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Year 11 into 12 – Biology Summer work

July 2024

GCSE to A-Level Key ideas

Introduction:

A-Level Biology is extremely well valued by both employers and universities. It is, however, a challenging course. We want you to be ready to face these challenges and to do so you must have a good understanding of some key ideas that you studied at GCSE.
The purpose of this booklet is to inform you of the required skills for the A-Level Biology course and inform you of resources available to you to help you prepare.

How to prepare:

You are advised to purchase your own copy of the required textbook to bring to lessons.
You need an A4 (lever arch) folder with at least 6 folder dividers

During the first couple of weeks of the course you will take a diagnostic test to assess your suitability for this course.

To prepare for this:

1. Use the checklist to RAG rate your current understanding of GCSE Biology for each of the topics identified below:

- Biological molecules
- Cell structure
- Genetics and cell division
- Exchange
- Disease and immunity
- The circulatory system
- Variation evolution and classification
- Respiration and photosynthesis

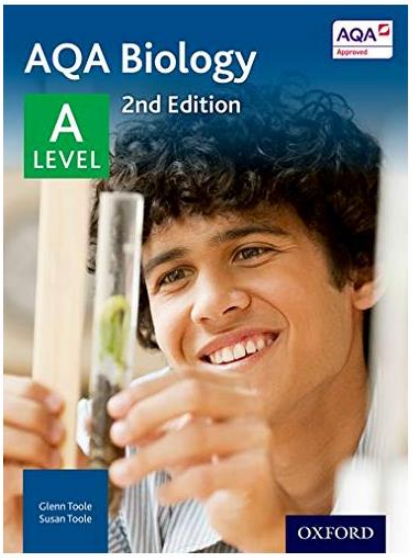
2. Produce consolidation mind maps / information pages / notes for any areas identified red or amber for each of the topics.

You can use the following resources to help you:

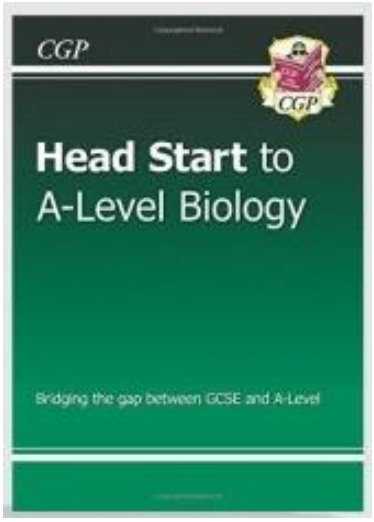
1. AQA GCSE Biology Revision Notes 2018 | Save My Exams
2. AQA GCSE (9-1) Biology Revision - PMT (physicsandmathstutor.com)
3. GCSE revision guides
4. Head start to GCSE Biology textbook (ISBN 9781847623232))

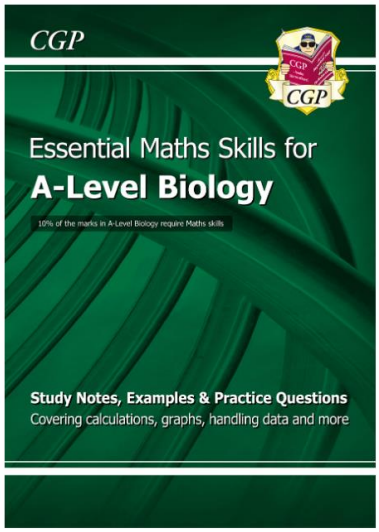
Required resources

You will need to purchase a copy of this textbook and bring it with you to your lessons.



Optional resources





AQA Biology (8461) from 2016 Topic B4.1 Cell biology				
Topic	**Student Checklist**	**R**	**A**	**G**
4.1.1 Cell structure 4.1.2 Cell division	Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells			
	Describe the features of bacterial (prokaryotic) cells			
	Demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, inc standard form			
	Recall the structures found in animal and plant (eukaryotic) cells inc algal cells			
	Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures			
	Describe the functions of the structures in animal and plant (eukaryotic) cells			
	Describe what a specialised cell is, including examples for plants and animals			
	Describe what differentiation is, including differences between animals and plants			
	Define the terms magnification and resolution			
	Carry out calculations involving magnification using the formula: magnification = size of image/ size of real object -inc standard form			
	Describe how genetic information is stored in the nucleus of a cell (inc genes & chromosomes)			
	Describe the processes that happen during the cell cycle, including mitosis (inc recognise and describe where mitosis occurs)			
4.1.3 Transport in cells	Describe the process of diffusion, including examples			
	Explain how diffusion is affected by different factors			
	Define and explain "surface area to volume ratio", and how this relates to single-celled and multicellular organisms (inc calculations)			
	Explain how the effectiveness of an exchange surface can be increased, inc examples of adaptations for small intestines, lungs, gills roots & leaves			
	Describe the process of osmosis (inc calculation of water uptake & percentage gain and loss of mass of plant tissue)			
	Describe the process of active transport, including examples - gut and roots			
	Explain the differences between diffusion, osmosis and active transport			

AQA Biology (8461) from 2016 Topic B4.2 Organisation				
Topic	**Student Checklist**	**R**	**A**	**G**
4.2.1 Principles of organisation & 4.2.2 Animal tissues, organs and organ systems	Describe the levels of organisation within living organisms			
	Describe the digestive system and how it works as an organ system (from KS3)			
	Describe basic features of enzymes (inc rate calculations for chemical reactions)			
	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			
	Explain the effect of temperature and pH on enzymes			
	Describe the digestive enzymes, including their names, sites of production and actions			
	Describe how the products of digestion are used			
	Describe the structure of the human heart and lungs (inc how lungs are adapted for gaseous exchange)			
	Explain how the heart moves blood around the body (inc role and position of 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			
	Describe the structure and function of arteries, veins and capillaries			
	Describe blood and identify its different components, inc identifying blood cells from photographs/diagrams			
	Describe the functions of blood components, including adaptations to function			
	Describe what happens in coronary heart disease and what statins are used for			
4.2.3 Plant tissues, organs and system	Describe plant tissues (epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem) and describe their functions			
	Explain how the structure of plant tissues are related to their function within the leaf (plant organ) inc stomata and guard cells			
	Recall the plant parts that form a plant organ system that transports substances around the plant			
	Explain how root hair cells, xylem and phloem are adapted to their functions			
	Describe the process of transpiration and translocation including the role of the different plant tissues			
	Explain how the rate of transpiration can be affected by different factors (inc naming the factors)			
	Describe the role of stomata and guard cells in the control of gas exchange and water loss			

AQA Biology (8461) from 2016 Topic B4.3 Infection and response				
Topic	**Student Checklist**	**R**	**A**	**G**
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)			
	Explain how pathogenic bacteria and viruses cause damage in the body			
	Explain how the spread of diseases can be reduced or prevented			
	Describe measles, HIV and tobacco mosaic virus as examples of viral pathogens			
	Describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens			
	Describe the signs, transmission and treatment of rose black spot infection in plants as an example of fungal pathogens			
	Describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector as an example of a protists pathogen			
	Describe defences that stop pathogens entering the human body (inc skin, nose, trachea & windpipe, stomach)			
	Recall the role of the immune system			
	Describe how white blood cells destroy pathogens			
	Describe how vaccination works, including at the population level			
	Explain how antibiotics and painkillers are used to treat diseases, including their limitations			
	Describe how sources for drugs have changed over time and give some examples			
	Describe how new drugs are tested, including pre-clinical testing and clinical trials (inc double blind trials and placebos)			

AQA Biology (8461) from 2016 Topic B4.4 Bioenergetics				
Topic	**Student Checklist**	**R**	**A**	**G**
4.4.1 Photosynthesis	Describe what happens in photosynthesis, including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose			
	Explain why photosynthesis is an endothermic reaction			
	Recall the limiting factors of photosynthesis			
	Explain how limiting factors affect the rate of photosynthesis, including graphical interpretation (limited to one factor)			
	HT ONLY: Explain how the limiting factors of photosynthesis interact, inc graphical interpretation (two/three factors)			
	HT ONLY: Explain how limiting factors are important to the economics of greenhouses, including data interpretation			
	HT ONLY: Explain and use inverse proportion in the context of photosynthesis			
	Describe how the glucose produced in photosynthesis is used by plants			
4.4.2 Respiration	Describe what happens in respiration including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen & glucose			
	Describe aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred			
	Recognise the equations for aerobic respiration, anaerobic respiration in muscles and anaerobic respiration in plants and yeast cells.			
	Describe what happens to heart rate, breathing rate and breath volume during exercise and why these changes occur			
	Explain what happens when muscles do not have enough oxygen and define the term oxygen debt			
	HT ONLY: Explain what happens to accumulated lactic acid in the body			
	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			

AQA Biology (8461) from 2016 Topic B4.5 Homeostasis and response				
Topic	**Student Checklist**	**R**	**A**	**G**
4.5.1 Homeostasis	Describe what homeostasis is and why it is important stating specific examples from the human body			
	Describe the common features of all control systems			
4.5.2 The human nervous system	State the function of the nervous system and name its important components			
	Describe how information passes through the nervous system			
	Describe what happens in a reflex action and why reflex actions are important			
	Explain how features of the nervous system are adapted to their function, including a reflex arc (inc all types of neurone and the synapse)			
	Required practical 7: plan and carry out an investigation into the effect of a factor on human reaction time			
	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			
	Bio ONLY: Describe the functions of different regions of the brain			
	Bio & HT ONLY: Explain how neuroscientists have been able to map regions of the brain to particular functions			
4.5.3 Hormonal coordination in humans	Describe the endocrine system, including the location of the pituitary, pancreas, thyroid, adrenal gland, ovary and testis and the role of hormones			
	State that blood glucose concentration is monitored and controlled by the pancreas			
	Describe the body's response when blood glucose concentration is too high			
	Explain what type 1 and type 2 diabetes are and how they are treated			
	HT ONLY: Describe the body's response when blood glucose concentration is too low			
	HT ONLY: Explain how glucagon interacts with insulin to control blood glucose levels in the body			
	Describe how water, ions and urea are lost from the body			
	Describe the consequences of losing or gaining too much water for body cells			
	HT ONLY: Recall that protein digestion leads to excess amino acids inside the body and describe what happens to these			
	Describe how the kidneys produce urine			
	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			
	Describe how kidney failure can be treated by organ transplant or dialysis and recall the basic principles of dialysis			
.5.4 Plant hormones	*Bio ONLY: Describe hormone-linked plant responses, to include phototropism and gravitropism and the role of auxin*			
	Bio & HT ONLY: Describe the functions of gibberellins and ethene in plants			
	HT ONLY: Explain the use of plant growth hormones are used in agriculture and horticulture (auxins, ethene and gibberellins)			

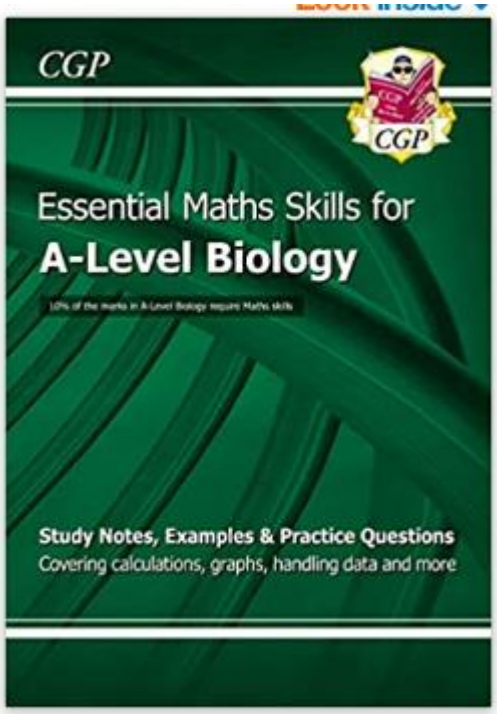
AQA Biology (8461) from 2016 Topic B4.6 Inheritance, variation and evolution				
Topic	**Student Checklist**	**R**	**A**	**G**
4.6.1 Reproduction	Describe features of sexual and asexual reproduction			
	Describe what happens during meiosis and compare to mitosis			
	Describe what happens at fertilisation			
	Bio ONLY: Explain advantages of sexual and asexual reproduction			
	Bio ONLY: Describe examples of organisms that reproduce both sexually and asexually (malarial parasites, fungi, strawberry plants and daffodils)			
	Describe the structure of DNA and its role in storing genetic information inside the cell			
	Explain the term 'genome' and the importance of the human genome (specific examples from spec only)			
	Bio ONLY: Describe the structure of DNA, including knowledge of nucleotide units			
	Bio & HT ONLY: Explain complementary base pairing in DNA			
	Bio & HT ONLY: Explain the relationship between DNA bases (ATCG), amino acids and proteins			
	Bio & HT ONLY: Describe how proteins are synthesised on ribosomes, including protein folding and its importance for protein function			
	Bio & HT ONLY: Explain what mutations are, and the possible effects of mutations			
	Bio & HT ONLY: Explain what non-coding parts of DNA are, and why they are important			
	Describe how characteristics are controlled by one or more genes, including examples			
	Explain important genetic terms: gamete, chromosome, gene, allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous			
	Explain and use Punnet square diagrams, genetic crosses and family trees			
	HT ONLY: Construct Punnet square diagrams to predict the outcomes of a monohybrid cross			
	Describe cystic fibrosis and polydactyly as examples of inherited disorders			
	Evaluate social, economic and ethical issues concerning embryo screening when given appropriate information			
	Describe how the chromosomes are arranged in human body cells, including the function of the sex chromosomes			
	Explain how sex is determined and carry out a genetic cross to show sex inheritance			
4.6.2 Variation and evolution	Describe what variation is and how it can be caused within a population			
	Describe mutations and explain their influence on phenotype and changes in a species			
	Explain the theory of evolution by natural selection			
	Describe how new species can be formed			
	Describe what selective breeding is			
	Explain the process of selective breeding, including examples of desired characteristics and risks associated with selective breeding			
	Describe what genetic engineering is, including examples, and how it is carried out			
	Explain some benefits, risks and concerns related to genetic engineering			
	HT ONLY: Explain the process of genetic engineering, to include knowledge of enzymes and vectors			
	Describe some sources of evidence for evolution			
	Describe what fossils are, how they are formed and what we can learn from them			
	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			
	Describe some of the causes of extinction			
	Describe how antibiotic-resistant strains of bacteria can arise and spread (inc MRSA)			
	Describe how the emergence of antibiotic-resistant bacteria can be reduced and controlled, to include the limitations of antibiotic development			
4.6.4 Classification	Describe how organisms are named and classified in the Linnaean system			
	Explain how scientific advances have led to the proposal of new models of classification, inc three-domain system			
	Describe and interpret evolutionary trees			

AQA Biology (8461) from 2016 Topic B4.7 Ecology				
Topic	**Student Checklist**	**R**	**A**	**G**
4.7.1 Adaptations, interdependence and competition	Recall what an ecosystem is			
	Describe which resources animals and plants compete for, and why they do this			
	Explain the terms 'interdependence' and 'stable community'			
	Name some abiotic and biotic factors that affect communities			
	Explain how a change in an abiotic or biotic factor might affect a community			
	Describe structural, behavioural and functional adaptations of organisms			
	Describe what an extremophile is			
4.7.2 Organisation of an ecosystem	Represent the feeding relationships within a community using a food chain and describe these relationships			
	Explain how and why ecologists use quadrats and transects			
4.7.3 Biodiversity and the effect of human interaction on ecosystems	Describe what biodiversity is, why it is important, and how human activities affect it			
	Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity			
	Describe programmes that aim to reduce the negative effects of humans on ecosystems and biodiversity			

Maths for Biology Specification

Outlined are the Maths skills for A level Biology. Some of these you are expected to know from GCSE Biology and GCSE Maths. The others you will learn on the A level course.

Task: The areas shaded in grey are the ones you will learn at A level. Please go through and RAG rate the Skills which have been left white. These are the ones from GCSE.



This book is recommended, it isn't compulsory so it's unlikely that work will be set directly from it but it will give you extra help, support and guidance which will complement the Maths Skills taught in A-level Biology lessons.

Maths Skill	Example	R / A / G
Arithmetic and Numerical Computation		
Recognise and make use of appropriate units in calculations	Students may be tested on their ability to: • convert between units, eg mm3 to cm3 as part of volumetric calculations • work out the unit for a rate, eg breathing rate	
Recognise and use expressions in decimal and standard form	Students may be tested on their ability to: • use an appropriate number of decimal places in calculations, eg for a mean • carry out calculations using numbers in standard and ordinary form, eg use of magnification • understand standard form when applied to areas such as size of organelles • convert between numbers in standard and ordinary form • understand that significant figures need retaining when making conversions between standard and ordinary form, eg 0.0050 mol dm–3 is equivalent to 5.0 × 10–3 mol dm–3	
Use ratios, fractions and percentages	Students may be tested on their ability to: • calculate percentage yields • calculate surface area to volume ratio • use scales for measuring • represent phenotypic ratios (monohybrid and dihybrid crosses)	
Estimate results	Students may be tested on their ability to: • calculate percentage yields • calculate surface area to volume ratio • use scales for measuring • represent phenotypic ratios (monohybrid and dihybrid crosses)	
Use calculators to find and use power, exponential and logarithmic functions	Students may be tested on their ability to: • estimate the number of bacteria grown over a certain length of time	
Handling Data		
Use an appropriate number of significant figures	Students may be tested on their ability to: • report calculations to an appropriate number of significant figures given raw data quoted to varying numbers of significant figures	

	• understand that calculated results can only be reported to the limits of the least accurate measurement	
Find arithmetic means	Students may be tested on their ability to: • find the mean of a range of data, eg the mean number of stomata in the leaves of a plant	
Construct and interpret frequency tables and diagrams, bar charts and histograms	Students may be tested on their ability to: • represent a range of data in a table with clear headings, units and consistent decimal places • interpret data from a variety of tables, eg data relating to organ function • plot a range of data in an appropriate format, eg enzyme activity over time represented on a graph • interpret data for a variety of graphs, eg explain electrocardiogram traces	
Understand simple probability	Students may be tested on their ability to: • use the terms probability and chance appropriately • understand the probability associated with genetic inheritance	
Understand the principles of sampling as applied to scientific data	Students may be tested on their ability to: • analyse random data collected by an appropriate means, eg use Simpson's index of diversity to calculate the biodiversity of a habitat	
Understand the terms mean, median and mode	Students may be tested on their ability to: • calculate or compare the mean, median and mode of a set of data, eg height/mass/size of a group of organisms	
Use a scatter diagram to identify a correlation between two variables	Students may be tested on their ability to: • interpret a scattergram, eg the effect of lifestyle factors on health	
Make order of magnitude calculations	Students may be tested on their ability to: • use and manipulate the magnification formula magnification = size of image / size of real object	
Select and use a statistical test	Students may be tested on their ability to select and use: • the chi-squared test to test the significance of the difference between observed and expected results • the Student's t-test • the correlation coefficient	
Understand measures of	Students may be tested on their ability to: •	

dispersion, including standard deviation and range	calculate the standard deviation • understand why standard deviation might be a more useful measure of dispersion for a given set of data, eg where there is an outlying result	
Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined	Students may be tested on their ability to: • calculate percentage error where there are uncertainties in measurement	
Algebra		
Understand and use the symbols: =, <, <<, >>, >, ∝, .	No exemplification required.	
Change the subject of an equation	Students may be tested on their ability to: • use and manipulate equations, eg magnification	
Substitute numerical values into algebraic equations using appropriate units for physical quantities	Students may be tested on their ability to: • use a given equation, eg Simpson's index of diversity	
Solve algebraic equations	Students may be tested on their ability to: • solve equations in a biological context, eg cardiac output = stroke volume × heart rate	
Use logarithms in relation to quantities that range over several orders of magnitude	Students may be tested on their ability to: • use a logarithmic scale in the context of microbiology, eg growth rate of a microorganism such as yeast	
Graphs		
Translate information between graphical, numerical and algebraic forms	Students may be tested on their ability to: • understand that data may be presented in a number of formats and be able to use these data, eg dissociation curves	
Plot two variables from experimental or other data	Students may be tested on their ability to: • select an appropriate format for presenting data, bar charts, histograms, graphs and scattergrams	
Understand that y = mx + c represents a linear relationship	Students may be tested on their ability to: • predict/sketch the shape of a graph with a linear relationship, eg the effect of substrate concentration on the rate of an reaction with excess enzyme	
Determine the intercept of a graph	Students may be tested on their ability to: • read off an intercept point from a graph, eg	

	compensation point in plants	
Calculate rate of change from a graph showing a linear relationship	Students may be tested on their ability to: • calculate a rate from a graph, eg rate of transpiration	
Students may be tested on their ability to: • calculate a rate from a graph, eg rate of transpiration	Students may be tested on their ability to: • use this method to measure the gradient of a point on a curve, eg amount of product formed plotted against time when the concentration of enzyme is fixed	
Geometry and Trigonometry		
Calculate the circumferences, surface areas and volumes of regular shapes	Students may be tested on their ability to: • calculate the circumference and area of a circle • calculate the surface area and volume of rectangular prisms, of cylindrical prisms and of spheres • eg calculate the surface area or volume of a cell	

How can I revise in an effective way?

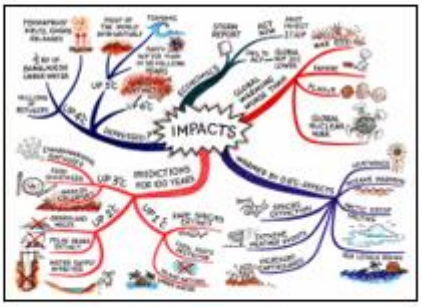
WARNING! There is no quick and easy way to revise effectively for your exam.

...There are, however, several **logical, interesting, effective** ways to revise and recap your **knowledge and understanding** - and therefore making it easier to apply in your GCSE examinations...

Create a revision timetable

Practice, Practice, Practice

Join with classmates

Making flash cards.	Making a mind map.
Create a set of cards with either key words on one side their definitions on the other or questions on one side with answers on the other. These can include equations / labelled diagrams etc? This is a great way of recalling the most important words / information in a topic – and will help you to use the words correctly in an exam 	Really useful for **linking ideas together**, concept maps allow you to **elaborate on your points** more than mind maps. Different colours could indicate social, environmental and economic factors. Add diagrams, make physical links use and symbols to make the concept map more interesting and visual. 
Completing relevant questions in your science workbooks.	Using an Internet resource like GCSE Pod / Seneca learning*/ BBC Bitesize (you will need some proof of this though – screen shots are fine)
Use the corresponding pages from your revision guide and answer the questions in your workbooks: 	Log on to any of the below resources and complete their quizzes / activities: www.gcsepod.com www.senecalearning.com www.bbc.co.uk/bitesize/subjects/zrkw2hv (choose AQA)