The Crossley Heath
Bridging the Gap

Helping you make the transition between
GCSE and A-Level Biology

Contents

1. Introduction

2. Expectations

3. Biology topics needed for A level Biology.

4. Ideas for what to work to do

5. Techniques for answering exam questions

6. Practice GCSE exam questions

7. Mark scheme for practice GCSE exam questions

8. Suggested book list

9. Links to presentaions

Introduction

The transition between GCSE and AS-level is large, even for pupils who have completed a single GCSE in Biology. If you have completed the Trilogy award science then the transition is even harder.

This objective of this booklet is to help you make the transition to A level Biology more easily.

You will be given advice throughout this booklet on areas of the course you are expected to know about. Many of the areas are not included in the Trilogy GCSE but included in the Separate Science GCSE, all the topics will be relevant to A-level Biology. When you start year 12, at a suitable time indicated by your teacher, you will be expected to sit a test paper made of questions on the topics on the next sheet. Practise GCSE exam questions have been provided in this document to help you prepare for the test.

Expectations

You are expected to work through the topics listed on the next page over the remainder of the summer holidays. It is expected that you spend at least 4 hours reviewing the relevant material and preparing for the test. It is your responsibility to ensure you are adequately prepared for the test paper. This may mean you need to spend more than 4 hours if you are finding the subject matter more difficult. Remember that that the material you learn now will help you improve your understanding of A-Level. We would like you to aim to achieve a B grade in the test paper you are given. If you achieve a lower grade the Biology department will provide you with further support. This is likely to include you coming in for extra sessions during lunch times.
(N.B. Don’t forget the reading list and web links at the end of this document.)

Topics you will need to know include:

Dissolved substances
- Ideas of diffusion, osmosis and active transport
- Effectiveness and adaptation of exchange surfaces using examples of villi and alveoli

Gaseous exchange
- The function of the lungs and ventilation

Exchange systems in plants
- Leaves, roots, their surface areas, water vapour and guard cells surrounding the stomata

The blood system
- Structure of the heart
- Arteries, veins and capillaries

The blood
- Role of red blood cells in transporting oxygen

Transport systems in plants
- Xylem and phloem
- Transpiration

Homeostasis
- Kidney failure and diabetes
- Water and ion content of the body
- Blood glucose levels
- Control of body temperature
- The structure of the eye
- Plant hormones

Removal of waste and water control
- Removal of CO_2 and urea from the body

Sugar control
- Insulin, glucagon and what they do in relation to glucose and blood
- Type I diabetes

Food production
- Biomass
- Efficiency of food production
- Food test practicals

Microbiology
- How to culture microbes
- The effect of antibiotics on bacterial growth
- Production and use of monoclonal antibodies

Variation and evolution
- Advantages and disadvantages of sexual and asexual reproduction
- DNA structure
- Cloning
- Theory of evolution & speciation

Ecology
- Trophic levels,
- Pyramids of biomass

Resources to help you:

BBC Bitesize
Alternatively you may find it useful to get a GCSE level text book to help you. Often these are available from your local library. You can either use:

- AQA Science GCSE Biology: Third edition by Ann Fullick (2016 edition).
- CGP Head start to A- Level Biology (This book usually costs around £4-5)

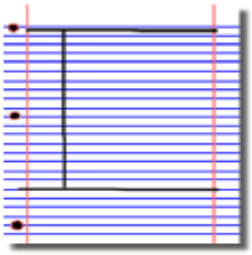
Activities to do

- **Write notes**
  Work your way through the topics you need to know outlined above and write summary notes about each section. Make sure you understand what you are writing. Don't just copy from the textbook, try to convert it into your own words so you are actively trying to learn each topic.

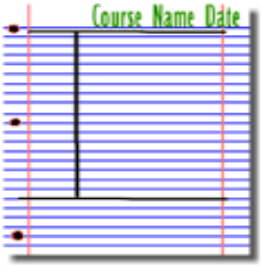
- **Revise the topics**
  Make your revision an active process. If you just read your notes through this will probably not be enough for you to remember all the details. Try some of the following tactics until you find a system that works for you. Use a different strategy for each topic:

1. Make Cornell notes

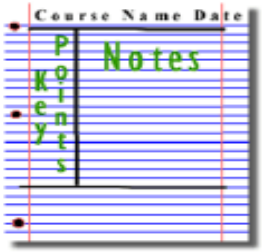
1. Divide your page into three sections like this



2. Write the name, date and topic at the top of the page

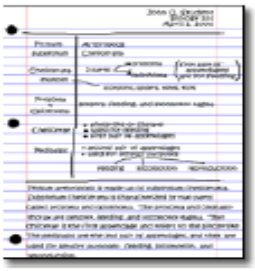


3. Use the large box to make notes. Leave a space between separate idea. Abbreviate where possible.



4. Review and identify the key points in the left hand box

5. Write a summary of the main ideas in the bottom space



2. Draw a mind map or concept map. This is similar to a spider diagram joining all ideas about particular topic together. Include key words you must know.
3. Read through the text then go away and do something else. After 5 a short period of time return to your desk and see how much you can remember by writing everything down. Then compare to your original notes. Keep doing this until you can remember virtually all of the information.
4. Write yourself some test questions with model answers. You could do this on cards with the question on one side and the answer on the other. Get a friend or family member to test you.
5. Go on to the AQA website (www.aqa.org.uk) and download some more practice exam questions. The exam board also provides the mark scheme so you can mark your own papers.

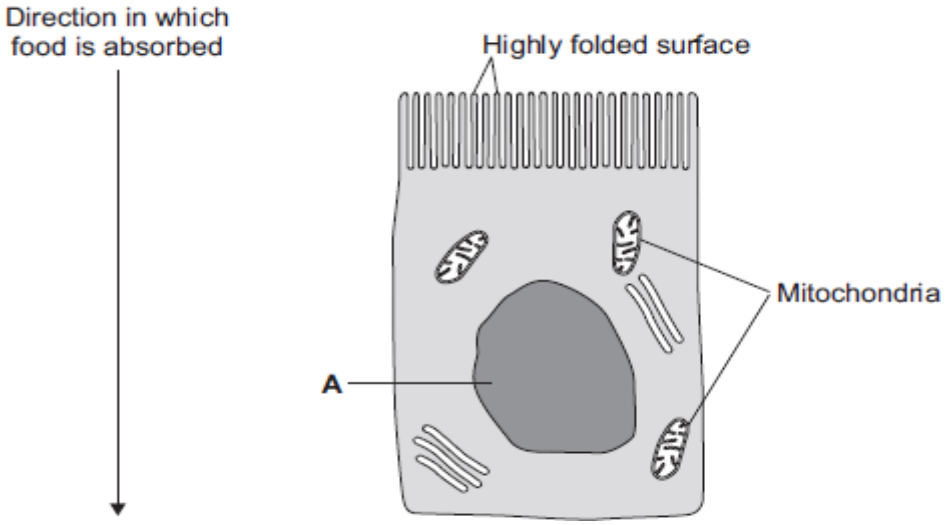
Complete the practice GCSE questions
When you are confident you have completed a significant amount of revision try the practice GCSE questions below. The mark scheme is at the end of the questions so you can mark the work yourself or get a family member to mark the answers (this will hopefully avoid bias!).
After the questions have been marked you should then go back through the answers using the examiners' report (at the end of the mark scheme) and highlight those areas you have not done as well in. It is probably worth revising these topics again. Alternatively it could be your exam technique. Some ideas for helping you improve your exam technique are provided below.

Techniques for answering exam questions

1. Check how many marks the question is worth. If it is worth 2 marks you have to make two separate points to get both marks.
2. On any questions that ask you to *describe* the graph you should start by referring to the x-axis (which will be the independent variable) and say how this changes the variable on the y-axis. If there is a change in the trend of the line then you will need to refer to this. Finally, to get high marks on graph questions you should give figures from the graph.
Example answer: In the first 10 minutes (this tells you the independent variable is time) the rate of the reaction (the dependent variable) increases to [insert figure here]. The rate of reaction then starts to slow down from 11 minutes onwards until it reaches [insert figure here]. By 20 minutes the rate of the reaction has completely stopped.
3. If you are asked to ***explain*** a graph you need to use your scientific knowledge, i.e you will need to use scientific key words in your answer. The examiner is expecting you to tell them *why* something is happening.
4. If you are given an ***Evaluate*** question you need to work out advantages and disadvantages of the topic being asked by the examiner. You also need to give a conclusion. Your conclusion can't just say 'I think this is a good/bad idea'. You need to write a one sentence conclusion which summarises your perspective e.g. 'This is a good idea because the advantage of … far outweighs the disadvantage of …'
5. Avoid using words like 'it'. Say what 'it' is. If the examiner is unsure what you are referring to they will automatically mark it wrong.
6. Don't panic if you see a question you don't believe you have learned. Sometimes examiners throw these kinds of questions in and expect you to be able to *apply* your knowledge. Usually this kind of question will start with '***Suggest***…'. Read the question very carefully and highlight the key words. Ask yourself: what part of this course is this likely to link to. Then try to answer the question.

Practice GCSE Questions (Print these out and bring them to your first Biology lesson)

Q1. The image below shows an epithelial cell from the lining of the small intestine.



(a) (i) In the image above, the part of the cell labelled **A** contains chromosomes.

What is the name of part **A**?

.....

(1)

(ii) How are most soluble food molecules absorbed into the epithelial cells of the small intestine?

Draw a ring around the correct answer.

diffusion **osmosis** **respiration**

(1)

(b) Suggest how the highly folded cell surface helps the epithelial cell to absorb soluble food.

.....

.....

(1)

(c) Epithelial cells also carry out active transport.

(i) Name **one** food molecule absorbed into epithelial cells by active transport.

..... **(1)**

(ii) Why is it necessary to absorb some food molecules by active transport?

.....

.....**(1)**

(ii) Suggest why epithelial cells have many mitochondria.

.....

.....

.....

.....

(2)

(d) Some plants also carry out active transport.

Give **one** substance that plants absorb by active transport.

.....

(1)
(Total 8 marks)

2. As they go higher up a mountain, mountaineers take less oxygen into their bodies with each breath, as shown in the table below.

		MILLIGRAMS OF OXYGEN INTO **BLOOD** WITH EACH NORMAL BREATH	
HEIGHT	MILLIGRAMS OF OXYGEN TAKEN INTO **LUNGS** WITH EACH NORMAL BREATH	AT FIRST	AFTER STAYING AT 4500 METRES FOR TWO WEEKS
sea-level	300	60	90
1500 metres	250	50	
3000 metres	200	40	
4500 metres	150	30	45

(a) (i) How does the amount of oxygen taken into the blood with each breath vary with the amount of oxygen breathed into the lungs with each breath?

.....

(2)

(ii) Use the idea of diffusion to explain why the amount of oxygen taken into the blood varies in this way.

.....

.....

(1)

(b) (i) How does staying at an altitude of 4500 metres for two weeks affect the mountaineers?

.....

(2)

(ii) Suggest an explanation for this.

.....

.....**(1)**

(iii) Add the two missing figures to the right-hand column of the table.

(2)

(Total 8 marks)

Q3.(a) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

..... **(1)**

(b) In a healthy person, insulin prevents high levels of glucose in the blood.
To make insulin, cells in the pancreas need amino acids.

Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to amino acids that cannot be stored in the body.

.....

.....

.....

.....

.....

.....

.....

.....**(3)**

(Total 4 marks)

Q4. The photograph shows a red blood cell in part of a blood clot. The fibres labelled **X** are produced in the early stages of the clotting process.

(a) Suggest how the fibres labelled **X** help in blood clot formation.

.....

(1)

(b) The average diameter of a real red blood cell is 0.008 millimetres.
On the photograph, the diameter of the red blood cell is 100 millimetres.

Use the formula to calculate the magnification of the photograph.

Diameter on photograph = Real diameter × Magnification

.....

.....

.....

Magnification = ...

(2)

(c) Some blood capillaries have an internal diameter of approximately 0.01 millimetres.

(i) Use information given in part (b) to explain why only one red blood cell at a time can pass through a capillary.

.....

(1)

(ii) Explain the advantages of red blood cells passing through a capillary one at a time.

.....

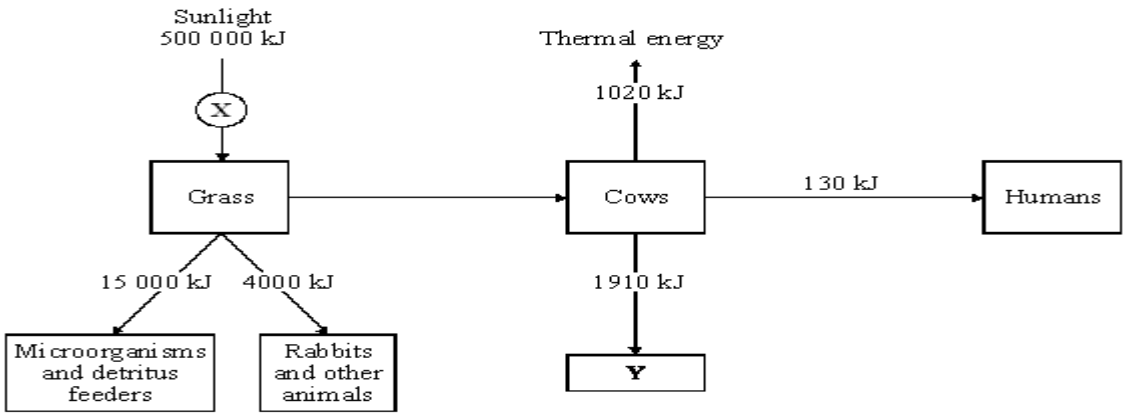
.....

.....

.....

.....**(3)**

Q5. The diagram shows the amounts of energy that are transferred, over a period of time, through some living things in a grassland habitat.



(a) Calculate the amount of energy transferred from the grass to the cows.

.....

.....

Amount of energy = ... kJ **(1)**

(b) **X** is a process in plants.

(i) Calculate the amount of energy usefully transferred by process **X**.

.....

.....

.....

Amount of energy = ... kJ **(1)**

(ii) Name process **X**.

..... **(1)**

(c) Give **two** ways in which energy is 'lost' from the cows at **Y**.

1 .....

.....

2 .....

..... **(2)**

(d) Describe how hormones can be used to improve the efficiency of producing food from plants.

.....

.....

.....**(2)**

(Total 7 marks)

Q6. Producing food for humans affects the environment.

(a) Increasing the efficiency of human food production will help to feed an increasing world population.

Give **three** ways in which the efficiency of human food production can be increased.

For each of these ways explain why the efficiency of food production is increased.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

(6)

(b) Organic foods have become popular in recent years. They are grown without the use of artificial pesticides and fertilisers. A government report in 2007 showed that the production of some organic foods is more damaging to the environment than their non-organic equivalents. However, supporters of organic farming claim that it is better than non-organic farming in conserving biodiversity and is better for the soil.

(i) What is meant by biodiversity?

.....

.....

(1)

(ii) Why is it important to conserve biodiversity?

.....

.....

(1)

(c) The table compares some of the effects of non-organic and organic food production on the environment.

Environmental effect and units per kilogram of production on farm	Sheep meat		Chicken		Milk	
	Non-organic	Organic	Non-organic	Organic	Non-organic	Organic
Energy used (in MJ)	23	18	12	16	2.5	1.6
Global warming potential (in grams of CO_2 equivalent)	17 400	10 100	4750	6680	1060	1230
Freshwater pollution potential by fertiliser (in grams of phosphate equivalent)	200	584	49	86	6.3	10.3
Land use (in hectares)	0.0014	0.003	0.64	1.4	0.001	0.002

Use data from the table to answer these questions.

(i) What additional data is needed to calculate which method of food production is most damaging to the environment?

.....

.....**(1)**

(ii) How would a complete change from non-organic to organic farming affect the area of land used for food production.

.....

.....**(1)**

(iii) Raising sheep has a greater global warming potential than raising chickens, per kilogram of meat produced.

Suggest an explanation for this.

.....

.....

.....

.....**(2)**

(iv) Give **two** ways in which global warming might affect species on a worldwide scale.

.....

.....

.....

.....**(2)**

(Total 14 marks)

Q7.

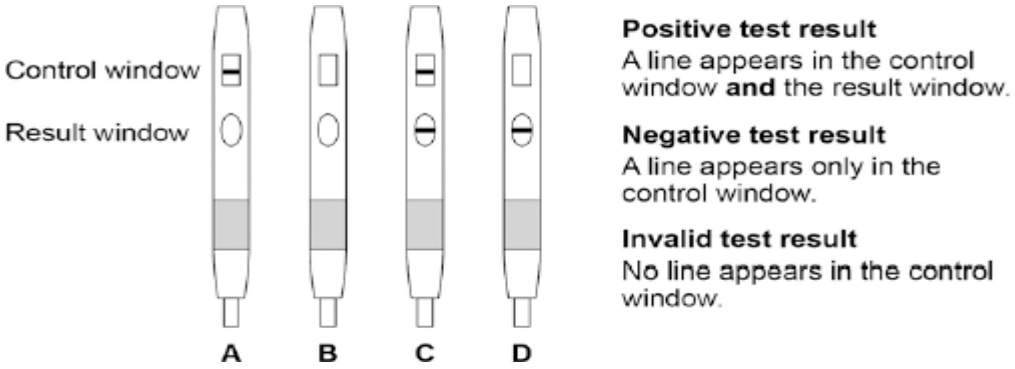
Monoclonal antibodies are used to measure the levels of hormones in the blood.

Pregnant women produce the hormone HCG.

HCG is excreted in urine.

Figure 1 shows four pregnancy test strips.

Figure 1



(a) Which test strip shows a negative test result?

Tick **one** box.

A ☐ B ☐ C ☐ D ☐

(1)

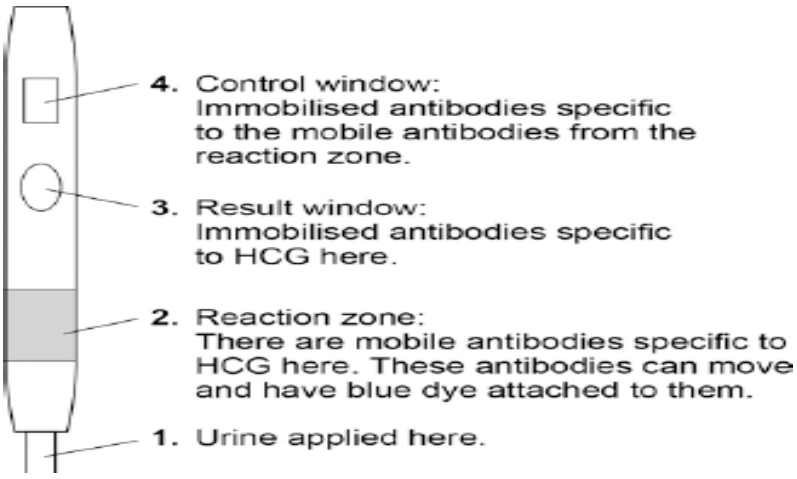
(b) Monoclonal antibodies are used for pregnancy testing.

Give **one other** use of monoclonal antibodies.

_____ **(1)**

(c) **Figure 2** shows the parts of a pregnancy test strip.

Figure 2



The pregnancy test strip will show a positive test result when a woman is pregnant.

Explain how the pregnancy test strip works to show a positive result.

_____

(6)

(Total 8 marks)

Q8

Darwin's theory of natural selection states that all living things have evolved from simple life forms.

(a) Use the correct answer from the box to complete the sentence.

three billion	**three million**	**three thousand**

Darwin's theory states that life began on Earth _____ years ago.

(1)

(b) Life evolved due to changes in genes. Changes in genes cause variation.

Complete the sentences.

Changes in genes are called _____ .

Individuals with characteristics most suited to the environment are more likely

to survive and _____ .

(2)

(Total 3 marks)

Q9

(a) Which of the following is the **best** definition of a species?

Tick (✓) **one** box.

Organisms with many features in common ☐

Organisms that live in the same habitat and eat the same food ☐

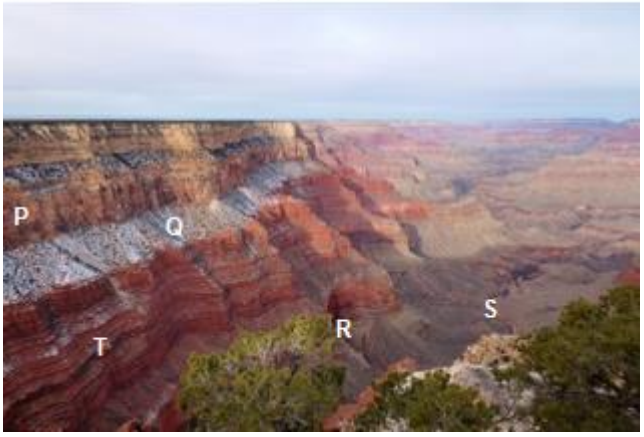
Organisms that reproduce together to form fertile offspring ☐

(1)

(b) **Figure 1** is a photograph of the Grand Canyon.

The layers of rock contain fossils.

Figure 1



© Sumikophoto/iStock/Thinkstock

Scientists found five fossils of different species of animal, **P**, **Q**, **R**, **S** and **T**, at the positions shown in **Figure 1.**

(i) What is the evidence in **Figure 1** that animals **P** and **Q** were alive at the same time?

_____

_____

(1)

(ii) Was animal **R** alive at an earlier time or at a later time than animals **P** and **Q**? Give the reason for your answer.

_____

_____

(1)

(iii) Which **two** of the following would be evidence that animal **T** may have evolved from animal **S**?

Tick (✓) **two** boxes.

The fossils of animals **S** and **T** have many features in common, but **T** is more complex than **S**. ☐

The fossils of animals **S** and **T** are the same size. ☐

The fossils of animals **S** and **T** have the same skin colour. ☐

The fossil of animal **S** was found in a deeper layer of rock than the fossil of animal **T**. ☐

The fossil of animal **T** is more similar to the fossil of animal **R** than to the fossil of animal **S**. ☐

(2)

(c) **Figure 2** shows two species of ground squirrel, **W** and **X**.

Figure 2

Squirrel W

Squirrel X

Squirrel **W** lives on the high ground to the south of the Grand Canyon.

Squirrel **X** lives on the high ground to the north of the Grand Canyon.

The land to the north of the Grand Canyon is about 300 metres higher than the land on the south side. The north side also has lower winter temperatures and has more rain and snow than the south side.

(i) The two species of squirrel are very similar.

Describe **one** way, which you can see in **Figure 2**, in which squirrel **X** is different from squirrel **W**.

_____

_____

(1)

(ii) The Grand Canyon was formed about 6 million years ago.

Explain how the two different species of squirrel could have developed from a common ancestor.

(6)

(iii) Squirrels **W** and **X** are separate species, but they are still very similar.

Suggest why the two species have **not** become more different over time.

(2)

(Total 14 marks)

ANSWERS to Practice GCSE Questions

M1.(a) (i) nucleus

1

(ii) diffusion

1

(b) increases / larger surface area (for diffusion)
ignore large surface area to volume ratio

1

(c) (i) sugar / glucose
accept amino acids / other named monosaccharides

1

(ii) against a concentration gradient
or
from low to high concentration

1

(iii) (active transport requires) energy

1

(from) respiration

1

(d) minerals / ions
accept named ion ignore nutrients
do not accept *water*

1
[8]

M2. (a) (i) increasing one increases the other
gains 1 mark

but
they increase in proportion/ 1/5 taken in at first / 3/10 taken in after 2 weeks
gains 2 marks

2

(ii) *idea that* more/faster diffusion with higher concentration
for 1 mark

or
with more oxygen particles/molecules (in same space)

1

(b) (i) can take more oxygen from (the same) air/changes from 30 to 45/increases by 15
gains 1 mark

but
takes 50% more or 1.5 times as much
gains 2 marks

or

increases by 15 mg breath

2

(ii) more red blood cells develop
or
more haemoglobin in the blood
(not just 'acclimatises')
for 1 mark

1

(iii) 75
60
each for 1 mark

2
[8]

M3.(a) Pancreas
allow phonetic spelling

1

(b) any **three** from:
max 2 *if any one process goes on in wrong organ*

- (amino acids) broken down
- (amino acids) form urea
- (amino acids broken down / converted **or** urea formed) in liver
- (urea / broken down amino acids) removed / filtered by kidney

*do **not** allow amino acids filtered / removed by kidney*

- (urine / urea / broken down amino acids) stored / held in bladder

*do **not** allow amino acids stored / held in bladder*

3
[4]

M4. (a) hold cells together **or** prevent flow of cells **or** trap cells

1

(b) 12500
if correct answer, ignore working / lack of working

$\frac{100}{0.008}$ *for **1** mark*

ignore any units

2

(c) (i) size RBC approximately same size capillary **or**
no room for more than one cell **or**
only one can fit **or**
RBC is too big
allow use of numbers
*do **not** accept capillaries are narrow*

1

(ii) more oxygen released (to tissues) **or**

more oxygen taken up (from lungs)

1

and any **two** from:

- slows flow **or** more time available
- shorter distance (for exchange) **or** close to cells / capillary wall
- more surface area exposed

2
[7]

M5. (a) 3060 (kJ)

1

(b) (i) 22060 (kJ)

1

(ii) photosynthesis

1

(c) faeces / undigested food

reference to movement and respiration are neutral

urine / urea

2

accept excretion / waste / droppings if
both of the mark points are not gained

(d) any **two** from

- control ripening
- herbicides
- prevent over ripening in transport
- stimulate root growth

other growth references are not neutral

- use in tissue culture to produce large numbers of plantlets

2
[7]

M6. (a) 1 reduce the number of stages in food chain

1

because there are energy losses at each stage in a food chain

1

2 keep animals indoors

1

so that less energy is used in maintaining body temperature

1

3 restricting movement of animals

1

so that less energy is used in movement

1

NB responses are in pairs

(b) (i) the range of species in a habitat

1

(ii) conserved organisms may have future uses

1

(c) (i) the total mass of each type of food produced

1

(ii) increase by factor of approximately 2 for each

1

(iii) greater carbon dioxide output

1

since takes longer to produce sheep meat

1

(iv) change in migration patterns

1

changes in distribution/loss of habitat

1

[14]

Q7.

(a) **A**

1

(b) any **one** from:

- identify / locate specific molecules / other hormones
- locate blood clots
- diagnose / treat some cancers

1

(c) (as) urine passes through reaction zone

1

HCG hormone binds to the mobile HCG antibody (in the reaction zone)

1

(passes up the stick) HCG hormone binds to the immobilised HCG antibodies in the results zone

1

(the other) antibodies which do not attach to HCG

1

bind to antibodies in control zone

1

blue dye appears in both control and results zones (to show positive result)**1**

[8]

Q8.

(a) three billion

1

(b) mutation(s)

1

breed / reproduce

in this order only

allow pass on their genes

1

[3]

Q9.

(a) organisms that reproduce together to form fertile offspring

1

(b) (i) fossils of **P** and **Q** in same stratum / layer / level / height

1

(ii) earlier − fossil in deeper layer / further down

1

(iii) the fossils of animals **S** and **T** have many features in common, but **T** is more complex that **S**

1

the fossil of animal **S** was found in a deeper layer of rock than the fossil of animal **T**

1

(c) (i) **X** has white tail / shorter tail

*allow other points eg **X** has furrier tail / smaller feet / is furrier*

or

***W** has sharper claws / **W** has larger claws*

1

(ii) two (ancestral) populations separated / isolated (by geographical barrier / by canyon / river)

1

genetic variation (in each population) / different alleles / different genotypes / (different) mutation(s)

1

different environmental conditions / example described

allow abiotic or biotic example

1

the better adapted survive / natural selection occurs

allow survival of the fittest

ignore they adapt to the environment

1

so (different / favourable) alleles / genes passed on (in each population)

1

eventually two types cannot interbreed successfully

allow to produce fertile offspring

1

(iii) any **two** from:

- environments similar / described

  allow example, e.g. similar predator(s) / food / climate
- therefore similar adaptations / features / phenotypes suit

  accept suitable named feature
- original ancestor already well adapted

  ignore reference to not enough time for evolution.

2

[14]

Examiners' Report on the Practice Questions

E1.(a) (i) The majority of students correctly identified the nucleus in the epithelial cell.

(ii) Nearly all of the students knew that soluble food molecules were absorbed by diffusion. Osmosis was the most common incorrect answer.

(b) A highly folded cell surface increases the surface area of a cell. Many students lost a mark in this question for failing to use comparative wording, hence a 'large surface area' did not gain a mark, whereas a 'larger surface area' did. Some students referred to the surface area to volume ratio which was not relevant.

(c) (i) Over half of students know one food molecule absorbed by active transport. Glucose and amino acids were the most common answers. Other correctly named monosaccharides were accepted but protein was not allowed.

(ii) Just over half the cohort were able to state why some food molecules area absorbed by active transport. Students most commonly said that absorption was against the concentration gradient. Some students elaborated in more detail to state that there was a higher concentration of molecules in the cell or blood compared to the gut.

(iii) Fewer than half the students correctly described that energy released from respiration is required for active transport. Many students lost at least one mark by saying that respiration produces or makes or creates energy. Energy may only be released or transferred or provided by respiration.

(d) Only two thirds of the cohort was able to state one substance that plants absorb by active transport. The most common answer was 'mineral ions' but many also named an ion, most commonly nitrates. The most common incorrect responses were water, nutrients, nitrogen, pollen, oxygen and proteins.

E3.(a) Most students knew that the 'pancreas' is the organ that monitors blood sugar concentration. Examiners were willing to accept some variation in spelling. Common incorrect answers were 'liver' and 'kidney'.

(b) Many students struggled here. Some believed that excess amino acids were simply reabsorbed and used in the body. Others were quite confused about the roles of the liver, kidney and bladder in the process, sometimes suggesting that the liver filters out amino acids which are then converted into urea in the kidney. 'Urea' was sometimes confused with 'urine' as if they were the same substance, so urine was described as passing around in the blood stream. Others believed that somehow these amino acids are returned to the digestive system and passed out 'in the faeces'. Good students knew the story well and would often have gained more marks had they been available.

E4. This question discriminated well at the A/B boundary. For the most part, candidates operating at all levels responded well, with the exception of part (c)(ii).

(a) Despite the large photograph, some candidates answered without reference to it, and often became tangled in poor descriptions of other factors involved in blood clotting.

(b) The calculation was, almost without exception, correctly completed, and candidates went on to use the information well in answering part (c)(i).

(c) (ii) This part proved to be more challenging, with few candidates referring to the slow passage of blood cells through capillaries, and the consequent improved loading/unloading of oxygen at various points. A number of candidates suggested that red blood cells transport almost every component of the blood. However, when these same candidates answered in part (d) they confined their descriptions exclusively to oxygen.

E5. (a) Surprisingly few of the weaker candidates realised that they simply had to add up the three numbers leading from the box labelled ‘cow’.

(b) Only the better candidates recognised which figures to manipulate, although almost all correctly gave photosynthesis.

(c) Only a small minority of candidates gave both faeces and urea / urine. Most failed to realise that energy is transferred from movement as thermal energy and that this is included in the 1020 kJ on the diagram.

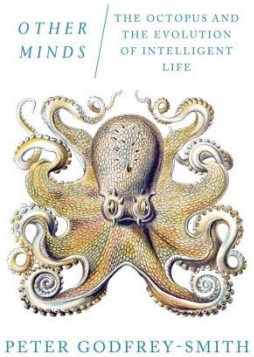
(d) The use of plant hormones in food production was not well known. Only a minority of candidates answered correctly in terms of fruit ripening both at the crop stage and during transport. Many candidates were content to state that ‘it makes plants grow better’. Others confused insecticides with herbicides.

Got some spare time before September?

If you wish to extend yourself beyond GCSE, try reading one of these recommended books.

The following list is designed to help you choose. There have been many great Biologists throughout time, making important discoveries as well as sharing their knowledge with others. As you have chosen to do A level Biology you will find reading about their work both enjoyable and it will enable you to see more clearly the relevance of the work you will do in lessons. There is so much more to Biology than learning lots of facts for an exam. The reviews are mainly written to help sell the book so make sure you choose carefully!

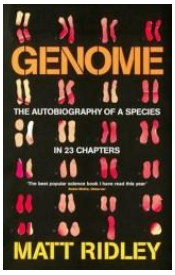
Other Minds: The Octopus and the Evolution of Intelligent Life



This is one of my favourite books and a must for those interested in evolutionary Biology (Mrs Lea)

News paper reviews say: ‘Brilliant’ Guardian ‘Fascinating and often delightful’ The Times What if intelligent life on Earth evolved not once, but twice? The octopus is the closest we will come to meeting an intelligent alien. What can we learn from the encounter?

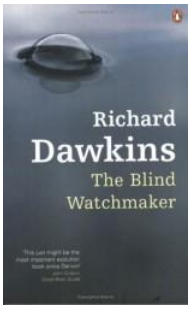
Genome



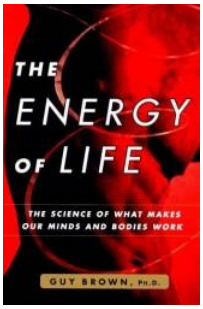
Probably the BEST popular introduction to modern genetics. Ridley’s structure is wonderfully simple – 23 chapters to cover the 23 human chromosomes – but he uses it brilliantly. We start with Chromosome number 1 and a gene that we share with every other life form, including, probably, the very first living organism.

The Blind Watchmaker

Every A-level Biology student should read at least one of Dawkins’ books, and this may be the best place to start. Readable and provocative, you can accuse Dawkins of many things, but he is never dull.

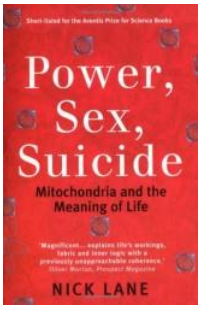


The Energy of Life

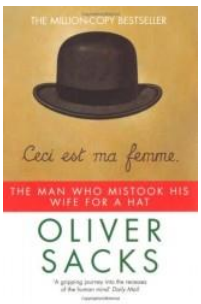


An enthralling account of the electricity that keeps you alive and one of the best popular science books ever written. It complements the A2 Respiration topic perfectly and makes all kinds of complex issues immediately accessible.

Power, sex, suicide: mitochondria and the meaning of life



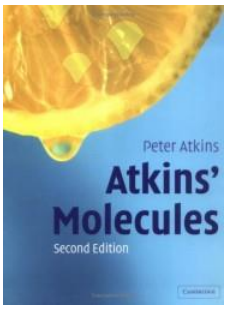
Not an easy read, but awesome in scope and mind-boggling in its implications. From the very origins of mitochondria in the murky bacterial soup, to the dangers of keeping DNA next to this bubbling furnace of free radicals, and the role of mitochondria in apoptosis. Includes all the latest research and ideas in the field, and is essential reading for anyone who's serious about Oxbridge.



The Man Who Mistook His Wife For a Hat

Sack's case studies make fascinating reading and this is the most famous, and probably the most accessible, of his books. The chapters are interesting for what they reveal about the human brain and how it works, but the stories are so much more than just dry case histories. Sachs never loses sight of the fact that his patients, for all their bizarre symptoms, are human beings, and his compassion is evident throughout. Extraordinary and moving, this book may change the way you view the world.

Atkin's Molecules



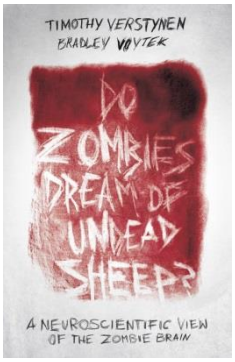
This sounds terribly dry. A book about molecules? Ugh. But try this extract from the section of pheromones:

"Another component of male underarm sweat provides an engaging story. This component is a hormone molecule that closely resembles one secreted by a male pig encouraging mating behaviour in a sow. The same pheromone is also secreted by the fungus we know as the truffle. Because truffles do not appear above ground, they must be sought out by pigs, who end up frustrated. Whether our enjoyment of truffles is related to our perhaps unconscious enjoyment of our own underarm sweat is a matter of conjecture." Could make you fall in love with Biochemistry…

The Periodic Table

Primo Levi is best known for his extraordinary accounts of his time in Auschwitz as a prisoner of the Nazis, how he lived, how he survived, and how he finally found his way home. These books, If This Is A Man, and The Truce, should be read by anyone and everyone. But Levi was an industrial chemist by training, and another of his books, the unpromisingly titled The Periodic Table, celebrates this first love. Forget the title. Each chapter has the name of an element, and each is a self-contained story. These vary hugely, from pure fantasy to historical fable to autobiographical snippets. Vanadium describes how his knowledge of that element's properties helped him survive the concentration camp. Lead tells the story of a mediaeval lead worker. Carbon, the best of all, narrates the journey of a carbon atom as it travels into and out of the living world. These are wonderful stories, wholly original and utterly compelling.

Do zombies dream of undead sheep?



Interesting for those studying Biology and Psychology: Even if you've never seen a zombie movie or television show, you could identify an undead ghoul if you saw one. With their endless wandering, lumbering gait, insatiable hunger, antisocial behavior, and apparently memory-less existence, zombies are the walking nightmares of our deepest fears. What do these characteristic behaviors reveal about the inner workings of the zombie mind? Could we diagnose zombism as a neurological condition by studying their behavior? In Do Zombies Dream of Undead Sheep?, neuroscientists and zombie enthusiasts Timothy Verstynen and Bradley Voytek apply their neuro-know-how to dissect the puzzle of what has happened to the zombie brain to make the undead act differently than their human prey. Combining tongue-in-cheek analysis with modern neuroscientific principles, Verstynen and Voytek show how zombism can be understood in terms of current knowledge.

Other suggested reading	The Greatest Show on Earth by Richard Dawkins. Bang up to date on the evidence for evolution- a great introduction to evolution. The Origin of Species by Charles Darwin (the final chapter- although it is all very well written). Why Evolution is True by Jerry Coyne (an introduction to evolutionary theory) Bad Science by Ben Goldacre- very good on the scientific method and how science works. Bad Pharma: How Drug Companies Mislead Doctors and Harm Patients is a book by British physician and academic Ben Goldacre about the pharmaceutical industry, its relationship with the medical profession, and the extent to which it controls academic research into its own products.
Additional Reading	The Selfish Gene by Richard Dawkins (a classic, if difficult read). River out of Eden by Richard Dawkins. Life by Richard Fortey (excellent on fossil evidence and the history of life). A Short History of Nearly Everything by Bill Bryson. Mapping the Deep by Robert Kunzig. Silent Spring by Rachel Carson. Almost Like A Whale by Steve Jones.
Websites	http://www.bbc.co.uk/nature/ http://www.bbc.co.uk/radio4/programmes/genres/factual/scienceandnature http://www.newscientist.com/ http://www.guardian.co.uk/science

If you have 30 minutes to spare, here are some great presentations (and free!) from world leading scientists and researchers on a variety of topics. They provide some interesting answers and ask some thought-provoking questions. Use the link or scan the QR code to view:

A New Superweapon in the Fight Against Cancer
Available at :
http://www.ted.com/talks/paula_hammond_a_new_superweapon_in_the_fight_against_cancer?language=en
Cancer is a very clever, adaptable disease. To defeat it, says medical researcher and educator Paula Hammond, we need a new and powerful mode of attack.

Why Bees are Disappearing
Available at :
http://www.ted.com/talks/marla_spivak_why_bees_are_disappearing?language=en
Honeybees have thrived for 50 million years, each colony 40 to 50,000 individuals coordinated in amazing harmony. So why, seven years ago, did colonies start dying en-masse?

Why Doctors Don't Know About the Drugs They Prescribe
Available at :
http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en
When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of the time, negative or inconclusive findings go unreported, leaving doctors and researchers in the dark.

Growing New Organs
Available at :
http://www.ted.com/talks/anthony_atala_growing_organs_engineering_tissue?language=en
Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.