ST BERNARD'S
HIGH SCHOOL

Curriculum Guide
Science
2025 - 26

Contents

Curriculum Intent

Our science curriculum provides a rigorous, knowledge-rich education in Biology, Chemistry, and Physics, enabling all students to acquire the scientific understanding, practical skills, and critical thinking required to succeed in further study and employment. Rooted in our Catholic ethos, the curriculum promotes awe and wonder at the complexity of creation, the development of moral and ethical reasoning, and a deep respect for the dignity of life. Through the integration of Catholic Social Teaching, including stewardship of the environment and commitment to the common good, students are encouraged to apply their scientific knowledge responsibly in a rapidly evolving world. The curriculum is structured to ensure high expectations, equitable access, and clear progression, enabling every learner to achieve their potential, develop resilience, and become scientifically literate citizens capable of contributing positively to society and the future development of scientific knowledge and concepts.

Head of Science

Miss C Campbell

Year 7

In Year 7, students follow the *Exploring Science* programme, designed to build a strong foundation in Biology, Chemistry, and Physics while fostering curiosity and practical skills. The curriculum introduces key scientific concepts, develops core investigative skills, and encourages students to make connections between science and the world around them, framed within our Catholic ethos of stewardship, respect, and awe for creation.

Number of lessons per fortnight: 3

Skills developed:

Scientific Enquiry Skills

- Planning and conducting investigations safely and systematically.
- Using scientific equipment (Bunsen burners, measuring instruments) with accuracy and care.
- Making and recording precise observations and measurements.
- Identifying variables and understanding how to control them.
- Applying scientific models to explain observations and predict outcomes.

Analytical and Thinking Skills

- Interpreting data from tables, graphs, and charts.
- Drawing valid conclusions and evaluating methods.
- Applying logical reasoning to explain patterns and relationships.
- Beginning to use scientific formulae (e.g., for speed, density) in simple contexts.
- Communicating ideas using appropriate scientific vocabulary.

Practical and Collaborative Skills

- Working effectively in teams to plan and carry out experiments.
- Developing resilience and problem-solving when experiments do not go as expected.
- Applying numeracy in practical contexts (calculations, scaling, averages).

Values and Personal Development

- Demonstrating respect for safety, equipment, and the environment.
- Reflecting on the moral and ethical implications of science, including stewardship of creation.
- Building curiosity, independence, and confidence as learners.

Classes: Students are taught in mixed ability classes.

Essential equipment: Standard school equipment with a Scientific Calculator

Extracurricular and enrichment opportunities: Cell models design, Shoebox car challenge with the race to the line via the learning partnerships, Science Club

Careers curriculum: In Year 7, students begin to make stronger connections between science concepts and the wide range of careers that use science skills. They explore how their growing scientific knowledge can lead to exciting jobs in healthcare, engineering, research, and more, building awareness of the relevance of science beyond the classroom

	Content studied	Literacy focus	What parents can do to help
Autumn Term	> Introduction to Science > Cells, tissues, organs and systems > Atoms, elements and molecules > Energy	Learn basic scientific vocabulary, read simple texts and diagrams, and practice clear descriptions.	Help learn new science words and talk about simple science ideas
Spring Term	> Sexual Reproduction > Mixtures and Separations > Current and Electricity	Use more complex terms, write structured explanations, interpret data, and develop scientific arguments	Support clear writing and discuss charts or diagrams together

Summer Term	> Acids and Alkalis > Ecosystems > Variation and Adaptation	Write detailed conclusions with evidence, evaluate information critically, and present ideas clearly in writing and speaking	Encourage writing detailed conclusions and explaining ideas out loud

Helpful books/websites:

Books

- CGP KS3 Science Study & Activity Book
- Collins KS3 Science Workbook
- Oxford Revise: KS3 Science

Websites

- BBC Bitesize KS3 Science — interactive lessons and quizzes
- Seneca Learning — free revision courses
- The Science Page — videos and tips by students
- In My Element — video lessons and worksheets

Opportunities for wider reading/research:

Biology

- Read *"Cells: An Owner's Handbook"* to understand how cells work.
- Research the invention and uses of the microscope in medicine.
- Compare how different animals reproduce (e.g. frogs vs mammals).
- Investigate how pollinators like bees help plants reproduce.
- Explore the human body systems using DK's *"The Human Body"* book or Kids Health website.

Chemistry

- Read *"The Elements"* by Theodore Gray for a fun look at the periodic table.
- Research real-life applications of acids and alkalis (e.g. antacids, cleaning products).
- Explore how atoms and particles explain changes in state (solid, liquid, gas).
- Investigate the work of famous chemists like Marie Curie or Mendeleev.
- Test pH levels of everyday substances at home using red cabbage indicator.

Physics

- Read *"Can You Feel the Force?"* by Richard Hammond to explore forces in real life.
- Investigate how animals like bats use sound to navigate (echolocation).
- Explore how mirrors and lenses work in making images.
- Research renewable vs non-renewable energy and how we use them.
- Look into how Newton's laws apply to everyday objects (e.g. cycling, jumping).

Year 8

In Year 8, students continue to build on their foundational knowledge from Year 7, developing a deeper understanding of key scientific concepts across biology, chemistry, and physics. In biology, they explore topics such as respiration, photosynthesis, microorganisms, and ecological relationships. Chemistry topics include the periodic table, elements and compounds, types of chemical reactions, and the Earth's structure and atmosphere. In physics, students investigate forces and motion, pressure in fluids and gases, light and sound waves, and energy transfers. Through practical work, scientific enquiry, and real-world applications, students are encouraged to think critically, develop their investigative skills, and appreciate how science impacts everyday life and global issues.

Number of lessons per fortnight: 4

Skills developed

- **Scientific Enquiry Skills**
  - Planning fair tests and investigations
  - Identifying variables (independent, dependent, control)
  - Making predictions based on scientific knowledge
  - Drawing conclusions and evaluating results
- **Practical & Laboratory Skills**
  - Safely using scientific equipment (e.g. Bunsen burners, measuring cylinders)
  - Accurately measuring, observing, and recording results
  - Following methodical instructions and working collaboratively in experiments
- **Analytical & Data Skills**
  - Presenting data using tables, bar charts, and line graphs
  - Identifying patterns and anomalies in results
  - Calculating averages and interpreting trends
- **Mathematical Application in Science**
  - Using equations to calculate speed, density, pressure, etc.
  - Applying basic arithmetic, percentages, and ratios to scientific data
  - Converting units (e.g. cm to m, g to kg)
- **Scientific Literacy & Communication**
  - Using correct scientific vocabulary and terminology
  - Reading and interpreting scientific texts and diagrams
  - Writing structured conclusions and evaluations
- **Critical Thinking & Problem Solving**
  - Applying knowledge to unfamiliar situations
  - Evaluating the reliability and validity of evidence
  - Considering the ethical and environmental impact of science

Classes: Students are taught in mixed ability classes.

Essential equipment: Standard school equipment with a Scientific Calculator

Extracurricular and enrichment opportunities: 'MISAC' – exploring tropical diseases in depth and antibiotics resistance, Science club

Careers curriculum: In Year 8, students begin to make clearer links between science topics and the world of work. They explore how scientific skills are used in a range of careers and industries, helping them understand the relevance of science in everyday life and future pathways

	Content studied	Literacy focus	What parents can do to help
Autumn Term	> Food and nutrition > Periodic Table > Metals and their uses	Reinforce key scientific terms, improve reading of complex texts	Reinforce key science vocabulary and discuss more complex texts and diagrams

		and diagrams, and practice clear writing of processes.	
Spring Term	> Breathing and respiration > Forces > Combustion	Use precise vocabulary in explanations, analyse data, write detailed methods and conclusions, and engage in scientific discussions.	Help with detailed explanations and interpreting data
Summer Term	> Light and Sound > Unicellular Organisms > Energy	Critically evaluate information, write extended responses with evidence, and confidently communicate scientific ideas orally and in writing	Encourage critical thinking, writing extended responses, and clear communication

Helpful books/websites:

Books

- Collins KS3 Science Year 8 Workbook
- Collins KS3 Science Year 8 Organise & Retrieve

Websites

- BBC Bitesize KS3 Science — interactive lessons and quizzes
- Seneca Learning — free revision courses
- The Science Page — student-made videos and tips
- In My Element — video lessons and worksheets

Opportunities for wider reading/research:

Biology

- Read *"Gregor Mendel: The Friar Who Grew Peas"* to explore inheritance and genetics.
- Research how characteristics are inherited and the role of DNA.
- Investigate adaptations of extreme animals (e.g. camels, deep-sea creatures).
- Explore food chains, webs, and the impact of human activity on ecosystems.
- Look into how the immune system fights disease and how vaccines work.

Chemistry

- Read *"The Way Things Work Now"* by David Macaulay for chemical reactions in action.
- Research combustion and how fuels power cars, planes, and homes.
- Investigate the environmental impact of metal extraction and recycling.
- Explore the reactivity series and what makes some metals more reactive than others.
- Try safe home experiments with neutralisation (e.g. vinegar + baking soda).

Physics

- Read *"Stuff Matters"* by Mark Miodownik (selected chapters) for materials in everyday life.
- Research how pressure affects things like hydraulics and weather systems.
- Investigate how light behaves through lenses and in everyday objects (e.g. glasses, cameras).
- Explore electrical circuits in real-life technology (e.g. phones, torches).
- Look into energy transfers and how we reduce energy loss in homes and machines.

Year 9

In Year 9, students follow a bridging curriculum designed to smoothly transition from KS3 to the GCSE AQA Science syllabus. This year focuses on consolidating foundational scientific knowledge while introducing the style and depth of GCSE content. Students develop key scientific enquiry skills, data analysis, and the precise use of scientific vocabulary. The course prepares learners for the increased challenge of Years 10 and 11 by strengthening their understanding and practical skills in Biology, Chemistry, and Physics.

Number of lessons per fortnight: 6

Skills developed:

Scientific Enquiry:
- Planning and conducting experiments safely and systematically
- Formulating hypotheses and controlling variables
- Collecting accurate and reliable data
- Evaluating and improving experimental methods

Data Analysis:
- Interpreting graphs, tables, and charts
- Identifying trends and anomalies
- Performing basic calculations and data manipulation

Scientific Literacy:
- Using precise scientific vocabulary correctly
- Writing clear, logical, and well-structured explanations and arguments
- Developing effective oral communication of scientific ideas

Problem Solving:
- Applying knowledge to unfamiliar and real-world scenarios
- Thinking flexibly and adapting understanding to new contexts

Critical Thinking:
- Evaluating reliability and validity of scientific evidence
- Assessing different sources of information critically
- Drawing justified and evidence-based conclusions

Practical Skills:
- Confidently using scientific equipment and techniques
- Carrying out accurate measurements and observations
- Maintaining safety standards during practical work

Classes: Students are taught in mixed ability classes/sets.

Essential equipment: Standard school equipment with a Scientific Calculator

Extracurricular and enrichment opportunities: 'Big bang' project linked to environmental issues; this can change yearly depending on the current scientific climate and research

Careers curriculum: In Year 9, students begin to explore science careers more specifically, making connections between their expanding scientific knowledge and a broad range of STEM professions. They start to understand how the skills they develop—such as critical thinking, problem-solving, and data analysis—are valuable in the workplace. This year also supports informed GCSE option choices by highlighting relevant career paths and pathways.

	Content studied	Literacy focus	What parents can do to help
Autumn Term	> Bridging Curriculum	Build subject-specific vocabulary, interpret scientific texts and graphs, and write clear explanations.	Help build scientific vocabulary and read scientific texts together

Spring Term	> Cells structure and transport > Atomic Structure > The periodic table > Conservation and dissipation of energy > Energy transfer by heating	Use technical terms accurately, construct structured answers with evidence, and analyse data critically	Support writing structured answers with evidence and analysing data
Summer Term	> Cell Division > Structure and bonding > Chemical calculations > Energy resources	Develop extended written responses, evaluate scientific information for reliability, and present scientific arguments confidently	Encourage extended writing, evaluating information critically, and discussing scientific ideas

Helpful books/websites:

Books

- CGP AQA GCSE 9-1 Combined Science Revision Guide
- CGP AQA GCSE Foundation & Higher Workbooks

Websites

- BBC Bitesize GCSE Science — lessons and quizzes
- Seneca Learning — free interactive revision
- The Science Page — student-made videos and tips
- In My Element — video lessons and worksheets
- Cognito – Revision and recall

Opportunities for wider reading/research:

Biology - (AQA Topics: Cell Biology, Organisation, Infection & Response)

- Read *"The Gene: An Intimate History"* by Siddhartha Mukherjee (selected excerpts for DNA and cell division).
- Research how vaccines are developed and their role in fighting global diseases.
- Investigate how organs (like the heart or lungs) are transplanted and the ethics involved.
- Explore the impact of antibiotics and the rise of antibiotic resistance.
- Watch documentary clips (e.g. BBC's *"The Human Body"*) to see organ systems in action.

Chemistry – (AQA Topics: Atomic Structure, Periodic Table, Bonding, Chemical Changes)

- Read *"The Elements Book"* by DK for a visual tour of the periodic table.
- Research how the atomic model has changed over time (Dalton, Thomson, Rutherford, Bohr).
- Explore real-life applications of electrolysis in industry (e.g. aluminium extraction).
- Investigate different types of chemical bonding using real materials (e.g. salt, graphite).
- Try safe kitchen chemistry experiments to observe neutralisation or reactions with acids.

Physics – (AQA Topics: Energy, Electricity, Particle Model)

- Read *"Energy Island"* by Allan Drummond to explore renewable energy in real life.
- Research how the National Grid works and why it's important for electricity distribution.
- Investigate how energy efficiency is improved in appliances and buildings.
- Explore the particle model by researching states of matter and changes of state.
- Watch simulations or demos of electricity circuits (e.g. Fuse School or BBC Bitesize videos).

Year 10

This subject is a compulsory GCSE subject OR This subject can be chosen as an option for GCSE.

The Year 10 AQA GCSE Science curriculum is designed to deepen students' understanding of key scientific concepts across Biology, Chemistry, and Physics while building essential practical and analytical skills. This year focuses on developing students' ability to apply scientific knowledge to real-world contexts and complex problems, fostering critical thinking and scientific literacy. The curriculum aims to prepare learners for the rigour of GCSE assessments by embedding strong enquiry skills, accurate data interpretation, and confident communication of scientific ideas. Through a combination of theory, practical work, and problem-solving, students are supported to become independent, reflective scientists ready for success in Year 11 and beyond

Number of lessons per fortnight: 6 for combined – 9 for Separate science consisting of three lessons of each of the specialisms, Biology Chemistry and Physics.

Skills developed:

- **Scientific Enquiry:**
  - Designing and conducting controlled experiments with increasing complexity
  - Planning investigations considering variables and controls
  - Making precise and repeatable measurements
  - Evaluating experimental methods and suggesting improvements
- **Data Analysis:**
  - Interpreting complex graphs, charts, and data sets
  - Calculating results using formulas and units correctly
  - Identifying patterns, trends, and anomalies in data
  - Applying statistical reasoning to assess data reliability
- **Scientific Literacy:**
  - Using advanced scientific terminology accurately
  - Writing detailed, coherent explanations and evaluations
  - Structuring extended answers with logical flow and clarity
  - Presenting scientific arguments confidently both in writing and verbally
- **Problem Solving:**
  - Applying scientific concepts to unfamiliar problems and real-life situations
  - Using mathematical skills to solve quantitative problems
  - Developing logical reasoning and decision-making skills
- **Critical Thinking:**
  - Critically evaluating evidence and sources for validity and bias
  - Making reasoned judgments based on evidence
  - Comparing and contrasting scientific theories and models
- **Practical Skills:**
  - Carrying out a wide range of practical investigations independently
  - Accurately using laboratory equipment and technology
  - Recording observations systematically and safely
  - Understanding and adhering to health and safety protocols

Classes: Students are taught in mixed ability classes/sets, with 1 class being a foundational class on each band

Essential equipment: Standard school equipment with a Scientific Calculator

Extracurricular and enrichment opportunities: Science made simple – Science STEM event, The dissection guy, premed anatomy visit, medical mavericks

Careers curriculum: In Year 10, students deepen their understanding of how science knowledge and skills relate to a wide range of careers, especially within STEM fields. This year focuses on linking curriculum content with real-world applications and careers, helping students to see the relevance of their studies and plan for post-GCSE pathways. Emphasis is placed on developing transferable skills like critical thinking, problem-solving, and communication.

	Content studied	**Literacy focus**	**What parents can do to help**
Autumn Term	> Organisation and the digestive system > Organising animals and plants > Chemical changes > Electrolysis > Electric circuits >Electricity in the home	Strengthen use of precise scientific vocabulary and interpret complex data and diagrams	Encourage your child to use precise scientific vocabulary and help them practice reading and interpreting complex data, diagrams, and graphs. Discuss any challenging topics to build understanding.
Spring Term	> Disease and Bioenergetics > Communicable Diseases > Non-communicable disease > Energy changes > Rates and equilibrium > Molecules and matter > Radioactivity	Write detailed explanations and evaluations using evidence and develop critical analysis skills.	Support your child in writing detailed explanations and evaluations, reminding them to back up answers with evidence. Help them develop critical thinking by discussing how to analyse scientific information carefully
Summer Term	> Preventing and treating disease > Photosynthesis > Respiration > Crude oil and fuels > Organic Reactions > Forces in balance > Motion	Produce extended responses, critically assess scientific information, and communicate confidently in both written and oral formats	Encourage practice in writing extended responses clearly and confidently. Talk through scientific ideas and help them communicate effectively, both in writing and verbally, especially in preparation for exams

Helpful books/websites:

Books

- CGP AQA GCSE 9-1 Combined Science Revision Guide
- CGP AQA GCSE Foundation & Higher Workbooks

Websites

- BBC Bitesize GCSE Science — lessons and quizzes
- Seneca Learning — free interactive revision
- The Science Page — student-made videos and tips
- In My Element — video lessons and worksheets
- Cognito – Revision and recall

Opportunities for wider reading/research:

Biology – (AQA Topics: Bioenergetics, Homeostasis, Inheritance)

- Read *"The Selfish Gene"* by Richard Dawkins (selected extracts) to explore evolution and genetic inheritance.
- Research how diabetes is managed and how insulin works in the body.
- Investigate the effects of exercise on respiration and oxygen debt.
- Explore genetic engineering and the ethical debate around GM crops or gene editing.
- Watch documentaries like *BBC's "Horizon – The Secret Life of Your Body Clock"* to understand homeostasis and biological rhythms.

Chemistry – (AQA Topics: Energy Changes, Rates of Reaction, Organic Chemistry)

- Read *"Why Chemical Reactions Happen"* by James Keeler (intro level or summary sources).
- Research how catalysts are used in real-life industrial processes (e.g. the Haber Process).
- Investigate how fossil fuels are formed and the environmental impact of their use.
- Explore the development of biofuels and alternatives to crude oil.
- Try a safe home experiment observing rates of reaction (e.g. how temperature affects dissolving or fizzing with baking soda + vinegar).

Physics – (AQA Topics: Forces, Waves, Magnetism, Electromagnetism)

- Read *"Storm in a Teacup"* by Helen Czerski for real-world physics examples (waves, forces, energy).
- Research how electromagnetic induction is used in devices like microphones and generators.
- Explore the physics of waves in different contexts (e.g. sound, light, earthquakes).
- Investigate the impact of friction, air resistance, and Newton's Laws in transport safety (e.g. crumple zones, airbags).
- Watch clips or simulations showing magnetic fields and electromagnetic applications (e.g. motors, MRI machines).

Year 11

This subject is a compulsory GCSE subject OR This subject can be chosen as an option for GCSE.

The Year 11 AQA GCSE Science curriculum is designed to consolidate and extend students' scientific knowledge and skills in preparation for final examinations. It focuses on refining practical abilities, enhancing data analysis, and mastering exam techniques while deepening understanding of complex scientific concepts. The curriculum encourages critical thinking, problem-solving, and effective communication, empowering students to apply their knowledge confidently in unfamiliar contexts. By fostering resilience and independent learning, Year 11 aims to equip students with the confidence and competence to succeed in their GCSEs and to inspire continued scientific curiosity beyond school

Number of lessons per fortnight: 6 for combined – 9 for Separate science consisting of three lessons of each of the specialisms, Biology Chemistry and Physics.

Skills developed:

- **Scientific Enquiry:**
  - Designing and refining complex investigations with control of variables
  - Conducting experiments independently and accurately
  - Evaluating and improving experimental methods critically
  - Applying knowledge of experimental design to new contexts
- **Data Analysis:**
  - Interpreting and analysing complex and unfamiliar data sets
  - Using calculations and formulae confidently and correctly
  - Identifying trends, anomalies, and drawing valid conclusions
  - Assessing the reliability and limitations of data
- **Scientific Literacy:**
  - Using precise and technical scientific vocabulary consistently
  - Writing extended, coherent, and well-structured answers under timed conditions
  - Developing clear scientific arguments and justifications
  - Communicating complex ideas effectively both in writing and orally
- **Problem Solving:**
  - Applying scientific knowledge to novel and complex scenarios
  - Integrating mathematical and analytical skills to solve problems
  - Evaluating solutions and considering alternative approaches
- **Critical Thinking:**
  - Critically evaluating scientific claims and evidence
  - Understanding bias, validity, and reliability in scientific contexts
  - Making well-reasoned judgments and conclusions based on evidence

- **Practical Skills:**
  - Carrying out advanced practical techniques with precision
  - Demonstrating thorough understanding of safety and ethical considerations
  - Recording and analysing experimental data meticulously
  - Preparing effectively for practical assessments and exams

Classes: Students are taught in mixed ability classes/sets, with 1 class being a foundational class on each band

Essential equipment: Standard school equipment with a Scientific Calculator

Extracurricular and enrichment opportunities: GCSE interventions, The dissection guy, premed anatomy visit, medical mavericks' opportunities

Careers curriculum: In Year 11, students consolidate their science knowledge while preparing for exams and making crucial decisions about their post-GCSE pathways. This year emphasises applying scientific skills and understanding to career planning, higher education, apprenticeships, and employment. Students explore a broad range of STEM and non-STEM careers, gaining insights into workplace expectations and developing employability skills.

	Content studied	**Literacy focus**	**What parents can do to help**
Autumn Term	> The human nervous system > Hormonal Coordination > Homoeostasis in action > Polymers > Chemical analysis >Forces and pressure > Wave properties	Consolidate scientific vocabulary and confidently interpret complex texts and data	Help your child consolidate key scientific vocabulary and support them in confidently reading and interpreting complex scientific texts, data, and graphs. Encourage discussions about difficult concepts to deepen understanding.
Spring Term	> Reproduction > Variation and evolution > Genetics and evolution > Adaptations, interdependence, and competition >Earth's atmosphere and resources > Using our resources > Light electromagnetism >Space	Write precise, well-structured answers with clear use of evidence and scientific reasoning	Assist your child in writing precise, well-structured answers that include clear evidence and scientific reasoning. Support them in developing strong exam techniques, such as planning answers and managing time effectively.

Helpful books/websites:

Books

- CGP AQA GCSE 9-1 Combined Science Revision Guide
- CGP AQA GCSE Foundation & Higher Workbooks

Websites

- BBC Bitesize GCSE Science — lessons and quizzes
- Seneca Learning — free interactive revision
- The Science Page — student-made videos and tips
- In My Element — video lessons and worksheets
- Cognito – Revision and recall

Opportunities for wider reading/research:

Biology – (AQA Topics: Ecology, Inheritance & Variation, Revision)

- Read *"The Gene Machine"* by Bonnie Rochman (selected chapters) to explore ethics of genetic testing and CRISPR.
- Research how ecosystems are affected by human activity and climate change.
- Investigate selective breeding and genetic modification in agriculture.
- Watch *David Attenborough: A Life on Our Planet* (Netflix) for real-world ecological impact and conservation efforts.
- Review real-life case studies of natural selection (e.g. antibiotic resistance, peppered moths).

Chemistry – (AQA Topics: Atmosphere, Using Resources, Revision)

- Read *"What a Waste"* by Jess French – a student-friendly guide to sustainable resource use.
- Research the life cycle assessment of everyday products (e.g. plastic bottle vs aluminium can).
- Explore how humans are tackling climate change through chemistry (carbon capture, green fuels).
- Investigate the development and purification of potable water in different countries.
- Watch *Periodic Videos* (YouTube channel) to recap elements and reactions in an engaging format.

Physics – (AQA Topics: Space Physics, Forces, Electromagnetism, Revision)

- Read *"Astrophysics for Young People in a Hurry"* by Neil deGrasse Tyson to explore key space concepts.
- Research the future of space travel (e.g. SpaceX, Artemis missions, Mars colonisation).
- Watch videos on BBC Bitesize or Fuse School covering redshift, the Big Bang, and the life cycle of stars.
- Investigate how physics underpins nuclear power and medical applications (e.g. radiotherapy, PET scans).
- Review how safety features (e.g. seatbelts, crumple zones) apply Newton's Laws in cars.

Year 12

The Year 12 science curriculum is designed to provide students with a deep, rigorous foundation in Biology, Chemistry, and Physics. It builds on prior GCSE knowledge and introduces more advanced scientific principles, encouraging students to think critically, apply mathematical skills, and engage in complex problem-solving. Across all three disciplines, the curriculum aims to develop independent learners who can analyse data, design and evaluate experiments, and communicate scientific ideas with precision and clarity. Practical work is central to the curriculum, supporting the development of hands-on skills and scientific enquiry. Through a challenging and enriching programme of study, students are prepared not only for success at A-Level but also for progression into STEM-related higher education, careers, and lifelong scientific engagement.

Number of lessons per fortnight: 5

Skills developed:

Scientific Enquiry & Practical Skills

- Planning and carrying out complex, multi-step investigations
- Using a wide range of scientific equipment with precision and accuracy
- Recording observations and results methodically
- Evaluating methods and suggesting improvements with scientific reasoning
- Meeting the requirements of core practical's/required practical

Data Analysis & Interpretation

- Processing and interpreting complex datasets, graphs, and spectra
- Applying statistical techniques (e.g. standard deviation, chi-squared tests in Biology)
- Analysing trends and anomalies with logical justifications
- Drawing conclusions based on quantitative and qualitative evidence

Mathematical & Computational Skills

- Applying algebra, ratios, and percentages to solve scientific problems
- Using standard form, significant figures, and unit conversions accurately
- Manipulating and rearranging equations (especially in Physics and Chemistry)
- Calculating rates, concentrations, energy changes, and uncertainties

Scientific Literacy & Communication

- Using subject-specific terminology fluently and accurately
- Constructing clear, well-organised written responses, justifications, and evaluations
- Communicating complex ideas concisely in both written and verbal formats
- Interpreting and critiquing scientific articles and experimental reports

Critical Thinking & Problem Solving

- Applying knowledge to unfamiliar contexts, models, and scenarios
- Evaluating reliability, accuracy, and validity of experimental data
- Considering ethical, environmental, and societal impacts of scientific developments
- Linking theory to practice across disciplines

Independent Learning & Resilience

- Managing workload and developing effective revision strategies
- Reflecting on performance and acting on feedback
- Working independently and collaboratively to solve challenging problems
- Engaging in wider reading and research to deepen subject understanding

Essential equipment: Scientific Calculator, Course Textbooks, chemistry dictionary (useful but not required)

Extracurricular and enrichment opportunities: ZOOM meetings for medicine and dentistry applicants to explore and understand avenues into different types of scientific based work including skills demonstrated for successful applications to university

Careers curriculum:

	Content studied	**Literacy focus**	**What parents can do to help**
Autumn Term	Chemistry Atomic structures and chemical properties. > Analytical Chemical Processes. **Biology** Cell structure, Biological molecules, Nucleotides and nucleic acids, Enzymes and Biological membranes **Physics** Particles and radiation Electromagnetic radiation	Develop scientific language in written communication.	Read mark schemes and ensure the specification has been downloaded and referred to in independent study.
Spring Term	**Chemistry** Chemical reaction types, Rates of reaction, Enthalpy of reactions. **Biology** Cell division, cell diversity and cellular organisation, Exchange surfaces, Transport in animals and Transport in plants. **Physics** Waves Mechanics Material	Develop and use new language to describe and explain new concepts at a higher level.	Help quiz them using flashcards (or apps like Anki or Quizlet). Ask about what they have learnt each week and get them to explain an idea that you might not ordinarily understand.
Summer Term	**Chemistry** Redox reactions, Basic organic synthesis, Chemical equilibrium **Biology** Communicable diseases, disease prevention and the immune system, Biodiversity, Classification and evolution **Physics** Electricity	Mathematical and accurate drawing.	Encourage past paper practice and checking mark schemes together.

Helpful books/websites:

- Chemguide – www.chemguide.co.uk
- Excellent explanations of A Level topics, especially organic and physical chemistry.
- Physics & Maths Tutor (OCR Chemistry A) – www.physicsandmathstutor.com/chemistry/a-level-ocr-a
- Topic-based notes, past paper questions, and mark schemes.
- OCR Chemistry A Specification & Resources – www.ocr.org.uk
- Includes the official specification, sample papers, and practical guides.
- Royal Society of Chemistry (RSC Learn Chemistry) – edu.rsc.org
- Real-world applications, teaching resources, and inspiration for further study.

Opportunities for wider reading/research:

- The Disappearing Spoon by Sam Kean
  A fascinating collection of stories behind elements on the periodic table – quirky, historical, and scientific.
- Stuff Matters by Mark Miodownik
  Explores the chemistry of everyday materials (like glass, steel, chocolate). Super engaging and highly relevant.
- Molecules: The Elements and the Architecture of Everything by Theodore Gray
  A beautifully visual and beginner-friendly book showing the structure and role of molecules in life and materials.
- Napoleon's Buttons by Penny Le Couteur and Jay Burreson
  Tells the stories of 17 molecules that changed the world — blending chemistry, history, and global impact.
- The Poisoner's Handbook by Deborah Blum
  Chemistry meets forensic science – great for students interested in real-life applications of chemical detection

Year 13

The Year 13 science curriculum aims to deepen and refine students' understanding of complex scientific concepts, building upon the foundational knowledge and skills developed in Year 12. This final year of A-level study is focused on mastery—applying knowledge to unfamiliar, real-world scenarios; developing independence in scientific enquiry; and preparing for high-stakes assessments and progression into higher education or scientific careers. Students are challenged to think critically, evaluate evidence with precision, and communicate their understanding through extended writing and problem-solving tasks. A strong emphasis is placed on practical competence, analysis, and academic resilience. The curriculum supports students in becoming scientifically literate, analytical thinkers who are well-prepared to succeed in university-level study and contribute thoughtfully to the scientific and global community.

Number of lessons per fortnight: 5

Skills developed:

Scientific Enquiry & Practical Skills

- Planning and carrying out complex, multi-step investigations
- Using a wide range of scientific equipment with precision and accuracy
- Recording observations and results methodically
- Evaluating methods and suggesting improvements with scientific reasoning
- Meeting the requirements of core practical/required practical

Data Analysis & Interpretation

- Processing and interpreting complex datasets, graphs, and spectra
- Applying statistical techniques (e.g. standard deviation, chi-squared tests in Biology)
- Analysing trends and anomalies with logical justifications
- Drawing conclusions based on quantitative and qualitative evidence

Mathematical & Computational Skills

- Applying algebra, ratios, and percentages to solve scientific problems
- Using standard form, significant figures, and unit conversions accurately
- Manipulating and rearranging equations (especially in Physics and Chemistry)
- Calculating rates, concentrations, energy changes, and uncertainties

Scientific Literacy & Communication

- Using subject-specific terminology fluently and accurately
- Constructing clear, well-organised written responses, justifications, and evaluations
- Communicating complex ideas concisely in both written and verbal formats
- Interpreting and critiquing scientific articles and experimental reports

Critical Thinking & Problem Solving

- Applying knowledge to unfamiliar contexts, models, and scenarios
- Evaluating reliability, accuracy, and validity of experimental data
- Considering ethical, environmental, and societal impacts of scientific developments
- Linking theory to practice across disciplines

Independent Learning & Resilience

- Managing workload and developing effective revision strategies
- Reflecting on performance and acting on feedback
- Working independently and collaboratively to solve challenging problems
- Engaging in wider reading and research to deepen subject understanding

Essential equipment: Standard school equipment with a Scientific Calculator

Extracurricular and enrichment opportunities:

Careers curriculum: Real-World Applications

- Topics like pharmaceuticals, green chemistry, and industrial processes are linked to careers in:
    - Medicine, dentistry, and veterinary science
    - Chemical engineering and materials science
    - Environmental science and sustainability
- Students explore how chemistry solves global challenges, such as climate change and drug development

	Content studied	**Literacy focus**	**What parents can do to help**
Autumn Term	**Chemistry** Rates of reaction, Equilibrium, Acids, bases and pH, Buffers and neutralisation. Aromatic Chemistry, Carbonyls and carboxylic acids **Biology** Photosynthesis and respiration Roles of the nervous and hormonal systems Physics	Develop key vocabulary learned in year 1. Include the key terms in exam responses and general conversation in lessons.	Read mark schemes and ensure the specification has been downloaded and referred to in independent study. Support UCAT exam entry as a priority (19th sept deadline)
Spring Term	**Chemistry** Enthalpy and entropy, Redox and electrode potentials, Transition elements, Amines, Amino acids and proteins. Organic Synthesis. **Biology** Inheritance and genetics Biotechnology Physics	Develop comparative and descriptive writing, Develop symbolic literacy for equations.	Help quiz them using flashcards (or apps like Anki or Quizlet or bloket). Ask about what they have learnt each week and get them to explain an idea that you might not ordinarily understand.
Summer Term	**Chemistry** Unifying concepts and revisions Chromatography and spectroscopy. **Biology** Revision and exam preparation Physics	Respond to command words with accurate information and style. Mathematical fluency and speed should be well developed.	Encourage past paper practice and checking mark schemes together.

Helpful books/websites:

Calculations in AS/A Level Chemistry by Jim Clark

chemguide: helping you to understand Chemistry - Main Menu

Welcome to Allery Chemistry!

Opportunities for wider reading/research:

- **OCR A Level Chemistry: Oxford Revise** – A compact revision guide with clear summaries, key term call-outs, exam tips, and structured exam-style practice. Includes free online access via a code inside the book. Ideal for active recall and exam technique reinforcement Oxford Revise.
- **The Perfect Answer Revision Guide – OCR A Level Chemistry (H432)** – A PDF resource offering model answer structures and diagrams to help you craft high-scoring responses swhlearning.co.uk.
- **CGP A-Level Chemistry: OCR A Year 1 & 2 Complete Revision & Practice** – Though not official, CGP is praised for straightforward explanations and concise revision layouts