Henry Box School A-Level Biology

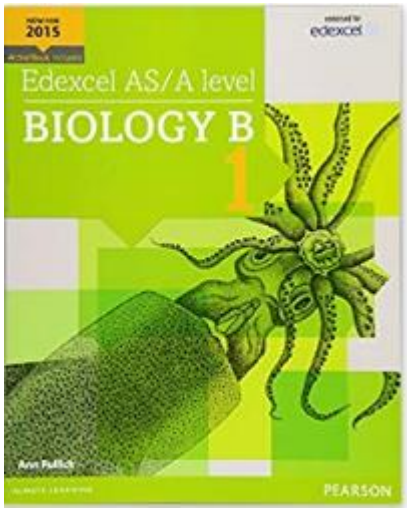
GCSE → A Level Biology work

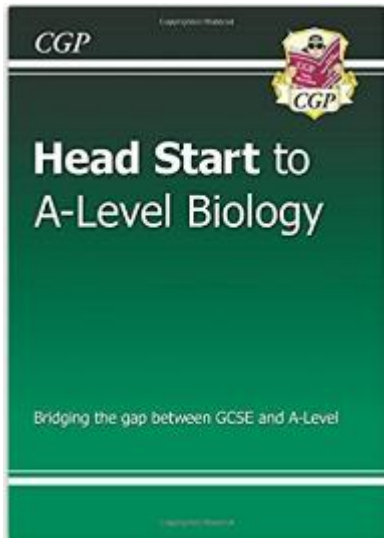
Course: Edexcel Biology B (2015)

A level Biology covers a very broad range of topics and involves the use of many complex terms. There is a big step up from GCSE to A-Level but it is worth it! Biology is a fascinating subject and brings the real world to life.

With the prolonged period of time off you are having it is imperative that you keep your knowledge relevant and present. Therefore, it is a requirement that all students **complete this booklet** of review tasks that will help refresh your knowledge and help to bridge the gap between GCSE and A Level Biology.

The required text book for the course is Edexcel Biology B by Ann Fullick and published by Pearson. You can get this new or second hand. There are also good revision guides available but these are optional. The "Head start to A-Level Biology" revision guide is also useful to ensure your GCSE knowledge is up to date, again this is optional. Currently, you can download this free from amazon.





If you have any other questions I will be happy to help, please email me (acollins@henrybox.oxon.sch.uk).

Task 1

This is compulsory if you did combined science; optional (although useful) if you did separate science. You need to be familiar with all following content which we revisit at A-Level.

Read the following links, you might want to make revision notes on these or add to yours if you have not yet done so.

Treating, curing and preventing disease (pages 1-8)
https://www.bbc.co.uk/bitesize/guides/z8fkmsg/revision/1
The Brain and the eye (pages 1-7)
https://www.bbc.co.uk/bitesize/guides/z8fkmsg/revision/1
Control of body temperature, Maintaining nitrogen and water balance in the body and Negative feedback (pages 1-6)
https://www.bbc.co.uk/bitesize/guides/zxgmfcw/revision/6
Plant Hormones (pages 1-5)
https://www.bbc.co.uk/bitesize/guides/zc6cqhv/revision/5
Evolution and Speciation (Pages 1-7)
https://www.bbc.co.uk/bitesize/guides/zcqbdxs/revision/1
Basics of genetics (Pages 1-5)
https://www.bbc.co.uk/bitesize/guides/zg8f4qt/revision/6
Trophic levels and biomass (pages 1-5)
https://www.bbc.co.uk/bitesize/guides/zs7gw6f/revision/4

Task 2

This is compulsory for all students. Below are a series of worksheets which require you to complete a series of different tasks. They also require you to convert information which you have read and looked up into different formats. This is something that is exceptionally useful as an A-Level skill.

Worksheet 1: Cell structures 1

Read through the passage below about animal, plant and bacterial cells. Use the information and your own knowledge to complete the table to list some of the structural features of animal, plant and bacterial cells.

The plant cell and the animal cell possess a nucleus containing chromosomes and a nucleolus. In a bacterial cell the DNA is located in the cytoplasm. Only the bacterial cell and the plant cell have a cell wall but all three cells have a cell membrane. The plant cell wall is made of cellulose and the bacterial cell wall is made of peptidoglycan.

Centrioles are present only in the animal cell and chloroplasts are found only in the plant cell. Mitochondria and rough endoplasmic reticulum are not present in the bacterial cell. All three cells contain structures called ribosomes which are involved in the synthesis of protein. Bacterial cells can have pili or a capsule.

Features present in animal cells	**Features present in plant cells**	**Features present in bacterial cells**

Worksheet 2: Cell structures 2

Read through the passage below about animal, plant and bacterial cells. Use the information and your own knowledge to draw and label an animal, plant and bacterial cell. You should include the features listed if appropriate.

The plant cell and the animal cell possess a nucleus containing chromosomes and a nucleolus. In a bacterial cell the DNA is located in the cytoplasm. Only the bacterial cell and the plant cell have a cell wall but all three cells have a cell membrane. The plant cell wall is made of cellulose and the bacterial cell wall is made of peptidoglycan.

Centrioles are present only in the animal cell and chloroplasts are found only in the plant cell. Mitochondria and rough endoplasmic reticulum are not present in the bacterial cell. All three cells contain structures called ribosomes which are involved in the synthesis of protein. These work alongside the golgi apparatus. Bacterial cells can have pili and often a capsule.

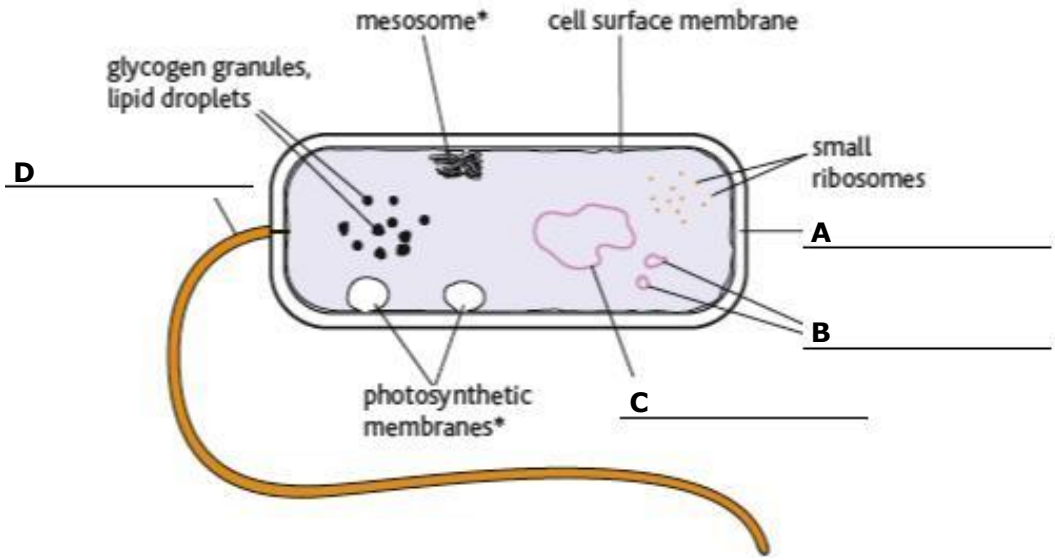
Golgi apparatus Cell wall Nucleus Cell Membrane Ribosome Capsule
Mitochondria Cytoplasm Chloroplast Plasmid Chromosome Nucleolus

Research any of these organelles which are new to you or you do not fully know the function of.

Animal Cell	**Plant Cell**
Bacterial Cell	

Practice questions

1 The diagram shows a bacterial cell with some of the key features labelled.



a Label cell features A, B, C and D.

b Complete the table to identify three features present in animal cells and describe their function.

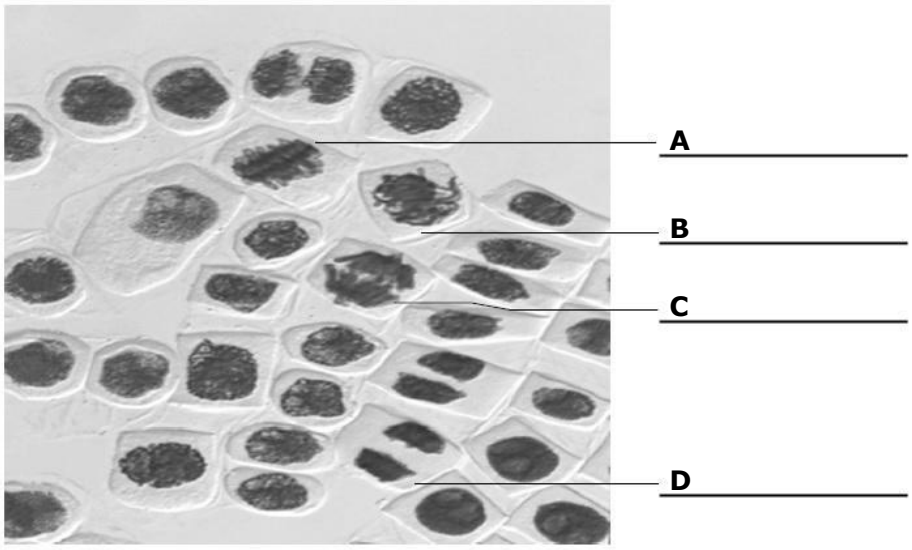
Animal cell feature	Function

c Some antibiotics prevent protein synthesis by targeting the ribosome.

Ribosomes in eukaryotes have a different structure to prokaryotes.

In no more than 50 words, explain why these types of antibiotics can be used to treat bacterial infections without effecting human cells.

2 The image shows root tip cells at different stages of the cell cycle.

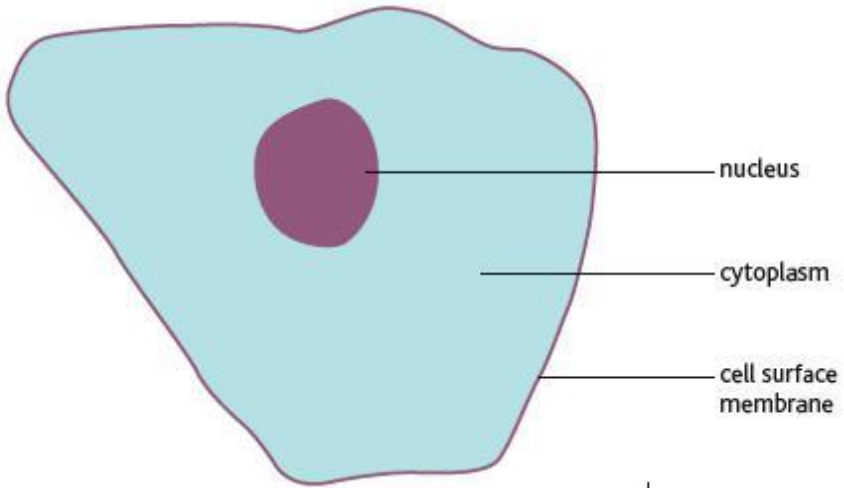


a Identify the stages of mitosis for cells A, B, C and D.

b The microscope used to view the cells had a 10× eye piece lens. Which objective lens was needed to view the cells at this magnification level?

c Calculate the length of cell A.

3 The diagram shows an animal cell with three key features labelled.



a Identify three additional features which are found in animal cells and describe their functions.

1

2

3

b An image of an animal cell nucleus with a diameter of 6 μm was obtained using a 10× eye piece lens and 20× objective lens. Calculate the diameter of the nucleus on the image.

Substances can be transported into cells through diffusion, osmosis and active transport and facilitated diffusion.

4 Write a definition for diffusion, osmosis, active transport, and facilitated diffusion.

Diffusion:

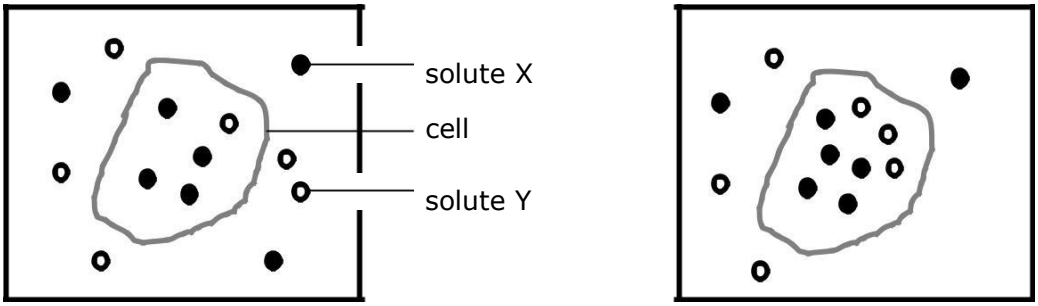
Osmosis:

Active transport:

Facilitated Diffusion

5 Cells were placed in a solution containing solute X and solute Y.

The diagram below represents the concentration of the two solutes inside and outside one of the cells, when this cell was placed in the solution and then after 30 minutes.



Initial concentration **After 30 minutes**

Explain the movement of solute X and solute Y into the cell.

6 A red blood cell was placed in a solution of distilled water.

Explain the effect on the red blood cell of being placed in a solution of distilled water.

7 Explain the key word 'isotonic'.

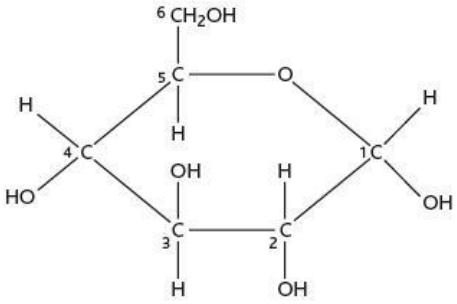
8 A student took 15 identical sized potato chips. The mass of each chip was recorded and the chips were placed in 4 salt solutions (0.1M, 0.2M, 0.3M and 0.4M) and pure water for 30 minutes. The chips were dried and the mass recorded. The mass change and % change in mass was calculated.

Design a table to record the students raw and processed data.

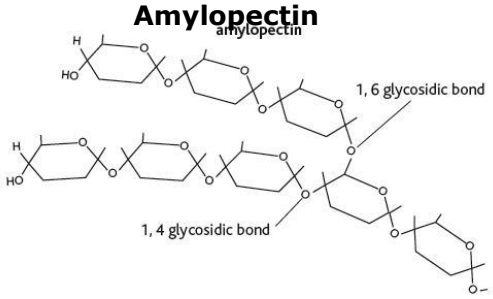
Worksheet 3: Carbohydrates

The diagram shows the chemical structures of some monosaccharides, disaccharides and polysaccharides. Giving a reason, separate the molecules into these three groups.

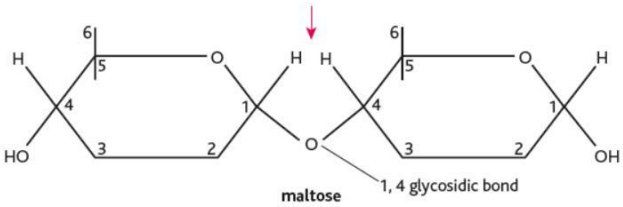
Glucose



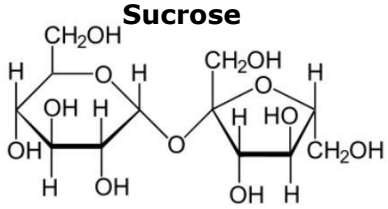
Amylopectin



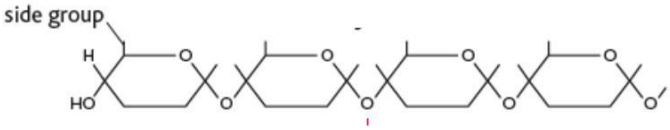
Maltose



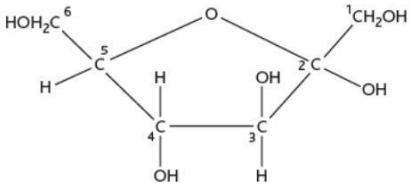
Sucrose



Amylose



Fructose



Monosaccharides	Disaccharides	Polysaccharides

Worksheet 4: Data analysis

Processed data should be recorded to the same number of decimal places as the primary data

This table shows the same data recorded to different numbers of decimal places.

Data set 1	Data set 2
2.4	2.37
3.6	3.55
4.1	4.05
2.8	2.76
3.5	3.51

1 Compare the mean values for data set 1 and data set 2.

2 Express data set 2 to 1 decimal place. What do you notice?

3 Explain why it is incorrect to record 3.28 as the mean for data set 1.

4 Convert the data in the table below.

Data		Value
45 100 g	into standard form	
45 100 g	into kilograms	
34 ms	into seconds	
780 μm	into millimetres	
0.25×10^{-9} s	into nanoseconds	

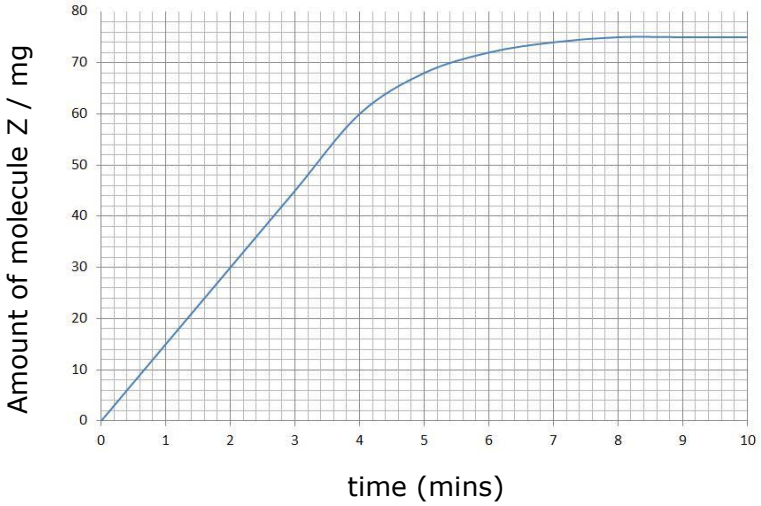
Practice questions

1 Enzyme A catalyses the breakdown of molecule X into Y and Z.

$$X \xrightarrow{\text{Enzyme A}} Y + Z$$

Molecule X and enzyme A were mixed together at 30°C at pH 6.8.

This graph shows the mass of molecule Z formed over a 10 minute time period.



a Calculate the initial rate of reaction of enzyme A.

b What is the rate of reaction of enzyme A after 8 minutes?

c Suggest a reason for the rate of reaction calculated in **b**.

2 Enzyme B catalyses the breakdown of molecule X into Y and Z.

$$X \xrightarrow{\text{Enzyme B}} Y + Z$$

Molecule X and enzyme B were mixed together at different temperatures.
This table shows the initial rate of reaction of enzyme B at 15°C, 25°C, 30°C, 35°C, 40°C and 50°C.

Temperature	Initial rate of reaction of enzyme B ($mmol.min^{-1}$)
15	8
25	14
30	18
35	20
40	18
50	12

a The table has some missing information. Add the missing information to the table.

b Plot the data from the table on graph to show the initial rate of reaction of enzyme B at different temperatures.
You should consider:

- the variable which should be on the x-axis
- the labels for the axis
- the title of the graph.

c Compare different rates of reaction of enzyme B at 20°C, 37°C and 45°C.

For questions which involve the use of data from a graph you must use scientific knowledge to explain the data you have extract from the graph.

3 Mutations in DNA can impact on the activity of enzymes.

This DNA sequence is from the region of the gene which codes for the active site of an enzyme.

GAA GAG AGT GGA CTC ACA GCT CGG

The table shows the amino acid coded for by some codons.

Amino acid/stop signal	**DNA triplet codons**
Proline	GGT GGG GGA
Alanine	CGG CGA CGT CGC
Cysteine	ACA ACG
Serine	AGG AGA AGT AGC
Leucine	GAA GAG GAT GAC
Arginine	GCA GCG GCT GCC
Glutamine	CTT CTC
Gkycine	CCT CCG CCA CCC
Threonine	TGC TGA TGT TGG
Stop signal	ATT ATC ACT

a State the amino acid sequence coded for by the sequence above.

b Using the information above explain the effect on the protein produced for the following mutations.

GAA GA**T** AGT GGA CTC ACA GCT CGG

GAA GAG AGT GGA CTC **C**CA GCT CGG

GAA GAG AGT GGA CTC ACA **A**CT CGG

Worksheet 5: Prefixes

Scientific terms use common prefixes. Find out the definition/meaning of the prefixes shown in the table.

Word/prefix	Definition/meaning
endo	
exo	
pulmonary	
cardiac	
hepatic	
mono	
di	
photo	
haem	
bio	
chemo	

Worksheet 6: Keywords

Read the responses to the questions below. Using the keywords from the box write improved answers to the questions.

concentration		capillaries			vein		
	Diffusion		thin			semi-lunar	
right		pulmonary			valve		
	gradient		atrioventricular			left	
aorta		vena cava			artery		
	thick		osmosis				

1 Explain how oxygen enters the blood at the alveoli.

In the alveolus oxygen from the air moves into the blood vessels through the walls of the alveolus. The blood is moving so there is always a low concentration in the blood.

2 Describe the route blood takes from the lungs to the body.

Blood from the lungs blood travels through a vein to the atrium. The blood is pumped from the atrium into the ventricle and then into the aorta.

Practice questions

1 **a** Write a definition for each key word in the box. If possible give a structural feature for each key word.

atria	ventricles	aorta	vena cava	pulmonary artery
pulmonary vein	atrioventricular valves	septum		
semi-lunar valves	diastolye	systole		

atria:

ventricles:

aorta:

vena cava:

pulmonary artery:

pulmonary vein:

atrioventricular valves:

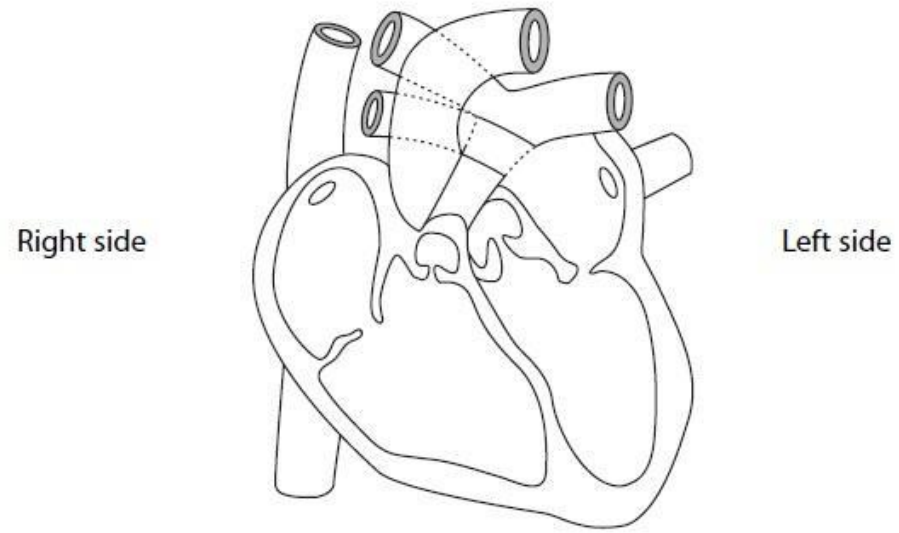
septum:

semi-lunar valves:

diastole:

systole:

b Label this diagram of the heart using as many of the key words from **1 a** as possible.

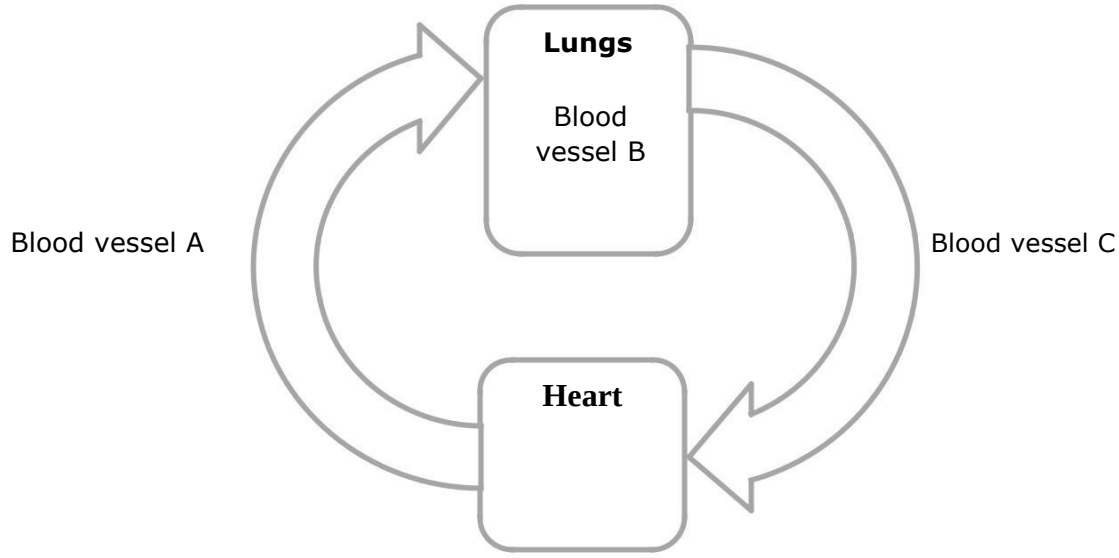


c Use the keywords from **1 a** in your answers to the following questions.

i Explain why the left ventricles has thicker chamber walls than the right ventricle and the atriums.

ii Describe the role of the atrioventricular valves.

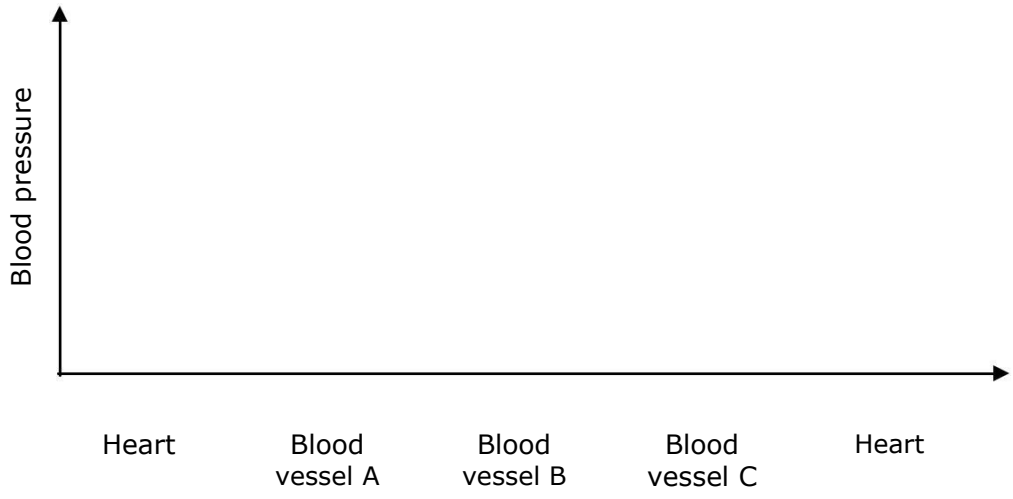
2 This flow diagram shows the part of the circulation system in a mammal.



a Complete a table to show conditions of blood vessel A, B and C.

Blood vessel	Type of vessel	Level of oxygen saturation	Relative pressure of the blood	Valves present in the vessel	Thickness of blood vessel walls
A					
B					
C					

b Draw a line on the axis to show the blood pressure changes in the blood as it flows from the heart to the lungs before returning to the heart.



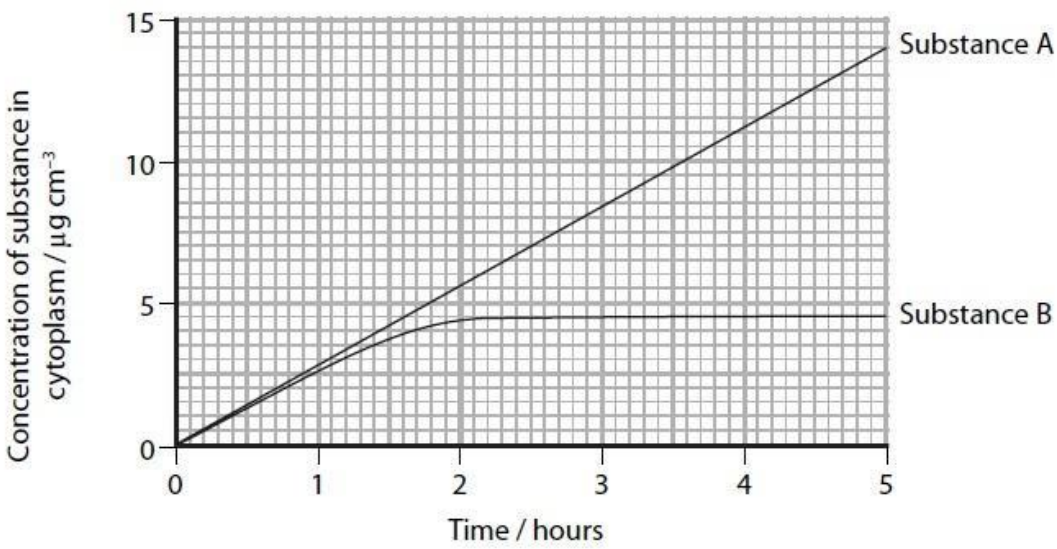
3 *Amoeba* is a single-celled aquatic organism. Substances in the water can enter the cell by a variety of mechanisms.

An experiment was carried out to compare the uptake into *Amoeba* of substance A and substance B.

Some of these organisms were placed in a solution containing equal concentrations of both substances and kept at 25ºC.

The concentration of substances A and B, in the cytoplasm of these organisms, was measured every 30 minutes over a period of 5 hours.

The results of this experiment are shown in the graph below.



a Using the information in the graph, compare the uptake of substance A with the uptake of substance B during this period of 5 hours.

b Substance B enters the cells by diffusion. Describe and explain how the results of this experiment support this statement.

c Substance A enters the cells by active transport. Give **two** differences between active transport and diffusion.

1

2

Task 4 (compulsory for all)

In Biology the longest answer is a 9 mark question. This will require you to amalgamate a large amount of information into a relatively concise answer. To this end use the table below to answer the following question:

"Explain the biological significance of water"
(9 marks)

Function	**Examples/Explanations**
Transport	
Chemical Reactions (metabolism)	
Temperature control	
Support	
Movement	
Reproduction	

Answer:

Task 5 (optional)

Biology is a fascinating and an ever-changing subject. During your A-Levels you will focus on the specification however it is important to stay interested in the subject and up to date (especially if you are considering going on to a career in Biology). Therefore, over this time away from school take advantage of the opportunity to watch some of these talks or read some of these books. This is not a limited or extensive list- just a brief introduction!

Four billion years of evolution in six minutes:
https://www.youtube.com/watch?v=XyTcINLKq4c

Did humans evolve from monkeys or from fish? In this enlightening talk, ichthyologist and TED Fellow Prosanta Chakrabarty dispels some hardwired myths about evolution, encouraging us to remember that we're part of a complex, four-billion-year process- and not the end of the line.

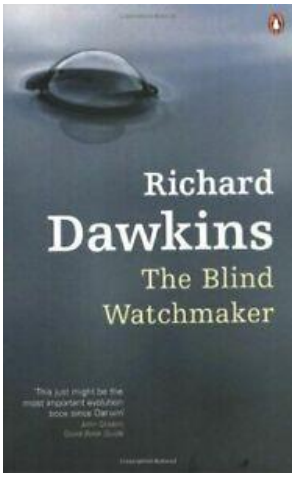
Can we cure genetic diseases by rewriting DNA?:
https://www.youtube.com/watch?v=ONs9FCY74p0

Genome editing takes the promise of CRISPR to the next level: if CRISPR proteins are molecular scissors, programmed to cut specific DNA sequences, then base editors are the pencils, capable of directly rewriting one DNA letter into another.

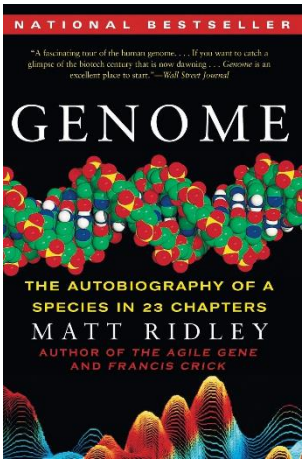
The brain-changing benefits of exercise:
https://www.youtube.com/watch?v=BHY0FxzoKZE
Get inspired to do some exercise as Wendy Suzuki discusses the science of how working out boosts you mood and memory- and protects you brain against neurodegenerative diseases like Alzheimer's.

How do we combat antibiotic resistance?:
https://www.youtube.com/watch?v=8Ss1cGyOyEk

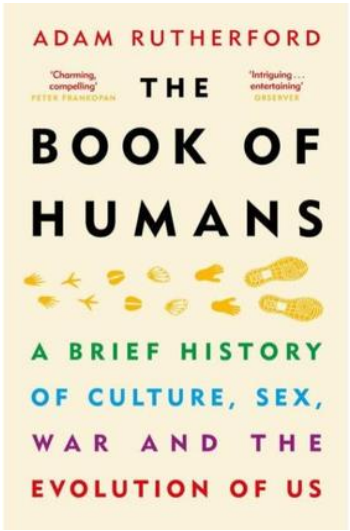
Antibiotic resistance is rampant in the world, and we are moving towards dark ages when it comes to curing something as simple as a cut or a wound. Hear what human kind should do to protect one of our most valuable discoveries-antibiotics.



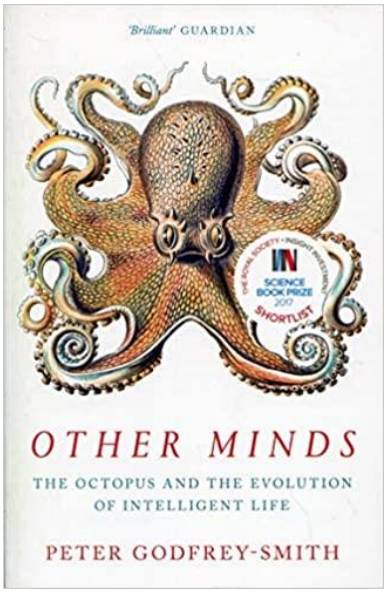
The Bind Watchmaker
Like him or hate him, every A-Level Biology student should read one of Dawkins' books. Readable and provocative, this is probably the best of his books to start on.



Genome
Probably the best popular introduction to modern genetics. Ridley's structure is wonderfully simple – 23 chapters to cover the 23 human chromosomes. 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 Book of Humans
This describes some of the characteristics that show off our intelligence as a species - starting fires, sex for pleasure, development of languages, to name a few - are also shared by animals. Rutherford poses the unnerving existential question: what is it that makes us as human after all?



Other minds: The octopus and the evolution of intelligent life
In *Other Minds*, Godfrey-Smith, a distinguished philosopher of science and a skilled scuba diver, tells a bold new story of how nature became aware of itself – a story that largely occurs in the ocean, where animals first appeared.

Other optional but interesting websites and videos are listed below (again, this is not extensive, there are hundreds more):

The surprising use of silk:
https://www.youtube.com/watch?v=RS-cjTkuX9w&feature=youtu.be
Researching the reef:
https://www.youtube.com/watch?v=2iQaDeGSj1w&feature=youtu.be
Bringing back the butterfly:
https://www.youtube.com/watch?v=9k72VVSQxG4&feature=youtu.be
National geographic:
https://www.nationalgeographic.com/
New scientist:
https://newscientist.com/