KS4 Curriculum Overview: Biology

Rationale:

In Year 9 we continue to teach Biology separately to Physics and Chemistry. These divisions are mirrored further in the Sixth Form at Level 3, in the structure of both A level courses and units of the Vocational BTEC Level 3 National Extended Certificate in Applied Science.

During Year 9 we aim to build on the knowledge and understanding of Biology gained during Key Stage 3. This follows the philosophy of a '5 Year Key Stage 4' inherent in the current Programme of Study and National Curriculum for KS3 and 4 Science. (In other words, both the knowledge and skills directly gained at KS3 and those developed further during KS4 are tested during the GCSE exams taken at the end of Year 11).

In Year 9 we follow the AQA Scheme of Learning, in common with Physics and Chemistry. All students in Year 9 follow the Combined Science course, with two classes being taught the Separate Science content in preparation for course decisions made by the Head of Department at the end of the summer term of Year 9.

Students begin by studying Cell Biology in Year 9, the study of the basic unit of all forms of life. All subsequent biological knowledge builds on this foundation as the course evolves into studying tissues, organs and organ systems and then into how organisms inherit characteristics, evolve, and co-exist within ecosystems. Students are familiar with the concept of cells from studying it at KS3 in Year 7 (with numerous references to cells within the KS3 course) and, although it contains some difficult concepts, it is embedded in the rest of the course. Along with Cell Biology, students also study Organisation, which again builds on the topic of cells in addition to knowledge gained in Year 7 regarding the relationship between cells, tissues, organ and organ systems.

1. *In the following Overview, the lesson numbers are approximate and will vary depending on the number of weeks in each term.*
2. *All in italic are for separate sciences only*
3. **All in bold are for higher tier only**

Reading in the curriculum: The Sciences offer many opportunities to develop and extend students' literacy skills. There is a large amount of new, subject-specific vocabulary, and so each unit includes a glossary which students will complete and learn during the unit. Students will use texts to find out information for themselves, using the functional layout of such texts, including index, contents and glossary sections of text books used in class, and also at home in an online format. Students will also review and connect information within topics, so knowledge organisers are provided for each topic.

Connected knowledge: Topics in the Sciences do not stand alone. Each topic connects to prior knowledge from primary school, other topics learnt or still to be learnt at this school both in the Sciences and in other subjects and also in the outside world. Connected knowledge is discussed in class, starting with the Context Summary which is shared with students at the start of each topic.

Diversity: Science belongs to everyone, regardless of background, and people from all walks of life contribute to its development and reap its benefits. This is reflected in the examples used in lessons and the Scientists whose work we consider.						
Term / Length of Unit	**Outline**	**Assessment**	**Home Learning**	**Resources**	**Knowledge/Skills End Points**	**Reading in the Curriculum**
Year 9 Autumn Term 1 Topic 1 Cell Biology 6 lessons (8 including assessment and responding to feedback lessons) *Triple material to be taught to relevant classes*	<u>Topic 1 Cell Biology Term 1</u> Students learn about how structural differences between types of cells enables them to perform specific functions within the organism, and that the differences in cells are controlled by genes in the nucleus. They also learn about stem cells and the potential they have for treating diseases such as Parkinson's disease. Students also have the opportunity to use their practical skills in making slides and using microscopes to view and measure cells as well as using maths skills with the magnification equation.	There are 3 summative Science tests through the year, and formative assessment is carried out regularly in lessons in a variety of formats	In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y9 Blog	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Biology Student Book	<u>Knowledge</u> • Structure and function of plant, animal and bacterial cell organelles • Understanding similarities and differences between eukaryotes and prokaryotes • How and why cells become specialised, and how specialised cells are adapted to their function • How improvement of microscopy techniques has enabled knowledge of cell structure and function to develop • The importance of stem cells in future therapies • *The culture of microorganisms* <u>Skills</u> • RP – use a light microscope to observe, draw and label a selection of plant and animal cells. • *RP - investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.* • Use of magnification equation • Use prefixes centi, milli, micro and nano. • Recognise, draw and interpret images of cells.	Guided reading opportunities: specialised cells and electron microscopes Please see Y9 Blog for glossary using this link: b1-cell-biology-glossary.pdf
Year 9 Autumn Term 2 Chapter 1 Cell Biology 8 lessons (10 including assessment and	<u>Chapter 1 Cell Biology Term 2</u> Students learn about how cells reproduce to produce identical copies of	There are 3 summative Science tests through the year, please see the and formative assessment is carried out	In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in	SoL on science shared area, including powerpoints, details of practical investigations	<u>Knowledge</u> • The role of chromosomes and the stages of the cell cycle, including mitosis • Explain why mitosis is important and recognise when it is taking place	Guided reading opportunities: movement of substances Please see Y9 Blog for glossary using this link: b1-cell-biology-glossary.pdf

responding to feedback lessons)	themselves by studying chromosomes, mitosis and the cell cycle. How substances enter and leave cells is also covered, learning about diffusion, osmosis and active transport. Finally, the importance of exchange surfaces and surface area: volume ratio is studied. Students have the opportunity to practice their practical skills by observing osmosis in potatoes.	regularly in lessons in a variety of formats	a Biology – Chemistry – Physics rotation. Further information is available in the Y9 Blog	and associated risk assessments, worksheets, revision resources, homework booklet and test. Biology Student Book	• Compare and contrast diffusion, active transport and osmosis • Give examples of substances transported in and out of cells by each mechanisms • State factors that affect the rate of diffusion • Explain how the small intestine, alveoli and root hair cells are good exchange surfaces <u>Skills</u> • RP - investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. • Recognise, draw and interpret diagrams that model diffusion. • Calculate surface area:volume ratio • Calculate % mass change	
Year 9 Spring Term 1 Topic 2 Organisation 6 lessons (8 including assessment and responding to feedback lessons)	<u>Topic 2 Organisation Term 3</u> Students develop their knowledge of cells as the basic unit of all living things and learn how they work together to produce tissues, organs and organ systems. The digestive system is explored in depth and enzymes are introduced within this context. Students have hands-on experience in testing for different biological molecules in food, and investigate factors that affect enzyme activity. Students can also observe or participate in the dissection of a rat to observe it's digestive system.	There are 3 summative Science tests through the year, and formative assessment is carried out regularly in lessons in a variety of formats	In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y9 Blog	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Biology Student Book	<u>Knowledge</u> • Definitions and examples of plant and animal tissues, organs and organ systems • Identifying organs of the digestive system, their adaptations and functions • The function of enzymes and factors that affect their activity • Specific role of digestive enzymes (carbohydrases, proteases and lipases) <u>Skills</u> • RP - use qualitative reagents to test for a range of carbohydrates, lipids and proteins. • RP - investigate the effect of pH on the rate of reaction of amylase enzyme. • Calculating rate of reaction • Recording results in tables and graphs • Dissection	Guided reading opportunities: structure and function of the digestive system Please see Y9 Blog for glossary using this link: b2-organisation-glossary.pdf

Year 9 Spring Term 2 Topic 2 Organisation 8 lessons (10 including assessment and responding to feedback lessons)	<u>Topic 2 Organisation Term 4</u> Students complete their learning of the digestive system, then move on to learn about the physiology of the respiratory system and the circulatory system, building on previous work related to specialised cells, diffusion and exchange surfaces. Pathology is also introduced as non-communicable diseases such as coronary heart disease and cancer are studied, along with risk factors. There are lots of opportunities for dissections in this topic (heart, lungs) in addition to observing blood smears and other tissues using a microscope.	There are 3 summative Science tests through the year, and formative assessment is carried out regularly in lessons in a variety of formats	In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y9 Blog	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Biology Student Book	<u>Knowledge</u> • Identifying the main parts of the lungs and the heart, describing their function and their adaptations • Identifying blood cells, their function and adaptation • Identifying blood vessels, their function and adaptation • Describing CHD, causes and treatments • Describing cancer, causes and treatments • Evaluating risk factors for non-communicable diseases such as CHD and cancer <u>Skills</u> • Dissection and biological drawings • Using a microscope to view and draw different tissues and blood cells	
Year 9 Summer term 1 Topic 2 Organisation 5 lessons (7 including assessment and responding to feedback lessons)	<u>Topic 2 Organisation Term 5</u> Students complete their learning of the circulatory system, building on previous work related to specialised cells, diffusion and exchange surfaces. Pathology is also introduced as non-communicable diseases such as coronary heart disease and cancer are studied, along with risk factors. There are lots of opportunities for dissections in this topic (heart, lungs) in addition to observing blood smears and other tissues using a microscope.	There are 3 summative Science tests through the year, and formative assessment is carried out regularly in lessons in a variety of formats	In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y9 Blog	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Biology Student Book	<u>Knowledge</u> • Identifying the main parts of the lungs and the heart, describing their function and their adaptations • Identifying blood cells, their function and adaptation • Identifying blood vessels, their function and adaptation • Describing CHD, causes and treatments • Describing cancer, causes and treatments • Evaluating risk factors for non-communicable diseases such as CHD and cancer <u>Skills</u> • Dissection and biological drawings	Guided reading opportunities: causes and treatment of coronary heart disease Please see Y9 Blog for glossary using this link: b2-organisation-glossary.pdf

					• Using a microscope to view and draw different tissues and blood cells	
Year 9 Summer term 2 Topic 2 Organisation 5 lessons (7 including assessment and responding to feedback lessons)	<u>Topic 2 Organisation Term 6</u> Students move on to learn about tissues, organs and organ systems in plants. Plant tissues such as phloem and xylem are studies, and organ systems working together to perform processes such as transpiration and translocation. This is linked again with concepts previously covered such as cell specialisation, diffusion, osmosis and active transport, and adaptations of exchange surfaces. (Students have learned about photosynthesis in Year 8 and it is covered at GCSE level in Topic 4 – Bioenergetics). Practical work includes investigating factors that affect transpiration and using microscopes to look at plant tissue and distribution of stomata on the surfaces of leaves.	There are 3 summative Science tests through the year, and formative assessment is carried out regularly in lessons in a variety of formats	In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y9 Blog	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<u>Knowledge</u> • Identifying plant tissues and organs, describing their functions and adaptations (epidermal tissues, palisade mesophyll, spongy mesophyll, xylem and phloem, meristem tissue) • Knowledge and understanding of transpiration, and features that affect the rate of transpiration • Function and distribution of stomata and guard cells • Knowledge and understanding of translocation, and how it is similar and different to transpiration <u>Skills</u> • Microscopy to view xylem, phloem, root hair cells and stomata • Investigations into factors that affect rate of transpiration • Calculating rate of transpiration • Calculating number of stomata per mm^2	Guided reading opportunities: translocation and transpiration Please see Y9 Blog for glossary using this link: b2-organisation-glossary.pdf