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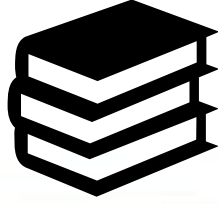


Idsall School

Year 7-13 Biology Learning Journey

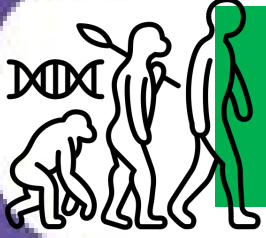


This way to Training, Employment or Further Education



A-Level:
Exams

Year 13



Genetics,
Evolution &
Ecosystems

Communication,
Homeostasis &
Energy

Development of
Practical Skills in
Biology



Year 12

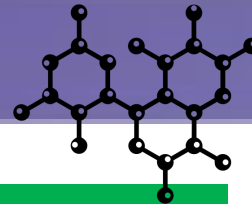


Biodiversity,
Evolution &
Disease

Exchange &
Transport

Foundations in
Biology

Development of
Practical Skills in
Biology



GCSE:
Exams

Year 11

Genetics &
Evolution

Variation &
Evolution

Reproduction

Homeostasis in
Action (Separate
Science only)

Organising an
Ecosystem

Biodiversity &
Ecosystems

Human Nervous
System

Hormonal
Coordination



Year
10:

Year 10

Adaptations,
Interdependence
& Competition

Respiration

Photosynthesis

Organising Animals
& Plants

Organisation &
Digestion
vCC

Communicable
Disease

Non-
Communicable
Disease

Preventing &
Treating Disease

Cell Structure &
Transport

Cell Division



Year 9



Photosynthesis

Key Concepts
Communicable
Disease

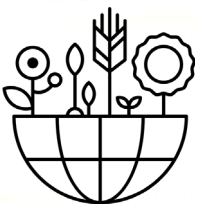
Detection

Biological
Processes



Year
9:

Year 8



Ecosystems &
Adaptations

Inheritance

Health &
Lifestyle

Year
8:

Year 7



Reproduction

Structure &
Function of Body
Systems

Cells



Start
here

The Big Picture -Intent:

This year is a combination of grounding pupils in the key concepts which underpin Biology as subject and ensuring they have a firm understanding of the key topics of cellular biology, body systems and reproduction as the foundation of the study of life. The cells topic is a fundamental topic within biology a good understanding of which most of the biology topics build upon. We encourage the exploration and understanding of the world around them. The curriculum is knowledge rich and builds upon prior knowledge in order to reinforce understanding of Biology as a subject at a deeper level. Science lessons will focus on the substantive knowledge and content, but in addition teach methods of enquiry and investigation to stimulate creative thought. Pupils will ask questions and begin to appreciate the way Science will affect their future on a personal, national and global level.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary

Implementation:

In Year 7 biology there are 3 units of study: Cells, structure and function of systems, reproduction. Each unit has separate key study skills and these will be fostered through observation, practical and independent practical skills. Students study skills will be developed through in class and independent assessment preparation. We ensure that we also prepare students in both practical and mathematical skills, for them to fully access the curriculum and explore investigations scientifically.

Cells: learn the fundamental concept that all living organisms are made up of cells. These building blocks of life make up all the major structures in living organisms. This topic ignites a sense of wonder as it introduces students to the new world of life at a microscopic level.

Levels of organisation within organisms: Study how cells group together to form tissues. The major organ systems are revisited, and knowledge is built relating to the structure and function of key organs, based on pre-existing understanding of each system's purpose.

Reproduction: The structure of both the human and plant reproductive systems in depth. The main stages of puberty and the menstrual cycle are also introduced, along with the role hormones play in them. Identify the role of all the key reproductive structures.

Key Summative Assessments:

Baseline assessments will take place in the Autumn term.

Cumulative formal End of unit tests will take place at the end of each unit.

Cumulative end of Year exams in the summer term.

Retrieval homework.

Live marking and low stakes quizzing

Autumn Term:

Baseline Testing
Cells.

Spring Term:

Structure & Function of Body
Systems

Summer term:

Reproduction
Year 7 cumulative exam.

Impact:

A deeper understanding of cells and their effects on organisms is key substantive knowledge that we want students to know by the end of year 7

We want to pupils to feel they are real scientists by the end of Year 7; competent and comfortable in their practical skills e.g. handling glassware, using lab equipment, making accurate observations as well as having a sound understanding of some of the key concepts across Biology.

Students will have increased understanding and confidence in biological substantive and disciplinary knowledge and be able to apply new skills to a variety of new and challenging scientific concepts. Students will know more and remember more. There will be an increase in attainment, evidenced in regular, formal and interleaved assessments. We want all our pupils to develop an understanding of natural phenomena and we aim to stimulate the natural curiosity in finding out why things happen the way they do. We aim for our students to develop into confident, resilient, and reflective learners who enjoy biology and understand the importance of its study in the world

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.	Prior Learning KS2	Future Learning (Y8)
Cells:	Maths: Substituting values into an equation when calculating magnification. Sensible estimation of size – units and scale. Literacy: Prefixes/ suffixes of words. Correct use of key words Use of tier 2 & 3 scientific language in writing Sc1 – working scientifically: Using a microscope to observe plant and animal cells and draw scientific diagram of microscope images. Labelling cell images Investigate diffusion	<ul style="list-style-type: none"> • Microscopes • Plant and animal cell theory • Identification of specialised cells • Structural adaptations of specialised cells. • Unicellular organisms and their functions • Movement of substances - Role and process of diffusion. 	<ul style="list-style-type: none"> • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers 	<ul style="list-style-type: none"> • Inheritance • Health & Lifestyle
Structure & function of body systems:	Maths: Plot a bar chart using scientific data. Design results tables to record data. Literacy: Prefixes/ suffixes of words. Correct use of key words Use of tier 2 & 3 scientific language in writing Extended writing in reference to gas exchange Sc1 – working scientifically: Use appropriate SI units. Make models/ use of concrete examples. Evaluate and analyse results	<ul style="list-style-type: none"> • Understanding organisation in plants and animals (cells to systems). • Knowledge of the respiratory system • Structural adaptations of gas exchange surfaces (alveoli). • Knowledge of the structure and function of the skeletal systems, including joints and muscles. 	<ul style="list-style-type: none"> • Main parts of plants and animals. • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant 	<ul style="list-style-type: none"> • Health and lifestyle.

			<ul style="list-style-type: none"> Investigate the way in which water is transported within plants 	
Reproduction:	Maths: Percentage, calculating means. Literacy: Correct use of key words Extended writing in terms of discussing the development of the foetus and the menstrual cycle. Sc1 – working scientifically: Carry out flower dissection and discuss safety procedures. Quantitative investigation of dispersal mechanisms using evaluation and mathematical skills	<ul style="list-style-type: none"> Human fertilisation and implantation. Structure and function of the male and female reproductive systems. Plant pollination and fertilisation. 	<ul style="list-style-type: none"> Observe and describe how seeds and bulbs grow into mature plants Life cycles of plants and animals Notice that animals, including humans, have offspring which grow into adults Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal 	Inheritance

The Big Picture - Intent:

Students build upon their previous learning adding challenge and diversity, revisiting and extending previously learnt concepts further developing scientific knowledge, skills and thinking. In year 8 students study health and lifestyle, inheritance, ecosystems and adaptation. The biology curriculum is knowledge rich and builds upon prior learning in order to develop understanding at a deeper level. The curriculum encompasses the national curriculum and follows a spiral structure. We intend for our students to develop into confident, resilient, and reflective learners who enjoy Biology and move on and up to be successful at KS3, GCSE, A-Level and beyond

Biology lessons will focus on the substantive knowledge and content, but in addition explore methods of enquiry and investigation to stimulate creative thought. Pupils will ask questions and continue to develop an appreciation of the way Biology will affect their future on a personal, national and global level.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

In Year 8 biology there are 3 units:

Health and lifestyle: The concept of a healthy diet is revisited through the study of all the major food groups, looking in detail at their roles in the body and other living organisms. Dietary energy requirements are calculated based on number of factors and the effect of too little/too much nutrition is explored. Students focus in on one organ system in the digestive system and also learn about the effects of drugs, alcohol and smoking on the body.

Inheritance: Building on work on human characteristics and variation in a species, the more abstract concept of how characteristics are inherited through DNA is introduced. The concept of organisation of structures is also revisited by looking at how genes are sections of DNA, found on chromosomes. Students also study natural selection and extinction in this unit.

Ecosystems and adaptation: Students' study ecosystems by looking at communities and the abiotic and biotic factors affecting them, building and deepening students' knowledge of interdependence and competition. Students confirm their models by sampling their environment.

Each unit has separate key study skills and these will be fostered through observation, practical and independent practical skills. Students study skills will be developed through in class and independent assessment preparation. We ensure that we also prepare students in both practical and mathematical skills, for them to fully access the curriculum and explore investigations scientifically

Key Summative Assessments:

Formal End of unit tests will take place at the end of each unit.

Cumulative end of year exams in the summer term.

Retrieval homework.

Live marking and low stakes quizzing

Autumn Term:

Health and lifestyle.

Spring Term:

Inheritance.

Summer term:

Ecosystems and adaptation.
Year 8 exam.

Impact:

Students will have increased understanding and confidence in biological substantive and disciplinary knowledge and be able to apply new skills to a variety of new and challenging scientific concepts. Students will know more and remember more. There will be an increase in attainment, evidenced in regular, formal and interleaved assessments.

We want all our pupils to develop an understanding of natural phenomena and we aim to stimulate the natural curiosity in finding out why things happen the way they do. We aim for our students to develop into confident, resilient, and reflective learners who enjoy biology and understand the importance of its study in the world today.

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.	Prior Learning (KS2-Y7)	Future Learning (Y9)
Health & lifestyle	<p>Maths: Percentage change.</p> <p>Literacy: Key terms & definitions in context – Enzymes.</p> <p>Sc1: Modelling: Students will use models to represent the digestive system.</p> <p>Modelling: Pupils will evaluate models.</p>	<ul style="list-style-type: none"> • Food groups and food tests. • Structure and function of the digestive system. • The role of enzymes in digestion. • Absorption of food molecules by diffusion. • The effect of drugs on the body. 	<p>KS2 Animals including humans:</p> <ul style="list-style-type: none"> • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their body's function. • Describe the ways in which nutrients and water are transported within animals, including humans. <p>Y7 Cells:</p> <ul style="list-style-type: none"> • Plant and animal cell theory • Identification of specialised cells • Structural adaptations of specialised cells. • Unicellular organisms and their functions • Movement of substances - Role and process of diffusion. <p>Y7 Structure and Function of Body Systems:</p> <ul style="list-style-type: none"> • Understanding organisation in plants and animals (cells to systems). • Knowledge of the respiratory system • Structural adaptations of gas exchange surfaces (alveoli). • 	Biological processes Key concepts: Communicable disease.
Inheritance	<p>Maths: Express genetic outcomes as percentages and probabilities.</p> <p>Literacy: Recall the definitions of the keywords: chromosome, gene and DNA and link to their function.</p>	<ul style="list-style-type: none"> • Variation (genetic and environmental). • Variation (continuous or discontinuous) • Natural selection. 	<p>KS2: Evolution and inheritance:</p> <ul style="list-style-type: none"> • Recognise that living things have changed over time and that fossils provide. • Information about living things that inhabited the Earth millions of years ago. 	Detection

	<p>Sc1: Describe how characteristics are inherited. Describe how scientists worked together to develop the DNA model.</p>	<ul style="list-style-type: none"> • Inheritance of characteristics. 	<ul style="list-style-type: none"> • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. <p>Y7: Reproduction</p> <ul style="list-style-type: none"> • Human fertilisation and implantation. • Structure and function of the male and female reproductive systems. • Plant pollination and fertilisation. 	
<p>Ecosystems & adaptation.</p>	<p>Maths: Interpreting predator/ prey graphs. Literacy: Key terms & definitions in context Sc1: Biological diagrams and representations – conventions in food chains and webs. Adaptation of animals to their environment. Sampling ecosystems.</p>	<ul style="list-style-type: none"> • Interdependence of organisms. • Food chains. • Food webs. • Feeding relationships. • Plant and animal adaptations. 	<p>KS2 Food chains:</p> <ul style="list-style-type: none"> • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals • Give reasons for classifying plants and animals based on specific characteristics. • Life cycles of plants and animals • Notice that animals, including humans, have offspring which grow into adults • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) 	<p>Biological processes Photosynthesis</p>

The Big Picture – Intent:

In Year 9 students draw together their biological learning in KS3 ready to apply knowledge and understanding to KS4 topics. The application of topic knowledge in Year 7 and 8 demands linking of concepts learnt and an increased demand in terms of conceptual understanding. Students study biological processes, the key concepts of communicable disease and photosynthesis. The curriculum aims to encompass the national curriculum and follow a spiral structure, constantly building upon prior knowledge in order to reinforce understanding at a deeper level. We aim for our students to develop into confident, resilient, and reflective learners who enjoy Biology and move on and up to be successful at KS3, GCSE and A-Level and beyond.

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

There are 4 units of study.

Respiration: Students should recall that this is one of the most important processes in living cells. Students describe the aerobic respiration process including the word equation. Students identify mitochondria as the site of aerobic respiration.

Anaerobic respiration, students understand this process in muscles and write the word equation. Students understand that anaerobic respiration occurs in yeast cells and some plant cells. Students know the economic importance of fermentation and are able to write the word equation.

Detection: Students apply knowledge from cells, body systems and inheritance learnt in years 7 & 8. Students use microscope technique and find out how forensic scientists help to solve crimes through the analysis of evidence found at the scene of a crime.

Communicable disease: Students understand how the concept of health is affected by communicable diseases. Students study the different pathogens that cause communicable disease, including bacteria, viruses, and protists, and how these can be spread between organisms. Students study the development of simple hygiene methods to prevent the spread of pathogens; the isolation of individuals who are infected; the destruction of or control of vectors, and the use of vaccination.

Photosynthesis: Students study photosynthesis in plants and algae. They will be familiar with the word equation for photosynthesis and learn that photosynthesis is an exothermic reaction taking in thermal energy. Students study the adaptations of a leaf and the minerals required by plants for growth.

Key Summative Assessments:

Formal End of unit tests will take place at the end of each unit.

Cumulative end of Year exams in the summer term.
Retrieval homework.

Live marking and low stakes quizzing

Autumn Term:

Biological processes

Spring Term:

Detection

Key concepts:
Communicable disease.

Summer term:

Photosynthesis.
Year 9 exam.

Impact:

Students will consolidate biological substantive and disciplinary knowledge and be able to apply their skills to a variety of new and challenging scientific concepts. Students will know more and remember more. There will be an increase in attainment, evidenced in regular, formal and interleaved assessments.

We want all our pupils to develop an understanding of natural phenomena and we aim to stimulate the natural curiosity in finding out why things happen the way they do. We aim for our students to develop into confident, resilient, and reflective learners who enjoy biology and understand the importance of its study in the world today.

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.	Prior Learning (Y7-Y8)	Future Learning (GCSE)
Biological processes	<p>Maths: Use of word and chemical equations to represent respiration. Balancing of reactants and products in chemical equations</p> <p>Literacy: Key terms & definitions in context.</p> <p>Sc1: Investigating variables Applications of the use of microorganisms.</p>	<ul style="list-style-type: none"> • The process of aerobic respiration in living organisms. • The process of anaerobic respiration in humans and microorganisms. • The role of diffusion in the movement of materials in and between cells. • The role of microorganism in producing food & cleaning. 	<p>Y7:</p> <ul style="list-style-type: none"> • Cells • Structure & Function of Body Systems <p>Y8:</p> <ul style="list-style-type: none"> • Health & Lifestyle 	B9 Respiration
Detection	<p>Maths: Extract and interpret data from graphs. Working out magnification</p> <p>Literacy: Key terms & definitions in context. Identify ideas and supporting evidence in text.</p> <p>Sc1: Use of scientific equipment and measurement.</p>	<ul style="list-style-type: none"> • Using a microscope. • Structure and function of animal cells. • Fingerprints as an example of variation in humans. • Composition of human blood. • Rate of reaction (application in time of death). 	<p>Y7:</p> <ul style="list-style-type: none"> • Cells • Structure & Function of Body Systems <p>Y8:</p> <ul style="list-style-type: none"> • Inheritance 	B1 Cell structure and transport B4 Organising animals and plants
Key concepts: Communicable disease	<p>Maths: Using data with regards to trends in communicable diseases</p> <p>Literacy: Key terms & definitions in context. Identify ideas and supporting evidence in text.</p> <p>Sc1: Using scientific equipment precisely and safely. Investigating variables</p>	<ul style="list-style-type: none"> • The definition of health and pathogen. • The ways in which pathogens can spread. • Communicable and noncommunicable disease. • Diseases caused by viruses, bacteria, fungi and protists. 	<p>Y8</p> <ul style="list-style-type: none"> • Health and lifestyle 	B6 Preventing and treating disease

The Big Picture – Intent:

Biology takes students on a journey through the living world, starting from its simplest form of cells and tissues to the more complex interaction of whole ecosystems. An understanding of an ever evolving and adapting planet has never been so important as the world faces unprecedented challenges in regard to its treatment and respect for the environment. Biology aspires to develop scientific curiosity through practical work, teacher demonstrations, and creative activities, whilst teachers use their excellent subject knowledge and enthusiasm to create a varied and tailored learning experience for each student. Students will gain an admirable understanding of the living world and a skill set suitable for a wide range of scientific careers if they choose to study the subject in higher education

The Biology Papers cover the following topics:

Paper 1 – (Topics 1-4): Cell structure and transport, Cell division, Organisation and the Digestive system, Organising plants and animals, Communicable diseases, Preventing and treating disease, Non-communicable disease, Photosynthesis, Respiration

Paper 2 – (Topics 5-7): Biological Responses (Human nervous system and hormonal control), Genetics and reproduction (reproduction, variation & evolution, genetics and evolution), Ecology (adaptation, interdependence & competition, ecosystems, biodiversity)

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

Students undertaking combined science have 10 science lessons a fortnight.

At Key Stage 4 most students follow AQA GCSE Combined Science Trilogy. The specification covers Biology, Chemistry and Physics. This is a linear course with all the examinations at the end of year 11. Students will sit six examinations, two in Biology, two in Chemistry and two in Physics. Each examination is one hour and fifteen minutes in length and worth 16.7% of the final grade. Papers consist of multiple choice structured, closed short answers and open responses.

Students can be entered at either Foundation or Higher tier and will attain the equivalent of two GCSEs at 9-1 grades. There are six papers: two biology, two chemistry and two physics. Students are exposed to a knowledge-rich, spiralised curriculum, with the introduction of aspirational career pathways embedded in all units, ranging from pathologists to electrical engineers. Additionally, students are given the opportunity to discuss ‘big questions’ around the moral, social and ethical implications of many areas of science.

Students learn about science through purposeful practical activities as part of day-to-day teaching and learning. Students will also undertake required practicals in class in order to deepen their understanding of scientific concepts and develop their skills of investigating, observing, experimenting and testing the validity of scientific concepts ideas.

Key Summative Assessments:

All units include:

- Retrieval homework
- Live marking
- Low stake quizzing
- End of Unit Tests

Required practical tasks:

- Microscopy
- Effect of antiseptics or antibiotics on bacterial growth
- Osmosis
- Food tests
- Effect of pH on amylase
- Effect of light intensity on photosynthesis

Autumn Term:

Biology: Disease.

Spring Term:

Biology: Cells.

Summer term:

Biology:
Bioenergetics.

Impact: By the end of the Year students will be confident with the fundamental and more complex principles, knowledge and application of this knowledge in Biology. They will be able to apply their chemistry knowledge and skills to both familiar and unfamiliar situations using the analytical, questioning and critical thinking skills that they will have developed during their study of biology in year 10.

Prior Learning:**Prior Knowledge****KS2:**

- Animals including humans
- Evolution & inheritance
- Food Chains

KS3 Cells

- Plant and animal cell theory
- Identification of specialised cells
- Structural adaptations of specialised cells.
- Unicellular organisms and their functions
- Movement of substances - Role and process of diffusion.

KS3 Structure & Function of Body Systems

- Understanding organisation in plants and animals (cells to systems).
- Knowledge of the respiratory system
- Structural adaptations of gas exchange surfaces (alveoli).

KS3: Health & Lifestyle

- Food groups and food tests.
- Structure and function of the digestive system.
- The role of enzymes in digestion.
- Absorption of food molecules by diffusion.
- The effect of drugs on the body.

KS3: Reproduction

- Human fertilisation and implantation.
- Structure and function of the male and female reproductive systems.
- Plant pollination and fertilisation.

KS3: Inheritance

- Variation (genetic and environmental).
- Variation (continuous or discontinuous)
- Natural selection.
- Inheritance of characteristics.

KS3: Ecosystems & Adaptations

- Interdependence of organisms.
- Food chains.
- Food webs.
- Feeding relationships.
- Plant and animal adaptations.

KS3: Biological Processes

- The process of aerobic respiration in living organisms.
- The process of anaerobic respiration in humans and microorganisms.
- The role of diffusion in the movement of materials in and between cells.
- The role of microorganism in producing food & cleaning.

KS3: Detention

- Using a microscope.
- Structure and function of animal cells.
- Fingerprints as an example of variation in humans.
- Composition of human blood.
- Rate of reaction (application in time of death).

KS3: Photosynthesis

- The process and importance of photosynthesis.
- The adaptations of leaves for photosynthesis.
- The minerals needed for plant growth.

KS4 Year 10:

- Cell structure & Transport
- Cell Division
- Organisation & digestive system
- Organisation in animals and plants
- Communicable disease
- Preventing and treating disease
- Non-communicable disease
- Photosynthesis
- Respiration
- Adaptations, Interdependence & Competition

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.
Cell structure & transport	<p>Maths: Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Conversion of units. • Reading scales • Recalling scales <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Compare microscope slides and calculate magnification. • Label plant, animal, eukaryotic, prokaryotic and specialised cells and link to function. • Describe diffusion and osmosis and explain factors that affect them. • Explain the consequences of osmosis in cells with reference to appropriate keywords • Explain surface area to volume ratio and its relationship with exchange. • Identify when active transport is appropriate and describe the process. 	<ul style="list-style-type: none"> • Microscopy. • Animal and plant cells. • Eukaryotic and Prokaryotic cells. • Specialisation in animal and plant cells • Movement across membranes. • Exchanging materials.
Cell division	Maths:	<ul style="list-style-type: none"> • Cell cycle and mitosis.

	<p>Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Conversion of units. • Calculation of cell division • Reading scales • Recalling scales • Reading units from graphs <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe the stages of the cell cycle including mitosis. Identification of DNA and how it is organised in the nucleus. • Identify the differences between the differentiation of plant and animal cells. • Identify similarities and differences between embryonic and adult stem cells. • Describe the process of therapeutic cloning. • Evaluate the use of stem cells in medicine and the ethics behind their use. 	<ul style="list-style-type: none"> • Growth and differentiation. • Stem cells and ethics.
Organisation & digestive system	Maths:	<ul style="list-style-type: none"> • The digestive system and how it works.

	<p>Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Interpreting graphs • Giving values of anomalous results • Rate of reaction <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • To label the digestive system and discuss the roles of each organ and role of enzymes. • To draw and explain basic structures of carbohydrates, proteins and lipids. • Identify the main food groups using standard food tests. • To be able to explain how enzymes work using the lock and key theory. • Use data to interpret the effect of temperature and pH on enzyme action. • To discuss the role of bile in the digestion of lipids. 	<ul style="list-style-type: none"> • The chemistry of food. • Enzymes as catalysts and factors affecting enzyme action. • Making digestion efficient
<p>Organisation in animals and plants</p>	<p>Maths:</p>	<ul style="list-style-type: none"> • Composition of the blood.

	<p>Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Interpreting graphs • Recalling units • Calculating percentages <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • To describe and explain the functions of each main component of blood. • To explain the structural difference between the different types of blood vessels including the importance of valves. • To be able to label the structure of the heart. • To explain how the blood flows around the body and the importance of a double circulatory system. • To describe the roles of artificial pacemakers and hearts. • To explain how gases are exchanged in the alveoli. • To describe ventilation in the lungs including pressure and volume changes. • Describe tissues and organs are organised in plants. • To describe the role of stomata and guard cells in controlling transpiration and factors that affect the rate of transpiration 	<ul style="list-style-type: none"> • Blood vessels. • The structure and function of the heart. • Helping the heart. • Breathing and gas exchange. • Tissues, organs and transport systems in plants. Evaporation and Transpiration.
Communicable diseases	Maths:	<ul style="list-style-type: none"> • What is good health?

Multiple equations and mathematical processes that students will need to employ
This makes up 10% of the marks available in the biology papers.

- Interpreting graphs
- Recalling units
- Calculating percentages
- Interpreting and displaying data

Literacy:

- Key terms & definitions in context.
- Use and understanding of GCSE command words
- Literacy through the use of GCSE exam questions

Sc1:

- To list the different causes of ill health including the role of pathogens.
- To calculate how bacteria grow by binary fission.
- Use aseptic techniques to grow bacteria safely in the laboratory.
- Explain the effect of different antibiotics on bacterial growth.
- To describe the relevance the work of key scientists played in the prevention of spread of disease.
- To be able to give examples of plant and animal diseases caused by viruses, bacteria, fungi and protists.
- Recall and describe the specific and nonspecific human immune defences.
- Describe the effect of mineral deficiencies and their impact on plant growth.
- Describe how plants have evolved various mechanisms to defend themselves

- Pathogens and disease.
- Growing bacteria in the lab.
- Preventing bacterial growth and infections.
- Diseases caused by viruses, bacteria, fungi and protists.
- Human defence responses.
- Plant disease and defence responses.
- *Growing bacteria in the lab*
- *Preventing bacterial growth*
- *More about plant diseases*
- *Plant defence options*

<p>Preventing and treating diseases</p>	<p>Maths: Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Interpreting graphs • Recalling units • Calculating percentages • Interpreting and displaying data <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe how vaccination induces an immune response. • Explain the importance of herd immunity. • Explain the difference between treating symptoms and treating a specific disease. • Recall how new drugs are developed and the stages involved in testing and trialling. • To explain the importance of double-blind trials and the use of a placebo. • Explain how monoclonal antibodies are produced and the uses of them. • Give examples of uses of monoclonal antibodies. 	<ul style="list-style-type: none"> • Vaccinations. • Antibiotics and painkillers. • Discovering and developing new drugs. • <i>Making and the uses of monoclonal antibodies.</i> • <i>Uses of monoclonal antibodies</i>
<p>Non Communicable diseases</p>	<p>Maths:</p>	<ul style="list-style-type: none"> • Cancer. • Smoking.

	<p>Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Interpreting graphs • Recalling units • Calculating percentages • Interpreting and displaying data <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe the relationship between health and disease and describe what a causal mechanism is • Explain the differences between a benign and malignant tumour and explain metastasis. • Explain smoking as a risk factor for disease in humans, including unborn babies. • Explain the effect of diet and exercise on the development of obesity and its link to cardiovascular disease. • Identify the impact of alcohol and other carcinogens on the body. 	<ul style="list-style-type: none"> • Diet • Exercise • Alcohol and other carcinogens
Photosynthesis	Maths:	<ul style="list-style-type: none"> • Photosynthesis equation.

	<p>Multiple equations and mathematical processes that students will need to employ This makes up 10% of the marks available in the biology papers.</p> <ul style="list-style-type: none"> • Interpreting graphs • Recalling units • Calculating percentages • Interpreting and displaying data • Photosynthesis equation <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe photosynthesis as an endothermic reaction. Label a cross section of a leaf and describe how the structure links to its function. Sketch and label graphs showing limiting factors of photosynthesis. Describe and explain the five different uses of glucose in plants. Calculation of inverse law. • Explain how photosynthesis can be optimised for industry 	<ul style="list-style-type: none"> • Limiting factors of photosynthesis. • Uses of glucose in plants. • <i>Making the most use of photosynthesis</i>
Respiration	Maths:	<ul style="list-style-type: none"> • Aerobic and anaerobic respiration equation

Multiple equations and mathematical processes that students will need to employ
This makes up 10% of the marks available in the biology papers.

- Interpreting graphs
- Recalling units
- Calculating percentages
- Interpreting and displaying data

Literacy:

- Key terms & definitions in context.
- Use and understanding of GCSE command words
- Literacy through the use of GCSE exam questions

Sc1:

- Describe respiration as an exothermic reaction and explain the need for it
- Describe the effect of muscle fatigue in the body and oxygen debt
- Explain the role of the liver during metabolism

- The response of the body to exercise
- Metabolism and the liver

		Some of the ways in which the human body defends itself against pathogens.		
Photosynthesis	<p>Maths: Balancing equations</p> <p>Literacy: Key terms & definitions in context.</p> <p>Sc1: Using scientific equipment precisely and safely. Investigating variables</p>	<ul style="list-style-type: none"> • The process and importance of photosynthesis. • The adaptations of leaves for photosynthesis. • The minerals needed for plant growth. 	<p>Y7:</p> <ul style="list-style-type: none"> • Cells <p>Y8</p> <ul style="list-style-type: none"> • Ecosystems and adaptations 	B8 Photosynthesis

The Big Picture – Intent Y11 Separate Biology:

Biology takes students on a journey through the living world, starting from its simplest form of cells and tissues to the more complex interaction of whole ecosystems. An understanding of an ever evolving and adapting planet has never been so important as the world faces unprecedented challenges in regard to its treatment and respect for the environment. Biology aspires to develop scientific curiosity through practical work, teacher demonstrations, and creative activities, whilst teachers use their excellent subject knowledge and enthusiasm to create a varied and tailored learning experience for each student. Students will gain an admirable understanding of the living world and a skill set suitable for a wide range of scientific careers if they choose to study the subject in higher education

The Biology Papers cover the following topics:

Paper 1 – (Topics 1-4): Cell structure and transport, Cell division, Organisation and the Digestive system, Organising plants and animals, Communicable diseases, Preventing and treating disease, Non-communicable disease, Photosynthesis, Respiration

Paper 2 – (Topics 5-7): Biological Responses (Human nervous system and hormonal control), Genetics and reproduction (reproduction, variation & evolution, genetics and evolution), Ecology (adaptation, interdependence & competition, ecosystems, biodiversity)

All students will be able to access the main content of all lessons and all students will be taught to the top with scaffolding, adaptive teaching and stretch and challenge provided where necessary.

Implementation:

Students undertaking combined science have 5 Biology lessons a fortnight (with 5 Chemistry and 5 Physics)

At Key Stage 4 students follow AQA GCSE Separate Biology. This is a linear course with all the examinations at the end of year 11. Students will sit six examinations, two in Biology, two in Chemistry and two in Physics. For Biology each examination is one hour and forty-five minutes in length and worth 50% of the final Biology grade. Papers consist of multiple choice structured, closed short answers and open responses.

Students can be entered at either Foundation or Higher tier and will attain the equivalent of three GCSEs at 9-1 grades. Students are exposed to a knowledge-rich, spiralised curriculum, with the introduction of aspirational career pathways embedded in all units, ranging from pathologists to electrical engineers. Additionally, students are given the opportunity to discuss ‘big questions’ around the moral, social and ethical implications of many areas of science.

Students learn about science through purposeful practical activities as part of day-to-day teaching and learning. Students will also undertake required practicals in class in order to deepen their understanding of scientific concepts and develop their skills of investigating, observing, experimenting and testing the validity of scientific concepts ideas.

Key Summative Assessments:

All units include:

- Retrieval homework
- Live marking
- Low stake quizzing
- End of Unit Tests

Required practical tasks:

- Population size
- Rates of decay
- Human reactions times
- Effect of light or gravity on growth of seedlings

Autumn Term:

Biology:
Ecosystems
Nervous system

Spring Term:

Biology:
Homeostasis
Reproduction
Variation

Summer term:

Biology: Genetics
Evolution

Impact: By the end of the Year students will be confident with the fundamental and more complex principles, knowledge and application of this knowledge in Biology. They will be able to apply their biology knowledge and skills to both familiar and unfamiliar situations using the analytical, questioning and critical thinking skills that they will have developed during their study of biology in year 10.

Prior Knowledge

KS2:

- Animals including humans
- Evolution & inheritance
- Food Chains

KS3 Cells

- Plant and animal cell theory
- Identification of specialised cells
- Structural adaptations of specialised cells.
- Unicellular organisms and their functions
- Movement of substances - Role and process of diffusion.

KS3 Structure & Function of Body Systems

- Understanding organisation in plants and animals (cells to systems).
- Knowledge of the respiratory system
- Structural adaptations of gas exchange surfaces (alveoli).

KS3: Health & Lifestyle

- Food groups and food tests.
- Structure and function of the digestive system.
- The role of enzymes in digestion.
- Absorption of food molecules by diffusion.
- The effect of drugs on the body.

KS3: Reproduction

- Human fertilisation and implantation.
- Structure and function of the male and female reproductive systems.
- Plant pollination and fertilisation.

KS3: Inheritance

- Variation (genetic and environmental).
- Variation (continuous or discontinuous)
- Natural selection.
- Inheritance of characteristics.

KS3: Ecosystems & Adaptations

- Interdependence of organisms.
- Food chains.
- Food webs.
- Feeding relationships.
- Plant and animal adaptations.

KS3: Biological Processes

- The process of aerobic respiration in living organisms.
- The process of anaerobic respiration in humans and microorganisms.
- The role of diffusion in the movement of materials in and between cells.
- The role of microorganism in producing food & cleaning.

KS3: Detention

- Using a microscope.
- Structure and function of animal cells.
- Fingerprints as an example of variation in humans.
- Composition of human blood.
- Rate of reaction (application in time of death).

KS3: Photosynthesis

- The process and importance of photosynthesis.
- The adaptations of leaves for photosynthesis.
- The minerals needed for plant growth.

KS4 Year 10:

- Cell structure & Transport
- Cell Division
- Organisation & digestive system
- Organisation in animals and plants
- Communicable disease
- Preventing and treating disease
- Non-communicable disease
- Photosynthesis
- Respiration
- Adaptations, Interdependence & Competition

Content	Disciplinary Knowledge (Skills) This is the actions taken within a topic to gain substantive knowledge	Substantive Knowledge This is the specific, factual content for the topic, which is connected into a careful sequence of learning.
Organising an Ecosystem	<p>Maths:</p> <ul style="list-style-type: none"> • Find arithmetic means • Understand the terms mean, mode and median • Translate information between graphical and numeric form • Plot two variables from experimental or other data <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe food chains and food webs and explain how predators and prey interact in a community • Describe and explain the decay, carbon and water cycles, including their role in the environment. • Explain how temperature, water and availability of oxygen affect the rate of decay. 	<ul style="list-style-type: none"> • Feeding relationships. • Materials cycling. • The carbon Cycle. • Rates of decomposition. • Required Practical: Population size • Required Practical: Rate of decay
Biodiversity and Ecosystems	<p>Maths:</p> <ul style="list-style-type: none"> • Use ratios, fractions and percentages • Construct and interpret frequency tables and diagrams, bar charts and histograms <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Identify links between human population growth and land and resources available. • Describe the impact of land, water and air pollution and the living world and identify ways to reduce the impact. • Explain the effects of deforestation and peat destruction on biodiversity. • Describe some of the biological consequences of global warming and explain the greenhouse effect. 	<ul style="list-style-type: none"> • The human population. • Land, water and air pollution. • Deforestation and peat destruction. • Global warming. • Maintaining biodiversity. • Trophic levels and biomass transfers. • Food security and production.

	<ul style="list-style-type: none"> • Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity. • Identify trophic levels within a community and demonstrate them in a pyramid of biomass. • Describe some of the biological factors affecting levels of food security • Explain ways to optimise and sustain food production. 	
The human nervous system	<p>Maths:</p> <ul style="list-style-type: none"> • Construct and interpret frequency tables and diagrams, bar charts and histograms • Translate information between graphical and numeric form <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe the pathway of an impulse through the CNS. • Describe the difference between reflex and non-reflex actions. • Identify the reflex arc for different stimuli. • Label a synapse and explain its importance in response to stimuli. • Identify main sections of the brain and describe methods of investigation. • Label the eye and explain how the eye focusses on objects near and far • Explain how common problems with the eye occur and are treated. 	<ul style="list-style-type: none"> • Structure and function of the nervous system. • Reflex actions. • Synapses. • Structure and study of the brain. • Structure and function of the eye. • Common problems with the eye.
Hormonal Coordination	<p>Maths:</p> <ul style="list-style-type: none"> • Construct and interpret frequency tables and diagrams, bar charts and histograms • Translate information between graphical and numeric form <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Identify glands and their function in mammals. • Explain the mechanisms of controlling blood glucose levels and the importance of such. • Identify the difference between type 1 and type 2 diabetes, how they occur, and treatment options. 	<ul style="list-style-type: none"> • Endocrine system and glands. • Glucoregulation. • Diabetes and treatment. • Negative feedback and its role. • Human reproduction. • Menstrual cycle. • Artificial control of fertility. • Fertility treatments. • Plant hormones and responses. • Required Practical: The affect of light or gravity on growth of seedlings

	<ul style="list-style-type: none"> • Describe examples of negative feedback in the body, including the control of thyroxine levels. • Label human reproductive organs and link the structure to the function. • Describe the menstrual cycle and the hormones involved. • Describe methods of controlling fertility. • Explain the effects of different plant hormones in the presence of different stimuli. • Explain the uses of plant hormones in industry 	
Homeostasis in action	<p>Maths:</p> <ul style="list-style-type: none"> • Construct and interpret frequency tables and diagrams, bar charts and histograms • Use a scatter diagram to identify a correlation between two variables • Translate information between graphical and numeric form <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe the mechanisms used to maintain optimum internal body temperature. • Explain process of removing different waste products from the body. • Describe why kidneys are important and how they work. • Create a negative feedback loop describing the control of water levels using ADH. • Describe and evaluate treatments for kidney disease 	<ul style="list-style-type: none"> • Thermoregulation. • Removal of waste products. • The human kidney. • Dialysis. • Kidney transplants.
Reproduction	<p>Maths:</p> <ul style="list-style-type: none"> • Understand simple probability • Use ratios, fractions and percentages • Understand and use the symbols: =, <>, >, α, ~ • Construct and interpret frequency tables and diagrams, bar charts and histograms • Translate information between graphical and numeric form <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Describe the different types of reproduction and explain when each are necessary. 	<ul style="list-style-type: none"> • Types of reproduction in different organisms and situations. • DNA, the genome and protein synthesis. • Gene expression and mutation. • Inheritance and inherited disorders. • Screening for inherited disorders.

	<ul style="list-style-type: none"> • Identify differences between meiosis and mitosis and explain why meiosis is used in the production of sex cells. • Describe advantages and disadvantages of sexual and asexual reproduction. • Describe the structure of DNA and how it is used to create proteins. • Explain the impact of mutations on the expression of genes. • Demonstrate the mechanisms of inheritance using Punnett squares, including the inheritance of dominant and recessive disorders. • Interpret information from genetic diagrams to explain the inheritance of genetic disorders. • Evaluate the screening of embryos for genetic disorders 	
Variation and Evolution	<p>Maths:</p> <ul style="list-style-type: none"> • Translate information between graphical and numeric form <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Identify sources of variation. • Describe the process of evolution by natural selection. • Explain the process of selective breeding and evaluate the use. • Describe, in detail, the process of genetic engineering. • Explain the different ways of creating clones and why they are useful. • Evaluate the uses of genetic technologies. 	<ul style="list-style-type: none"> • Variation. • Evolution by natural selection. • Selective breeding. • Genetic engineering. • Cloning.
Genetics and Evolution	<p>Maths:</p> <ul style="list-style-type: none"> • Construct and interpret frequency tables and diagrams, bar charts and histograms • Translate information between graphical and numeric form <p>Literacy:</p> <ul style="list-style-type: none"> • Key terms & definitions in context. • Use and understanding of GCSE command words • Literacy through the use of GCSE exam questions <p>Sc1:</p> <ul style="list-style-type: none"> • Explain how Mendel's work fits in with modern genetics. • To use evidence discovered by Darwin to explain the theory of evolution. • To use Wallace's ideas on how new species arise by speciation. • To be able to use fossil data as evidence for evolution and extinction. 	<ul style="list-style-type: none"> • The history of genetics. • Theories of evolution and speciation. • Evidence of evolution and extinction. • Antibiotic resistance and bacteria. • Classification systems.

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| | <ul style="list-style-type: none">• Describe how mutations can lead to the development of antibiotic resistant strains of bacteria.• Use the principles of classification using the binomial naming system and evolutionary trees. | |
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