TOPIC 2 ORGANISATION

*red writing is for definitions

Cell organisation

If you look at multicellular organisms for instance humans, there is a system as to how all the cells function together to create an organism
Cells will become specialised for a certain function
They will gather to form TISSUE, in humans, there are 3 types of tissue you need to know about

- MUSCULAR TISSUE, which contracts to move whatever it has attached itself to
- GLANDULAR TISSUE, which makes and secretes chemicals such as hormones
- EPITHELIAL TISSUE, it works by covering parts of the body, for example, the inside of the gut

The tissue then forms to make organs
In the stomach, the different tissues give the organ its functions

- the muscular tissue will aid is the churning up of digested food,
- the glandular tissue will proceed to secrete enzymes to hydrolyse and digest the food
- the epithelial muscle is the outside and inside lining of the stomach

An organ system is now in place
Now looking at the digestive system, each organ has its own particular functions
In a human, there are multiple systems, not just the digestive one. They are there for exchanging and transporting important materials around the body.

Enzymes

The definition of an enzyme
it's a protein which acts as a biological catalyst- meaning it speeds up the digestion of specific foods without being used up. Proteins, carbohydrates and fats because these molecules are too large to pass through the walls of the digestive system

You must know what these enzymes are called, what they break down and the products created, also where the enzyme works in the body

- PROTEASE
  This is an enzyme that catalyses the break down of proteins into amino acids
  This enzyme is produced in the stomach, small intestine and pancreas but only works in the stomach and intestine
- LIPASE
  This is an enzyme which breaks down fats into fatty acids and sugar called glycerol, the enzyme is secreted from the pancreas and small intestine but only works in the small intestine
- AMYLASE

This is an enzyme which breaks down starch into maltose (a sugar). The enzyme was secreted by salivary glands, pancreas and small intestine but only works in the salivary glands and small intestine

BILE

- Bile IS NOT an enzyme however it aids lipase in breaking down fats by EMULSIFYING them into fat droplets which increases its surface area and allows lipase to fully break down fats at a faster rate
- Its produced in the liver but stored in the gall bladder
- Neutralises the stomach acid providing alkaline conditions

For enzymes to work they must be in their optimum PH and temperature or else the enzyme would not function.
If the temperature is too hot, bonds in the enzyme will not hold which changes the active site of it so the substrate can't fit anymore, the enzyme is now denatured.
Optimum PH varies depending on where the enzyme is working, it's mostly PH 7 but enzymes working in the stomach work best at PH 2 which is acidic conditions.
Too high or too low of a PH for an enzyme can also denature us rendering it useless

The lock and key model / induced fit model
In an enzyme, there is a specific section where the substrate (protein, carbohydrate or lipid) will attach to so it can catalyse a reaction, this is called the active site and the active site is specific to the substrate.
The substrate must have a complementary shape to the enzyme so that it can fit in or else no reaction will take place

Investigating enzymatic reactions

This is the practical investigating the effect of ph on enzyme activity

1. A drop of iodine needs to be put in every well in a spotting tile
2. A bunsen burner is placed on a heatproof mat, a tripod and gauze over the bunsen burner. A beaker of water is on top of the tripod and the water is heated until its 35 degrees Celcius. The temperature must be constant throughout.
3. Using a syringe 1cm3 of buffer solution and 1cm3 of amylase was added to a boiling tube, then 5cm3 of starch is added
4. The contents are immediately mixed and a stopwatch is started
5. To see how long it takes for the enzyme to break the starch down, continuous sampling is used. In 30 second time intervals, using a dropping pipette, a fresh sample is taken from the boiling tube and dropped into the wells.
6. Once the browny-orange colour remains in the iodine instead of becoming blue-black you know the starch is broken down
7. The experiment is repeated with different PH's in the buffer solution
8. Variables like concentration and volume and heat are controlled to make it a fair test

Enzymes and digestion

Digestions start with the salivary glands/mouth

- Your teeth are chewing up the food, making it much easier to swallow and increasing its surface area. As you are chewing, saliva is being secreted from the salivary

glands and the liquid contains the enzyme amylase breaks down the starch in the food to simple sugars

Food is now passing down the oesophagus and it is contracting to push down the food into the stomach, this contracting of the muscles is called peristalsis

Next is the stomach

- The stomach does a lot of things during digestion
- It churns up the food increasing its surface are even more
- Protease (also know as pepsin when in the stomach) breaks down any proteins into amino acids which will later be absorbed into the blood through the small intestine
- There is an also hydrochloric acid with a PH1, this obtains ph conditions for the enzyme and also kills bacteria or microorganisms lingering in the food

The food is to be neutralised by bile after being in the acidic conditions of the stomach

Next is the small intestine

- Digestive juices are added to the food to break it down, lipase is breaking down fats, amylase is acting on any starch left. The villi (finger-like projections) absorb the nutrients into the bloodstream
- Villi are adapted by having a single layer of surface cells to make the diffusion path for digested food smaller, have a large surface area so diffusion increases, they have a really good blood supply provided by a network of capillaries

Large intestine

- Any extra water is absorbed leaving behind waste also known as faeces which will layer be stored in the rectum and released through the anus

Food tests

The food must be made into a paste by grinding with a mortar and pestle, the food is then dissolved in distilled water, filtered then tested

STARCH

You test for starch with iodine solution, if it turns blue/black from an orange colour

GLUCOSE

Add benedicts solution to the food your testing and place that tube in a hot water bath (75 degrees), if it becomes brick red from a light blue colour, glucose is present

PROTEIN

Add biuret solution to your sample, if the solution becomes purple from a blue colour, protein is present

LIPIDS

Add ethanol and distilled water and shake the test tube, if it turns milky white, lipids are present

Or Sudan 3 can be used. Add Sudan 3 to 5cm3 of your food sample and shake. If the mixture separates into 2 layers with the top layer being bright red then lipids are presents

Lungs

Aerobic respiration requires oxygen and produces carbon dioxide as a waste product and that is how the respiratory system comes into place
It begins with
TRACHEA

Air passes from the mouth and into the windpipe, to hold its structure together there are rings of cartilage which are only placed at the front of the tube, not the back because the oesophagus sits right behind it and would prevent it from contracting and pushing food down

BRONCHI
This is where the trachea splits off into 2 tubes called the bronchi
BRONCHIOLES
The bronchi now split off into multiple branches of cartridge tubes
ALVEOLI
These are air sacs attached to the ends giving the lungs its soft texture, they are surrounded by blood capillaries and carry out gas diffusion of oxygen into the blood and carbon dioxide out of the blood.
Diffusion is the movement of gases from an area of high concentration to a low concentration so when the oxygen is diffusing into the body cells, it goes from a high oxygen concentration to a low one

More on the alveoli
These are incredibly important in gas exchange, this is how they are adapted for their function

- Have a large surface area to increase the rate of diffusion of gases
- Good blood supply
- A lot of them which speeds up the diffusion process
- moisture for dissolving gases
- Thin lining / only one cell thick so the diffusion pathway is short

Ventilation
The movement of air in and out the lungs is also controlled by the ribs, diaphragm and intercostal muscle surrounding the lungs
Inhaling is when air enters and exhaling is when the air leaves the lungs

When inhaling …..
The diaphragm contracts and forms a flat shape as it moves downwards
The intercostal muscles contract allowing the ribs to move upwards and outwards
The volume of your lungs/ribcage increases
The pressure inside your chest decreases below atmospheric pressure

When exhaling …..
The diaphragm relaxes and moves upwards to form a dome shape
The intercostal muscles relax letting the ribs move downwards and inwards
The volume of your volume/ ribcage decreases
The pressure increases above atmospheric pressure