

Sciences Department Curriculum Statement



Intent

In science we aim to:

- develop **inquiring minds** and **curiosity** about science and the natural world
- **acquire knowledge**, **conceptual understanding** and **skills** to **solve problems** and **make informed decisions** in scientific and other contexts
- develop skills of **scientific inquiry** to **design** and **carry out** scientific investigations and **evaluate** scientific evidence to draw conclusions
- **communicate** scientific ideas, arguments and practical experiences accurately in a variety of ways
- think **analytically**, **critically** and **creatively** to **solve problems**, **judge arguments** and **make decisions** in scientific and other contexts

The curricula we offer not only underpins the IB learner, but that of the schools values of Intellect, Empathy and Courage.

Implementation

a) Content & Skills

In Science we implement a curriculum that has been designed to ensure that both **knowledge of procedures and concepts** are developed throughout their time at Bexley Grammar School. The key goal of our Science Curriculum is to deliver **engaging lessons** that would produce students that **know and understand the key ideas of science**. The students would be equipped with the tools to work scientifically; **analyse**, **communicate**, **enquire** and **solve problems** with confidence. The seven years of study are based around a **spiral curriculum**: a student will meet each fundamental concept multiple times throughout their school career, with each encounter increasing in complexity and reinforcing their previous learning. The sequence of teaching is set out in a logical and hierarchical order, commencing in fundamental concepts and then progressively expanding to global concepts.

KS3 Sciences Year 7-8

- Each Year 7 pupil has a total of eight 50 minute periods of Science teaching per fortnight. (Three hours and 20 minutes of Science teaching per week.)
- This teaching in general is delivered by one Science teacher per class, however, some are taught by 2 teachers per class
- Pupils are taught in tutor groups of 30 students in Year 7 and 32 students in Year 8.
- Pupils progress through the 12 Year 7 Science topics spending approximately 2.5 weeks on each.
- Pupils progress through the 11 Year 8 Science topics spending (approximately 2.5 weeks/topic), and then carry out revision activities in preparation for the end of year examination in the summer term, as a means of summative and formative assessment.
- The KS3 curriculum was reviewed in 2019 -2021 with the aim, in part, to develop investigation skills in preparation for Internal Assessments in the IB course. In 2021-2022 a new scheme has been introduced at Year 7 and 8 titled 'Exploring Science' which focuses on the skills mentioned and on safety and disciplinary literacy .

KS4 Sciences Year 9 - 11

- Students study GCSE Biology, GCSE Chemistry and GCSE Physics Separate Science Higher. All GCSE Science students are taught by specialist science teachers where possible, and follow the OCR Gateway 9-1 specification.
- In year 9 students study topics, B1, B2; C1, C2; P1, P2, delivered over 3 X 50 minute lessons per fortnight. Taught in 8 sets (A – H) of approximately 25 pupils per set.
- In year 10 students study topics, B3, B4; C3, C4; P3, P4, P5, delivered over 4 X 50 minute lessons per fortnight. Taught in 8 sets (X1-X4, Y1-Y4) of approximately 25 pupils per set.
- In year 11 students study topics, B5, B6; C5, C6; P6, P7, P8, delivered over 4 X 50 minute lessons per fortnight. Taught in 9 sets (X1-X5, Y1-Y4) of approximately 25 pupils per set.

KS5 Sciences Year 12 - 13

- Students can opt to follow the following Group 4 subjects in the IB course: Higher Biology; Higher Chemistry; Higher Physics (new syllabuses introduced in September 2023). Standard: Biology (new syllabus introduced in September 2023); Standard Environmental Systems and Societies (new syllabus introduced in September 2024).
- IB Higher students receive 10 x 50 minute lessons per fortnight in Year 12 and 8 x 50 minute lessons per fortnight in Year 13
- IB Standard students receive 5 x 50 minute lessons per fortnight in Year 12 and 6 x 50 minute lessons per fortnight in Year 13, and IB Higher students receive ten 50 minute periods per fortnight for the duration of Y12.

Biology

In Biology students study living organisms and how they interact with the world around them. In order to gain an in-depth understanding of the living world, studies are conducted at the molecular level within cells, building up to tissues, organs and organ systems and then studying whole organisms and how they interact in ecosystems.

Year 7-8	Year 9-11	Sixth form HL and SL
Cells, Tissues, Organs & Systems Sexual Reproduction Muscles & Bones Ecosystems Food and nutrition Plants and their reproduction Breathing and respiration Unicellular organisms	B1: Cell level systems B2: Scaling up B3: Organism level systems B4: Community level systems B5: Genes, inheritance and selection B6 Global challenges B7 Practical skills	A Unity and diversity B Form and function C Interaction and interdependence D Continuity and change Practical scheme of work Practical activities Collaborative sciences project Scientific investigation

Chemistry

Chemistry is often considered to be the central Science being used to explain the complex reactions that occur in biological systems as well as explaining why materials behave in a certain way. The course covers the traditional aspects of Chemistry as well as exploring the concepts of Green Chemistry and sustainable development. Chemistry allows students to understand why and how things happen in the world around them and gives some understanding of how it can be used to help shape a better future world.

Year 7-8	Year 9-11	Sixth form HL only
Safety Mixtures and Separation Acids & Alkalis Particle model Atoms, Elements & Molecules Combustion The periodic table Metals and their uses	C1 Particles C2 Elements, compounds and mixtures C3 Chemical reactions C4 Predicting and identifying reactions and products C5 Monitoring and controlling chemical reactions C6 Global challenges C7 Practical skills	Structure 1. Models of the particulate nature of matter Structure 2. Models of bonding and structure Structure 3. Classification of matter Reactivity 2. How much, how fast and how far? Reactivity 3. What are the mechanisms of chemical change? Practical scheme of work Practical activities Collaborative sciences project Scientific investigation

Physics

Physics is the most fundamental of the experimental sciences, as it seeks to explain the world in which you live. It deals with matter and energy and how they interact, looking at objects ranging from the very small to the entire universe.

Year 7-8	Year 9-11	Sixth form HL only
Energy Electricity Sound Forces Fluids Light Energy Transfer Earth and Space	P1: Matter P2: Forces P3: Electricity P4: Magnetism and magnetic fields P5: Waves in matter P6: Radioactivity P7: Energy P8: Global challenges P9 Practical skills	A Space, time and motion B. The particulate nature of matter C. Wave behaviour D. Fields E. Nuclear and quantum physics Practical scheme of work Practical activities Collaborative sciences project Scientific investigation

Environmental Systems and Societies

Students develop a wide range of skills during the environmental systems and societies course including practical skills, use of statistics, interpreting, analysing and evaluating information, graphical skills, working systematically, considering opinions and values and independent thinking whilst developing a scientific and ethical understanding of environmental issues and sustainability.

Sixth form SL only	
Topic 1 Foundation Topic 2 Ecology Topic 3 Biodiversity and conservation Topic 4 Water	Topic 5 Land Topic 6 Atmosphere and climate change Topic 7 Natural resources Topic 8 Human populations and urban systems
Practical scheme of work Practical activities	Collaborative sciences project Scientific investigation

b) Learning environment

The department is very well resourced and consists of 14 members of teaching staff. The department is supported by a team of 6 laboratory technicians, led by a senior technician. There are 12 laboratories which are in general arranged for specialist teaching at KS5, these are each well decorated with informative, useful display work and resourced a variety of teaching aids including interactive whiteboards and whiteboards. Data-logging is used to investigate concepts introduced during courses, and class sets of chromebooks are available to ensure that all students can take part in these activities.

Expectations of behaviour in laboratories are reinforced through the department code of conduct and safety rules. In addition to the schools ' non-negotiables which are displayed in all laboratories.

Homework is an important part of learning and is used to reinforce and practice concepts, skills and knowledge learned in class. It is also used on occasions for students to research in preparation for the next lesson. This includes quizzes, Seneca and Cognito, Kognity online platforms, and extended writing. Students throughout the key stages take part in extracurricular activities, details of these activities can be found in the last section of this document.

c) Assessment & Feedback

Assessment:

Assessments for all year groups 7-11 take place half termly, with results recorded centrally. Assessments for the sixth form are taken after each unit of work and results are recorded centrally to monitor progress.

Students receive written and verbal feedback on a regular basis indicating what they need to do improve. Moderation of 6 mark answer questions and Internal Assessments are undertaken.

Student record sheets are also used to assess progress, and suggest areas for improvement, with students and teachers setting relevant targets to help improve their work.

Feedback:

Students in Years 7 and 8 are given progress trackers, which are updated with grades and targets based on areas for improvement, this allows them to reflect after mini topic tests, subject tests, and end of year examinations. These sheets are to be found at the front of their exercise books.

Students in Years 9-11 are given record sheets and in Years 12 and 13 are given electronic target sheets respectively. Students are encouraged to identify their weak areas in order to rectify them through targeted review, and revision.

At all key stages student progress is tracked through assessment marks, and grades recorded on tracker sheets on Google drive. In addition to individual support by class teachers, students are selected using this data for intervention clinics.

d) Monitoring

There is a centralised system of assessment spreadsheets across all year groups, which are monitored by the Head of Science and three Subject Leaders, and used to inform intervention. Reports are also monitored for consistency between classes.

Learning walks and lesson observations are carried out by the head of department and subject leaders to monitor quality of teaching and learning. Work scrutiny is carried out in department meetings. Results of individual teaching groups are compared to identify any under or over performing groups.

All teachers maintain Context Sheets for latest SEND data, and these are centralised so the HoD and subject leaders can monitor and support differentiated provision and personalisation. Intervention clinics continue to be held, where science prefects support targeted students to mentor and support those students identified by the subject leaders and their subject teachers. This, in addition to personalisation strategies to be used in class by their subject teacher. Those students who are the most able are stretched and challenged through extension work, through material to 'read around' the subject, and through extra curricular activities such as science and STEM clubs and through visits, lectures and competitions such as the Sixth Form Olympiads, Arkwright Scholarship, ICE Cityzen Competition.

Impact

Outcomes in the Science department are very favourable when compared to national standards in terms of attainment and progress at KS4 and KS5. The Sciences are incredibly popular in the Sixth Form with the majority studying at least one of the IB Higher in Biology, Chemistry or Physics. We have had great success with students progressing to prestigious universities to study Science based subjects, such as Medicine, Veterinary Medicine, Dentistry and Engineering.

The department provides a range of opportunities for students to develop their interest in the subject outside lessons, with our annual highlight celebrating British Science Week and our STEM focussed Power Days. Our students created a Periodic Table mural to celebrate 150 years since the Periodic Table was developed by Dmitri Mendeleev. This was selected for display in a photographic competition organised by the Royal Society of Chemistry Kent, and was displayed in a Whitstable Art gallery. The Periodic Table is now constructed in the stairwell near the main building.

See co-curricular opportunities website for opportunities available at Bexley Grammar School ([please insert link here](#))