

Content and Specification

Throughout the A Level Biology course taught at Riverside Sixth Form, students will have the opportunity to study a wide range of biological topics that will allow them to broaden and deepen their understanding of the biological world. Students will examine the structure and role of key biological macromolecules include proteins, carbohydrates and lipids and nucleic acids. They will also explore the ultrastructure of cells and examined how cellular communication and co-operation allows organisms to carry out fundamental life processes.

Students studying A-level will be following the **AQA** A level Biology specification. This is a two-year linear course that encompasses eight content-based modules that will be formally assessed at the end of the two-year course with 3 papers.

Students will also be trained and assessed across a range of practical skills, which is assessed separately as part of their practical endorsement.

<https://filestore.aqa.org.uk/resources/biology/specifications/AQA-7401-7402-SP-2015.PDF>

Specification at a glance

AS and first year of A-level

- 1 Biological molecules.**
- 2 Cells.**
- 3 Organisms exchange substances with their environment.**
- 4 Genetic information, variation and relationships between organisms.**

A-level only

- 5 Energy transfers in and between organisms.**
- 6 Organisms respond to changes in their internal and external environments.**
- 7 Genetics, populations, evolution and ecosystems.**
- 8 The control of gene expression.**

The assessment for the A-level consists of three exams

Paper 1	+	Paper 2	+	Paper 3
What's assessed <ul style="list-style-type: none"> Any content from topics 1–4, including relevant practical skills 		What's assessed <ul style="list-style-type: none"> Any content from topics 5–8, including relevant practical skills 		What's assessed <ul style="list-style-type: none"> Any content from topics 1–8, including relevant practical skills
Assessed <ul style="list-style-type: none"> written exam: 2 hours 91 marks 35% of A-level 		Assessed <ul style="list-style-type: none"> written exam: 2 hours 91 marks 35% of A-level 		Assessed <ul style="list-style-type: none"> written exam: 2 hours 78 marks 30% of A-level
Questions <ul style="list-style-type: none"> 76 marks: a mixture of short and long answer questions 15 marks: extended response questions 		Questions <ul style="list-style-type: none"> 76 marks: a mixture of short and long answer questions 15 marks: comprehension question 		Questions <ul style="list-style-type: none"> 38 marks: structured questions, including practical techniques 15 marks: critical analysis of given experimental data 25 marks: one essay from a choice of two titles

Suggested reading list for A level Biologists

Magazines, Newspapers & Journals

New Scientist Scientific

American

Nature

Science

Biological Sciences Review

British Medical Journal

Any scientific articles in newspapers (e.g. the Guardian on Wednesday)

Websites

- www.ibiblio.org/virtualcell/index.htm - an interactive cell biology site
- www.accessexcellence.org/RC/VL/GG - A site showing illustrations of many processes of biotechnology.
- www.dnai.org/a/index.html - Explore the genetic code
- www.nobelprize.org – Details of the history of the best scientific discoveries
- www.nature.com – The site of the scientific journal
- <https://royalsociety.org/> – Podcasts, news and interviews with scientists about recent scientific developments
- www.nhm.ac.uk – The London Natural History Museum’s website with lots of interesting educational material.
- www.bmj.com – The site of the British Medical Journal.
- www.bbc.co.uk/news/science_and_environment - The BBC news page for Science and the Environment

Movies to watch:

Everyone loves a good story and everyone loves some great science. Here are some of the picks of the best films based on real life scientists and discoveries. You won’t find Jurassic Park on this list; we’ve looked back over the last 50 years to give you our top 3 films you might not have seen before. Great watching for a rainy day.

1. Something the Lord Made (2004) Professor Snape (the late great Alan Rickman) in a very different role. The film tells the story of the scientists at the cutting edge of early heart surgery as well as issues surrounding racism at the time.
2. Lorenzo's Oil (1992) Based on a true story. A young child suffers from an autoimmune disease. The parents research and challenge doctors to develop a new cure for his disease.
3. Andromeda Strain (1971) Science fiction by the great thriller writer Michael Crichton (he of Jurassic Park fame). Humans begin dying when an alien microbe arrives on Earth.

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 to view:

1. A New Superweapon in the Fight Against Cancer Available at :

https://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.

2. Why Doctors Don't Know About the Drugs They Prescribe Available at:

https://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.

3. Growing New Organs Available at :

https://www.ted.com/talks/anthony_atala_growing_new_organs?language=en

Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.

Research these on Amazon and select a few to read:

Richard Dawkins:

The Selfish Gene

The Blind Watchmaker

Unweaving the Rainbow

Climbing Mount Improbable

The Ancestor's Tale

Steve Jones:

Y: The Descent of Men In the Blood: God, Genes and Destiny

Almost Like a Whale: The 'Origin of Species' Updated

The Language of the genes

Matt Ridley Genome:

The Autobiography of a Species in 23 Chapters

The Red Queen: Sex and the Evolution of Human Nature The Language of Genes

Francis Crick: Discoverer of the Genetic Code

Nature via Nurture: Genes, Experience and What Makes Us Human

James Watson:

DNA: The Secret of Life The Double Helix: Personal Account of the Discovery of the Structure of DNA.

Lewis Thomas:

The Lives of a Cell: Notes of a Biology Watcher

The Medusa and the Snail: More Notes of a Biology Watcher

Barry Gibb:

The Rough Guide to the Brain (Rough Guides Reference Titles).

Charles Darwin: The origin of species

Armand Marie Leroi: Mutants: on the Form, Varieties and Errors of the Human Body.

David S Goodsell: The Machinery of Life

Ernst Mayr: This is Biology: The Science of the Living World

George C Williams: Plan and Purpose in Nature

Steve Pinker: The Language Instinct

Edward O Wilson: The Diversity of Life

Primo Levi: The Periodic Table

Richard Leaky: The Origin of Humankind

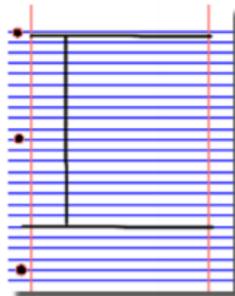
Bill Bryson: A Short History of Nearly Everything

Research activities:

The following tasks are designed to help you to develop your independent study skills which is a key skill for all A-level students. It comprises of a variety of tasks that will help you strengthen your key concepts from GCSE and push towards A-level content.

Research, reading and note making are essential skills for A level Biology study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

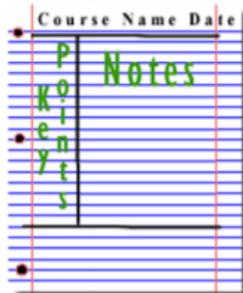
1. Divide your page into three sections like this



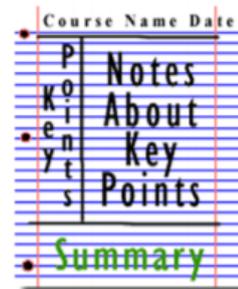
2. Write the name, date and topic at the top of the page



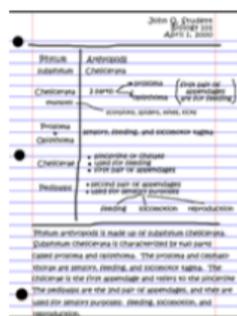
3. Use the large box to make notes. Leave a space between separate idea. Abbreviate where possible.



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



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



The Big Picture is an excellent publication from the Wellcome Trust. Along with the magazine, the company produces posters, videos and other resources aimed at students studying for GCSEs and A level. For each of the following topics, you are going to use the resources to produce one page of Cornell style notes. Use the links of scan the QR code to take you to the resources.

Topic 1: The Cell Available at: <https://www.stem.org.uk/resources/elibrary/resource/34589/cell-suitable-home-teaching>

The cell is the building block of life. Each of us starts from a single cell, a zygote, and grows into a complex organism made of trillions of cells.

In this issue, we explore what we know – and what we don't yet know – about the cells that are the basis of us all and how they reproduce, grow, move, communicate and die.



Topic 2: The Immune System Available at:

<https://www.stem.org.uk/resources/elibrary/resource/35694/immune-system>

The immune system is what keeps us healthy in spite of the many organisms and substances that can do us harm. In this issue, explore how our bodies are designed to prevent potentially harmful objects from getting inside, and what happens when bacteria, viruses, fungi or other foreign organisms or substances breach these barriers.



Topic 3: Exercise, Energy and Movement Available at: <http://bigpictureeducation.com/exercise-energyand-movement>

All living things move. Whether it's a plant growing towards the sun, bacteria swimming away from a toxin or you walking home, anything alive must move to survive. For humans though, movement is more than just survival – we move for fun, to compete and to be healthy. In this issue we look at the biological systems that keep us moving and consider some of the psychological, social and ethical aspects of exercise and sport.



Topic 4: Populations Available at:

<https://www.stem.org.uk/resources/elibrary/resource/35113/populations>

What's the first thing that pops into your mind when you read the word population? Most likely it's the ever-increasing human population on earth. You're a member of that population, which is the term for all the members of a single species living together in the same location. The term population isn't just used to describe humans; it includes other animals, plants and microbes too. In this issue, we learn more about how populations grow, change and move, and why understanding them is so important.



A level Biology will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following tasks to make sure your knowledge is up to date and you are ready to start studying:

1. Cells

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study. Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure. In complex multicellular organisms' cells are organised into tissues, tissues into organs and organs into systems. During the cell cycle genetic information is copied and passed to daughter cells. Daughter cells formed during mitosis have identical copies of genes while cells formed during meiosis are not genetically identical.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/cells-and-organelles>

<http://www.bbc.co.uk/education/guides/zvjyedm/revision>

And take a look at these videos:

<https://www.youtube.com/watch?v=gcTuQpuJyD8>

<https://www.youtube.com/watch?v=L0k-enzoeOM>

<https://www.youtube.com/watch?v=qCLmR9-YY7o>

Task: Produce a two-page revision guide to share with your class in September summarising one of the following topics:

Cells and Cell Ultrastructure, Prokaryotes and Eukaryotes, or Mitosis and Meiosis. Whichever topic you choose, your revision guide should include: Key words and definitions Clearly labelled diagrams Short explanations of key ideas or processes.

2. Biological Molecules

Biological molecules are often polymers and are based on a small number of chemical elements. In living organisms carbohydrates, proteins, lipids, inorganic ions and water all have important roles and functions related to their properties. DNA determines the structure of proteins, including enzymes. Enzymes catalyse the reactions that determine structures and functions from cellular to whole-organism level. Enzymes are proteins with a mechanism of action and other properties determined by their tertiary structure. ATP provides the immediate source of energy for biological processes.

Read the information on these websites (you could make more Cornell notes if you wish):

<http://www.s-cool.co.uk/a-level/biology/biological-molecules-and-enzymes>

<http://www.biologymad.com/master.html?http://www.biologymad.com/biochemistry/biochemistry.htm>

And take a look at these videos:

<https://www.youtube.com/watch?v=H8WJ2KENIKO>

<http://ed.ted.com/lessons/activation-energy-kickstarting-chemical-reactions-vance-kite>

Task: Krabbe disease occurs when a person doesn't have a certain enzyme in their body. The disease affects the nervous system. Create a summary page for enzymes and include research on Krabbe disease and its effects.

Your poster should: Describe the structure of an enzyme.

Explain what enzymes do inside the body and the factors which affect the rate of enzymes.

3. Exchange and Transport

Organisms need to exchange substances selectively with their environment and this takes place at exchange surfaces. Factors such as size or metabolic rate affect the requirements of organisms and this gives rise to adaptations such as specialised exchange surfaces and mass transport systems. Substances are exchanged by passive or active transport across exchange surfaces. The structure of the plasma membrane enables control of the passage of substances into and out of cells.

Read the information on these websites:

<http://www.s-cool.co.uk/a-level/biology/gas-exchange>

<http://www.s-cool.co.uk/a-level/biology/nutrition-and-digestion/revise-it/human-digestive-system>

And take a look at these videos:

<http://ed.ted.com/lessons/insights-into-cell-membranes-via-dish-detergent-ethan-perlstein>

<http://ed.ted.com/lessons/what-do-the-lungs-do-emma-bryce>

Task: Create a summary 2 page spread summary.

Your summary should either: compare exchange surfaces in mammals and fish or compare exchange surfaces in the lungs and the intestines.

You could use a Venn diagram to do this.

Your summary should: Describe diffusion, osmosis and active transport

Explain why oxygen and glucose need to be absorbed and waste products removed Compare and contrast your chosen focus.

4. DNA and the Genetic Code

In living organisms' nucleic acids (DNA and RNA have important roles and functions related to their properties. The sequence of bases in the DNA molecule determines the structure of proteins, including enzymes. The double helix and its four bases store the information that is

passed from generation to generation. The sequence of the base pairs- adenine, thymine, cytosine and guanine tell ribosomes in the cytoplasm how to construct amino acids into polypeptides and produce every characteristic we see. DNA can mutate leading to diseases including cancer and sometimes anomalies in the genetic code are passed from parents to babies in disease such as cystic fibrosis, or can be developed in unborn fetuses such as Downs Syndrome.

Read the information on these websites:

<http://www.bbc.co.uk/education/guides/z36mmp3/revision>

<http://www.s-cool.co.uk/a-level/biology/dna-and-genetic-code>

And take a look at these videos:

<http://ed.ted.com/lessons/the-twisting-tale-of-dna-judith-hauck>

<http://ed.ted.com/lessons/where-do-genes-come-from-carl-zimmer>

Task: Produce a wall display to put up in your classroom in September. You might make a poster or do this using PowerPoint.

Your display should use images, keywords and simple explanations to:

Define gene, chromosome, DNA and base pair

Describe the structure and function of DNA and RNA

Explain how DNA is copied in the body.

Outline some of the problems that occur with DNA replication and what the consequences of this might be.