

## RMGS CURRICULUM MAP - BIOLOGY DEPARTMENT

### CURRICULUM INTENT

Science department vision:

*“To instil a passion for Science through excellent teaching and learning. To develop independent, scientifically literate students who are equipped with the analytical and evaluative skills required for their future careers.”*

Our biology curriculum at RMGS is designed to teach students about the beauty and complexity of life; from cells as the fundamental unit of life to how they can interact with other cells to create organs, organ systems and multicellular organisms; from how organisms in an ecosystem interact with one another and their environment to how the process of natural selection changes the characteristics of organisms in a species over time.

Through excellent teaching and learning, we teach students the key facts, concepts and vocabulary (substantive knowledge) they need to understand how life works. Furthermore, practical activities are embedded across the curriculum so that students also develop the skills and understanding (disciplinary knowledge) they need to carry out their own investigations into how life works or appreciate how scientists in the past devised the theories that the students are learning about. The biology curriculum also gives students many opportunities to develop scientific thinking skills, such as analysis, interpretation and evaluation. These skills will prepare student well for the wider world, irrespective of whether they continue to study biology or not.

#### Year 7-11

From year 7-11, students study a spiralled 5-year curriculum, based on the 10 ‘Big Ideas’ model designed by AQA. The 3 big ideas for biology are: cells, ecosystems and genes. In our curriculum map (below) the big ideas are in bold. The map shows how these concepts are spiralled throughout the five years.

In year 7-8 students learn about the fundamental concepts of life; namely (1) cells as the fundamental unit of life, (2) the organisation of cells into tissues, organs and organ systems that allows large multicellular organisms to survive and (3) the cellular reactions respiration and photosynthesis that sustain life. Students also get to study interesting areas of biology that is not revisited at GCSE, such as plant reproduction and the anatomy of bones and muscles.

We treat year 9 as a transition year between Key Stage 3 and 4, where students build on the three key concepts they learn in year 7 and 8 (see above) in preparation for the more specialised GCSE content they learn in year 10 and 11.

Once students have a secure foundation in terms of their understanding of biology, we then begin to specialise in year 10 by studying three very interesting areas of biology: disease, genetics and ecology. Students, particularly those who want to pursue a career in healthcare, are fascinated by the causes, prevention and treatment of disease. In year 7 and 8, students touched on variation, human reproduction, evolution and inheritance; but in year 10, we get to teach this in greater depth as students are now mature enough to understand challenging concepts such as DNA structure, alleles, protein synthesis and mutations. Finally, we spend the summer term in year 10 teaching ecology – the interactions between organisms and their environments. This is intentional as it maximises the chances of good weather so that students can get outside to carry out field investigations. Year 10 is where we can really fuel students' intellectual curiosity in our subject as they can apply what they are learning in the classroom to the wider world; from the spread of, and response to, the COVID-19 pandemic to tackling the loss of biodiversity caused by climate change.

In year 11, students finish their work on ecology that they started in year 10. Then, they move onto the final unit: Biological Responses. This gives students an opportunity to apply their knowledge of cells and multicellular organisms (learned in year 7, 8 and 9) to neuronal and hormonal cell signalling and homeostasis within a multicellular organism. This is arguably the most challenging content in GCSE biology, and we therefore teach it at the end of the course to the most mature students.

Throughout years 7-11, students get numerous opportunities for 'hands-on' learning, whereby they carry out experiments that provide evidence for the theoretical knowledge that they learn. Furthermore, students have many opportunities to develop their literacy and mathematical skills in GCSE biology. This is most notable in the wide range of biological terminology they are required to learn and use appropriately, and applying maths to solve problems in biological contexts.

### Year 12-13

The A-level biology curriculum is designed in a similar format to the 5-year curriculum that students follow in the lower school. Students start by learning the "Foundations in Biology" module. This module, as the name suggests, provides students with the key knowledge and concepts necessary to access the rest of the course. Two teachers share the teaching of the topics within this unit: one teacher explores cell theory with the students while the other teacher focusses on biochemistry. Once students have a secure understanding of the foundations, the course begins to specialise into different areas of biology. Again, this is split between two teachers; one teaching the "Exchange and Transport" module while the other teaches "Biodiversity, Evolution and Disease". By May half-term, students have learnt all the content in year 1 (AS-level) of the course. In the summer term of year 12, the students learn two year 2 (A-level) topics: (6.5) ecosystems and (6.6) populations and sustainability. Similarly, to GCSE, teaching the ecology topics in the summer is intentional as it maximises the chances of good weather so that students can get outside to carry out field investigations. In year 13, the teaching is again split between two teachers; one teaches the "Communication, Homeostasis and Energy" module, while the other teaches the genetics topics in the "Genetics and Ecosystems" module.

Practical skills (module 1 in the OCR A specification) is taught throughout the two-year course. Students carry out wide range of practicals, including a minimum of 12 assessed practicals (PAGs), throughout the course. As they do the experiments, they develop strong practical skills (set out in module 1 of the OCR specification) and the practical also serve as a useful teaching and learning tool to embed theoretical knowledge. We believe that the practical activities are highly useful learning tools and so we actually carry out far more than the minimum of 12 PAGs.

Throughout year 12 and 13, students are set extra (ZigZag) questions to complete and mark independently. This is designed to improve their ability to learn independently and encourage them to take responsibility for their own learning, key skills for further education and beyond. Furthermore, students are encouraged to read and research beyond the scope of the A-level curriculum; for example, we direct them to MOOCs that they could complete or the school library where we have a range of biology-related book available. Furthermore, students have many opportunities to develop their literacy and mathematical skills in A-level biology. This is most notable in the wide range of biological terminology they are required to learn and use appropriately, and applying maths to solve problems in biological contexts.

Termly Curriculum Overview						
Year Group	Autumn 1	2	Spring 3	4	Summer 5	6
7	<b>Organisms</b> (Movement and Cells) Portfolio task: comparing plant and animal cells  (Students also learn about one chemistry and one physics big ideas as well)		<b>Ecosystems</b> (Interdependence and plant reproduction) Portfolio task: Ecological Balance  (Students also learn about one chemistry and one physics big ideas as well)		<b>Genes</b> (Variation and Human Reproduction) Portfolio task: Transfer via Placenta  (Students also learn about one chemistry and two physics big ideas as well)  EoY assessment – exam	
8	<b>Organisms</b> (Breathing and Digestion) Portfolios: Height and lung volume link.  (Students also learn about one chemistry and one physics big ideas as well)		<b>Ecosystems</b> (Respiration and photosynthesis)  Portfolios: Respiration of yeast  (Students also learn about one chemistry and one physics big ideas as well)		<b>Genes</b> (Evolution and Inheritance)  Portfolios: How the dinosaurs became extinct.  (Students also learn about one chemistry and one physics big ideas as well)  EoY assessment – exam	
9	<b>Organisms</b> - Unit 1: Cells Required practical 1 – microscopy Required Practical 3 – osmosis	<b>Organisms</b> - Unit 1: Cells End of unit assessment – in-class test	<b>Organisms</b> – unit 1: Cells - Unit 2: Organisation Required practical 4 – food tests Required practical 5 – enzymes	<b>Organisms</b> - Unit 2: Organisation	<b>Organisms</b> - Unit 2: Organisation End of unit assessment – in-class test  Revision for end-of-year (EoY) exam	EoY assessment – exam  <b>Ecosystems</b> - Unit 4: Bioenergetics (first half - photosynthesis) Required practical 6 – photosynthesis

10	<p><b>Ecosystems</b> - Unit 4: Bioenergetics (second half - respiration) End of unit assessment – in-class test</p> <p><b>Organisms</b> - Unit 3: Disease Required Practical 2 – microbiology</p>	<p><b>Organisms</b> - Unit 3: Disease</p>	<p><b>Organisms</b> - Unit 3: Disease End of unit assessment – in-class test</p> <p><b>Genes</b> - Unit 6: Genetics, Reproduction and Evolution</p>	<p><b>Genes</b> - Unit 6: Genetics, Reproduction and Evolution</p>	<p><b>Genes</b> - unit 6: Genetics, Reproduction and Evolution End of unit assessment – in-class test</p> <p>Revision for end-of-year (EoY) exam</p>	<p>EoY assessment – exam</p> <p><b>Ecosystems</b> - Unit 7: Ecology Required Practical 9 – sampling</p>
11	<p><b>Ecosystems</b> - Unit 7: ecology Required Practical 10 – decay (triple science classes only) End of unit assessment – in-class test</p>	<p><b>Organisms</b> - Unit 5: Biological Responses Required Practical 7 – reaction time</p>	<p><b>Organisms</b> - Unit 5: Biological Responses</p> <p>GCSE Combined Science (trilogy) classes finish learning new content here End of unit assessment – in-class test</p>	<p>GCSE biology (triple science) classes continue with <b>Organisms</b> - Unit 5: Biological Responses</p> <p>Required Practical 8 – plant responses (triple science classes only) End of unit assessment – in-class test</p>	<p>Revision for final public examinations</p>	<p>Preparation work for students planning on taking A-level biology</p>

12	<p>Teacher A –Cell Structure, Biological Membranes (module 2)</p> <p>Teacher B – Biological Molecules (module 2)</p> <p>End of topic tests</p>	<p>Teacher A – Biological Membranes, Cell Division (module 2)</p> <p>Teacher B – Nucleic Acids, Enzymes (module 2)</p> <p>End of topic tests</p>	<p>Teacher A – finish off module 2, then Exchange and Breathing, Transport in Animals (module 3)</p> <p>Teacher B – Communicable Diseases, Evolution and Classification (module 4)</p> <p>End of topic tests</p>	<p>Teacher A – Transport in Animals, Transport in Plants (module 3)</p> <p>Teacher B – Evolution and Classification, Biodiversity (module 4)</p> <p>End of topic tests</p>	<p>Finish modules 3 and 4</p> <p>End of topic tests</p> <p>Revision for end-of-year exams</p>	<p>End-of-year exam</p> <p>Teacher A – Ecosystems (module 6)</p> <p>Teacher B - Populations and Sustainability (module 6)</p> <p>End of topic tests</p>
13	<p>Teacher A – photosynthesis and respiration (module 5)</p> <p>Teacher B – cellular control, patterns of inheritance (module 6)</p> <p>End of topic tests</p>	<p>Teacher A – photosynthesis and respiration (module 5)</p> <p>Teacher B – patterns of inheritance (module 6)</p> <p>End of topic tests</p>	<p>PEQ (mock) exam</p> <p>Teacher A – communication and homeostasis, neuronal and hormonal signalling (module 5)</p> <p>Teacher B – manipulating genomes (module 6)</p> <p>End of topic tests</p>	<p>Teacher A – Plant and animal responses (module 5)</p> <p>Teacher B – cloning and biotechnology</p> <p>Revision for in-class mock exams</p>	<p>In-class mock exams</p> <p>Revision for final public exams</p> <p>Final public exams</p>	