**The Student Guide to**

**A Level Biology**

**2019 - 2020**



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**BIOLOGY**

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**1. MEMBERS OF STAFF**

|  |  |  |
| --- | --- | --- |
|  | Dr Debbie Haggar Head of DepartmentMr Alex ChappelowDeputy Head of Department |  |
|  | Mrs Justine ChatwinMiss Jess ThomasDr Jackie GlenMrs Nicola Rokadia (Technician) |  |

**2. AIMS OF THE DEPARTMENT**

To help students gain high standards in public examinations.

To deliver biological teaching that:

* Stimulates students and fosters a passion for the subject;
* Allows students to work according to their own ability, but also strive to achieve personal targets;
* Is supportive and caring;
* Is built upon the Scientific Education of Key Stage 4;
* Develops a broad range of transferable practical and data-handling skills;
* Is valuable for vocational and higher education;
* Takes into account issues of equality and diversity

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**3. WHAT ADVANCED LEVEL COURSE IS STUDIED?**

 The syllabus is set by AQA. The title and code is:

1. Biology – 7402

**4. AQA SYLLABUS AIMS**

This A level specification encourages candidates to:

1. Develop essential knowledge and understanding of different areas of Biology and how they relate to each other
2. Develop and demonstrate a deep appreciation of the skills, knowledge and understanding of scientific methods
3. Develop competence and confidence in a variety of practical, mathematical and problem solving skills
4. Develop their interest in and enthusiasm for Biology, including developing an interest in further study and careers associated with Biology
5. Understand how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society.

5. COURSE STRUCTURE AND ASSESSMENT

At A level students study 8 core concepts of Biology. Topics 1-4 are taught in the Lower Sixth year, topics 5-8 are taught in the upper sixth;

1. [Biological molecules](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/biological-molecules)
2. [Cells](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/cells)
3. [Organisms exchange substances with their environment](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/organisms-exchange-substances-with-their-environment)
4. Genetic information, variation and relationships between organisms
5. Energy transfer in and between organisms
6. Organisms’ responses to changes in their internal and external environments
7. Genetics, populations, evolution and ecosystems
8. The control of gene expression

The A-level specification is designed to be taken over two years. Students are examined at the end of the two year period.

Students that have elected to study just AS Biology will be examined at the end of their first year in two written exams (May and June).

**AS assessment:**



**A Level Assessment**



6. SUBJECT CONTENT – WHAT IS TAUGHT IN EACH MODULE?

1. [Biological molecules](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/biological-molecules)
	* All life on Earth shares a common chemistry. This provides indirect evidence for evolution. Despite their great variety, the cells of all living organisms contain only a few groups of carbon-based compounds that interact in similar ways.
	* Carbohydrates are commonly used by cells as respiratory substrates. They also form structural components in plasma membranes and cell walls.
	* Lipids have many uses, including the bilayer of plasma membranes, certain hormones and as respiratory substrates.
	* Proteins form many cell structures. They are also important as enzymes, chemical messengers and components of the blood.
	* Nucleic acids carry the genetic code for the production of proteins. The genetic code is common to viruses and to all living organisms, providing evidence for evolution.
	* The most common component of cells is water; hence our search for life elsewhere in the universe involves a search for liquid water.
2. [Cells](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/cells)
	* All life on Earth exists as cells. These have basic features in common. Differences between cells are due to the addition of extra features. This provides indirect evidence for evolution.
	* All cells arise from other cells, by binary fission in prokaryotic cells and by mitosis and meiosis in eukaryotic cells.
	* All cells have a cell-surface membrane and, in addition, eukaryotic cells have internal membranes. The basic structure of these plasma membranes is the same and enables control of the passage of substances across exchange surfaces by passive or active transport.
	* Cell-surface membranes contain embedded proteins. Some of these are involved in cell signalling – communication between cells. Others act as antigens, allowing recognition of ‘self’ and ‘foreign’ cells by the immune system. Interactions between different types of cell are involved in disease, recovery from disease and prevention of symptoms occurring at a later date if exposed to the same antigen, or antigen-bearing pathogen.
3. [Organisms exchange substances with their environment](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/organisms-exchange-substances-with-their-environment)
	* The internal environment of a cell or organism is different from its external environment. The exchange of substances between the internal and external environments takes place at exchange surfaces. To truly enter or leave an organism, most substances must cross cell plasma membranes.
	* In large multicellular organisms, the immediate environment of cells is some form of tissue fluid. Most cells are too far away from exchange surfaces, and from each other, for simple diffusion alone to maintain the composition of tissue fluid within a suitable metabolic range. In large organisms, exchange surfaces are associated with mass transport systems that carry substances between the exchange surfaces and the rest of the body and between parts of the body. Mass transport maintains the final diffusion gradients that bring substances to and from the cell membranes of individual cells. It also helps to maintain the relatively stable environment that is tissue fluid.
4. [Genetic information, variation and relationships between organisms](http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/subject-content/genetic-information%2C-variation-and-relationships-between-organisms)
	* Biological diversity – biodiversity – is reflected in the vast number of species of organisms, in the variation of individual characteristics within a single species and in the variation of cell types within a single multicellular organism.
	* Differences between species reflect genetic differences. Differences between individuals within a species could be the result of genetic factors, of environmental factors, or a combination of both.
	* A gene is a section of DNA located at a particular site on a DNA molecule, called its locus. The base sequence of each gene carries the genetic code that determines the sequence of amino acids during protein synthesis. The genetic code is the same in all organisms, providing indirect evidence for evolution.
	* Genetic diversity within a species can be caused by gene mutation, chromosome mutation or random factors associated with meiosis and fertilisation. This genetic diversity is acted upon by natural selection, resulting in species becoming better adapted to their environment.
	* Variation within a species can be measured using differences in the base sequence of DNA or in the amino acid sequence of proteins.
	* Biodiversity within a community can be measured using species richness and an index of diversity.

5. Energy transfer in and between organisms (A level only)

* Life depends on continuous transfers of energy.
* In photosynthesis, light is absorbed by chlorophyll and this is linked to the production of ATP.
* In respiration, various substances are used as respiratory substrates. The hydrolysis of these respiratory substrates is linked to the production of ATP.
* In both respiration and photosynthesis, ATP production occurs when protons diffuse down an electrochemical gradient through molecules of the enzyme ATP synthase, embedded in the membranes of cellular organelles.
* The process of photosynthesis is common in all photoautotrophic organisms and the process of respiration is common in all organisms, providing indirect evidence for evolution.
* In communities, the biological molecules produced by photosynthesis are consumed by other organisms, including animals, bacteria and fungi. Some of these are used as respiratory substrates by these consumers.
* Photosynthesis and respiration are not 100% efficient. The transfer of biomass and its stored chemical energy in a community from one organism to a consumer is also not 100% efficient.

6. Organisms respond to changes in their internal and external environments (A-level only)

* A stimulus is a change in the internal or external environment. A receptor detects a stimulus.
* A coordinator formulates a suitable response to a stimulus. An effector produces a response.
* Receptors are specific to one type of stimulus.
* Nerve cells pass electrical impulses along their length. A nerve impulse is specific to a target cell only because it releases a chemical messenger directly onto it, producing a response that is usually rapid, short-lived and localised.
* In contrast, mammalian hormones stimulate their target cells via the blood system. They are specific to the tertiary structure of receptors on their target cells and produce responses that are usually slow, long-lasting and widespread.
* Plants control their response using hormone-like growth substances.

7. Genetics, populations, evolution and ecosystems (A-level only)

* The theory of evolution underpins modern Biology. All new species arise from an existing species. This results in different species sharing a common ancestry, as represented in phylogenetic classification.
* Common ancestry can explain the similarities between all living organisms, such as common chemistry (eg all proteins made from the same 20 or so amino acids), physiological pathways (eg anaerobic respiration), cell structure, DNA as the genetic material and a ‘universal’ genetic code.
* The individuals of a species share the same genes but (usually) different combinations of alleles of these genes. An individual inherits alleles from their parent or parents.
* A species exists as one or more populations. There is variation in the phenotypes of organisms in a population, due to genetic and environmental factors. Two forces affect genetic variation in populations: genetic drift and natural selection. Genetic drift can cause changes in allele frequency in small populations.
* Natural selection occurs when alleles that enhance the fitness of the individuals that carry them rise in frequency. A change in the allele frequency of a population is evolution.
* If a population becomes isolated from other populations of the same species, there will be no gene flow between the isolated population and the others. This may lead to the accumulation of genetic differences in the isolated population, compared with the other populations. These differences may ultimately lead to organisms in the isolated population becoming unable to breed and produce fertile offspring with organisms from the other populations. This reproductive isolation means that a new species has evolved.
* Populations of different species live in communities. Competition occurs within and between these populations for the means of survival. Within a single community, one population is affected by other populations, the biotic factors, in its environment. Populations within communities are also affected by, and in turn affect, the abiotic (physicochemical) factors in an ecosystem.

8. The control of gene expression (A level only)

* Cells are able to control their metabolic activities by regulating the transcription and translation of their genome. Although the cells within an organism carry the same genetic code, they translate only part of it. In multicellular organisms, this control of translation enables cells to have specialised functions, forming tissues and organs.
* There are many factors that control the expression of genes and, thus, the phenotype of organisms. Some are external, environmental factors, others are internal factors. The expression of genes is not as simple as once thought, with epigenetic regulation of transcription being increasingly recognised as important.
* Humans are learning how to control the expression of genes by altering the epigenome, and how to alter genomes and proteomes of organisms. This has many medical and technological applications.
* Consideration of cellular control mechanisms underpins the content of this section. Students who have studied it should develop an understanding of the ways in which organisms and cells control their activities. This should lead to an appreciation of common ailments resulting from a breakdown of these control mechanisms and the use of DNA technology in the diagnosis and treatment of human diseases.

**7. EXPECTATIONS**

1. **What is expected of me?**

All students in Biology are required to attend all timetabled lessons and to turn up to lessons on time. All preparation work must be completed to ensure you can fully participate in the lesson. Absences must be reported to main reception and **students are expected to catch up on any missed work**.  Homework must be submitted by the due date.

**The Importance of Feedback**

Learning will not happen instantly and takes time; attending lessons is not enough, you also need to be working outside of class, to learn new information and consolidate learning. In the process, you will make mistakes but hopefully feedback will enable you to learn from these mistakes. It is better to make a mistake during the year and correct it, than make your first mistake in the actual exam. Feedback is essential for your learning and will consist of written (teacher marking), verbal feedback from your teacher, peer (where you feedback on someone else’s work in the class) and self (where you assess yourself) assessment.

**Weekly Independent Tasks (Homework)**

Homework does not necessarily need to be completed at home! You can use free periods during the day to complete these tasks outside of lessons. To keep a good work/life balance, you might like to treat College as an 08:45 to 16:15 day and use your free periods in the library completing tasks. This will minimise the work you need to complete at home and might make you more productive.

You should expect to complete 5 hours of Biology homework per week (in addition to your lesson times). If the homework only takes you 2 hours for a week, then you will have a further 3 hours to conduct further reading and consolidate learning.

 Homework tasks will consist of two types:

* *‘PREP WORK’:* Not all homework will be marked. It will be given a quick inspection in class and then will involve peer and self-assessment as part of a class exercise. This work will ‘prepare’ you for the lesson. Your teacher will check you have completed this work and your understanding will be checked during the lesson.
* *Past paper questions:* Throughout the year, for each unit, there will be a question pack of past exam questions set.
* *Consolidation:* You must consolidate your Biology as you go along. There is too much Biological theory to leave it all until the exams. Go through your class notes and make sure you understand what was covered, read text books, use the internet, go through your own and other Biology teacher’s power points.

**Benchmark Assessments**

Throughout each of the two years, there will be 4 benchmark assessments for each side of the course in November, January, March and April. These will be for 1 hour and consist of questions that you would see in the exam and will cover the most recent topics.

* WRITTEN FEEDBACK: Each benchmark assessment will receive substantial written feedback that relates directly to the assessment criteria of the exam board.
* VERBAL FEEDBACK: 1-2-1’s will occur in November and March after the benchmarks have been marked. These benchmark assessments will then feed directly into the student reviews (‘reports’) which get sent home to your parents.
* REFLECTION AND TARGET SETTING: After each assessment, students will be expected to reflect on the written feedback from their teacher and set themselves targets for improvement in the period in question. These targets will be stored on A3 sheets within the classroom and the students will write up their targets as ‘Learning Conversations’ onto the centralised computer system.
* FOLLOW UP WORK: Benchmarks are extremely important and should be treated like as if they are a public exam. They are an ideal opportunity to see how you are progressing and to get valuable feedback. You will make mistakes in the benchmarks and so the follow up work is to test whether you have learned from those mistakes to become better at the subject and exam technique.

**DEADLINES AND MOCK EXAM**

|  |  |
| --- | --- |
| **Year 1** | **Year 2** |
| The benchmarks will be set in the following windows of time and this is where you will receive your main written feedback from the teacher:* **1: Mid October**

This will feed into the November subject reviews* **2: Late December/ early January**
* **3: Late April/ Early May**
* **End of Year Exam: June**

Covering all topics covered so far | The benchmarks will be set in the following windows of time and this is where you will receive your main written feedback from the teacher:* **1: Mid October**

This will feed into the November subject reviews* **2: Late December/ early January**

**3: February** This will include essay practice* **Paper 1 mock: March**
* **Paper 2 and 3 mocks: May**
 |

**Other Considerations**

* *LATE POLICY:* In line with the ‘College Assessment Policy’, the department are under no obligation to provide feedback to a student who does not meet the internal deadlines for weekly independent tasks, benchmark assessments or coursework drafts. Please be warned that a failure to meet the final coursework deadline is the equivalent to missing the exam and it will be recommended that the student should be removed from the course. Students who fail to prepare adequately for the lesson as requested, may be excluded for part of the lesson and asked to work independently at the back of the classroom. A continued failure to meet ‘PREP’ work requirements will result in a reference to the pastoral team and a phone call home to parents.
* *RETURNED WORK:* Work will be assessed and returned within 10 working days of it being submitted.
* *PLAGIARISIM:*  Plagiarism is submitting another person’s written work as one’s own original work or using someone else’s idea without referencing the source or using pictorial work without permission or referencing the source. If there is a suspicion of plagiarism, the Head of Department and Senior Tutor will be informed and a meeting will take place. If a student is found guilty, they will be subject to disciplinary action by the College and the awarding body will be informed. Students should be aware that the College is subscribed to software designed to detect plagiarism.
1. **What can I expect?**
* 4½ hours of high quality teaching per week.
* Online quizzes.
* Range of practical activities.
* Access to all teacher power points and handouts.
* Regular homework, tests and packs of past paper questions.
* An online 1-2-1 booking system so you can get help from your teacher or the Head of Department at a time to suit you.
**8.** **WHAT ARE THE MAIN TEXTBOOKS USED IN THE DEPARTMENT?**

##  *AQA Biology AS / Year 1 Student Book, Glenn Toole, Susan Toole,* [*Oxford University Press (including Nelson Thornes)*](http://www.oxfordsecondary.co.uk/aqaalevelscience%20)*, ISBN-13: 978-0-19-835176-4*

*AQA AS Biology, Glenn Toole and Susan Tooles, Nelson Thornes.
ISBN 978-0-7487-8275-8*

*AQA Biology for AS, Bailey, Indge and Rowland, Hodder Education, ISBN 978-0-340-94599-5*

##  *Advanced Biology for you, Gareth Williams, Published by Nelson Thornes. ISBN 978-0-7487-5298-0*

*Copies are also available in the College Library.*

We also **strongly recommend** that all A/AS level students subscribe to the bi-monthly “Biological Sciences Review”. Aimed at A level students this greatly broadens and enriches the courses on offer. The department will arrange subscriptions for those students wishing to receive this publication.

In addition to the above texts, which all students will have, the College library has multiple copies of a number of other excellent A-level books. Each has its own strengths (and weaknesses!) and you should read the relevant sections of these books as the course progresses. You can only achieve your full potential if you make full use of the range of books available to you within the College.

**Excellent A level Biology Books which are very useful for background reading**

* + 1. A-level Year 1 & AS Biology for AQA, CPG (ISBN 978 1 78294 283 2)
		2. Bradfield, P. Dodds, J, Dodds, J.& Taylor, N.Longman 2001

(ISBN 0 582 42946 3)

**Advance Extension reading for potential medical and veterinary students**

(vi) **Biological Science**

 N.P.O. Green, G. W. Stour & D. J. Taylor, Vol 1 – 2

 Cambridge 1984 ISBN 0 521 28407 4 & 0 521 26951 2)

*Note : You may find Biological “Dictionaries” useful:*

**The Complete A – Z Biology Handbook 1997-**Indge, B.

 Hodder & Stoughton ISBN 0 340 663731

**9. I.T FACILITIES AND WEBSITES**

The College has a large number of computers available to students, all of which have high-speed Internet access. The number of useful web sites that you should visit is vast and grows daily, so no list can ever be exhaustive or complete. However, the following are particularly recommended: ‘Registration’ with a web-site means supplying a valid e-mail address, such as your College e-mail address:

http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402

An **essential** site to visit – giving the full Specification, past exam papers, mark schemes, Examiners’ Reports (good for finding out what annoys them!) and practical work guidance.

[http://www.biologyguide.net](http://www.biologyguide.net/)

This is run by a medical student and contains revision notes geared to AQA **Human** Biology, though a lot is directly relevant to your course too. Also includes many on-line MCQ revision tests and downloadable notes. This site requires registration to access all its features.

[www.schoolzone.co.uk](http://www.schoolzone.co.uk/)

An excellent site with many thousands of links to sites **each of which has been checked and recommended by teachers.** Covering the whole curriculum, this is an excellent ‘gateway’ site to educationally-useful websites and so avoiding the overload that Google supplies!

<http://www.spolem.co.uk/>

Silly name – excellent site, covering much of the syllabus with links to external resources.

[www.mrothery.co.uk/](http://www.mrothery.co.uk/)

Geared to AQA B biology, but this site has some useful notes and other resources, many of which have been duplicated elsewhere. Worth checking out, though.



1. **HEALTH & SAFETY**

**Lab Rules**

In accordance with the College Health & Safety Policy, your attention is drawn to the Biology Department's Laboratory Rules.

**Laboratories are potentially dangerous places. It is important that everyone acts carefully and thoughtfully to minimise the risk of accident or danger to themselves and other laboratory users. Risk assessments of the practical experiments have been carried out. If in doubt about any particular procedure or the course of an experiment, do not hesitate to ask for help.**

1. Students should not enter or work in laboratories without the permission of Biology Staff.

2. Whilst waiting outside a laboratory, please do not obstruct doorways or corridors.

3. When in the laboratory try to keep bags and other personal items from causing an obstruction.

4. Tie back long hair and flowing clothing.

5. Laboratory coats should be worn whenever chemicals are used or substances heated.

6. Safety glasses should be worn whenever chemicals are used or substances heated.

7. Eating and drinking in the laboratory are not permitted.

8. Move around the laboratory carefully.

9. At the end of a practical:

* place dirty apparatus where instructed
* leave the work areas clean and tidy
* report any damage or breakages
* wash hands

10. Prep rooms are not to be entered without permission.

11. When using microscopes do not attempt to clean lenses. Ask a technician to clean using the correct issue and cleaning agent.

12. IF IN ANY DOUBT AT ANY TIME, ALWAYS ASK FOR HELP OR GUIDANCE.

**Health & Safety Policy**

The Department endorses the College Health & Safety Policy. The tutors will carry out risk assessments to maintain a safe working environment with minimum risk to the students and themselves. The presentation of the course topics is not normally associated with specific hazards but your tutors will brief you should the need arise. Any visits associated with your course are also covered by risk assessments.

Students have a duty of care and are expected to follow the general College Health & Safety Guidelines displayed in each room and in the student diary, to ensure their own safety and that of others.

**11. EQUAL OPPORTUNITES**

The Department will follow the College Equal Opportunities Policies which aim to:

• Treat everyone with respect as an individual;

• Create a climate in which students feel valued and are encouraged to develop their skills,

 abilities, qualities and interests;

• Value the race, colour, gender, sexual orientation, social class, religion, culture, ability and

 age of every student;

• Develop a community in which tolerance, respect, courtesy, sensitivity and understanding

 are encouraged;

• Encourage students to achieve their potential and to raise their level of achievement.

**Disability Equality**

Information on students with disabilities is taken from the application form and notes from interviewers. This will be added to in the course of the academic year. An Inclusion register is produced by Learning Support and distributed to all staff. The College’s Equal Opportunities Committee has responsibility for establishing and implementing the Disability Equality Scheme.

For more information about all the key Godalming College policies, visit www.godalming.ac.uk/about\_us/publications/

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**Information contained in this Student Guide is correct at time of press**

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