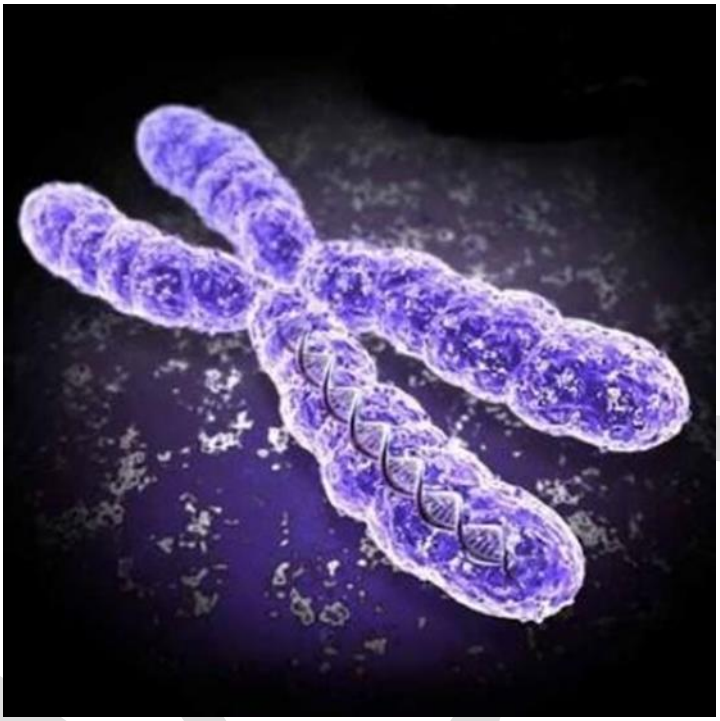
WORCESTER
SIXTH FORM COLLEGE

Progression – Biology



Contents:

1. Thinking of studying A Level Biology at Worcester Sixth Form College?

We teach the **EDUQAS** specification.

Here is a brief summary of the topics we cover over the two-year course. If you want to find out more about each of these topics, you can find the full specification on the EDUQAS website: https://www.eduqas.co.uk/qualifications/biology-as-a-level/#tab_overview

Many of the topics should be familiar with from GCSE, but you will study them in greater depth at A level:

- Biological compounds, including enzymes and nucleic acids.
- Cell structure, cell membranes and cell transport.
- Energy in living systems including The Importance of ATP, Photosynthesis Respiration & Microbiology.
- Energy in ecosystems, population size and human impact on the environment.
- All organisms are related through their evolutionary history.
- Genetic material is copied and passed onto daughter cells and sexual reproduction in humans and in plants
- Inheritance, Variation and evolution.
- Application of reproduction and genetics.
- Adaptations of living systems for gas exchange, transport (circulation) & nutrition.
- Homeostasis and the kidney.
- The nervous system
- Immunology and disease

2. Tasks to complete before September

In order to prepare for the course, you need to complete the tasks on p4-14.

Before you begin, find a folder to store this Booklet and all the notes that you make on the tasks. **You need to bring in this folder at the start of the course.** Make sure that your notes are neat and well-organised!

2. Tasks to complete before September

Cellular Structures Task:

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study. In complex multicellular organisms, cells are organised into tissues, tissues into organs and organs into systems.

. So for your first task you need to define:

a) Eukaryotic & Prokaryotic cells and then explain why viruses are described as acellular.

b) Produce a large hand drawn, detailed & labelled diagrams of:

a virus, a bacterium & a plant cell (an example of a eukaryotic cell).

Diagrams need to be neat, accurate and have the structures drawn & labelled that are listed below. Complete diagrams on plain paper.

Use labels to identify the following structures found in each:

Virus Particle	**Bacterial Cell**	**Plant Cell (Eukaryote)**
Genetic material	Cell Wall	Cell wall
Capsid	Cell Membrane	Cell membrane
Lipoprotein coat	ribosomes	nucleus
	plasmids	ribosomes
	flagella	RER
	cytoplasm	Golgi body
	DNA/nucleoid	cytoplasm
	slime capsule	vacuole
	mesosomes	mitochondria
	pili	vesicles

Useful resources:

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

https://www.bbc.com/bitesize/guides/zyhrng8/revision/2

https://alevelbiology.co.uk/notes/an-introduction-to-cells/

http://www.a-levelnotes.co.uk/biology-aqa-as-notes-cells-structure-of-prokaryotic-cells-and-viruses.html

https://www.youtube.com/watch?v=mUJryLNKScg

https://www.youtube.com/watch?v=xLcwJnTL2WM

https://www.youtube.com/watch?v=k-rN-EAdxi8

https://www.stem.org.uk/resources/elibrary/resource/34589/cell-suitable-home-teaching#&gid=undefined&pid=8

Functions of Cellular Structures Task

In this task you need to find out what the organelle is made of and then the role it performs in the cell to allow the cell to function. Some organelles work closely with other structures, this is also worth making a note of.

You will need to research these using the resources listed above from the previous task.

Virus Particle	**Function**
Genetic material	
Capsid	
Lipoprotein coat	

Bacterial Cell	**Function**
Cell Wall	
Cell Membrane	
Ribosomes	
Plasmids	
Flagella	
Cytoplasm	
DNA/nucleoid	
slime capsule	
Mesosomes	
Pili	

Plant Cell (Eukaryote)	**Function**
Cell wall	
Cell membrane	
Nucleus	
Ribosomes	
RER	
Golgi body	
Cytoplasm	
Vacuole	
Mitochondria	
Vesicles	

DNA and the Genetic Code Task

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 diseases such as cystic fibrosis, or can be developed in unborn foetuses such as Downs Syndrome.

Read the information on these websites (make notes)

https://www.bbc.co.uk/bitesize/guides/z36mmp3/revision/1 Structure of DNA

After the information is a little test, take it & see how you get on.

https://www.bbc.co.uk/bitesize/guides/zrwhrj6/revision/1 Replication of DNA in the body & how PCR is used in the lab to make multiple copies of DNA strands (amplification)

https://www.s-cool.co.uk/a-level/biology/dna-and-the-genetic-code/revise-it/introduction-to-dna-and-rna

And take a look at these videos:

https://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 Keyword task & Storyboard

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 the information on these websites (make notes)

https://www.bbc.co.uk/bitesize/guides/ztn9y4j/revision/1

https://www.s-cool.co.uk/a-level/biology/evolution/revise-it/natural-selection

https://www.s-cool.co.uk/a-level/biology/evolution/revise-it/evidence-for-evolution

https://www.s-cool.co.uk/a-level/biology/evolution/revise-it/evolution-in-action

https://www.s-cool.co.uk/a-level/biology/evolution/revise-it/evolution-by-speciation

And take a look at this video:
https://www.bbc.co.uk/bitesize/guides/ztn9y4j/video

Using the notes you have made you can now complete the evolution glossary of terms and the storyboard of th evolution of the Manchester pepeered moth. The video clip gives a very good explanation of this example of evolution. To complete the storyboard you need to include a written explanation for each of the 6 images, as if it were a commentary for a wildlife documentary, using the images in the storyboard to help convey the information.

Evolution Key Words

Term	definition
Mutation	
Variation	
Selection Pressure	
Natural selection	
Species	
Speciation	
Selective advantage	
Adaptations	
Stablising Selection	
Directional Selection	
Disruptive Selection	
Divergent Evolution	
Convergent Evolution	
Evolutionary Fitness	
Isolating Mechanisms	
Reproductive Isolation	

Storyboard for The Evolution of the Peppered Moth

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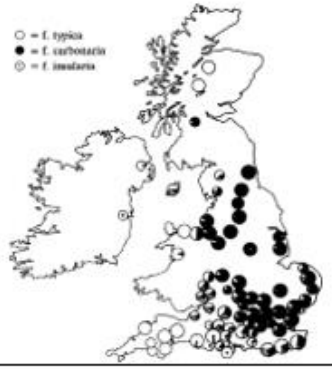
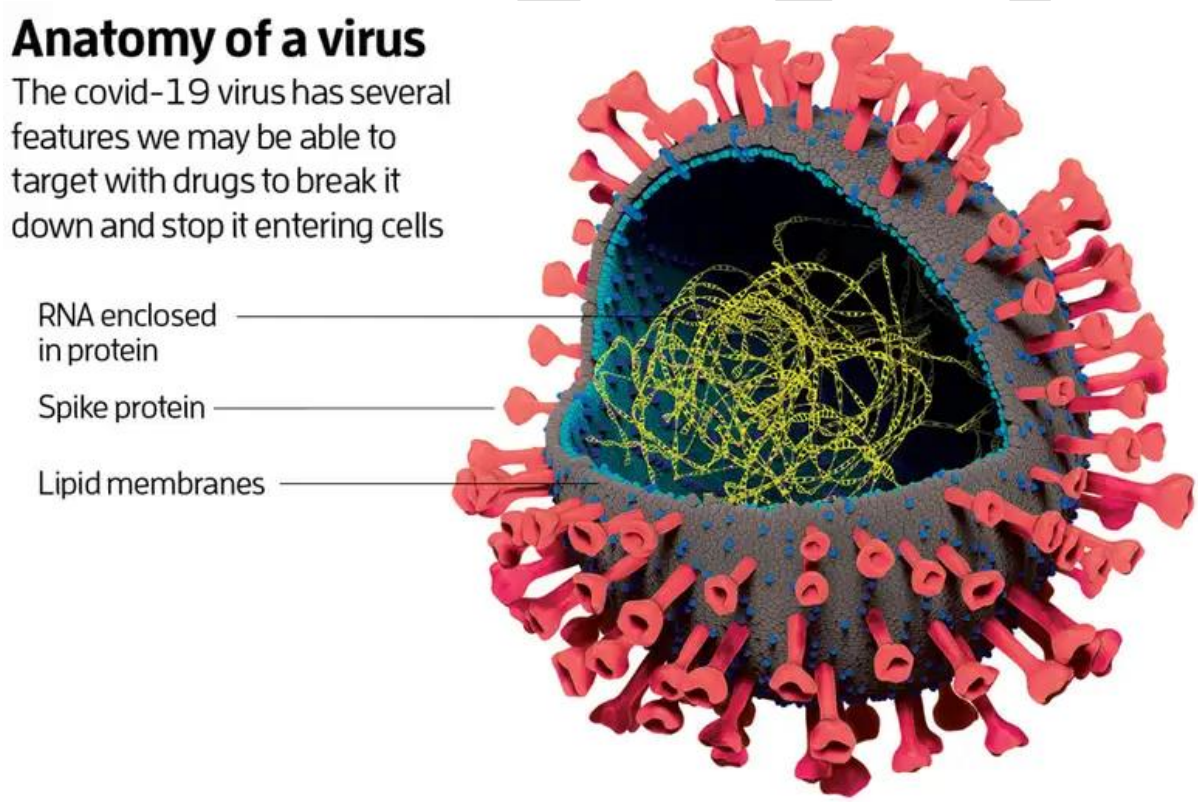
4. 	5. 	6. 

Covid 19 Research Task

This current pandemic of which we have not seen the like of for 100 years is due to a novel virus infecting the human population which has no immunity to it.

The virus and it's effects highlight a number of areas of the A level Biology specification and studying it will give you an insight into many of the areas you will study over the next 2 years. It also allows you to practise 2 very important skills. Firstly, looking at Biology holistically, it is a 'big picture' suject, where lots of different areas of study are drawn together to gain a full understanding. And secondly the application of knowledge. Scientists are currently working on understanding the virus and the progress of the disease are having to work out what is going on in this exceptional situation. All of this is new & they applying what they know to provide solutions to the politicians and clinicians so we can overcome this disease. One of the big differences between A level & GCSE is the application of knowledge to new situations, indeed 45% of the a level Biology questions are based on application and I hope this is one of your inspirations for choosing such a fundamentally important subject.



So by using the BBC bitesize & scool websites, a couple of You Tube clips, along with the BBC News website, you could summarise the main features of the virus, the transmission & disease process, the immune response and impacts of the disease. Below is a research frame you can use to gather the information. Please be selective with the sources that you use as there is a fair amount of misinformed information on the internet. Keep to the sites and links given below to help you.

COVID 19 research sheet:

What is a pandemic and an epidemic?	
Viruses, general structure and replication. What are the specific features of the corona virus?	
What is zoonosis, how did the disease transmit to humans and now from human to human? What is R_0 why is it important?	

Signs and symptoms of Covid- 19?	
How does corona virus affect the lungs? How are the aveoli damaged?	
What is the immune response? How does the bodies defence attempt to overcome the infection?	
How will we become immune to the corona (SARS – Cov 2) virus?	
What are the future hopes for a vaccine & how does vaccination work?	

Useful web links:

https://www.bbc.co.uk/bitesize/guides/zcjfmsg/revision/2 lung structure

https://www.s-cool.co.uk/a-level/biology/gas-exchange/revise-it/gas-exchange-in-humans Gas exchange in humans

https://www.s-cool.co.uk/a-level/biology/immunity Immunity

https://www.s-cool.co.uk/a-level/biology/health-and-disease/revise-it/health-statistics study of disease

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

https://www.nationalgeographic.com/science/health-and-human-body/human-diseases/viruses/ information on viruses.

https://www.statnews.com/2020/04/14/how-much-of-the-coronavirus-does-it-take-to-make-you-sick/ Corona infectivity

https://www.bbc.co.uk/news/world-51235105 tracking the global pandemic

https://www.bbc.co.uk/news/health-52446965 Corona virus imunity

https://www.bbc.co.uk/news/health-51358459 what is a pandemic?

https://www.bbc.co.uk/news/av/health-51224894/epidemic-v-pandemic-what-s-the-difference what is a pandemic & an epidemic

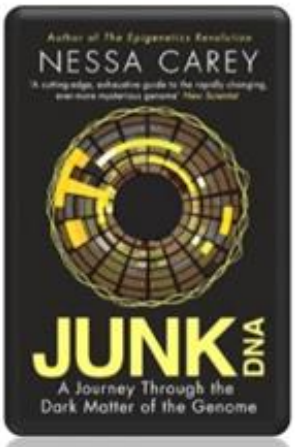
https://www.bbc.co.uk/news/av/health-52382236/coronavirus-what-is-a-vaccine-and-how-is-one-made Vaccinations

https://www.youtube.com/watch?v=bCDlS690q6k Snap Revise Disease: Viruses A-level Biology

https://www.youtube.com/watch?v=YRfwZcLeOm4&t=103s Ninja Nerd Science COVID-19 | Coronavirus: Epidemiology, Pathophysiology | APRIL UPDATE. Detailed but lots of useful information. More updated videos will also be produced as time moves forward.

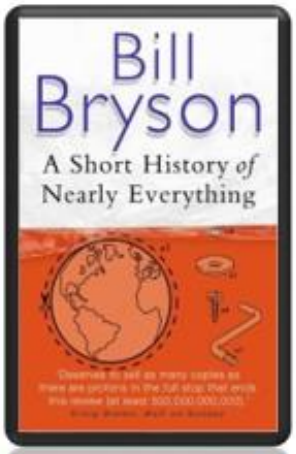
3. Optional Tasks

Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Biology.



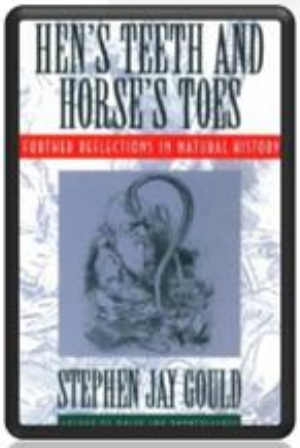
Junk DNA
Our DNA is so much more complex than you probably realize, this book will really deepen your understanding of all the work you will do on genetics. Available at amazon.co.uk

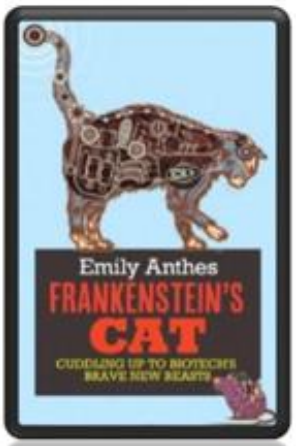
The Red Queen
It's all about sex. Or sexual selection at least. This book will really help your understanding of evolution and particularly the fascinating role of sex in evolution. Available at amazon.co.uk



A Short History of Nearly Everything
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

Studying Geography as well?
Hen's Teeth and Horse's Toes
Stephen Jay Gould is a great evolution writer and this book discusses lots of fascinating stories about geology and evolution. Available at amazon.co.uk





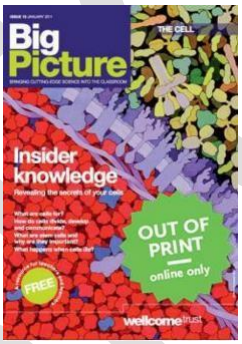
An easy read..
Frankenstein's Cat
Discover how glow in the dark fish are made and more great biotechnology breakthroughs. Available at amazon.co.uk

Carry out some research on an area that interests you:

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 or scan the QR code to take you to the resources.

BigPicture

Topic 1: The Cell
Available at: http://bigpictureeducation.com/cell
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:
http://bigpictureeducation.com/immune
The immune system is what keeps us healthy in spite of the many organisms and substances that can do us harm. In this issue, we 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-energy-and-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:
http://bigpictureeducation.com/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.

Topic 4: Health and Climate Change
Available at: http://bigpictureeducation.com/health-and-climate-change
The Earth's climate is changing. In fact, it has always been changing. What is different now is the speed of change and the main cause of change – human activities. This issue asks: What are the biggest threats to human health? Who will suffer as the climate changes? What can be done to minimise harm? And how do we cope with uncertainty?