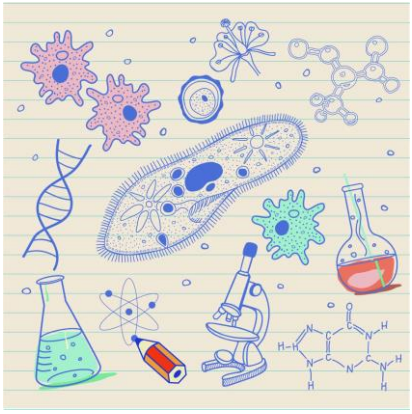
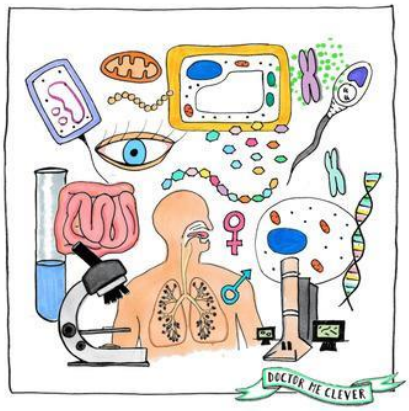
A level Biology

Transition Pack

ORMISTON FORGE ACADEMY



A Level Biology
Year 11 Transition Booklet



Dear Year 11,
Welcome to A Level Sciences. We hope that in choosing to study an A Level science, you have already looked into the requirements of the course and your suitability for it, as well as how it will combine with your other A Level subjects and how it could lead into your future university course, job or apprenticeship.

A Level Biology, Chemistry and Physics are demanding courses and we always advise that students thoroughly understand what is expected from them during the 2-year course and are prepared to supplement learning during lessons with thorough independent study at home or in school.

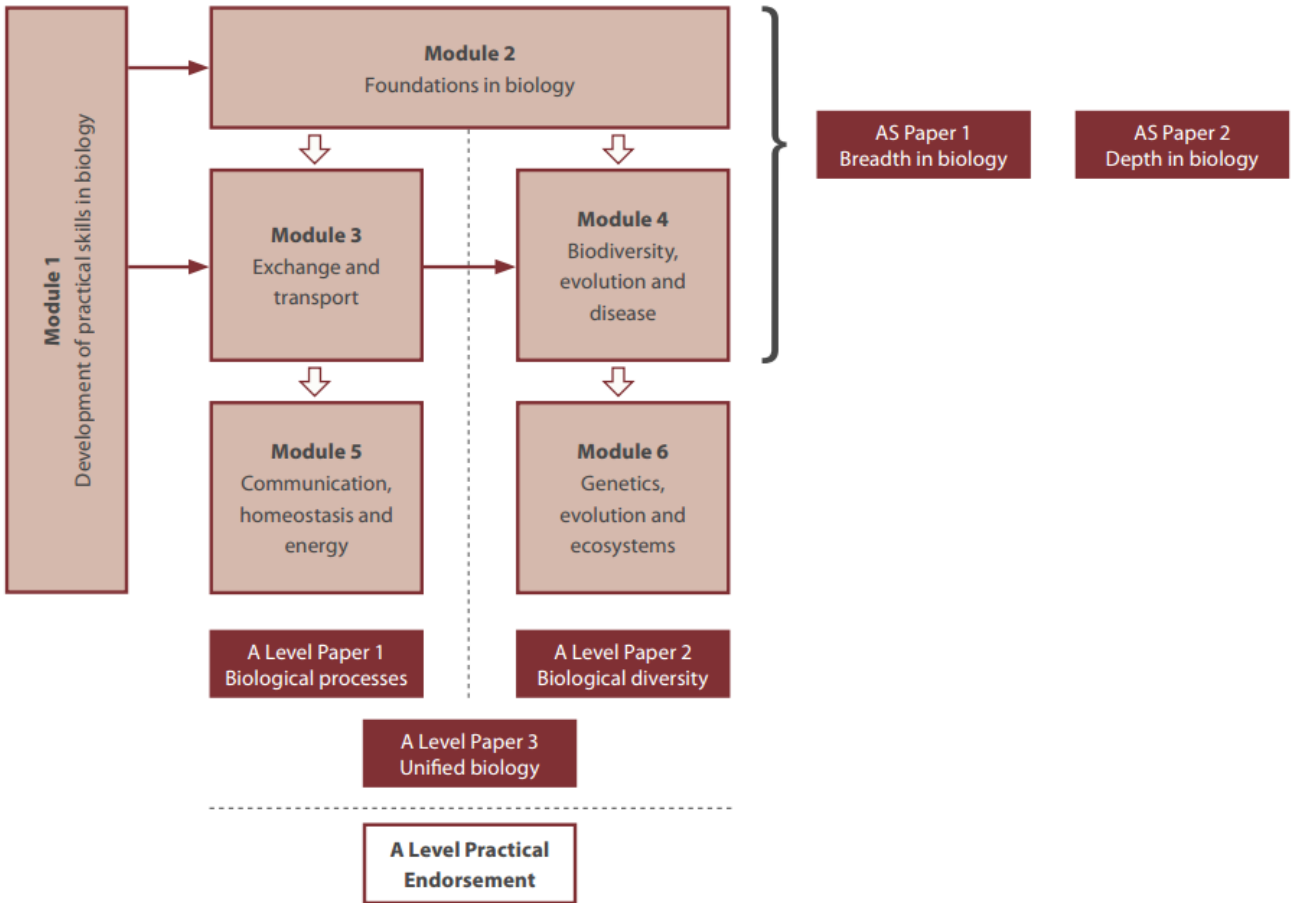
This transition pack is designed to give you an insight into the course, a taster of some of the work you will do and also our expectations of what should already know and be able to do from GCSE.

To be able to begin studying any of the A Level Sciences in September, as well as meeting the entry requirements, you will need to bring this completed booklet to your first lesson. A Level Scientists must prove that they are critical thinkers, problem solvers and, above all, hard workers.

You will also receive a multiple choice question assessment on some of the content covered in this booklet, so highlight / make notes as appropriate.

If you are struggling to complete any of the tasks or have any questions about an A Level Science, please contact the course leader:
Biology – Miss Fellows – katie.fellows@oatforge.co.uk
Chemistry – Mr Wallace - scott.wallace@oatforge.co.uk
Physics – Mr Iliffe – michael.iliffe@oatforge.co.uk

OCR A Level Biology Course Outline



Year 12- Modules 1 – 4
Year 13 – Modules 5- 6

Practical Endorsement a set of practical activities which are assessed by your teacher and form part of your final written examination

Task 1 – Glossary

Create a key term glossary by finding the correct **scientific** definitions. The terms shaded in grey are new – the others you should already be familiar with from GCSE.

Key word	Definition
Abiotic	
Active transport	
Adrenaline	
Biodiversity	
Biuret test	
Clone	
Condensation reaction	
Denaturation	
Dendrite	
Diffusion	
Dominant allele	
Enzyme	
Gamete	
Genotype	
Glucagon	

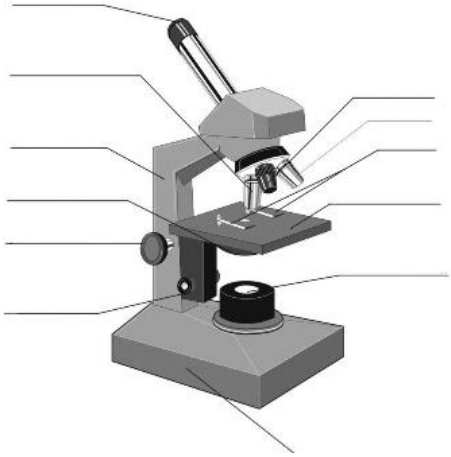
Glycogenesis	
Homeostasis	
Insulin	
Limiting factor	
Meiosis	
Mitosis	
Osmosis	
Pathogen	
Pentose	
Phloem	
Photomicrograph	
Polymer	
Synapse	
Triglyceride	
Vector	
Xerophyte	
Xylem vessels	

Task 2 – Links to previous topics (research where necessary)

Microscopes;

The Light microscope allows you to view animal cells. It can magnify up to 1500 times. Larger organelles such as mitochondria, chloroplasts, vacuoles, cell walls, cell membranes and nuclei are visible. Staining makes these organelles visible.

Label and annotate the diagram.



The electron microscope; invented in 1950s it allows a much higher magnification (500 000x) and better resolution, allowing greater detail to be seen.

Electron microscopes allowed detailed ultrastructure of the cell to be seen, such as ribosomes and the inside of mitochondria and chloroplasts.

Questions:

Name 3 things visible with a light microscope in both animal and plant cells.

Name 4 organelles that both plant and an animal cell have.

What is the calculation used to calculate the magnification of an object?

What is the function of the mitochondria?

Cell structure;

Nuclei: controls the cell function, containing the DNA which is the coded information for the production of proteins.

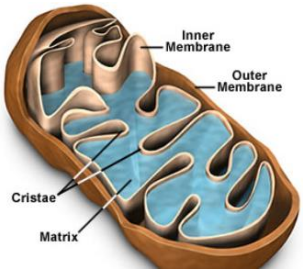
During cell division the chromosomes become shorter and thicker and can be seen with a light microscope. The chromosomes will then make a copy of themselves, one copy for each cell produced during cytokinesis.

Nuclei have a double membrane called the nuclear envelope.

Mitochondria: can be seen with a light microscope,

however, greater internal detail can be seen using an

electron microscop



The mitochondria's function is to carry out aerobic respira

The energy release used to form molec of ATP.

ATP is used in the cells to provide energy for muscular contractions, active transport as well as anabolic and catabolic reactions.

Cell wall: the plant cell wall is made up of cellulose

Molecules laid side by side to form

Questions;

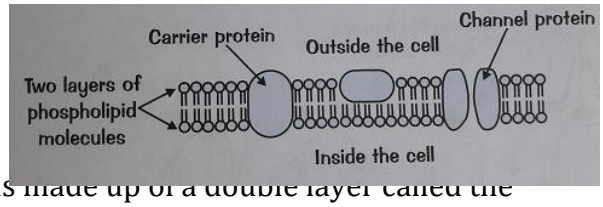
Name 2 molecules that make up the cell membrane.

What is the name of the molecule that provide energy to the cell?

What is meant by water potential? Research if you need to.

Cell structure;

Cell surface membrane: Found around every cell, it allows the movement of substances into and out of the cell. It is a partially permeable membrane and will prevent certain substances from entering.



It is made up of a double layer called the PHOSPHOLIPID BILAYER. These are molecules closely packed together in a mosaic pattern. Within the bilayer are large proteins which are also responsible for transport and for cell recognition.

Transport into and out of cells

There are 4 modes of transport you need to be aware of;

Diffusion; can be gas or liquid particles. They move from an area of high concentration to an area of low concentration down a concentration gradient. Small molecules such as oxygen, water and carbon dioxide can pass through the phospholipid bilayer.

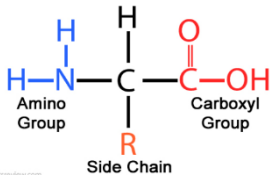
Osmosis; occurs only with water. The water particles move from an area of high water concentration to an area of low water concentration, down a concentration gradient, across a partially permeable membrane. NO ENERGY IS REQUIRED. You will be required to refer to **water potential** in AS level not water concentration.

Facilitated diffusion; Some particles are too large to fit through the phospholipid bilayer and therefore require a carrier protein to assist. The protein carriers are within the bilayer and they change shape when they come into contact with a specific molecule (i.e. Glucose). NO ENERGY IS REQUIRED.

Active transport; This moves substances for an area of low concentration to an area of high concentration against a concentration gradient. ENERGY IS NEEDED for this to occur. Specific carrier proteins are also required these can be called 'pumps'.

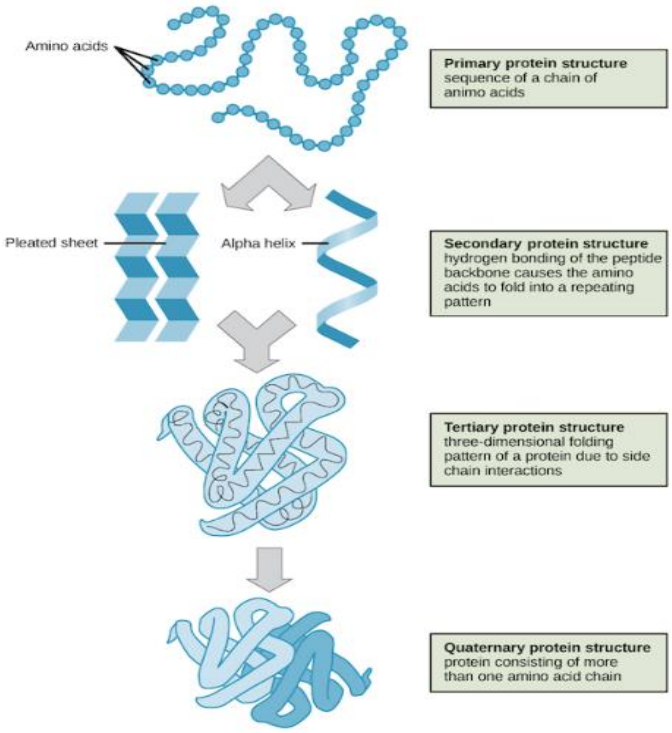
Proteins;

Proteins are made of long chains of amino acids, up to several hundred long. There are only 20 different amino acids and the combination of these 20 produce a wide range of complex proteins. Protein structures are held together with strong bonds called PEPTIDE bonds. The order of the amino acids determines the structure and how it works.
All amino acids have the same structure (shown below) with one variation on the R group.
Contains; Hydrogen, oxygen, Nitrogen and carbon.



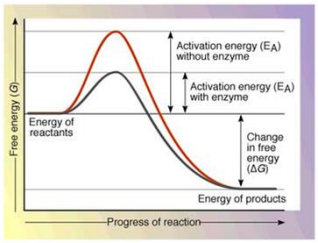
Proteins structure;

The order of the amino acids forms the PRIMARY STRUCTURE. The protein chain can then **coil** or **fold** into **pleats** which are held together by weak hydrogen bonds to for the SECONDARY STRUCTURE.
Enzymes have a further folding held together with stronger disulphide bonds. This is the TERTIARY STRUCTURE. If the structure is almost spherical it is called a **globular protein**.



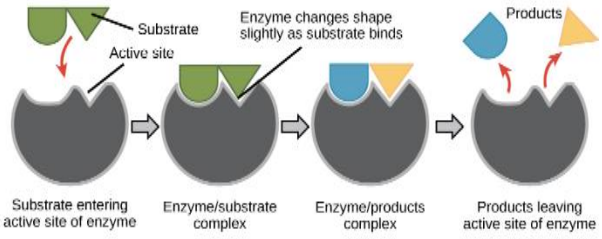
Enzymes; Help to speed up biochemical reactions.

Enzymes are proteins; enzymes are globular proteins with a specific order of amino acids that determines what the enzyme does.
Enzymes can be catabolic (break substrates down) or anabolic (build substrates up). Enzymes have a specific site into which the substrates can attach itself, this attachment site is called the **active site.** The active site is **complementary** to the shape of the substrate. Once they attach together they form the **enzyme substrate complex**. The substrate then breaks bonds or makes bonds (depending on the type of enzyme) and the product leaves the active site. The active site is now able to accept another substrate.



Denaturing enzymes; Enzymes have a specific tertiary structure held in place by weak hydrogen bonds and stronger disulphide bonds. These bonds can be broken by an increase in temperature (kinetic energy) or a change in pH (H^+ in acid or OH^- in alkali disrupt the bonds).

Useful enzymes; Digestive enzymes are catabolic, breaking down food into smaller molecules. Enzymes are also needed in DNA replication, building up molecules (D



Questions;
What monomers make up proteins?

What types of bond hold together the secondary structure?

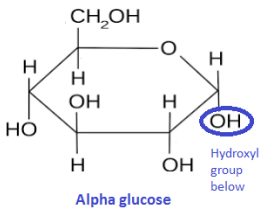
What are the two types of secondary structure protein?

What bonds hold together the tertiary structure?

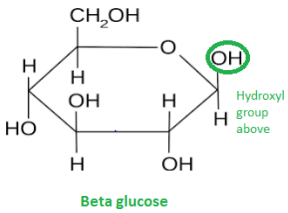
What is a quaternary protein?

Carbohydrates;

Three elements make up the carbohydrate molecule – carbon, hydrogen and oxygen.
There are several types of carbohydrates;
Sugars; Small, sweet, water soluble molecules. Can be **monosaccharides** or **disaccharides**. Monosaccharides are single rings from which disaccharides are built. **Glucose** and **Fructose** are monosaccharides and join together to form the disaccharide sucrose. The joining together of 2 monosaccharides occurs to release a molecule of **water** this is called a **condensation reaction.**
Glucose occurs in 2 forms alpha (α) glucose and beta (β) glucose.



Alpha glucose

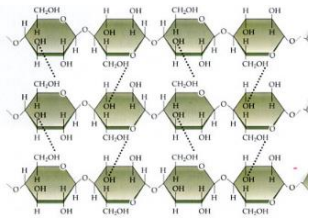


Beta glucose

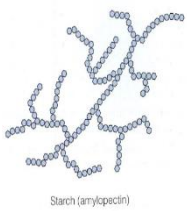
Starch; A **POLYSACCHARIDE** (a large molecule –polymer, made up of monomers). Two different polysaccharides of glucose are used to make starch- **amylose** and **amylopectin**. Starch is insoluble so it is a good storage molecule in plants.

Cellulose; a polymer of glucose. Bonding is different in cellulose, molecules are bonded in a long straight line with **hydrogen** bonds between the strands. It forms **microfibrils** to provide strength to plant cell walls.

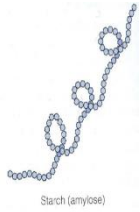
Cellulose



Amylopectin

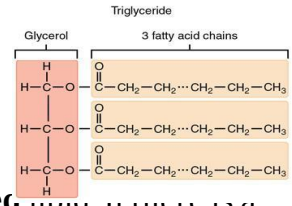


Amylose

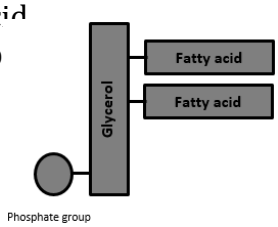


Lipids;

Three elements make up the lipid molecule – carbon, hydrogen and oxygen. Lipids are fats and oils, predominantly made up of a group of lipids called **triglycerides**. These contain a molecule of **GLYCEROL** with 3 **fatty acids**.



The fatty acid is a long chain of carbon atoms with an acid (-COOH) group. Hydrogen atoms are attached to the carbons by single bond. A single bond forms a **saturated** lipid. If there is a double bond then the lipid is **unsaturated**, many double bonds forms a **polyunsaturated** lipid.
Cell membranes are formed from phospholipid. They do not have 3 fatty acid chains but 2 fatty acid chains and a phosphate group



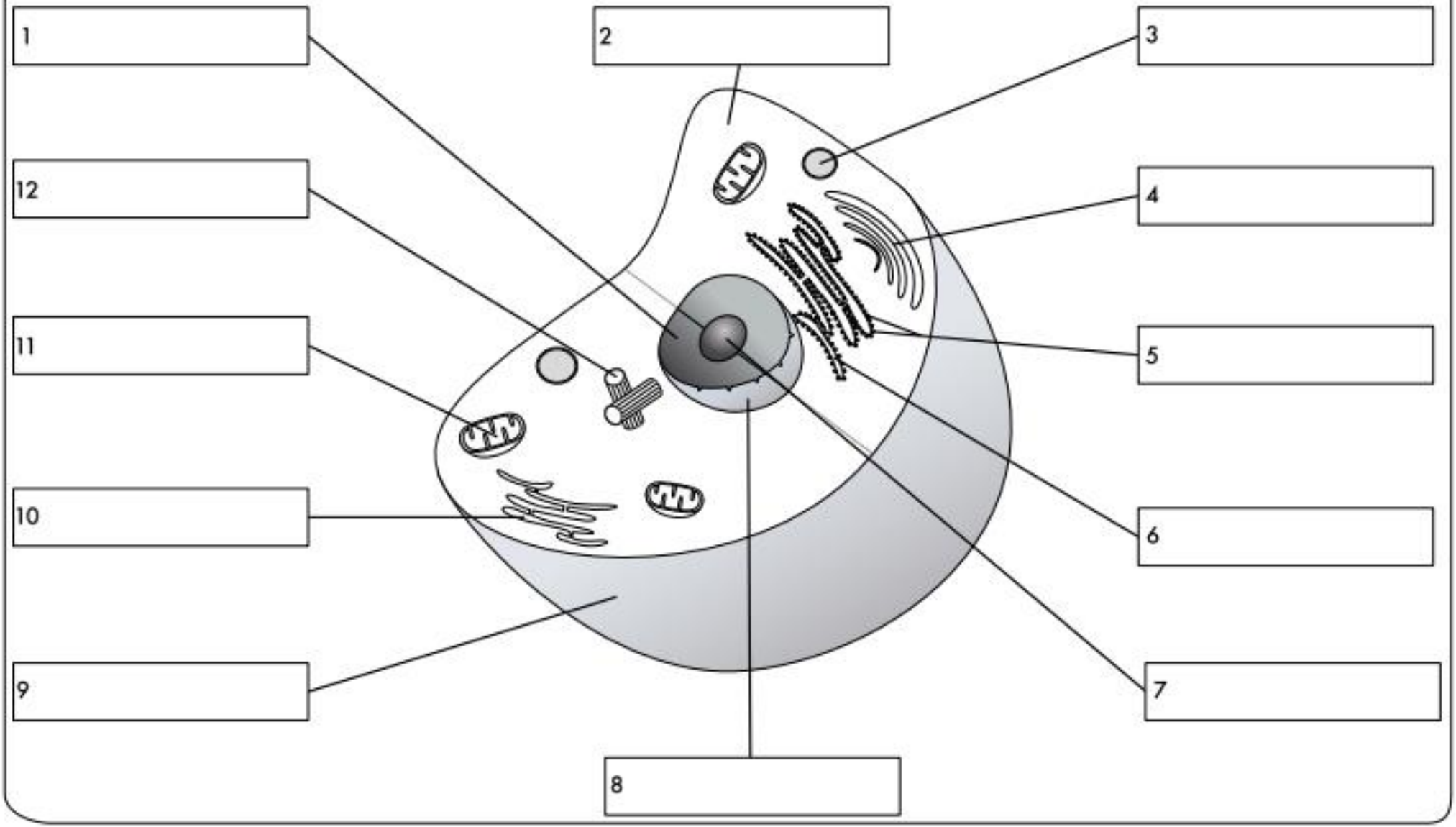
Questions;
Describe the difference between a triglyceride and a phospholipid.

Describe the difference between starch and cellulose.

Describe the difference between alpha and beta glucose.

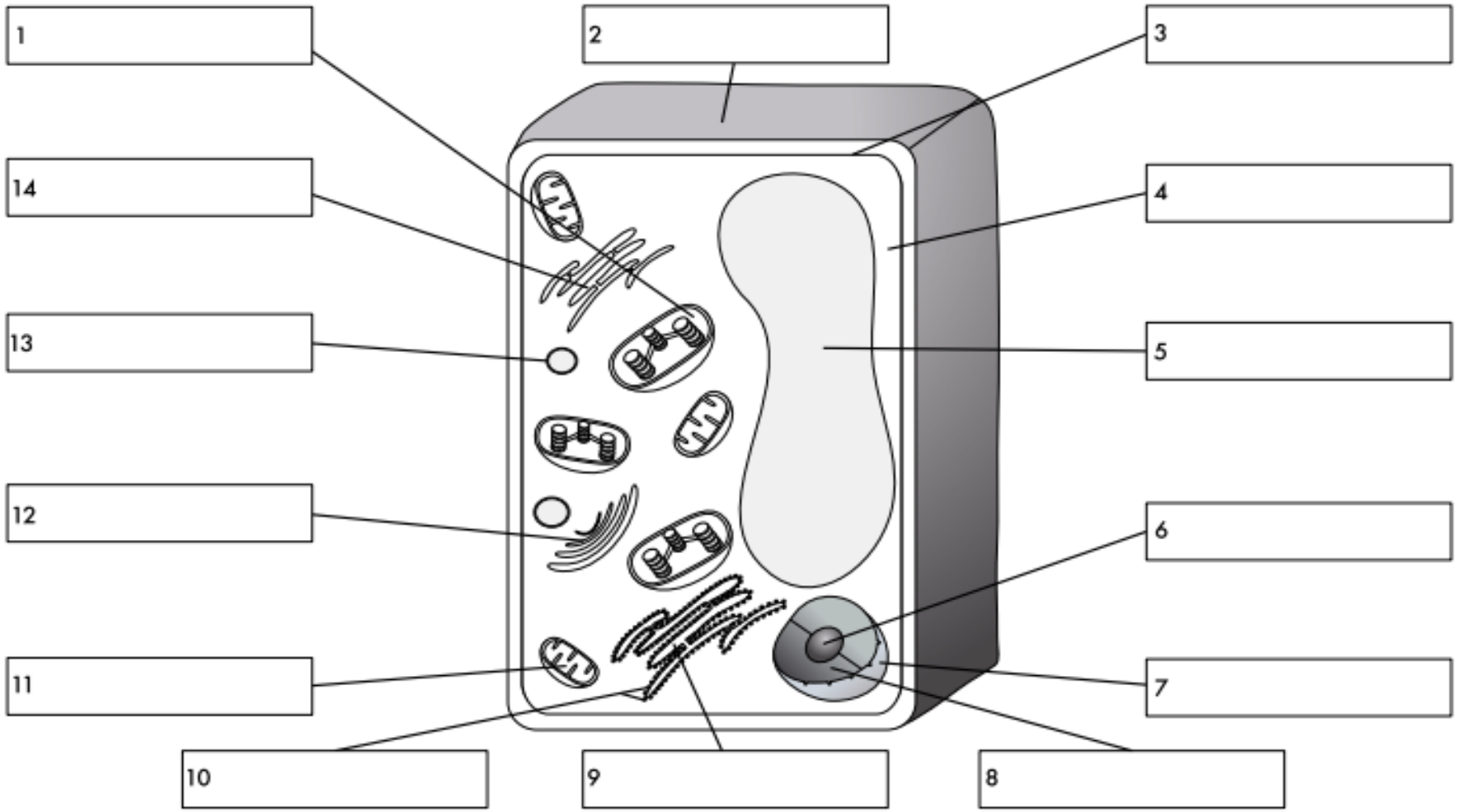
EUKARYOTIC CELLS: ANIMAL CELLS

A GENERALISED ANIMAL CELL: Label the key components of the ultrastructure of the cell

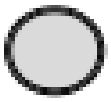


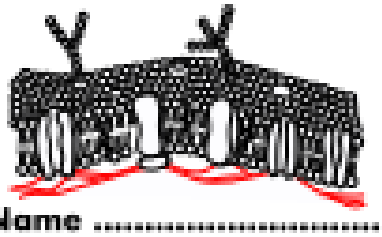
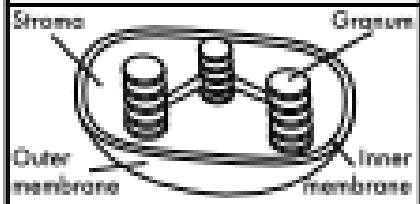
EUKARYOTIC CELLS: PLANT CELLS

A GENERALISED PLANT CELL: Label the key components of the ultrastructure of the cell



Complete the table by identifying the organelle and describing both its structure and function.

Organelle	Structure	Function
 **Name**		
 **Name**		
 **Name**		
 **Name**		
 **Name**		
 **Name**		
 **Name**		

Organelle	Structure	Function
 Name		
 Name		
 Name		
 Name		

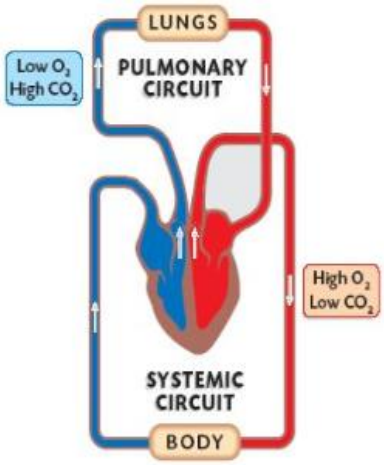
The circulatory system and blood vessels;

Large multicellular organisms have a small surface area to volume ratio and have evolved a complex circulatory system to transport chemicals around the body, this is called the **CIRCULATORY SYSTEM**.

Some organisms such as flat worms can diffuse oxygen and glucose across their surface. Less active organisms such as insects may have a much more simplified circulatory system.

Fish have a more complex system were by the blood enters the heart once before being transported to the **systemic** system this is called a **single circulatory system**. Mammals have evolved a **double circulatory** system with a **pulmonary** and a **systemic** circuit.

The heart pumps the deoxygenated blood to the lungs **(pulmonary system**) to pick up oxygen and remove carbon dioxide. The oxygenated blood is then returned to the heart to be pumped out to the organs (**systemic system**).

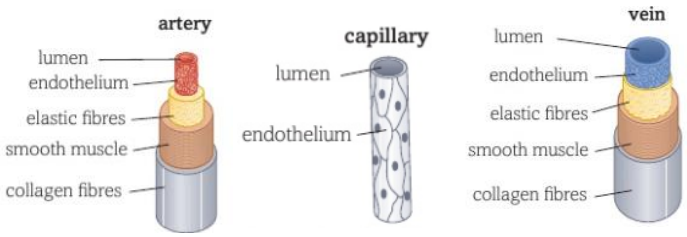


The blood travels through 3 main types of blood vessels;

1) **The Arteries**; carry blood **away** from the heart. They have a thick layer of **elastic tissue** and **smooth muscle**. The elastic walls **stretch** when the heart contracts and the elastic tissue **recoils** to maintain the high pressure.

2) **Capillaries;** These consist of a single layer of **endothelial cells**. The arteries subdivide **arterioles** which further divide into thousands of capillaries. The capillaries come into close contact with body cells providing a huge surface area to volume ratio and a short diffusion distance for the exchange of oxygen, glucose, carbon dioxide, urea and other substances.

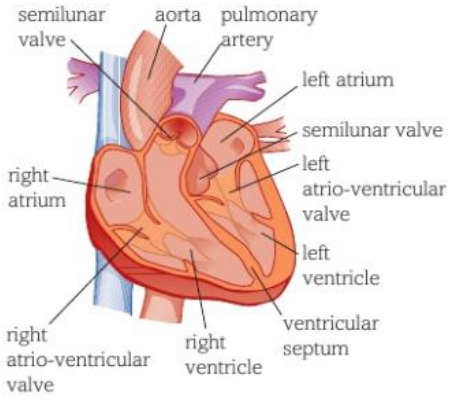
3) **Veins**; The capillaries start to come back together forming **venules** and then veins. Veins carry blood back towards the heart. Blood is at a lower pressure and therefore do not need such a thick layer of elastic tissue or smooth muscle. The veins contain **valves** to prevent the blood flowing backwards.



The heart;

The right side of the heart pumps blood to the lungs and the left side pumps blood to the body.

Valves open and close in response to the changes of pressure inside the chambers.



The heart is made up of 4 chambers; the right **atria**, the right **ventricle**, the left **atria** and the left **ventricle**. The left side of the heart has a **thicker muscular wall** to create enough pressure to force the blood around the whole body.

The hearts contractions are initiated by a cluster of specialised cells on the right atrium wall called the **SINO-ATRIAL NODE** or the **PACEMAKER**. These cells send out electrical impulses at regular intervals.

The coronary arteries supply the muscle in the heart with blood.

The cardiac cycle; This is the sequence of events that occur in a single heartbeat.

Questions;

Which blood vessels contain valves?

Which blood vessel has the thickest smooth muscle and what is its function?

Which heart valves close when the ventricles contract?

Which blood vessel is adapted for exchanging substances across it via diffusion?

How is this blood vessel adapted for exchanging substances efficiently?

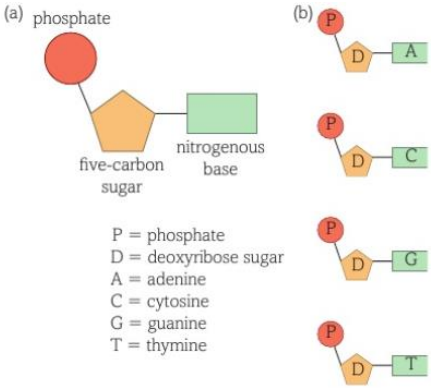
Where is the sino-atrial node (SAN) located?

DNA and protein synthesis;

DNA is a complex chemical, found in the nucleus of eukaryotes and in the cytoplasm of prokaryotes. DNA is made up of; **pentose sugar**, **phosphate** and **nitrogenous bases** forming a **NUCLEOTIDE**.

There are 4 different nitrogenous bases;

A= Adenine
T= Thymine
C= Cytosine
G= Guanine

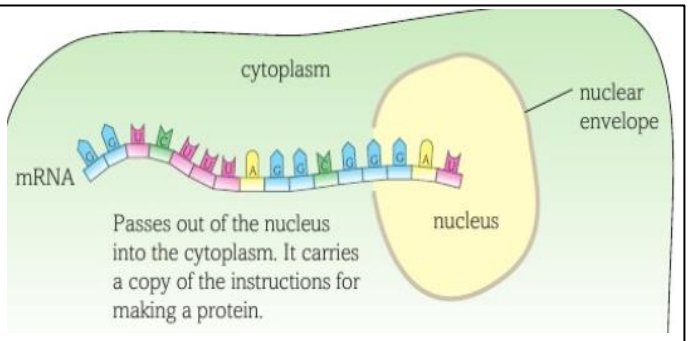


Complementary Base pairing;
A pairs with T
C pairs with G

The bases pair up in the formation stated above. They are held together by **hydrogen bonds**. The two strands run in opposite directions causing the molecule to spiral forming a **DOUBLE HELIX**.

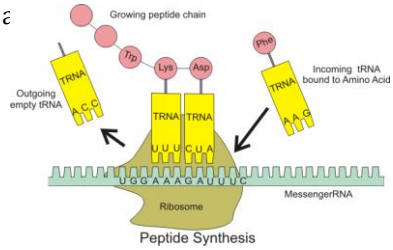
DNA controls the production of proteins. A section of DNA that codes for a protein is called a **gene**. Proteins are made up of a string of **amino acids**, each protein has a different number and order of amino acids. The proteins also have different bonds which holds the molecule in a unique shape which means all proteins have a different function.

Protein synthesis; Protein synthesis occurs in the cytoplasm, carried out by **RIBOSOMES**. When a protein is required then the gene has to be copied producing a molecule called **messengerRNA (mRNA)**. mRNA is small enough to pass out of the nucleus into the cytoplasm. mRNA is a template, containing nucleotides and bases. The nucleotide on the mRNA will line up with the **complementary base**. However, on RNA there is no Thymine, RNA will have the base **URACIL** (**U**).



The mRNA passes out of the nucleus carrying the code for a protein. Once in the cytoplasm the mRNA binds to a ribosome. Within the cytoplasm there is another molecule called transferRNA (tRNA).

At one end, the **anticodon** is complementary to the mRNA. At the opposite end there a which code for an **amino acid**. The amino acid is brought in to form a **peptide bond** with the amino acids brought in by the previous tRNA. This forms a **polypeptide** chain which will form hydrogen and **disulfide bonds** to form the unique protein.



Mutations: Mutations change the order of bases in the DNA. Some bases may change to a different base (**substitution**), some bases may be deleted and some bases may be added. Mutations can cause the following;
- Incorrect protein to be produces
- No change in protein being made
- Causes a harmful proteins/ no protein to be made

Questions;

What are the components of a nucleotide?

What are the names of the 4 nitrogenous bases?

What type of bonds hold two complementary nucleotide bases together?

What is the name of a section of DNA that codes for a protein?

What are proteins made from?

DNA is too big to leave the nucleus, what is the copy of the gene called that enters the cytoplasm?

What organelle will this molecule attach to?

Which molecule has a complementary anticodon and brings in the correct amino acid?

Task 3 - Research activities

Use your online searching abilities to see if you can find out as much about the topic as you can. Remember it you are a prospective A level biologist, you should aim to push **your** knowledge.

You can make a 1-page summary for each one you research, using note form. (A link to Cornell note taking is below- this is a useful technique when starting an A Level course.)
http://coe.jmu.edu/learningtoolbox/cornellnotes.html

Biological Molecules: Proteins

Biological molecules are often polymers and are based on a small number of chemical elements. In living organisms carbohydrates, proteins, lipids and water all have important roles and functions related to their properties.

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
https://alevelnotes.com/notes/biology/biological-molecules/biological-molecules

And take a look at these videos:
https://www.youtube.com/watch?v=YO244P1e9QM
https://www.youtube.com/watch?v=2cx3O_af-SQ
https://www.youtube.com/watch?v=hok2hyED9go

Task:

Cells

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study.

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/zvjycdm/revision

And take a look at these videos:
https://www.youtube.com/watch?v=gcTuQpuJyD8
https://www.youtube.com/watch?v=qCLmR9-YY7o

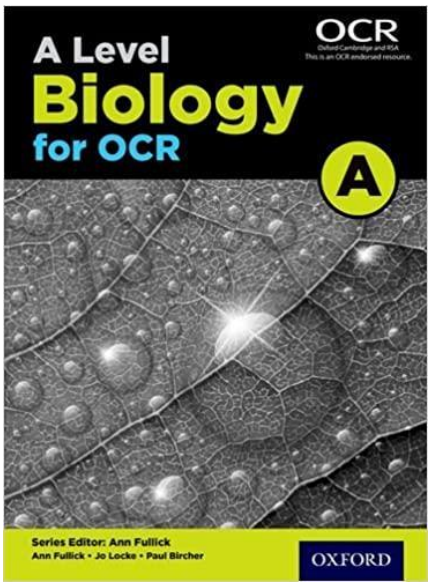
Task:
Produce a one page revision guide to share with your class in September summarising one of the following topics: Cells and Cell Ultrastructure, Prokaryotes and Eukaryotes, or Mitosis and Meiosis. Whichever topic you

Reading List

Below are some recommended textbooks that will help you during your time studying A-Level Biology. They will also help complete the tasks in this booklet, but are not necessary for this.

Suggested textbooks:

A Level Biology for OCR A (Oxford University Press)
- very detailed.



A Level Biology (OCR A) (CGP)

- **Clear and concise. Similar to GCSE revision guides in terms of layout.**