



A-Level Biology

Introduction

Biology is an interesting subject to study at advanced level as it provides an understanding of life at all levels from molecules and cells to ecosystems and the biosphere. A good grade in the subject rewards students with the respect of future employers and a wealth of career opportunities. The most challenging part of A level biology is bridging the gap between GCSE and A level work.

The transition between GCSE and A level is large, both for pupils who have completed a single GCSE in biology and for students who have completed GCSE science trilogy. The objective of this booklet is to help you to make this transition more easily.

Expectations

As you embark upon your study of A level biology, you will begin to explore cells and important biological molecules. As well as developing skills, knowledge and understanding in biology and the necessary literacy skills to communicate your ideas, you will also need to demonstrate competence in applying practical and mathematical skills. In addition, to reach the highest grades in A-level biology, you should engage in wider reading around the subject to develop your understanding beyond the specification.

To give yourself the best possible start to the course:

Task 1. Complete this task in the last week of the summer holidays so you arrive with the knowledge still fresh in your mind ready to start lessons. It should take about 4 hours (1 hour per topic). Try to complete it in a few small sittings.

Task 2. Choose at least one TED talk to watch and write a short review.

Task 3. Have a browse through the A level biology specification and let us know what you are most looking forward to learning!

Tasks 1 – 3 will be due in by the end of 12th September.

Tasks 4-6 (optional). Try to carry out some of the optional reading / watching / listening tasks as they will help you fit everything you learn in lessons into context more easily, which, in turn, makes learning it all a lot more enjoyable!

Be aware that there will be a baseline test at the start of the course; this booklet will help you prepare.

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Exam Board and Specification: AQA AS and A-Level Biology

Link to Specification:

<https://cdn.sanity.io/files/p28bar15/green/98cdb01fb651d63df2ab345a2547774092b43bbc.pdf>



Review GCSE Biology Key Ideas

Task 1: Read or watch

Read or watch (it's your preference) the key information from GCSE Biology to refresh your memory. Those shown in bold refer to topics from the single science specification. If you did the combined science (trilogy) course, spend a little more time on these as they will be new to you.

Topic	Read	Watch
Cells	<ul style="list-style-type: none"> https://www.bbc.co.uk/bit/eseize/guides/z84jtv4/revisi on/1 	<ul style="list-style-type: none"> https://www.youtube.com/watch?v=HBZcpzr5B2g&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=1 https://www.youtube.com/watch?v=EAoel2gXBRg&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=5 https://www.youtube.com/watch?v=GuY0n7-zfds&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=4
Transport in cells	<ul style="list-style-type: none"> https://www.bbc.co.uk/bit/eseize/guides/zc7k2nb/revisi on/1 	<ul style="list-style-type: none"> https://www.youtube.com/watch?v=C5pMigXBAgk&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=14 https://www.youtube.com/watch?v=qqe2NhQt8bY&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=16 https://www.youtube.com/watch?v=BXTi5tbnOr0&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=18 https://www.youtube.com/watch?v=DHGWH3NdAjc&list=PL9louNCPbCxVU74eQtCcqbaQdYmwzAnlC&index=15
Enzymes	<ul style="list-style-type: none"> https://www.bbc.co.uk/bit/eseize/guides/zcttv9q/revisi on/1 	<ul style="list-style-type: none"> https://www.youtube.com/watch?v=VLK2wANjQm0&list=PL9louNCPbCxXGDt3ATU1xM_X_F8JghPCB&index=2 https://www.youtube.com/watch?v=Rfvh4LIsEEM&list=PL9louNCPbCxXGDt3ATU1xM_X_F8JghPCB&index=3
DNA	<ul style="list-style-type: none"> https://www.bbc.co.uk/bitesize/guides/z9pkmsg/revisi on/1 	<ul style="list-style-type: none"> https://www.youtube.com/watch?v=TQ_iCf8mzMA&list=PL9louNCPbCxWt28Bifo2jK9xn-ym956sf&index=4 https://www.youtube.com/watch?v=o4LHU79fB3s&list=PL9louNCPbCxWt28Bifo2jK9xn-ym956sf&index=5 https://www.youtube.com/watch?v=1GgNNYz47rk&list=PL9louNCPbCxWt28Bifo2jK9xn-ym956sf&index=6

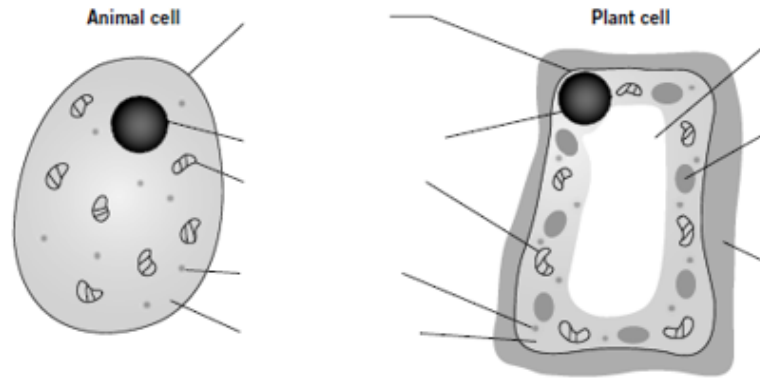
For each of the four topics, complete the summary page in this booklet (you will need to insert textboxes onto the pages or print and handwrite it on).

Bring your four summaries to your first lesson of Biology in September.

Cell Structure

Eukaryotic cells

Animal and plant cells are eukaryotic. They have genetic material (DNA) that forms **chromosomes** and is contained in a **nucleus**. Label the diagram.

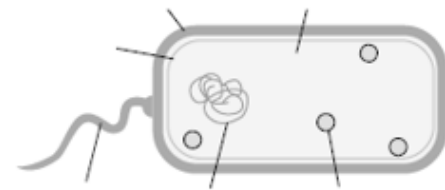


Prokaryotic cells

Bacteria have the following characteristics:

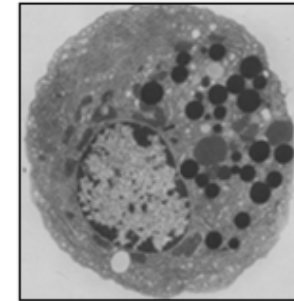
-
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Label the diagram.



Four types of eukaryotic cell are:

- 1.
- 2.
- 3.
- 4.



Here is a cell.
1. What type of microscope was used to take this image?

2. If the magnification is 500x, what is the actual size of the

cell? Give your answer in μm _____
3. Draw a scale bar on the cell to show a line that represents 20 μm .
4. What type of cell is this? How do you know?

When preparing slides for light microscopy, the sample should be a single layer of cells so that...

Eukaryotic cells are bigger / smaller than prokaryotic cells

Microscopes

Light microscope	Electron microscope
	uses a beam of electrons to form images
living samples can be viewed	
relatively cheap	
	high magnification
	high resolution

Electron microscopes allow you to see sub-cellular structures, such as _____, that are too small to be seen with a light microscope.

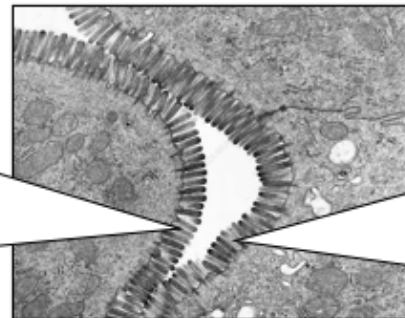
L To calculate the **magnification** of an image:

magnification = _____

Organelle	Function	Found in which types of cell?
Nucleus		
Cytoplasm		
Cell membrane		
Mitochondrion		
Chloroplast		
Ribosome		
Vacuole		
Plasmid		
Cell wall		

Cell Transport

Comparing diffusion, osmosis, and active transport

	Diffusion	Osmosis	Active transport
Definition	The spreading out of particles, resulting in a net movement from an area of _____ to an area of _____. Factors which affect the rate of diffusion: _____, _____, and _____.	The diffusion of water from a _____ solution to a _____ solution through a _____.	The movement of particles from a more dilute solution to a more concentrated solution using energy from _____.
Movement of particles	Particles move down the _____ - from an area of <i>high</i> concentration to an area of <i>low</i> concentration.	Water moves from an area of <i>lower</i> _____ concentration to an area of <i>higher</i> solute concentration.	Particles move against the concentration gradient - from an area of <i>low</i> concentration to an area of <i>high</i> concentration.
Energy required?	_____	_____	_____
Examples	Humans • • •	Plants •	Humans • Plants •
	Fish • • Plants • •	<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="border: 1px solid black; border-radius: 15px; padding: 5px; width: 25%;"> These are cells from the small intestine. Name this feature: _____ </div> <div style="text-align: center;">  </div> <div style="border: 1px solid black; border-radius: 15px; padding: 5px; width: 25%;"> How does this feature increase absorption? _____ _____ _____ </div> </div>	

Three factors that affect the rate of diffusion are:

- 1.
- 2.
- 3.

To find out the concentration of the cytoplasm of plant tissue, follow these steps:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Word	Definition
Dilute	
Concentrated	
Concentration gradient	
Turgid	
Plasmolysed	

Enzymes

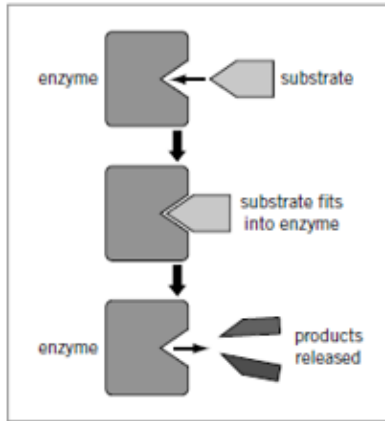
Enzymes

Enzymes are large proteins that _____ (speed up) reactions. Enzymes are not changed in the reactions they catalyse.

Lock and key theory

This is a simple model of how enzymes work:

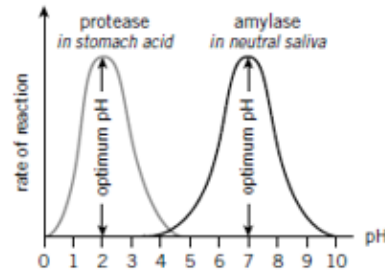
- 1 The enzyme's _____ (where the reaction occurs) is a specific shape.
- 2 The _____ (the lock) will only catalyse a specific reaction because the _____ (the key) fits into its active site.
- 3 At the active site, enzymes can _____ molecules down into smaller ones or bind small molecules together to form _____ ones.
- 4 When the products have been released, the enzyme's active site can accept another substrate molecule.



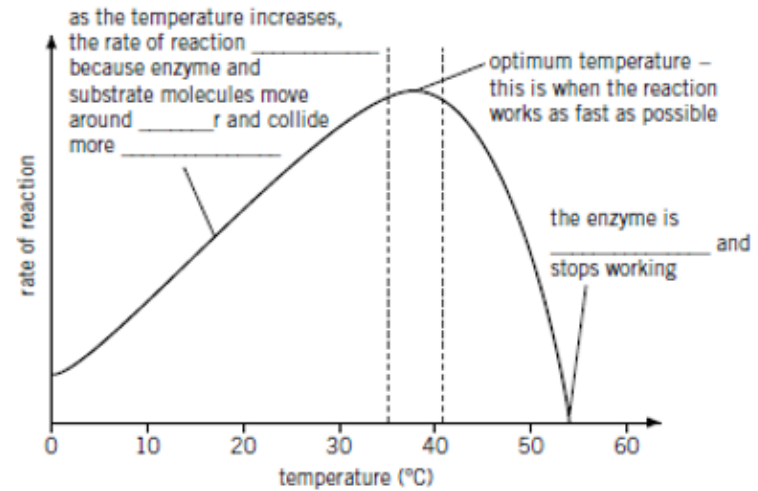
The effect of pH on enzymes

Different enzymes have different _____ pH values.

This allows enzymes to be adapted to work well in environments with different pH values. For example, parts of the digestive system greatly differ in _____.



The effect of temperature on enzymes

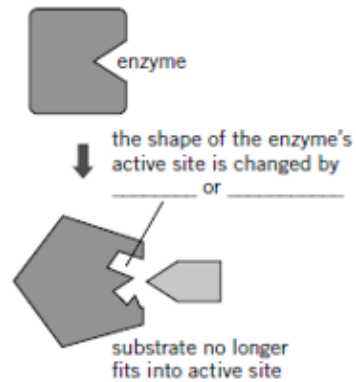


Lipase breaks down _____ to _____

Protease breaks down _____ to _____

Denaturation

At extremes of pH or at very high temperatures, the shape of an enzyme's active site can change.



The substrate can no longer _____ to the active site, so the enzyme cannot catalyse the reaction - the enzyme has been **denatured**.

To find out the optimum pH for the enzyme amylase, follow these steps:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Word	Definition
Enzyme	
Active Site	
Denature	
Optimum	

DNA

DNA and the genome

Genetic material in the nucleus of a cell is composed of _____.

DNA is made up of two strands forming a _____.

DNA is contained in structures called _____.

A _____ is a small section of _____ on a chromosome that codes for a specific sequence of _____, to produce a specific protein.

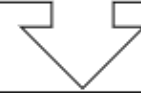
The _____ of an organism is the entire _____ material of that organism.

The whole human genome has been studied, and this has allowed scientists to

-
-
-

Draw a labelled diagram of DNA:

The sequence of bases in DNA (in groups of ___) codes for the _____ of _____ in a protein.



Sequence of _____ in a protein determine how it _____ up.



How a protein _____ up determines its function e.g. the _____ of an _____ of an enzyme.

Word	Definition
Gene	
Chromosome	
Genome	
Polymer	
Nucleotide	
Base	
Mutation	

Describe the process of protein synthesis.

Mutations in DNA can have 3 effects





Browse the A-Level Specification

Have a browse through the A Level Biology specification by following this link:

<https://www.aqa.org.uk/subjects/biology/a-level/biology-7402/specification/specification-at-a-glance>

Task 3: Let us know what you think by answering these questions:

1. What are you most looking forward to learning about? Why?

2. What do you think you will find most challenging? Why?

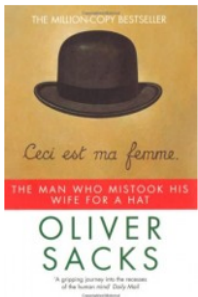
3. Which topic(s) will be completely new to you (you didn't study them at GCSE)?



Wider Reading (Optional)

Task 4: Going on holiday?

Looking for something to do? Pick one of these for a great summer read!

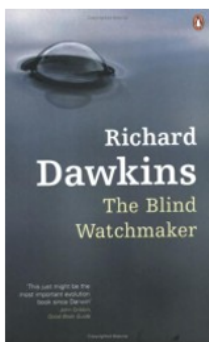
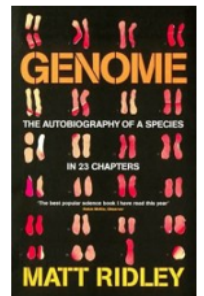


The Man Who Mistook His Wife for a Hat

Sacks'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. Sacks 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.

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.

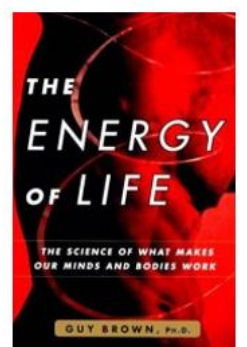


The Blind Watchmaker

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.

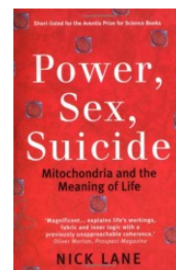


CROSSLEY HEATH SIXTH FORM



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.



Other Minds: The Octopus and the Evolution of Intelligent Life

OTHER MINDS / THE OCTOPUS AND THE EVOLUTION OF INTELLIGENT LIFE

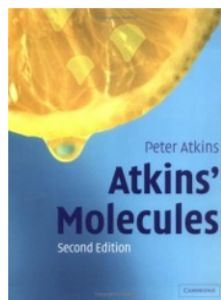


PETER GODFREY-SMITH

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

Newspaper 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?

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 behaviour, and apparently memory-less existence, zombies are the walking nightmares of our deepest fears. What do these characteristic behaviours reveal about the inner workings of the zombie mind? Could we diagnose zombism as a neurological condition by studying their behaviour? 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





Task 5: Follow some great biology accounts on Instagram **optional*

Science magazine: @sciencemagazine

IFLScience: @iflscience

The Deep: @thedeephull

Chester Zoo: @chesterzoo

New Scientist: @newscientist



Task 6: Watch / listen to some biology documentaries on BBC iPlayer / BBC Sounds **optional*

The Life Scientific (BBC Sounds) – Jim Al-Khalili interviews a famous scientist each week about their work and their life

Anything by Sir David Attenborough! (BBC iplayer)

Any episodes of Horizon or Panorama you find interesting (BBC iplayer)

More or Less (BBC Sounds) – a surprisingly entertaining look at the use and misuse of statistics in the news

The Infinite Monkey Cage (BBC Sounds) – a comedy science quiz hosted by Brian Cox

Curious Cases (BBC Sounds) – a comedy show where two scientists investigate questions sent in by the public

BBC
iPLAYER

BBC
SOUNDS