HASTINGS HIGH SCHOOL

YEAR 11 EXAMINATION GUIDE

Subject	SEPARATE SCIENCE BIOLOGY
Course code	AQA GCSE BIOLOGY (8461)
Website address	http://www.aqa.org.uk/subjects/science/gcse/biology-8461
Provisional examination dates	Paper 1: Topics 1–4: Cell biology; Organisation; Infection and Response; and Bioenergetics Paper 2: Topics 5–7: Homeostasis and Response; Inheritance, Variation and Evolution; and Ecology
GCSE grade type awarded	9-1 (New 2016 Specification)
Coursework	There is no coursework but students are tested on 10 key practical investigations completed during the course in both examination papers. *A **minimum of 15%** of the questions will be based upon these investigations.*
Paper 1 **Paper 2**	**Paper 1**: Written exam: 1 hour 45 minutes Foundation and Higher Tiers 100 marks 50% of GCSE **Paper 2:** Written exam: 1 hour 45 minutes Foundation and Higher Tier 100 marks 50% of GCSE *Multiple choice, structured, closed short answer and open response style questions will be given in the examinations.* *10% of the Biology examinations as a minimum will be Mathematically based questions.*
Extra Support	The class will use past papers extensively throughout the course. We will focus on the extended style questions in particular. Students have also been provided with a Required Practical Handbook.
Revision book	CGP Revision Guide ISBN: 978 1 78294 576 5
Useful websites	Freescience: https://www.freesciencelessons.co.uk/videos https://www.youtube.com/channel/UCqbOeHaAUXw9Il7sBVG3_bw BBC Bitesize: https://www.bbc.co.uk/bitesize/examspecs/zpgcbk7 Cognito science videos: https://www.youtube.com/channel/UCaGEe4KXZrjou9kQx6ezG2w SENECA: https://www.senecalearning.com/

KNOWLEDGE GAPS ANALYSIS

Topic	Collins Page	Notes
Paper 1 Unit 1 Cell Biology		
B4.1.1 Cell Structure		
Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells	9	
Describe the features of bacterial (prokaryotic) cells	9	
Demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, including standard form	10	
Recall the structures found in animal and plant (eukaryotic) cells inc. algal cells	8	
Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures	10	
Required practical 1: use a light microscope to observe, draw and label a selection of plant and animal cells	10	
Describe the functions of the structures in animal and plant (eukaryotic) cells	8	
Describe what a specialised cell is, including examples for plants and animals	16	
Describe what differentiation is, including differences between animals and plants	12/13	
Define the terms magnification and resolution	10	
Compare electron and light microscopes in terms of their magnification and resolution	10	
Carry out calculations involving magnification using the formula: magnification = size of image/ size of real object -inc standard form	11	
Bio ONLY: Describe how bacteria reproduce and the conditions required	11	
Bio ONLY: Describe how to prepare an uncontaminated culture	11	
Bio ONLY: Calculate cross-sectional areas of colonies or clear areas around colonies using πr^2	11	

Topic	Collins Page	Notes
Bio ONLY: Calculate the number of bacteria in a population after a certain time if given the mean division time	11	
Bio & HT ONLY: Express answers for last two points in standard form		
Required practical 2: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition	11	
B4.1.2 Cell division		
Describe how genetic information is stored in the nucleus of a cell (inc genes & chromosomes)	12	
Describe the processes that happen during the cell cycle, including mitosis (inc. recognise and describe where mitosis occurs and the stages involved via diagrams)	12	
Describe stem cells, including sources of stem cells in plants and animals and their roles	13	
Describe the use of stem cells in the production of plant clones and therapeutic cloning	13	
Discuss the potential risks, benefits and issues with using stem cells in medical research/treatments (inc. diabetes and paralysis)	13	
B4.1.3 Transport in Cells		
Describe the process of diffusion, including examples	14	
Explain how diffusion is affected by different factors	14	
Define and explain "surface area to volume ratio", and how this relates to single-celled and multicellular organisms (inc calculations)	14	
Explain how the effectiveness of an exchange surface can be increased, inc examples of adaptations for small intestines, lungs, gills roots & leaves	14	
Describe the process of osmosis (inc calculation of water uptake & percentage gain and loss of mass of plant tissue)	14	
Required practical 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue	15	

Topic	Collins Page	Notes
Describe the process of active transport, including examples – intestines, gills, alveoli and roots	15	
Explain the differences between diffusion, osmosis and active transport	15	
B4.2 Organisation		
4.2.1 Principles of organisation & 4.2.2 Animal tissues, organs and organ systems		
Describe the levels of organisation within living organisms	16	
Describe the digestive system and how it works as an organ system (from KS3)	17	
Describe basic features of enzymes (inc rate calculations for chemical reactions)	18	
Describe the lock and key theory as a model of enzyme action and explain how the shape a of the active sites makes the enzyme specific	18	
Explain the effect of temperature and pH on enzymes	18	
Describe the digestive enzymes, including their names, sites of production and actions on substrates	19	
Describe how the products of digestion are used	19	
Describe the features and functions of bile and state where it is produced and released from	19	
Required practical 4: use qualitative reagents to test for a range of carbohydrates, lipids and proteins	18	
Required practical 5: investigate the effect of pH on the rate of reaction of amylase enzyme	19	
Describe the structure of the human heart and lungs (inc how lungs are adapted for gaseous exchange)	21	
Explain how the heart moves blood around the body (inc role and position of	21	

Topic	Collins Page	Notes
the aorta, vena cava, pulmonary artery & vein and coronary arteries)		
Explain how the natural resting heart rate is controlled and how irregularities can be corrected	21	
Describe the structure and function of arteries, veins and capillaries	20	
Use simple compound measures such as rate and carry out rate calculations for blood flow		
Describe blood and identify its different components, inc identifying blood cells from photographs/diagrams	20	
Describe the functions of blood components, including adaptations to function	20	
Describe what happens in coronary heart disease and what statins are used for	23	
Describe and evaluate treatments for coronary heart disease and heart failure (inc drugs, mechanical devices or transplant)	23	
Recall that heart valves can become faulty and describe the consequences of this	23	
Describe how patients can be treated in the case of heart failure	23	
Describe health and the explain causes of ill-health and the relationship between health and disease	22	
Describe how different types of diseases may interact and translate disease incidence information between graphical and numerical forms	22	
Describe what risk factors are and give examples discussing human and financial costs of non communicable diseases at local, national and global levels	22	

Topic	Collins Page	Notes
Describe what cancer is and explain the difference between benign and malignant tumours	23	
Describe the known risk factors for cancer, including genetic and lifestyle risk factors	23	
Paper 1: Unit 4.2.3 Plant tissues, organs and system		
Describe plant tissues (epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem) and describe their functions	24	
Explain how the structure of plant tissues are related to their function within the leaf (plant organ) inc stomata and guard cells	24/25	
Recall the plant parts that form a plant organ system that transports substances around the plant	24/25	
Explain how root hair cells, xylem and phloem are adapted to their functions	24	
Describe the process of transpiration and translocation inluding the role of the different plant tissues	24/25	
Explain how the rate of transpiration can be affected by different factors (inc naming the factors)	24/25	
Describe the role of stomata and guard cells in the control of gas exchange and water loss	25	
Paper 1: Unit B4.3 Infection and Response		
B4.3 4.3.1 Communicable diseases		
Explain what a pathogen is and how pathogens are spread (inc how viruses, bacteria, protists and fungi are spread in animals and plants)	34/35	
Explain how pathogenic bacteria and viruses cause damage in the body	34/35	

Topic	Collins Page	Notes
Explain how the spread of diseases can be reduced or prevented	34/35	
Describe measles, HIV and tobacco mosaic virus as examples of viral pathogens	34/35	
Describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens	34/35	
Describe the signs, transmission and treatment of rose black spot infection in plants as an example of fungal pathogens	34/35	
Describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector as an example of a prototist pathogen	34/35	
Describe defences that stop pathogens entering the human body (inc skin, nose, trachea & windpipe, stomach)	36/37	
Recall the role of the immune system	36/37	
Describe how white blood cells destroy pathogens	36/37	
Describe how vaccination works, including at the population level	36/37	
Explain how antibiotics and painkillers are used to treat diseases, including their limitations	38/39	
Describe how sources for drugs have changed over time and give some examples	38/39	
Describe how new drugs are tested, including pre-clinical testing and clinical trials (inc double blind trials and placebos)	38/39	
B4.3.2 Monoclonal antibodies		
Bio & HT ONLY: Describe what monoclonal antibodies are and why they are useful	39	

Topic	Collins Page	Notes
Bio & HT ONLY: Describe how monoclonal antibodies are produced	39	
Bio & HT ONLY: Explain how monoclonal antibodies are used for diagnosis, research, chemical testing and disease treatments	39	
Bio & HT ONLY: Evaluate the advantages and disadvantages of monoclonal antibodies (inc side effects)	39	
Bio & HT ONLY: Describe some observable signs of plant disease, and how plant diseases can be identified	39	
B4.3.3 Plant disease		
Bio ONLY: Give examples of plant pathogens	40/41	
Bio ONLY: Give examples of plant ion deficiencies and their effects	40/41	
Bio ONLY: Describe physical, chemical and mechanical defence responses of plants	40/41	
Paper 1 B4.4 Bioenergetics		
B4.4.1 Photosynthesis		
Describe what happens in photosynthesis, including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose	42/43	
Explain why photosynthesis is an endothermic reaction	42/43	
Recall the limiting factors of photosynthesis	42/43	
Explain how limiting factors affect the rate of photosynthesis, including graphical interpretation (limited to one factor)	42/43	
HT ONLY: Explain how the limiting factors of photosynthesis interact, inc	42/43	

Topic	Collins Page	Notes
graphical interpretation (two/three factors)		
HT ONLY: Explain how limiting factors are important to the economics of greenhouses, including data interpretation	42/43	
HT ONLY: Explain and use inverse proportion in the context of photosynthesis	42/43	
Required practical 6: investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed	42/43	
Describe how the glucose produced in photosynthesis is used by plants	42/43	
B4.4.2 Respiration		
Describe what happens in respiration including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose	44/45	
Describe aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred	44/45	
Recognise the equations for aerobic respiration, anaerobic respiration in muscles and anaerobic respiration in plants and yeast cells.	44/45	
Recall what type of respiration fermentation is and its economic importance.	44/45	
Describe what happens to heart rate, breathing rate and breath volume during exercise and why these changes occur	44/45	
Explain what happens when muscles do not have enough oxygen and define the term oxygen debt	44/45	
HT ONLY: Explain what happens to accumulated lactic acid in the body	44/45	

Topic	Collins Page	Notes
Explain the importance of sugars, amino acids, fatty acids and glycerol in the synthesis and breakdown of carbohydrates, proteins and lipids		
Explain what metabolism is, including examples	45	
Paper 2: B4.5 Homeostasis and Response		
B4.5.1 Homeostasis		
Describe what homeostasis is and why it is important stating specific examples from the human body	46/47	
Describe the common features of all control systems	46/47	
Describe the process of negative feedback in maintaining homeostasis	46/47	
B4.5.2 The human nervous system		
State the function of the nervous system and name its important components	48/49	
Describe how information passes through the nervous system	48/49	
Describe what happens in a reflex action and why reflex actions are important	48/49	
Explain how features of the nervous system are adapted to their function, including a reflex arc (inc all types of neurone and the synapse)	48/49	
Required practical 7: plan and carry out an investigation into the effect of a factor on human reaction time	48/49	
Bio ONLY: State the function of the brain and how it is structured, including identifying he cerebral cortex, cerebellum and medulla on a diagram of the brain	48/49	
Bio ONLY: Describe the functions of different regions of the brain	48/49	
Bio & HT ONLY: Explain how neuroscientists have been able to map	48/49	

Topic	Collins Page	Notes
regions of the brain to particular functions		
Bio ONLY: State the function of the eye and how it is structured, including names of specific parts	48/49	
Bio ONLY: Describe the functions of different parts of the eye, including relating structure to function	48/49	
Bio ONLY: Describe what accommodation is, and how it is carried out	48/49	
Bio ONLY: Explain what myopia and hyperopia are and how they are treated, including interpreting ray diagrams	48/49	
Bio ONLY: Describe how body temperature is monitored and controlled	46/47	
Bio & HT ONLY: Explain how the body's responses act to raise or lower temperature in a given context	46/47	
B4.5.3 Hormonal coordination in humans		
Describe the endocrine system, including the location of the pituitary, pancreas, thyroid, aderenal gland, ovary and testis and the role of hormones	50/51	
State that blood glucose concentration is monitored and controlled by the pancreas	50/51	
Describe the body's response when blood glucose concentration is too high	50/51	
Explain what type 1 and type 2 diabetes are and how they are treated	50/51	
HT ONLY: Describe the body's response when blood glucose concentration is too low	50/51	
HT ONLY: Explain how glucagon interacts with insulin to control blood glucose levels in the body	50/51	
Describe how water, ions and urea are lost from the body	50/51	

Topic	Collins Page	Notes
Describe the consequences of losing or gaining too much water for body cells	50/51	
HT ONLY: Recall that protein digestion leads to excess amino acids inside the body and describe what happens to these	50/51	
Describe how the kidneys produce urine	50/51	
HT ONLY: Describe the effect of ADH on the permeability of the kidney tubules and explain how the water level in the body is controlled by ADH	50/51	
Describe how kidney failure can be treated by organ transplant or dialysis and recall the basic principles of dialysis	50/51	
Describe what happens at puberty in males and females, inc knowledge of reproductive hormones	52/53	
Describe the roles of the hormones involved in the menstrual cycle (FSH, LH and oestrogen)	52/53	
HT ONLY: Explain how the different hormones interact to control the menstrual cycle and ovulation	52/53	
Describe how fertility can be controlled by hormonal and non-hormonal methods of contraception (giving specific examples from the spec)	52/53	
HT ONLY: Explain how hormones are used to treat infertility, inc the steps in IVF	52/53	
HT ONLY: Evaluate the risks and benefits of fertility treatments	52/53	
HT ONLY: Describe the functions of adrenaline and thyroxine in the body, and recall where they are produced	50	
HT ONLY: Explain the roles of thyroxine and adrenaline in the body as negative feedback systems	50	

Topic	Collins Page	Notes
B4.5.4 Plant hormones		
Bio ONLY: Describe hormone-linked plant responses, to include phototropism and gravitropism and the role of auxin	54/55	
Bio & HT ONLY: Describe the functions of gibberellins and ethene in plants	54/55	
Required practical 8: investigate the effect of light or gravity on the growth of newly germinated seedling	54/55	
HT ONLY: Explain the use of plant growth hormones are used in agriculture and horticulture (auxins, ethene and gibberellins)	54/55	
Paper 2: B4.6 Inheritance, Variation & Evolution		
B4.6.1 Reproduction		
Describe features of sexual and asexual reproduction	74/75	
Describe what happens during meiosis and compare to mitosis	74/75	
Describe what happens at fertilisation	74/75	
Bio ONLY: Explain advantages of sexual and asexual reproduction	74/75	
Bio ONLY: Describe examples of organisms that reproduce both sexually and asexually (malarial parasites, fungi, strawberry plants and daffodils)	74/75	
Describe the structure of DNA and its role in storing genetic information inside the cell	76/77	
Explain the term 'genome' and the importance of the human genome (specific examples from spec only)	76/77	
Bio ONLY: Describe the structure of DNA, including knowledge of nucleotide units	76/77	

Topic	Collins Page	Notes
Bio & HT ONLY: Explain complementary base pairing in DNA	76/77	
Bio & HT ONLY: Explain the relationship between DNA bases (ATCG) , amino acids and proteins	76/77	
Bio & HT ONLY: Describe how proteins are synthesised on ribosomes, including protein folding and its importance for protein function	76/77	
Bio & HT ONLY: Explain what mutations are, and the possible effects of mutations	76/77	
Bio & HT ONLY: Explain what non-coding parts of DNA are, and why they are important	76/77	
Describe how characteristics are controlled by one or more genes, including examples	78/79	
Explain important genetic terms: gamete, chromosome, gene, allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous	78/79	
Explain and use Punnet square diagrams, genetic crosses and family trees	78/79	
HT ONLY: Construct Punnet square diagrams to predict the outcomes of a monohybrid cross	78/79	
Describe cystic fibrosis and polydactyly as examples of inherited disorders	78/79	
Evaluate social, economic and ethical issues concerning embryo screening when given appropriate information	78/79	
Describe how the chromosomes are arranged in human body cells, including the function of the sex chromosomes	78/79	
Explain how sex is determined and carry out a genetic cross to show sex inheritance	78/79	

Topic	Collins Page	Notes
B4.6.2 Variation and evolution		
Describe what variation is and how it can be caused within a population	80/81	
Describe mutations and explain their influence on phenotype and changes in a species	80/81	
Explain the theory of evolution by natural selection	80/81	
Describe how new species can be formed	80/81	
Describe what selective breeding is	82/83	
Explain the process of selective breeding, including examples of desired characteristics and risks associated with selective breeding	82/83	
Describe what genetic engineering is, including examples, and how it is carried out	82/83	
Explain some benefits, risks and concerns related to genetic engineering	82/83	
HT ONLY: Explain the process of genetic engineering, to include knowledge of enzymes and vectors	82/83	
Bio ONLY: Describe different cloning techniques, to include: tissue culture, cuttings, embryo transplants and adult cell cloning	82/83	
B4.6.3 The development of understanding of genetics and evolution		
Bio ONLY: Describe the ideas proposed by Darwin in his theory of natural selection and explain why this theory was only gradually accepted	80/81	
Bio ONLY: Describe other inheritance-based theories that existed (apart from the theory of natural selection), and the problems with these theories	80/81	
Bio ONLY: Describe the work of Alfred Russel Wallace	85	

Topic	Collins Page	Notes
Bio ONLY: Explain how new species can be formed	85	
Bio ONLY: Describe how our understanding of genetics has developed over time, to include knowledge of Mendel	80	
Describe some sources of evidence for evolution	81	
Describe what fossils are, how they are formed and what we can learn from them	81	
Explain why there are few traces of the early life forms, and the consequences of this in terms of our understanding of how life began	81	
Describe some of the causes of extinction	84	
Describe how antibiotic-resistant strains of bacteria can arise and spread (inc MRSA)	81	
Describe how the emergence of antibiotic-resistant bacteria can be reduced and controlled, to include the limitations of antibiotic development	81	
B4.6.4 Classification		
Describe how organisms are named and classified in the Linnaean system	84/85	
Explain how scientific advances have led to the proposal of new models of classification, inc three-domain system	84/85	
Describe and interpret evolutionary trees	84/85	
Describe how antibiotic resistant bacteria develop	84/85	
Paper 2: B4.7 Adaptations, interdependence and competition		
B4.7.1 Adaptations, interdependence and competition		
Recall what an ecosystem is	86/87	
Describe which resources animals and plants compete for, and why they do this	86/87	
Explain the terms 'interdependence' and 'stable community'	86/87	
Name some abiotic and biotic factors that affect communities	86/87	

Topic	Collins Page	Notes
Explain how a change in an abiotic or biotic factor might affect a community	86/87	
Describe structural, behavioural and functional adaptations of organisms	86/87	
Describe what an extremophile is	86/87	
B4.7.2 Organisation of an ecosystem		
Represent the feeding relationships within a community using a food chain and describe these relationships	88/89	
Explain how and why ecologists use quadrats and transects	88/89	
Describe and interpret predator-prey cycles	88/89	
Required practical 9: measure the population size of a common species in a habitat. Use sampling to investigate the effect of one factor on distribution	88/89	
Describe the processes involved in the carbon cycle	88/89	
Describe the processes involved in the water cycle	88/89	
Bio ONLY: Explain how temperature, water and availability of oxygen affect the rate of decay of biological material	88/89	
Bio ONLY: Explain how the conditions for decay are optimised by farmers and gardeners, and the reasons for this	88/89	
Bio ONLY: Describe how methane gas can be produced from decaying materials for use as a fuel	88/89	
Bio ONLY: Required practical 10: investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change	88/89	
Bio ONLY: Explain how environmental changes can affect the distribution of	88/89	

Topic	Collins Page	Notes
species in an ecosystem (temperature, water and atmospheric gases)		
B4.7.3 Biodiversity and the effect of human interaction on ecosystems		
Describe what biodiversity is, why it is important, and how human activities affect it	90/91	
Describe the impact of human population growth and increased living standards on resource use and waste production	90/91	
Explain how pollution can occur, and the impacts of pollution	90/91	
Describe how humans reduce the amount of land available for other animals and plants	90/91	
Explain the consequences of peat bog destruction	90/91	
Describe what deforestation is and why it has occurred in tropical areas	90/91	
Explain the consequences of deforestation	90/91	
Describe how the composition of the atmosphere is changing, and the impact of this on global warming Describe some biological consequences of global warming	90/91	
Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity	90/91	
Describe programmes that aim to reduce the negative effects of humans on ecosystems and biodiversity	90/91	
B4.7.4 Trophic levels in an ecosystem		
Bio ONLY: Describe the different trophic levels and use numbers and names to represent them	92/93	
Bio ONLY: Describe what decomposers are and what they do	92/93	

Topic	Collins Page	Notes
Bio ONLY: Construct a pyramids of biomass accurately from data and explain what they represents	92/93	
Bio ONLY: State how much energy producers absorb from the Sun and how much biomass is transferred	92/93	
Bio ONLY: Explain how biomass is lost between trophic levels, including the consequences of this and calculate efficiency between trophic levels	92/93	
B4.7.5 Food production		
Bio ONLY: Explain the term 'food security' and describe biological factors that threaten it	92/93	
Bio ONLY: Explain how the efficiency of food production can be improved	92/93	
Bio ONLY: Explain the term 'factory farming', including examples, and ethical objections	92/93	
Bio ONLY: Explain the importance of maintaining fish stocks at a level where breeding continues	92/93	
Bio ONLY: Explain some methods that can help to conserve fish stocks	92/93	
Bio ONLY: Describe how modern biotechnology is used in food production, including the fungus Fusarium as an example	92/93	
Bio ONLY: Describe the uses of genetically modified organisms in insulin and food production	92/93	