AQA BIOLOGY UNIT 2: ORGANISATION

Tissues and Organs

Tissues: cells working together

Animal	Glandular	• Ribosomes – make enzymes and hormones • Vesicles to store enzymes and hormones
	Muscular	• Long, thin cells contracts • Lots of mitochondria for energy
	Epithelial	• Goblet cells make mucus • Cells have cilia
Plant	Mesophyll	• Lots of chloroplasts • Photosynthesis
	Epidermal	• Thin and translucent to allow light through
	Xylem	• Transports water
	Phloem	• Transports sugars

Organs: tissues working together

Stomach: Glandular: Makes enzymes and acid
Epithelial: mucus protects lining
Muscular: contracts, churns food

Enzymes – biological catalyst made from protein in ribosomes

- Enzymes have an active site (shape)
- Active site fits a substrate and breaks it down

enzyme + reactant ↔ enzyme-reactant complex ↔ enzyme + products

Denature: Active site changes
No longer recognises substrate

- **Temperature** – too cold too slow
  - optimum = 37°C
  - too hot = denatures
- **pH** – enzymes only work at specific pH
  - stomach enzymes need pH 1-2 (acid)
  - intestinal enzymes need pH 7-8 (bile)

Digestive Enzymes

Carbohydrase (e.g. amylase)	Large sugars (starch) → Simple sugars (glucose)	Salivary glands, pancreas, Small intestine	pH7-8 37°C
Protease (e.g. pepsin)	Protein → Amino acids	Stomach Pancreas Small intestine	Stomach = pH1-2 37°C
Lipase (e.g. pancreatic lipase)	Fats → Fatty acids and glycerol	Stomach Pancreas Small intestine	pH 7-8 37°C

Commercial Use – speed up reactions, increase yields but need to monitor temperature and pH.

Industry	Function of Enzymes
Diet foods	change glucose into fructose, which is sweeter so less is needed and is used in 'slimming' foods (isomerase).
Baby food	start off digestion of food (proteases and lipases)
Biological detergent	break down stains (proteases and lipases).

REQUIRED PRACTICAL: Food Tests

Type of Food	Name of Test	Positive Result	Negative Result
Starch	Iodine	Blue/Black	Brown
Glucose	Benedict's (must be heated)	Green → Yellow → Brick red	Blue
Protein	Biuret	Lilac	Blue
Lipids	Emulsion	Cloudy precipitate	Clear

Health and Risk Factors

- **Communicable disease:** Any disease transmitted from one person or animal to another, also called contagious disease.
- **Non Communicable disease:** Medical condition or disease that is non-infectious or non-transmissible.

Risk Factors:

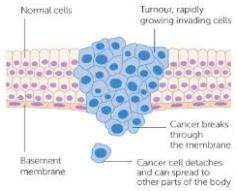
- **Cardiovascular disease:** diet/obesity, age, genetics and exercise.
- **Lung disease:** smoking and cleanliness of the environment.
- **Liver disease:** alcohol, diet/obesity, genetics, drugs and viral infection
- **Type 2 diabetes:** genetics, diet/obesity and exercise

Cancer

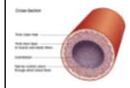
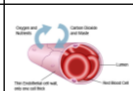
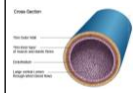
When our cells divide, mutations can occur in the DNA which lead to abnormal cells.

Malignant cancer can spread to other parts of the body. We call this **metastasis**.

A cancer cell can detach from the tumour and be carried by the blood to other parts of the body. The cancer cell can become stuck in a capillary by an organ and then begin growing until it has invaded that organ too.



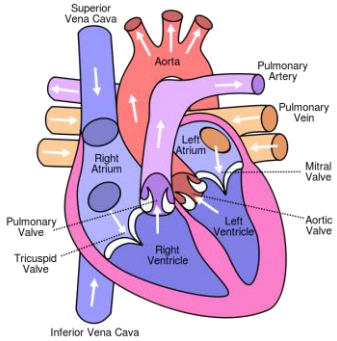
Blood Vessels

Blood Vessel	Diagram	Type of Blood	Pressure	Special Features
Artery		Oxy	High	Thick muscular elastic walls Smaller lumen
Capillary		Both	Med	1 cell thick walls for fast diffusion
Vein		Deoxy	Low	Large lumen Valves to prevent back flow of blood

Blood

- Red Blood Cells – haemoglobin carries oxygen, biconcave disk increases surface area, no nucleus to fit in more haemoglobin.
- White blood cells – fight pathogens
- Plasma – transports dissolved substances
- Platelets – bits of cytoplasm used to form blood clots

The Heart



Double circulation

Right = lungs for gas exchange

Left = Rest of body

Needed because humans are more active and lungs are very delicate so blood can't be at a high pressure but must be to go round the rest of the body.

What could happen if our coronary arteries narrow?

Plaque (fatty deposit) builds on the walls of the blood vessel.

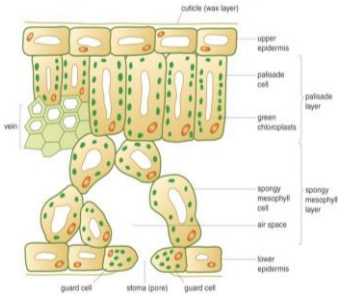
The blood vessel can become blocked or in some cases the blood pressure increases causing some plaque to break away.

The plaque blocks narrower vessels causing blood clots and a lack of oxygen to tissue and organs.

- Lack of oxygen
- Lack of glucose
- For respiration
- No energy for contraction of cardiac muscle
- Heart stops (cardiac arrest)

Plants and Photosynthesis

Roots	• Uptake of water and minerals • Large surface area due to root hair cells • Protein channels for active transport • Meristems – plant stem cells
Stem	• Hold leaves in position • Waxy epidermis to prevent water loss • Xylem – transports water • Phloem – transports sugars
Leaves	• Broad, flat to increase surface area • Contain 4 types of tissue to carry out photosynthesis (see below) • Guard cells close stomata at night to prevent water loss by transpiration • Waxy epidermis to prevent water loss



How is the leaf adapted for efficient photosynthesis?

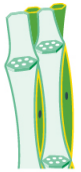
- Sun hits palisade cells at top
- Palisade – lots of chloroplasts
- Spongy mesophyll allows gas movement
- Xylem brings water
- Phloem maintains concentration gradient by removing glucose
- Guard cells open to allow carbon dioxide to diffuse into the leaf.

CHD and Other Heart Defects

Procedure	How they work	Advantages	Disadvantages
Statins	Drugs that lower blood cholesterol levels preventing plaque forming	Cheap Preventative	Can cause side effects
Stents	Insert a balloon and wire mesh to artery. Inflate balloon and leave wire in place	Invasive Minor surgery	Anticoagulant drugs are needed which prevents blood clotting
Bypass Surgery	Piece of vein is grafted from leg to bypass the blocked coronary artery	Permanent solution	Expensive Scars Major surgery
Mechanical Valve Replacement	Synthetic valve used to replace faulty one.	Last longer	Need anticoagulant drugs
Biological Valve Replacement	Animal valve used to replace faulty one	No drugs needed	Only lasts 15 years
Pacemaker	Device used to trigger the heart to beat in its normal rhythm	Keeps heart beating properly	Surgical procedure Can stop working near machinery and electronic devices
Heart Transplant	Donor heart used to replace patient's heart	Permanent solution	Major surgery Rejection Immunosuppressant drugs needed

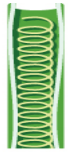
Transpiration and Translocation

Phloem



- Phloem vessels are made of long, thin-walled cells that form tubes.
- Sugars and amino acids dissolved in sap are transported in the phloem by a process called **translocation**.
- The ends of the phloem tubes are called **sieve plates** and they have small holes in them to allow transport in both directions.
- Phloem cells have no nuclei. They have **companion cells** next to them to control them which are filled with mitochondria.

Xylem



- Xylem tubes are made from long cells with thick, reinforced walls made from **lignin**.
- The vessel has a large hollow lumen for water and minerals to flow through in one direction.
- The cell walls are waterproof which makes the cells die which results in wood in trees!

Transpiration Stream

1. Higher concentration of water in soil than in roots
2. Water moves into roots by osmosis
3. Higher concentration of water in roots than in leaves
4. Water moves up the xylem by osmosis to the leaves
5. Water lost through stomata and used for photosynthesis maintains concentration gradient.
6. This causes more water to be drawn in by the roots. This is called the transpiration stream