DAVENANT FOUNDATION SCHOOL

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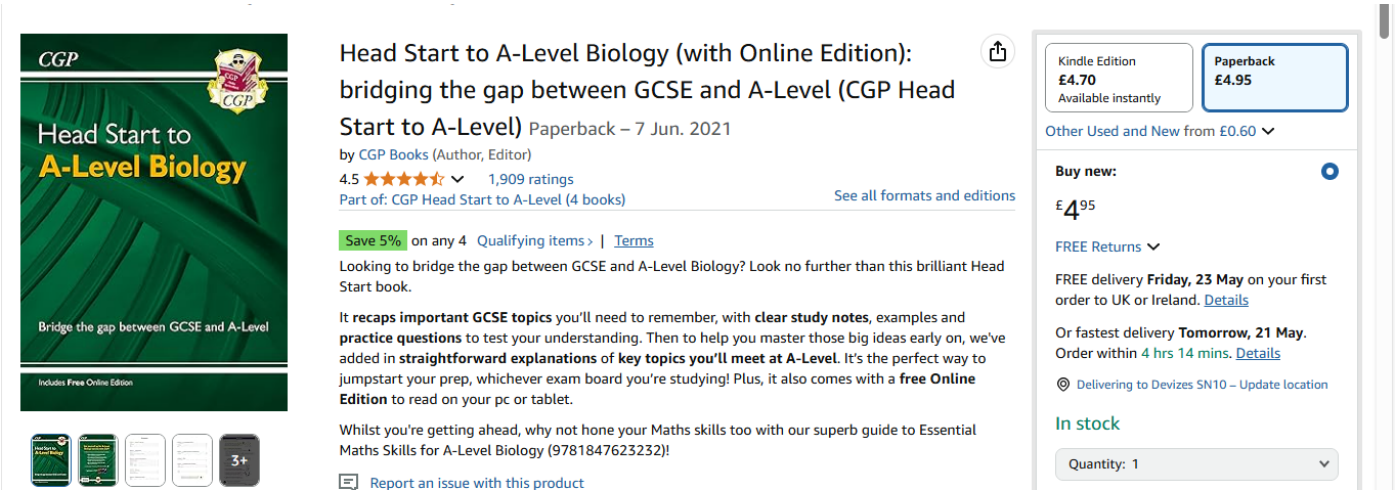
Ofsted Outstanding Sixth Form Provision Sept 2021

Y12 BIOLOGY SUMMER WORK
DEADLINE: Your first biology lesson

If you would like to carry out some pre-reading in preparation for your A Level Biology course, below is a link to a CPG book which is called 'Head Start to A-level Biology (CGP A-Level Biology)' It is free to download if you have a kindle.
https://www.amazon.co.uk/Head-Start-level-Biology-Level/dp/1782942793/ref=cm_cr_arp_d_product_top?ie=UTF8



Below are the tasks that need to be completed during the summer in preparation for your **first lesson** in Y12 biology in September.

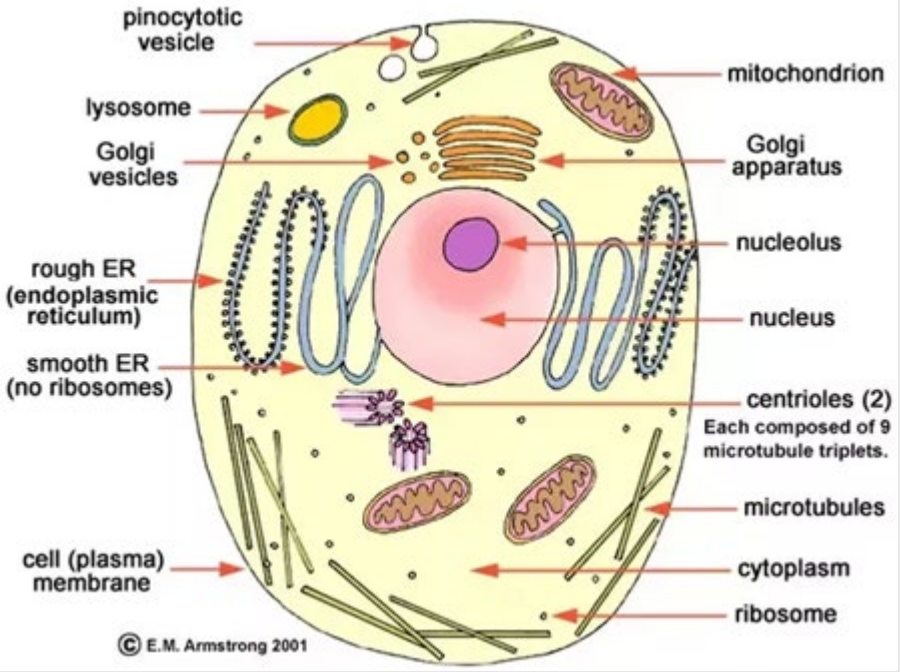
During these tasks if you find any words difficult to understand use the site www.onelook.com which accesses various dictionaries including biology-specific ones, to provide you with definitions (scroll down to the science/biology section).

It is required that you attempt all of the tasks below, and if you are unable to complete any of them then please email the Head of Biology; Mrs Johnson (Alexandra.johnson@davenant.org)

During the second week of year 12 Biology in September you will be given a test /50 that will assess your understanding of the tasks we have set below. This will give both, teachers and yourself an indication of the demands of work and effort that will be expected from you during the A Level Biology course.

TASK 1: Eukaryotic cells

1. On an A4/A3 piece of paper, **draw and label** the ultrastructure of a eukaryotic cell – example below (Use colours to help) – Next to each labelled organelle **add a description** of its role.



You will need to be able to label a eukaryotic cell (similar to the diagram above) including a description of each organelles function;

Organelles with a membrane	**Function**
Nucleus	Controls the cell, stores the organism's DNA. DNA contains genes which provides the instruction for protein synthesis.
Rough endoplasmic reticulum (RER)	It provides a large surface area for ribosomes to attach to, which assemble amino acids into proteins.
Smooth endoplasmic reticulum (SER)	Contains enzymes that catalyse reactions involved with lipid metabolism. It is involved with the absorption, synthesis and transport of lipids.
Golgi apparatus	Proteins are modified and packaged into secretory vesicles that are pinched off and either stored in the cell or moved to the plasma membrane to be exported outside of the cell.
Mitochondria	Is the site of ATP production during aerobic respiration.
Lysosomes	Keep the hydrolytic enzymes and are used for digestion.
Organelles without a membrane	**Function**
Ribosomes	Synthesis proteins
Centrioles	Involved in the formation of cilia and undulipodia. Involved in the movement of pulling chromosomes to the opposite ends

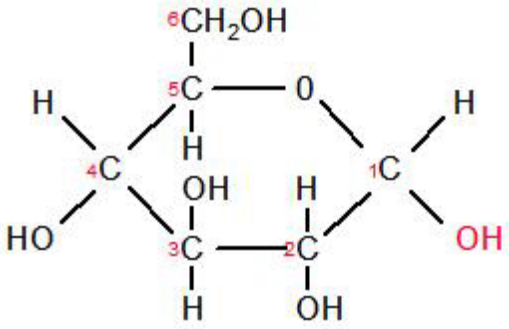
	of the cells during cell division.
Cytoskeleton	Gives support to the cell. Changes the shape of the cell. Moves organelles eg. Mitochondria Moves chromosomes

TASK 2: Biological molecules

Biological molecules are a key topic you will learn about during Year 12 biology and it is a requirement to be able to draw structures of carbohydrates, proteins and fats.

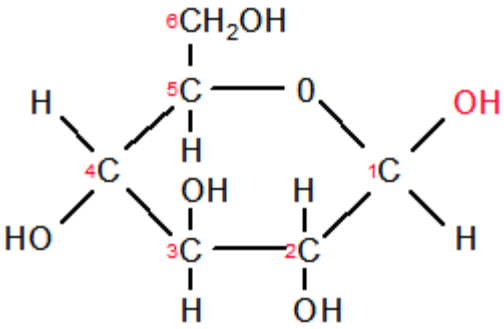
We have found that year 12 students find it difficult to learn the two structures of glucose – please learn to draw these:

Alpha glucose



α-glucose

Beta glucose



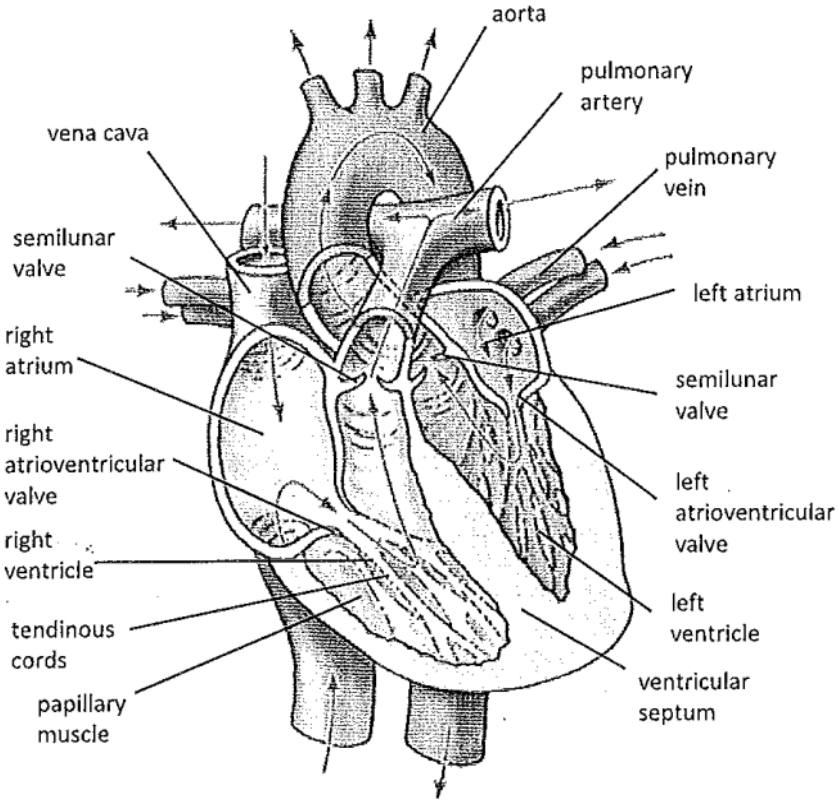
β-glucose

TASK 3: Mammalian heart

In the September exam, you will be assessed on the following content about the mammalian heart ;

- The structure of the mammalian heart
- Your understanding of why the chamber walls are of different thicknesses.
- Comparing a single and a double circulatory system.

Task: print out a blank diagram/draw the mammalian heart (example of diagram below) and label each structure including an explanation for each part.

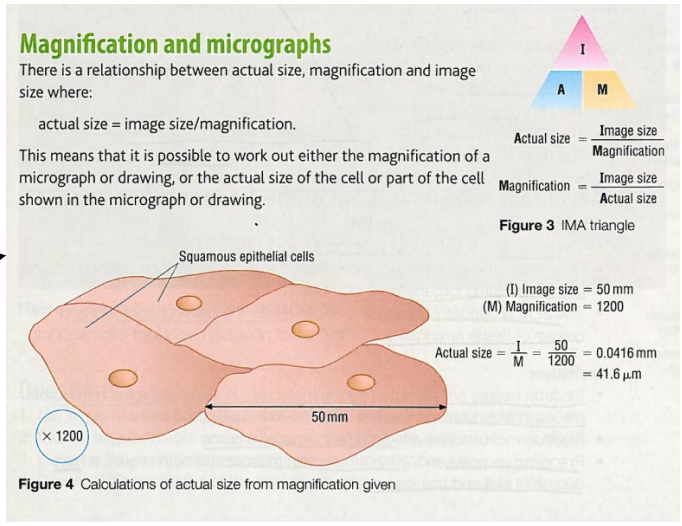


Task 4: Mathematical skills in Biology

10% of each exam covers GCSE Math.

Here are a few examples of how you are expected to apply math's in biology. You will be expected to be able to apply these math's skills to the exam you will take in September.

1. **Magnification**
2. **Being able to calculate averages and identifying anomalies**
3. **Surface area to volume ratio**
4. **Graph skills**



Magnification and micrographs

There is a relationship between actual size, magnification and image size where:

actual size = image size/magnification.

This means that it is possible to work out either the magnification of a micrograph or drawing, or the actual size of the cell or part of the cell shown in the micrograph or drawing.

I
A M

Actual size = Image size / Magnification

Magnification = Image size / Actual size

Figure 3 IMA triangle

Figure 4 Calculations of actual size from magnification given

	Small cube	Medium cube	Large cube
Length of side/cm	1	5	10
Surface area (SA)/cm^2	6	150	600
Volume (V)/cm^3	1	125	1000
SA/V ratio	6	1.2	0.6

Habitat	Height of grass species (cm)				Average height of grass species (cm)
	Sample 1	Sample 2	Sample 3	Sample 4	
A	11.1	11.9	12.1	11.4	
B	9.2	5.9	9.1	9.0	

Use the following information to answer the questions. You will need graph paper.

A student investigated the digestion of fat by the enzyme lipase. The student wanted to investigate the effect of increasing temperature on the rate of reaction. When fats are broken down the change in pH decreases. This change in pH can be detected by an indicator, such as bromothymol blue, which is blue at pH 7.6, green at pH 7.0 and yellow at 6.0. The time taken for the indicator to change to yellow can be measured. The student presented their data in a table as shown below;

Time taken for indicator to become yellow (secs)			Temperature
1	2	3	
454	476	468	10^{o}C
287	295	305	15^{o}C
210	208	212	20^{o}C
121	123	126	25^{o}C
105	110	109	30^{o}C
68	63.5	65.5	35^{o}C

1. The table of results above is incorrect. Draw the table out again including the any corrections.
2. Calculate the mean time taken for the indicator to become yellow for each temperature:

Temperature	Mean
10ºC	
15ºC	
20ºC	
25ºC	
30ºC	
35ºC	

3) Using the mean values you calculated in question 10(b) **plot a suitable graph** for the mean time taken for the indicator to turn yellow at different temperatures.
4) Draw a line of best fit on your graph
5) Use your graph to find an estimate for the mean time taken for the indicator to turn yellow at 22^{o}C.

_____

Task 5 – Protein synthesis

1. Watch the following video clip on protein synthesis.

https://www.youtube.com/watch?v=x5ZXQo-xeMo&vl=en-GB

2. Produce a poster that explains the main steps involved in protein synthesis. You can use the diagram below to help you.

TRANSCRIPTION

1a) What do the enzymes do to the DNA in order to allow the process of transcription to begin?

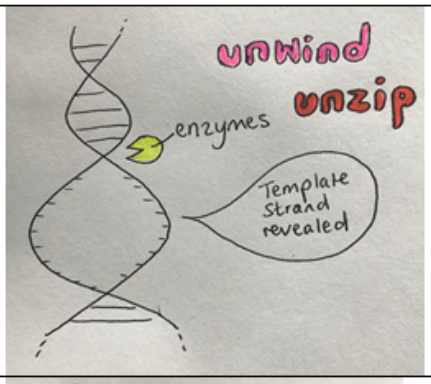
_____

1b) What strand is revealed when the enzymes do this?

_____

1c) In what part of the cell does transcription occur? _____

1d) In this process only a short section of DNA is unwound and unzipped. What is the name of a short section of DNA? _____



2a) Whereabouts is the non-coding region of DNA in relation to the gene?

_____

2b) What enzyme is needed for transcription?

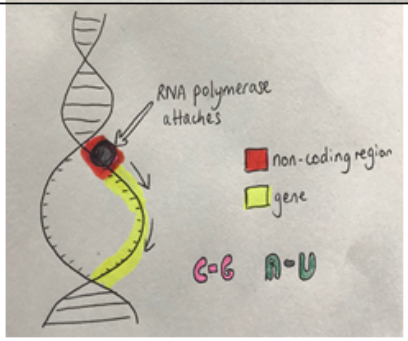
_____

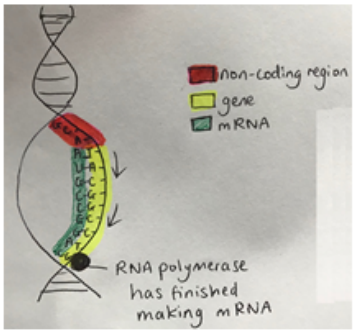
2c) If the template strand was the top row (below). Work out what mRNA sequence that RNA polymerase would make from it (write your answer in the boxes)

T	A	C	G	T	A	T	C	G	A

2d) What does the m stand for in mRNA?

_____

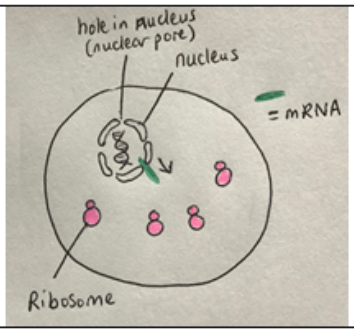




3a) After transcription finishes how does the mRNA get out of the nucleus? It travels through the _____

3b) For the mRNA to get to a ribosome, what part of the cell does the mRNA have to travel through once it leaves the nucleus?

_____

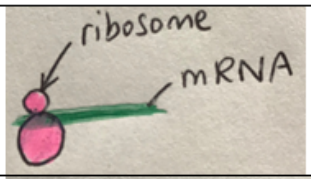


TRANSLATION

4) Translation starts when mRNA binds to a _____.

5) Ribosomes are found in which part of the cell?

_____

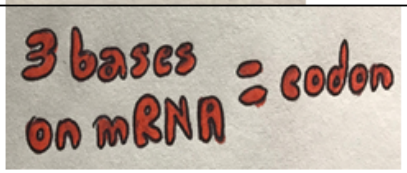


5a) How many bases does a ribosome "read" at a time? _____

5b) What is meant by a codon?

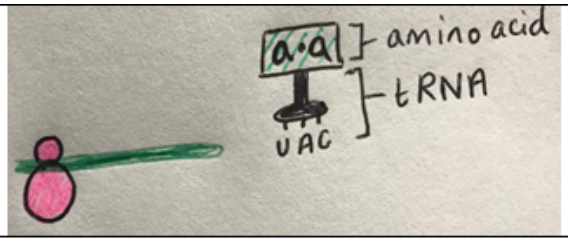
_____

5c) If a ribosomes "reads" 21 codons in an mRNA strand. How many amino acids would this code for? _____

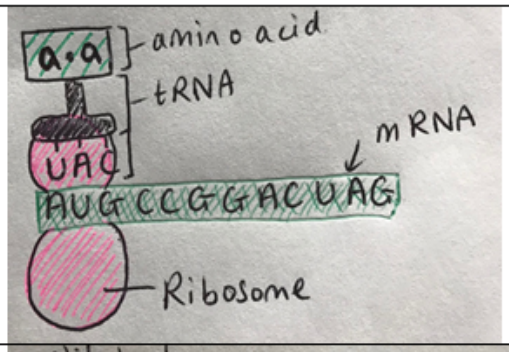


6a) What is the role of tRNA?
_____
_____

6b) What does the t stand for in tRNA?
_____

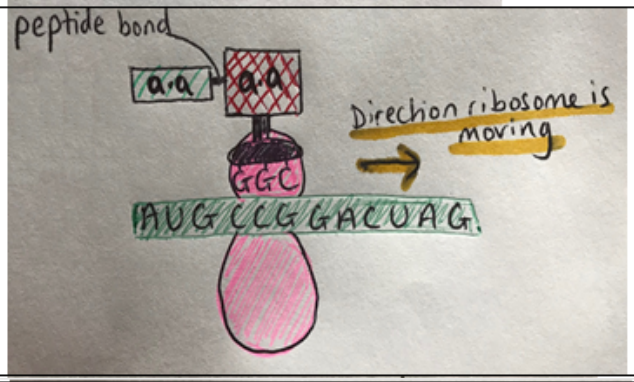


7) The tRNA's anticodon binds to the mRNA's _____. This is called complementary _____ pairing.
This ensures the correct amino acid is brought to the ribosome to build up a chain of
_____ _____.

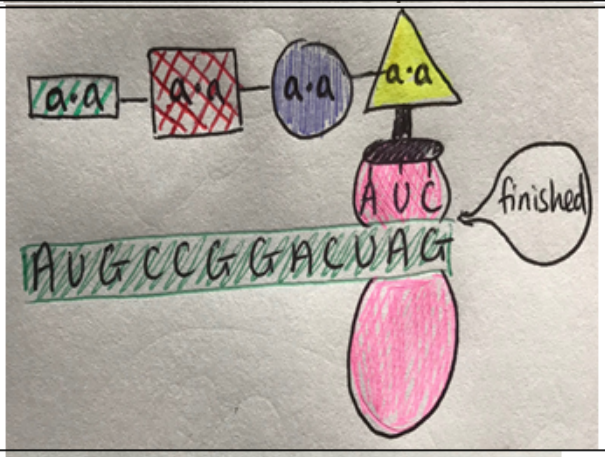


8a) What bond forms between two amino acids?
_____

8b) Look at this diagram how many amino acids will be found in this polypeptide chain?
_____



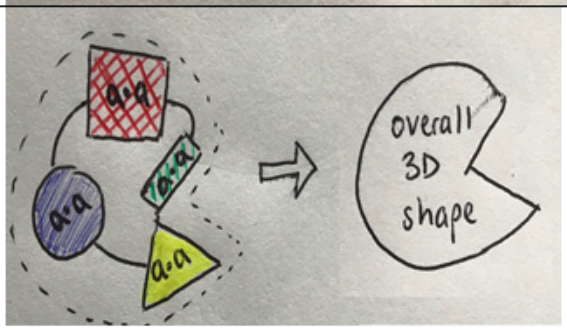
9) How does the ribosome know when translation is complete?
_____
_____

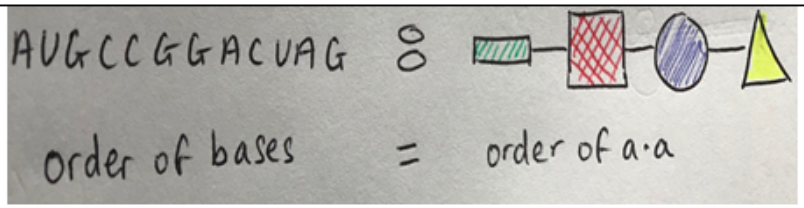


10a) How does a polypeptide chain become a fully functioning protein?
_____
_____
_____

10b) Haemoglobin is a protein found in red _____ cells. It contains more than 1 polypeptide chain. In fact each molecule contains _____ polypeptide chains.

10c) Another example of a protein that could be made in this process is an enzyme. Label where the active site could be located on the diagram on the right. Tick here when done _____



11a) The sequence of bases determines the exact sequence of _____ 11b) The word s_____ is another word for order.	

Task 6: Using the ticklist, check that you have completed all of the tasks. You will be expected to hand in the following work during your first Biology lesson, clipped together or in a clear plastic wallet.

Task	Work to submit	Completed?
1. Eukaryotic cells	- A **drawn and labelled** eukaryotic cell with a **description** of each structure. - Attached, **completed questions** on the eukaryotic cell structures	
2. Biological molecules	- **Drawings** of both alpha and beta glucose (need to learn these off by heart)	
3. Mammalian heart	- **Printed out/drawn mammalian heart** including an explanation for each structure.	
4. Mathematical skills in biology	- Correctly **drawn table of results** - **Mean** values calculated - **Graph drawn** on graph paper including a **line of best fit**	
5. Protein synthesis	- **A poster** that explains the main steps involved in protein synthesis	