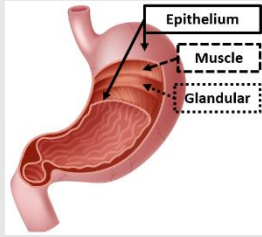


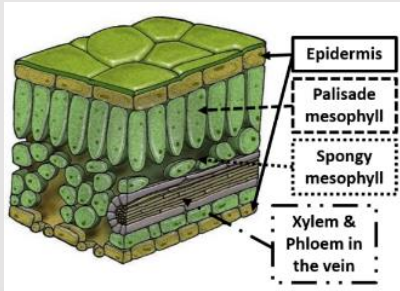
**1. Principles of organisation**

- **Cells:** the basic building blocks of all living organisms.
- **Tissue:** a group of cells with a similar structure and function.
- **Organs:** a collection of tissues performing specific functions.
- Organs are organised into **organ systems**, which work together to form **organisms**.



**Animal Organ Example**

The stomach's function is to make and secrete acid and protease, and to contract to churn and digest the food



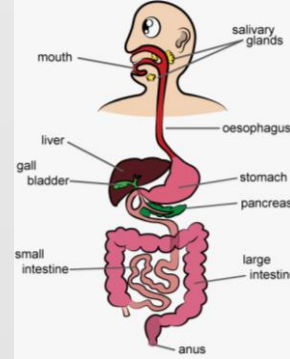
**Plant organ example**

The function of the leaf is to absorb light and exchange gases for photosynthesis

	Tissue name	Adaptation and function
Animal - Stomach	Glandular	Lots of ribosomes make <b>enzymes</b> & acid – for release into the stomach
	Muscle	Long, thin cells <b>contract</b> , lots of mitochondria for energy – churns food
	Epithelium	Flat, covering layer - <b>goblet cells</b> make mucus, cells may have <b>cilia</b>
Plant - Leaf	Palisade mesophyll	Packed close together, lots of chloroplasts - for <b>photosynthesis</b>
	Spongy mesophyll	Air spaces increase the internal surface area - for <b>diffusion</b> of gases
	Epidermis	Thin and translucent covering layer lets light in
	Xylem	Waterproof lignin in walls - transport water
	Phloem	Live cells with end wall holes - transports sugars

**2. Digestive System** – a collection of organs that break down food and absorb nutrients into the bloodstream.

- **Mechanical digestion** – food is broken down by crushing (teeth & stomach)
- **Chemical digestion** – large molecules are broken down to small molecules by enzymes (mouth, stomach & small intestine)



- **Salivary glands** make and release **amylase**
- **Stomach** makes and releases **protease. Hydrochloric acid** kills bacterial cells
- **Pancreas** makes and releases **protease, carbohydrase & lipase**
- **Liver** makes **bile**
- **Gall bladder** stores bile and releases it into small intestine
- **Small intestine** chemical digestion and **absorption** into the bloodstream
- **Large intestine** – absorbs water

**Bile** – an alkali released into the small intestine. Its stored in the gall bladder.

- **Neutralises** acid from the stomach and **emulsifies** fats into smaller droplets.
- This increases the surface area for lipase to work faster.



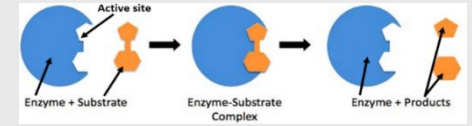
**4. PRACTICAL – QUALITATIVE FOOD TESTS**

- Sugar:** add **Benedict's** (blue) + heat → brick red ✓ sugar
- Starch:** add **Iodine** (brown) → blue-black ✓ starch
- Protein:** add **Biurets** (blue) → purple ✓ protein
- Fat:** add **Ethanol** (clear) + water + shake → cloudy ✓ lipids

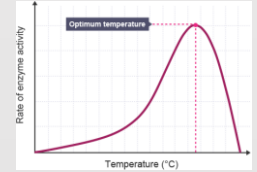
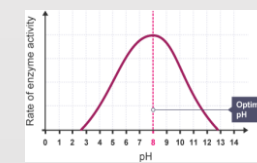


**5. Enzymes** are biological **catalysts** – they speed up reactions.

- They have an **active site** - space for the **substrate** to fit (**lock & key mechanism**).



- They are sensitive to **temperature** and **pH**
- They **denature** (active site loses shape) if too hot or the wrong pH.
- They are used to increase yields, make baby food & detergents



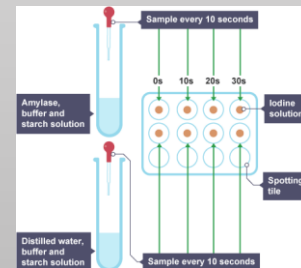
Digestive enzyme	enzyme action	optimal conditions
<b>CARBOHYDRASE</b>	Starch → glucose	pH 7 37°C
<b>PROTEASE</b>	Protein → amino acids	pH 2 37°C
<b>LIPASE</b>	Fats → glycerol & fatty acids	pH 7 37°C

- Products of digestion are used to build new carbohydrates, proteins and lipids.

**6. PRACTICAL – INVESTIGATE THE EFFECT OF PH ON AMYLASE ACTIVITY**

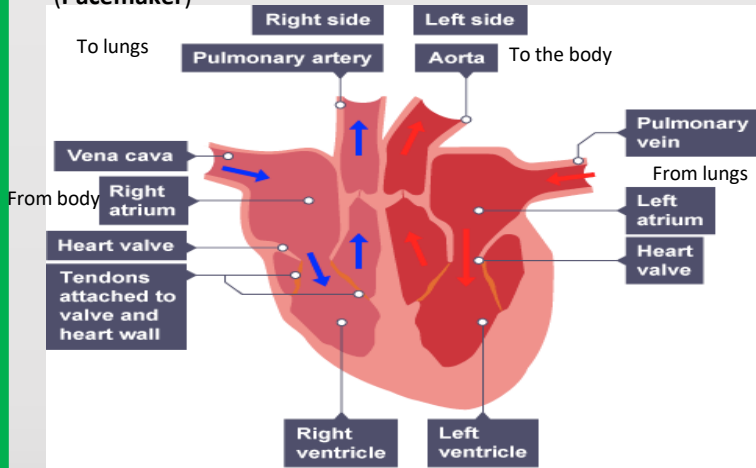
**Buffer solutions** produce a particular pH, and will maintain it if other substances are added.

1. Set up 5 test tubes containing a mixture of starch and amylase at different pHs.
2. Remove a sample from the test tubes every 10 seconds to test for the presence of starch.
3. Iodine will turn blue-black if starch is still present but will remain brown when all the starch is gone or the amylase stops working.
4. A control tube with no amylase must also be tested every 10s to compare the colour changes.



**7. Heart:**

- Made of muscle tissue
- 2 separate halves to keep **oxygenated** (left side) and **deoxygenated** (right side) blood separate
- 4 chambers: **atria** (L&R) at top, **ventricles** (L&R) at bottom
- vena cava** and **pulmonary vein** bring blood to the heart
- aorta** and **pulmonary artery** take blood away
- valves** maintain one-way blood flow (prevent **backflow**)
- heart beat controlled by group of cells in the right atrium (**Pacemaker**)

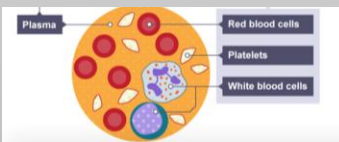


Humans have a **double circulatory system** (heart pumps blood through the heart twice in one circuit).

- The **pulmonary circulation** transports blood to the **lungs** (oxygen diffuses into the blood from the alveoli, the blood becomes oxygenated and carbon dioxide diffuses from the blood into the lungs)
  - The **systemic circulation** transports oxygen and nutrients to the **body** and carbon dioxide and other wastes away from cells
- Artificial pacemakers correct irregularities in the heart rate.

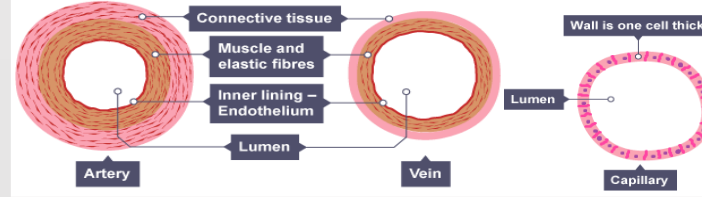
**8. Blood** has 4 components

**Plasma**- Transporting carbon dioxide, digested food, urea and hormones  
**Red blood cells**- Transporting oxygen. No nucleus and **biconcave**  
**White blood cells**- Ingesting pathogens and producing antibodies  
**Platelets**- Involved in blood clotting to form a scab



**9. Blood vessels:**

Artery	Vein	Capillary
Blood carried away from heart, high pressure, thick wall, narrow lumen	Blood carried towards heart, low pressure, thin wall, wide lumen, valves	Tiny vessels, wall 1 cell thick, diffusion happens through the wall, into and out of blood



**10. Coronary Heart Disease: Plaque** (fatty deposit) builds on the walls inside the coronary arteries. Coronary arteries are located on the outside of the heart.

- Blood vessels can get blocked or plaque/clot may break away.
- Vessels narrow causing reduced blood flow = Lack of oxygen & glucose for respiration = no energy for contraction of cardiac muscle = heart stops (cardiac arrest).
  - Risk factors:** poor diet, high cholesterol, smoking, high blood pressure, alcohol.

Procedure	How they work	Advantages	Disadvantages
Statins	Drugs lower blood cholesterol levels	Cheap Preventative	Side effects
Stents	Insert a wire mesh into artery. Inflate balloon and leave wire in place	Minor surgery	Anticoagulant drugs needed
Bypass Surgery	Piece of vein is grafted from leg to bypass blocked coronary artery	Permanent solution	Expensive Scars Major surgery
Mechanical Valves	Synthetic valve used to replace faulty one.	Last longer	Need anticoagulant drugs
Biological Valves	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
Heart Transplant	Donor heart used to replace patient's heart	Permanent solution	Major surgery Rejection

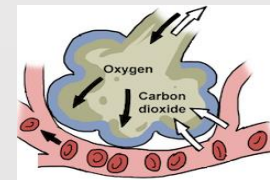
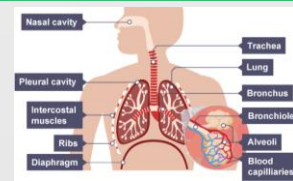
**11. Human respiratory system:**

Adapted for efficient gas exchange.

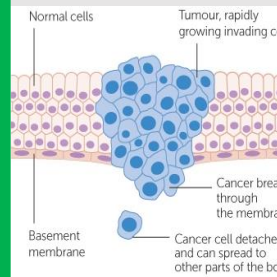
**Alveoli** are the exchange surface in the lungs.

**Alveoli adaptations**

- large surface area to volume ratio
- thin wall
- good blood supply for faster diffusion of O<sub>2</sub> into and CO<sub>2</sub> out of the blood



**Non Communicable diseases:** Not caused by pathogens and can not be spread.



**Cancer:** uncontrollable cell division of abnormal cells caused by DNA mutation.

**Malignant cancer** can spread to other parts of the body through the blood.

**Benign cancer** can not spread and is contained in one area.

**Health state** of physical and mental wellness.

**12. Plant Transport:**

**Translocation** – movement of sugars through the **phloem** from the leaves (made) to roots & flowers (store)



**Transpiration** – movement of water and minerals from the roots to the leaves through the **xylem** where it evaporates through the stomata. The rate of transpiration is increased by: warm temperature, wind, dry air, soil moisture, sunlight



Transpiration can be measured using a **potometer**

As the shoot takes up water the air bubble moves and this can be timed to give a volume of water per min.

