AS level Biology

Introduction

Welcome to your AS or A-level Biology course. This Introduction is a guide to what you can expect from the course, and it will show you how to plan your study effectively. Take time to read it thoroughly before you start the lessons.

The course is designed to prepare students for two **Edexcel** specifications (syllabi):

- **A-level Biology B** (full name **Advanced GCE in Biology B**): course code **9BIO** (this is the first half)
- **AS Biology B** (full name **Advanced Subsidiary GCE in Biology B**): course code **8BIO**

The AS specification corresponds to the first half of the full A-level specification and to the first of the two course packs.

The AS specification is examined for the first time in **June 2016**, and the A-level is examined for the first time in **June 2017**.

Please note that Edexcel also produces another set of GCE Biology specifications (Biology A: Salters-Nuffield) which are taught and examined differently.

AS and A-level

In September 2015, new A-levels were introduced in most subjects. In these restructured courses, **the entire content is tested in a single set of exams right at the end of the two-year course.**

AS levels have been retained as separate qualifications, with an examination taken after one year of study.

Oxford Open Learning

The content of the first year of the A-level course is identical to the content of the AS course. Students intending to study the full A-level may, if they so wish, sit the AS examination after their first year of study, but this is not compulsory. Sitting the AS exam like this is a good idea if:

- you would like some exam practice, marked by the exam board, to help you see how you are getting on
- you would like a qualification and grade, beyond (I)GCSE, to put on your application forms when applying for further education courses.

However, bear two things in mind if you are intending to carry on to the full A-level:

- sitting the AS exam gives you no dispensation. **You still have to sit both years of the full A-level right at the end of the course, and none of your AS marks will be carried forward**
- you will have to pay an additional set of exam fees

You are advised to discuss whether or not to sit the AS exam with your Tutor and Student Adviser.

This file covers both the AS course and the first year of the two-year A-level course, which are identical. It is called AS Biology for convenience. The second year of the A-level course will be issued later as a separate file.

Modules and exam papers

AS Level

The **AS course** is examined by two 90 minutes exam papers. All of the material required is contained in the following two course modules, each of which covers the material for one of the exams:

- Module 1: Molecules, Cells and Reproduction (Exam title: Core Cellular Biology and Microbiology 8BIO/01)
- Module 2: Exchange, Transport and Diversity (Exam title: Core Physiology and Ecology 8BIO/02)

A-level

The **A-level course** is examined by three exam papers. All of the extra material required is contained in the two course modules in the second file. Each module covers the extra material needed for one of the first two exams:

- Module 3: Energy, Pathogens and Genetics (Exam title: Advanced Biochemistry, Microbiology and Genetics 9BIO/01)

- Module 4: Variation, Control and Ecosystems (Exam title: Advanced Physiology, Evolution and Ecology 9BIO/02)

Both of these papers also examine *all* of the AS content from the first year of the course.

The third paper is synoptic: it examines material from the entire course, and therefore from all four of the Oxford Open Learning modules (Exam title: General and Practical Principles in Biology 9BIO/03).

Accompanying Textbook

The textbook referred to throughout the AS course is:

Ed Lees, Martin Rowland and C J Clegg, *Edexcel A-level Biology 1* (2015, Hodder Education, ISBN: 9781471807343). It is sometimes listed instead as *Edexcel A-level Biology Student Book 1.*

You will need a copy of this textbook for every lesson, and you can buy one through the Oxford Open Learning website or direct from Amazon. A second, companion, volume will cover the second year of the A-level course.

The textbook is accompanied by a website which contains:

- answers to the Test Yourself questions, the Activity questions and the Exam Practice questions.
- glossaries of the meanings of new words, arranged chapter by chapter.

You can access this website at www.ool.co.uk/0112ba, or by using QR codes: see pages 288 – 289 of the textbook.

By using the textbook, the website and the course you will have excellent coverage of all the material in the specification.

Please note that you will not be able to access the Dynamic Learning website advertised in the textbook. This is a website, available only to institutions, which enables teachers to set students selected questions online. The material available in the Oxford Open Learning course more than makes up for this.

Other books are not essential, but you may like to look at other Biology textbooks from time to time. Several revision guides for A-level are also published in book form. If you feel that you would like to use a revision guide before the examination, ask your Tutor which one they recommend.

The textbook recommends a magazine called *Biological Sciences Review*: see page 282 and www.ool.co.uk/0003ba. This is written specifically for A-level

students and contains extension material at the right level. It is very good, but not at all cheap as an individual subscriber – consider it if you are looking for extension material and are prepared to pay.

2nd Year Course Text

The 2nd Year course requires the following text:

Ed Lees, Martin Rowland & C. J. Clegg: *Edexcel A Level Biology Student Book 2* (Hodder Education; ISBN: 978-1471807374)

Assumed background

The specification assumes that you have obtained at least a grade C in (I)GCSE Biology or Double Award Science, Each chapter of the textbook starts with a blue "Prior knowledge" box, followed by "Test yourself on prior knowledge" questions, so that you can revise this knowledge and assess whether you understand it.

All of the facts to be examined are covered during the Oxford Open Learning course. However, if you have not studied Biology (or Double Award Science) at (I)GCSE, or wish to firm up on this background, the following textbook is recommended. It is the book used in the Oxford Open Learning IGCSE Biology course:

Philip Bradfield and Steve Potter, *Edexcel International GCSE (9-1) Biology: Student Book* (2017, Pearson Education, ISBN: 9 780435 185084)

AS and A-level Biology also make use of some of the Chemistry studied at (I)GCSE. This is introduced at appropriate points in the course.

Finally, at least 10% of the examination marks are awarded for use of Mathematics in a biological context. The level required corresponds to the higher tier of GCSE Mathematics, and the skills tested are listed on pages 40 – 44 of the AS specification. Note that the skills printed in **bold** on these pages are only needed for the full A-level, not for the AS alone. This Mathematics will also be introduced at appropriate points of the course, and the whole of Chapter 13 of the textbook is devoted to it. Consult your Tutor if you feel that you need further help with mathematical aspects of the course.

Lesson Contents and Textbook References

You are advised to study the lessons in the order given, as the content has been written to enable you to develop your knowledge and skills as you progress through the course.

AS Level

The 1st Year course contains the following modules and lessons:

Module 1: Molecules, Cells and Reproduction

Lesson	*Title*	*Textbook reference: pages*
1	Life on Planet Earth	1 - 9
2	Carbohydrates	9 - 17
3	Lipids	2 – 4, 17 - 22
4	Proteins and Ions **TMA (Tutor-marked Assignment) A**	2, 26 – 34
5	Two Types of Cell	66 – 68, 78 – 88, 183 - 186
6	Microscopy Core Practical 2	68 – 77, 260 – 262, 267
7	DNA **TMA B**	48 – 57
8	Protein Synthesis	56 – 62
9	Mutations and Viruses	62 – 63, 88 – 90
10	Enzymes A **TMA C**	34 – 37 and 39 - 44
11	Enzymes B Core Practical 1	38 – 39, 261, 262 - 265
12	Cell Division Core Practical 3 **TMA D**	93 – 111
13	Sexual Reproduction Core Practical 4	116 – 132

Module 2: Exchange, Transport and Diversity

Lesson	*Title*	*Book reference*
14	Surface Area, Volume and Exchange	186 – 190, 192, 197 – 200, 204 – 206
15	Osmosis	190 – 197

	Core Practicals 5 and 6 **TMA E**	
16	Gas Exchange Core Practical 7	207 – 216
17	Circulation	224 – 233
18	Blood and Transport **TMA F**	216 – 220, 226 – 227, 234 – 235
19	Blood and Defence	226 – 227, 235 – 243
20	Plant Transport Core Practical 8 **TMA G**	246 – 257
21	Classification	138 – 153
22	Natural Selection	156 – 172
23	Biodiversity **TMA H** **TMA I**: AS Mock Exam Paper 1 **TMA J**: AS Mock Exam Paper 2	173 – 180

Year 2

This second file contains the following modules and lessons. You are advised to study the lessons in the order given, as the content has been written to enable you to develop your knowledge and skills as you progress through the course.

Module 3: Energy, Pathogens and DNA		
Lesson	*Title*	*Textbook reference: pages*
24	Aerobic respiration	1 - 8
25	Anaerobic respiration Core Practical 9	9 - 11
26	Photosynthesis 1 **TMA K**	19 - 27
27	Photosynthesis 2 Core Practicals 10 and 11	15 – 18, 28 - 30
28	Pathogens, antibiotics and endemic diseases	57 - 73
29	Response to infection **TMA L**	78 - 92
30	Microbial techniques Core practicals 12 and 13	34 - 53
31	Gene expression and stem cells **TMA M**	95 - 108
32	Gene sequencing and gene technology	112 - 135

Module 4: Genetics, Control and Ecosystems		
Lesson	*Title*	*Textbook reference: pages*
33	Mendelian genetics **TMA N**	139 - 154
34	Population genetics	158 - 170
35	Homeostasis and hormones Core Practical 14 **TMA O**	193 - 207
36	Nervous systems	173 - 186
37	Sight, synapses and control of heart rate	187 – 290 and 211 - 218
38	Osmoregulation and temperature control **TMA P**	219 - 234
39	Analysing ecosystems Core Practical 15	238 - 260
40	Changing ecosystems Core Practical 16	264 - 289
41	Revision of Maths and exam skills **TMA Q**: A-level Mock Exam Paper 1 **TMA R**: A-level Mock Exam Paper 2 **TMA S**: A-level Mock Exam Paper 3	Volume 1: 260 – 281 Volume 2: online chapters 15 and 16

Practical Work

The AS specification includes 8 Core Practicals. These develop a set of investigative skills which are tested in the main examination papers (there is no separate practical examination). A further 8 Core Practicals are specified for the second year of the full A-level course.

The examination papers will assume that you have done these practicals in a school laboratory. For most Oxford Open Learning students this will not be possible. However, the course covers this material by a combination of:

- home practicals, suitable for carrying out in the kitchen with normal household materials, and
- videos and photographs to view online.

The textbook also contains detailed descriptions of these practicals, with comments and questions to help you understand their significance.

Three of these AS Core Practicals (found in Lessons 6, 12 and 13 of the course) make use of a microscope. It will not be possible to do any version of these yourself unless you have a microscope, although you will be able to watch videos of them. If you can borrow or buy a microscope to use, it will give you greater hands-on experience. If you are willing to buy a microscope, we recommend **The New Apex Learner Microscope**. At the time of writing, this was on sale through Amazon for £62. This microscope is excellent value, providing optics as good as those found in many school microscopes.

The A-level (although not the AS) specification also lists a number of practical skills - such as the ability to use apparatus and to make and record observations - to be internally assessed by teachers. The skills are listed on pages 37 – 38 of the specification and the rules are listed on page 4. This assessment leads to a statement of "practical competency" or "Science Practical Endorsement" - simply "pass" - which is reported alongside the grade on the final A-level certificate. It will not be possible for you to be tested in this way, unless you attend a short practical course at a college specifically geared to obtaining this course component. However, it is not necessary to obtain such a statement or endorsement to obtain an A-level grade and certificate, and a lack of a pass in them has no effect on that grade. If you are concerned about this issue, or if you would like to attend such a practical course, you should discuss it further with your Student Adviser.

Internet Resources

As mentioned above, the textbook has an associated website on the Hodder Education site.

The course also uses several online videos including those found on YouTube at www.youtube.com.

A variety of other activities, some of which are designated as "Extension" activities, also make use of internet resources.

If you do not have an internet connection at home, consider building in regular trips to a library, or a café with free internet connection, as part of your study schedule.

The Structure within each Lesson: How to Study

Front Page

The front page of each lesson shows:

- The **Title**.
- **Aims** for the lesson, closely related to statements in the specification. These set out the position that you should reach after working

through the lesson. Keep these aims in mind while reading the lesson material, and review them at the end to make sure that they have been met.
- **Context**, giving section references to the specification.
- **Reading**, specifying pages to read from the textbook to reinforce and expand your learning.

Lesson notes

The notes which follow are an outline of the subject material to be studied in the lesson. Read the notes carefully several times, and carry out the activities, until you feel that you have understood the broad outline of the theory involved. When the notes refer you to a page in the textbook, look this up straight away.

Common misunderstandings to avoid, including those often seen in student responses in exam scripts, are highlighted thus:

Get it right!

The term "species" can be both singular and plural. So we can talk about "the human species" (singular) and "all the species in a locality" (plural).

Use of textbook

When the lesson has been completed, tackle the reading references. The textbook will deal with some subjects in greater detail, and, as with the notes, you will probably need to read the passages several times.

The textbook contains Test Yourself questions with answers on the accompanying website. Make sure that you answer all of these questions, check the answers, and follow up any mistakes or misunderstandings. At revision time you may want to return to these questions to test your knowledge.

The textbook also gives "Exam practice questions" at the end of each chapter. These are colour-coded and graded in order of increasing difficulty. The colours are explained on the page before page 1 of the textbook as follows:

Colour	**AS grade**	**A-level grade**
green	E - C	E - C
brown	C - A	C
purple	A	C - A

As you can see, the A-level questions are generally more difficult than the AS questions, even though both are set on the same material.

Suggested answers to these questions are provided on the accompanying website, and further commentary is provided on some of them at the end of each lesson.

Keywords

At the end of each lesson there is an alphabetical list of Keywords whose meanings you should now understand. These are also picked out in **bold** in the lesson notes.

The website accompanying the textbook also has a set of Glossaries (lists of words plus their meanings) arranged chapter by chapter.

Use these two resources in tandem to ensure that you can understand, spell and use the biological terms used in the course.

Command words

Examination questions usually begin with "command words", like "describe", "explain" and "calculate". These tell you what to do, and the sorts of things that marks will be (and will not be) awarded for.

These command words are crucial. Examination candidates often score no marks at all for lengthy paragraphs of correct Biology because they have ignored them and are not answering the question set.

A full list of the command words is given on pages 278 and 279 of the textbook, and on pages 45 – 46 of the AS specification. Refer back to these lists often, and use them every time you submit a TMA for marking. In this way, they will have become second nature by the time you sit the examination.

Activities

Activities are placed in the notes at relevant points. They are indicated thus:

Activity 1	An organelle has a diameter of 8.2 μm. Express this length in millimetres using standard form.

Where there is a pencil symbol, you should make your own notes on these Activities in the spaces provided. When (as here) the activity sets a question, an answer will be found at the end of the lesson.

Activities involving use of the internet may be indicated thus:

Activity 5	You can find an up-to-date assessment of this question by going to www.nasa.gov, and typing "Europa", "Titan", "Mars" and "Exoplanets" one at a time into the search box.
	

The textbook also has a number of Activity sections devoted to key topics. Make sure that you work through these carefully, writing down responses to the questions and checking them against the answers to be found on the website.

Self-Assessment Tests

Every lesson is concluded with either Self-Assessment Questions (SAQs) or a Tutor-Marked Assignment (TMA). Only tackle this when you feel that you have fully mastered the material in the lesson.

With the SAQs, first try to check your answers by referring back to the lesson, and then compare your answers with those given right at the end of the course for each year.

Tutor-Marked Assignments

After every few lessons there is a Tutor-Marked Assignment (TMA). Each TMA includes questions in AS and A-level examination style and will thoroughly check your understanding of the previous few lessons. You should send your answers to your tutor, who will return your marked script with a set of suggested answers.

Preparing for the exams

Do <u>not</u> leave reading this section until later!

Textbook Chapter 14, "Preparing for the exams", contains invaluable advice on your approach to study. You are strongly encouraged to read it now, before starting Lesson One, and then to refer back to it throughout the course. As well as studying the "command" words, note especially the following points:

1. Knowledge and skills

Only 35 – 37 % of the marks available are awarded for showing knowledge of "the **facts**", the items listed in "What you need to know" at the end of each lesson. The rest are awarded for a variety of **skills**, listed in "What you might be asked to do", which make use of these facts. Two things follow:

- Simply relying on the learning of facts will not be successful: even if perfect, on its own it can only gain you a grade U (that is, a fail).
- As skills must be developed over time, leaving all of the work on them until the last minute is a recipe for disaster.

A successful approach is to work at the skills diligently throughout the course, paying as much attention to them as to the biological information in the lessons.

2. Memory and forgetting

Look at Figure 14.3 on page 277 of the textbook. This shows the results of an experiment into how much learned material we forget over time.

The moral is this. If you have a certain number of hours available for learning, you will enter the exam room remembering more if you go over the material several times briefly, with gaps in between, rather than learning it all once intensively at the end.

So: do **not** leave all of your revision until the end of the course. You will certainly need to revise thoroughly for the examination then, but frequent revision throughout the course is also **essential**.

Note: this is not advising you to work *more* hours in total, but to work "*smart*".

The Mock Examinations

The last TMAs in the course are mock exams, consisting of two papers, which follow closely the format of the AS exam itself. You are recommended to study the online practice exams and mark schemes (see the section on Past Papers below) before attempting these TMAs and sending them to your tutor. It is also a good idea to restrict yourself to the time specified for each paper; this will give you valuable practice in writing under time pressure.

Chapter 14 of the textbook has helpful advice on doing examinations on pages 280 – 281. Read this before attempting the mock exam.

Checking the Specification

This course has been written to cover the contents of Edexcel's **AS Biology B** (full name **Advanced Subsidiary GCE in Biology B**: course code **8BIO**) and the first half of **A-level Biology B** (full name **Advanced GCE in Biology**: course code **9BIO**). These specifications are available to download from the Edexcel website. The easiest way to access them is to enter "edexcel" into a Google search box, and follow the links via "A-levels", "B" for Biology, "Biology B (2015)", "Specification", "AS" and "Exam Materials".

You should look particularly at:

- knowledge, skills and understanding on pages 3 -15
- the assessment objectives and weightings on page 18
- the list of required mathematical skills on pages 40 - 44
- the list of command words used in examinations on pages 45 - 46.

The AS Examination

See also Modules and Exam Papers above. More details of the A-level examination will be given in the Introduction to the second half of the course.

The examination for the AS course (optional for A-level students) consists of two papers. The testing of investigative and mathematical skills is built into both of the papers.

AS Paper 1: Core Cellular Biology and Microbiology (Paper code: 8BIO/01)

This is a 90 minute examination paper, which tests the content of Module 1: Molecules, Cells and Reproduction. The total number of marks is 80, 50% of the overall total. There will be a range of multiple-choice, short answer,

open-response, calculation and extended writing questions All of the questions are compulsory.

AS Paper 2: Core Physiology and Ecology (Paper code: 8BIO/02)

This is a 90 minute examination paper, which tests the content of Module 2: Exchange, Transport and Diversity. The total number of marks is again 80, 50% of the overall total. There will again be a range of multiple-choice, short answer, open-response, calculation and extended writing questions. All of the questions are again compulsory.

A-level Exam Papers

If you do the *full* A-level, there are three written papers.

Paper 1 (1 hour 45 minutes; 90 marks) is worth 30% of the A-level. It assesses Module 3 from the second year of the course, plus the whole of the AS course.

Paper 2 (also 1 hour 45 minutes; 90 marks) is also worth 30% of the A-level. It assesses Module 4 from the second year of the course, plus the whole of the AS course.

Paper 3 (2 hours) (120 marks) is worth 40% of the A-level. It assesses the whole of the two-year course, with a special emphasis on experimental design and interpretation.

You should read the specification throughout the course, and more especially when you are revising, to check that you have covered everything. Keep a copy on your computer or print it out.

Past Papers

A sample set of exam papers and mark schemes is available for download from the Edexcel website at www.ool.co.uk/0013ba. The sample exam papers are called SAMs (Sample Assessment Materials).

With examinations on this new specification being set for the first time in 2016, there is are relatively few past papers available. However, a collection of past papers from the old (pre-2015) specification, with mark schemes, is available online. Enter “Edexcel past papers” into a Google search box and follow the links. Please note: “Pearson” is the publishing house for Edexcel materials.

Please liaise with your tutor concerning news of the availability and use of past papers.

Your Tutor

You have a lot of resources to help you in your studies: your course blue file, your textbook, internet resources and your tutor. You should make good use of your tutor to help you with any difficulties that you may have during the course, especially at the start.

And finally... the best of luck with your studies!