

# Curriculum Information

Key Stage 4



Science  
Faculty

*“Students appreciate that Science  
is a way of thinking much more  
than it is a body of knowledge”*

For yourself & for others

## Curriculum Intent

Science isn't just lab work carried out by people in white coats... it's everywhere! From the moment you get up in the morning to the moment you go to sleep at night, science plays a huge part in our daily lived. At Ashby School, we inspire and enthuse students by encouraging them to discover and investigate the phenomena of the world around them and to witness that *Anything is Possible!*

### Key Stage 4

The majority of Key Stage 4 students study the AQA GCSE Combined Science: Trilogy (8464) course, although students can opt to follow the AQA GCSE separate science courses. Around 20% of students of KS4 students take the more in-depth Separate Science courses. Students, and their parents, are guided by teachers as to which programme is more suitable.

The GCSE separate science programme provides additional stretch and challenge for students who are passionate about the subject. The course requires that students study additional content within most topics. Students therefore gain a greater breadth and depth of scientific knowledge.

Students following the Combined Science GCSE course have seven 75-minute science lessons per fortnight. In Year 10, one of these lessons will be focussed on the development of the scientific, mathematical, study and exam skills that are common to Biology, Chemistry and Physics. Students following the separate science GCSE course will have eleven 75-minute lessons per fortnight (to include teaching of the 'Science Skills' programme).

Biology, Chemistry and Physics are taught by subject specialists. Science teachers follow an agreed scheme of work and all staff utilise the same lesson resources, although the expectation is that staff will adapt these as appropriate to suit the needs of their classes. Shared resources facilitate: greater parity of experience for students; ensure timely delivery of the specification through sequences of deliberately connected lessons; and ensure that appropriate emphasis is placed on development of mathematical and experimental skills alongside scientific theory. Lesson resources are reviewed on an annual basis and are continually developed to enhance the learning experience for students and ensure that they receive deliberately connected sequences of lessons. All staff contribute to the review and development of lesson plans and resources. Staff with extensive experience as AQA examiners play a particularly prominent role in helping to develop resources that address weaknesses or issues in candidate's knowledge and skills as identified by examiner's reports or by in-house enhanced results analysis. Lesson resources are also regularly reviewed to ensure that materials are as relevant and up to date as possible, for example practise exam questions are updated as new materials become available. Required practicals are a prominent feature of GCSE science specifications and exam papers include numerous questions based on the knowledge and skills that students develop through carrying these out. The schemes of work for the two specifications therefore dedicate significant time to lessons focussed on required practicals.

#### **Key Stage 4**

Students are set a biweekly homework to support revision of key topics. Students are required to create a mind map on a selected topic and complete an exam question that deals with common misconceptions. All students receive the same homework task. This task is adapted for higher tier and foundation tier to ensure appropriate challenge.

Homework is set and marked by the student's base tutor, who monitors completion.

Additional homework tasks may be set by subject teachers as appropriate to the needs and progress of their classes. Feedback is provided in accordance with the school Assessment and Feedback Policy.

Tests and exams are set using past AQA exam questions and are marked in accordance with examiner's mark schemes. Papers are compiled in a way that mirrors the design and level of demand of GCSE exams as closely as possible. Grade boundaries for end-of-topic tests have been formulated after all papers have been marked based on the proportion of Ashby School students who would typically be awarded each grade. End of year 10 exams and year 11 mock exams utilise past exam papers and AQA grade boundaries are applied. In this way students, teachers and parents should receive a realistic picture of a student's progress and the grade they are most likely to achieve at GCSE. Early assessments in Year 10 are common to all students. This is to facilitate objective comparison of student performance and the movement of students to a set that best supports their progress while offering appropriate stretch and challenge. The exam at the end of Year 10 and all assessments in Year 11 have foundation and higher tier papers in order to set an appropriate level of challenge for students and assist with decisions regarding a student's tier of entry for the GCSE exams.

Students are encouraged to develop effective independent learning strategies in preparation for tests, mock exam and their final exams in the summer term of Year 11. Students receive revision advice and materials through the 'Science Skills' programme (in Year 10), and a structured programme of in-class Science revision activities following completion of teaching in Year 11, revision timetables to help them manage their time and workload, and banks of past exam questions that can be accessed via the student portal. Students are also encouraged to attend online after-school revision sessions.

### **Key Stage 4 Biology**

Both of the GCSE specifications consist of seven Biology topics. Four topics are taught in Year 10 and three topics are taught in Year 11. Teaching fewer topics in Year 11 allows time for mock exams and a structured revision programme in the weeks preceding final examinations. Topics are taught in the order set out in the AQA specification. Topics taught at the start of the course, such as Cell Biology, recap basic biological knowledge (e.g. cell ultrastructure) that most students will have some familiarity with from KS3. Early topics then introduce ideas such as cell differentiation that students need in order to understand more complex ideas (e.g. therapeutic cloning) later in course. Topics such as Homeostasis and Inheritance require students to draw on knowledge and concepts from across the course and are therefore placed towards the end of the programme.

Biology topics: teaching order

Topic	Specification reference	When taught
Cell Biology	4.1	Year 10 – topic 1
Organisation	4.2	Year 10 – topic 2
Infection and response	4.3	Year 10 – topic 3
Bioenergetics	4.4	Year 10 – topic 4
Homeostasis and response	4.5	Year 11 – topic 1
Inheritance, variation and evolution	4.6	Year 11 – topic 2
Ecology	4.7	Year 11 – topic 3

### Key Stage 4 Chemistry

Both of the GCSE specifications consist of ten Chemistry topics. Five of the larger topics are taught in Year 10 and five smaller topics are taught in Year 11. Teaching the smaller topics in Year 11 allows time for mock exams and a structured revision programme in the weeks preceding final examinations. Topics are taught in the order set out in the AQA specification. Topics taught at the start of the course, such as Atomic Structure and the Periodic Table, underpin the whole Chemistry course and build the basic knowledge that students will need for the subsequent topics. Further early topics then introduce ideas such as how atoms make larger structures in Bonding, Structures and the Properties of Matter that students need in order to understand more complex ideas (e.g. Organic Chemistry) later in the course. Topics such as Chemical Changes require students to draw on knowledge and concepts from the early topics in the course and are therefore placed towards the end of Year 10. Topics taught in Year 11 build upon the basic concepts studied in Year 10 including bonding in Organic Chemistry, ions and ionic formula in Chemical Analysis and the concepts introduced in energy changes are extended in the Rates and Extent of Chemical Change topic. Quantitative Chemistry concepts run through the entire course so this topic is taught during Year 10 to enable students to gain confidence and practice these key calculations throughout the course.

#### Chemistry topics: teaching order

Topic	Specification reference	When taught
Atomic Structure and the Periodic Table	5.1	Year 10 – topic 1
Bonding, Structures and the Properties of Matter	5.2	Year 10 – topic 2
Quantitative Chemistry	5.3	Year 10 – topic 3
Chemical Changes	5.4	Year 10 – topic 4
Energy Changes	5.5	Year 10 – topic 5
Rate of Extent of Chemical Changes	5.6	Year 11 – topic 1
Organic Chemistry	5.7	Year 11 – topic 2
Chemical Analysis	5.8	Year 11 – topic 3
Chemistry of the Atmosphere	5.9	Year 11 – topic 4
Using Resources	5.10	Year 11 – topic 5

### **Key Stage 4 Physics**

For both courses, four topics are taught in Year 10. In Year 11 three topics are taught for Combined Science and four for GCSE Physics, although the fourth topic is very small at only 3 lessons. Teaching fewer topics in Year 11 allows time for mock exams and a structured revision programme in the weeks preceding final examinations. Topics are taught in the order set out in the AQA specification. Energy is a fundamental area of Physics and the types of energy are referred to throughout the course so we start with this.

Electricity builds upon the energy topic, the idea of wasted heat energy in electrical circuits refers back to the earlier efficiency lesson in the energy topic. Now the students are able to understand why heat energy is dissipated through use of the particle collision theory of current and resistance. There are many practical lessons in the electricity topic so placing it here is a good point to maintain interest in the course before the more theoretical topics later on.

Particle nature of matter builds upon previous knowledge of solids, liquids and gases (KS3) and extends this to include specific heat capacity and specific latent heat. These are difficult concepts to grasp so placing them here is helpful as students will have gained confidence by this point from working through easier topics.

Atoms structure has great cross-links with Chemistry as it involves atomic structure and the make-up of the nucleus. At this point in the course students have already covered this in Chemistry so that knowledge can be built upon in this topic, reinforcing their understanding. The development of the nuclear model from the alpha scattering experiment is covered in both sciences.

Forces builds upon the earlier topic of work done/energy transfer from the energy topic. For the Hooke's law investigation it also revisits the concept of a spring constant from the elastic potential energy lesson from the first half-term. It explores Newton's laws of motion, a key concept of any Physics course. Gradient calculations of motion graphs and resultant force calculations involving Pythagoras' theorem and trigonometry occur in this topic. Students would have been unable to tackle these earlier in the course but by this point they have the knowledge and skills from their mathematics course to study them.

The waves topic reintroduces familiar topics from KS3 about wave properties and the reflection and refraction practicals help to maintain interest in the topic for kinaesthetic learners. Together with the magnetism topic, there are hardly any equations to learn by this point on the course, meaning students are not still learning new equations close to their final exams. This gives them longer to work on remembering the majority of the equations for the course.

The magnetism and electromagnetism topic builds upon previous knowledge from KS3. It introduces some new concepts, particularly the motor effect and transformer theory. We revisit the earlier National Grid topic from year 10 electricity and explain how the transformers actually work.

A comprehensive revision programme then follows, leading up to the final exams.

## GCSE Combined Science: Trilogy Physics topics - teaching order

Topic	Specification reference	When taught
Energy	4.1	Year 10 – topic 1
Electricity	4.2	Year 10 – topic 2
Particle model of matter	4.3	Year 10 – topic 3
Atomic structure	4.4	Year 10 – topic 4
Forces	4.5	Year 11 – topic 1
Waves	4.6	Year 11 – topic 2
Magnetism and electromagnetism	4.7	Year 11 – topic 3
Space physics	4.8	Year 11 – topic 4

## GCSE Physics topics - teaching order

Topic	Specification reference	When taught
Energy	6.1	Year 10 – topic 1
Electricity	6.2	Year 10 – topic 2
Particle model of matter	6.3	Year 10 – topic 3
Atomic structure	6.4	Year 10 – topic 4
Forces	6.5	Year 11 – topic 1
Waves	6.6	Year 11 – topic 2
Magnetism and electromagnetism	6.7	Year 11 – topic 3

### Links to specifications:

Combined Science - <https://www.aqa.org.uk/subjects/science/gcse/combined-science-trilogy-8464>

Biology - <https://www.aqa.org.uk/subjects/science/gcse/biology-8461>

Chemistry - <https://www.aqa.org.uk/subjects/science/gcse/chemistry-8462>

Physics - <https://www.aqa.org.uk/subjects/science/gcse/physics-8463>