Roding Valley High School

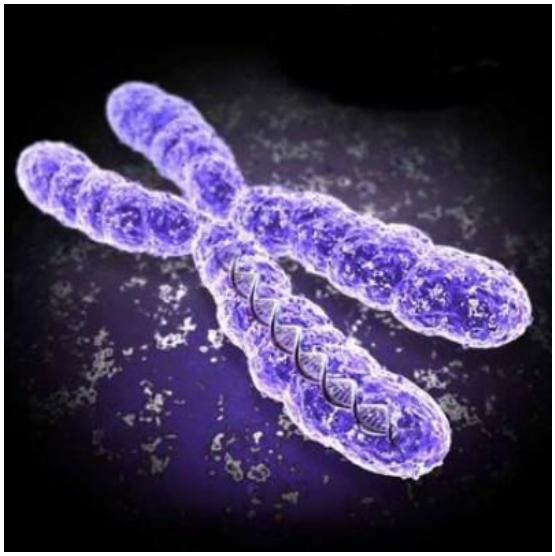
A Level Biology Transition booklet

Get ready for A-level!

A guide to help you get ready for A-level biology, including everything from topic guides to days out and online learning courses.

What is included:

- Book recommendations
- Movie recommendations
- Guidance on how to make notes
- **Research activities – you must complete all of these**
- **Pre-knowledge topics – you must complete all**
- Ideas for day trips
- Science on social media
- Science websites



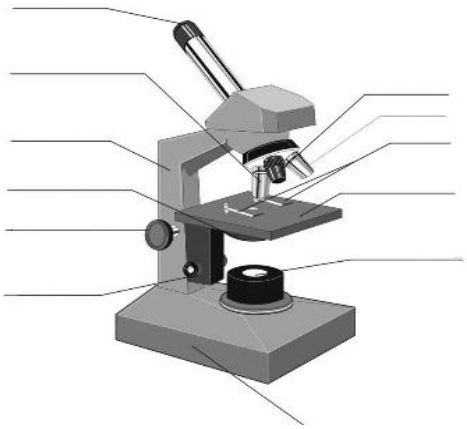
https://www.distance-education-academy.com/wp-content/uploads/2013/06/biology-a-level-course.jpg

The compulsory activities highlighted in red must be submitted on google classroom. Please use the code hdkn5x6 to join the classroom and complete any additional work set here.

Microscopes;

The Light microscope allows you to view animal cells. It can magnify up to 1500 times. Some 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

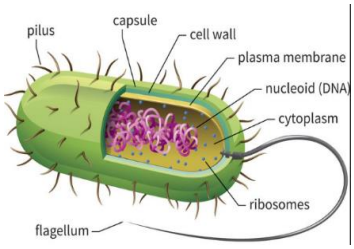
inside of mitochondria and chloroplasts. The image is

called an ELECTRON MICROGRAPH

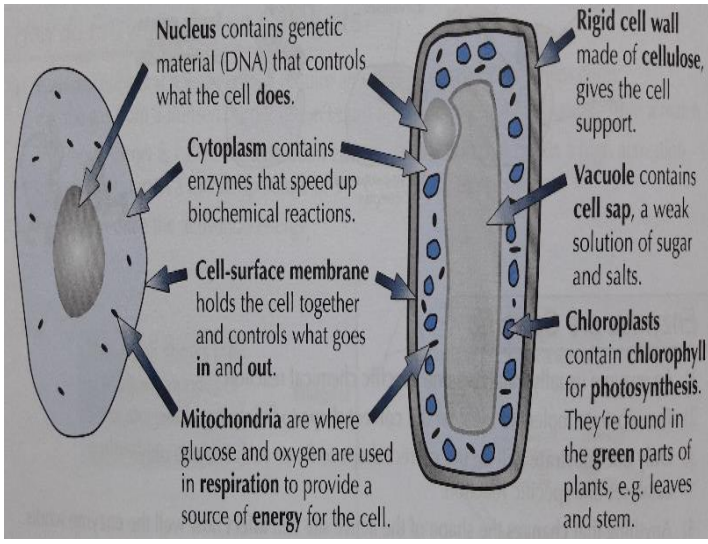
Eukaryotes and prokaryotes;

Prokaryotes are singled celled organisms such as bacteria.

Usually much smaller than eukaryotic cells (1/10th the size), do not contain a nucleus, chloroplasts or mitochondria, DNA can be found floating free in the cytoplasm or in loops called Plasmids, some have flagellum for movement.



Eukaryotic cells are more complex and can be single cellular or multi cellular organisms.



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? _____

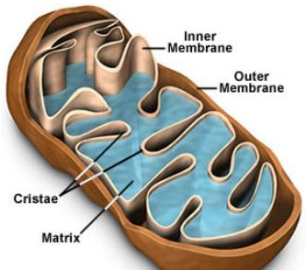
Cell structure;

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 microscope.



The mitochondria's function is to carry out aerobic respiration.

The energy released is used to form molecules 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 microfibrils.

These provides rigidity and support for the cell.

Questions;

Name 2 molecules that make up the cell membrane.

_____

Describe the membranes of the mitochondria.

_____

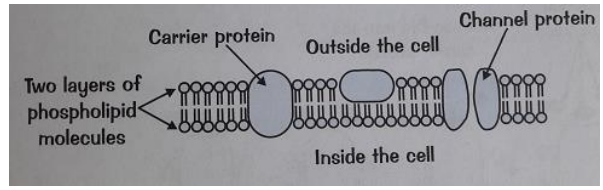
What is the name of the molecule that provide energy to the cell? _____

What term is used to describe water concentration?

_____

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'.

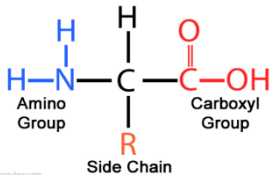
Proteins;

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 with one variation on the R group.

Contains; Hydrogen, oxygen,

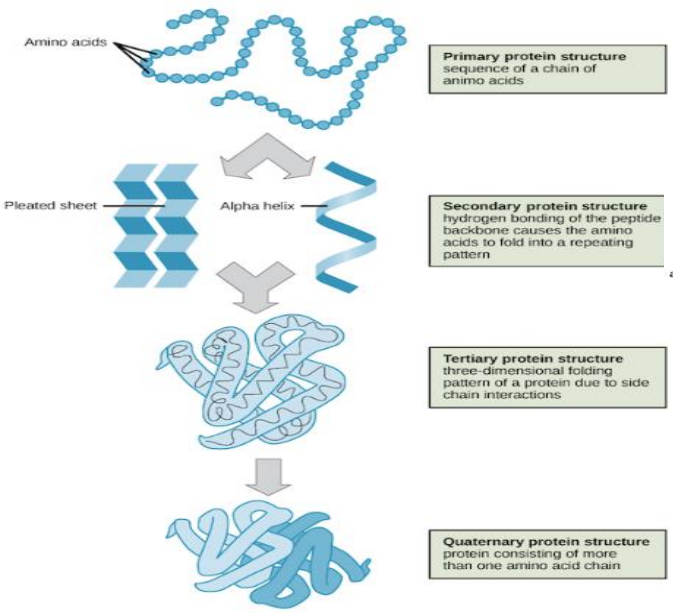
Nitrogen and carbon.



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**.



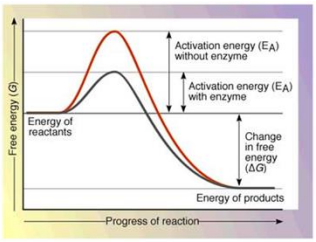
Enzymes; Help to speed up biochemical reactions.

Metabolism is the sum of all the biochemical reactions that occur per second and a single chain of these reactions is called a metabolic pathway.

Enzymes are biological catalysts and increase the rate of reactions.

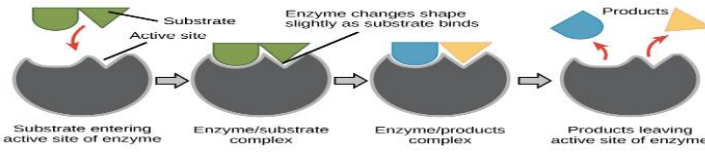
Reactions that release energy need an input energy to start.

The input energy is called the ACTIVATION ENERGY. Enzymes reduce the activation energy.



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



Denaturing enzymes; Enzymes have a specific tertiary shape 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 (DNA polymerase).

Questions;

What types of bond hold together the secondary structure? _____ The tertiary structure? _____

How many amino acids are there and what elements are found in them? _____

Explain why denatured enzymes will not function.

_____

_____

_What is activation energy?

_____

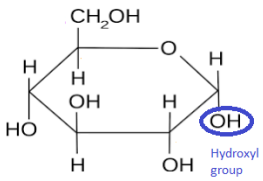
Carbohydrates;

Three elements make up the carbohydrate molecule – carbon, hydrogen and oxygen.

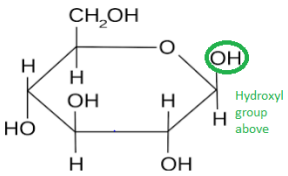
There are several types of carbohydrates;

Sugars; Small, sweet, water soluble molecules. Can be **monosaccharides** or **disaccharides**. Monosaccharides are single units 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

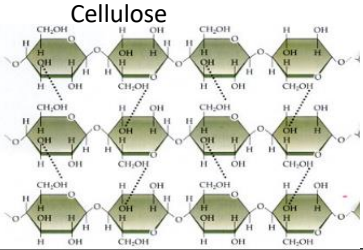


Beta glucose

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

Questions;

Describe the difference between a triglyceride and a phospholipid. _____

_____

Describe the difference between Starch and cellulose.

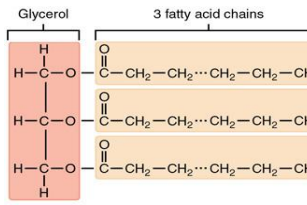
_____

_____

What bonds hold Cellulose microfibrils together? _____

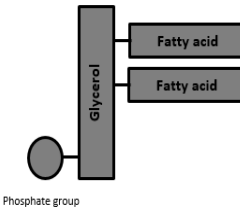
Lipids;

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.

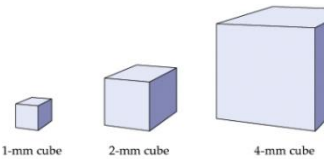
Cell membranes are formed from phospholipid. They do not have 3 fatty acid chains but 2 fatty acid chains and a phosphate group.



Exchange surfaces;

All good exchange surfaces require adaptations to make the exchange efficient. The smaller the object the quicker exchange is able to occur due to it having a large surface area to volume ration, however larger, more complex organisms have a much smaller surface area to volume ratio.

The larger the object the lower the surface area to volume ratio.



Surface area	6 sides × 1^2 = 6 mm^2	6 sides × 2^2 = 24 mm^2	6 sides × 4^2 = 96 m
Volume	1^3 = 1 mm^3	2^3 = 8 mm^3	4^3 = 64 mm^3
Surface area-to-volume ratio	6/1	3/1	1.5/1

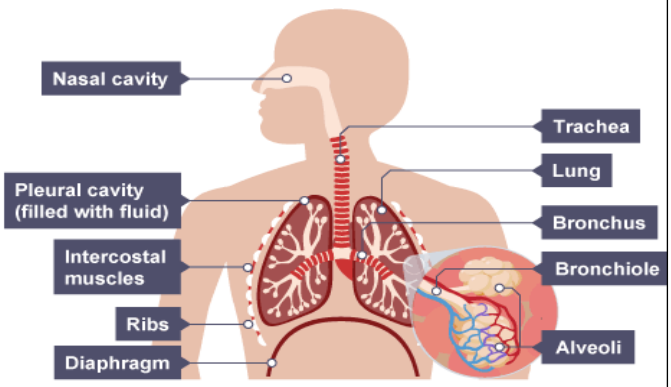
To overcome this, multicellular organisms have highly adapted exchange organs. Adaptations include;

- Folded to increase the surface area to volume ratio for a faster exchange.
- A good blood supply to maintain the concentration gradient.
- One cell thick (thin) to reduce diffusion distance.

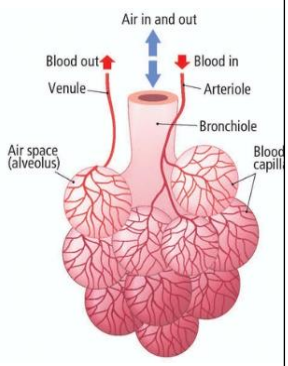
Materials that need to be exchanged between the cell and he environment include; heat, oxygen, water, carbon dioxide, nutrients and other waste products such as urea. The adaptations allow MORE substances to be exchanged at a faster rate.

Gas exchange in animals;

Lungs; Multi cellular organisms have evolved a **complex blood supply system** and a large gas exchange system (**lungs**). The lungs contain millions of tiny air sacs called ALVEOLI which are then folded to further increase the surface area of the lung.

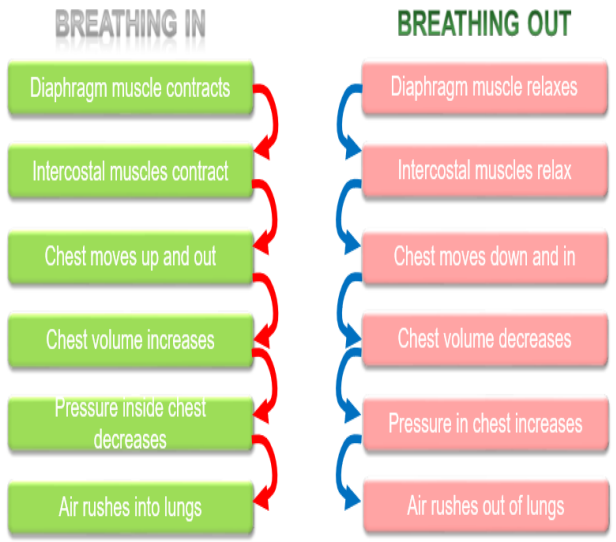


The alveoli are further adapted by having a single flattened layer of **epithelial squamous cells** which reduces the diffusion distance increasing the speed of diffusion. Alveoli have a dense network of capillaries to move the blood away quickly, maintaining a steep diffusion gradient. The walls of the alveoli are fully permeable to dissolved oxygen and carbon dioxide.

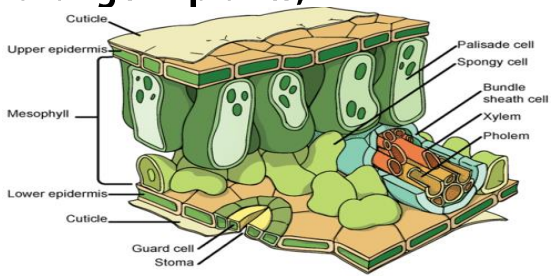


Breathing/ventilation; The process of maintaining a high concentration of oxygen inside the lungs and getting rid of the waste product carbon dioxide. Ventilation increases he rate of diffusion.

Lungs are suspended in the airtight Thorax and any change in volume will affect the pressure in the thorax.



Gas exchange in plants;



Plants also have adaptations to allow gas exchange. The leaf is an organ that is adapted to allow the movement of water from the leaf and the diffusion of carbon dioxide into the leaf. The upper mesophyll layer contains Palisade cells which are packed with chloroplasts to absorb as much energy from the sun as possible for photosynthesis. The lower part of the mesophyll layer is the spongy mesophyll which contains air spaces to facilitated the diffusion of gases into the cells and out of the cells.

The upper epidermis is covered by a waxy cuticle to prevent water loss. The lower epidermis has a specialised pair of cells called the **GUARD CELLS**. The guard cells have an uneven thickening in the cell wall which causes the cell to bend and open up a hole in the lower epidermis called the **STOMA**. The stoma allows the water vapour to move out of the leaf into the environment (**transpiration**) and carbon dioxide to move into the leaf.

Transpiration; The movement of water from the root and out of the leaf is called the transpiration stream. Water passes into the root by osmosis and then moves through the root by 3 different processes;

- The symplast pathway; water moves from root cell to root cell through the cytoplasm.
- The apoplast pathway; water moves through the cell wall, not passing over the cell membrane, carrying minerals with it through a process called **MASS FLOW**.
- The vacuolar pathway; water moves from root cell to root cell via the cytoplasm and the vacuole.

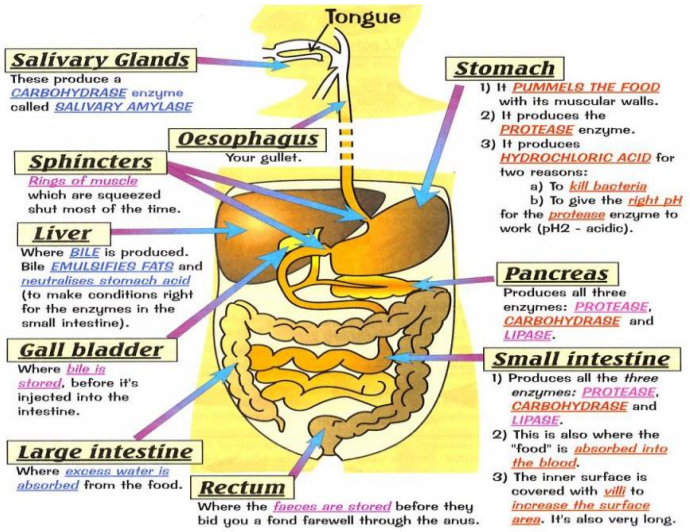
Water moves out of the leaf by diffusion into the environment. The water moves from root to leaf through a specialised tube called the **xylem**. Water is pulled up the xylem due to an attraction force between the water particles causing a tension in the xylem (**Cohesion tension**) and the attraction between the water particles and the sides of the xylem vessel (**adhesion**).

The second vessel in the plant is the **phloem** and this is responsible for **translocation**, the mass flow of substances from the leaf to the rest of the plant.

Other exchange surfaces;

Digestion; The human digestive system has 3 main functions;

- Mechanical breakdown of food
- Chemical breakdown of food
- Absorption of digested food particles into the blood stream.



The digestive system contains 3 types of enzyme;

- **Carbohydrase** enzymes for breaking down complex carbohydrates into simple sugars. These are found in the mouth (amylase enzyme), the pancreas and the small intestine.
- **Protease** enzymes break down proteins into amino acids. These are found in the stomach (protease enzyme requires a pH 2 which is provided by the **hydrochloric acid**), the pancreas and the small intestine.
- **Lipase** enzymes breaks down lipids into fatty acids and glycerol. These are found in the pancreas and the small intestine.

Bile is an important chemical in digestion. Bile is made in the liver and stored in the gall bladder. It has 2 roles;

1) Makes the digested food, leaving the stomach, slightly alkali for enzymes to work in.
2) It emulsifies the lipids, breaking them up into small droplets to increase the surface area for lipase to digest.

Questions;

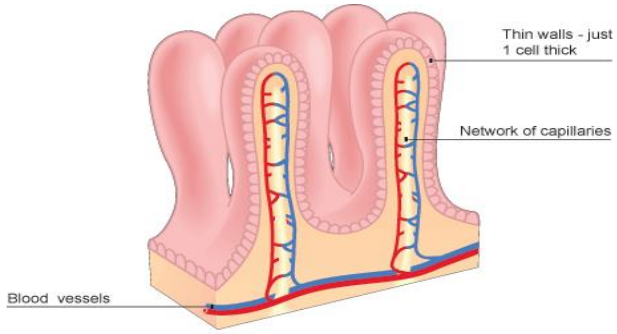
What are the features that makes a surface better adapted for exchange? _____

What is transpiration? _____

What is translocation? _____

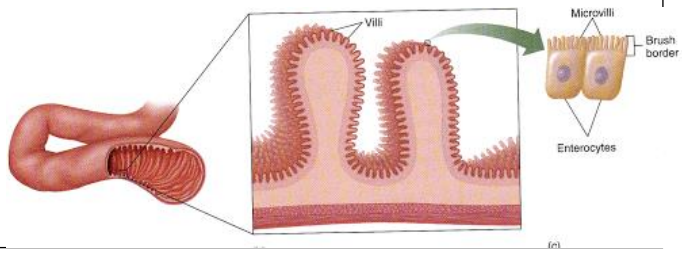
Other exchange surfaces:

All of the digested food is now small enough to pass through the wall of the small intestine into the blood stream.



As an exchange surface it displays the same characteristic adaptations as the lung; Large surface area to volume ratio, good blood supply and one cell thick.

Microvilli; the walls of the small intestine are highly folded into villi, to increase the SA:Vol. ratio. However, this can be increase further by each individual cell having further folds called microvilli.



Questions;

What are the 3 ways water moved through the root?

_____

_____

_____

_____What are the 3 digestive enzymes, what do they break down and where are they found?

Enzyme	Breaks down (chemical)	Into (chemicals)	Where found

What is the role of Bile?

_____

_____

_____ How is the small intestine adapted to increase the rate of diffusion of digested food products?

_____

_____

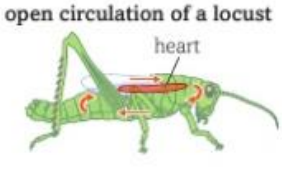
_____

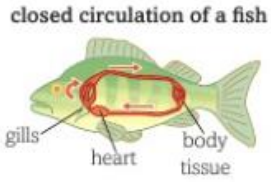
_____

The circulatory system and blood vessels;

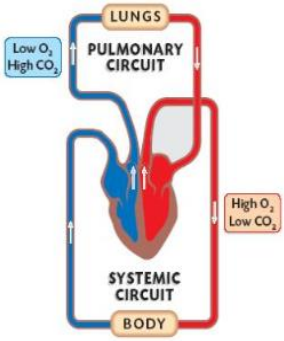
Large multicellular organisms have a small surface area to volume ratio and have evolved a complex circulatory system to transport chemicals around the body, this is called the **CIRCULATORY SYSTEM**.

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.



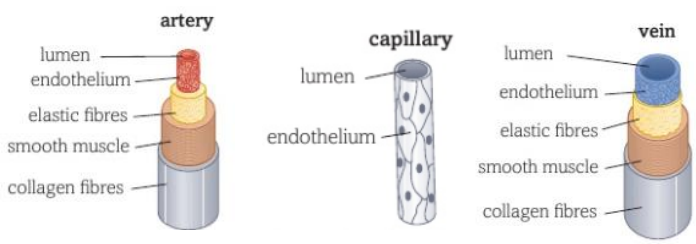
The heart pumps the deoxygenated blood to the lungs **(pulmonary system**) to pick up oxygen and removes carbon dioxide. The oxygenated blood is then returned to the heart to be pumped out to the organs (**systemic system**).

The blood travels through 3 main types of blood vessels;

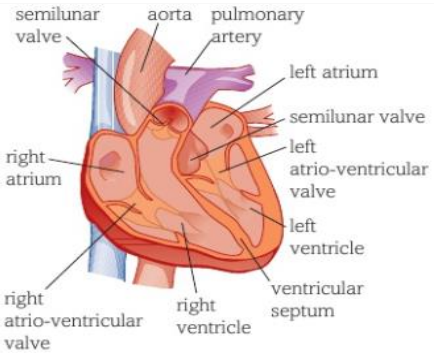
1) **The Arteries**; carry blood **away** from the heart. They have a thick layer of **elastic tissue** and **smooth muscle**. The elastic walls **stretch** when the heart contracts and the elastic tissue **recoils** to maintain the pressure.

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 heart has two separate pumps. The right side of the heart pumps blood to the lungs and the left side pumps blood to the body. Valves within the heart keep the blood flowing in the correct direction. Valves open and close in response to the changes of pressure inside the chambers.

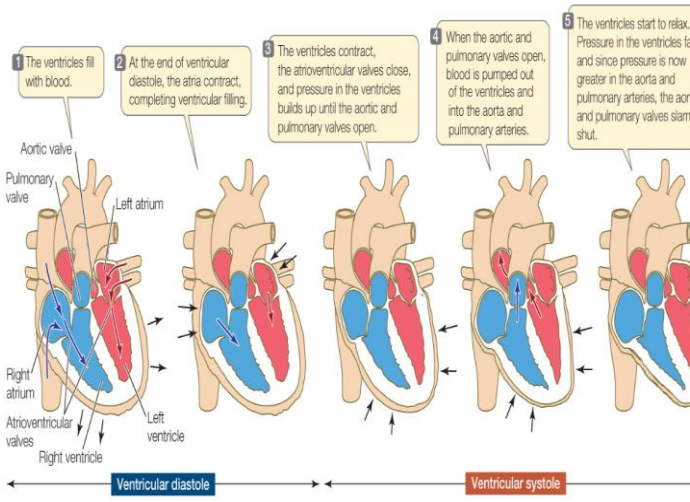
The heart is made up of 4 chambers; the right **atria**, the right **ventricle**, the left **atria** and the left **ventricle**. The left side of the heart has a **thicker muscular wall** to create enough pressure to force the blood around the whole body.

The hearts contractions are initiated by a cluster of specialised cells 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;

What is the name of the system that sends blood to body organs?

_____

_____ Which blood vessels contain valves?

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

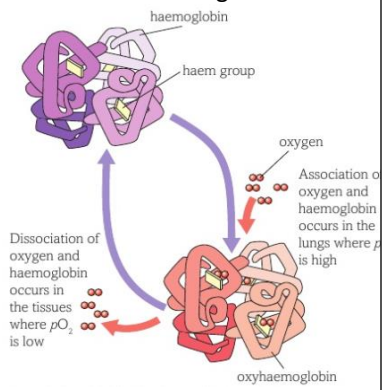
_____

Which Valves close when the ventricles contract?

_____ Which side of the heart is the thickest and why? _____

The blood;

Blood is made up of 4 different components;
1) **Plasma**; the liquid part of blood that transports the cells, dissolved substances and thermal energy.
2) **Platelets**; cell fragments responsible for clotting of the blood.
3) **White blood cells**; there are many different white blood cells all responsible for protecting the body from pathogens.
4) **Red blood cells** AKA **erythrocytes**; these are responsible for transporting oxygen to body cells. Erythrocytes contain a complex protein called **HAEMOGLOBIN**. Haemoglobin contains four iron ions each will bind to one oxygen.
One haemoglobin can carry 4 molecules of oxygen (100% saturated) and becomes **OXYHAEMOGLOBIN**.
Due to the low availability of oxygen in the tissue and the high concentration of carbon dioxide, the oxygen will dissociate from the haemoglobin. The carbon dioxide from the respiring tissues makes the haemoglobin less able to 'hold on' to the oxygen so increases the rate at which the oxygen **dissociates**.

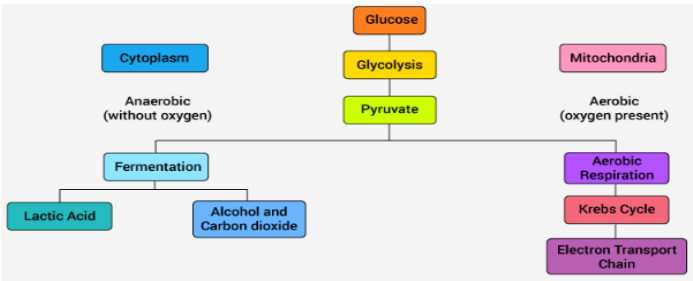


Questions;

1)What substance is picked up by the blood in the lungs?
_____
__ 2) What is the name of the protein found in the erythrocyte?
_____
__ 3) What metal ion is present in the protein?
_____ 4) What does it mean if the blood is said to be 'fully saturated'?
_____
_____
____ 5) Which gas affects the oxygen binding properties of haemoglobin?
_____ 6) What is the term used to describe oxygen leaving the haemoglobin protein? _____ 7) What is the name of the stage of respiration that is common to aerobic and anaerobic respiration? _____
8) What are the products of the first stage of respiration?
_____
__ 9) Name the remaining 3 stages of aerobic respiration.
_____
_____
____ 10) Name the molecule that is produced and will supply energy to other parts of the body.
_____

Respiration;

Aerobic respiration; This occurs in the mitochondria of cells. It requires a number of small stages to break down **glucose** ($C_6H_{12}O_6$) to release a large amount of energy; **adenosine triphosphate** (ATP). The first stage is a stage called **GLYCOLYSIS**, this occurs in the cytoplasm and converts glucose into two 3 carbon molecules called **PYRUVATE**. Pyruvate is formed in both aerobic and anaerobic respiration, however in aerobic respiration the pyruvate passes into the matrix of the Mitochondria. Pyruvate then goes into the **link reaction** to form **acetyl CoA** which then passes into to the **Kreb cycle** with the oxidise products passing into **oxidative phosphorylation** to form **ATP** and waste products **carbon dioxide** and **water**.



Anaerobic respiration; Respiration without oxygen.
This form of respiration occurs **without oxygen**. Glucose is converted into pyruvate, through the process of **GLYCOLYSIS**, in the cytoplasm and is unable to pass into the mitochondria. The process of glycolysis releases small amounts of energy and over a short period of time it can keep the muscles working.

Anaerobic respiration in plants and yeast forms **carbon dioxide** and **alcohol**. Anaerobic respiration in animals forms **lactic acid**. The build-up of lactic acid in muscles must be broken down as the formation of the acid alters the pH and affects enzymes in the cells, slowing down reactions. As the lactate ions build up in the muscles this causes pain called **fatigue**. The oxygen required to convert the lactate ions back to pyruvate is called the **oxygen debt**.

Questions continued….

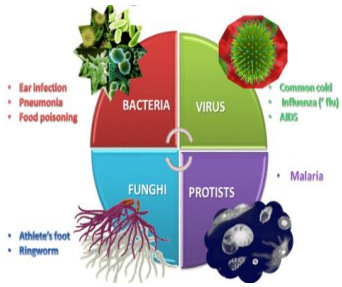
11) Define the term anaerobic respiration
_____
_____
__ 12) Write a word equation for;
a) anaerobic respiration in plants and yeast
_____
__ b) anaerobic respiration in mammals
_____
__ 13) What is the oxygen debt?
_____
_____
__ 14) Why can a person not anaerobically respire for a long time?
_____
__
_____

Disease;

Disease can be **communicable** and **non-communicable**.

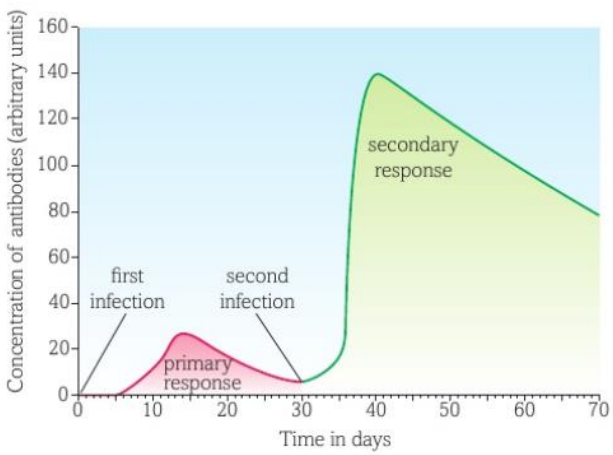
♦ Non-communicable disease are disease's which cannot be directly passed for person to person. These include cancer, heart disease, diabetes and Alzheimer's.

♦ Communicable disease are disease which can be transmitted from organism to organism. These are caused by **PATHOGENS** such as **VIRUSES**, **BACTERIA**, **FUNGI** and **PROTISTS**.



Bacteria will produce toxins. Viruses will place their genetic information into a cell and the information replicates and bursts the host cells. Fungi produce **mycelium** and **exocytose** digestive enzymes to digest the tissue it is living on; it then reabsorbs the digestive products. Protists use a host to complete an important part of its life cycle and will damage the hosts cells/organs in the process.

If the first lines of defence do not prevent the pathogen entering the body, then the bodies defence systems will be activated. All cells have a unique protein structure (**ANTIGEN**) identifying it as not self and activating the **immune system**. White blood cells will respond in different ways. First the **MONOCYTES** and **MACROPHAGES** (types of phagocyte) identify the pathogen as 'foreign'. These cells will **engulf** the pathogen and destroy it. Macrophages do not destroy all of the pathogen, it retains the antigen of the pathogen and '**presents**' it on its own surface. This is now an **ANTIGEN PRESENTING CELL** and initiates the next round of specific white blood cells. The **LYMPHOCYTES** now have 3 jobs, track down and destroy the pathogens (**T Lymphocytes**), produce antibodies (**B Lymphocytes**) and make **memory cells** to produce antibodies quickly if the pathogen enters the body again in the future.



Primary and secondary response to infection.

Risk factors;

A risk factor is something that will **increase the chance** of becoming ill. Risk factors do not always lead to the disease, just increase the risk. Some risk factors are unavoidable such as genetic risk factors; genetic predisposition to producing high quantities of cholesterol, having high blood pressure or carrying the **BRCA** gene which increase the risk of breast cancer.

Other risk factors are avoidable such as; smoking, drinking alcohol, unprotected sex, high fat or high salt diet. Some risk factors (**carcinogens**) can cause DNA to mutate and cause cells to go into uncontrolled cell growth.

Questions;

What is a pathogen? _____

_____

Give 3 examples of non-communicable disease.

_____

_____

How do bacteria make us ill? _____

_____

How do viruses make us ill? _____

_____

What do monocytes do? _____

_____

_____

What do macrophages do? _____

_____

What are the 2 main types of lymphocytes?

_____

What do memory cells do? _____

_____

Look at the graph. Describe the different between the primary and secondary response. _____

_____

_____

_____

_____

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;

Adenine

Thymine

C= Cytosine

G= Guanine

Complementary pair;

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**.

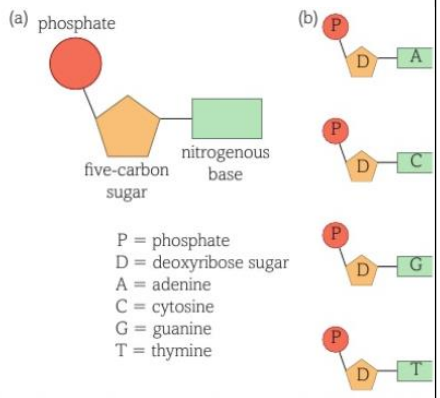
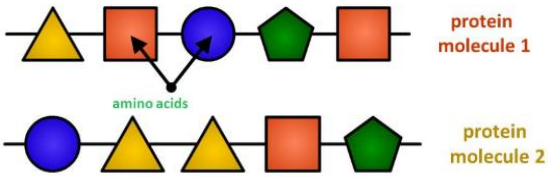


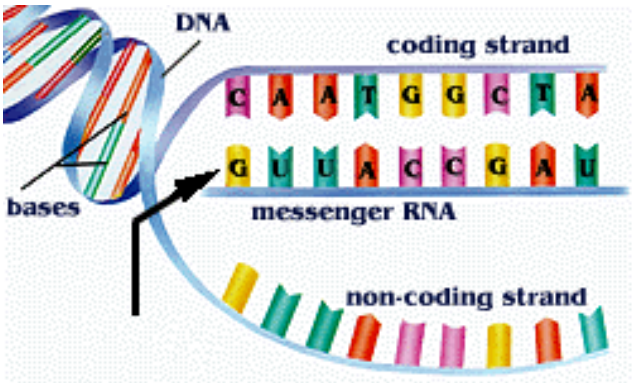
Figure 1 (a) General structure of a single nucleotide. (b) The four DNA nucleotides.

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.

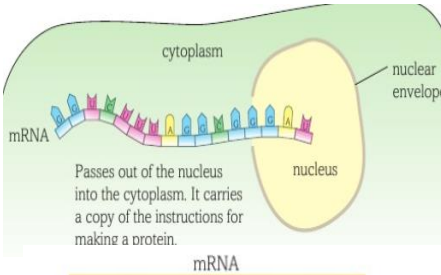


Different combinations of amino acids make different proteins.

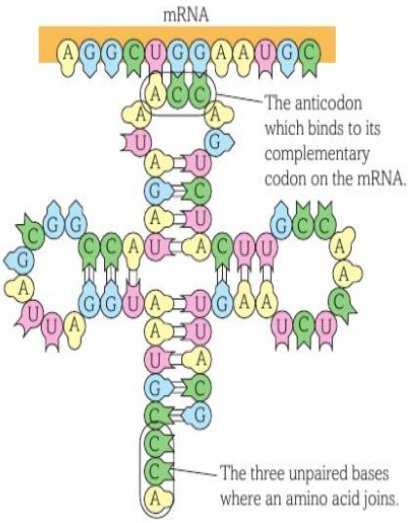
Protein synthesis; Protein synthesis occurs in the cytoplasm, carried out by **RIBOSOMES**. When a protein is required then the gene has to be copied producing a molecule called **messengerRNA (mRNA)**. mRNA is small enough to pass out of the nucleus into the cytoplasm. mRNA is a template, containing 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**).

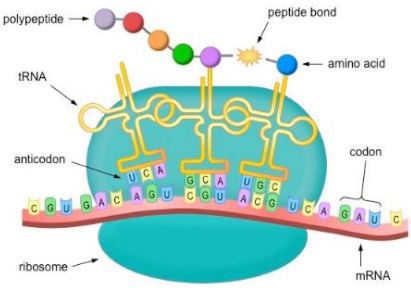


The mRNA passes out of the nucleus carrying the code for a protein. Once in cytoplasm the binds to a ribosome.



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 are three **unpaired bases** 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?

_____

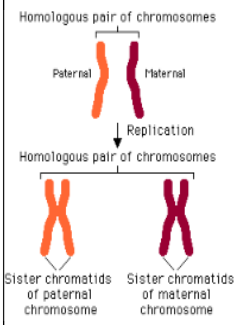
_ What type of bonds hold the 2 strands together?

_____ 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? _____

Genetics and cell division;

The DNA molecule contains thousands of genes along its length. The DNA molecule is wound up into a chromosome. Each body cell in a human contains **23 pairs of chromosomes (diploid number)**, one from mother and one from father. These pair up forming a **homologous pair**, both the **same size** and containing the **same genes** (these genes can be different **alleles**). A chromosome is often seen as an X shaped molecule. The X shape is actually one chromosome attached to an exact copy of itself (2 **CHROMATIDS**). They are joined together by an attachment called a **centromere.**



In preparation for **cell division** the chromosome will make a copy of itself. All damaged tissue and cells are replaced by a process of cell division called **MITOSIS**. Mitosis is also seen in **asexual reproduction,** the offspring are **genetically identical** to the parent.

Mitosis cell division;

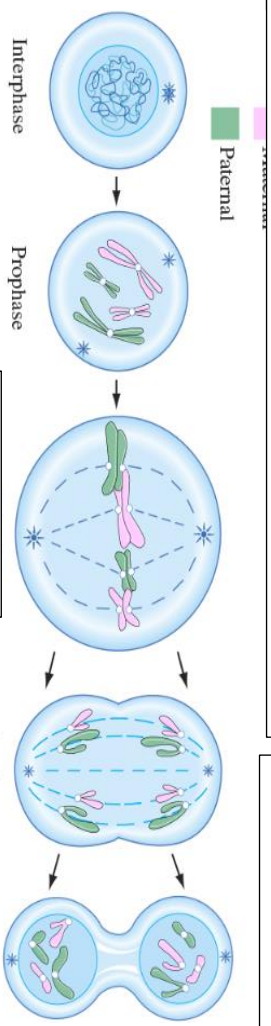
Interphase; DNA molecules are indistinct in the nucleus. They replicate their DNA, attaching at the centromeres.

Prophase; The DNA becomes **supercoiled** and **compact** and can now be seen under a light microscope. It has the X shape.

Metaphase; the nuclear membrane breaks down, the chromosomes line up along the **equator** of the cell and **spindle fibres**, produced by the **centrioles**, attach to the chromosomes.

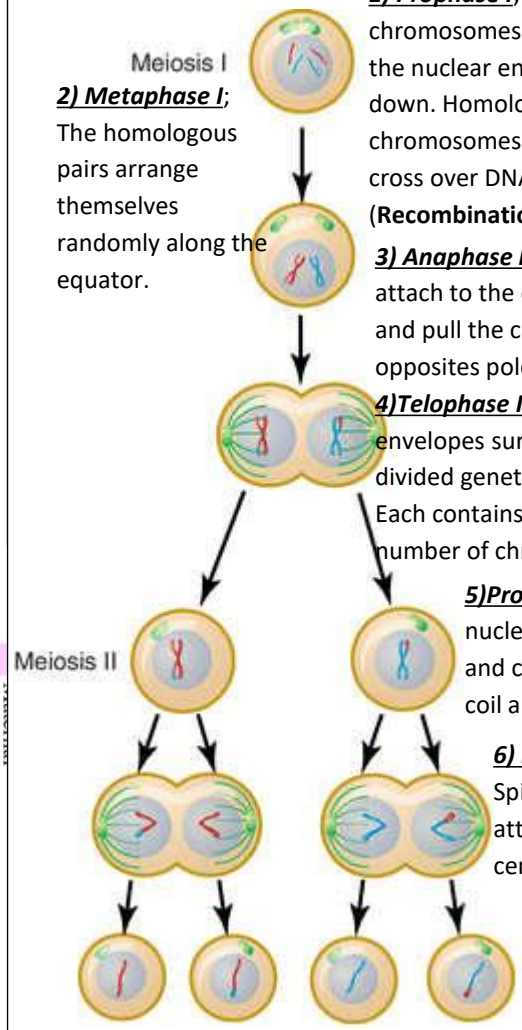
Anaphase; The **spindle fibres** pull the **centromere** apart and the **chromatids** separate and are dragged to the poles of the cell.

Telophase; A **nuclear envelope** forms around each set of **chromatids** and the **cytoplasm divides** forming 2 genetically identical cells.



Meiosis; This cell division is responsible for the production of sex cells and introduces **genetic variation**. It results in the formation of gametes containing half the original genetic information (**Haploid number**). This ensures, that during **fertilisation**, the **embryo** obtains two complete sets of genetic information.

In meiosis the cell undergoes 2 cellular divisions.



1) Prophase I; The chromosomes condense and the nuclear envelope breaks down. Homologous chromosomes pair up and can cross over DNA (**Recombination**).

2) Metaphase I; The homologous pairs arrange themselves randomly along the equator.

3) Anaphase I; Spindle fibres attach to the centromere and pull the chromosomes to opposites poles.

4)Telophase I; Two nuclear envelopes surround the divided genetic information. Each contains half the number of chromosomes.

5)Prophase 2; New nucleus breaks down and chromosomes coil and condense.

6) Metaphase 2; Spindle fibres attach to the centromeres.

7) Anaphase 2; The spindle fibres start to drag the chromatids to opposite sides of the cell.

8) Telophase 2; The nuclei's start to reform and the cytoplasm spits to form 4 haploid cells that are genetically different to the parent cells.

Questions;

Which cell division forms haploid cells? _____

What happens during prophase? _____

_____

What do centrioles do? _____

_____

Which organs produce haploid cells? _____

_____

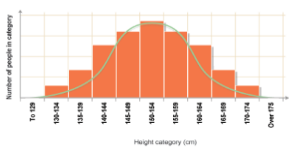
What happens in Telophase? _____

Variation and evolution;

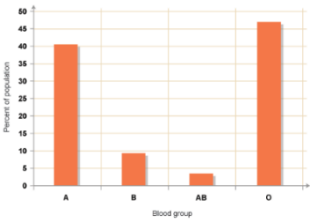
Due to the mechanisms used to produce haploid cells through meiosis, **genetic variation** occurs. Organisms of the same species show some variation due to alleles. There are 2 types of variation;

- **Genetic variation**; passed from parent to child (blood group, eye colour).
- **Environmental variation**; caused by the environment (scars, accents, freckles)

Some variation can be due to a **combination of both** genetic variation and environmental variation (intelligence, height and weight).

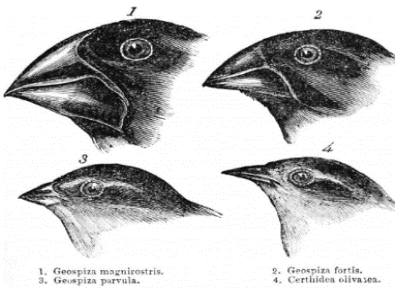


Some **characteristics** fall into the category of **continuous variation** whereby there is a large range in variations (height and weight).



Other characteristics fall into a few distinct categories such as blood type, colour, tongue rolling; this is called **discontinuous variation**.

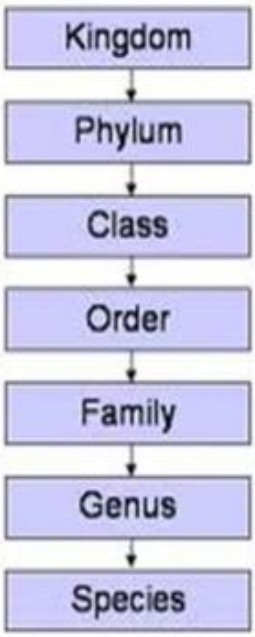
Sometimes a variation may lead to a characteristic that helps the organism to **survive** and be **better adapted** to its environment. The variation may be that the animal is slightly fast or better camouflaged. This slight difference within the species will allow the individual to **compete** better, **survive**, **breed** and potentially **pass on the genetic variation** to it's offspring. This is called **Natural selection**. **Evolution** can occur through natural selection. **Gradual changes over millions of years** can ultimately lead to the formation of a **new species**.



as antibiotic-resistant bacteria. Darwin noticed that the finches - songbirds - on the different islands in the Galápagos were fundamentally similar to each other, but showed wide variations in their size, beaks and claws from island to island. For example, their beaks were different depending on the local food source. Darwin concluded that, because the islands are so distant from the mainland, the finches that had arrived there in the past had changed over time.

Classification;

Developed by Carl Linnaeus in the 18th century, it was a method of sorting, grouping and naming different groups of organisms.



Organisms were grouped into divisions based on characteristics they had in common. The five kingdoms are; **Animalia, Plantae, Fungi, Prokaryotes, Protoctists**. The kingdoms then divide into **Phylum**; in Animalia these are; Cnidaria (**invertebrates**), Chordata (**vertebrates)**, Arthropods, Molluscs and Echinoderms.

In animals the vertebrate's phylum further splits into Mammalia (Mammals Fish, Birds, Amphibians and Reptiles.

Order, Genus and species further classifies the organisms. The Genus and species names are always written in Lati and italics. The genus name has a capita letter and the species is lower case.

A species was classified as a group of organisms that look very similar to each other and can reproduce to form fertile offspring.

Technology has advanced and organisms can now be classified on a genetic level using base sequence, proteins and enzymes in common and growth during embryonic stage.

The Three Domains; Taxonomic ranking was altered in the 1970's with the introduction of the domains before kingdom. It was further clarified in the 1990's with better understanding of cellular structure. **Archaea** are prokaryotic cells, **Bacteria** (even though bacteria are prokaryotic cells just like Archaea, their cell membranes have a different composition) and **Eukarya** (eukaryotes).

Questions;

What type of variation can be displayed as a distribution curve?

_____

What type of variation can be displayed on a bar chart?

_____

Describe Natural selection. _____

_____

_____

_____

_____

What are the 3 domains? _____

What method did Linnaeus use to group organisms? _____

_____

What newer methods are now used? _____

_____

Define species. _____

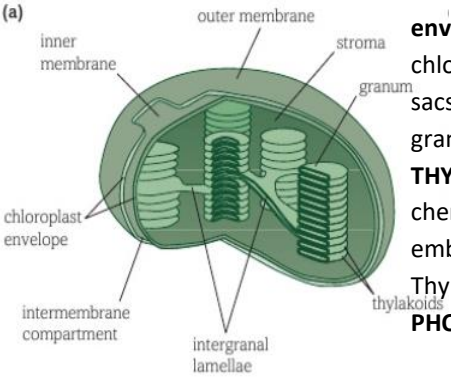
Photosynthesis;

Photoautotrophs are organisms that produce their own food with the use of **solar energy**. They are the source of chemical energy for other organisms within a food chain.

The general equation for photosynthesis is:

$$6CO_2 + 6H_2O + \text{energy from photons} \xrightarrow{\text{chlorophyll}} C_6H_{12}O_6 + 6O_2$$

Photosynthesis is and **endothermic** reaction requiring the energy to initiate it. A special organelle in the plant cell called the **CHLOROPLAST** contains a chemical called **CHLOROPHYLL**. The chloroplast has an inner and outer membrane called the **envelope**. Inside the chloroplast are flattened sacs called **GRANA**. The grana stack up to form **THYLAKOIDS**. The chemical, chlorophyll is embedded in the Thylakoid membrane in **PHOTOSYSTEMS.**



The photosystems contain different **photosynthetic pigments** which absorb different wavelengths of light. A fluid filled matrix called the **STROMA** surrounds the grana and contains **enzymes** and **DNA** for protein production within the chloroplast.

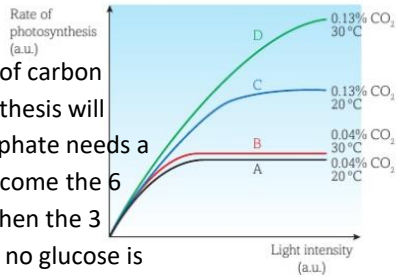
Photosynthesis occurs in two stages; - **The Light dependent stage (LDS)**; this uses light energy and water to provide **hydrogen ions** and **electrons**, which are moved through electron carriers, to produce **oxygen** and **reduced NADP** which can pass into the next phase. - **The light independent stage (LIS) or CALVIN CYCLE**; the Calvin cycle uses inorganic carbon dioxide gas to produce organic glucose. A five carbon compound called **Ribulose bisphosphate** accepts one carbon from the carbon dioxide with the help of an enzyme, **RuBisCo**. This forms and unstable 6 carbon compound which dissociates into two 3 carbon molecules called glycerate-3-phosphate (GP) which then accepts a hydrogen ion from the reduced NADP (brought in from the light dependent stage) to make 2 molecules of triose phosphate (TP). TP can then be synthesised into other sugars or used to synthesis amino acids, fatty acids and glycerol.__

Limiting factors and Photosynthesis;

Factors that can affect the rate of photosynthesis are called limiting factors. These can be the raw materials of photosynthesis (**carbon dioxide** and **water**), **Light intensity** or factors that affect enzymes responsible for photosynthesis (**temperature** and **pH**).

Water stress; water does not generally limit photosynthesis since it is required in other cellular reactions the plant, turgidity, transpiration stream and cooling is usually dead before water is at a low enough level to affect photosynthesis.

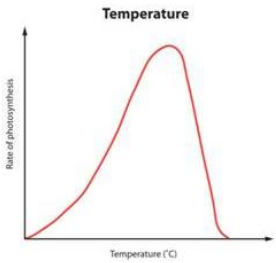
Carbon dioxide;



Without the presence of carbon dioxide then photosynthesis will stop. Ribulose bisphosphate needs a carbon from CO_2 to become the 6 carbon molecule and then the 3 carbon TP. Without TP no glucose is made.

Light intensity; Light is required to provide photons of energy in the LDS. Light can also cause the stoma to open in the leaf bringing about transpiration.

Temperature;



At lower temperatures the rate of reaction is slow due to the molecules and enzymes having less **kinetic energy** and therefore fewer collisions per second. As the temperature increases, the molecules gain more kinetic energy and collisions per second increase as does the reaction rate. However, these reactions are reliant upon enzymes. Enzymes have a specific structure to allow them to carry out the specific function. As the temperature increases then hydrogen and disulfide bond holding the tertiary structure, will break and the enzymes active site changes shape (**DENATURES**) and the enzyme can no longer catalyse the reaction.

pH; Similar to temperature, enzymes work best in particular pH's. If the pH alters then bonds break and the enzyme denatures.

Questions; Define photoautotroph.

_____ Where in the chloroplast are the photosynthetic pigments found? _____

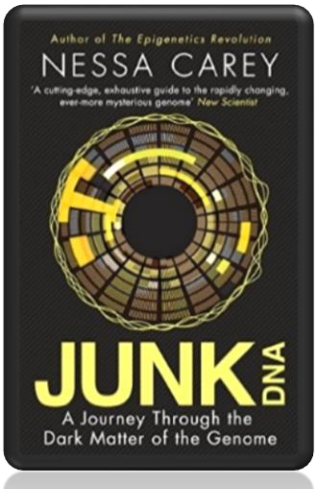
_____

____ What reactant of photosynthesis is broken down in the light dependent stage? _____ What reactant of photosynthesis is used in the light independent stage? _____ What effect does increasing temperature have on the rate of photosynthesis? _____

_____

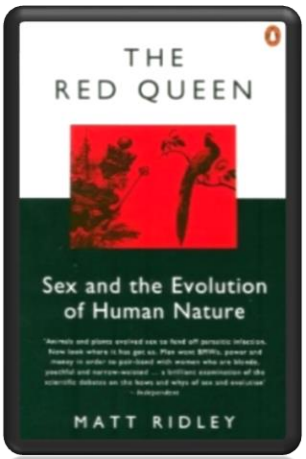
Book Recommendations

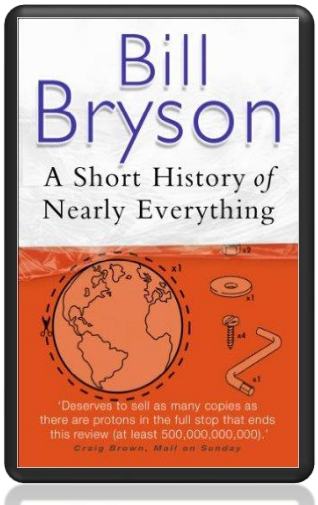
Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Biology



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

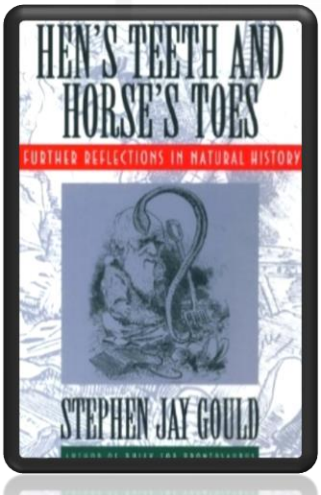
The Red Queen
Its all about sex. Or sexual selection at least. This book will really help your understanding of evolution and particularly the fascinating role of sex in evolution. Available at amazon.co.uk

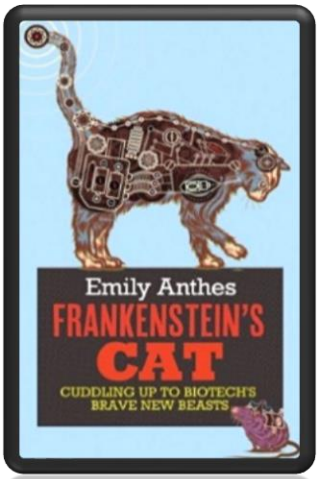




A Short History of Nearly Everything
A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at amazon.co.uk

Studying Geography as well?
Hen's teeth and horses 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

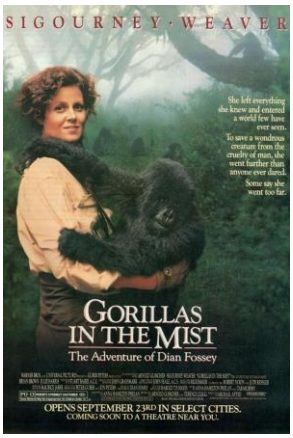




An easy read..
Frankenstein's cat
Discover how glow in the dark fish are made and more great Biotechnology breakthroughs. Available at amazon.co.uk

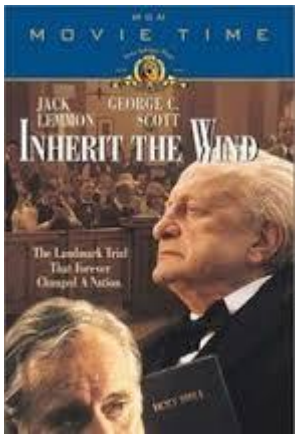
Movie Recommendations

Everyone loves a good story and everyone loves some great science. Here are some of the picks of the best films based on real life scientists and discoveries. You wont find Jurassic Park on this list, we've looked back over the last 50 years to give you our top 5 films you might not have seen before. Great watching for a rainy day.



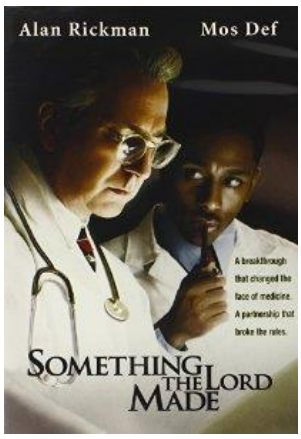
Gorillas in the Mist (1988)
An absolute classic that retells the true story of the life and work of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A tear jerker.

Inherit The Wind (1960)
Great if you can find it. Based on a real life trial of a teacher accused of the crime of teaching Darwinian evolution in school in America. Does the debate rumble on today?



Andromeda Strain (1971)
Science fiction by the great thriller writer Michael Cricthon (he of Jurassic Park fame). Humans begin dying when an alien microbe arrives on Earth.

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.

There are some great TV series and box sets available too, you might want to check out: Blue Planet, Planet Earth, The Ascent of Man, Catastrophe, Frozen Planet, Life Story, The Hunt and Monsoon.

Movie Recommendations

If you have 30 minutes to spare, here are some great presentations (and free!) from world leading scientists and researchers on a variety of topics. They provide some interesting answers and ask some thought-provoking questions. Use the link or scan the QR code to view:

A New Superweapon in the Fight Against Cancer
Available at :
http://www.ted.com/talks/paula_hammond_a_new_superweapon_in_the_fight_against_cancer?language=en
Cancer is a very clever, adaptable disease. To defeat it, says medical researcher and educator Paula Hammond, we need a new and powerful mode of attack.

Why Bees are Disappearing
Available at :
http://www.ted.com/talks/marla_spivak_why_bees_are_disappearing?language=en
Honeybees have thrived for 50 million years, each colony 40 to 50,000 individuals coordinated in amazing harmony. So why, seven years ago, did colonies start dying en-masse?

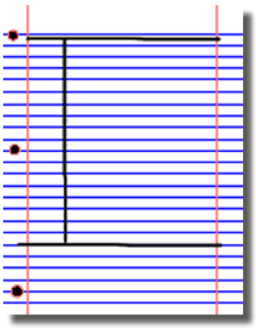
Why Doctors Don't Know About the Drugs They Prescribe
Available at :
http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en
When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of the time, negative or inconclusive findings go unreported, leaving doctors and researchers in the dark.

Growing New Organs
Available at :
http://www.ted.com/talks/anthony_atala_growing_organs_engineering_tissue?language=en
Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.

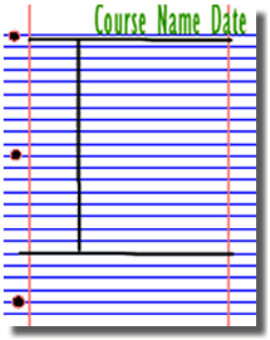
Research activities

Research, reading and note making are essential skills for A level Biology study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

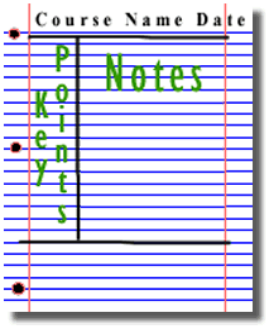
1. Divide your page into three sections like this



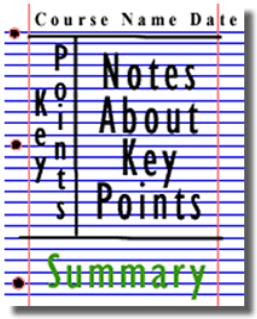
2. Write the name, date and topic at the top of the page



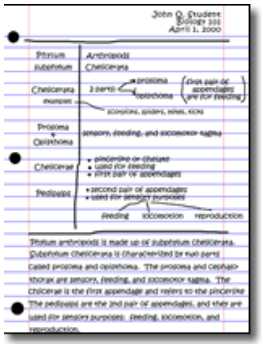
3. Use the large box to make notes. Leave a space between separate idea. Abbreviate where possible.



4. Review and identify the key points in the left hand box



5. Write a summary of the main ideas in the bottom space



Images taken from http://coe.jmu.edu/learningtoolbox/cornellnotes.html

Research activities

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 of 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, 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: Populations
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?

Pre-Knowledge Topics

A level Biology will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following tasks to make sure your knowledge is up to date and you are ready to start studying:

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 foetuses such as Downs Syndrome.

Read the information on these websites (you could make more Cornell notes if you wish):

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 the information on these websites (you could make more Cornell notes if you wish):

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 an AS 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 the information on these websites (you could make more Cornell notes if you wish):
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 the information on these websites (you could make more Cornell notes if you wish):
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.

Cells

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study. Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure. In complex multicellular organisms cells are organised into tissues, tissues into organs and organs into systems. During the cell cycle genetic information is copied and passed to daughter cells. Daughter cells formed during mitosis have identical copies of genes while cells formed during meiosis are not genetically identical

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=L0k-enzoeOM
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 choose, your revision guide should include:
Key words and definitions
Clearly labelled diagrams
Short explanations of key ideas or processes.

Biological Molecules

Biological molecules are often polymers and are based on a small number of chemical elements. In living organisms carbohydrates, proteins, lipids, inorganic ions and water all have important roles and functions related to their properties. DNA determines the structure of proteins, including enzymes. Enzymes catalyse the reactions that determine structures and functions from cellular to whole-organism level. Enzymes are proteins with a mechanism of action and other properties determined by their tertiary structure. ATP provides the immediate source of energy for biological processes.

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
http://www.bbc.co.uk/education/guides/zb739j6/revision

And take a look at these videos:
https://www.youtube.com/watch?v=H8WJ2KENlK0
http://ed.ted.com/lessons/activation-energy-kickstarting-chemical-reactions-vance-kite

Task:

Krabbe disease occurs when a person doesn't have a certain enzyme in their body. The disease effects the nervous system. Write a letter to a GP or a sufferer to explain what an enzyme is.

Your poster should:
Describe the structure of an enzyme
Explain what enzymes do inside the body

Ecosystems

Ecosystems range in size from the very large to the very small. Biomass transfers through ecosystems and the efficiency of transfer through different trophic levels can be measured. Microorganisms play a key role in recycling chemical elements. Ecosystems are dynamic systems, usually moving from colonisation to climax communities in a process known as succession. The dynamic equilibrium of populations is affected by a range of factors. Humans are part of the ecological balance and their activities affect it both directly and indirectly. Effective management of the conflict between human needs and conservation help to maintain sustainability of resources.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.bbc.co.uk/education/guides/z7vqtfr/revision
http://www.s-cool.co.uk/a-level/biology/ecological-concepts

And take a look at these videos:
https://www.youtube.com/watch?v=jZKIHe2LDP8
https://www.youtube.com/watch?v=E8dkWQVFAoA

Task:
Produce a newspaper or magazine article about one ecosystem (e.g. the arctic, the Sahara, the rainforest, or something closer to home like your local woodland, nature reserve or shore line).
Your article should include:
Key words and definitions
Pictures or diagrams of your chosen ecosystem.
A description of the changes that have occurred in this ecosystem
An explanation of the threats and future changes that may further alter this ecosystem.

Control Systems

Homeostasis is the maintenance of a constant internal environment. Negative feedback helps maintain an optimal internal state in the context of a dynamic equilibrium. Positive feedback also occurs. Stimuli, both internal and external, are detected leading to responses. The genome is regulated by a number of factors. Coordination may be chemical or electrical in nature

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.s-cool.co.uk/a-level/biology/homeostasis
http://www.bbc.co.uk/education/topics/z8kxpv4

And take a look at these videos:
https://www.youtube.com/watch?v=x4PPZCLnVkA
https://www.youtube.com/watch?v=x4PPZCLnVkA

Task:
Produce a poster to display in your classroom in September summarising one of the following topics: Temperature Control, Water and the Kidneys, Glucose, or The Liver.
Whichever topic you choose, your poster or display should include:
Key words and definitions
Clearly labelled diagrams
Short explanations of key ideas or processes.

Energy for Biological Processes

In cellular respiration, glycolysis takes place in the cytoplasm and the remaining steps in the mitochondria. ATP synthesis is associated with the electron transfer chain in the membranes of mitochondria and chloroplasts in photosynthesis energy is transferred to ATP in the light- dependent stage and the ATP is utilised during synthesis in the light-independent stage.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.bbc.co.uk/education/guides/zcxrd2p/revision
http://www.s-cool.co.uk/a-level/biology/respiration

And take a look at these videos:
https://www.youtube.com/watch?v=00jbG_cfGuQ
https://www.youtube.com/watch?v=2f7YwCtHcgk

Task:

Produce an A3 annotated information poster that illustrates the process of cellular respiration and summarises the key points.

Your poster should include:
Both text and images
Be visually stimulating
Key words and definitions
Clearly labelled diagrams
Short explanations of key ideas or processes.

Scientific and Investigative Skills

As part of your A level you will complete a practical assessment. This will require you to carry out a series of practical activities as well as planning how to do them, analysing the results and evaluating the methods. This will require you to: use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH), use appropriate instrumentation to record quantitative measurements, such as a colorimeter or photometer, use laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions, use of light microscope at high power and low power, including use of a graticule, produce scientific drawing from observation with annotations, use qualitative reagents to identify biological molecules, separate biological compounds using thin layer/paper chromatography or electrophoresis, safely and ethically use organisms, use microbiological aseptic techniques, including the use of agar plates and broth, safely use instruments for dissection of an animal organ, or plant organ, use sampling techniques in fieldwork.

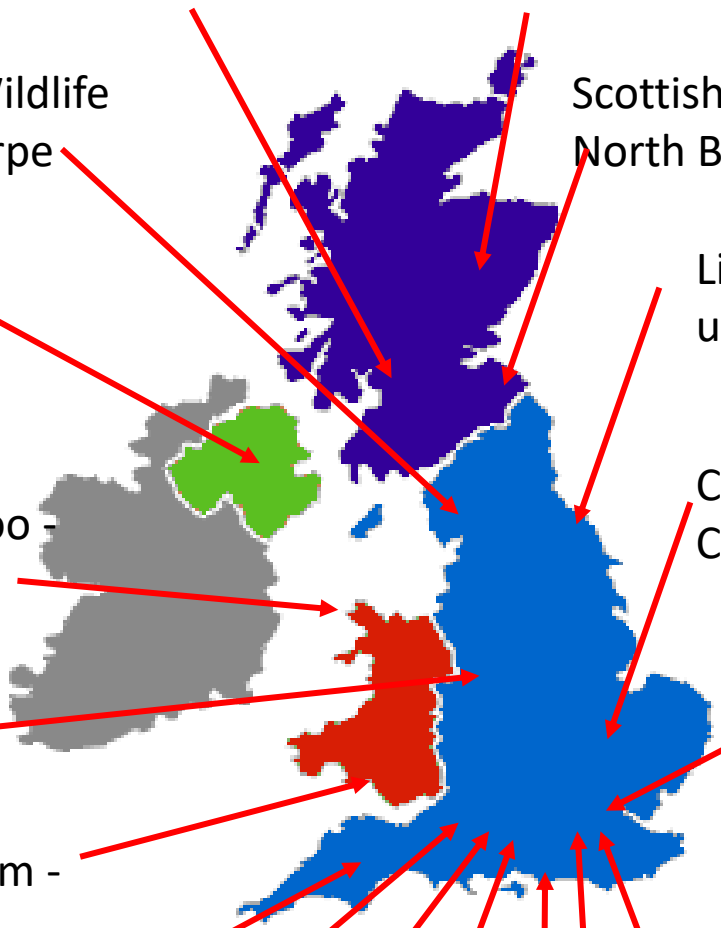
Task:

Produce a glossary for the following key words:

accuracy, anomaly, calibration, causal link, chance, confounding variable, control experiment, control group, control variable, correlation, dependent variable, errors, evidence, fair test, hypothesis, independent, null hypothesis, precision, probability, protocol, random distribution, random error, raw data, reliability, systematic error, true value, validity, zero error,

Ideas for Day Trips

If you are on holiday in the UK, or on a staycation at home, why not plan a day trip to one of these :



Glasgow Science Centre - Glasgow

Dundee Science Centre - Dundee

The Lakeland Wildlife Oasis - Milnthorpe

Scottish Seabird centre – North Berwick

W5 - Belfast

Life – Newcastle-upon-Tyne

Anglesey Sea Zoo - Anglesey

Cambridge Science Centre - Cambridge

Think-tank - Birmingham

Herriman Museum and Gardens - London

National Museum - Cardiff

The Eden Project - Cornwall

Centre of the Cell - London

Bristol Science Centre - Bristol

Royal Botanic Gardens – Kew - Edinburgh

The Living Rainforest - Newbury

Oxford University Museum of Natural History - Oxford

National Marine Aquarium - Plymouth

Ideas for Day Trips

If you are on holiday in the UK, or on a staycation at home, why not plan a day trip to one of these :

Remember there are also lots of zoos, wildlife and safari parks across the country, here are some you may not have heard of or considered:
Colchester Zoo, Cotswold Wildlife Park, Banham Zoo (Norfolk), Tropical Birdland (Leicestershire), Yorkshire Wildlife Park, Peak Wildlife Park, International Centre for Birds of Prey (York), Blackpool Zoo, Beale Park (Reading)

There are also hundreds of nature reserves (some of which are free) located all over the country including:
RSPB sites at Lochwinnoch, Saltholme, Fairburn Ings, Old Moor, Conwy, Minsmere, Rainham Marshes, Pulborough Brooks, Radipole Lake, Newport Wetlands.
Wildlife Trust Reserves and others at Rutland Water, Pensthorpe, Insh Marshes, Attenborough Centre, Inversnaid, Skomer, Loch Garten, Donna Nook, Chapmans Well, Woodwalton Fen, London Wetland Centre, Martin Down and Woolston Eyes Reserve.

Many organisations also have opportunities for people to volunteer over the summer months, this might include working in a shop/café/visitor centre, helping with site maintenance or taking part in biological surveys. Not only is this great experience, it looks great on a job or UCAS application.

For opportunities keep an eye out in your local press, on social media, or look at the websites of organisations like the RSPB, Wildlife Trust, National Trust or Wildlife & Wetland Trust.

There are also probably lots of smaller organisations near you who would also appreciate any support you can give!

Science on Social Media

Science communication is essential in the modern world and all the big scientific companies, researchers and institutions have their own social media accounts. Here are some of our top tips to keep up to date with developing news or interesting stories:

Follow on Twitter:
Commander Chris Hadfield – former resident aboard the International Space Station @cmdrhadfield

Tiktaalik roseae – a 375 million year old fossil fish with its own Twitter account!
@tiktaalikroseae

NASA's Voyager 2 – a satellite launched nearly 40 years ago that is now travelling beyond our Solar System
@NSFVoyager2

Neil dGrasse Tyson – Director of the Hayden Planetarium in New York
@neiltyson

Sci Curious – feed from writer and Bethany Brookshire tweeting about good, bad and weird neuroscience
@scicurious

The SETI Institute – The Search for Extra Terrestrial Intelligence, be the first to know what they find!
@setiinstitute

Carl Zimmer – Science writer Carl blogs about the life sciences
@carlzimmer

Phil Plait – tweets about astronomy and bad science
@badastronomer

Virginia Hughes – science journalist and blogger for National Geographic, keep up to date with neuroscience, genetics and behaviour
@virginiahughes

Maryn McKenna – science journalist who writes about antibiotic resistance
@marynmck

Find on Facebook:
Nature - the profile page for nature.com for news, features, research and events from Nature Publishing Group

Marin Conservation Institute – publishes the latest science to identify important marine ecosystems around the world.

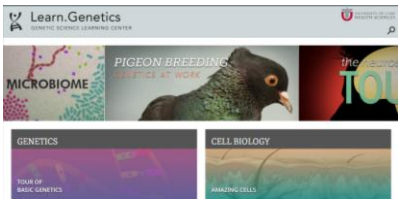
National Geographic - since 1888, National Geographic has travelled the Earth, sharing its amazing stories in pictures and words.

Science News Magazine - Science covers important and emerging research in all fields of science.

BBC Science News - The latest BBC Science and Environment News: breaking news, analysis and debate on science and nature around the world.

Science websites

These websites all offer an amazing collection of resources that you should use again and again through out your course.



Probably the best website on Biology….
Learn Genetics from Utah University has so much that is pitched at an appropriate level for you and has lots of interactive resources to explore, everything from why some people can taste bitter berries to how we clone mice or make glow in the dark jelly fish.
http://learn.genetics.utah.edu/

ZSL
LIVING CONSERVATION

In the summer you will most likely start to learn about Biodiversity and Evolution. Many Zoos have great websites, especially London Zoo. Read about some of the case studies on conservation, such as the Giant Pangolin, the only mammal with scales.
https://www.zsl.org/conservation

At GCSE you learnt how genetic diseases are inherited. In this virtual fly lab you get to breed fruit flies to investigate how different features are passed on.
http://sciencecourseware.org/vcise/drosophila/

DNA from the beginning is full of interactive animations that tell the story of DNA from its discovery through to advanced year 13 concepts. One to book mark!
http://www.dnaftb.org/

Ok, so not a website, but a video you definitely want to watch. One of the first topics you will learn about is the amazing structure of the cell. This BBC film shows the fascinating workings of a cell… a touch more detailed than the "fried egg" model you might have seen.
http://www.dailymotion.com/video/xzh0kb_the-hidden-life-of-the-cell_shortfilms
If this link expires – google "BBC hidden life of the cell"

Science: Things to do!

Day 4 of the holidays and boredom has set in?
There are loads of citizen science projects you can take part in either from the comfort of your bedroom, out and about, or when on holiday. Wikipedia does a comprehensive list of all the current projects taking place. Google 'citizen science project'

Bumblebee Conservation Trust

AgeGuess

OPAL
EXPLORE NATURE

big butterfly count
15th July - 7th August

eoceans
www.eoceans.org

THE SHORE THING
GET INVOLVED!

WildlifeLog
SPOT IT - SHARE IT - SAVE IT

The Big Moss Map

MOOC

canvas NETWORK
edX
coursera
OPEN 2 STUDY
UDACITY udacity.com
FUTURELEARN
KHAN ACADEMY
ed2go

Want to stand above the rest when it comes to UCAS? Now is the time to act.
MOOCs are online courses run by nearly all Universities. They are short FREE courses that you take part in. They are usually quite specialist, but aimed at the public, not the genius!
There are lots of websites that help you find a course, such as edX and Future learn.
You can take part in any course, but there are usually start and finish dates. They mostly involve taking part in web chats, watching videos and interactives.

Completing a MOOC will look great on your Personal statement and they are dead easy to take part in!