

<b>(Triple Science) Biology Paper 1</b>	<b>Confidence Level</b>		
	<b>Red</b>	<b>Amber</b>	<b>Green</b>
<b>Topic 1 – Key concepts in biology</b>			
Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: animal, plant & bacteria			
Explain how specialised cells are adapted to their functions, including: sperm, egg and ciliated epithelial cells			
Explain how changes in microscope technology, including electron microscopy, have enabled us to see cell structures with more clarity and detail than in the past			
Demonstrate an understanding of number, size and scale, including the use of estimations and explain when they should be used			
Demonstrate an understanding of the relationship between quantitative units in relation to cells, including: milli, micro, nano & pico			
<i>Core Practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations</i>			
Explain the mechanism of enzyme action including the active site and enzyme specificity			
Explain how enzymes can be denatured due to changes in the shape of the active site			
Explain the effects of temperature, substrate concentration and pH on enzyme activity			
<i>Core Practical: Investigate the effect of pH on enzyme activity</i>			
Demonstrate an understanding of rate calculations for enzyme activity			
Demonstrate an understanding of rate calculations for enzyme activity			
Explain the importance of enzymes as biological catalysts in the synthesis and breakdown of carbohydrates, fats and proteins			
Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport			
<i>Core Practical: Investigate osmosis in potatoes</i>			
Calculate percentage gain and loss of mass in osmosis			
<i>Bio ONLY: Core Practical: Investigate the use of chemical reagents to identify starch, reducing sugars, proteins and fats</i>			
Bio ONLY: Explain how the energy contained in food can be measured using calorimetry			
<b>Higher Tier Only</b>			
Complete calculations with numbers written in standard form			
<b>Topic 2 – Cells and control</b>			
Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis			
Describe the importance of mitosis in growth, repair and asexual reproduction			
Describe the division of a cell by mitosis in terms of cells formed and chromosome numbers			
Describe cancer as the result of changes in cells that lead to uncontrolled cell division			
Describe growth in plants and animals including: cell division, differentiation and elongation (plants only)			
Explain the importance of cell differentiation in the development of specialised cell			
Demonstrate an understanding of the use of percentiles charts to monitor growth			
Describe the function of embryonic stem cells in animals and meristems in plants			
Discuss the potential benefits and risks associated with the use of stem cells in medicine			

Bio ONLY: Describe the structures and functions of the brain including the cerebellum, cerebral hemispheres and medulla oblongata			
Explain the structure and function of the nervous system including neurones, synapses and neurotransmitters			
Explain the structure and function of a reflex arc including sensory, relay and motor neurones			
Bio ONLY: Explain the structure and function of the eye as a sensory receptor including the role of: cornea, lens, iris, rod and cone cells			
Bio ONLY: Describe defects of the eye including cataracts, long-sightedness, short-sightedness and colour blindness			
<b>Higher Tier Only</b>			
Explain how the difficulties of accessing brain tissue inside the skull can be overcome by using CT scanning and PET scanning			
Explain some of the limitations in treating damage and disease in the brain and other parts of the nervous system			
<b>Topic 3 – Genetics</b>			
Explain the role of meiotic cell division in terms of cells formed and chromosome numbers			
Describe the structure of DNA in terms of bases and bonding			
Describe what a genome and gene are and describe the role of a gene			
Explain how DNA can be extracted from fruit			
Explain why there are differences in the inherited characteristics as a result of alleles			
Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote			
Explain monohybrid inheritance using genetic diagrams, Punnett squares and family pedigrees			
Describe how the sex of offspring is determined at fertilisation, using genetic diagrams			
Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits			
State that most phenotypic features are the result of multiple genes rather than single gene inheritance			
Describe the causes of variation that influence phenotype: genetic/environmental variation and mutations			
Discuss the outcomes of the Human Genome Project and its potential applications within medicine			
State that there is usually extensive genetic variation within a population of a species and that these arise through mutations			
Bio ONLY: Explain how cataracts, long-sightedness and short-sightedness can be corrected			
Bio ONLY: Explain some of the advantages and disadvantages of asexual reproduction			
Bio ONLY: Explain some of the advantages and disadvantages of sexual reproduction			
Bio ONLY: Describe the work of Mendel in discovering the basis of genetics and recognise the difficulties of understanding inheritance before this discovery			
Bio ONLY: Describe the inheritance of the ABO blood groups with reference to codominance and multiple alleles			
<b>Higher Tier Only</b>			
Explain how the order of bases in a section of DNA decides the order of amino acids and how this determines the shape of the protein			
Describe the stages of protein synthesis, including transcription and translation:			

Describe how genetic variants in the non-coding DNA of a gene can affect phenotype			
Describe how genetic variants in the coding DNA of a gene can affect phenotype			
Explain how sex-linked genetic disorders are inherited			
<b><u>Topic 4 – Natural selection and genetic modification</u></b>			
Describe the differences in severity of a genetic mutation on the phenotype			
Explain Darwin’s theory of evolution by natural selection			
Explain how the emergence of resistant organisms supports Darwin’s theory of evolution including antibiotic resistance in bacteria			
Describe the evidence for human evolution, based on fossils, including: Ardi, Lucy and Leakey’s discovery of fossils			
Describe the evidence for human evolution based on stone tools, including: a) the development of stone tools over time b) how these can be dated from their environment			
Describe how genetic analysis has led to the suggestion of the three domains rather than the five kingdoms classification method			
Explain selective breeding and its impact on food plants and domesticated animals			
Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics			
Recall and use Fleming’s left-hand rule to represent the relative directions of the force			
Use the equation: $F = B \times I \times l$			
Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors			
Bio ONLY: Describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection and explain the impact of these ideas on modern biology			
Bio ONLY: Describe how the anatomy of the pentadactyl limb provides scientists with evidence for evolution			
Bio ONLY: Describe the process of tissue culture and its advantages in medical research and plant breeding programmes			
Bio ONLY: Explain the advantages and disadvantages of genetic engineering to produce GM organisms including the modification of crop plants			
Bio ONLY: Explain the advantages and disadvantages of agricultural solutions to the demands of a growing human population, including use of fertilisers and biological control			
<b><u>Higher Tier Only</u></b>			
Describe the main stages of genetic engineering including the use of: restriction enzymes, ligase, sticky ends and vectors			
<b><u>Topic 5 – Health, disease and the development of medicines</u></b>			
Evaluate the benefits and risks of genetic engineering and selective breeding in modern agriculture and medicine, including practical and ethical implications			
Describe health as defined by the World Health Organization (WHO)			
Describe the difference between communicable and non-communicable diseases			
Explain why the presence of one disease can lead to a higher susceptibility to other diseases			
Describe a pathogen as a disease-causing organism, including viruses, bacteria, fungi and protists			
Describe some common infections, including: cholera, tuberculosis, Chalaria ash dieback, malaria, HIV, stomach ulcers, Ebola and state the pathogen type and details of the symptoms			
Explain how pathogens are spread and how this spread can be reduced or prevented, including: cholera, tuberculosis, Chalaria ash dieback, malaria, HIV, stomach ulcers, Ebola			

Explain how sexually transmitted infections (STIs) are spread and how this spread can be reduced or prevented, including: Chlamydia and HIV			
Describe how the physical barriers and chemical defences of the human body provide protection from pathogens			
Explain the role of the specific immune system of the human body in defence against disease, including ideas on antigens and lymphocytes			
Explain the body's response to immunisation using an inactive form of a pathogen			
Explain why antibiotics can only be used to treat bacterial infections			
Describe that the process of developing new medicines, including antibiotics, has many stages, including discovery, development, preclinical and clinical testing			
Describe that many non-communicable human diseases are caused by the interaction of a number of factors			
Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels including BMI, alcohol and smoking			
Evaluate some different treatments for cardiovascular disease, including: life-long medication, surgical procedures and lifestyle changes			
Bio ONLY: Describe the lifecycle of a virus, including lysogenic and lytic pathways			
Bio ONLY: Describe how some plants defend themselves against attack from pests and pathogens by physical barriers			
Bio ONLY: Describe how plants defend themselves against attack from pests and pathogens by producing chemicals and how some can be used to treat humans			
Bio ONLY: Discuss the advantages and disadvantages of immunisation, including the concept of herd immunity			
Bio ONLY: Explain the aseptic techniques used in culturing microorganisms in the laboratory			
<i>Bio ONLY: Core Practical: Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures</i>			
Bio ONLY: Calculate cross-sectional areas of bacterial cultures and clear agar jelly using $\pi r^2$			
<b>Higher Tier Only</b>			
Describe different ways plant diseases can be detected and identified			
Describe the production of monoclonal antibodies			
Explain the use of monoclonal antibodies			