

# START



| Principles of organisation |   |
|----------------------------|---|
| Cells                      | The basic building blocks of all living organisms.      |
| A tissue                   | A group of cells with similar structure and function.   |
| Organs                     | Groups of tissues performing specific functions.        |
| Organ systems              | Groups of organs which work together to form organisms. |

**Bile** is made in the liver and stored in the gall bladder. Bile is not an enzyme but it is an alkaline solution that neutralises hydrochloric acid from the stomach. It also emulsifies fat to form small droplets which increases the surface area. The alkaline conditions and large surface area increase the rate of fat breakdown by lipase in the small intestine.

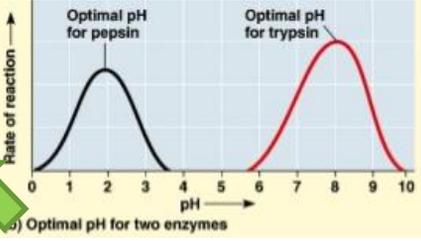
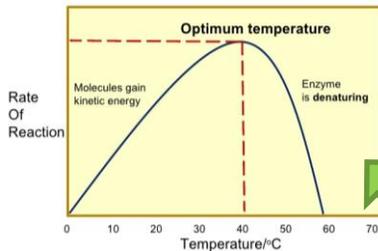
Digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream.

| What needs to be broken down? (substrate) | What enzyme does this? | Where is the enzyme produced?                     | What are the products of digestion? | Where does this type of digestion take place? |
|---|------------------------|---|-------------------------------------|---|
| Starch                                    | Amylase                | •Salivary glands<br>•Small intestine<br>•Pancreas | Maltose and other simple sugars     | •Mouth<br>•Small intestine                    |
| Protein                                   | Protease               | •Stomach<br>•Small intestine<br>•Pancreas         | Amino acids                         | •Stomach<br>•Small intestine                  |
| Lipids (fats)                             | Lipase                 | •Small intestine<br>•Pancreas                     | Fatty acids and glycerol            | •Small intestine                              |

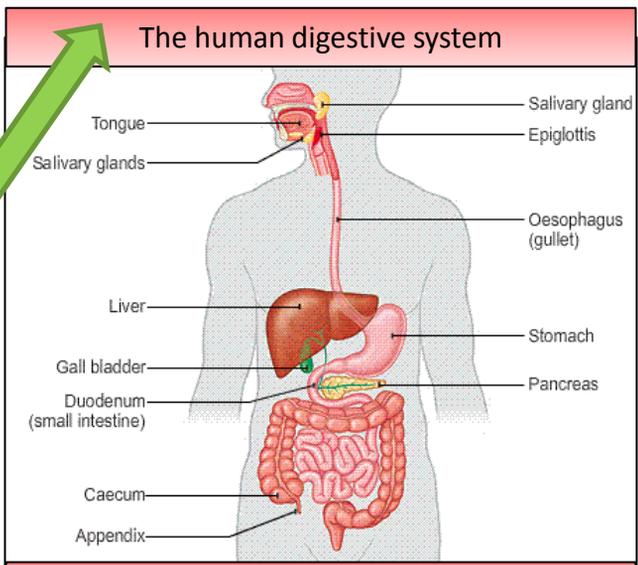
Enzymes are also affected by temperature.

- At lower temperatures the rate of reaction increases as the molecules gain kinetic energy and there are more successful collisions between the enzyme and the substrate.
- In humans the optimum temperature is body temperature (around 40°C).
- Above the optimum temperature the enzyme denatures and the rate of reaction falls.

| Food test   | Food type   | Start - Positive result       |
|-------------|-------------|-------------------------------|
| Iodine      | Starch      | Orange – blue/black           |
| Biuret test | Protein     | Blue – Purple                 |
| Benedicts   | Some sugars | Blue – red or green or orange |
| Fat         | Sudan III   | Red layer                     |



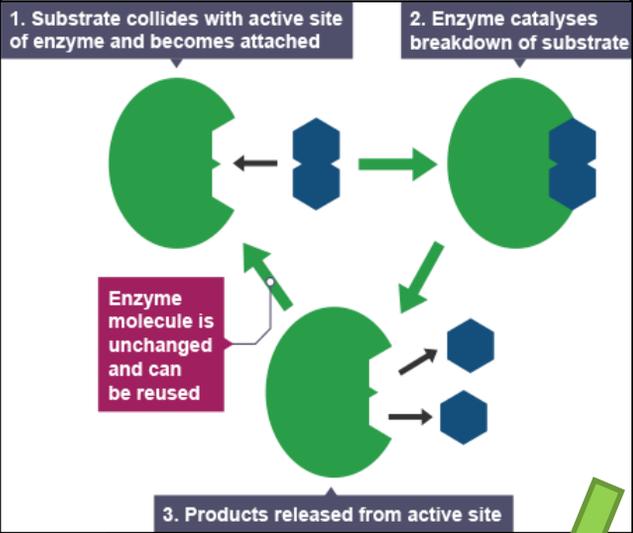
- Each enzyme has an optimal pH
- Most between pH 6-8
- Exception: digestive enzymes
  - those in the stomach work best at pH 2
  - those in the intestine are optimal at pH 8
  - both match their working environments.



An example of an organ system in which several organs work together to digest and absorb food

**Enzymes** are protein molecules which catalyse specific reactions in living organisms due to the shape of their active site.

The lock and key theory is a simple model to explain how enzymes work...



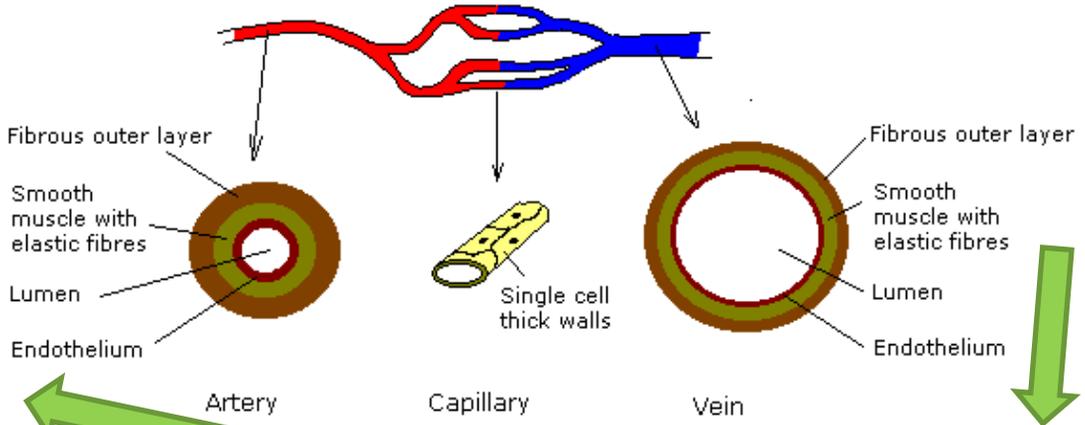
b) Optimal pH for two enzymes

START

| Blood             |   |  |
|-------------------|---|--|
| Part of tissue    | Function  | Structure & Adaptations  |
| Plasma            | Carries everything except oxygen in the blood. E.g. Carbon dioxide, glucose, amino acids, urea, hormones, antibodies, antitoxins. | <ul style="list-style-type: none"> <li>•Pale straw coloured liquid.</li> <li>•Red and white blood cells and platelets travel within this liquid.</li> </ul>  |
| White blood cells | Defend against disease.   | <ul style="list-style-type: none"> <li>•Large blood cells with a nucleus.</li> <li>•Can change shape to engulf microorganisms.</li> <li>•Produce antibodies to fight microorganisms.</li> <li>•Produce antitoxins to neutralise toxins produced by microorganisms.</li> </ul>                                      |
| Red blood cells   | Carry oxygen from the lungs to all the cells in the body.   | <ul style="list-style-type: none"> <li>•Biconcave shape to provide large surface area to absorb oxygen.</li> <li>•No nucleus so they have more space to carry oxygen.</li> <li>•Contain a red pigment called haemoglobin.</li> <li>•Haemoglobin + oxygen <math>\rightleftharpoons</math> oxyhaemoglobin</li> </ul> |
| Platelets         | Help blood clot..   | <ul style="list-style-type: none"> <li>•Small fragments of cells.</li> <li>•No nucleus.</li> <li>•Help blood to clot at a wound site.</li> </ul>   |

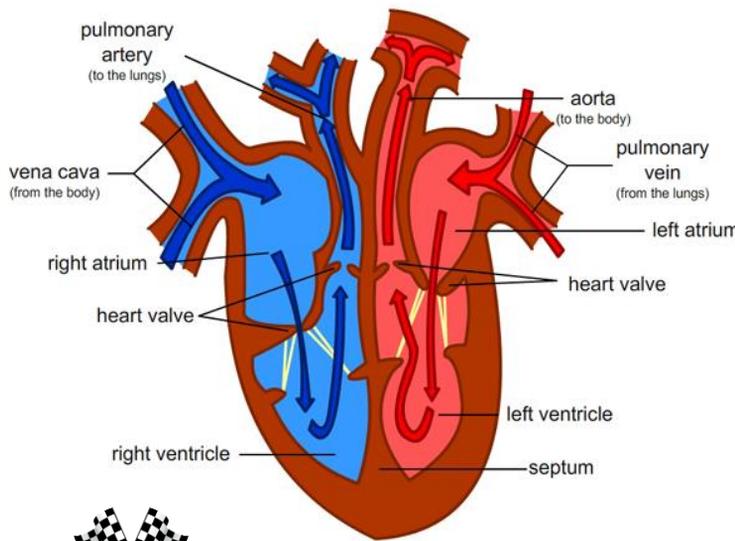
**Coronary heart disease** is when the arteries that supply blood to the muscle of the heart get blocked with fatty deposits. This causes the arteries to become narrow and blood flow is restricted. This decreases oxygen supply to the heart muscle which can result in a heart attack.

**Blood vessels**

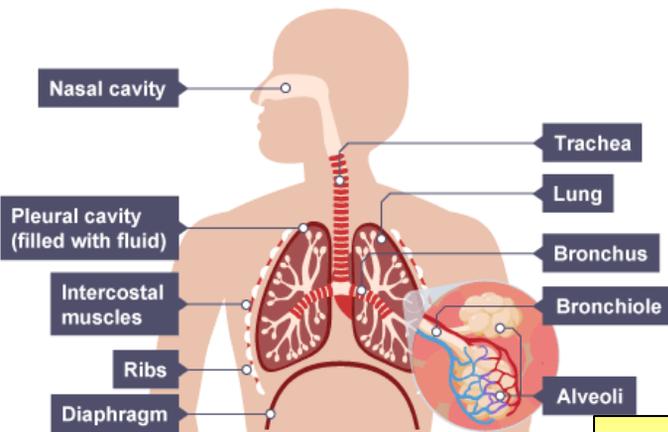


THE HEART is made of muscle which contracts to pump blood around the body.

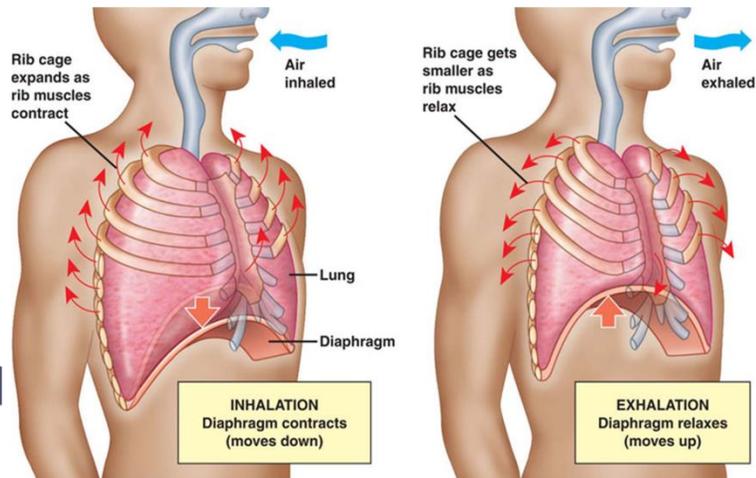
| Treating coronary heart disease |  |
|---------------------------------|--|
| Stents                          | A small mesh tube that's used to treat narrow or weak arteries.  |
| Statins                         | Tablets to reduce the cholesterol levels in blood which then slows down fatty deposits.  |
| Transplants / Artificial Hearts | A donor heart or heart and lungs can be transplanted. An artificial heart can be used to keep patients alive whilst waiting for a transplant or allow the heart to rest. |
| Pacemaker                       | A small metal box put in the chest to regulate heart beats by giving the heart a small electrical signal.  |



THE LUNGS are adapted for gas exchange.



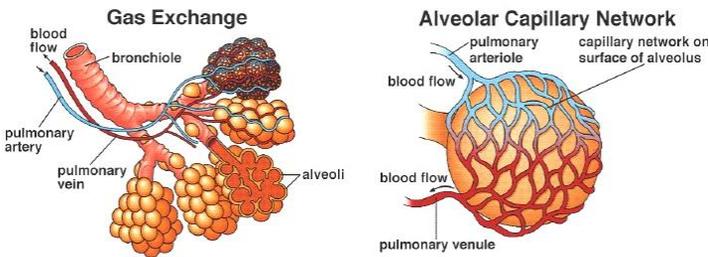
Alveoli are adapted for efficient gas exchange



INHALATION happens because pressure in the chest cavity is reduced.  
EXHALATION happens because pressure in the chest cavity is increased.

Many **alveoli** at the end of the bronchioles

- walls made of **flat cells**; only **one cell thick**
- each alveolus lined with **moisture**
- surrounded by **capillary network** carrying blood



**Health= state of physical and mental well-being.**

Disease, both communicable and **non-communicable** cause ill health.

Factors such as diet, stress, and life situations have an effect on health.

Different types of disease may interact:

- Defects in immune system means someone more likely to suffer from infectious disease.
- Viruses living in cells can trigger some cancer.
- Immune reactions first caused by pathogens can trigger allergies.
- Severe physical ill health can lead to depression and other mental illness.

**Cancer** = uncontrolled cell division and growth.

**Benign tumours** = growth of abnormal cells in one area within membrane – DO NOT SPREAD.

**Malignant** tumour cells are cancer. Invade tissues and spread to different parts of the body and form secondary tumours.

There are genetic and lifestyle factors that increase risk.

Other causal factors (**lifestyle** that cause certain diseases).

**Obesity** linked to Type 2 diabetes

**Alcohol** on liver (liver tissue scarring which do not work as well and liver cancer) and brain (becomes soft and pulpy and can not longer function properly).

**Smoking** on lung disease and cancer: Bronchitis, COPD and lung cancer.

**Smoking and alcohol** during pregnancy. Smoking causes lack of oxygen to foetus (premature births, low birthweight and even stillbirths). Alcohol can cause miscarriage, stillbirth, premature births and low birth weight. Babies can have facial deformities, kidney, liver, heart and learning problems (foetal alcohol syndrome).

# Plants

Roots, stem and leaves form plant organ systems

## PLANT TISSUES

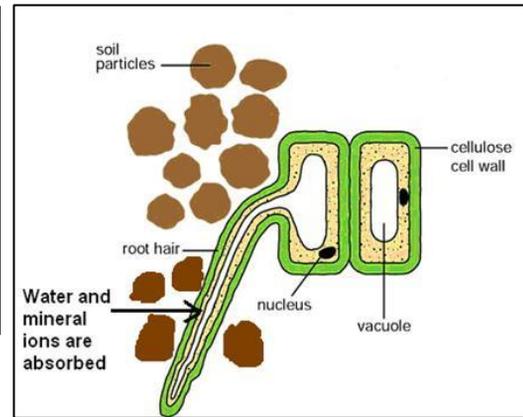
**Epidermis:** covers and protects the leaf.

**Palisade mesophyll:** contains lots of chloroplasts.

**Spongy mesophyll:** a few chloroplasts but has air spaces to increase surface area for diffusion.

**Xylem and phloem:** transport tissues

**Meristem:** growing tips in roots and shoots, made up of rapidly dividing plants cells that grow and differentiate into different types of cells.



**Root hair cells** increase surface area to uptake more water by osmosis and mineral ions by active transport.

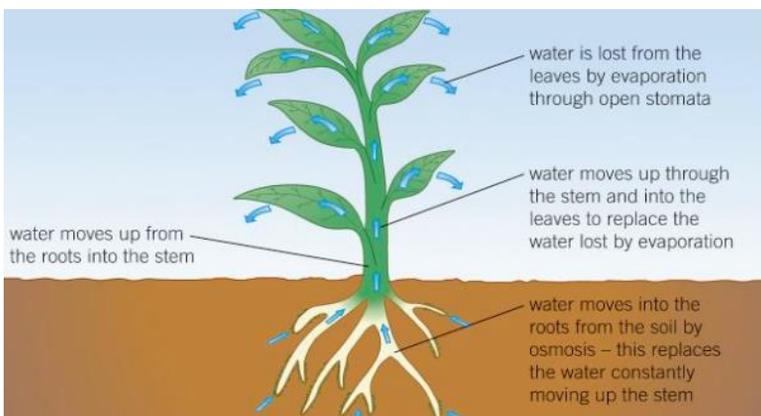
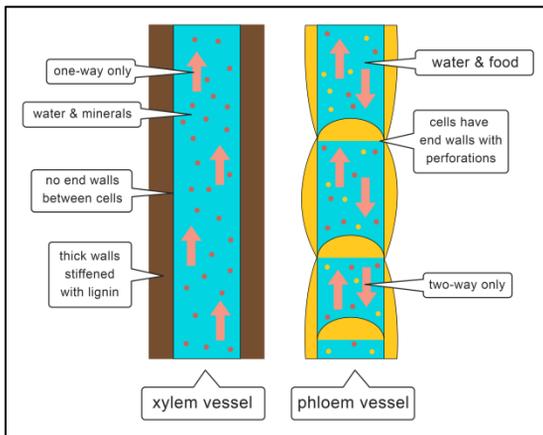
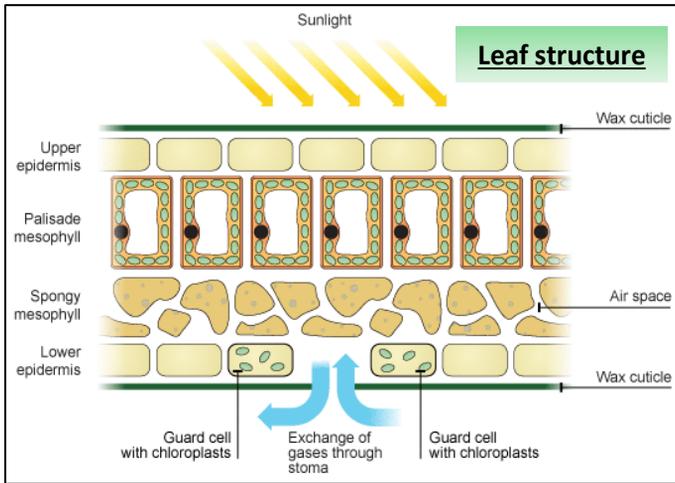
**Xylem tissue** transports water and mineral ions from roots to stems and leaves. Xylem tissue is made of hollow strengthened tubes to transport water in transpiration stream.

**Stomata** in leaves are open and closed by the guard cells to allow water and carbon dioxide to diffuse in and out of the leaf.

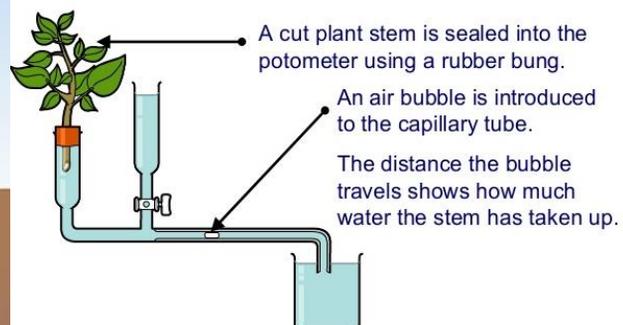
**Phloem tissue** transports sugars (made during photosynthesis from the leaves to the rest of the plant tissues).

**Transpiration** = The loss of water vapour from the leaves.

- Transpiration rate increases in high temperatures as molecules move faster. Photosynthesis is increased and guard cells open stomata.
- High humidity reduces transpiration because there is a lower concentration gradient for osmosis at the stomata.
- High air movement increases transpiration by maintaining a steep concentration gradient.
- Light intensity increases photosynthesis which opens stomata increasing water loss.



Transpiration can be measured using a **potometer**.



## Organisation revision questions

1. Describe the journey of food through the digestive system.
2. What are the role of enzymes in our body? What is this called?
3. How do enzymes speed up the process of digestion
4. What is the name of the model given to explain how enzymes work?
5. Describe how amylase breaks down starch and where it does it.
6. What is the effect of temperature on how enzymes work?
7. Name the four main chambers of the heart.
8. Describe how heart rate is regulated. What can be given to regulate an irregular heart beat?
9. How are arteries and veins adapted to do their job?
10. Give three ways the lungs are adapted to have efficient gas exchange.
11. a. Name the two cells carried in the blood.
12. b. State their job (function)
13. c. How are they adapted to carry out this function?
14. Why is coronary heart disease described as non-communicable?
15. Give three ways coronary heart disease can be treated
16. Describe the advantages and disadvantages of using a stent to improve blood flow to the heart.
17. Give a definition of health.
18. Explain how the following effect the risk of cardiovascular disease: Smoking, Exercise and Diet
19. Name the diseases that the following lifestyle behaviours are CAUSAL factors for (including during pregnancy): Smoking, Alcohol
20. What is cancer?
21. Describe a malignant tumour and it's effect on the body.
22. Look at the graph; what is the relationship between obesity and Type 2 diabetes
23. Explain the role of the palisade and spongy mesophyll layer in the leaf
24. What is translocation?
25. Where does it take place?
26. What is transpiration?
27. What organs in the plant move water from the root to the leaves?
28. How are these organs adapted to do this?
29. How do the following factors affect the rate of transpiration?  
  
High temperatures:  
  
Increased light intensity:  
  
High humidity:  
  
Increased air movement (windy conditions):