

Biology

Biology is the study of living organisms and how these interact with each other and their environments. Biology is really a multidisciplinary subject that is made of many different and interdependent fields. Biology explores how living systems are constructed, as well as how they develop, communicate, interact, reproduce, defend themselves, and shape the biophysical environment around them. Biologists are constantly looking to understand links between different disciplines of biology and in this sense evolution is a unifying concept in biology.

Students who study biology at A level learn the fundamentals of the cell, biochemistry, ecology, physiology and other key elements of subject so that they can go on to study subjects at degree level such as agriculture, biochemistry, biomedical science, genetics, ecology, medicine, dentistry, neurology, physiology and zoology. Whatever you study, biology at Advanced level will be hard work, but always fascinating, engaging and relevant to you, and above all, this planet.

Recommended Reads

Junk DNA by Nessa Carey

Our DNA is so much more complex than you probably realize, this book will really deepen your understanding of all the work you will do on Genetics. Available at [amazon.co.uk](https://www.amazon.co.uk)

The Red Queen by Matt Ridley

Its all about sex. Or sexual selection at least. This book will really help your understanding of evolution and particularly the fascinating role of sex in evolution. Available at [amazon.co.uk](https://www.amazon.co.uk)

A Short History of Nearly Everything by Bill Bryson

A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at [amazon.co.uk](https://www.amazon.co.uk)

Frankenstein's cat by Emily Anthes

Discover how glow in the dark fish are made and more great Biotechnology breakthroughs. Available at [amazon.co.uk](https://www.amazon.co.uk)

Recommended Movies

Gorillas in the Mist (1988)

An absolute classic that retells the true story of the life and work of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A tear jerker.

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.

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.

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 Down's Syndrome.

Read and make notes from 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 or similar. 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.

Evolution

Transfer of genetic information from one generation to the next can ensure continuity of species or lead to variation within a species and possible formation of new species. Reproductive isolation can lead to accumulation of different genetic information in populations potentially leading to formation of new species (speciation). Sequencing projects have read the genomes of organisms ranging from microbes and plants to humans. This allows the sequences of the proteins that derive from the genetic code to be predicted. Gene technologies allow study and alteration of gene function in order to better understand organism function and to design new industrial and medical processes.

Read and make notes from the information on these websites:

<http://www.bbc.co.uk/education/guides/z237hyc/revision/4>

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

And take a look at these videos:

<http://ed.ted.com/lessons/how-to-sequence-the-human-genome-mark-j-kiel>

<http://ed.ted.com/lessons/the-race-to-sequence-the-human-genome-tien-nguyen>

Task

Produce a one page revision guide for a Biology student that recaps the key words and concepts in this topic. Your revision guide should:

Describe speciation

Explain what a genome is

Give examples of how this information has already been used to develop new treatments and technologies.

Biodiversity

The variety of life, both past and present, is extensive, but the biochemical basis of life is similar for all living things. Biodiversity refers to the variety and complexity of life and may be considered at different levels. Biodiversity can be measured, for example within a habitat or at the genetic level. Classification is a means of organising the variety of life based on relationships between organisms and is built around the concept of species. Originally classification systems were based on observable features but more recent approaches draw on a wider range of evidence to clarify relationships between organisms. Adaptations of organisms to their environments can be behavioural, physiological and anatomical. Adaptation and selection are major factors in evolution and make a significant contribution to the diversity of living organisms.

Read and make notes from the information on these websites:

<http://www.s-cool.co.uk/a-level/biology/ecological-concepts>

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

And take a look at these videos:

<http://ed.ted.com/lessons/why-is-biodiversity-so-important-kim-preshoff>

<http://ed.ted.com/lessons/can-wildlife-adapt-to-climate-change-erin-eastwood>

Task

Write a persuasive letter to an MP, organisation or pressure group promoting conservation to maintain biodiversity. Your letter should:

Define what is meant by species and classification

Describe how species are classified

Explain one way scientists can collect data about a habitat, giving an example

Explain adaptation and how habitat change may pose a threat to niche species

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 and make notes from 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 poster or display to go in your classroom in September. Your poster 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 poster 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.