

## Science Curriculum Map

**Intent:** Our Science curriculum is centred around 'Science in our everyday lives'. We aim to develop students' curiosity about the world, and for them to be able to give increasingly complex definitions of natural phenomena, supported by their understanding of the principles, laws and theories of Biology, Chemistry and Physics. The curriculum also aims for students to understand Science as a discipline: to understand how our scientific knowledge has developed over time and how scientists work, including learning the principles of planning valid investigations, analysing and presenting data and evaluating conclusions. Finally, the curriculum aims for students to see that 'Science is for me': that Science is done by people from all backgrounds and in a variety of careers. Through all of this, we intend for students to achieve the highest possible academic outcomes in Science, as these will allow them to go on to study Science and pursue a career in Science in the future.

Term	1	2	3	4	5	6
<b>Year 7</b>	<p>We use the first two terms to discover and embed the foundations of science. Starting with chemistry, students use the particle model to explain the properties of substances and to explain how mixtures can be separated. In this unit, there is a focus on the names of scientific equipment and techniques, such as the use of thermometers and Bunsen burners. Then, in biology, students look closely at the human body focusing on cells, tissues and organs and different organ systems. Students will also use microscopes for the first time.</p> <p>In physics, they look at energy stores and transfers. Each of these topics builds on what they would have learnt from KS2 science but also sets the foundation for science throughout their years in the academy. Students will be assessed using an exam covering all three topics. Data from these assessments will be used to change teaching groups.</p> <p><u>Topics covered</u> Biology - Cells, tissues and organs (7BC) Chemistry - Particles and the particle model (7CP) Physics - Energy (7PE)</p>	<b>Synoptic Assessment</b>	<p>The next two terms continue developing the foundations of science. Students build on their knowledge of cells, as well as their knowledge of life cycles from KS2, to learn about the reproductive systems in plants and animals. We also begin to look at analysing and presenting data in a short unit on variation. In chemistry, we look at chemical reactions: students study elements, mixtures and compounds and the reactions of acids and alkalis. Here, students build on their knowledge of science apparatus and learn about risk assessment. Finally, students will study a unit on forces. In this unit, students will investigate friction, and will begin to look at variables and method writing.</p> <p><u>Topics covered</u> Physics – Forces (7PF) Chemistry - Chemical reactions (7CC) Biology - Reproduction (7BR)</p>	<b>Synoptic Assessment</b>	<p>This term is used to complete the units from term 4, for revision and assessment. Following the assessments, teachers plan 'feedback' lessons, to ensure that gaps in students' knowledge are closed.</p>	<p>This term we focus on other organisms around us and the relationship they have with each other and with humans. When the weather is good, students will be able to take part in practical fieldwork such as using quadrats and different sampling techniques.</p> <p><u>Topics covered</u> Biology – Ecological relationships (8BE)</p>

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<p><b>Year 8</b></p>	<p>In year 8, we build on some of the big ideas learned in year 7 and continue to build on ideas first introduced in KS2. We begin by looking at atomic structure. This is the foundation for understanding bonding and its effect on the properties of substances, which is covered in year 10. Then, students look at the periodic table and trends in Group 1 and Group 7 elements. At the end of the unit, students complete a 'Meet the Scientist' lesson, in which they learn about some of the female scientists who contributed to the development of the periodic table. This helps students to understand how the body of scientific knowledge is developed and how science is open to all.</p> <p>After atomic structure, students move on to the Healthy Diet unit. This builds on the study of organ systems in KS2 and in year 7. As part of this unit, students also focus on the recording and presentation of data, as part of their investigations into the action of enzymes.</p> <p>Finally, students study space and light. This is a fascinating topic that allows students to explore and learn about the universe that they live in. They also develop an understanding of light and its different properties, such as reflection and refraction. Students will also understand how shadows are formed, how we see colour, and the structure of the eye.</p> <p>Students will be assessed using an exam covering all three topics. Data from these assessments will be used to change teaching groups.</p> <p><u>Topics covered</u>  Chemistry – The periodic table (8CP)  Biology – Digestion and nutrition (8BD)  Physics – Space and Light (8PE)</p>		<p>After the January assessments, we begin to look at Electricity &amp; Magnetism. Students will return to the simple circuits they looked at in KS2 and will build on these to understand the relationship between current, potential difference and resistance. These are core concepts for the GCSE course. They will investigate the link between wire length and resistance and will record and present their own data. Finally, they will look at magnets and electromagnets – which will also be returned to at GCSE – and will, again, have the opportunity to carry out extended practical work.</p> <p>Finally, students will look at a unit on Materials and the Earth. In this topic, students will learn the different processes by which rocks are formed. They will look at the benefits and drawbacks to limestone quarrying. They will also consider the use of fossil fuels and their impacts, including the link to the carbon cycle. These concepts are important for Biology and Chemistry modules in year 11 – as well as for students' knowledge of 'science in our everyday lives'.</p> <p><u>Topics covered</u>  Physics – Electricity and magnetism (8PE)  Biology – Plants and photosynthesis (9BP)</p>		<p>This term is used to complete the units from term 4, for revision and assessment. Following the assessments, teachers plan 'feedback' lessons, to ensure that gaps in students' knowledge are closed.</p>	<p>This term, students study a unit on Photosynthesis. Students continue to develop their knowledge of working scientifically, writing a method for and carrying out their own investigation. Students also look at the structure of the leaf, building on their work on structure and function in the year 7 cells unit and the year 8 digestion unit. Finally, lessons on food security build on the Ecological Relationships unit studied in year 7 and the concept of resource used covered in the Materials and the Earth unit.</p> <p><u>Topics covered</u>  Biology – Biological systems (9BB)</p>

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<b>Year 9</b>	<p>At the beginning of Year 9, students study a unit on Biological Systems and Processes. This is the final Biology unit in KS3. It includes the study of the musculoskeletal system, the respiratory system, smoking, drugs and inheritance. This unit allows students to learn more complex examples of the relationship between structure and function and provides many opportunities for learning about 'real life science'. Much of this content is revisited in Year 10.</p> <p>After this, students study a chemistry unit on reactivity. In this, students learn more examples to support their understanding of the idea that atoms are rearranged in chemical reactions, which is first covered in year 7. Students also practise drawing conclusions from experimental results and learn about how principles can be applied in the real-life extraction of pure metals from their ores.</p> <p>Following this, students study a unit on Matter. This builds on knowledge of the particle model developed in year 7, as students learn to explain temperature changes during changes of state. Students also link the particle model to the idea of density and write methods for investigating density of different objects. This provides a platform for studying Matter in year 10, when students develop these concepts further (e.g. learning about specific heat capacity / specific latent heat).</p> <p>Finally, students study a short unit on Energetics. This provides an opportunity for practical work and provides the foundation for learning about endothermic and exothermic reactions in year 10.</p> <p><u>Topics covered:</u>            9BB Biological Systems            9CR Reactivity            9PM Matter            9CR Reactivity</p>		<b>Assessment</b>	<p>At the start of this term, students complete targeted revision lessons, followed by an assessment. This assesses understanding of topics from year 9, and key content from previous years. Following the assessment, changes are made to teaching groups and teachers complete feedback lessons to ensure learning gaps are closed.</p> <p>This term, students complete two Physics units: the first on Sound, the second on Forces. In the Sound unit, students build on ideas from year 7 and 8 about the transfer of energy between different stores. They learn about sound waves as an example of longitudinal waves, which constitute one way energy can be transferred. Students use the speed equation from year 7 to calculate the speed of sound and apply this to the use of sonar in different situations. In doing so, they learn about a range of different contexts in which they can apply basic scientific principles.</p> <p>In the Forces unit, students look at the effect of forces on motion – by looking at moments – and on materials, by looking at springs. In both topics, they practise substituting into equations and converting units. In the latter, they have the opportunity to carry out and evaluate an investigation. Both of these topics link to topics studied in year 11.</p> <p><u>Topics covered:</u>            9PS Sound            9PF Forces</p>		<b>Assessment</b>
						<p>In the final term of year 9, students begin their Science GCSE course. First, they study the B1 unit, which covers cells, microscopy, cell division and transport. This unit builds mainly on year 7 concepts and provides important foundations for other GCSE units – for example, students need to know about diffusion and active transport to understand the absorption of nutrients in the small intestine in B2.</p> <p>Later, students study the C1 unit, looking at atoms and the periodic table. This links to the atomic structure topic in year 8 and the separating techniques topic in year 7.</p> <p><u>Topics covered:</u>            B1 Cells            C1 Atoms and Periodic Table</p>

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<b>Year 10</b> Year 10 begins with the study of B2 Organisation. Here, students build on their understanding of cells to learn how these are organised into organ systems: the digestive system, circulatory system and leaves in plants. Students practise identifying variables and method writing when investigating enzymes, risk assessment and drawing conclusions when testing for food groups and analysing data when studying CHD, as an alternative means of answering scientific questions about the causes of CHD.  Then, students complete the C2 unit on Structure and Bonding, which builds on knowledge from C1. This also helps students develop their understanding of the link between structure and properties, first introduced in year 7. This is followed by the C4 unit on Chemical Reactions. A key part of this unit is electrolysis; the sequence of these units has been chosen, as the understanding of electrolysis relies heavily on the idea of ionic bonding. In this unit, students also study the reactions of acids and alkalis and the extraction of metals. A short assessment is completed in November, after the completion of C2.  Finally, students study a Physics unit: P1 Energy. In this unit, a number of key equations are introduced, e.g. for calculating an object's kinetic energy. Students focus on unit conversions and substituting, then solving, now that this idea has been covered in Maths.  <u>Topics covered</u> B2 Organisation C2 Bonding C4 Chemical Reactions P1 Energy			<b>Mock 1</b> The Energy unit provides an important foundation that support students to understand the Electricity unit, which is covered next. Here, students build on Year 8 content and complete their own investigations. They learn to write methods for this, and to present data and draw conclusions. They also learn to apply a variety of equations, such as those for charge, potential difference, energy and power.  Next, students study the B3 Infection & Response unit. This builds on students' understanding of communicable disease, first introduced in B2. Here, students also have an opportunity to develop their understanding of the nature of science – e.g. through Fleming's development of antibiotics and drug trials.  After this, students study B4 Bioenergetics, which includes the concepts of metabolism, respiration and photosynthesis. Students build on their understanding from year 8 and 9 and complete further practical work.  Finally, students cover C3 Quantitative Chemistry and C5 Energy Change. The former introduces concepts such as relative formula mass and the mole (Higher only). The latter adds more examples of endothermic/exothermic reactions (first covered in year 9) and also includes more complex bond energy calculations for Higher tier students.  Students are assessed on all year 10 content so far in March. The results are used to diagnose learning gaps and make changes to teaching groups.  <u>Topics covered:</u> P2 Electricity B3 Infection & Response B4 Bioenergetics C3 Quantitative Chemistry C5 Energy Change	<b>Mock 2</b> In this term, students first study a Matter unit. The concept of specific heat capacity is first introduced here and students carry out a practical to find the SHC of a metal block. This is covered in this unit, rather than P1, so that students have prior understanding of relevant electrical power equations.  Finally, students study a topic on Atomic Structure & Radioactivity. Here, students build on the C1 topic, in order to identify changes to atoms during radioactive decay. They also learn about how our model of atomic structure has changed over time, to incorporate a variety of experimental findings.  Once all Paper 1 content is completed, students complete full mock papers in Biology, Chemistry and Physics. Teachers plan feedback lessons to close learning gaps.  <u>Topics covered:</u> P3 Matter P4 Atomic Structure	<b>Mock 3</b> In term 6, we begin teaching paper 2 content: B7 and C9. Both units deal with human impacts on the environment.  In B7, students learn about interdependence in ecosystems. This builds on work done in year 8. They also learn about sampling as a method of estimating population size or the distribution of organisms. They learn about humans' land use, deforestation and global warming.  In C9, students learn about the evolution of the atmosphere. We look at pollution and evidence for global warming.  <u>Topics covered:</u> B7 Ecosystems C9 Atmosphere	

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Year 11	<p>At the start of year 11 students, begin the B5 topic. The focus is on the nervous and endocrine system. Students are introduced to new key words such as homeostasis and reflex actions. They develop their skills in comparing when they are asked to compare the nervous system and endocrine system. Students also investigate reaction time and practise evaluating different examples of this investigation. Finally, students evaluate different methods of contraception and consider the limits and drawbacks of fertility treatment – with consideration of the idea that science cannot provide 'right answers' in relation to these issues.</p> <p>Next, students study the P5 Forces topic. Here, students build on concepts from year 7, 9 and 10 to examine the effect of forces on the motion of different objects. A variety of equations are introduced and Higher students look at multi-step problems. Students also learn about more practical techniques, e.g. datalogging in the investigation of Newton's second law.</p> <p>Later students study Rates of Reaction (C6). By this point, students are expected to plan and carry out and analyse the results of practical work more independently.</p> <p>During year, 11 students have an extra hour of lessons during intervention. The interventions focus on revision of paper 1 material to make sure they are confident on these topics before their first set of mocks in November.</p> <p>After the mock exams, students study how inheritance and how our understanding of evolution and artificial selection has developed in the B6 topic. This presents an opportunity to evaluate genetic engineering and selective breeding.</p> <p><u>Topics covered:</u>            B5 Homeostasis            P5 Forces            C6 Rates of Reaction            B6 Inheritance and Selecton</p>	<p>After Christmas, students look at C7 Organic Chemistry and C8 Chemical Analysis. Both topics involve looking at data and identifying patterns. We finish the Chemistry content by looking at uses of resources. Here, students apply their understanding of human impacts on the environment in order to evaluate the impact of each stage of a product's lifecycle on the environment.</p> <p>Once we have finished the Chemistry topics, students study P6 Waves. Here, students build on their understanding of energy transfers. We refer back to conduction, convection and radiation as methods of heat transfer from P1. We look at different types of wave, and how to investigate the properties of different waves. Students learn about a variety of ways of taking measurements of wave properties, and how these can be used in the wave equation.</p> <p>Finally, students study P7 Magnetism. This includes some basic recap from KS3, including magnetic fields and the uses of electromagnets, as well as the motor effect at Higher tier. Triple Science students will study the P8 Space Physics unit at this point.</p> <p><u>Topics covered:</u>            C7 Organic Chemistry            C8 Chemical Analysis            C10 Resources            P6 Waves            P7 Magnetism            P8 Space Physics – triple science only</p>	Mock 2	<p>This term is used for targeted revision lessons for all topics and to support students to refine their exam technique.</p> <p><u>Exams</u></p>		

#### Impact:

- To monitor students' progress, we ensure that all students complete a marked piece of work at the end of each unit of work. This includes questions from across the topic, as well as testing key foundational content and aspects of the Working Scientifically curriculum. Following each marked activity, teachers plan a feedback lesson, in order to address the key gaps in students' learning.
- Students have access to key vocabulary and definitions through their knowledge organiser booklet. Every fortnight in KS3, and every week in KS4, students are given definitions to learn for homework and are then tested in class to ensure this has been done. Success in KO tests is monitored closely.
- Students are also set an online homework quiz via Educake, once per fortnight in KS3 and once per week in KS4. We set quizzes on topics covered several weeks previously, to help students embed knowledge in their long term memory. Again, completion and success rates are monitored closely, and interventions are put in place where this needs to be improved.
- We our progress towards the aim of all students seeing that 'Science is for Me' through uptake of Science Club across KS3 and through our annual pupil survey and pupil voice activities. We also aim to monitor the uptake of Science at KS5 by different groups of students.

