam Practice	All topics	<ul style="list-style-type: none"> Revise all topics in the specification Highlight and recall methods of the required practicals -Know how to approach the exams techniques to aid in revision 	<ul style="list-style-type: none"> Recall key terminology. Apply knowledge from all topics Devise methods to investigate scientific theories Interpret given data Complete practice questions Revision techniques to support individual needs Knowledge of where to find resources to help prepare for exams Ability to interpret questions and strategies to aid individuals e.g. highlighting key words, looking at marks available etc. 	<ul style="list-style-type: none"> Peer and self assessments throughout Educake Quizzes Synoptic Assessments External GCSE exams 	

Cultural and skills lessons:

- Throughout the year students will also complete lessons to improve their cultural capital and skills such as problem solving. These themes will include:
 - How to revise
 - How to use textbooks
 - How to use Seneca learning and BBC bitesize to aid independent learning

Assessment: Year 10 and 11 students will be assessed throughout the year through summative and formative assessments.. They will also complete mock exams based on previous years external GCSE exams.

