Programme of study for Year 10 GCSE Biology

Autumn (1st term)	Autumn (2nd term)	Spring (1st term)	Spring (2nd Term)	Summer (1st term)	Summer (2nd term)
Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:
Topic / Big Question: B5: Communicable diseases Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B6: Preventing and treating disease B7 Non-communicable diseases Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B8 Photosynthesis and B9 Respiration Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B10 The human nervous system Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B11 Hormonal coordination Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B12 Homeostasis in action Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.
Key Learning Outcomes (students should know): In this B5 topic, students will see how the concept of health (as a state of physical and mental well-being) is affected by	Key Learning Outcomes (students should know): In this B6 topic, students will study the prevention of disease by vaccination. They should know how the immune system	Key Learning Outcomes (students should know): In this B8 topic, students will study photosynthesis in both plants and algae. They should be familiar with the word equation for photosynthesis, and also the	Key Learning Outcomes (students should know): In this B10 topic students have studied the principles of homeostasis, and should be able to give some examples and outline the control system	Key Learning Outcomes (students should know): In this B11 topic students have studied the principles of hormonal control and the endocrine system. They should	Key Learning Outcomes (students should know): In this B12 topic students have studied homeostasis, starting with why and how the body controls its temperature. They should recall the role of the

communicable (infectious) diseases. They will look at the different pathogens that can cause communicable disease, including bacteria, viruses, and protists, and how these can be spread between organisms – both animals and plants. As part of this, they will look at the development of simple hygiene methods to prevent the spread of pathogens as well as the isolation of individuals who are infected, the destruction of or control of vectors, and the use of vaccination. Students should be able describe the different pathogens, the symptoms and treatments of a range of different animal and plant diseases, and the different defence mechanisms of the human body and plants. They should also complete the required practical to grow bacteria in the laboratory to investigate the effect of disinfectants and antibiotics.	works and what is meant by an antigen. They should appreciate that the shapes of antigens and antibodies are complementary. They should understand what a vaccine contains and how it works, giving examples, and the concept of herd immunity. They should understand that memory cells remain in the body to provide long-term immunity. Students will study the treatment of disease by drugs including painkillers and antibiotics. They should understand that painkillers such as aspirin and paracetamol treat the symptoms and not the cause of disease. They should be aware that antibiotics are drugs used to cure bacterial infections. They should know how they work and be aware of the current crisis of antibiotic-resistant strains of bacteria, linking with work in B14.8 *Antibiotic resistant bacteria*. Students have studied the discovery of drugs in plants and microbes, including the discovery of penicillin. They should be aware of how drugs are made today to be effective and safe, and be able to outline the processes of clinical trials including double blind trials and using placebos. This topic includes the higher-tier GCSE Biology only topic of the production and uses of monoclonal antibodies. Higher-tier GCSE Biology students should be able to name lymphocytes as the white blood cells responsible for producing antibodies. They should recall the stages in stimulating the	symbol equation in the case of higher-tier students. They should be aware that photosynthesis is an endothermic reaction. Students will study the adaptations of leaves to achieve maximum efficiency in photosynthesis. Students will study factors that affect the rate of photosynthesis. They should understand the concept of limiting factors. They should have carried out data interpretation exercises and be able to explain the results. Higher-tier students should understand that that any one factor could become limiting as the factors interact. These students should be confident in analysing two or three factors displayed on a graph and deciding which factor is limiting. They should be confident describing the inverse square law as applied to light intensity. In this B9 topic all students should be aware of the fate of glucose – its use in respiration, and also how it can be assimilated into starch and cellulose. Students should also consider the need for nitrate ions as well as glucose to make proteins, and how glucose can be used to make lipids. Finally, students will consider the use of greenhouses and study how the conditions can be monitored and manipulated to achieve the highest rate of photosynthesis. Higher-tier students should have an appreciation of the economics of increasing the rate of photosynthesis – they should be	involved. Students should recall details of the human nervous system and its structure and function. They should be able to describe a reflex arc, with detail of synaptic transmission. Students should appreciate that receptors detect a change in a stimulus and not the stimulus itself. They should be able to describe an electrical impulse accurately. Students have studied the brain, linking each area with its function. There is a higher-tier topic of investigating the brain and the treatment of brain damage. Students have also studied the structure and function of the human eye and the process of accommodation. They should understand that the ciliary muscles contract in accommodation. These students should be able to describe common defects of the eye including myopia, hyperopia, and the role of new technology in the treatment of these conditions.	be able to identify the main parts of the endocrine system and recall the hormones they produce. Students should recall how blood-glucose concentration is controlled, including the role of insulin. Higher-tier students should also be able to explain the role of glucagon, and clearly distinguish between glucose, glycogen, and glucagon. All students should be aware of the causes and treatments of both type 1 and type 2 diabetes. Higher-tier students should understand the process of negative feedback, particularly as applied to the hormones adrenaline and thyroxine. All students have studied hormones in human reproduction. They should recall the action of hormones in bringing about puberty. They should be aware of the role of oestrogen in the menstrual cycle in females, and of testosterone in males. Higher-tier students should have a more detailed understanding of how hormones interact to control the menstrual cycle. Students should understand how hormones are used in the control of fertility as applied to contraception, and for higher-tier students, to infertility treatments. Finally, students have studied the role of hormones in plants, and the tropism responses they cause. Higher-tier students should understand the use of plant hormones in agriculture and horticulture.	thermoregulatory centre in the brain and be able to describe the body's responses if the body temperature starts to become too high or too low. Higher-tier students should be able to explain these mechanisms in a given context. In studying the removal of waste products, students should recall that water, ions, and urea are lost from the skin in an uncontrolled way, and that the removal of excess water, ions, and urea by the kidneys is a controlled process. Higher-tier students should be aware that the digestion of proteins may result in excess amino acids, which are deaminated in the liver to ammonia and then converted to urea for safe excretion. Students should understand the role and functions of the human kidney. They should recall that the kidneys produce urine by filtration of the blood and selective reabsorption of useful substances such as glucose, some ions, and water. Higher-tier students should recall the action of ADH as a hormone working by negative feedback. Finally, students have studied treatments for kidney failure. They should understand how dialysis works, and link this with earlier work on diffusion. They should recall the process of kidney transplantation including the problems of rejection. Students should have compared dialysis with transplantation and be able to analyse the

	correct lymphocyte to be made and then fused with a tumour cell to form a hybridoma cell. They should link this work with B2 *Cell division* and B5.9 *Human defence responses*. They should be able to give examples of how monoclonal antibodies are used, as well as their disadvantages. In this B7 topic, students will study non-communicable diseases and should understand what is meant by risk factors for a disease. They will analyse the impact of disease at several different levels. Students should recognise correlations between data sets and the need for evidence to secure a causal mechanism. They should understand the difference between correlated data and causal mechanisms, and be able to read graphs and quote data to support correlations and causations. Students will study cancer and the different types of tumour, along with the general causes and treatment of cancer. Students should be aware of the risks of diseases from smoking. They should recall the roles of nicotine, carbon monoxide, and tar, and understand how each specifically affects health, as well as recalling the dangers of smoking whilst pregnant. They should have applied the concept of a causal mechanism to data on smoking and developing lung cancer. Students should understand the impact of smoking on the heart. In considering the effect of diet and exercise on disease, students should appreciate the	aware that using a greenhouse is expensive, and weigh it up against the profit gained in increased biomass. In this topic students will study respiration, and should be able to recall that this is one of the most important processes in living cells. They should be able to describe the process of respiration and write the word equation, and higher-tier students should also be able to write the balanced symbol equation. Students will look at mitochondria as the site of respiration. Students should be able to list examples of living processes that need the energy released from respiration. Students will study the response of humans to exercise, including changes in heart rate, breathing rate, and breakdown of glycogen, all to increase the rate of respiration in muscle cells. In studying anaerobic respiration, students should be aware of this process in mammalian muscles, and be able to write the word equation. Students should be aware that anaerobic respiration occurs in yeast cells and some plant cells. They should know that fermentation is an economically important reaction and be able to write the word equation, with higher-tier students knowing the balanced symbol equation for fermentation. Higher-tier students should also be able to link aerobic respiration in mammalian muscles to the oxygen debt.			advantages and disadvantages of both treatment options.

	connection between obesity and other diseases such as type 2 diabetes. Students have studied alcohol and health, and should understand the effect of alcohol on the brain and liver, and of drinking alcohol during pregnancy. Finally, students should be aware of the sources and carcinogenic effects of ionising radiation.	Students will study metabolism, and should be able to list common metabolic reactions. Finally, higher-tier students should recall the roles of lactic acid, urea formation, and the liver.			
Term 1 assessment to cover: Linear Exam on B1 Cells, B2 Cell Division, B3 Organisation and digestive system, B4 Organising animals and plants, B5 Communicable diseases, B6 Preventing and treating disease, B7 Non-communicable diseases Required practical: Microbiology		Term 2 assessment to cover: Linear Exam on B1 Cells, B2 Cell Division, B3 Organisation and digestive system, B4 Organising animals and plants, B5 Communicable diseases B6 Preventing and treating disease, B7 Non-communicable disease, B8 Photosynthesis, B9 Respiration, B10 The human nervous system. Required practical: Photosynthesis Required practical: Reaction time		End of year assessment to cover: Linear Exam on B1 Cells, B2 Cell Division, B3 Organisation and digestive system, B4 Organising animals and plants, B5 Communicable diseases, B6 Preventing and treating disease, B7 Non-communicable disease, B8 Photosynthesis, B9 Respiration, B10 The human nervous system, B11 Hormonal coordination, B12 Homeostasis in action. Required practical: Plant response	
Building understanding: Rationale / breakdown for your sequence of lessons: In this B5 topic, students will look at the different pathogens that can cause communicable disease, including bacteria, viruses, and protists and link this back to *Topic B1 Cell structure.* This forms the foundation for the next topic where we look at how to prevent the spread of pathogens.	**Building understanding: Rationale / breakdown for your sequence of lessons:** In this B6 topic, students should be aware that antibiotics are drugs used to cure bacterial infections. They should know how they work and be aware of the current crisis of antibiotic-resistant strains of bacteria, linking with work in B14.8 *Antibiotic resistant bacteria*.	**Building understanding: Rationale / breakdown for your sequence of lessons:** In this B8 topic, students should link the adaptations of leaves to achieve maximum efficiency in photosynthesis with B1.2 *Animal and plant cells*, B1.5 *Specialisation in plant cells*, and B4.6 *Tissues and organs in plants*	**Building understanding: Rationale / breakdown for your sequence of lessons:** In this B10 topic students have studied the principles of homeostasis. They should link this work with studies on enzyme action in B3.2 *The human digestive system* and B3.4 *Catalysts and enzymes*. Students should recall details of the human nervous system and its structure and function. They	**Building understanding: Rationale / breakdown for your sequence of lessons:** In this B11 topic students have studied the principles of hormonal control and the endocrine system. They should be able to identify the main parts of the endocrine system and recall the hormones they produce. Students should recall how blood-glucose concentration is controlled,	**Building understanding: Rationale / breakdown for your sequence of lessons:** In this B12 topic students have studied homeostasis, starting with why and how the body controls its temperature. They should link the removal of carbon dioxide with their studies of breathing and gas exchange in the lungs in B4 *Organising animals and plants*. Higher-tier students should be aware that

	They should recall the stages in stimulating the correct lymphocyte to be made and then fused with a tumour cell to form a hybridoma cell. They should link this work with B2 *Cell division* and B5.9 *Human defence responses*. They should be able to give examples of how monoclonal antibodies are used, as well as their disadvantages. In the B7 topic, Students should link Cancer to mitosis and the cell cycle in B2 *Cell division*. In this B7 topic students should be aware of the risks of diseases from smoking, linked to work on the heart and blood vessels in B4 *Organising animals and plants*. They should therefore be able to recall the roles of nicotine, carbon monoxide, and tar, and understand how each specifically affects health, as well as recalling the dangers of smoking whilst pregnant. Students have studied alcohol and health previously, and so this should support their understanding of the effect of alcohol on the brain and liver, and of drinking alcohol during pregnancy.	All students should be aware of the fate of glucose – its use in respiration, and also how it can be assimilated into starch and cellulose. They should link this with B1.2 *Animal and plant cells*, B1.7 *Osmosis*, and B9 *Respiration*. Students should also consider the need for nitrate ions as well as glucose to make proteins, and how glucose can be used to make lipids. They should link this with B3.3 *The chemistry of food* where they carried out food tests. In this B9 topic students will look at mitochondria as the site of respiration, linking this with B1.2 *Animal and plant cells* and cell specialisation in B1.4 and B1.5. Students should be able to list examples of living processes that need the energy released from respiration. They should link this with work in B1.9 *Active transport*, in particular the transport of mineral ions into the root hair cell. Students will study the response of humans to exercise, including changes in heart rate, breathing rate, and breakdown of glycogen, all to increase the rate of respiration in muscle cells. They should link this with work on the heart and blood vessels in B4 *Organising animals and plants*. Students will study metabolism, and should be able to list common metabolic reactions. They should link these with B8.1 *Photosynthesis* and B8.3 *How plants use glucose*.	should link this with work on nerve cells in B1.4 *Specialisation in animal cells*. Students have studied the brain, linking each area with its function. There is a higher-tier topic of investigating the brain and the treatment of brain damage. Students should link this with the role of the brain in controlling body temperature, the role of the pituitary gland in the brain, and the role of ADH release in maintaining water and nitrogen balance in the body, studied in *B12 Homeostasis in action*. Students have also studied the structure and function of the human eye and the process of accommodation. They should understand that the ciliary muscles contract in accommodation. These students should be able to describe common defects of the eye including myopia, hyperopia, and the role of new technology in the treatment of these conditions.	including the role of insulin. Higher-tier students should also be able to explain the role of glucagon, and clearly distinguish between glucose, glycogen, and glucagon. All students should be aware of the causes and treatments of both type 1 and type 2 diabetes. They should link this with work in B2.3 *Stem cells* and with the effect of lifestyle on type 2 diabetes in B7.4 *Diet, exercise, and disease*. Higher-tier students should understand the process of negative feedback, particularly as applied to the hormones adrenaline and thyroxine. All students have studied hormones in human reproduction. They should recall the action of hormones in bringing about puberty. They should be aware of the role of oestrogen in the menstrual cycle in females, and of testosterone in males. Finally, students have studied the role of hormones in plants, and the tropism responses they cause. Higher-tier students should understand the use of plant hormones in agriculture and horticulture.	the digestion of proteins may result in excess amino acids, which are deaminated in the liver to ammonia and then converted to urea for safe excretion. Students should understand the role and functions of the human kidney, linking with work on diffusion, osmosis, and active transport in B1 *Cells and organisation*. Higher-tier students should recall the action of ADH as a hormone working by negative feedback, linked with B11.4 *The role of negative feedback*. Finally, students have studied treatments for kidney failure. They should understand how dialysis works, and link this with earlier work on diffusion. They should recall the process of kidney transplantation including the problems of rejection, linked with B5.9 *Human defence responses* and B6.1 *Vaccination*.
Home – Learning:	Home – Learning:	Home – Learning:	Home – Learning:	Home – Learning:	Home – Learning:

Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.

Reading / High Quality Text:

Use of online Kerboodle text book to support reading around the subject and deepening understanding. Practice of extended writing through 6 marks questions. Modelling of reading for purpose with exam questions; underlining/highlighting key command words.

Recommended wider reading list for students:

How we live and why we die; the secret lives of cells, author Lewis Wolpert

I contain multitudes; The microbes within us and a grander view of life, Ed Yong

Mutants, author Armand Marie Leroi.

The vaccine race, author Meredith Wadman

Numeracy:

1 Arithmetic and numerical computation

a Recognise and use expressions in decimal form

b Recognise and use expressions in standard form

c Use ratios, fractions and percentages

d Make estimates of the results of simple calculations

2 Handling data

a Use an appropriate number of significant figures

b Find arithmetic means

c Construct and interpret frequency tables and diagrams, bar charts and histograms

d Understand the principles of sampling as applied to scientific data

e Understand simple probability

f Understand the terms mean, mode and median

g Use a scatter diagram to identify a correlation between two variables

h Make order of magnitude calculations

3 Algebra

a Understand and use the symbols: =, <, <<, >>, >, $\propto$, ~

d Solve simple algebraic equations

4 Graphs

a Translate information between graphical and numeric form

b Understand that y = mx + c represents a linear relationship

c Plot two variables from experimental or other data

d Determine the slope and intercept of a linear graph

5 Geometry and trigonometry

c Calculate areas of triangles and rectangles, surface areas and volumes of cubes

Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):

Science week activities (involving a range of different Biology topics); including lectures, workshops and visits. Independent research tasks to enrich their understanding of the curriculum. Where a lesson relates to a potential career the teacher will discuss future career pathways; eg. Immunologist, microbiologist, epidemiologist, research scientist, careers in agriculture/crop farming, and endocrinologist. SMSC will be highlighted through discussions on ethics for example of animal testing and production of monoclonal antibodies.