Cellular organisation biology Revision materials

Content will be tested on Biology Paper 1

Checklist

Keypoints:	☺	☹
Organisation		
Name the organs in the digestive system		
Use the 'lock and key' model to explain how enzymes work		
Name the three digestive enzymes, what they act on and what the products are		
Explain why digestion of food is necessary		
Explain the functions of bile and hydrochloric acid in digestion		
Describe the chemical tests for sugar, starch, fat and protein and their positive results		
Label a diagram of the major structures of the heart		
Label a diagram of the major structures of the lungs		
Describe how the heart rate is normally regulated and the use of artificial pacemakers		
Describe the features of arteries, veins and capillaries		
Name and describe the functions of the four components of blood		
Describe the path blood takes around the body and the importance of valves in this		
Describe what 'coronary heart disease' is, describe and evaluate its treatment options		
Describe some of the diseases linked with lifestyle factors		
Describe the causes of cancer and what is meant by 'benign' and 'malignant' tumours		
Name the different plant tissues and describe how they are adapted for their function		
Explain how transpiration happens and describe factors that can affect the rate		
Explain what is meant by 'translocation'		

Sections

4.2.2.1 The human Digestive system

In multicellular organisms, surfaces and organ systems are specialised for exchanging materials. The effectiveness of the exchange surface is increased by:

- Having a large surface area
- A membrane that is thin, to provide a short diffusion path
- (in animals) having an efficient blood supply
- (in animals, for gaseous exchange) being ventilated.

Multicellular organisms: Large multicellular organisms develop systems for exchanging materials.

- During the development of a multicellular organism, cells differentiate so that they can perform different functions.
- A tissue: is a group of cells with similar structure and function.
- Organs : made of tissues.
    - One organ may contain several tissues.
    - Organ systems: are groups of organs that perform a particular function.

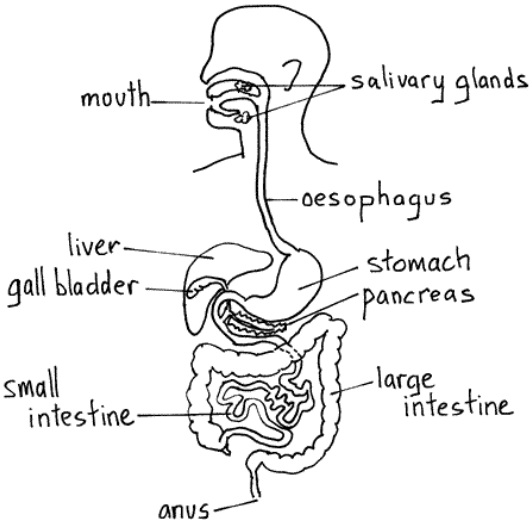
Animal organs:

Examples of animal tissues include:

- muscular tissue: which can contract to bring about movement
- glandular tissue: which can produce substances such as enzymes and hormones
- epithelial tissue: which covers some parts of the body.

The stomach is an organ that contains:

- muscular tissue -> to churn the contents
- glandular tissue -> to produce digestive juices
- epithelial tissue -> to cover the outside and the inside of the stomach.



Remember to link the specialised cells to the cellular organelles which are found in LARGE amounts to aid in their function:

- *Mitochondria – carries out respiration to release energy*
- *Ribosomes – to make proteins e.g. hormones, enzymes*

Functions of organs in the digestive system:

Organ	Function
Stomach	Where food is initially digested, food is mixed with acid and digestive juices
Pancreas	Make and release digestive juices that contain enzymes to break down food
Small intestine	Food is digested and soluble food molecules is absorbed into the blood system
Liver	Produces bile to support the digestion of lipids.
Gall bladder	Where bile is stored
Large intestine	Absorption of water

Digestion and absorption in the small intestine

The small intestine has 2 main jobs:

1) To complete the digestion of the food
2) To absorb the soluble products of digestion into the blood

When food leaves the stomach and enters the small intestine Pancreatic juice and Intestinal juice are. Both are released into the small intestine and contain 3 main enzymes:

Enzyme	Function of the enzyme:	Where is the enzyme made?
Amylase:	to complete the digestion of starch into glucose.	Salivary glands, pancreas, small intestine
Protease:	to complete the digestion of proteins into amino acids.	Stomach, pancreas, small intestine
Lipase:	to break down fats into fatty acids and glycerol.	pancreas, small intestine

Bile is produced in the liver and is released into the small intestine. Digestion of lipids takes place in the small intestine. Bile helps the digestion of lipid. It emulsifies fats it breaks the lipids into small droplets that are easier for the lipase enzymes to work on. It also neutralises the hydrochloric acid which provides alkaline conditions for lipases to breakdown lipids.

The three food groups / biological macromolecules below can be digested in the digestive system.

Carbohydrates	***Protein***	***Lipids (Fat and oils)***
Needed for energy	For growth and repair	For energy and insulation
Carbohydrates contain the elements carbon, hydrogen and oxygen - Carbohydrates are made of sugars (glucose) - Glucose is soluble in water	Protein contains the element nitrogen, carbon, hydrogen and oxygen. - Proteins are made of amino acids - Proteins are soluble in water	Fats contain carbon, hydrogen and oxygen - Fats are made of three fatty acids and one glycerol - Fats are insoluble in water

Food tests: Carry out the food tests to see if food has these molecules inside.

Test	***What do you do?***	***What is the result?***
Test for Sugars	Add Benedict's reagent	Orange-red colour
Test for protein	Add biuret reagent	colour turns from blue to purple
Test for starch	Add iodine	colour changes from brown to black/blue
Test for Lipids (fats and oils)	Add water and ethanol, shake the test tube.	Solution turns milky white.

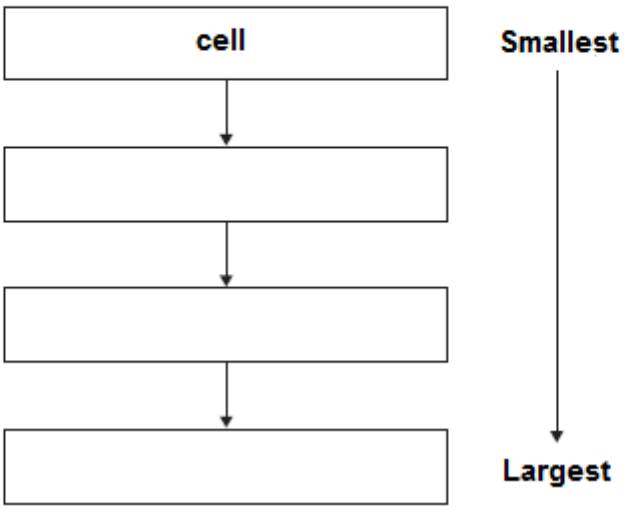
Q1. The human body is organised to carry out many different functions.

(a) Use words from the box to complete **Figure 1** by putting the parts of the body in order of size from smallest to largest.

The smallest one has been done for you.

cell	organ system	organ	tissue

Figure 1



(2)

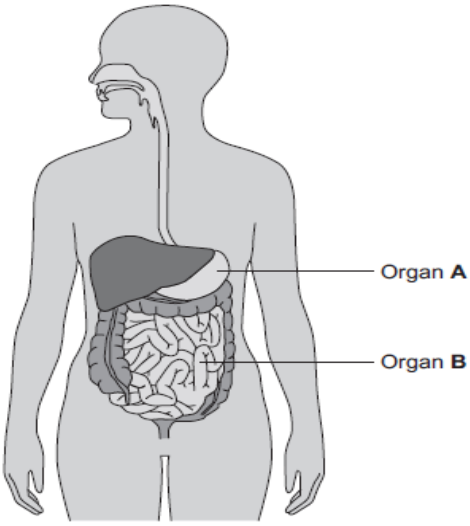
(b) The stomach is made of different types of tissue.

Draw **one** line from each type of stomach tissue to the correct description.

Epithelial tissue	Allows food to be churned around the stomach
Glandular tissue	Covers the outside and the inside of the stomach
Muscular tissue	Produces digestive juices
	Coordinates nerve impulses

(3)

Q2. The diagram below shows the human digestive system.



(a) (i) What is Organ **A**?

Draw a ring around the correct answer.

gall bladder **liver** **stomach**

(1)

(ii) What is Organ **B**?

Draw a ring around the correct answer.

large intestine **pancreas** **small intestine**

(1)

(b) Digestive enzymes are made by different organs in the digestive system.

Complete the table below putting a tick (✓) or cross (✕) in the boxes.

The first row has been done for you.

		Organ producing enzyme			
		salivary glands	**stomach**	**pancreas**	**small intestine**
Enzyme	**amylase**	✓	✕	✓	✓
	lipase				
	protease				

(2)

(c) The stomach also makes hydrochloric acid.

How does the acid help digestion?

_____

_____

(1)

(d) Draw **one** line from each digestive enzyme to the correct breakdown product.

Digestive enzyme	Breakdown products
Amylase breaks down starch into……	**amino acids.**
Lipase breaks down fats into…	**bases.**
Protease breaks down proteins into…	**fatty acids and glycerol.**
	sugars.

(3)

(Total 8 marks)

Q3. (b) Complete the sentences.

Choose the answers from the box.

catalyse	**denatured**	**digest**	**energise**
excreted	**ingested**	**insoluble**	**soluble**

Digestion is the process of breaking down large food molecules into smaller molecules that are _____ .

Enzymes help to break down food because they _____ chemical reactions.

If the temperature of an enzyme gets too high, the enzyme is _____ .

(3)

(c) Protease is an enzyme.

Protease breaks down protein.

What is protein broken down into?

Tick **one** box.

- Amino acids ☐
- Fatty acids ☐
- Glucose ☐
- Glycerol ☐

(1)

(d) Why is protein needed by the body?

_____

_____

(1)

(e) Which organ in the human digestive system produces protease?

Tick **one** box.

Gall bladder ☐

Large intestine ☐

Liver ☐

Stomach ☐

(1)

(f) Describe how you would test a sample of food to show it contains protein.

Give the reason for any safety precautions you would take.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

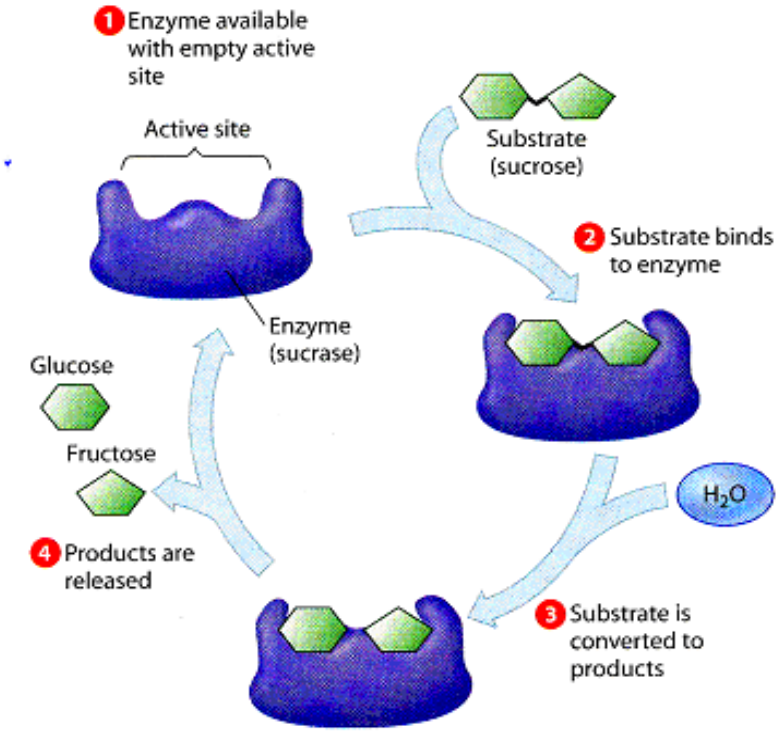
4.2.2.1 The human Digestive system - Enzymes

Enzymes structure and function: Enzymes are **biological catalysts**.

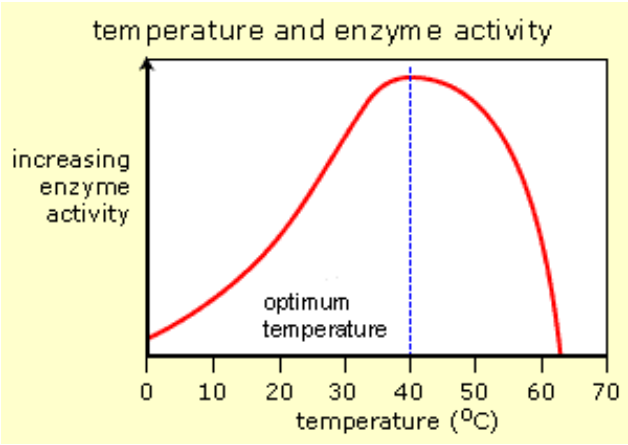
- **Enzymes** are **protein molecules** made up of long chains of amino acids.

Enzymes

- Enzymes are biological **catalysts** – they speed up chemical reactions in living organisms.
- Enzymes have a number of properties:
  - They are all large proteins.
  - There is a space within the protein molecule called the **active site**.
  - Each enzyme catalyses a specific reaction.
  - They work best at a specific temperature and pH called the **optimum**.
- The '**lock and key theory**' is a model used to explain how enzymes work: the chemical that reacts is called the substrate (key) and it fits into the enzyme's active site (lock).



Activation Energy: In order for a chemical reaction to take place, energy is required. This is called the activation energy. Enzymes reduce the activation energy of a reaction.

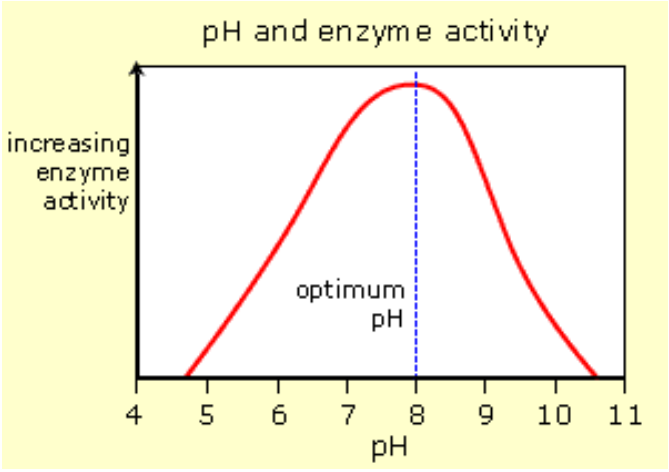


Effect of temperature on enzymes: Like most chemical reactions, the rate of enzyme-controlled reactions increases as the temperature increases.

- The enzyme and substrates move around faster so they collide more often.
- **Optimum**: the temperature when the enzyme is working fastest
  - This is true up to approximately 40˚C, higher than this and the structure of the enzyme changes.
  - As a result, the **active site becomes a different shape** and the substrate no longer fits.
  - It is then described as **denatured**.

The effect of pH on enzymes: pH can also affect the shape of the active site.

- It does this by affecting the forces that hold the enzyme molecule together.
- A change in **pH denatures the enzyme**.
- **Different enzymes** work best at **different pH values.**
  E.g. Stomach enzymes work best in acidic conditions.
- Mouth enzymes work best in neutral conditions.



Required practical 4: investigating the effect of pH on the reaction of enzyme action.

During this practical you should develop:

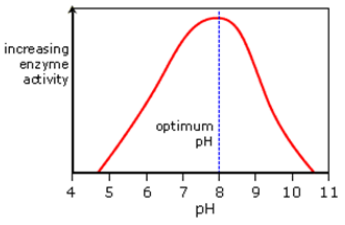
- Understanding of how to complete an investigation that produces valid data.
- Interpret data, use percentages and draw conclusion based on your knowledge and understanding of enzyme function.

GCSE Required Practical – Biology 1 – Investigating amylase enzyme

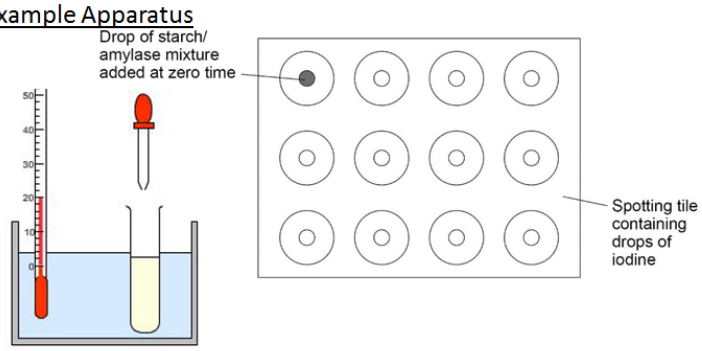
Enzyme: a biological catalyst. Speeds up reactions in the body by lowering the activation energy.
pH: how acidic or alkali a substance is (1 = strong acid, 7=neutral, 14 = strong alkali)
Amylase: an enzyme that breaks down starch into sugar

What's the point of the practical?
To find out what happens to the rate of enzyme activity when the pH changes.

Results
- At low pH and high pH, the iodine keeps turning black because the enzyme has been denatured.
- After just a few minutes at pH 7-9, the iodine stays brown – the starch has all broken down into sugar.



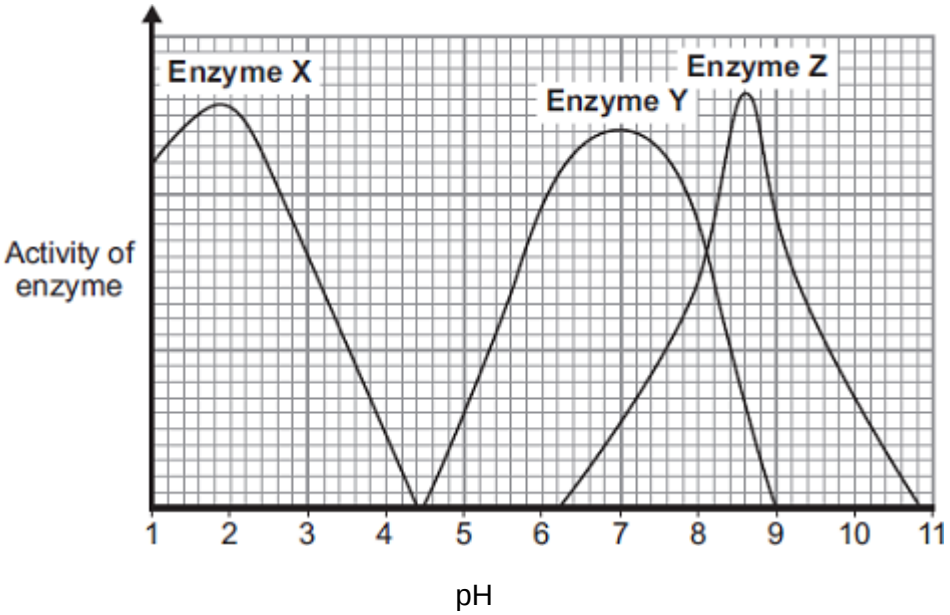
Example Apparatus



- Starch reacts with amylase in a water bath
- Take samples from the mixture every 30 seconds and add it to iodine
- Iodine goes black = starch present
- Iodine stays brown = no starch present (it's reacted)

What may they ask us about?
- Why do you need a water bath? *(To maintain the correct temperature, because temperature affects reaction rate)*
- If you test at pH 3,4,5,6,7,8,9 and 10, Why don't we know the exact optimum pH? *(because although two answers may both show quick reactions (e.g. pH7 and pH8), the actual optimum could be between those number (e.g. pH 7.6) so you need to test different pH's to find out the exact optimum.*
- Sources of error and weaknesses – e.g. in measuring, starting and stopping timers etc

Q1.(a) The graph shows the effect of pH on the activities of three enzymes, **X**, **Y** and **Z**.
These enzymes help to digest food in the human digestive system.
Each enzyme is produced by a different part of the digestive system.



(i) What is the optimum (best) pH for the action of enzyme **Z**?

_____

(1)

(ii) The stomach makes a substance that gives the correct pH for enzyme action in the human stomach.

Name this substance. _____

(1)

(iii) Which enzyme, **X**, **Y** or **Z**, will work best in the human stomach?

_____

(1)

Q2. (b) A student has eaten a steak for dinner. The steak contains protein and fat.

(i) Describe how the **protein** is digested.

_____

_____

_____

_____

_____

_____

(3)

(ii) Explain **two** ways in which bile helps the body to digest **fat**.

_____

_____

_____

_____

_____

_____

(4)

(c) A group of students investigated the action of salivary amylase.
The students:

- collected a sample of salivary amylase
- put a different pH solution and 5 cm^3 of a food substance in each of 6 test tubes
- added 1 cm^3 of salivary amylase to each of the 6 test tubes
- recorded the amylase activity after 10 minutes.

The results are shown in the table.

pH	7	6	5	4	3	2
Amylase activity in arbitrary units	12	10	3	0	0	0

(i) Name the food substance that amylase breaks down.

_____

(1)

(ii) Suggest what happens to the breakdown of this substance when food reaches the stomach.

Use information from the table to help you to answer this question.

_____

_____

_____

_____

_____

_____

(3)

(Total 15 marks)

Q3. Amylase is an enzyme found in the human body.
Amylase breaks down starch into sugars.

(a) Where is amylase produced in the human body?

Tick **one** box.

- Liver and pancreas ☐
- Liver and stomach ☐
- Salivary glands and pancreas ☐
- Salivary glands and stomach ☐

(1)

(b) Enzymes speed up chemical reactions.

Explain how amylase breaks down starch.

_____

_____

_____

_____

_____

(3)

(c) One sugar in the body is glucose.

Glucose is used for respiration.

Give **one** other use for glucose in the body.

_____

(1)

(d) A student investigated the effect of temperature on the activity of human amylase.

This is the method used.

1. Put 2 cm^3 of 1% starch solution into a boiling tube.
2. Put 2 cm^3 of amylase solution into a second boiling tube.
3. Put both boiling tubes into a water bath at 20 °C.
4. After 5 minutes, mix the amylase and the starch together in one boiling tube.
5. After 30 seconds, add a drop of the starch and amylase mixture to a drop of iodine solution in one well of a spotting tile.
6. Repeat step 5 until the iodine solution no longer changes colour.
7. Repeat steps 1 – 6 at 40 °C and at 60 °C and at 80 °C

Why did the student leave the starch and amylase solutions in the water bath for 5 minutes in step **3**?

_____

_____

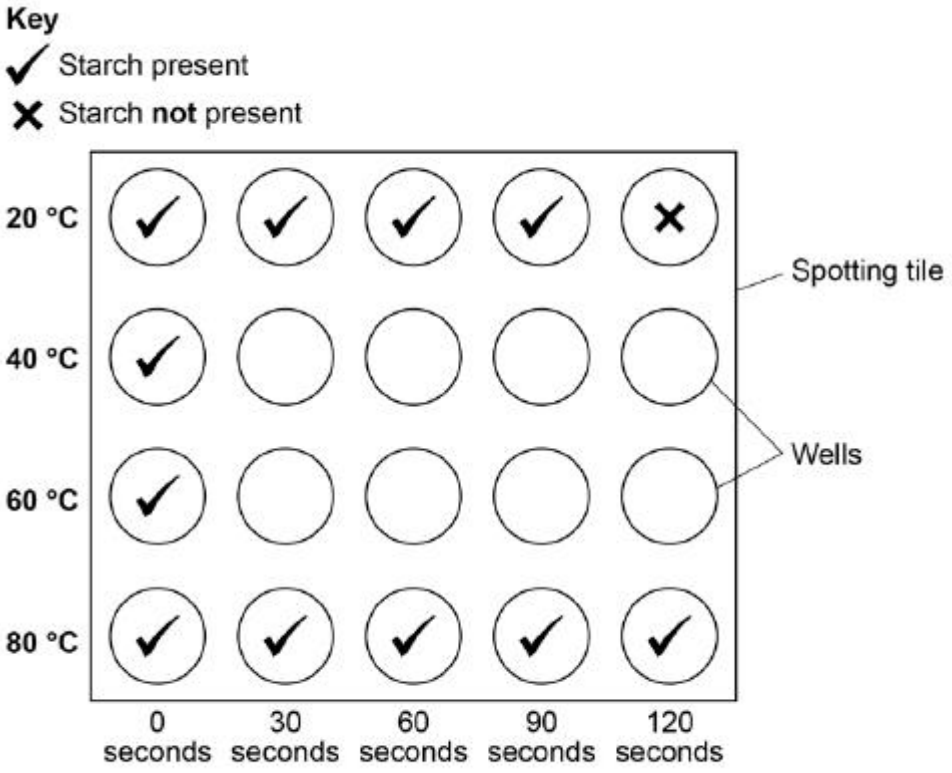
(1)

(e) The temperature of the human body is 37 °C

The diagram below shows the results of the investigation at 20 °C and at 80 °C

Complete the diagram to show the results you would expect at 40 °C and at 60 °C

You should write a tick or a cross in each well of the spotting tile.



(2)

(f) There are different ways to investigate the breakdown of starch by amylase.

One other method is to measure the **concentration** of starch present in the solution every 30 seconds.

Why is this method better than the method the student used?

_____

_____

_____

_____

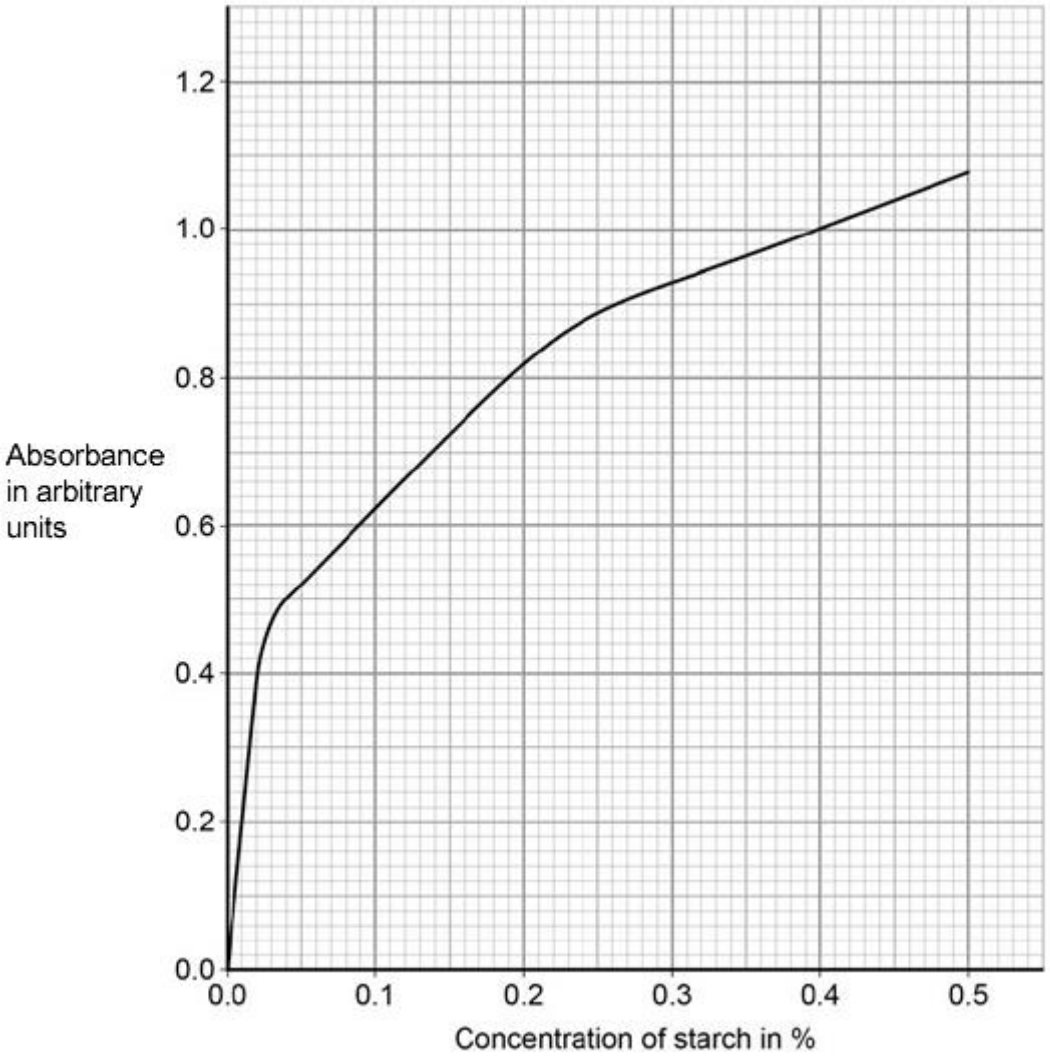
(2)

A colorimeter can be used to measure the concentration of starch present in the solution every 30 seconds.

A colorimeter measures the amount of light that **cannot** pass through a solution.

This is known as absorbance.

Below shows a graph of absorbance against concentration of starch.



(g) The absorbance of the solution at 40 °C was 0.56 arbitrary units after 30 seconds.

What was the concentration of starch in this solution?

_____

Concentration of starch = _____ %

(1)

(h) The concentration of starch in the solution at 20 °C after 1 minute is different from the concentration at 40 °C after 1 minute.

Explain why.

_____

_____

_____

_____

(2)

(i) Predict the absorbance for the solution at 80 °C after 30 seconds.

Give a reason for your answer.

Absorbance = _____ arbitrary units

Reason _____

_____

_____

_____

(3)

(Total 16 marks)

4.1.3.1 Breathing and gas exchange

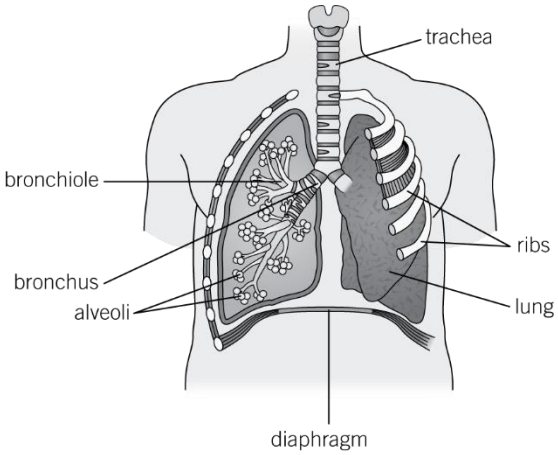
Oxygen and carbon dioxide are transported in and out of cells by diffusion during gas exchange.

Recap:

Factors that affect diffusion are:

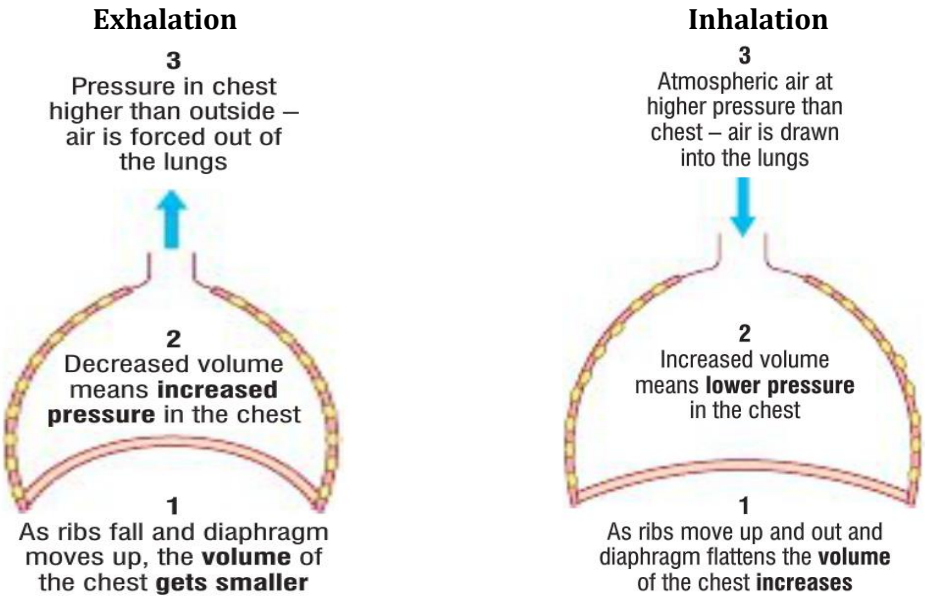
- The difference in concentrations, known as the concentration gradient.
- The temperature
- The surface area of the membrane.

In multicellular organisms (e.g. lungs in mammals), surfaces and organ systems are specialised for exchanging materials. This is to allow sufficient molecules to be transported into and out of cells for the organism's needs.



Air is obtained by breathing reaches the lungs through the trachea, which has rings of cartilage to prevent it collapsing. The trachea divides into two tube – the bronchi. The bronchi divide to form bronchioles. The bronchioles divide until they end in tiny air sacs called alveoli.

Ventilation of the lungs is brought about by the **contractions** and **relaxation** of the **intercostal muscles** between the ribs and the diaphragm, **changing the pressure inside the chest cavity** so air is **forced in or out** of the lungs as a **result of differences in pressure**.



Gas exchange occurs in the alveoli of the lungs.

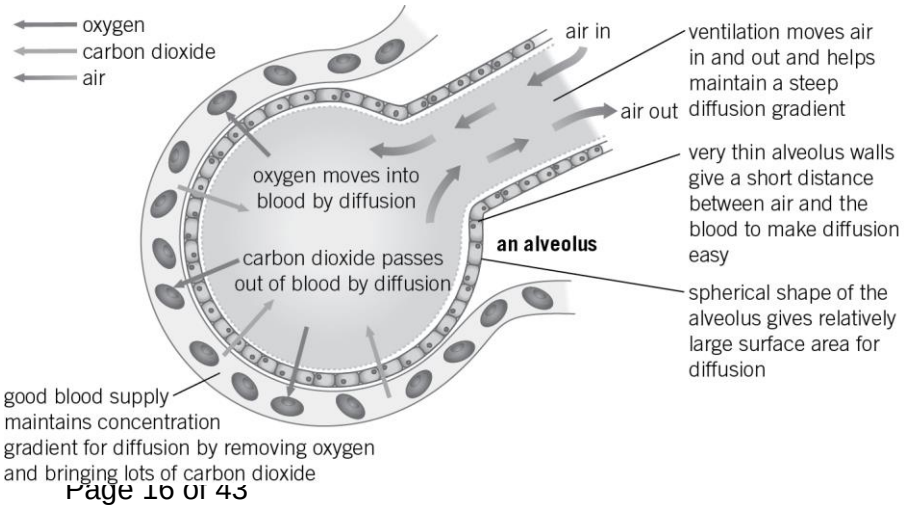
The effectiveness of an exchange surface is increased by:

• having a **large surface area**

• a membrane that is thin, to provide a **short diffusion path**

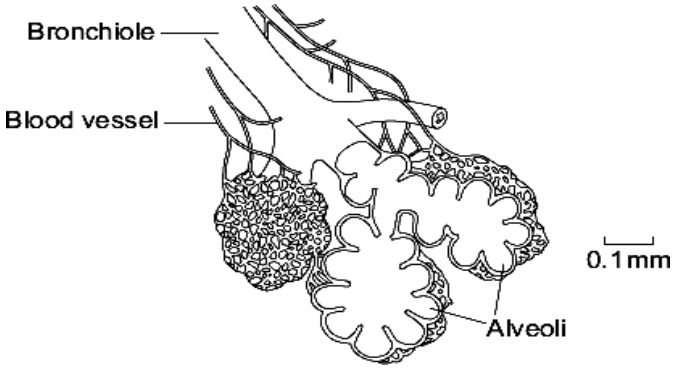
• (in animals) having an **efficient blood supply**

• (in animals, for gaseous exchange) being **ventilated**.



Exam practice 3

Q1. The human lung has about 80 million alveoli. The diagram shows some alveoli in a human lung.



(a) Give **three** features of the alveoli that allow large amounts of oxygen to enter the blood.

1. _____

2. _____

3. _____

(3)

(b) (i) Name the process by which oxygen passes from the air into the blood.

_____

(1)

(ii) Breathing allows large amounts of oxygen to enter the blood.

Explain how breathing does this.

_____

_____

_____

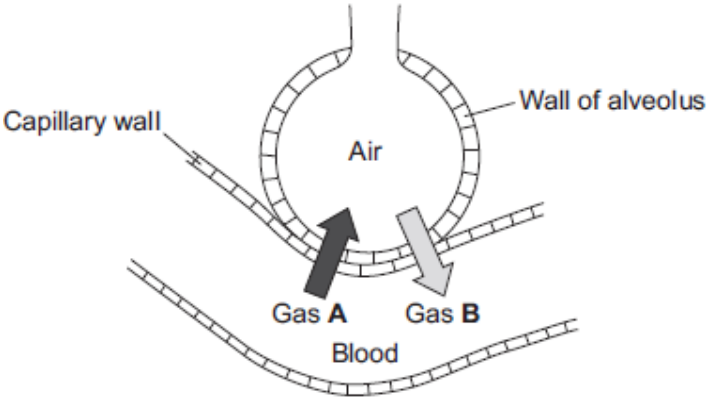
(2)

(Total 6 marks)

Q2. Gas exchange takes place in the lungs.

The diagram shows an alveolus next to a blood capillary in a lung.

The arrows show the movement of two gases, **A** and **B**.



a) (i) Draw a ring around the correct answer to complete the sentence.

Gases **A** and **B** move by

diffusion.
osmosis.
respiration.

(1)

(ii) Gas **A** moves from the blood to the air in the lungs.

Gas **A** is then breathed out.

Name Gas **A**.

_____

(1)

(iii) Which cells in the blood carry Gas **B**?

Draw a ring around the correct answer.

platelets **red blood cells** **white blood cells**

(1)

(b) The average number of alveoli in each human lung is 280 million.

The average surface area of 1 million alveoli is 0.25 m^2.

Calculate the total surface area of a human lung.

_____

Answer _____ m^2

(2)

(c) An athlete trains to run a marathon. The surface area of each of the athlete's lungs has increased to 80 m^2.

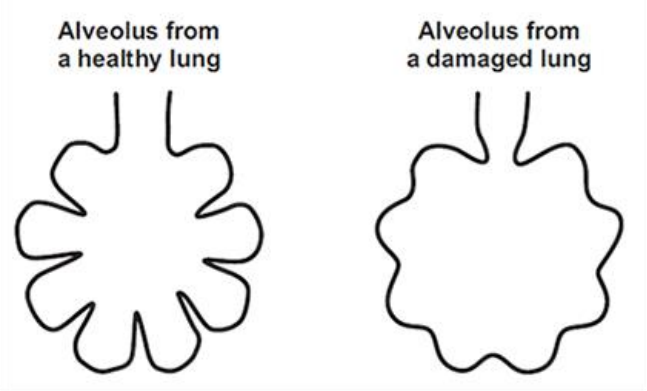
Give **one** way in which this increase will help the athlete.

_____

_____

(1)

Q3. The diagram below shows an alveolus from a healthy lung and an alveolus from a damaged lung.



(a) Which **one** of the following is a difference between the alveolus from the damaged lung and the alveolus from the healthy lung?

Tick (✔) **one** box.

The damaged alveolus has a smaller surface area. ☐

The damaged alveolus has a shorter diffusion pathway. ☐

The damaged alveolus has a better blood supply. ☐

(1)

(b) A person with damaged alveoli finds exercising difficult.
Which **one** of the following is the reason why the damaged alveoli will make exercising difficult?

Tick (✔) **one** box.

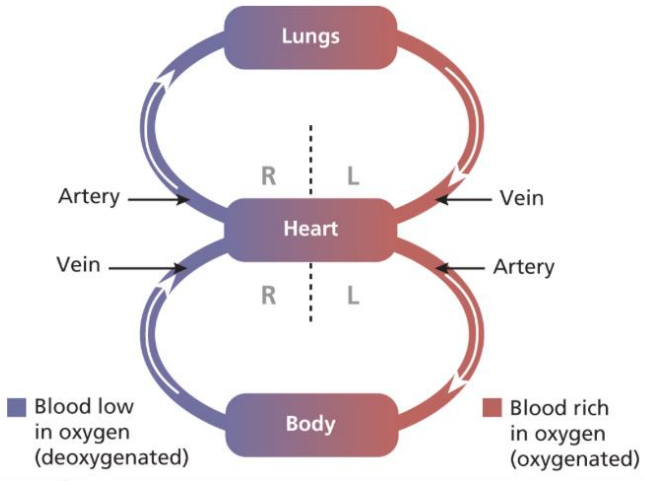
Less carbon dioxide is taken in. ☐

Less energy is needed for exercise. ☐

Less oxygen is taken in. ☐

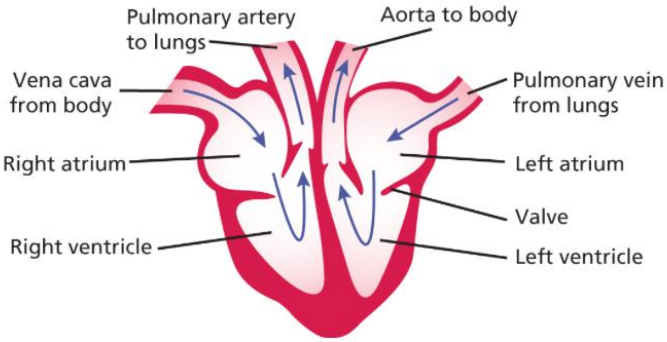
(1)

4.2.2.2 The heart and blood vessels



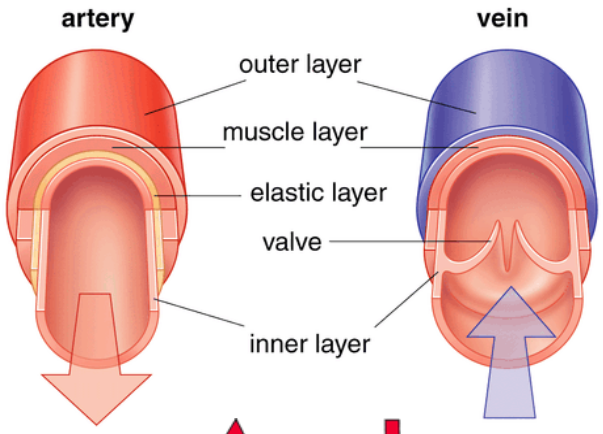
The blood system: The circulatory system transports substances around the body.

- **The heart**: an organ that pumps blood around the body.
- Much of the wall of the heart is made from muscle tissue.
- The muscle contracts to pump blood through the circulation systems.
- It is a double pump: there are two separate circulation systems:
    - One to the lungs
    - One to all the other organs of the body.
- The blood passes through the heart twice in order to pass round both of these circulation systems.
- In one cardiac cycle:
    - Blood enters the atria of the heart.
    - The atria contract and force blood into the ventricles.
    - The ventricles contract and force blood out of the heart.
- Valves: ensure that blood flows in the correct direction.
- Blood flows from the heart to the organs through arteries and returns through veins.
- Blood is pumped to the lungs from the right ventricle through the pulmonary artery.
- The blood returns from the lungs to the left atrium through the pulmonary vein.
- Blood is pumped to the organs of the body from the left ventricle through the aorta.
- Blood returns to the heart from the organs into the right atrium through the vena cava.

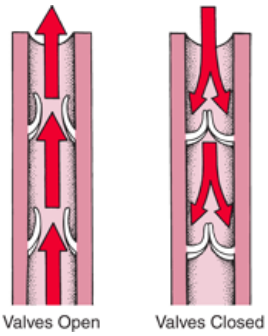


Blood vessels

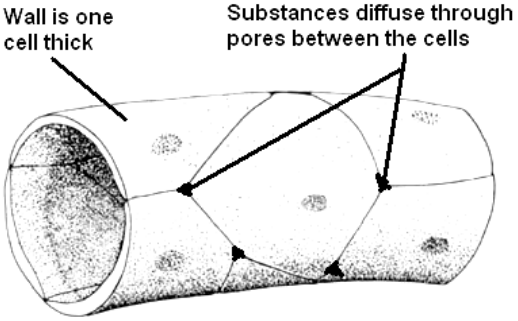
- Blood flows from the heart to the organs through arteries and returns through veins.
- Arteries: have thick walls containing muscle and elastic fibres.
- Veins: have thinner walls.



Veins often have valves to prevent back-flow of blood.



- Capillaries: thin-walled blood vessels in which blood flows through in the organs
- Substances needed by the cells in body tissues pass out of the blood, and substances produced by the cells pass into the blood, through the walls of the capillaries.



Arteries	Capillaries	Veins
Carry blood away from the heart to the organs.	Carry blood away from arteries into organs then back into veins.	Carry blood away from the organs back to the heart.
High blood pressure.	Decreasing blood pressure.	Low blood pressure.
Elastic to withstand high blood pressure.	No elastic tissue – walls one cell thick.	Not elastic.
Muscular walls, to create a pulse, to maintain blood pressure.	No muscle – walls one cell thick.	Very little muscle.
Rarely contain valves.	No valves.	Contain valves to control the direction of blood flow.

Exam practice 4

Q1. The heart is part of the circulatory system.

(a) (i) Name **one** substance transported by the blood in the circulatory system.

_____

(1)

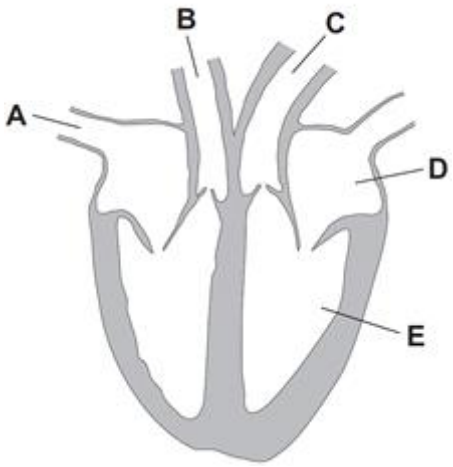
(ii) What is the main type of tissue in the heart wall?

_____

(1)

(b) **Figure 1** shows the human heart.

Figure 1



(i) Which blood vessel, **A**, **B** or **C**, takes blood to the lungs? ☐

(1)

(ii) Name parts **D** and **E** shown in **Figure 1**.

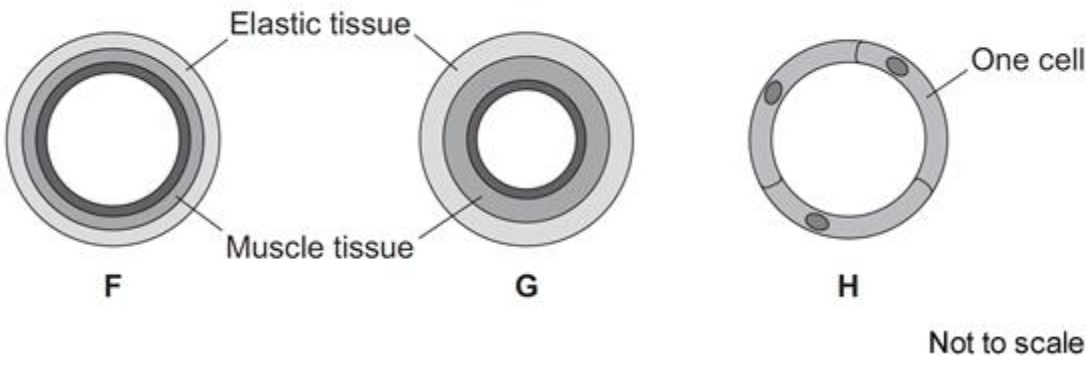
D _____

E _____

(2)

(c) **Figure 2** shows three types of blood vessel, **F**, **G** and **H**.

Figure 2



(i) What type of blood vessel is **F?**

Tick (✔) **one** box.

an artery ☐

a capillary ☐

a vein ☐

(1)

(ii) A man needs to have a stent fitted to prevent a heart attack.

In which type of blood vessel would the stent be placed?

Tick (✔) **one** box.

an artery ☐

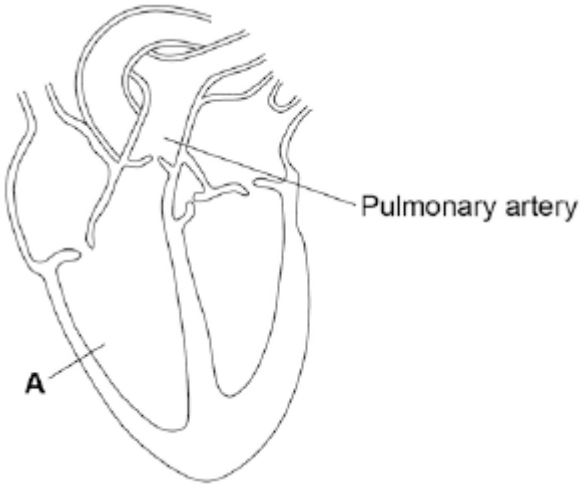
a capillary ☐

a vein ☐

(1)

Q2. **Figure 1** shows a diagram of the human heart.

Figure 1



(a) What part of the heart is labelled **A**?

Tick **one** box.

Aorta ☐

Atrium ☐

Valve ☐

Ventricle ☐

(1)

(b) Where does the pulmonary artery take blood to?

Tick **one** box.

Brain ☐

Liver ☐

Lungs ☐

Stomach ☐

(1)

(c) Circle a valve on **Figure 1**.

(1)

4.2.2.3 blood

Blood: Blood is a tissue. It consists of a fluid called plasma in which **red blood cells, white blood cells, and platelets** are suspended.

Components of Blood:

Plasma: The liquid part of the blood.	Red blood cells: transport oxygen from the lungs to the organs	White blood cells: have a nucleus.	Platelets**:** are small fragments of cells.
• Blood plasma transports Carbon dioxide from the organs to the lungs • **Soluble products** of digestion from the small intestine to other organs: ➢ Glucose ➢ Amino acids ➢ Urea from the liver to the kidneys.	• Red blood cells have **no nucleus**. • They are packed with a red pigment called **haemoglobin** They have a **biconcave** shape. • This increases their surface area to increase rate of diffusion across the cell membrane.	• They form part of the bodys defence system against disease causing microorganisms (pathogens) • Some produce antibodies which help to destroy pathogens. • Some engulf and digest pathogens.	• They have **no nucleus**. • Platelets help **blood to clot** at the site of a wound.

Exam practice 5

Q1. This question is about the circulatory system.

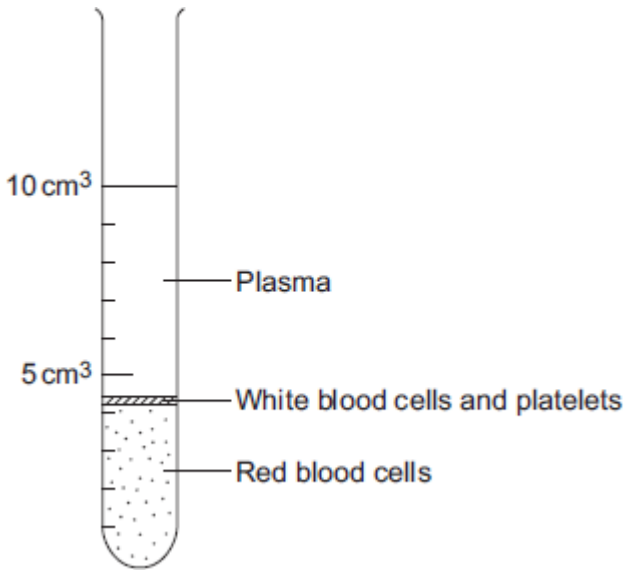
(a) Draw **one** line from each blood component to its function.

Blood Component	Function
	Destroys microorganisms
Platelet	Helps the blood to clot
Red blood cell	Transports glucose around the body
White blood cell	Transports oxygen around the body
	Transports urea

(3)

Q2. The parts of the blood can be separated from each other by spinning the blood in a centrifuge.

The image below shows the separated parts of a 10 cm^3 blood sample.



(a) Calculate the percentage of the blood that is made up of plasma.

_____

_____

Answer = _____ %

(2)

(b) Name **three** chemical substances transported by the plasma.

1. _____

2. _____

3. _____

(3)

Q3. The circulatory system is composed of the blood, blood vessels and the heart.

(a) Urea is transported in the blood plasma.

Name **two** other substances transported in the blood plasma.

1. _____

2. _____

(2)

(b) Some athletes train at high altitude.

Training at high altitude increases the number of red blood cells per cm^3 of blood.

Explain why having more red blood cells per cm^3 of blood is an advantage to an athlete.

_____

_____

_____

_____

_____

_____

(3)

4.2.2.4 Coronary heart disease: a non communicable disease

4.2.2.5 Health issues

4.2.2.6 The effect of lifestyle on some non communicable diseases.

Ways the heart can be damaged

The heart can be influenced by non-communicable diseases.

These could be caused by environmental factors such as a poor diet, high in cholesterol, leading to plaque building up inside arteries and increasing blood pressure.

A higher blood pressure means the heart has to pump harder and faster, causing coronary heart disease.

Heart disease can be genetically linked, meaning it can be passed on from parent to offspring.

A resting heart rate that is too high is referred to as tachycardia.

A resting heart rate that is too low is referred to as bradycardia.

An irregular heartbeat is called atrial fibrillation.

Ways to help the heart:

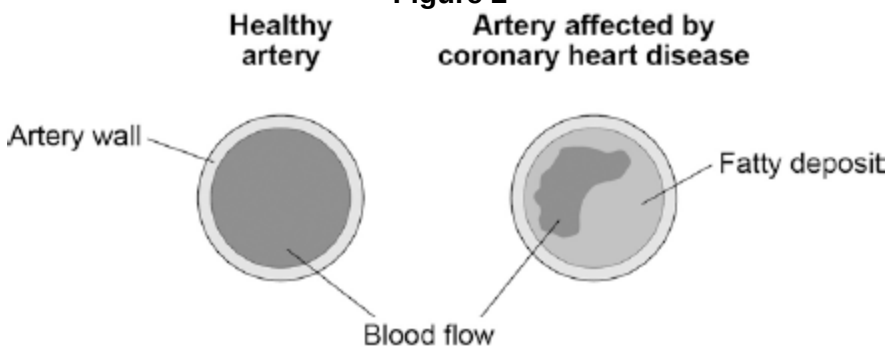
There are a number of ways a disease heart can be treated, you need to demonstrate an understand that each method carry some disadvantages/objections.

Stents:	• Arteries can be widened using a stent, a wire mesh is inserted inside the artery and a balloon is used to expand the mesh, thus expanding the artery. • They are made of metal mesh that does not corrode. • If arteries begin to narrow and restrict blood flow stents are used to keep them open.
pacemaker	• Hearts natural pacemaker is found in the right atrium. If this fails an artificial pacemaker is inserted into a patient in order to stabilise an irregular heart rate.
Statins	• a drug to reduce blood cholesterol levels, slowing plaque formation
Heart valves	• Diseased valves either restrict the flow of blood or the blood leaks backwards. • Mechanical valves can be implanted. • A pigs heart valve can be surgically xeno-transplanted into a patient, replacing an old/worn/damaged heart valve.
Transplants	• A donated heart can be transplanted into a patient in order to avoid total heart failure. • The recipient could reject the transplanted organ. To avoid this a tissue match is carried out and the patient takes immunosuppressant drugs.
Artificial hearts	• Artificial hearts can occasionally be used to keep patients alive long enough for a heart transplant.

Q1. (d) The coronary arteries supply blood to the heart.

Figure 2 shows two coronary arteries.

Figure 2



Describe **two** ways the healthy artery is different from the artery affected by coronary heart disease.

1. _____

_____

2. _____

_____

(2)

(e) What can be used to treat people with coronary heart disease?

Tick **two** boxes.

- Antibiotics ☐
- Hormones ☐
- Statins ☐
- Stent ☐
- Vaccination ☐

(2)

(f) Suggest **two** risk factors for coronary heart disease.

1. _____

_____

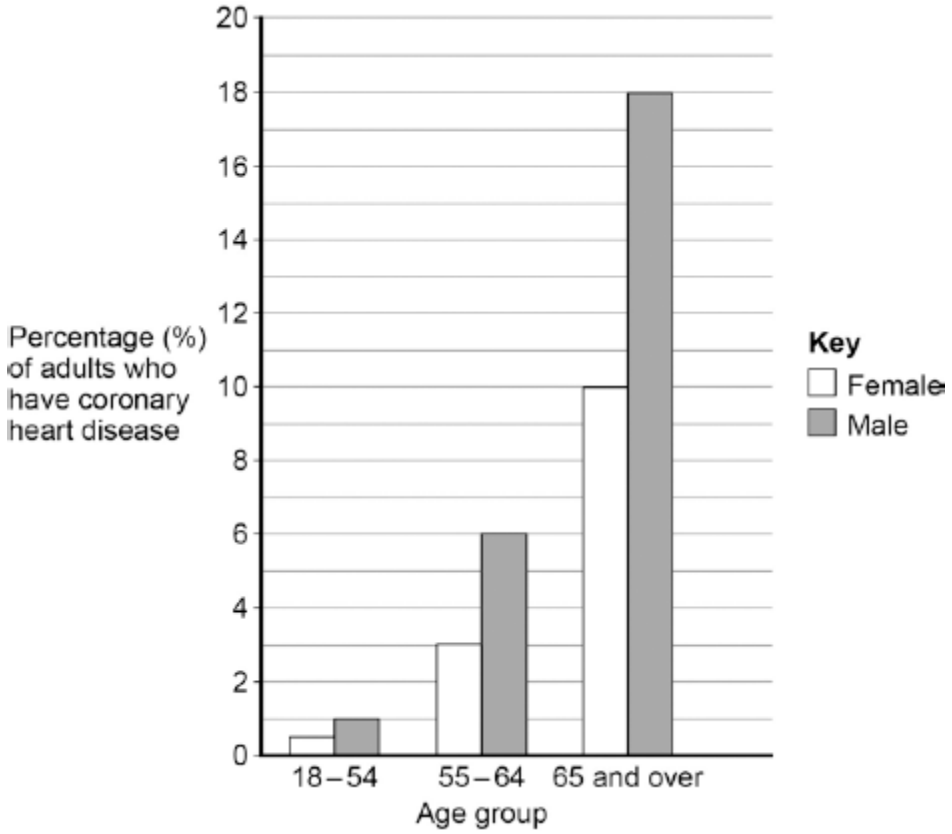
2. _____

_____

(2)

(g) **Figure 3** shows the percentages of adults in the UK who have coronary heart disease.

Figure 3



Calculate the difference in the percentage of male and female adults aged 65 and over who have coronary heart disease.

_____ %

(1)

(h) Which is the correct conclusion for the data in **Figure 3**?

Tick **one** box.

Children do **not** suffer from coronary heart disease ☐

More males suffer from coronary heart disease than females ☐

More younger people suffer from coronary heart disease than older people ☐

(1)

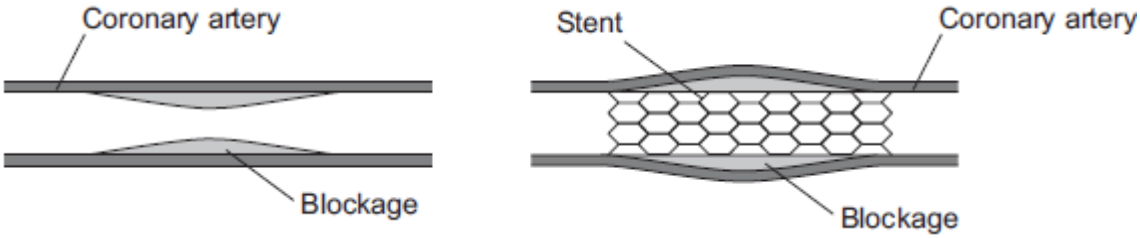
Q2. (c) A person's coronary artery has become narrower.

The person has a heart attack.

A doctor puts a stent into the person's coronary artery.

Figure 2 shows a stent inside a coronary artery.

Figure 2



(i) How does the stent help to prevent another heart attack?

Give **one** way.

_____

_____

(1)

(ii) **Figure 3** shows a surgeon putting a stent into a patient.

Figure 3

© Science Photo Library

The surgeon puts the stent into an artery in the leg. He moves the stent through the artery to the coronary artery.

Suggest **two** possible risks of this operation.

1. _____

_____

2. _____

_____

(2)

Q3. *Obesity* is a factor that affects Coronary Heart Disease (CHD).

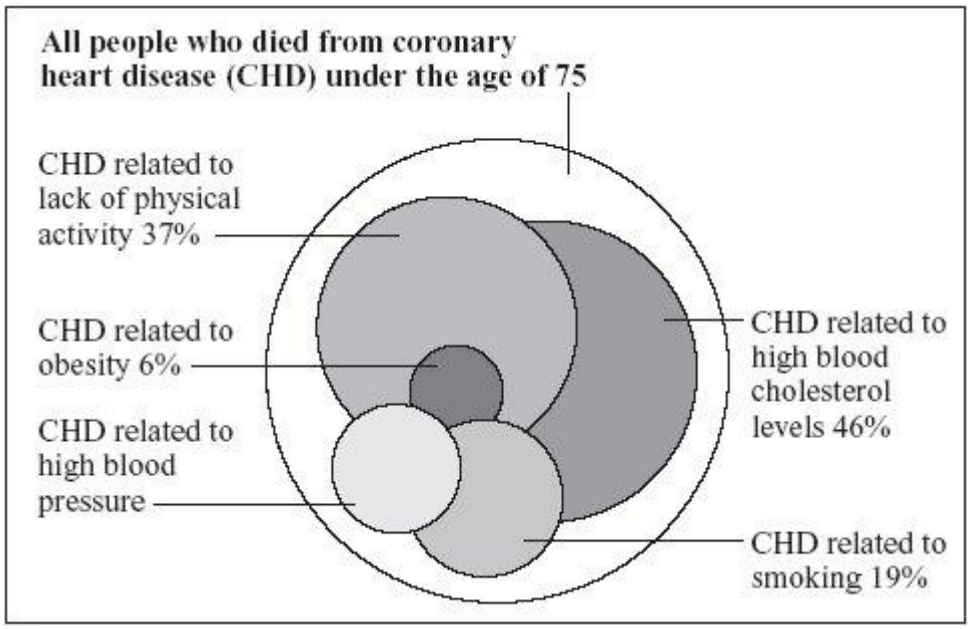
(a) What is meant by *obesity*?

_____

_____

(1)

(c) The chart below is published by the British Heart Foundation. It shows how death from CHD is related to a number of different factors.



copyright National Heart Forum

Each factor is represented by a circle.

The bigger the circle, the more people are affected by the factor.

(i) What is the main factor causing death from CHD?

_____

(1)

(ii) Estimate the percentage of deaths from CHD related to high blood pressure.

_____ %

(1)

(iii) The data are shown as overlapping circles instead of a bar chart. The percentages of deaths related to the different factors add up to more than 100%.

What does this tell you about some of the people who died from CHD?

_____

_____

(1)

(Total 8 marks)

Q4. The concentration of cholesterol in the blood affects people's health.

(a) Give **two** factors that affect the concentration of cholesterol in the blood.

1. _____

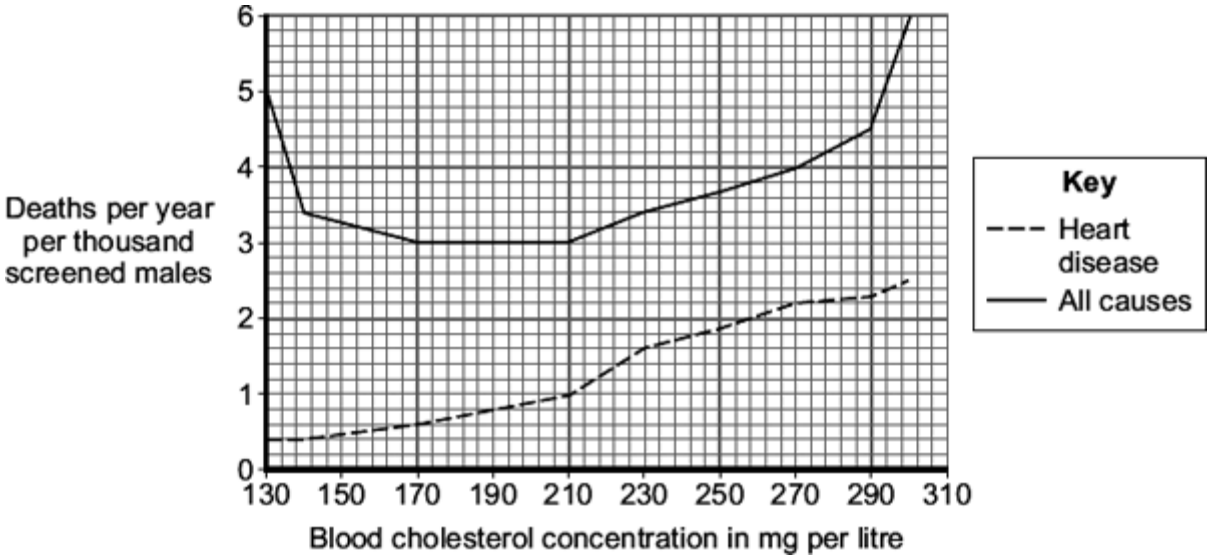
2. _____

(2)

(b) Doctors screened men for blood cholesterol concentration.

The doctors then compared death rates from heart disease with deaths from all causes in this screened group.

The graph shows the results.



(i) Which is the best conclusion that can be drawn from the data?

Tick (✓) **one** box.

There is a positive correlation between blood cholesterol concentration and deaths from all causes.	☐
There is a negative correlation between blood cholesterol concentration and deaths from all causes.	☐
Blood cholesterol concentration is only one of several factors affecting death from all causes.	☐

(1)

(ii) Based on the data in the graph **only**, which is the ideal range for blood cholesterol concentration?

Range _____ to _____ mg cholesterol per litre.

(1)

(Total 4 marks)

4.2.2.7 Cancer

Cancer is the result of change in cells that lead to uncontrolled growth and division.

Benign tumours are growth of abnormal cells which are contained in one area.

They do not in vade other parts of the body.

Malignant tumour cells are cancers.

They invade neighbouring tissues and spread to different parts of the body in the blood where they form secondary tumours.

Lifestyle risk factors increase the risk of developing cancer.

There are also genetic risk factors for some cancers.

Exam practice 7

Q1. The number of people in the UK with tumours is increasing.

(a) (i) Describe how tumours form.

_____

_____

(1)

(ii) Tumours can be malignant or benign.

What is the difference between a malignant tumour and a benign tumour?

_____

_____

(1)

(b) Describe how some tumours may spread to other parts of the body.

_____

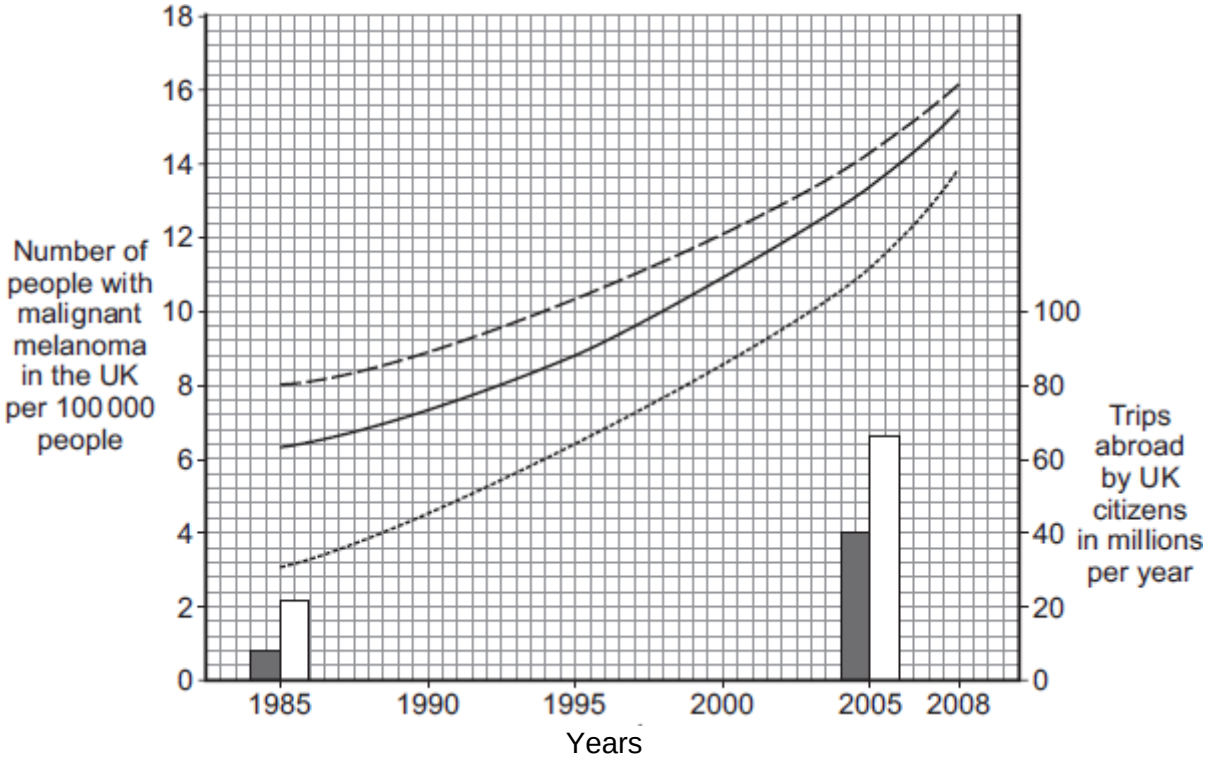
_____

(1)

(c) People from Northern Europe have fair skin and many people have malignant melanoma skin cancer.

The graph shows how the number of people in the UK with malignant melanoma changed between 1985 and 2008.

The bars on the graph show the number of people in the UK who travelled abroad and the number who took cheap holidays in the sun in 1985 and 2005.



Key

——— Mean for all areas
– – – Mean for people from rich areas
—·— Mean for people from poor areas

Total number of trips abroad
Number of cheap holidays in the sun

(i) Describe the trends in the number of people with malignant melanoma skin cancer between 1985 and 2008.

(3)

(ii) Use the data about the number of trips abroad to suggest an explanation for the trends you have described in part **(c)(i)**.

(2)

(Total 8 marks)

Q2. Level 3 question.

(b) Many people suffer from stomach ulcers caused by a species of bacteria called *Helicobacter pylori*.

The stomach is lined with a protective lining of mucus.

Helicobacter pylori are acid-tolerant bacteria which can damage this mucus lining.

Suggest how an infection with *Helicobacter pylori* might result in a stomach ulcer developing.

_____

_____

_____

_____

(2)

(c) *Helicobacter pylori* can also cause stomach cancer.

Describe how a person infected with *Helicobacter pylori* could also develop liver cancer.

_____

_____

_____

_____

_____

_____

(3)

(d) Gluten is a form of protein found in some grains.

Describe the test you would use to find out if protein is present in food.

_____

_____

_____

_____

_____

_____

(2)

(e) Coeliac disease is a disease of the digestive system.

It damages the lining of the small intestine when foods that contain gluten are eaten.

When people with coeliac disease eat foods that contain gluten:
1. their immune system forms antibodies to gluten
2. these antibodies attack the lining of the small intestine
3. this causes inflammation in the intestines and damages the villi.

Symptoms of coeliac disease include poor growth.

Suggest why a person with coeliac disease might have this symptom.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 12 marks)

4.2.3 Plant tissue, organs and systems

Plant organs: include stems, roots and leaves.

Examples of plant tissues include:

- epidermal tissues: which cover the plant
- mesophyll: which carries out photosynthesis
- xylem and phloem: which transport substances around the plant

Transport systems in Plants

The roots, stem and leaves form a transport system to move substances around the plant.

Xylem transports water and minerals from the roots, up the stems to the leaves. It is composed of **hollow tubes** strengthened by lignin.

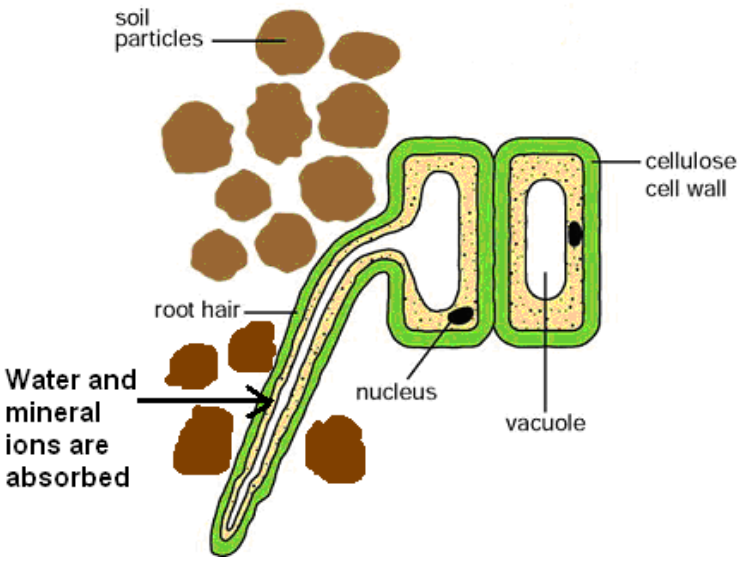
Phloem tissue transports sucrose from the leaves to the rest of the plant for immediate use or for storage. This movement is **called translocation** and the movement can occurs in **both directions**, up and down the phloem vessel.

Phloem is made up of elongated cells. Cell sap can move from one phloem cell to the next through pores in the end walls.

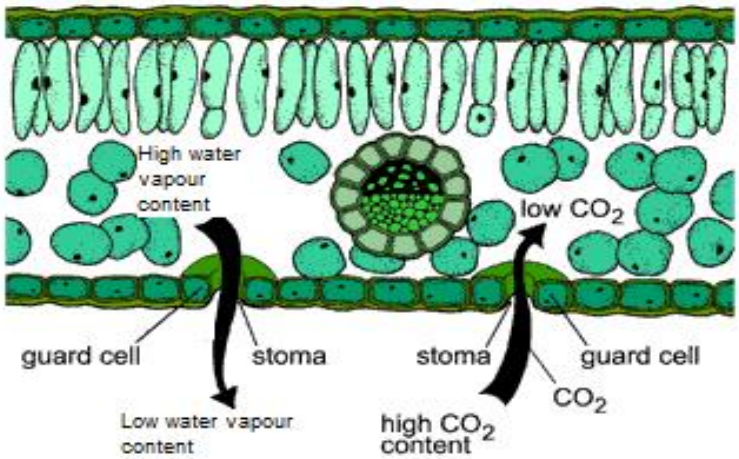
Exchange systems in plants:

Absorption of water by roots:

- The surface area of the roots is increased by root hairs.
- Most of the water and mineral ions are absorbed by root hair cells.
- Water is absorbed by osmosis.
- Most of the mineral ions are absorbed by active transport.

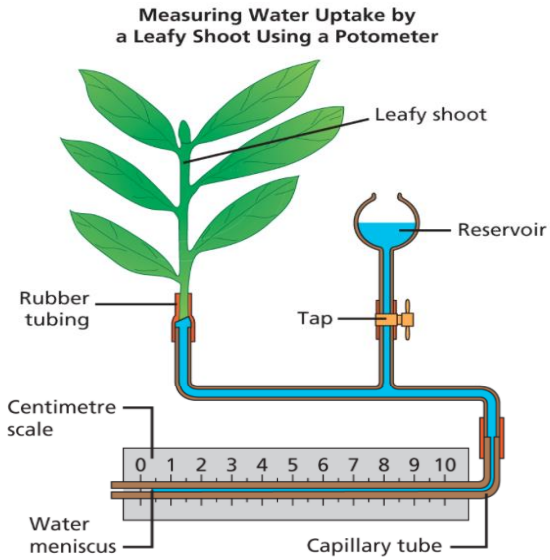


Transpiration: The process by which plants **lose water vapour from the surface of their leaves**. It **evaporates** into the air spaces in the leaf, and then diffuses out **through the stomata**.



- <u>Transpiration is more rapid in hot, dry and windy conditions:</u>
    - Heat causes the water to evaporate quicker.
    - Dry conditions increases the water vapour concentration gradient.
    - Wind moves the water vapour away from the leaf, maintaining the concentration gradient.
- Most of the water lost by transpiration leaves through the stomata.
    - Stomata close when it is dark, when carbon dioxide is not required.
    - This reduces the amount of water lost by the plant at a time when it is not needed for photosynthesis.
    - If plants lose water faster than it is replaced by the roots, the stomata can close to prevent wilting.

Measuring rate of transpiration



The **rate of transpiration** is estimated by measuring the rate of water uptake from a shoot.
Only an estimation as not all water taken up is lost, some is used in the leaf (photosynthesis/turgidity)

1. The leafy shoot with a woody stem is cut under water at a slant.
2. The potometer is assembled under water, and the shoot is then inserted under water.
3. The apparatus is removed from the water but the end of the capillary tube is kept submerged in a beaker of water.
4. The apparatus must be watertight and airtight.
5. The leaves on the leafy shoot are dried, and time is given for the shoot to acclimatise, then the tap to the reservoir is shut.
6. The capillary tube is removed from the beaker of water until one air bubble forms then the capillary tube is placed back in the beaker of water.
7. The starting position of the bubble is recorded, the distance the bubble moves over a period of time is recorded.
8. Other conditions that affect transpiration rates must be kept constant.

Q1. Plants are made up of cells, tissues and organs.

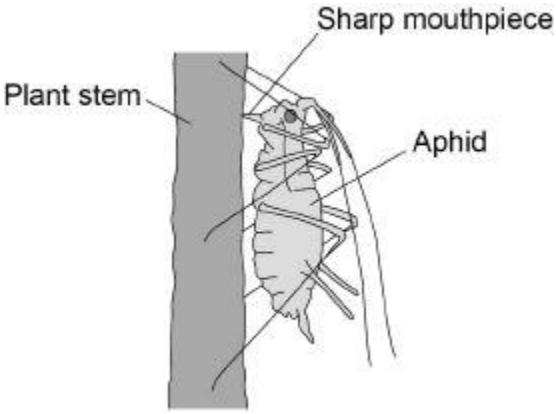
(a) Draw **one** line from each level of organisation to the correct plant part.

Level of organisation	Plant part
	Leaf
Organ	Root hair
	Spongy mesophyll
Tissue	Vacuole
	Xylem

(2)

Q2. Aphids are small insects that carry pathogens.

Figure 1 shows an aphid feeding from a plant stem.



(a) An aphid feeds by inserting its sharp mouthpiece into the stem of a plant.

After feeding, the mouthpiece of an aphid contains a high concentration of dissolved sugars.

Which part of the plant was the aphid feeding from?

Tick **one** box.

- Palisade layer ☐
- Phloem ☐
- Stomata ☐
- Xylem ☐

(1)

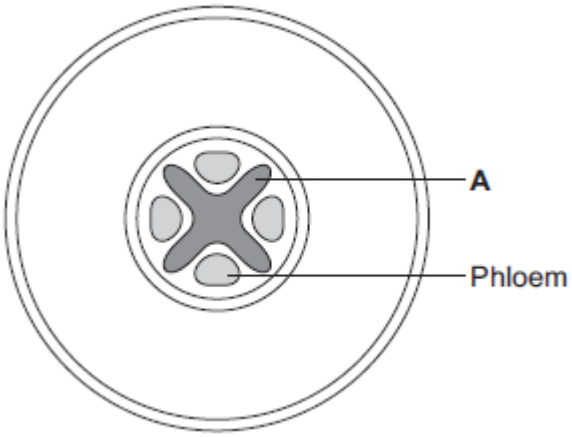
(b) What is the process that transports dissolved sugars around a plant?

Tick **one** box.

- Filtration ☐
- Respiration ☐
- Translocation ☐
- Transpiration ☐

(1)

Q3. The diagram below shows a cross-section of a plant root. The transport tissues are labelled.



(a) (i) What is tissue **A**?

Draw a ring around the correct answer.

cuticle **epidermis** **xylem**

(1)

(ii) Name **two** substances transported by tissue **A**.

1. _____

2. _____

(2)

(b) Phloem is involved in a process called translocation.

(i) What is translocation?

_____

_____

_____

(1)

(ii) Explain why translocation is important to plants.

_____

_____

_____

_____

(2)

(c) Plants must use active transport to move some substances from the soil into root hair cells.

(i) Active transport needs energy.

Which part of the cell releases most of this energy?

Tick (✓) **one** box.

mitochondria	
nucleus	
ribosome	

(1)

(ii) Explain why active transport is necessary in root hair cells.

_____

_____

_____

_____

_____

_____

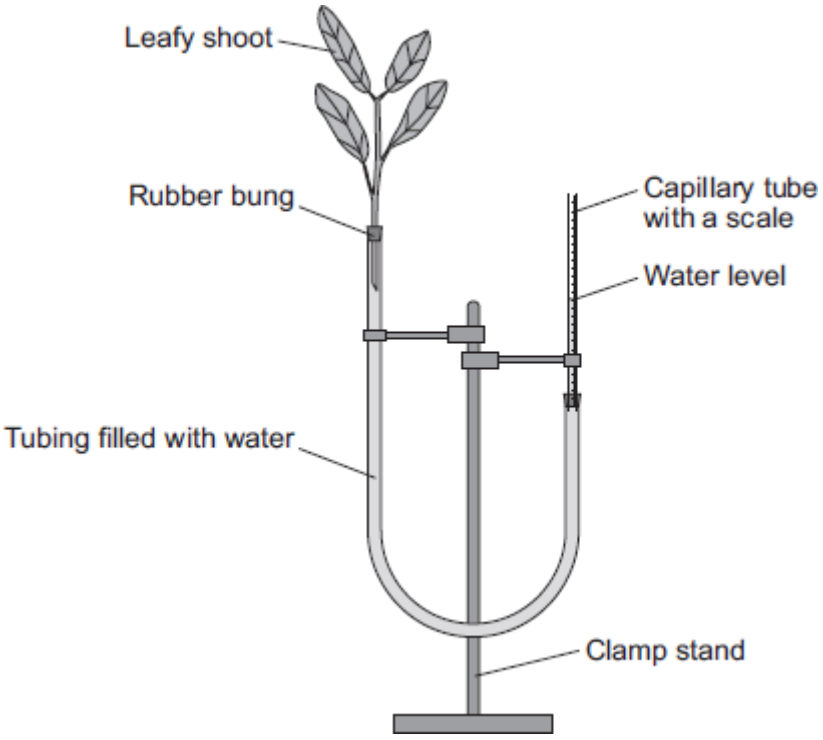
(2)

(Total 9 marks)

Q4. A potometer is a piece of apparatus that can be used to measure water uptake by a leafy shoot.

Figure 1 shows a potometer.

Figure 1



Some students used a potometer like the one shown in **Figure 1.**

- They measured the water taken up by a shoot in normal conditions in a classroom.
- As the water was taken up by the shoot, the level of water in the capillary tube went down.
- The students recorded the level of the water in the capillary tube at 2-minute intervals for 10 minutes.

Table 1 shows the students' results.

Table 1

Time in minutes	0	2	4	6	8	10

Level of water (on scale) in capillary tube in mm	2.5	3.6	4.4	5.4	6.5	7.5

The area of the cross section of the capillary tube was 0.8 mm^2.

(a) (i) Complete the following calculation to find the volume of water taken up by the shoot in mm^3 per minute.

Distance water moved along the scale in 10 minutes = _____ mm

Volume of water taken up by the shoot in 10 minutes = _____ mm^3

Therefore, volume of water taken up by the shoot in 1 minute = _____ mm^3

(3)

(ii) The students repeated the investigation but this time placed the potometer next to a fan blowing air over the leafy shoot.

Suggest how the results would be different. Give a reason for your answer.

_____

_____

_____

_____

(2)

(b) The students repeated the investigation at different temperatures.

The results are shown in **Table 2.**

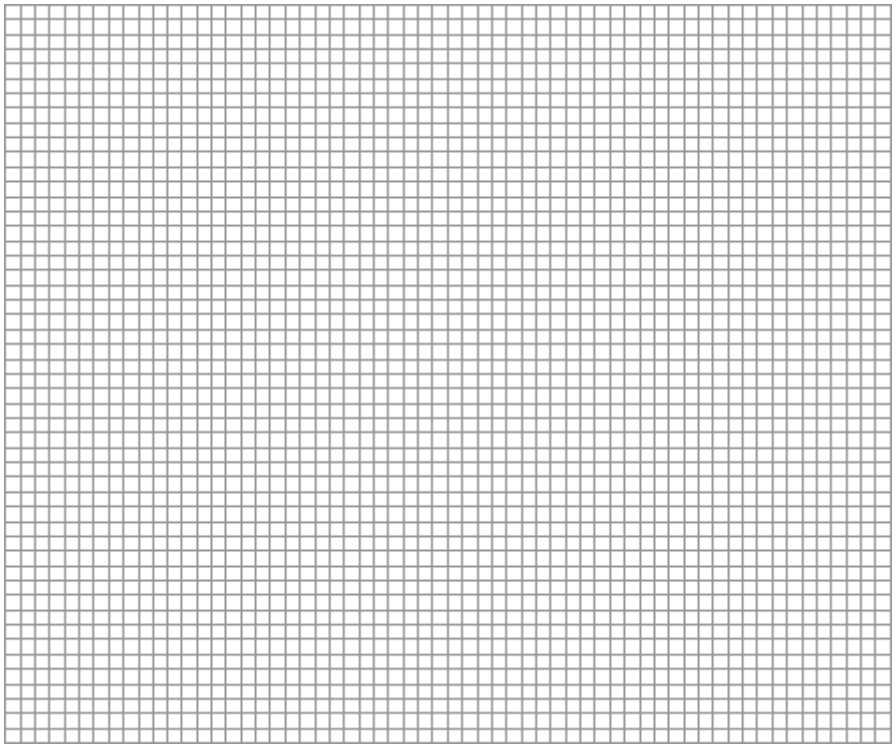
Table 2

Temperature in °C	Rate of water uptake in mm^3 per minute
10	0
15	0.4
20	1.0
25	2.1
30	3.2
35	4.0
40	4.4

Plot the data from **Table 2** on the graph paper in **Figure 2**.

Choose suitable scales, label both axes and draw a line of best fit.

Figure 2



(5)

(c) What would happen to the leaves if the potometer was left for a longer time at 40 °C?

Explain your answer.

_____

_____

_____

_____

_____

_____

(3)

(Total 13 marks)

Q5. Level 3 question

The leaves of most plants have stomata.

(a) (i) Name the cells which control the size of the stomata.

_____

(1)

(ii) Give **one** function of stomata.

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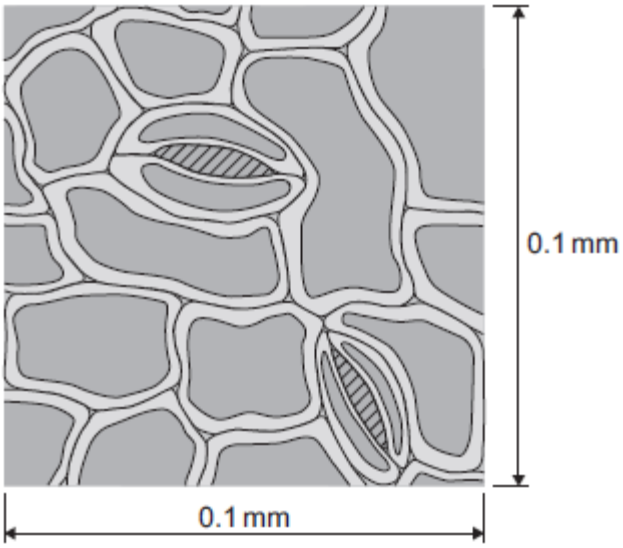
(1)

(b) The image below shows part of the surface of a leaf.



The length and width of this piece of leaf surface are both 0.1 mm.

(i) Calculate the number of stomata per mm^2 of this leaf surface.

_____

_____

_____ per mm^2

(2)

(ii) A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

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_____

(1)

(c) A student investigated the loss of water from plant leaves.

The student did the following:

- Step 1: took ten leaves from a plant
- Step 2: weighed all ten leaves
- Step 3: hung the leaves up in a classroom for 4 days
- Step 4: weighed all ten leaves again
- Step 5: calculated the mass of water lost by the leaves
- Step 6: repeated steps **1** to **5** with grease spread on the upper surfaces of the leaves
- Step 7: repeated steps **1** to **5** with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

The table below shows the student's results.

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

(i) What mass of water was lost in 4 days through the upper surfaces of the leaves?

_____

_____

Mass = _____ g

(1)

(ii) Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

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_____

(3)

(Total 9 marks)