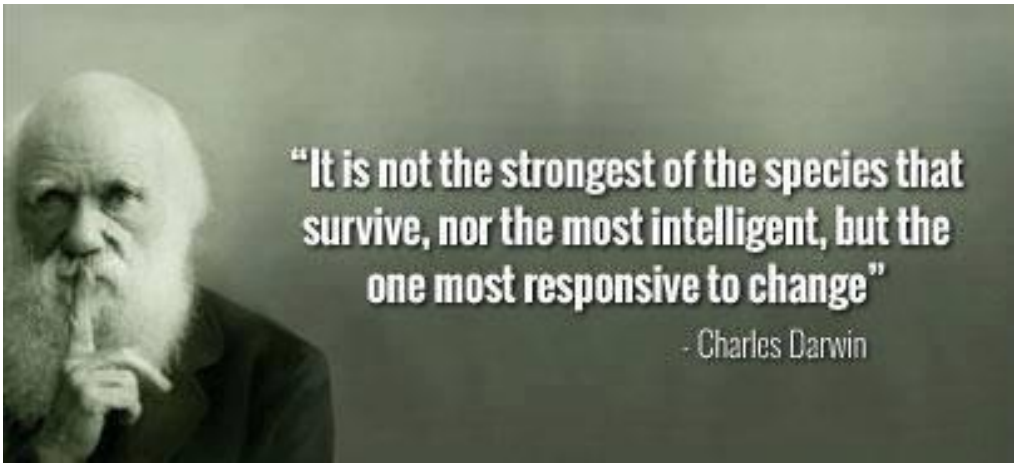
BRISTOL CATHEDRAL
CHOIR SCHOOL

BCCS Biology A-Level



Welcome to A-Level Biology!

The Biology team at BCCS is passionate about Biology and the way in which you can use scientific enquiry to explore the world around you. We believe that the AQA Biology GCE course is the best way to prepare you for an exciting future in biological science.

Like you, we believe that Biology is fundamentally an experimental subject. This course will provide numerous opportunities for you to use scientific practical equipment. You will become skilled in experimental techniques and you will be able to link your findings to theoretical study.

We hope that this course will inspire and nurture your interest in biology. If you embrace the challenge of studying biology you will become an accomplished independent learner who is equipped with the skills to succeed in further education.

This challenge is not to be taken lightly. Biology at A-level is hard. It is so hard that there is no time for coasting; you will need to work on your understanding consistently from day one. This requires you to do one hours work on your own for each hour of class tuition (i.e. 4 hours a week).

This booklet will outline the course content, the **new** format for practical assessment, a reading list for the summer and a summer assignment to bring to your first Biology lesson in September.

Best of luck with your exam results and we look forward to seeing you in our labs in September!

Mr Davies, Dr Stone, Ms New and Ms Brizzi

Biology A-Level Content

The year 1 Biology course is divided up into 4 modules:

- Biological molecules
- Cells
- Organisms exchange substances with their environment
- Genetic information, variation and relationships between organisms

You will be examined on all of these topics towards the end of year 12 in your progress exams.

The year 2 Biology course builds on the foundation knowledge that you have gained throughout year 12. It is also divided into 4 main modules:

- Energy transfers within and between organisms
- Organisms respond to changes in the environment
- Genetics, populations, evolution and ecosystems
- The control of gene expression

For more information on the content of the Biology AQA course you can view the specification at:
http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/specification-at-a-glance

Maths in Biology

At least 10% of your marks in exams will come directly from using Maths skills such as calculating percentage change, ratios, rates and statistics. These are mostly Maths skills that you will have developed as part of Higher Maths GCSE. There's no avoiding Maths in Biology!

A-Level Assessments

Your formal exams will take place at the end of year 13. These will consist of three papers, their content is outlined below.

Assessments

Paper 1	Paper 2	Paper 3
What's assessed • Any content from topics 1–4, including relevant practical skills	**What's assessed** • Any content from topics 5–8, including relevant practical skills	**What's assessed** • Any content from topics 1–8, including relevant practical skills
Assessed • written exam: 2 hours • 91 marks • 35% of A-level	**Assessed** • written exam: 2 hours • 91 marks • 35% of A-level	**Assessed** • written exam: 2 hours • 78 marks • 30% of A-level
Questions • 76 marks: a mixture of short and long answer questions • 15 marks: extended response questions	**Questions** • 76 marks: a mixture of short and long answer questions • 15 marks: comprehension question	**Questions** • 38 marks: structured questions, including practical techniques • 15 marks: critical analysis of given experimental data • 25 marks: one essay from a choice of two titles

You will also have progress exams in year 12 that will identify how well you are doing. We use this data to help us decide your projected grades for your year 13 exams and your UCAS predictions.

Biology Study Skills and in-class assessment

You will need to keep your notes from class in a folder that is separated by dividers. You must bring your folder to all lessons and it will be checked regularly by your teachers. These checks are used to check for evidence of good study skills including:

- A front sheet for the topic that has been filled in as you are going.
- Notes being complete with no gaps.
- Practice exam style questions; self, peer or teacher marked.
- Homework tasked; clearly titled.
- Self-study; clearly titled.
- Assessment review sheet; filled in with current working at grade.

Part of developing **good study skills** is to carry out revision of work as you go along. This is more than just making notes on the class work. You must actively review the notes from class. Make additions or redraft them as necessary. You should format them differently; converting them into mind maps or flash cards. By studying the material and checking your knowledge the **first time around** you will be adequately prepared for the next section of learning.

You will undertake end of topic tests for each chapter in the textbook. These may be single or combined tests as specified by the front sheet. You should be revising in a way that means you are ready for a test on the work covered **at any time**. As such the teachers may or may not give you notice of an end of topic test. It is up to you to stay on top of your understanding and be prepared for tests.

This is quite different to GCSE but you must take responsibility for your learning and aim for excellence at all times.

Required Practicals

Coursework for Biology is now a thing of the past. Instead, as well as your normal class practicals, you will be required to carry out and keep a log of 12 required practicals in a lab book. You will be assessed during these practicals to provide evidence of your practical skills (below) and ability to use particular apparatus and techniques. You can also be assessed on the required practicals and techniques in your exams.

The 12 required practicals for your AS-Biology course are:

Required activity	Apparatus and technique reference
1. Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction	a, b, c, f, l
2. Preparation of stained squashes of cells from plant root tips; set-up and use of an optical microscope to identify the stages of mitosis in	d, e, f
3. Production of a dilution series of a solute to produce a calibration curve with which to identify	c, h, j, l
4. Investigation into the effect of a named variable on the permeability of cell-surface membranes	a, b, c, j, l
5. Dissection of animal or plant gas exchange or mass transport system or of organ within such a	e, h, j
6. Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth	c, i
7. Use of chromatography to investigate the pigments isolated from leaves of different plants eg leaves from shade-tolerant and shade- intolerant plants	b, c, g
8. Investigation into the effect of a named factor on the rate of dehydrogenase activity in extracts of	a, b, c
9. Investigation into the effect of a named variable on the rate of respiration of cultures of single-	a, b, c, i
10. Investigation into the effect of an environmental variable on the movement of an animal using	h
11. Production of a dilution series of a glucose solution and use of colorimetric techniques to produce a calibration curve with which to identify	b, c, f
12. Investigation into the effect of a named environmental factor on the distribution of a given	a, b, h, k, l

During each practical you will be assessed against these criteria below. They are called 'common practical assessment criteria' (CPAC). By the end of year 13 you must demonstrate that you are competent in all of these areas:

CPAC1: Follows written procedures	Correctly follows instructions to carry out experimental techniques or procedures.
CPAC 2: Applies investigative approaches and methods when using instruments and equipment	Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting.
	Carries out techniques or procedures methodically, in sequence and in combination, identifying practical issues and making adjustments when necessary.
	Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled.
	Selects appropriate equipment and measurement strategies
CPAC 3: Safely uses a range of practical equipment and materials	Identifies hazards and assesses risks associated with these hazards, making safety adjustments as necessary, when carrying out experimental techniques and procedures in the lab or field.
	Uses appropriate safety equipment and approaches to minimise risks with minimal prompting.
CPAC 4: Makes and records observations	Makes accurate observations relevant to the experimental or investigative procedure.
	Obtains accurate, precise and sufficient data for experimental and investigative procedures and records this methodically using appropriate units and conventions.
CPAC5: Researches, references and reports	Uses appropriate software and/or tools to process data, carry out research and report findings.
	Cites sources of information demonstrating that research has taken place, supporting planning and conclusions.

You will also develop key practical techniques and skills in using scientific apparatus as outlined below:

	Apparatus and techniques
AT a	use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and
AT b	use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer
AT c	use laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions
AT	use of light microscope at high power and low power, including use of a
AT e	produce scientific drawing from observation with annotations
AT f	use qualitative reagents to identify biological molecules
AT	separate biological compounds using thin layer/paper chromatography
AT h	safely and ethically use organisms to measure: • plant or animal responses • physiological functions
AT i	use microbiological aseptic techniques, including the use of agar plates
AT j	safely use instruments for dissection of an animal organ, or plant organ
AT k	use sampling techniques in fieldwork
AT l	use ICT such as computer modelling, or data logger to collect data, or use software to process data

Required Practical Lab Book

You will be expected to keep a lab book, recording any and all experiments you undertake in class:

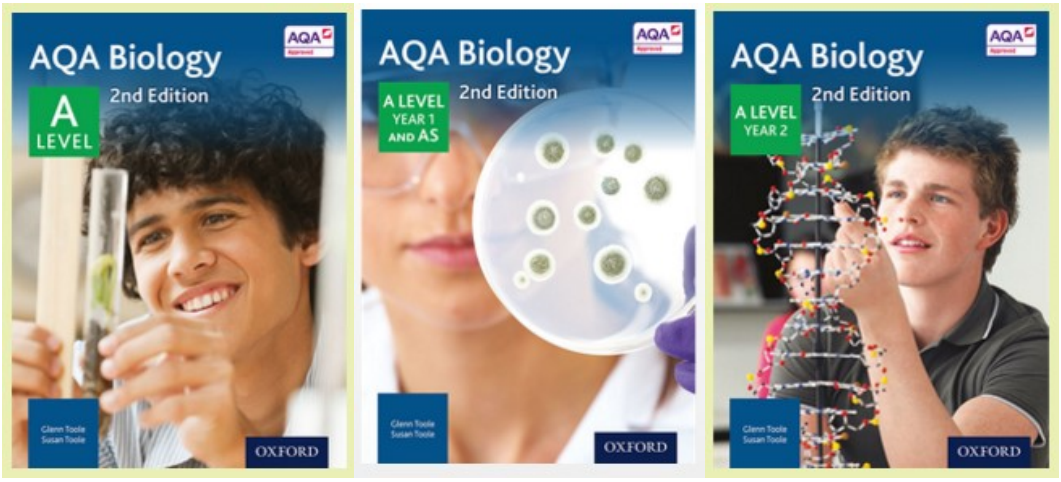
- You will be given an A4 exercise book for your practical work. You do not need to buy one.
- It will contain a tracker so that you can check which CPAC you have demonstrated competency in and which you need to work on.
- You will need to write up every practical and include tables and graphs where appropriate. These will all be stuck into your lab book.
- Your lab book will be a revision resource that you will need to use for your exams

Reading lists and Preparation Tasks

To ensure an excellent start to your A-Level course it is important to take some time over the summer holidays to practise your skills and develop your understanding of the A-level course content.

All of our students are provided with online access to textbooks via Kerboodle from September and have access to school copies of the textbooks in lessons. Some students prefer to buy their own hard copies of textbooks and the Biology revision guides to use at home.

If you would like to purchase the textbook, the one that we use in lessons is published by Oxford University Press and is called 'AQA Biology 2nd Edition' (AQA Approved). You would need to choose whether to purchase the whole 'A-Level' version (both years 1 and 2 of the course covered), or the years 1 and 2 copies separately. The covers look like this:



Both year 1 and 2 **Just year 1** **Just year 2**

Additional Reading for the bigger picture in Biology:

- Bill Bryson: A Short History of Nearly Everything
- Charles Darwin: The Origin of species (the final chapter in particular)
- Richard Dawkins: The Selfish Gene
- Matt Ridley: The Red Queen
- David Bellamy: Botanic Man
- Ben Goldacre: Bad Science
- New Scientist
- Nature

Preparation tasks:

Your very first lesson in September will involve setting up your folder to ensure you know how to manage your notes and revision.

You must bring a folder with cardboard dividers to your first lesson.

1) Planning a practical

The new specification for Biology A-Level demands high standards of practical skills and techniques which you will develop throughout the year.

Some people will have done more practical work than others at GCSE, so everyone will have different levels of experience. To help us to assess your starting point we would like you to spend some time planning an investigation into the topic below. You need to select what equipment you would like to use from the list below, design a method, hazard assessment and a results table to for your investigation. You can use the internet to find ideas if you like, but you must reference the other people's work that you use. In one of your first few lessons when you start in September we will be providing you with the equipment listed below

2) Data handling questions

All students must have at least a grade 'B' at Maths GCSE to be able to meet the demands of the maths component of the course.

The data handling questions show a taste of some of the more basic skills expected of Biology A-Level students.

Aim: To find out the concentration of glucose in a diabetic person's urine

Equipment you can choose from (you don't have to use everything!):

- Urine sample containing unknown concentration of glucose
- Urine samples of known concentrations (10mmol, 8mmol, 6mmol, 4mmol, 2mmol)
- Distilled water
- Measuring cylinder (variety of sizes)
- Beakers (variety of sizes)
- Test tubes
- Test tube rack
- Benedict's solution
- Bunsen burner
- Tripod
- Gauze
- Heat proof mat
- Splint
- Water bath (90^0C)
- Colorimeter
- Cuvettes
- Pipette

Websites you might find useful for ideas:

www.youtube.com

http://www.nuffieldfoundation.org/practical-biology

http://www.saps.org.uk/

Websites that you used: (Write down full URL and the date that you accessed the website)

Diagram of your experiment

List of equipment you have chosen to use:

Hazard assessment

Complete the table: Think of at least 3 hazards.

Hazard (what the dangerous thing is)	Risk (what might happen?)	Precaution (what will you do to minimise the risk of harm?)

Results table (Don't forget headings and units!)

Data handling questions

1) The table shows the volume of blood in a woman's left ventricle at different times during **one** second.

Plot an appropriate graph of the data

Time / seconds	Volume of blood in left ventricle / cm^3
0.0	112
0.1	120
0.2	95
0.3	65
0.4	50
0.5	55
0.6	82
0.7	90
0.8	100
0.9	112
1.0	120

Use the data in the table or your graph to calculate the heart rate in beats per minute.

2) Plot an appropriate graph of this data:

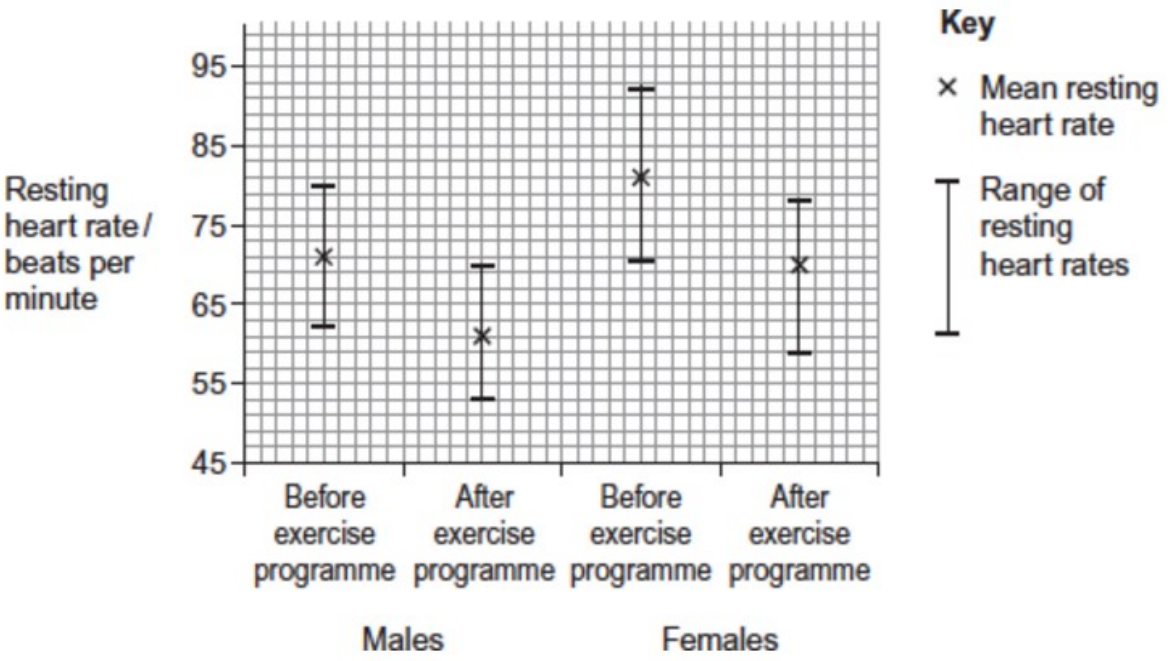
Students carried out similar investigations to you with green leaves and yellow leaves. The students stopped each chromatogram when the solvent front had run exactly the same distance. They then measured the distance moved by the pigment nearest the origin. The results are recorded in the table.

	Distance moved by pigment spot nearest to origin / mm	
Trial number	Green Leaf	Yellow Leaf
1	48	38
2	52	46
3	46	44
4	42	40
5	48	40
6	52	38
7	54	40
8	50	38
9	52	36

3) Scientists investigated the effect of a 6-week exercise programme on the resting heart rate of males and females.

The scientists recruited a large group of male volunteers and a large group of female volunteers. They measured the resting heart rate of each volunteer before the exercise programme. Both groups took part in the same exercise programme. The scientists measured the resting heart rate of each volunteer after the exercise programme.

The scientists determined the mean resting heart rate and the range of resting heart rates for each group before and after the exercise programme. The graph shows their results.



(a) What was the range of the resting heart rates in males after the exercise programme?

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(1)

(b) Calculate the percentage decrease in the mean resting heart rate of females after the exercise programme. Show your working.

Answer = ... %

(2)

4)

(a) Read the information and plot the data below on an appropriate graph.

A group of students investigated the effect of sucrose concentration on the change in length of cylinders of tissue cut from a young carrot. They measured the initial lengths of the carrot cylinders, then placed one in each of a number of sucrose solutions. After 18 hours, they removed the carrot cylinders and measured their final lengths. Some of the results are shown in the table.

Concentration of sucrose / mol dm^{-3}	Percentage decrease in length of carrot cylinder
0.4	4.2
0.5	8.7
0.6	13.0
0.7	16.8
0.8	18.1
0.9	18.1
1.0	18.1

(b) Explain how you would use a graph to predict the concentration of sucrose that would result in no change in length of the carrot cylinders.

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(2)