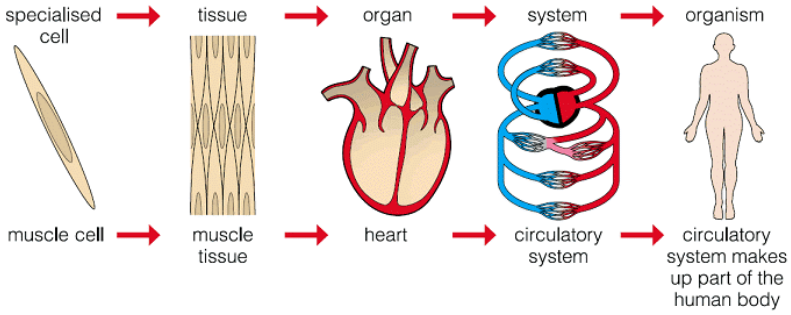
B2 – Organisation

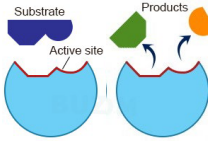
Levels of Organisation

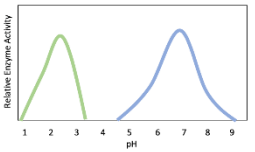
Cells = basic building blocks of all living organisms.
A tissue = group of cells with a similar structure and function.
Organs = aggregations of tissues performing specific functions.
Organ systems = organs organised to form organisms.



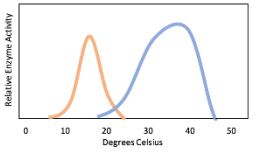
Enzymes

- Biological catalysts
- Digestive enzymes speed up the break down of insoluble food molecules
- Specific shape active site that matches substrate





Enzymes work best at certain temperatures or pH depending on their role.



Bile

The liver makes an **alkaline** solution called bile. Stored by the gall bladder.
Has two jobs:

- Emulsifies fats
- Neutralises stomach acid.

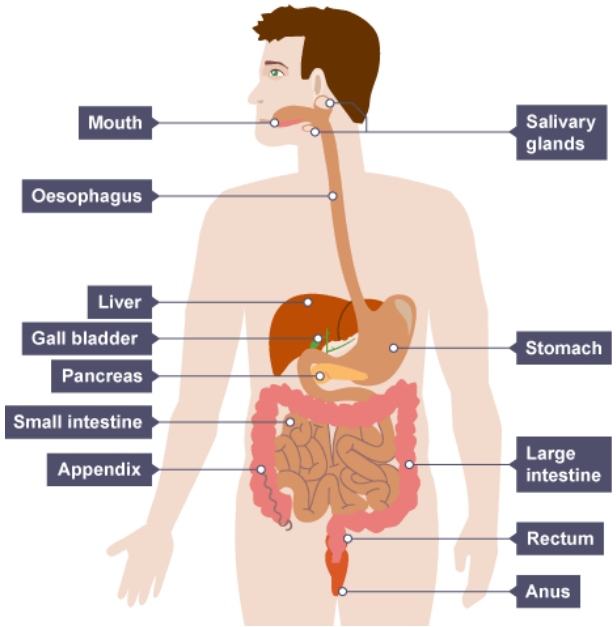
Digestive Enzymes

Starch —(amylase)→ Glucose

Protein —(protease)→ Amino Acids

Fats —(lipase)→ Fatty acids + Glycerol

Digestive System



Organ	Function
Mouth	Teeth and tongue to chew food.
Salivary Glands	Releases saliva containing enzymes.
Oesophagus	Muscle tube to squeeze food along.
Stomach	Contains enzymes and hydrochloric acid. Is made of muscle to churn food. Hydrochloric acid kills bacteria in food
Small Intestine	Where digestion is completed and soluble food particles (glucose, amino acids, fatty acids, glycerol). are absorbed
Large Intestine	Absorbs water.
Liver	Produces bile.
Gall Bladder	Stores bile.
Pancreas	Releases enzymes.

Where are the enzymes?

Enzyme	Salivary glands	Stomach	Pancreas	Small intestine
Amylase	X		X	X
Protease		X	X	X
Lipase			X	X

RP3 – Food Tests

Summaries of the four food tests.

Protein Add Biuret's reagent Positive test; Blue solution turns **Purple**	**Starch** Add Iodine Positive test; solution turns from orange to **Black**
Fats Add Ethanol and water Positive test – solution turns **Cloudy**	**Glucose** Add Benedict's and heat Positive test blue solution turns **Brick red** Water Bath

B2 – Organisation

1. What are group of cells with a similar structure and function?
2. Give an example of an organ.
3. Put these into order, starting with the smallest:
   tissue cell organ system organ

1. What is an enzyme?
2. What is the name of the part of the enzyme that the substrate fits into?
3. Give two factors that affect how enzymes work

1. Where is bile made?
2. Where is bile stored?
3. What are the two jobs of bile?

1. Which enzyme breaks down starch?
2. What are the products of fat digestion?
3. What are proteins made of?

1. Where are the salivary glands found?
2. What is the job of the oesophagus?
3. What is the job of the pancreas (in digestion)?
4. What is the job of the small intestine?
5. What is the function of the hydrochloric acid in the stomach?

1. Where is lipase released from?
2. Which enzyme is released in the stomach?
3. Which enzyme is found in the mouth?

1. Which two chemicals are added to test for fats?
2. What is the colour change when Biuret is added to a food containing protein?
3. Which test needs to be placed in a water bath?

B2 – Organisation

1. What are group of cells with a similar structure and function? tissue
2. Give an example of an organ. Brain / heart
3. Put these into order, starting with the smallest:
   tissue cell organ system organ

   cell tissue organ organ system

1. What is an enzyme? A molecule that speeds up reactions in the body
2. What is the name of the part of the enzyme that the substrate fits into? Active site
3. Give two factors that affect how enzymes work temperature, pH

1. Where is bile made? liver
2. Where is bile stored? Gall bladder
3. What are the two jobs of bile? Neutralise stomach acid, emulsify fats

1. Which enzyme breaks down starch? amylase
2. What are the products of fat digestion? Fatty acids and glycerol
3. What are proteins made of? Amino acids

1. Where are the salivary glands found? mouth
2. What is the job of the oesophagus? Take food from the mouth to the stomach
3. What is the job of the pancreas (in digestion)? Release digestive enzymes into the small intestine
4. What is the job of the small intestine? Digest food and absorb digested particles
5. What is the function of the hydrochloric acid in the stomach? Kill bacteria on food

1. Where is lipase released from? Small intestine and the pancreas
2. Which enzyme is released in the stomach? protease
3. Which enzyme is found in the mouth? amylase

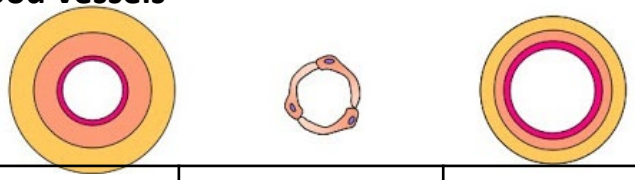
1. Which two chemicals are added to test for fats? Ethanol and water
2. What is the colour change when Biuret is added to a food containing protein? Blue to lilac
3. Which test needs to be placed in a water bath? Test for glucose

B2 – Organisation

The effect of pH on the rate of reaction of amylase

1. Add $2cm^2$ amylase solution, $2cm^2$ of starch solution and $2cm^2$ of pH2 buffer to a water bath (37°) in separate test tubes. Wait 10 minutes.
2. While waiting, add 2 drops of iodine solution to each well on the spotting tile.
3. Once the solutions in the water bath have reached 37° pour the amylase and PH2 buffer into the starch solution.
4. Immediately take a sample with a pipette and add to the first well of the spotting tile.
5. Repeat step 4 every 30 seconds until there is no colour change when testing with iodine solution.
6. Repeat steps 1-5 with pH4, pH6, pH8 and pH10 buffers.

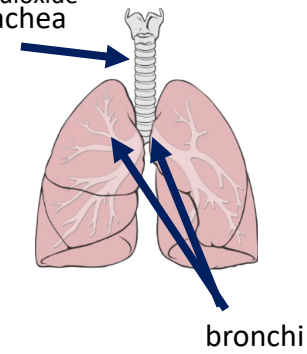
Blood Vessels



Arteries	Capillaries	Veins
• Blood carried away from heart • Thick muscular and elastic walls = withstands high pressure • Small lumen = maintains high pressure	• Walls only one cells thick = shorter diffusion pathway • Lumen just bigger than red blood cell • Blood flows very slowly • Diffusion takes place here	• Blood carried back to heart • Thin walls as blood is low pressure • Large lumen – lower resistance for blood passing through • Valves prevent back flow

Respiratory System

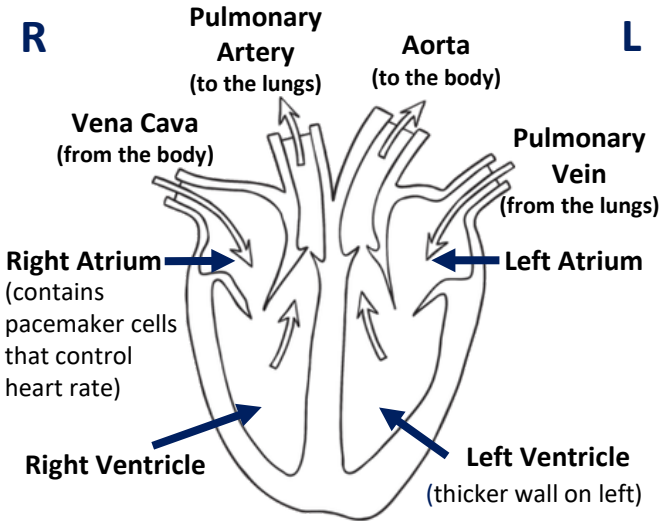
The lungs have two jobs – to get oxygen into the blood and remove carbon dioxide



Structures that cannot been seen on this diagram are the **alveoli and capillary network** – see 'unit 1 - diffusion'.

The Human Heart

Double pump because - left side pumps to whole body, right side pumps to the lungs.



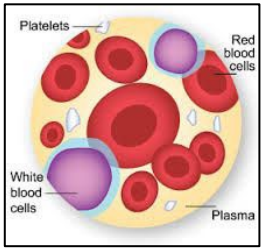
Blood – 4 components

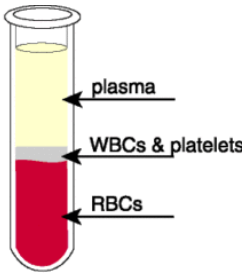
Red blood cells – contain haemoglobin to carry oxygen. More detail…

White blood cells – fight pathogens (see unit 3 – infection and response).

Platelets – cell fragments that clot blood.

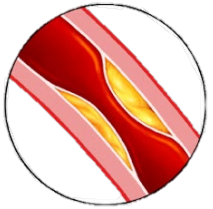
Plasma – liquid part that transports cells, cell fragments and dissolved substances (salts, urea, CO_2, hormones…)





Coronary Heart Disease (CHD)

- Coronary arteries supply heart muscle with blood (containing glucose and oxygen for respiration)
- Can become narrowed/blocked by fatty deposits if cholesterol high, reducing blood flow.
- Reduced muscle contraction in heart as cells don't get enough oxygen



B2 – Organisation

The effect of pH on the rate of reaction of amylase

1. What temperature should the water bath be set at for the affect of pH on amylase practical?
2. What is the name of the chemical used to test for the presence of starch?
3. What is the independent variable in this investigation?

1. Which blood vessels contain valves?
2. Which vessels carry blood under very high pressure?
3. In which blood vessels does diffusion take place?
4. Which blood vessels have thick muscular walls?
5. Which vessels have a wide lumen?

1. What is the name of the tube that connects the throat to the lungs?
2. What is the name of the tubes that enter each lung?
3. What are the two jobs of the lungs?

1. Which blood vessel returns blood to the heart from the lungs?
2. Which blood vessel carries blood away from the heart towards the body?
3. Which ventricle wall is thicker?
4. Where are pacemaker cells found?
5. Why is the heart knowns as a double pump?

1. Name the two types of cells in blood.
2. What are platelets?
3. What do platelets do?
4. Name 3 substances plasma might have dissolved in it?

1. What do coronary arteries do?
2. What can block coronary arteries?
3. What will happen to the heart if they become blocked?

B2 – Organisation

The effect of pH on the rate of reaction of amylase

1. What temperature should the water bath be set at for the affect of pH on amylase practical? 35-40°C
2. What is the name of the chemical used to test for the presence of starch? iodine
3. What is the independent variable in this investigation? pH of the enzyme and solution

1. Which blood vessels contain valves? veins
2. Which vessels carry blood under very high pressure? arteries
3. In which blood vessels does diffusion take place? capillaries
4. Which blood vessels have thick muscular walls? arteries
5. Which vessels have a wide lumen? veins

1. What is the name of the tube that connects the throat to the lungs? trachea
2. What is the name of the tubes that enter each lung? bronchi
3. What are the two jobs of the lungs? Get oxygen into the blood and remove carbon dioxide

1. Which blood vessel returns blood to the heart from the lungs? Pulmonary vein
2. Which blood vessel carries blood away from the heart towards the body? aorta
3. Which ventricle wall is thicker? left
4. Where are pacemaker cells found? Right atrium
5. Why is the heart knowns as a double pump? Because the right side pumps to the lungs and the left side pumps to the body

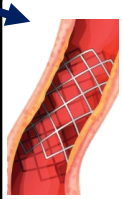
1. Name the two types of cells in blood. White and red blood cells
2. What are platelets? Fragments of cells
3. What do platelets do? Help clot the blood
4. Name 3 substances plasma might have dissolved in it? Hormones, glucose, carbon dioxide

1. What do coronary arteries do? Supply blood to the heart muscle
2. What can block coronary arteries? Fatty deposits
3. What will happen to the heart if they become blocked? It can reduce the blood flow to the heart, meaning respiration is reduced – some cells may die and this can cause a heart attack

B2 – Organisation

Heart Disease Treatment – Statins vs Stents

Statins	Stents
• Medication to be taken everyday • Lowers blood cholesterol • Does not work immediately	• Mesh tube to be inserted into artery to hold it open • Surgery required • Works immediately



Faulty Valves

- Valves in veins and the heart prevent backflow of blood
- Faulty valves = don't open or close fully
- Can be replaced with man-made valves or transplants from donors

faulty

healthy

Cancer

Uncontrolled cell growth

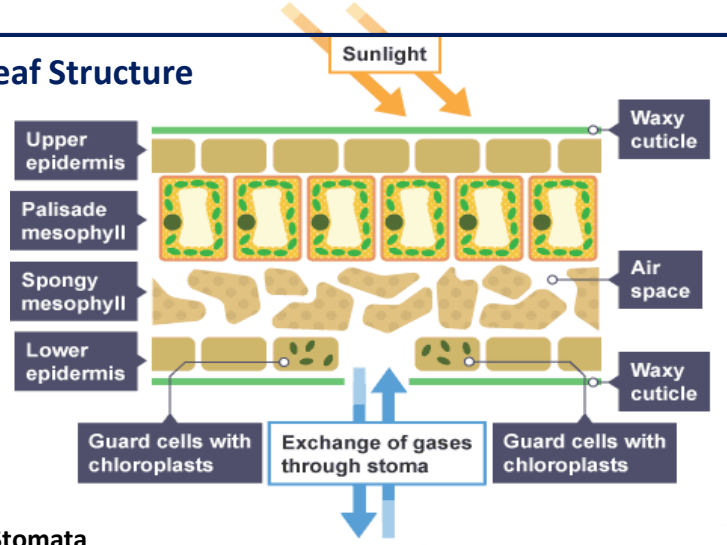
Benign tumours = abnormal cells, contained in one area, in a membrane, do not invade other parts of body.

Malignant tumours = cancer cells, not in a capsule, invade neighbouring tissue, and spread into blood and form secondary tumours.

Risk Factors

Lifestyle factors can have be risk factors for certain diseases. E.g. obesity is a risk factor for type 2 diabetes, or drinking and smoking while pregnant affects the development of the foetus.

Leaf Structure

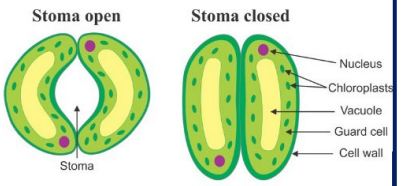


Stomata

Tiny pores on the underside of the leaf.

Allow oxygen and CO_2 to diffuse in and out

Guard cells surround the stomata and can open and close the pore

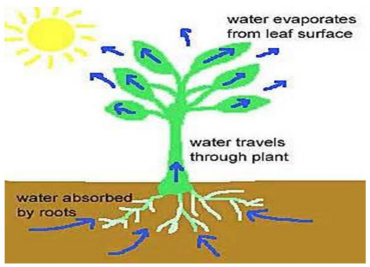


Interaction of Diseases

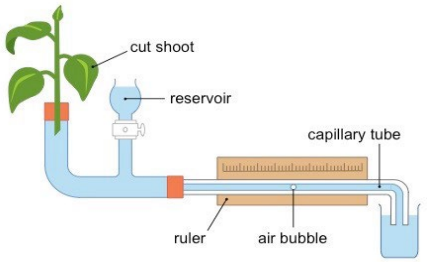
- Defects in the immune system - individual is more likely to suffer from infectious diseases.
- Viruses can trigger cancers, e.g. HPV can trigger cervical cancer.
- Immune reactions caused by pathogens can trigger allergies such as asthma or rashes
- Severe physical ill health can lead to depression and other mental illness.

Transpiration stream

Movement of water through plant from roots to leaves, driven by evaporation through the stomata



Measuring transpiration



Record the distance the bubble of air moves along the scale during set amount of time to calculate volume of water uptake per minute.

Transpiration	Translocation
Movement of water from roots to leaves	Movement of dissolved sugars from leaves all round the plant
Xylem - hollow tubes strengthened by lignin.	Phloem – tubes of elongated cells.
One way system – roots to leaves.	Two way system – sugars taken to wherever they are needed.

Increasing the rate of transpiration

- Higher temperature
- Lower humidity
- Higher light intensity
- Higher air movement

B2 – Organisation

1. How do stents treat CHD?
2. How do statins treat CHD?
3. Give an advantage of using stents rather than statins to treat CHD

1. What is the job of a valve?
2. How can faulty valves be treated?

1. What is a benign tumour?
2. Why do benign tumours not spread?
3. How can malignant tumours spread?
4. Name a disease linked with obesity

1. What are the cells called that surround the stomata?
2. What is the job of the stomata?
3. What the top layer of a leaf called?
4. Which tissue in a leaf has air spaces?
5. Which layer in the leaf contains cells with lots of chloroplasts?

1. Give and example of when cancer can be triggered by a virus.
2. Give an example of an immune reaction that can be triggered by a pathogen

1. What is transpiration?
2. What is translocation?
3. Which tissue carries out translocation?
4. Name 2 conditions that affect the rate of transpiration.
5. Describe how to investigate the rate of transpiration.

B2 – Organisation

1. How do stents treat CHD? They open up blockages, restoring blood flow
2. How do statins treat CHD? They lower cholesterol
3. Give an advantage of using stents rather than statins to treat CHD. Statins need to be taken every day – could be forgotten – and could have side effects

1. What is the job of a valve? Keep blood flowing one way
2. How can faulty valves be treated? Valve transplant

1. What is a benign tumour? One that does not spread
2. Why do benign tumours not spread? It has a capsule around it
3. How can malignant tumours spread? Parts of it can break off and enter the bloodstream
4. Name a disease linked with obesity type 2 diabetes, heart disease, arthritis

1. What are the cells called that surround the stomata? Guard cells
2. What is the job of the stomata? Allow diffusion of gases
3. What the top layer of a leaf called? epidermis
4. Which tissue in a leaf has air spaces? Spongy mesophyll
5. Which layer in the leaf contains cells with lots of chloroplasts? palisade

1. Give and example of when cancer can be triggered by a virus. HPV can cause cervical cancer
2. Give an example of an immune reaction that can be triggered by a pathogen asthma or skin rash

1. What is transpiration? Loss of water through the stomata by evaporation
2. What is translocation? Movement of dissolved glucose around the plant
3. Which tissue carries out translocation? phloem
4. Name 2 conditions that affect the rate of transpiration. Temperature, wind intensity, humidity levels
5. Describe how to investigate the rate of transpiration. Put a plant shoot into a potometer and measure how far the air bubble moves in a certain time