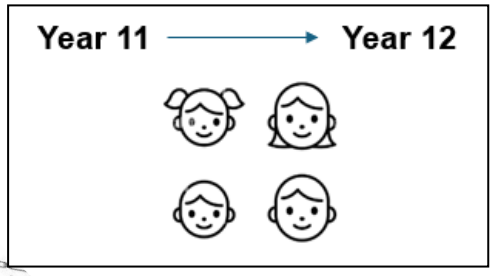
THE BECKET SCHOOL
A CATHOLIC VOLUNTARY ACADEMY
LABORARE EST ORARE

Biology:
Transition Work

NAME: .....



You need to complete ALL the tasks and bring it to your first Biology lesson.

Topic	Mark
Carbohydrates	/20
Lipids	/11
Proteins	/21
DNA and Water	/22
Animal Cell	/18
Plant Cell	/19
Transport	/21
Immunology	/19

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BIOLOGICAL MOLECULES GCSE PRIOR KNOWLEDGE

1) Biological Molecules

a) Carbohydrates: Starch, Cellulose and Glycogen
b) Lipids
c) Proteins and Enzymes
d) DNA, Energy and Water

Carbohydrates: Starch, Cellulose and Glycogen Prior Knowledge

QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. How may glucose be stored/used by plants? (4)			
2. What is starch made of? (1)			
3. What is the chemical formula for glucose? (1)			
4. Name two reasons starch is important in plants. (2)			
5. Which test is used to see if starch is present? (1)			
6. Which test is used to see if glucose is present? (1)			
7. Describe the method to test for glucose? (3)			
8. Where is cellulose found in a plant cell? (1)			
9. What is the function of cellulose? (1)			

10. Where is glycogen found? (1)			
11. What is the function of glycogen? (1)			
12. How is glycogen made? (2)			
13. What are carbohydrates made of? (1)			
14. What enzyme breaks down carbohydrates? (1)			
TOTAL			**/ 20**

Carbohydrates Building Knowledge

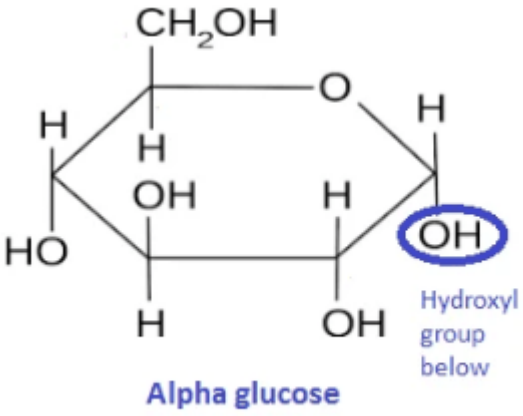
Three elements make up the carbohydrate molecule – **carbon**, **hydrogen** and **oxygen**.

There are several types of carbohydrates;

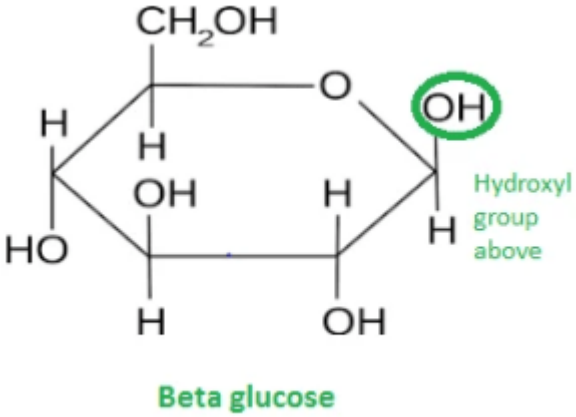
Sugars

Small, sweet, water soluble molecules. Can be **monosaccharides** (one) or **disaccharides** (two).
Monosaccharides are single units from which disaccharides are built.

Glucose occurs in 2 forms **alpha (α) glucose** and **beta (β) glucose**.



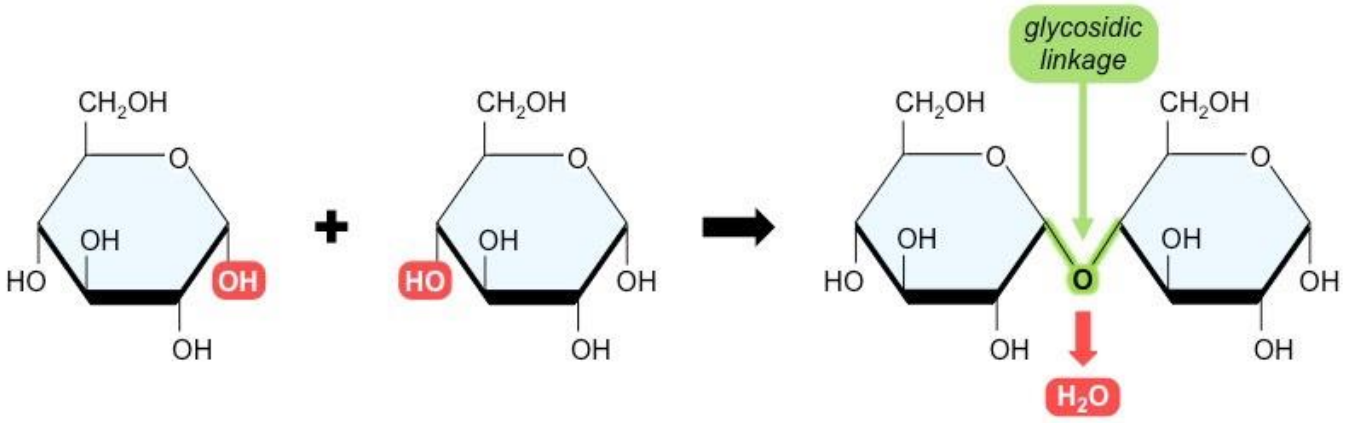
Alpha glucose



Beta glucose

Glucose and Fructose are monosaccharides and join together to form the disaccharide sucrose.

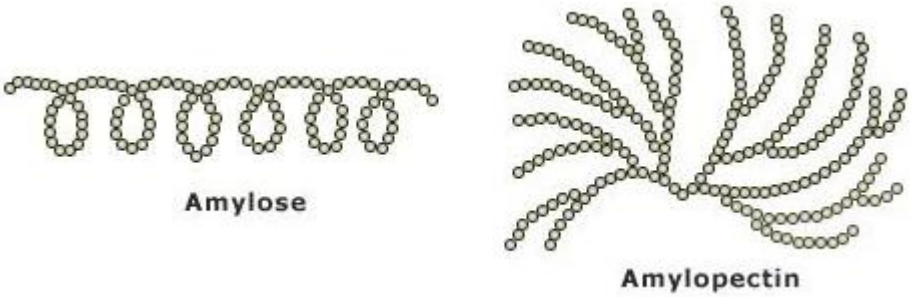
The joining together of 2 monosaccharides occurs to release a molecule of **water** this is called a **condensation reaction**.



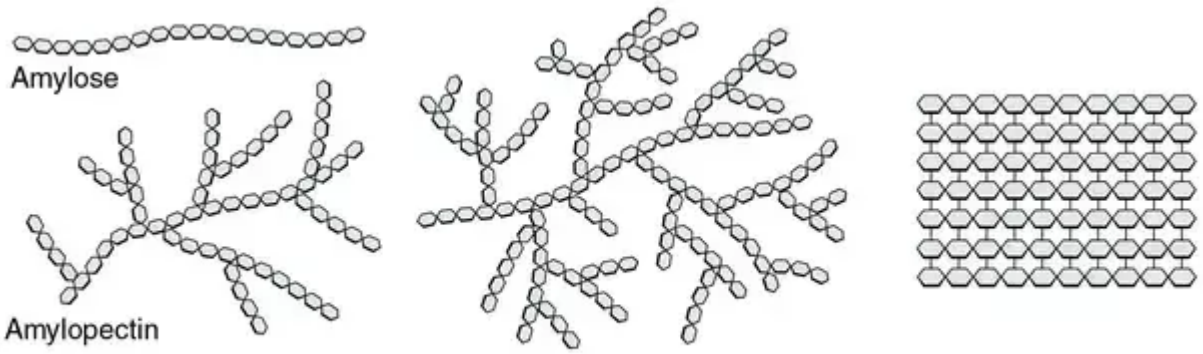
Monosaccharide Subunits **Disaccharide**

Disaccharides are made from the following monomers:
Glucose + Fructose → Sucrose + Water
Glucose + Galactose → Lactose + Water
Glucose + Glucose → Maltose + Water

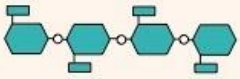
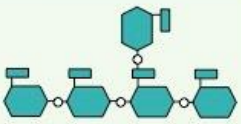
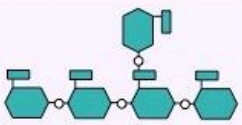
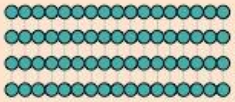
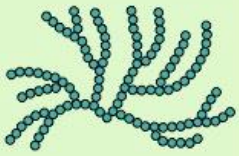
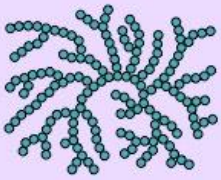
Starch;
A **Polysaccharide** (a large molecule –polymer, made up of monomers). Two different polysaccharides of glucose are used to make **starch**- **amylose** and **amylopectin**. Starch is insoluble and compact, so it is a good **storage molecule** in plants. Starch is only found in plant cells.



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



Starch **Glycogen** **Cellulose (fiber)**

	Cellulose	Starch		Glycogen
		Amylose	Amylopectin	
Source	Plant	Plant	Plant	Animal
Subunit	β-glucose	α-glucose	α-glucose	α-glucose
Bonds	1-4	1-4	1-4 *and* 1-6	1-4 *and* 1-6
Branches	No	No	Yes (~per 20 subunits)	Yes (~per 10 subunits)
Diagram				
Shape				

Questions:

1 Name two monosaccharides.

_____&_____

2 Which disaccharide is composed of two molecules of glucose?

_____

3 Name two polysaccharides.

_____&_____

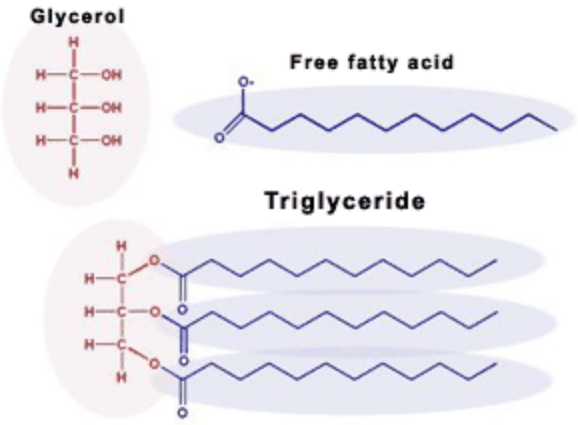
Lipids Prior Knowledge

QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. What are Lipids made up of? (1)			
2. What test is used to see if lipids are present? (1)			
3. Describe the method used to test for lipids? (3)			
4. What enzymes are used to break down lipids? (1)			
5. State 3 functions of lipids in the body (3)			
6. Name 2 foods high in lipids? (1)			
7. What disease is caused when large amounts of lipids are stored (1)			
TOTAL			**/ 11**

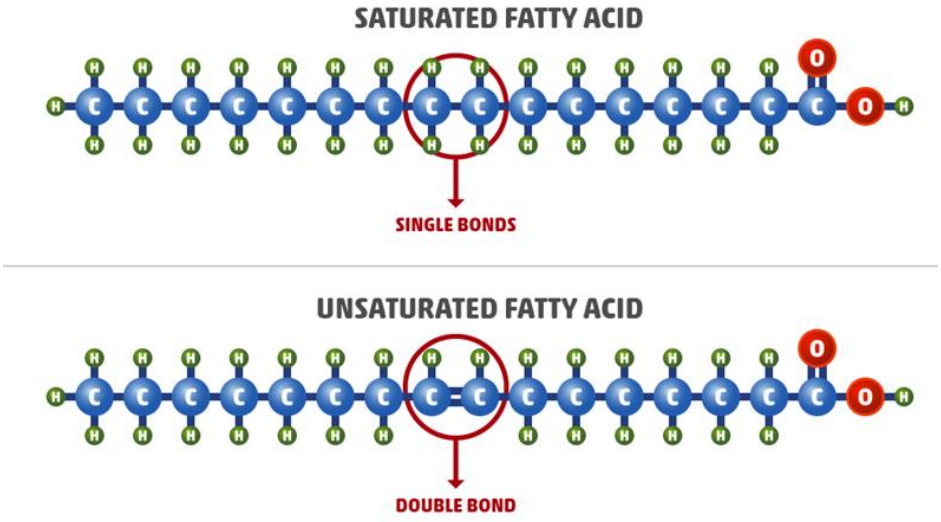
Lipids Building Knowledge

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**.

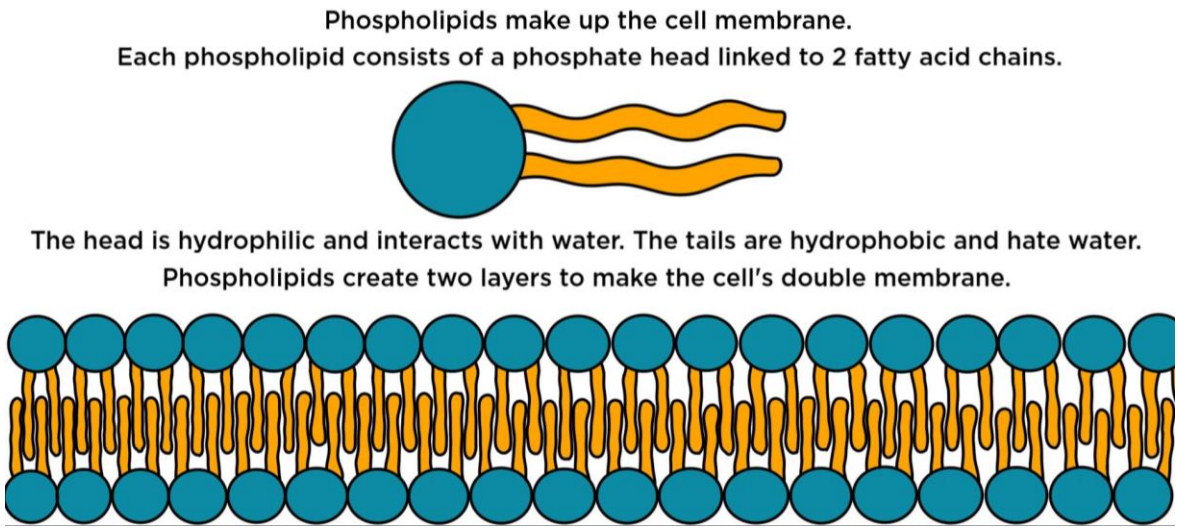


The **fatty acid** is a long chain of **Carbon** atoms with a carboxylic acid **(-COOH)** group on one end. **Hydrogen** atoms are attached to the Carbons by single bond. A single bond forms a **saturated** lipid. If there is a double bond then the lipid is **unsaturated**, many double bonds form a polyunsaturated lipid.



Phospholipids

Cell membranes are formed from two layers of **phospholipids**. They do not have 3 fatty acid chains but **2 fatty acid** chains and a **phosphate group**.



Questions:

1 Which elements are fatty acids composed of?

_____

2 What is the difference between saturated and unsaturated fatty acids?

_____

3 How are triglycerides different to phospholipids?

_____

_____

_____

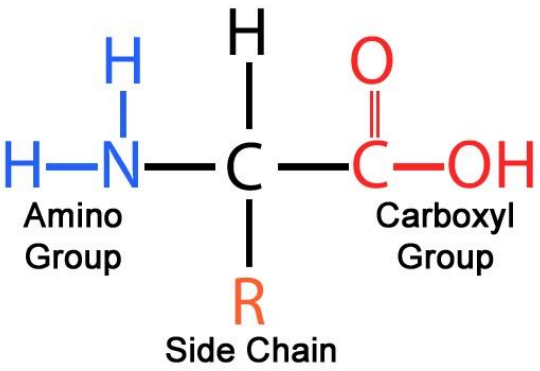
Proteins and Enzymes Prior Knowledge

QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. What are proteins made up of? (1)			
2. What test is used to see if protein is present? (1)			
3. Describe the method used to test for proteins? (3)			
4. What are proteins needed for? (4)			
5. Define enzyme (2)			
6. What are enzymes made of? (1)			
7. Name 3 factors that affect the rate an enzyme works? (3)			
8. What happens to an enzyme is the temperature is too low? (1)			
9. What happens to an enzyme if the temperature is too high? (1)			
10. Define the answer to question 9 (1)			
11. State 3 processes in the human body enzymes where are needed (3)			
TOTAL			**/ 21**

Proteins and Enzymes Building Knowledge

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 general structure however with a different **R group**. They contain; **Hydrogen**, **Oxygen**, **Nitrogen** and **Carbon**.

Proteins structure

PRIMARY STRUCTURE

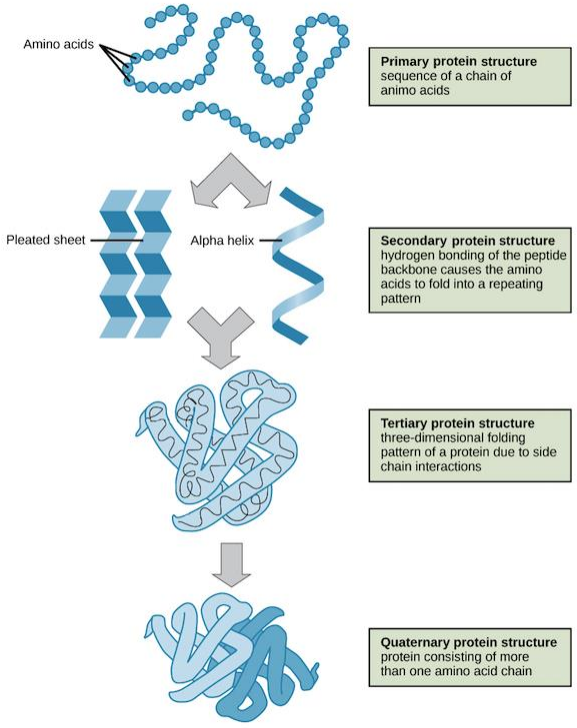
The order of the amino acids that are held together by **peptide bonds** into a **polypeptide** chain.

SECONDARY STRUCTURE

The polypeptide (protein) chain can then **coil** or **fold into pleats** which are held together by weak **hydrogen bonds**.

TERTIARY STRUCTURE

Enzymes have a further folding held together with hydrogen bonds as well as stronger **ionic bonds and disulphide bonds**. If the structure is almost spherical it is called a **globular protein**.

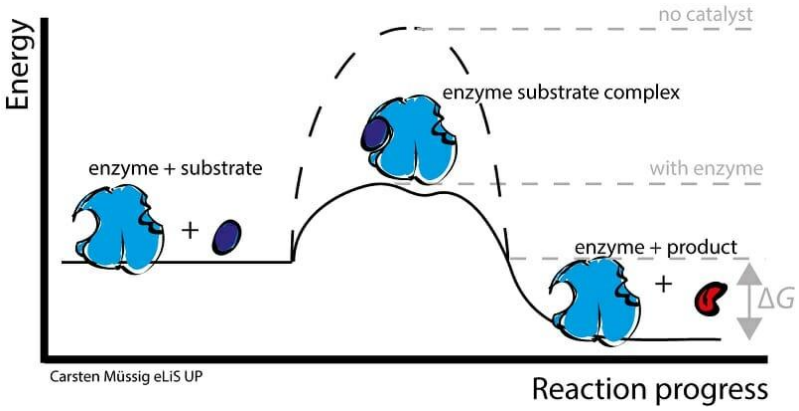


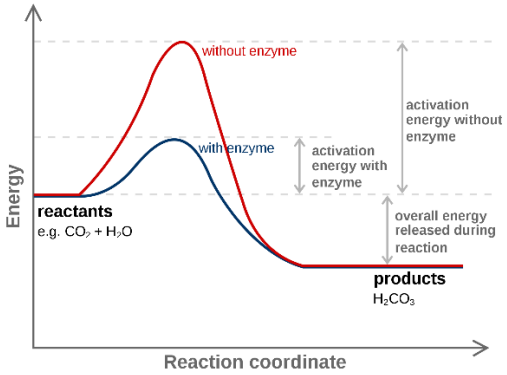
Enzymes

Speed up biochemical reactions.

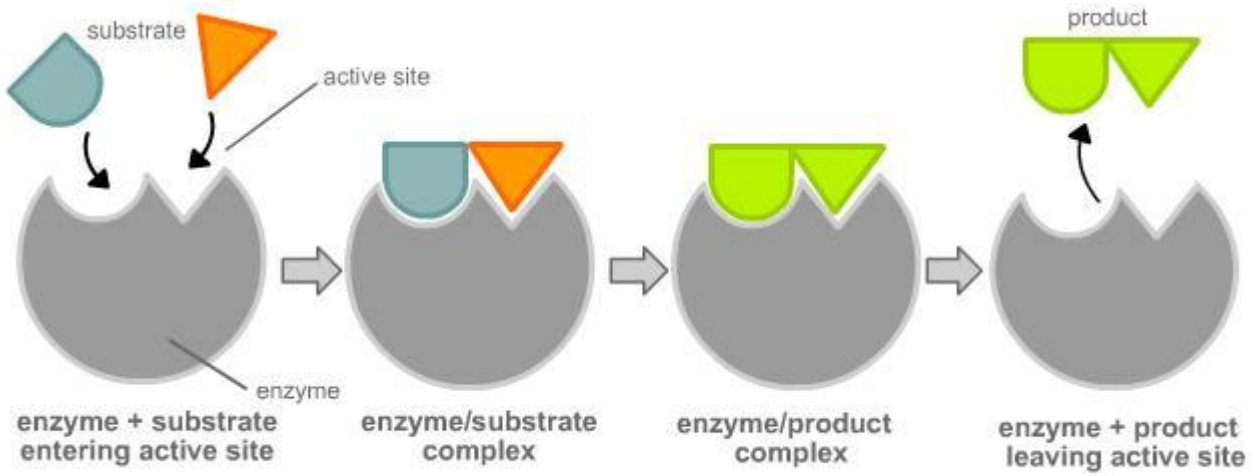
Metabolism is the sum of all the biochemical reactions that occur per second and a single chain of these reactions is called a **metabolic pathway**.

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 lower 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 called the **active site** into which the **substrates** can attach itself. The active site is **complementary** to the shape of the substrate. Once attached, 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. Enzymes are not used up in the reaction.



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:

1 What is the primary structure of a protein? Draw a labelled diagram of the monomer.

_____

Labelled Diagram:

2 What type of bonding is present in the secondary and tertiary structure of a protein?

Secondary Structure: _____

Tertiary Structure: _____

3 What is the role of enzymes?

_____

_____

_____

4 What is activation energy?

_____

_____

5 What is the role of digestive enzymes?

_____

_____

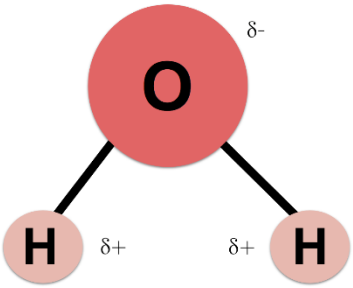
DNA, Energy and Water Prior Knowledge

QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. What does DNA stand for? (1)			
2. Describe the structure of DNA (2)			
3. Where is DNA found in a prokaryotic cell? (1)			
4. Where is DNA found in a eukaryotic cell? (1)			
5. What is the function of DNA? (1)			
6. What process is used to provide cells with energy? (1)			
7. Write the balanced symbol equation for aerobic respiration (2)			
8. Where does aerobic respiration take place? (1)			
9. Where does anaerobic respiration take place? (1)			
10. Name 4 way energy can be transferred in a cell (4)			
11. How many elements and atoms are present in a water molecule? (2)			
12. Draw the structure of water (2)			
13. State 3 ways your body losses water (3)			
TOTAL			**/ 22**

DNA, Energy and Water Building Knowledge

Water

Water is a **polar molecule** with partially positive charges on the Hydrogens and a partially negative charge on the Oxygen. Water is an excellent **solvent** which means it can dissolve many polar and ionic substances.



Questions:

1 What charge do each of the elements on a water molecule have?

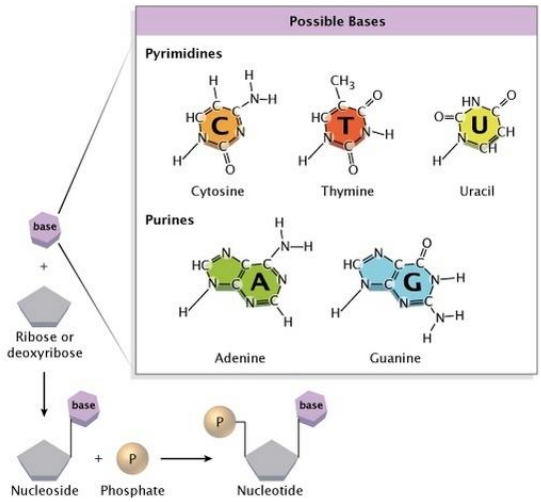
_____

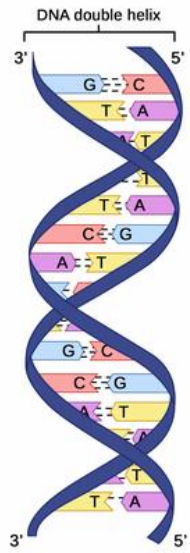
DNA and protein synthesis

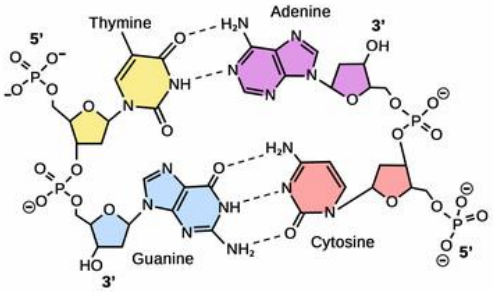
DNA is a complex chemical, found in the nucleus of eukaryotes and in the cytoplasm of prokaryotes. DNA is made up of; **pentose sugar, phosphate and nitrogenous bases** forming a **NUCLEOTIDE**.

There are 4 different nitrogenous bases;
A= Adenine
T= Thymine
C= Cytosine
G= Guanine

Complementary pair;
A pairs with T
C pairs with G



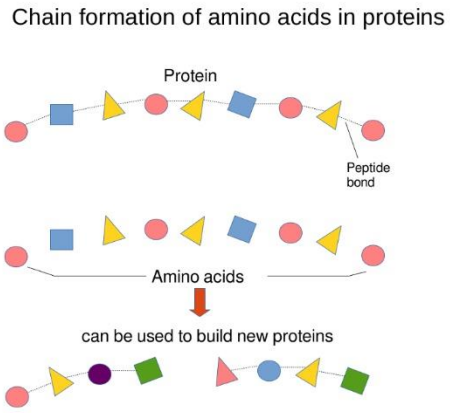




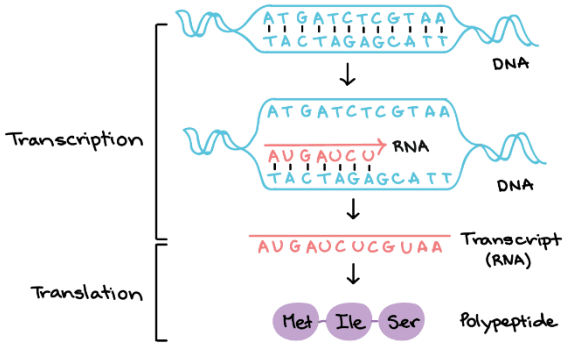
The bases pair up in the formation stated above. They are held together by **hydrogen bonds**. The two strands run in opposite directions causing the molecule to spiral forming a **DOUBLE HELIX**.

DNA controls the production of proteins. A section of DNA that codes for a protein is called a **gene**.

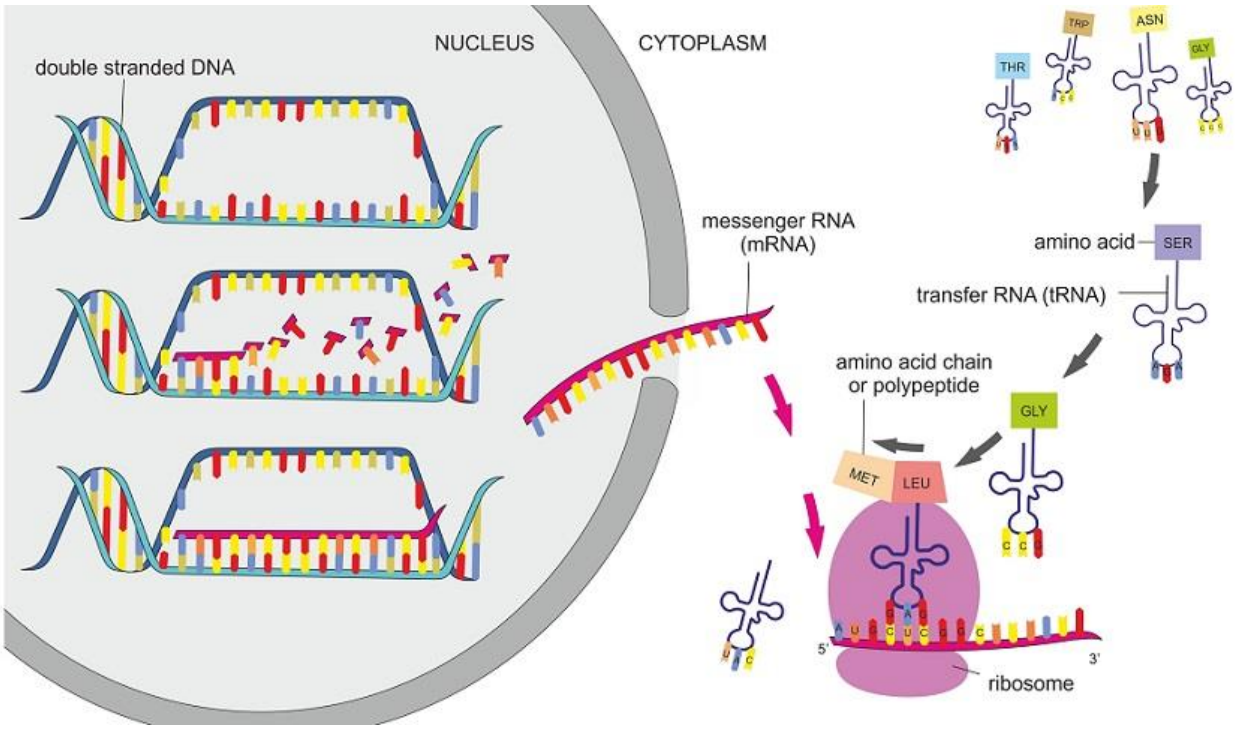
Proteins are made up of a string of **amino acids**, each protein has a different number and order of amino acids. The proteins also have different bonds which holds the molecule in a unique shape which means all proteins have a different function.



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**).

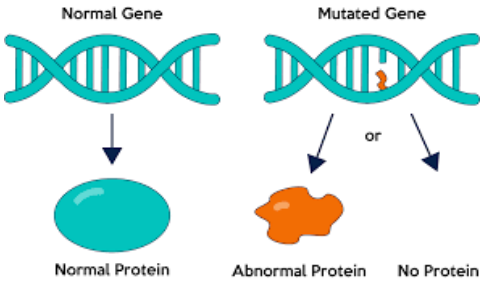
The mRNA passes out of the nucleus carrying the code for a protein. Once in the cytoplasm the mRNA binds to a ribosome.

Within the cytoplasm there is another molecule called transfer RNA (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 **ionic** and disulphide **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:

1 What are the components of a nucleotide?

_____

2 What are the four nitrogenous bases?

_____

3 What is the name given to the double-stranded structure of DNA?

_____

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

_____

5 What are proteins made from?

_____

6 What molecule contains the information from the DNA and is able to leave the nucleus?

_____

7 What organelle will this molecule attach to in the cytoplasm?

_____

CELLS GCSE PRIOR KNOWLEDGE

2) Cells

a) Animal Cell Structure and Function
b) Plant Cell Structure and Function
c) Diffusion, Osmosis and Active Transport
d) Immunology

Animal Cell Structure and Function Prior Knowledge

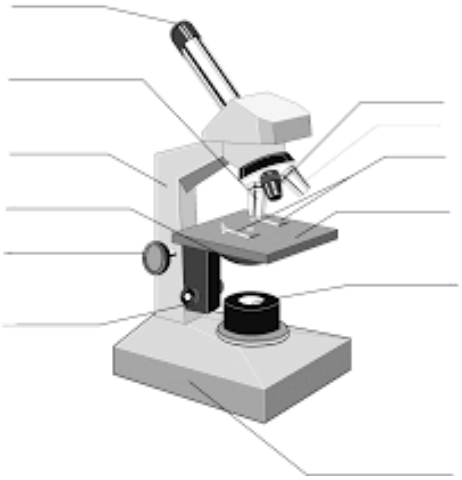
QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. What are the 5 most common structures in an animal cell? (5)			
2. Describe the function of each of those 5 structures? (5)			
3. List 3 specialised animal cells (3)			
4. How many mm in a cm? (1)			
5. How many µm in a mm? (1)			
6. What equation links magnification, size of real object and size of image? (1)			
7. State 2 differences between electron microscope and a light microscope? (2)			
TOTAL			**/ 18**

Animal Cell Structure and Function Building Knowledge

Microscopes;

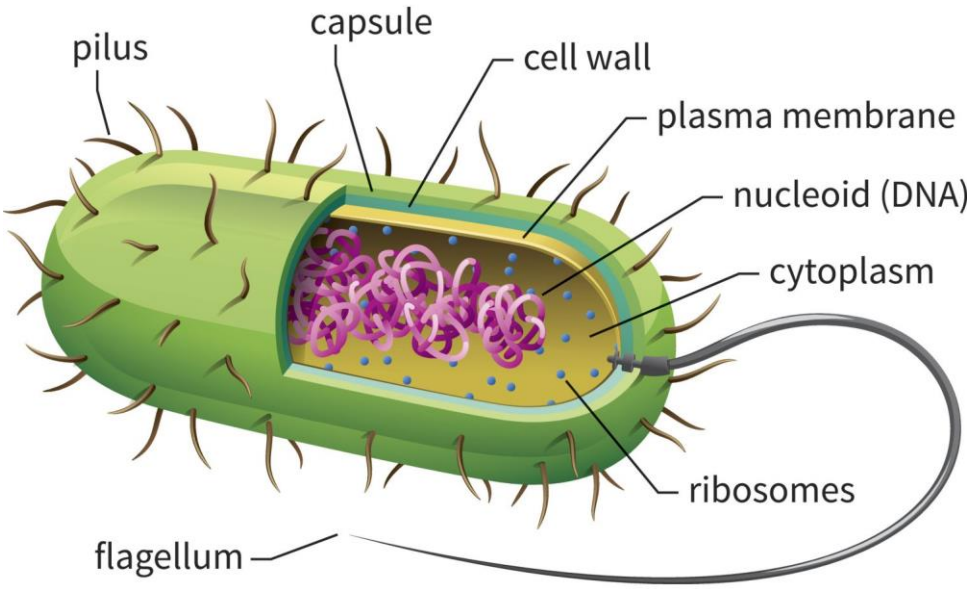
The Light microscope allows you to view animal cells. It can magnify up to 1500 times. Some organelles such as mitochondria, chloroplasts, vacuoles, cell walls, cell membranes and nuclei are visible. Staining makes these organelles visible.

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.

Prokaryotes; A bacterial cell is a prokaryotic cell. It is a single celled organism.



Prokaryotes like bacteria are roughly a **tenth the size** of eukaryotic cells.

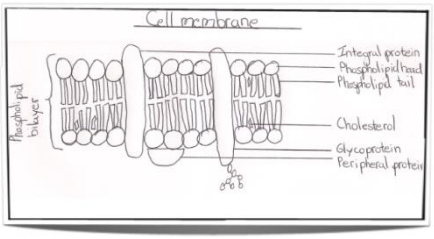
Prokaryotic cells **don't** contain a nucleus, mitochondria or chloroplasts.

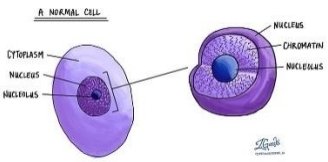
Some prokaryotes have a **rings of DNA** called **plasmids**.

Eukaryote Animal Cell

Cell structures

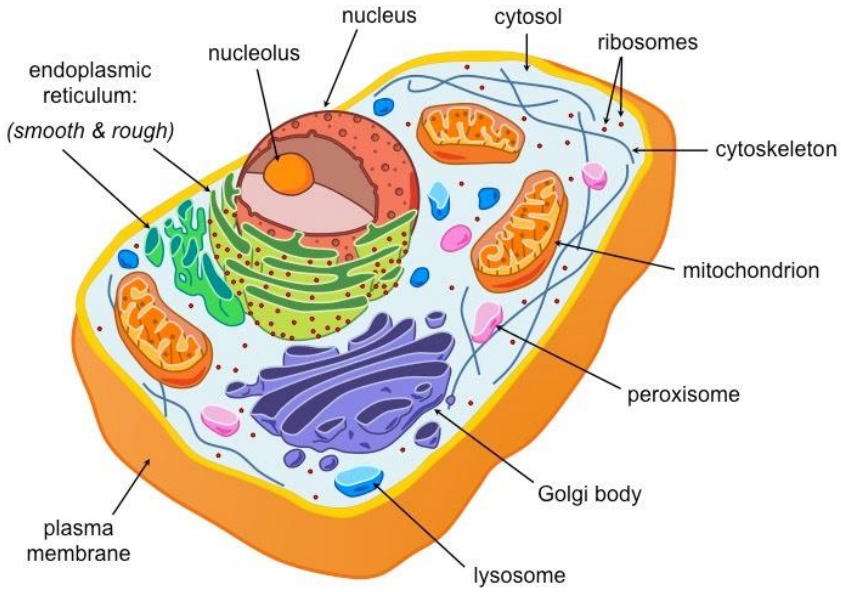
Cell surface membrane: Found around every cell, it allows the movement of substances into and out of the cell. It is a partially permeable membrane and will prevent certain substances from entering. It is made up of a double layer called the PHOSPHOLIPID BILAYER. These are molecules closely packed together in a mosaic pattern. Within the bilayer are large proteins which are also responsible for transport and for cell recognition.





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.



Challenge:

Can you find out about the structure and function of the other organelles labelled on the diagram?

Plant Cell Structure and Function Prior Knowledge

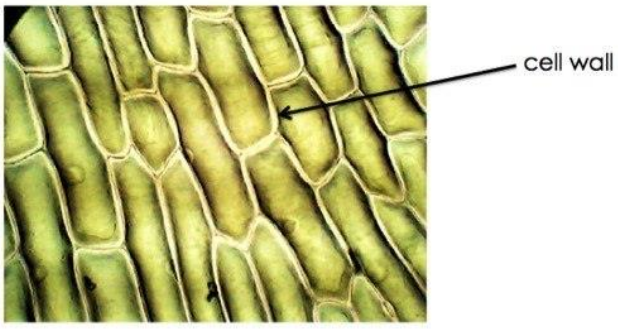
QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. State the 3 structures found in plant cells but not animal cells? (3)			
2. State the function of these 3 structures (3)			
3. What are cell walls made of? (1)			
4. What is the permanent vacuole filled with? (1)			
5. State 3 specialised plant cells (3)			
6. Name 4 tissues found in a leaf (4)			
7. Explain the roles of the 4 tissues found in a leaf (4)			
TOTAL			**/ 19**

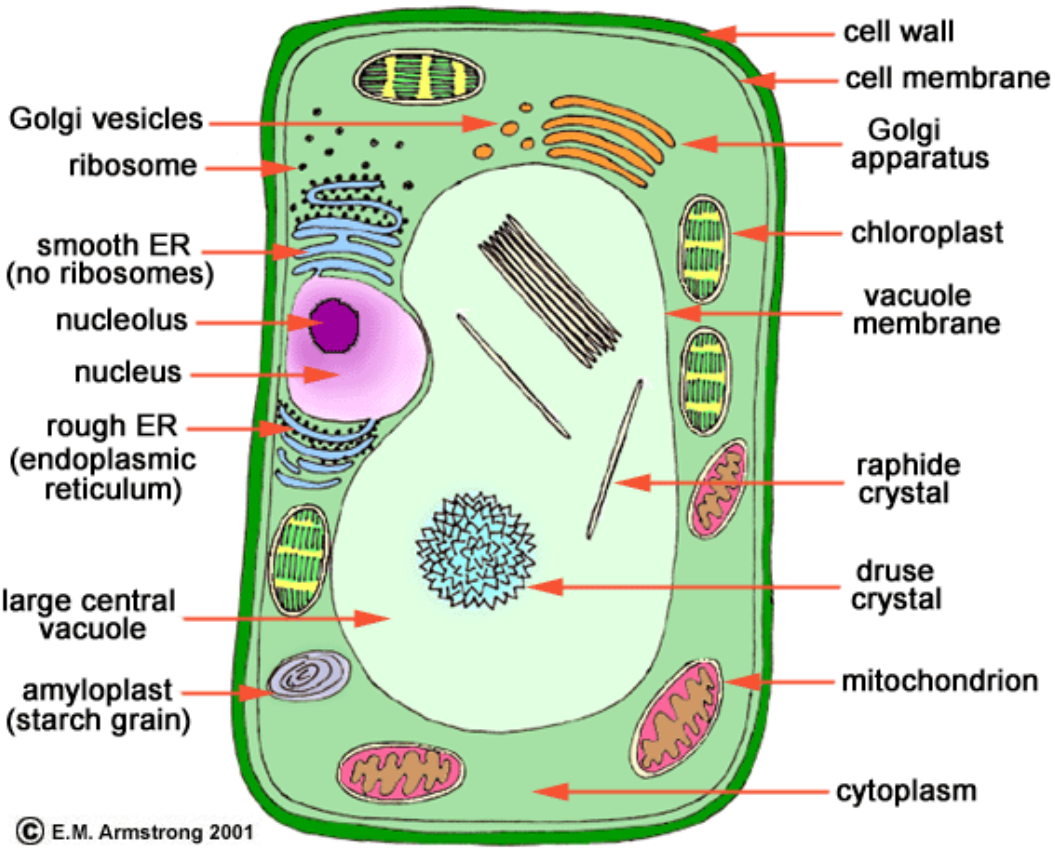
Plant Cell Structure and Function Building Knowledge

Eukaryote Plant Cell

Cell structures;

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.





Challenge:

Can you find out about the structure and function of the other organelles labelled on the diagram?

Questions:

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

_____

2 Name four organelles that both plant and animal cells have.

_____

3 What is the equation used to calculate the magnification of an object?

_____

4 What is the function of a mitochondrion?

_____

Diffusion, Osmosis and Active Transport Prior Knowledge

QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. Define diffusion (1)			
2. Define osmosis (1)			
3. Define active transport (1)			
4. What is the main difference between diffusion and osmosis? (1)			
5. What are the 2 main differences between active transport and the other 2? (2)			
6. State and describe where in a plant Active Transport occurs (2)			
7. State and describe where in an animal Diffusion will occur? (2)			
8. State and describe where in an animal osmosis will occur? (2)			
9. State and explain 3 factor that can change the rate of diffusion (6)			
10. Put these 500 ml surcrose concentrations in order of water concentration from highest to lowest. 20%, 0%, 45%, 10% and 15%(1)			
TOTAL			**/ 19**

Diffusion, Osmosis and Active Transport Building Knowledge

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. **NO ENERGY IS REQUIRED**.

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 (and channel proteins) 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.

Questions:

1 What do you call the diffusion of water molecules through the cell membrane?

_____

2 Give another term for the concentration of water molecules.

_____

3 Name the two types of protein involved in facilitated diffusion.

_____

4 Why does active transport require energy?

_____

Immunology Prior Knowledge

QUESTION	ANSWER	MARK (√ OR X)	CORRECTION (IF NEEDED)
1. What cell is responsible for immune response? (1)			
2. Define a pathogen (1)			
3. What is an antigen? (2)			
4. What is an antibody? (1)			
5. What is a monoclonal antibody? (1)			
6. State and explain the 3 ways this cell response to pathogens (6)			
7. How do vaccines work? (3)			
8. State the 3 main stages of drug testing? (3)			
9. What is a placebo and why is it used? (2)			
10. What hormone is detected in positive pregnancy tests? (1)			
TOTAL			**/ 21**

Disease and Immunology Building Knowledge

Disease

Pathogens are microorganism that can cause diseases. **Infectious diseases** can be passed on from person to person, for example TB, malaria, HIV.
Some diseases can be caused by **genetic defects** known as **mutations** in a person's genes, example includes cystic fibrosis.
Lifestyle choices can also **increase the risk** of getting certain diseases, for example smoking increases the chances of obtaining lung cancer.

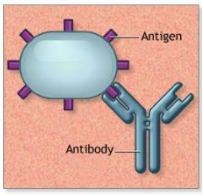
Risk factors are things that **increase the chances** of something negative taking place, although they don't always lead to a disease. Some risk factors are unavoidable because they are inherited, however some are associated with lifestyle choices and hence avoidable.

Risk factor	Diseases
Smoking	Mouth, lung and throat cancer, emphysema and other lung diseases, cardiovascular disease
Drinking too much alcohol	Mouth, stomach, liver and breast cancer, possibly many other cancers, cardiovascular disease
High blood pressure	Cardiovascular disease, diabetes
Overweight/obese	Various cancers, cardiovascular disease, diabetes
Unbalanced diet	Various cancers, cardiovascular disease, diabetes
Using sun beds too much	Skin cancer

Immunity

Phagocytes are a type of white blood cells that **engulf** pathogens carrying foreign antigens and destroying them.

Antigens are molecules on the surface of a pathogen that marks it as foreign to the body. All cells including human cells contain antigens on their surfaces.



There are different types of white blood cells. **B-cells** also known as **B-lymphocytes** are white blood cells that **produce antibodies** that bind to antigens. An antibody binding to the antigen brings about the death of the pathogen carrying it.

T-cells or **T-lymphocytes** are white blood cells that communicate between phagocytes and B-cells. When a phagocyte engulfs a pathogen, it signals to the T-cells that a foreign object has been found. The T-cell then **activates** the B-cells to produce antibodies.

Vaccinations
If your **vaccinated** against a pathogen, you have **immunity** against it. This means that you can no longer get that disease. Vaccines **contain antigens** from inactivated or dead pathogens.
You body then produces **antibodies** against the antigens so If the same pathogen tries to enter or invade, the immune system can **respond rapidly** preventing you from getting the **symptoms**.
Vaccines don't stop the pathogen from entering the body, however they **get rid of it** very quickly once it does enter.

Questions:

1 Give an example of an infectious disease.

_____

2 What is a risk factor?

_____

3 List two diseases that obesity is a risk factor for.

_____

4 What do phagocytes detect?

_____

5 What kind of white blood cells produce antibodies?

_____

6 What is the role of T-cells?

_____

7 What do vaccines contain?

_____