Organisation
Higher / Foundation

Name: _____

Class: _____

Date: _____

Time: **452 minutes**

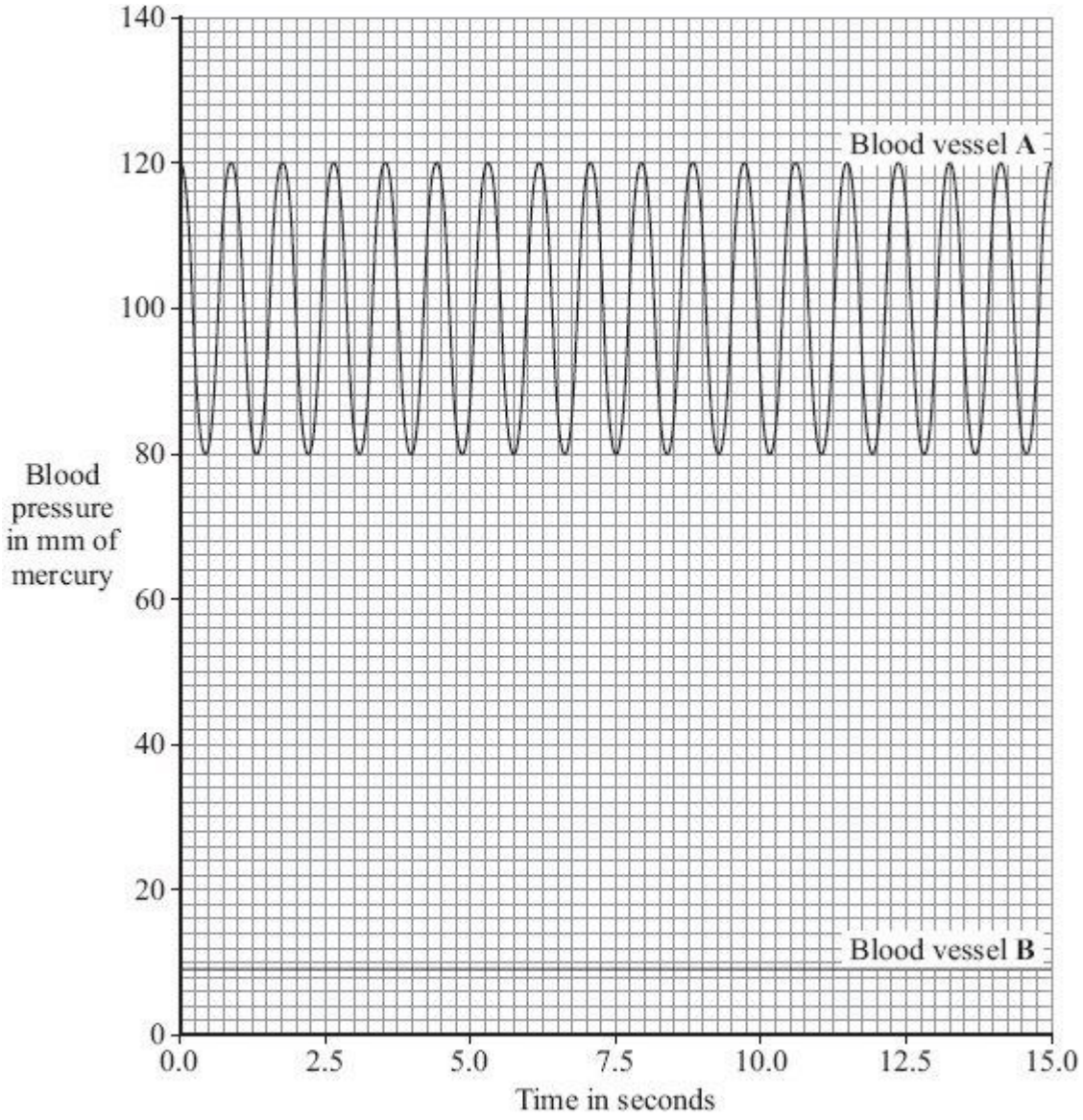
Marks: **450 marks**

Comments:

Q1.

The heart pumps blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



(a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel _____

Give **two** reasons for your answer.

Reason 1 _____

_____

Reason 2 _____

_____

(2)

(b) Use information from the graph to answer these questions.

(i) How many times did the heart beat in 15 seconds? _____

(1)

(ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

_____

_____

Heart rate = _____ beats per minute

(1)

(c) During exercise, the heart rate increases. This supplies useful substances to the muscles and removes waste materials from the muscles at a faster rate.

(i) Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1. _____

2. _____

(2)

(ii) Name **one** waste substance that must be removed from the muscles at a faster rate during exercise.

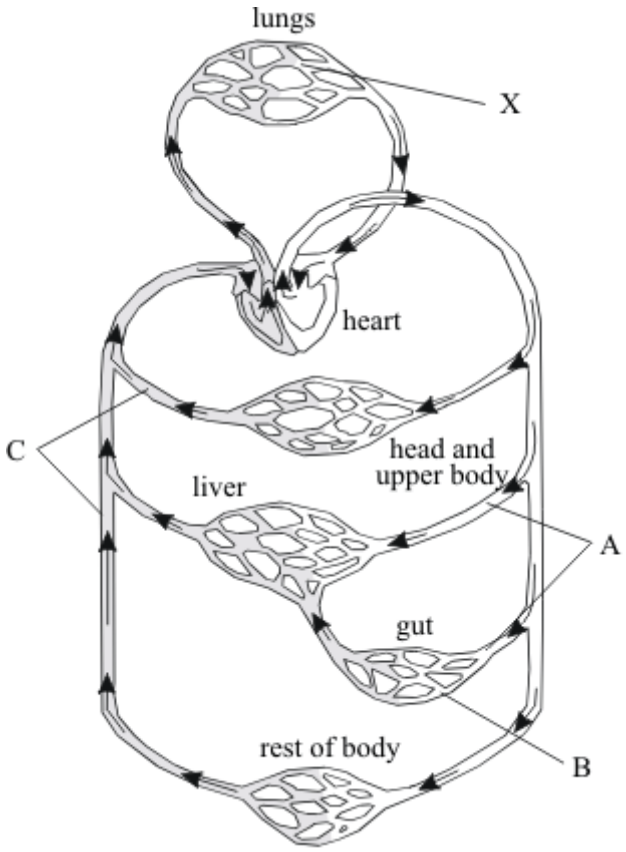
_____

(1)

(Total 7 marks)

Q2.

The diagram shows part of the circulatory system.



(a) Name the types of blood vessel labelled A, B and C on the diagram.

A _____

B _____

C _____

(3)

(b) What is the job of the circulatory system?

_____

_____

(1)

(c) Give **two** ways in which the composition of blood changes as it flows through the vessels labelled X on the diagram.

1. _____

_____

2. _____

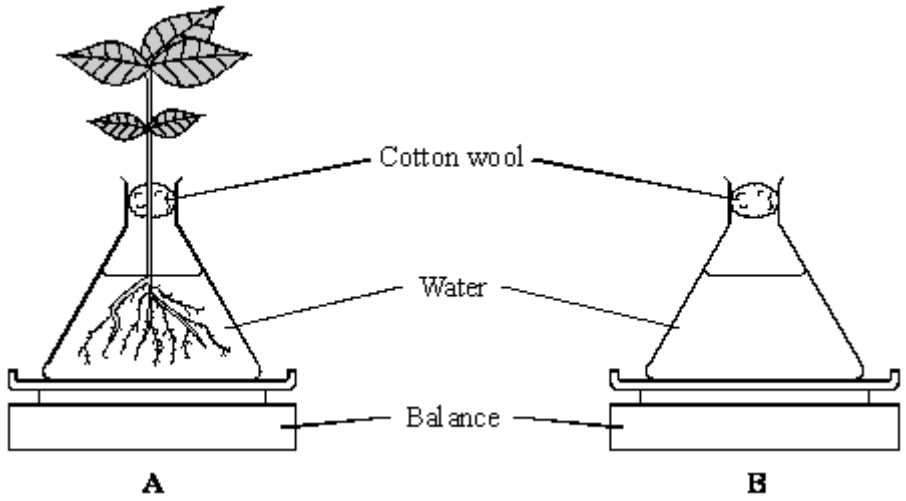
_____

(2)

(Total 6 marks)

Q3.

Some students set up the following apparatus.



The balances show the same mass at the start of the investigation.

After 24 hours the mass of flask **B** was the same but the mass of flask **A** had changed.

(i) Describe and explain the change to the mass of flask **A**.

_____

_____

_____

_____

_____

(3)

(ii) Why did the students need to set up flask **B**?

_____

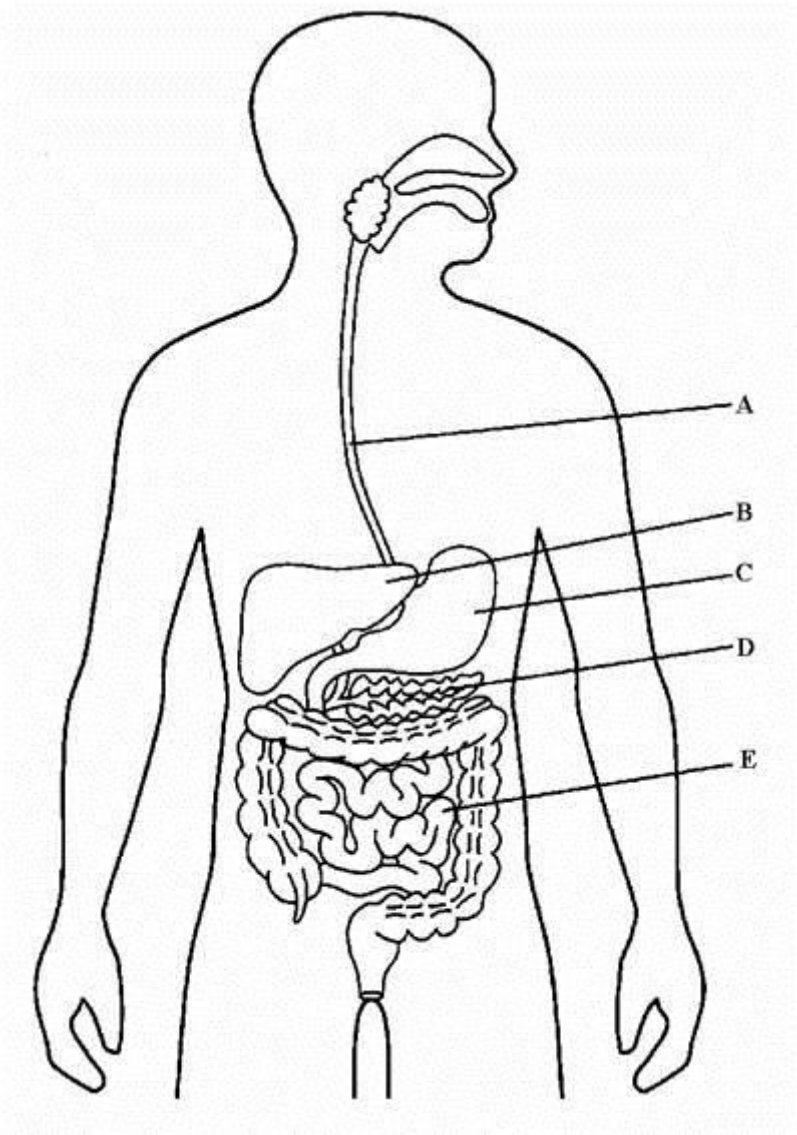
_____

(1)

(Total 4 marks)

Q4.

The diagram shows part of the human digestive system.



(i) Name part **B**.

_____

(1)

(ii) Describe the role of **B** and **D** in reducing blood sugar levels.

_____

_____

_____

_____

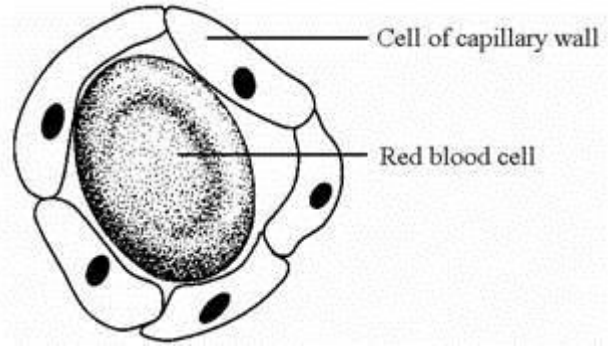
_____

(2)

(Total 3 marks)

Q5.

Capillaries are blood vessels in the body which join the arteries to the veins. They have walls which are one cell thick and so are able to exchange substances with the body cells.



(i) Name **two** substances that travel from the muscle cells to the blood in the capillaries.

1. _____

2. _____

(2)

(ii) Glucose is one substance that travels from the blood in the capillaries to the body cells. Explain how this happens.

_____

_____

_____

(2)

(Total 4 marks)

Q6.

(a) Complete the table to give one site where digestive substances are made.

Digestive substance	One site of production
bile	
amylase	
lipase	
protease	

(4)

(b) Describe **two** ways that the mouth can break down starchy foods.

_____

_____

_____

_____

(2)

(c) Describe how the liver helps to digest fats.

_____

_____

_____

(2)

(Total 8 marks)

Q7.

(a) Photosynthesis is a process that takes place in green plants.

(i) What type of energy is needed for this process?

_____

(1)

(ii) What substance in the plant absorbs this energy?

_____

(1)

(iii) In which part of the plant cell does photosynthesis take place?

_____

(1)

(iv) Write a balanced chemical equation for photosynthesis.

_____ → _____

(3)

(b) Describe **two** ways you could speed up photosynthesis.

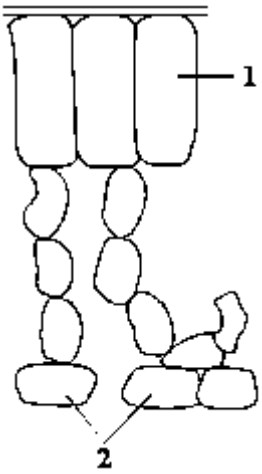
_____

_____

_____

(2)

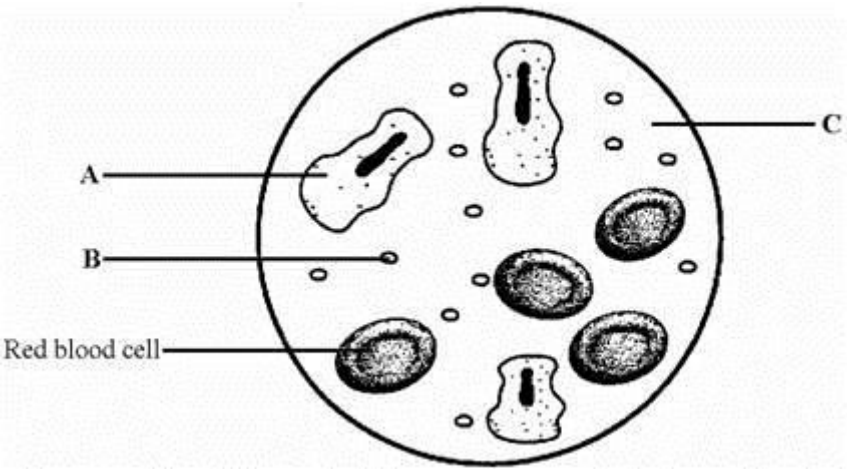
(c) The diagram shows the outline of a cross-section of a leaf. Name cells **1** and **2** and describe how they are involved in photosynthesis.



(4)
(Total 12 marks)

Q8.

The diagram shows four parts of blood.



(a) Complete the table to give the name and function of the parts labelled **A**, **B** and **C**.

Letter	Name	Function
A		
B		
C		

(6)

(b) Red blood cells contain haemoglobin. Explain how this enables red blood cells to pick up oxygen from the alveoli and release it to cells in other parts of the body.

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 10 marks)

Q9.

(a) Complete the following sentences.

Green plants produce their own food by a process called photosynthesis. In this process the raw materials are _____ and carbon dioxide. Glucose and _____ are produced. _____ energy is absorbed by the green substance called _____ .

(4)

(b) Name **two** things that can happen in the plant to the glucose produced in photosynthesis.

1. _____

2. _____

(2)

(c) Plants need mineral salts.

(i) Through which part do mineral salts get into the plant?

_____

(1)

(ii) Explain why water is important in this process.

_____

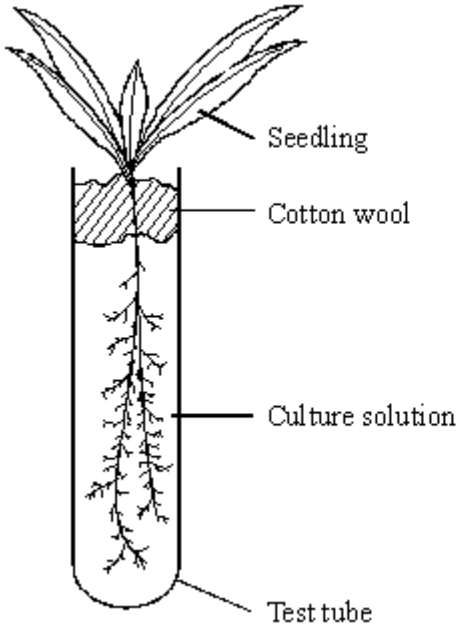
_____

_____

_____

(2)

Some students set up water cultures to find out how plants use nitrates.
They had two sets of nutrient solutions.
A full solution provided the plant with all the required nutrients.
The results table shows the average mass of the seedlings after 28 days of growth.



Culture solution	Average mass of seedling in g
distilled water	0.14
full solution with no nitrates	0.29
full solution	0.43

(d) (i) Give a conclusion you could make from these results.

_____

_____

(1)

(ii) Calculate the difference in average mass caused by the addition of nitrates to the culture solution.

_____

(1)

(iii) What are nitrates used for in the seedling?

_____

(1)

(iv) Some factors need to be controlled to keep this test fair. Name **two** of them.

1. _____

2. _____

(2)

(v) Suggest **one** way you could improve the experiment.

_____

(1)

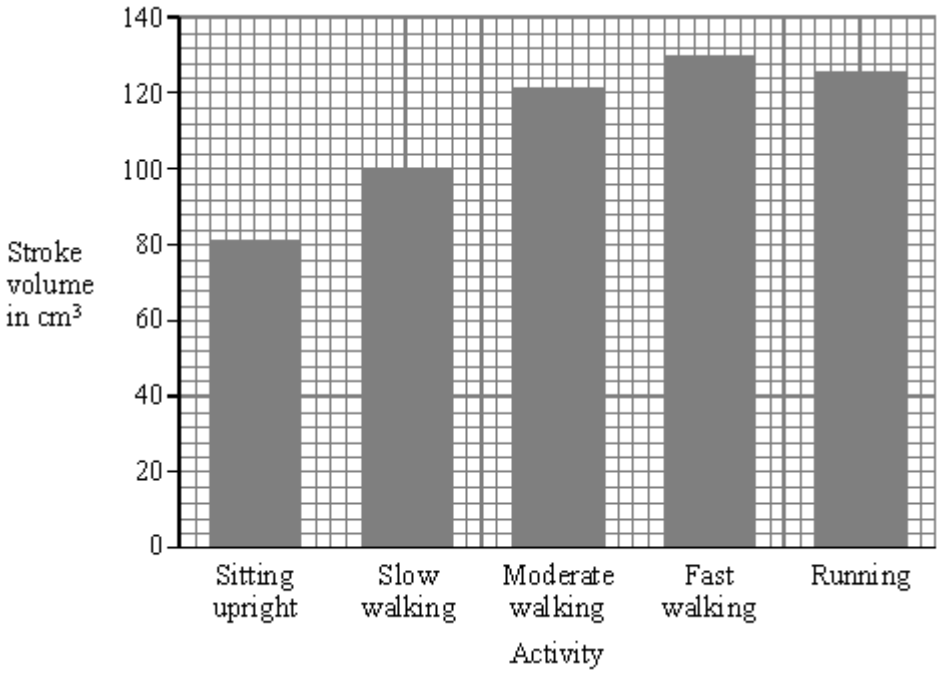
(Total 15 marks)

Q10.

A person did five different activities in turn. These activities needed increasing amounts of energy. For each activity two measurements were made. These were the rate of contraction of the left ventricle and its stroke volume (the volume of blood pumped at each beat). From these measurements the cardiac volume was calculated.

Some of these results are shown in the table and the bar chart.

Activity	Rate of contraction of left ventricle in beats per minute	Cardiac output in cm^3 per minute
Sitting upright	68	5 500
Slow walking		8 000
Moderate walking	98	12 000
Fast walking	130	17 500
Running	150	19 000



(a) (i) Describe how a person can count the rate of beating of the left ventricle.

_____

_____

(1)

(ii) Calculate the rate of ventricle contraction in beats per minute when the person was walking slowly. Show clearly how you work out your final answer.

_____

_____

_____

_____

Rate of ventricle contraction _____ beats per minute.

(2)

(iii) The pattern of results for stroke volume shows an anomalous result when the person is running. In what way is it anomalous?

_____

_____

(1)

(iv) There was a change in cardiac output when the person's movement changed from fast walking to running. How did the heart produce this change?

_____

_____

(1)

(b) Over a period of time, regular exercise can strengthen the heart muscle. This change in the heart muscle enables a person to run for longer before lactic acid build up occurs. Explain the reason for this.

_____

_____

_____

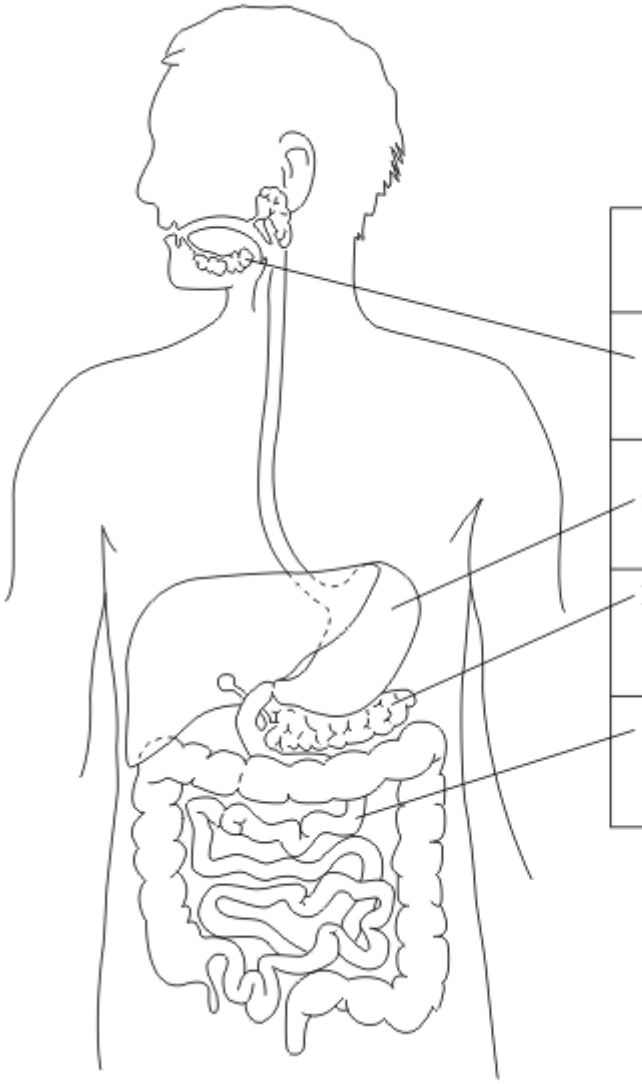
_____

(2)

(Total 7 marks)

Q11.

The diagram gives information about some parts of the human digestive system.



Organ	pH of digestive juice	Enzymes produced
Salivary gland	7	Amylase
Stomach	2	Protease
Pancreas	8.5	Amylase Lipase Protease
Small intestine	8.5	Amylase Lipase Protease

(a) (i) Name the organ which **makes** bile.

_____

(1)

(ii) Label this organ with the letter **X** on the diagram.

(1)

Information in the table may help you to answer parts (b) and (c).

(b) Name **two** parts of the digestive system where protein is digested.

1. _____

2. _____

(2)

(c) Suggest **two** reasons why starch is not digested in the stomach.

1. _____

_____

2. _____

_____

(2)
(Total 6 marks)

Q12.

(a) (i) Name the red pigment found in red blood cells.

_____

(1)

(ii) Describe, in detail, the function of this red pigment.

_____

_____

_____

_____

(2)

(b) Describe **one** other way in which the structure of a red blood cell is different from the structure of a white blood cell.

_____

_____

(1)
(Total 4 marks)

Q13.

Four leaves were removed from the same plant. Petroleum jelly (a waterproofing agent) was spread onto some of the leaves, as follows:

Leaf **A**: on both surfaces
Leaf **B**: on the lower surface only
Leaf **C**: on the upper surface only
Leaf **D**: none applied

Each leaf was then placed in a separate beaker, as shown in diagram **1**.

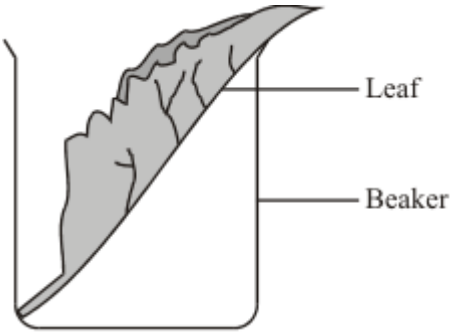
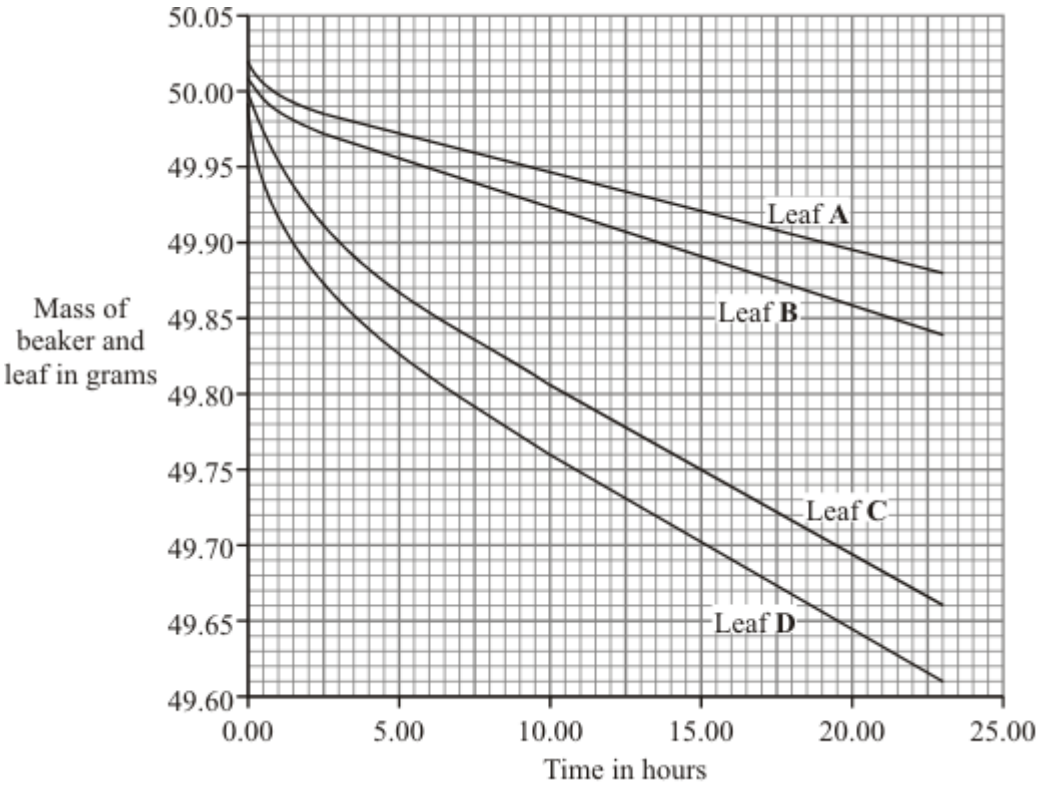


Diagram 1

Each beaker was weighed at intervals. The results are shown in the graph.



(a) Give evidence from the graph in answering the following questions.

(i) Which surface (upper or lower) loses water most rapidly? _____

Evidence _____

_____

(1)

(ii) Is water lost from both surfaces of the leaf? _____

Evidence _____

_____

(1)

(b) Diagram **2** shows the appearance of each surface of the leaf as seen through a microscope.

Upper Surface of Leaf **Lower Surface of Leaf**

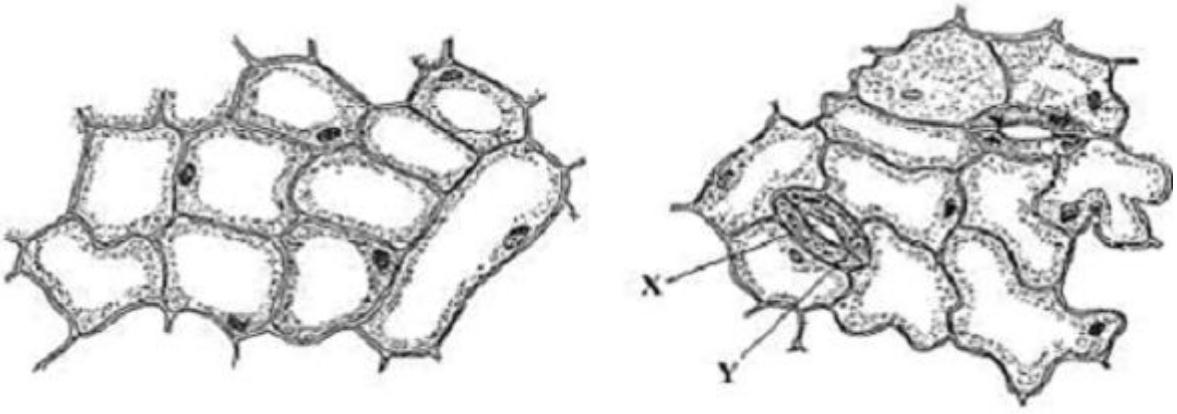


Diagram 2

(i) Name space **X** and cell **Y**.

X _____

Y _____

(2)

(ii) Use information in diagram **2** to explain why the results are different for leaves **B** and **C**.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q14.

(a) (i) What name is given to an enzyme which catalyses the breakdown of protein?

_____

(1)

(ii) What product is formed when protein is broken down by the enzyme?

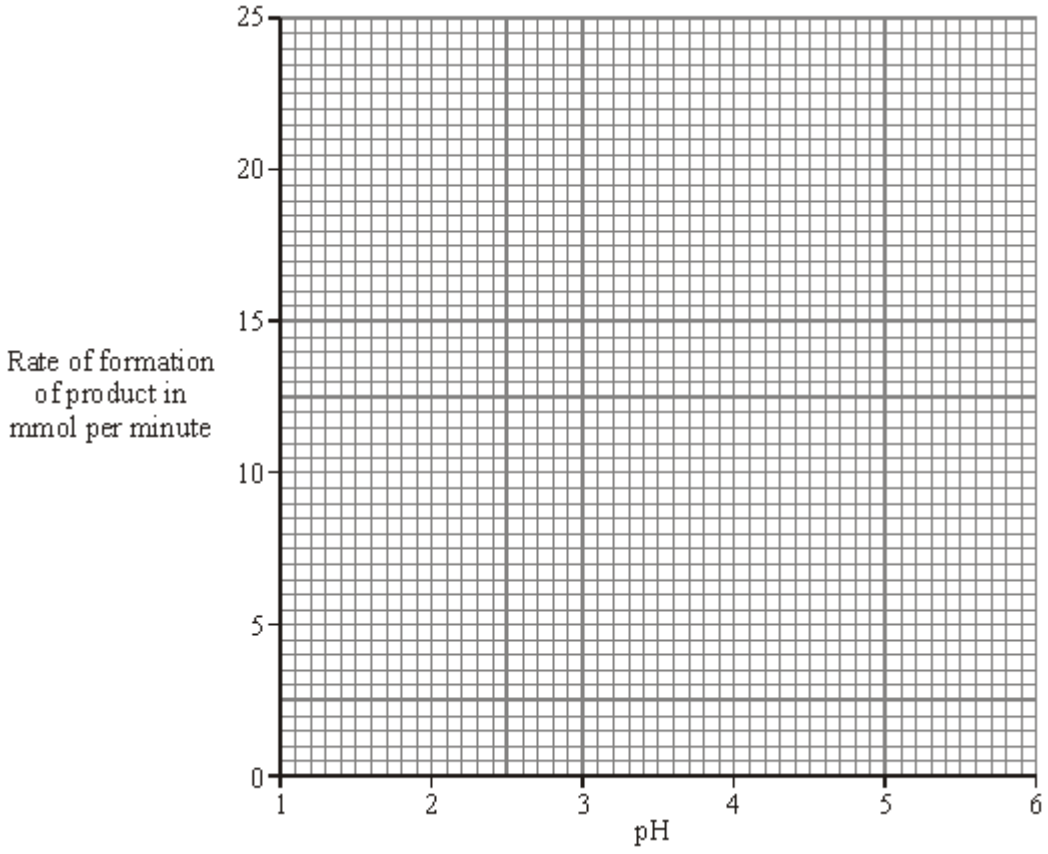
_____

(1)

The table shows the effect of pH on the activity of an enzyme which catalyses the breakdown of protein.

pH	1.0	2.0	3.0	4.0	5.0
Rate of formation of product in mmol per minute	10.5	23.0	10.5	2.5	0.0

(b) Draw a graph of the data in the table.



(3)

(c) The enzyme is produced by the human digestive system.

(i) At what pH does this enzyme work best? _____

(1)

(ii) Suggest which part of the digestive system produces this enzyme.

_____

(1)

(d) Why is it necessary to break down proteins in the digestive system?

_____

_____

_____

_____

_____

_____

(3)

(Total 10 marks)

Q15.

A group of students looked at stomata on four different species of plants, **A, B, C** and **D**. They estimated the number of stomata per cm^2 on the upper and lower surfaces of the leaves of the four species.

Their results are shown in the table.

Plant species	Estimated number of stomata per cm^2 of leaf surface	
	Upper surface of leaf	Lower surface of leaf
A	4000	28 000
B	0	800
C	8500	15 000
D	8000	26 000

(a) Which plant species probably lives in a dry region? ☐

Explain the reason for your answer.

_____

_____

_____

_____

_____

_____

(3)

(b) All four species have more stomata on the lower surface of their leaves than on the upper surface.

Suggest how this could help the plants to survive better.

_____

_____

_____

_____

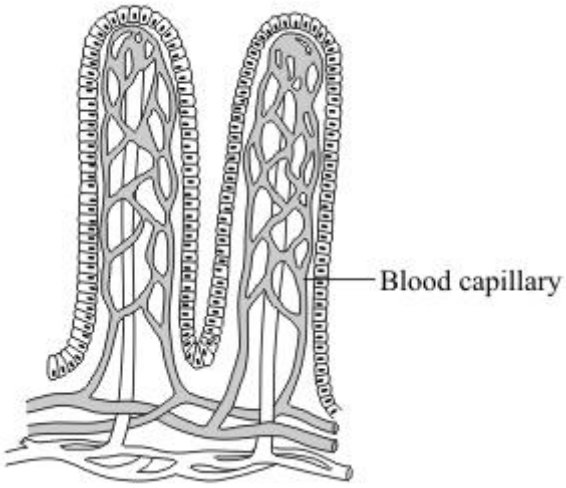
(2)

(Total 5 marks)

Q16.

Diagram 1 shows two villi in the small intestine of a healthy person.

Diagram 1



(a) Describe **two** features of the villi which help the small intestine to function.

1. _____

_____

2. _____

_____

(2)

(b) **Diagram 2** shows two villi in the small intestine of a person with coeliac disease.

Diagram 2

(i) How do the villi of the person with coeliac disease differ from those of a healthy person?

_____

_____

(1)

(ii) Suggest how this difference might affect how well the small intestine functions.

_____

_____

(1)

(Total 4 marks)

Q17.

Enzymes are used in biological detergents.

(a) Name the type of enzyme that digests stains containing fats.

_____

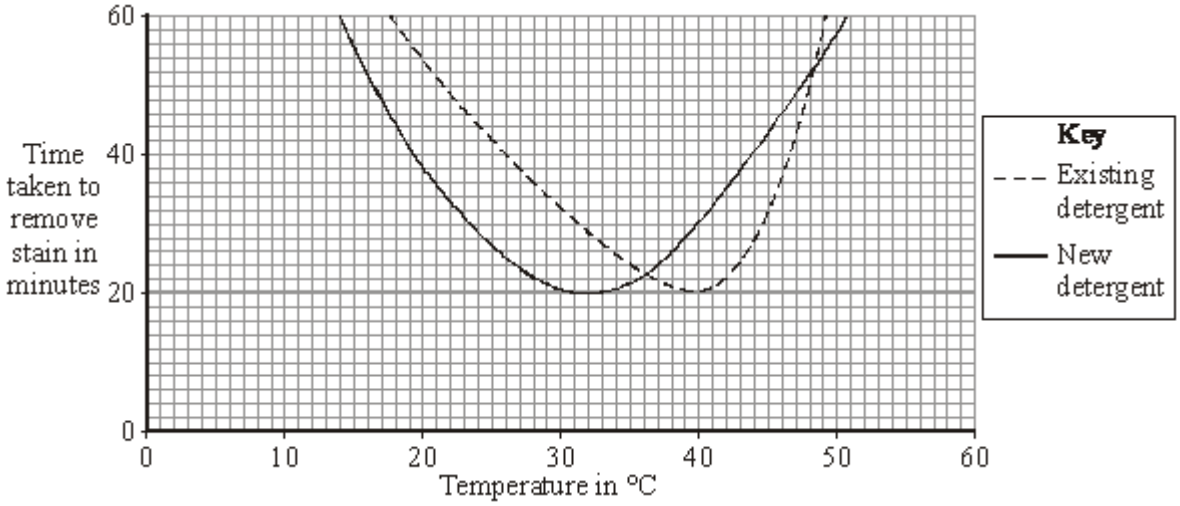
(1)

(b) A new detergent is marketed as being 'environmentally-friendly'.

Scientists compared the performance of this new detergent with an existing detergent.

They measured the time taken by the two detergents to remove a fat stain at different temperatures.

The graph shows their results.



(i) Describe the effect of increasing the temperature on the time taken by the existing detergent to remove the stain.

_____

_____

_____

_____

(2)

(ii) The new detergent works at a lower temperature than the existing one.

Is the new detergent likely to be more 'environmentally-friendly' than the existing detergent?

Draw a ring around your answer. **Yes / No**

Explain the reason for your answer.

_____

_____

_____

_____

(2)

(c) Neither detergent works well at 60 °C.

Explain why.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q18.

A popular diet book claims that a low-carbohydrate diet results in quicker weight loss and a more healthy body than a low-fat diet.

Scientists carried out an investigation to see if this claim is true.

- They used 120 overweight volunteers divided into two equal groups.
- **Group 1** was given a diet containing less than 20 g of carbohydrate per day.
- **Group 2** was given a low-fat diet. This contained less than 30% of energy from fat and less than 300 mg of cholesterol per day.
- Both groups were given the same exercise programmes and a weekly information meeting.
- Both groups were allowed only 2000 kilocalories per day.

The results after 24 weeks are shown in the table.

	Group 1 Low-carbohydrate diet	**Group 2 Low-fat diet**
Proportion of volunteers who completed the trial	76%	57%
Mean change in body mass	−12.9%	−6.7%
Mean change in body fat mass	−9.4 kg	−4.8 kg
Mean change in blood HDL concentration	+55 mg per litre	−16 mg per litre

Mean change in blood LDL concentration	+16 mg per litre	−74 mg per litre

(a) What was the independent variable in this investigation?

_____

(1)

(b) Give **one** variable that the scientists tried to control in this investigation.

_____

(1)

(c) Give **two** ways in which the method used by the scientists could have led to unreliable data.

1. _____

_____

2. _____

_____

(2)

(d) Does the data support the claim in the book?

Draw a ring around your answer. **Yes / No**

Give **two** reasons for your answer.

1. _____

_____

2. _____

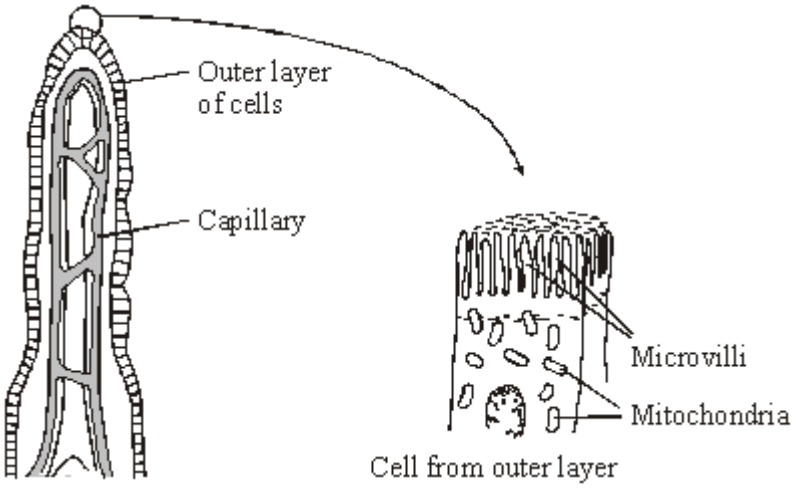
_____

(2)

(Total 6 marks)

Q19.

The small intestine is lined with millions of villi.
The diagram shows the structure of a villus.



In the small intestine, some of the products of digestion are absorbed into the blood by *active transport*.

(a) Explain what is meant by *active transport*.

_____

_____

_____

_____

(2)

(b) How do microvilli and mitochondria help in the active transport of the products of digestion from the small intestine into the blood?

Microvilli _____

_____

Mitochondria _____

_____

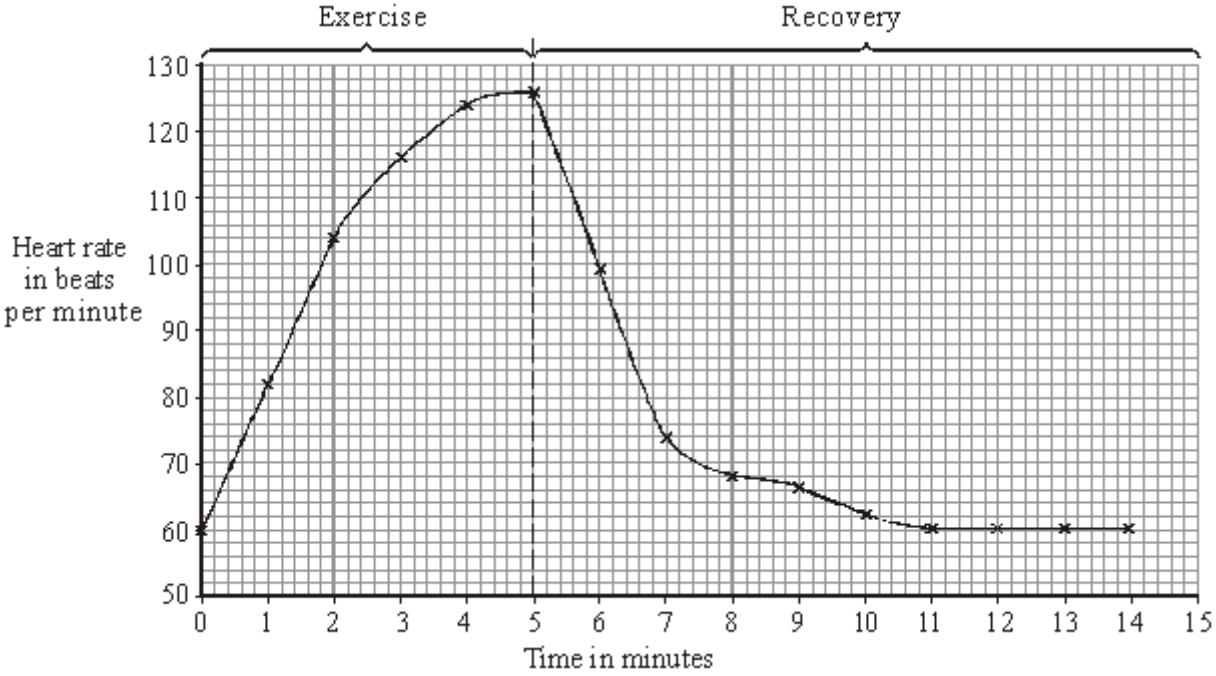
(2)

(Total 4 marks)

Q20.

A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise and also during recovery.

The results are shown in the graph.



(a) Describe, in as much detail as you can, the changes in heart rate between 0 and 14 minutes.

(3)

(b) How do arteries supplying the leg muscles alter the rate of blood flow through them during exercise?

(1)

(c) Explain how an increase in heart rate helped the student during exercise.

_____

_____

(4)

(Total 8 marks)

Q21.

Diet and exercise affect health.

(a) Many people are obese (very overweight).

Obesity can lead to heart disease.

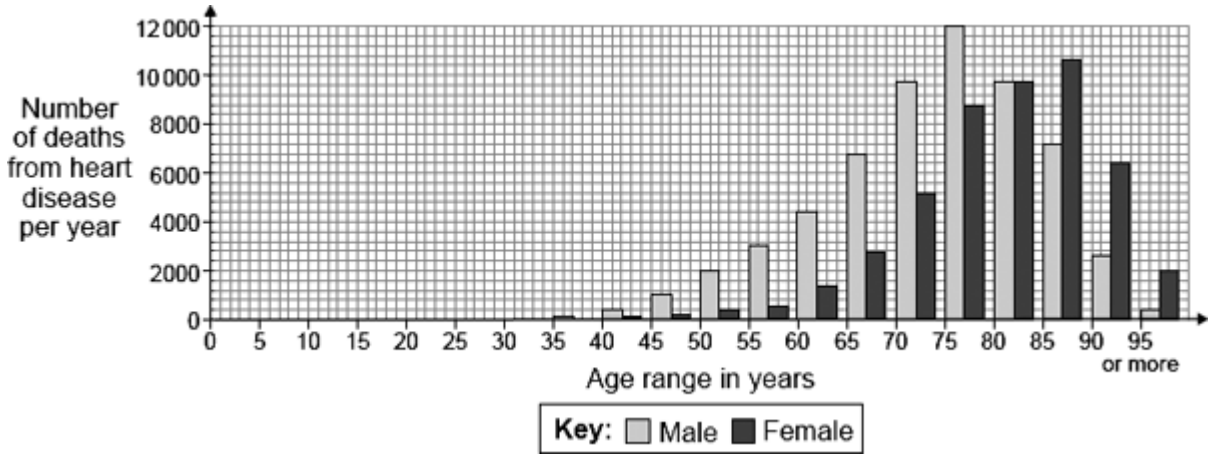
Other than heart disease, name **two** conditions which are linked to obesity.

1. _____

2. _____

(2)

(b) The graph shows the number of deaths from heart disease each year in the UK.



The pattern for deaths from heart disease in men is different from the pattern in women.

(i) Give **two** differences between the patterns for men and women.

1. _____

_____

2. _____

_____

(2)

(ii) Suggest **two** reasons for the difference in the number of deaths from heart disease in men and women between the ages of 40 and 60.

1. _____

_____

2. _____

_____

(2)

(c) Scientists have developed drugs to reduce the concentration of cholesterol in the blood.

Give the **three** main stages in testing a new drug before it is sold to the public.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(Total 9 marks)

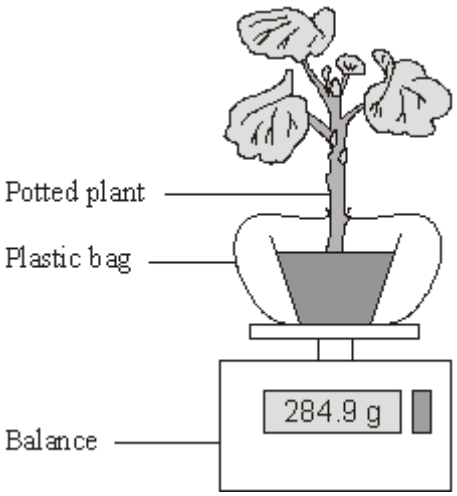
Q22.

(a) Name the process by which water is lost from plant leaves.

_____

(1)

(b) Some students set up the apparatus shown in the diagram to measure the water loss from a potted plant.



The apparatus was placed in different environmental conditions:

A in still air at 20 °C.

B in still air at 25 °C.

C in a wind at 20 °C.

D in a wind at 25 °C.

Readings from the balance were recorded by a datalogger at 10-minute intervals.

The results are given in the table.

Time in minutes	Balance reading in grams			
	A	B	C	D
0	285.6	284.6	282.9	280.9
10	285.3	284.2	282.4	280.2
20	284.9	283.8	281.9	279.4
30	284.7	283.4	281.4	278.8

(i) Under which conditions, **A**, **B**, **C** or **D**, was water lost most rapidly? ☐

(1)

(ii) Explain, as fully as you can, why water was lost most rapidly under these conditions.

_____

_____

_____

_____

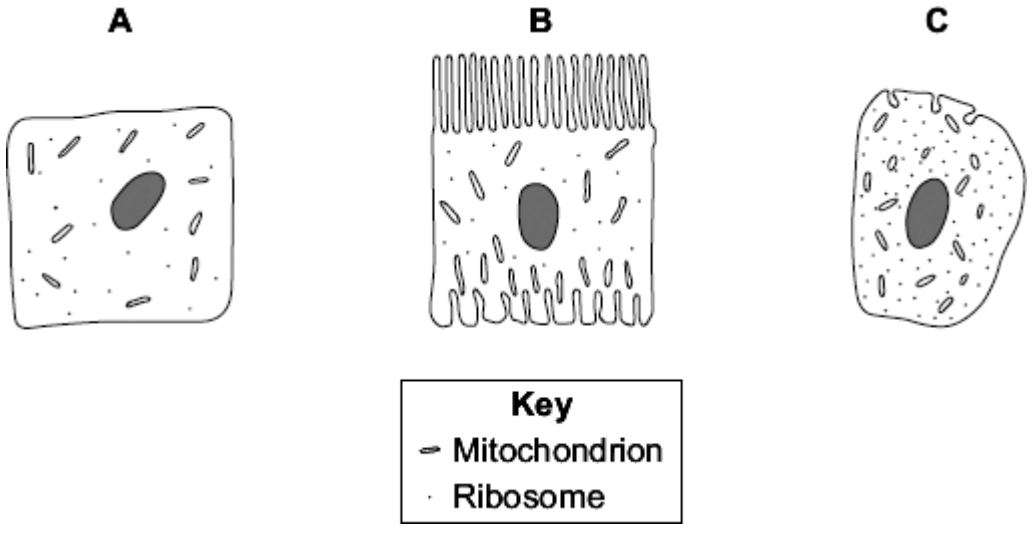
_____

(2)

(Total 4 marks)

Q23.

Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to have adaptations to increase diffusion into or out of

the cell? ☐

Give **one** reason for your choice.

_____

_____

(1)

(b) (i) Cell **C** is found in the pancreas.

Name **one** useful substance produced by the pancreas.

_____

(1)

(ii) Use information from the diagram to explain how cell **C** is adapted for producing this substance.

_____

_____

_____

_____

(2)

(Total 4 marks)

Q24.

(a) The table shows the effect of exercise on the action of one person's heart.

	At rest	**During exercise**
Heart rate in beats per minute	72	165
Volume of blood leaving the heart in each beat in cm^3	75	120
Heart output in cm^3 per minute	5400	

(i) Calculate the heart output for this person during exercise.

Show clearly how you work out your answer.

_____

_____

_____

_____

Answer = _____ cm^3 per minute

(2)

(ii) During exercise, more oxygen is carried to the working muscles.

Explain why this is helpful during exercise.

_____

_____

_____

_____

_____

(2)

(b) Give **two** other changes in the body that help to increase the amount of oxygen delivered to the working muscles during exercise.

1. _____

_____

2. _____

_____

(2)

(Total 6 marks)

Q25.

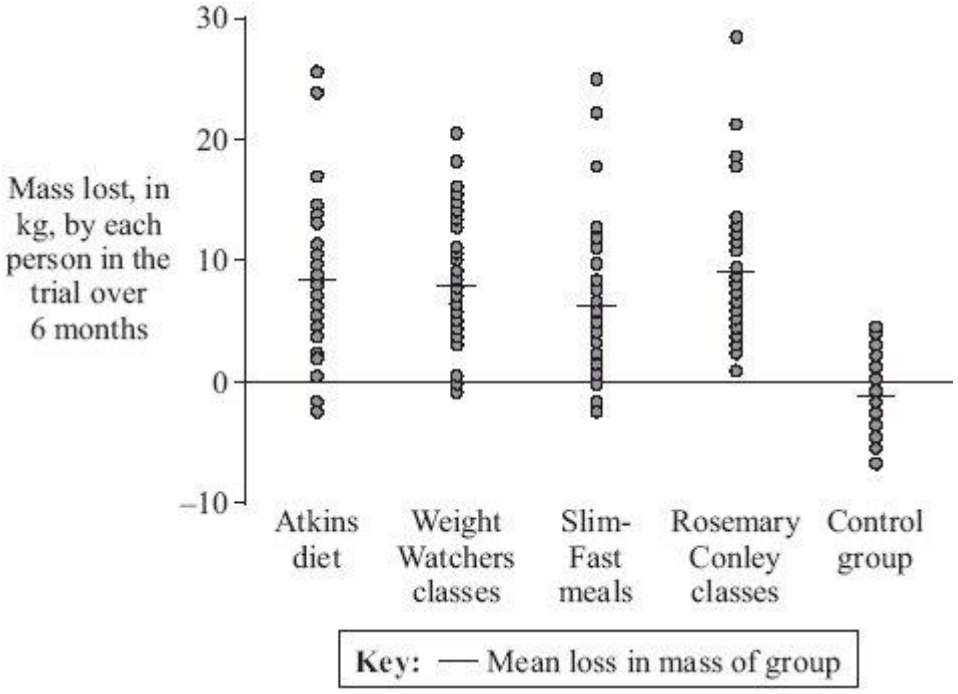
Many people who are overweight try slimming programmes.

A research study evaluated four different slimming programmes over 6 months.

Scientists selected a group of 40 people for each slimming programme and a control group.

Each of the five groups was matched for age, gender and mass.

The graph shows the results of the study.



Adapted from British Medical Journal, 2006, volume 332, pages 1309 –1314.

(a) Give **two** control variables that were used in this study.

1. _____

2. _____

(2)

(b) Give **two** conclusions that can be drawn from the results of this study.

1. _____

_____

2. _____

_____

(2)

(c) The costs of the four programmes were:

- Atkins book cost £3
- Rosemary Conley classes cost £140 for 6 months
- Weight Watchers classes cost £170 for 6 months
- Twice-daily Slim-Fast meal replacements cost £240 for 6 months.

Use this information and the graph to answer this question.

Which is the most cost effective of the four programmes?

_____

Explain the reason for your answer.

_____

_____

_____

_____

(2)

(d) Some slimming programmes include daily exercise.

Explain how daily exercise helps a person to lose mass.

_____

_____

_____

_____

(2)

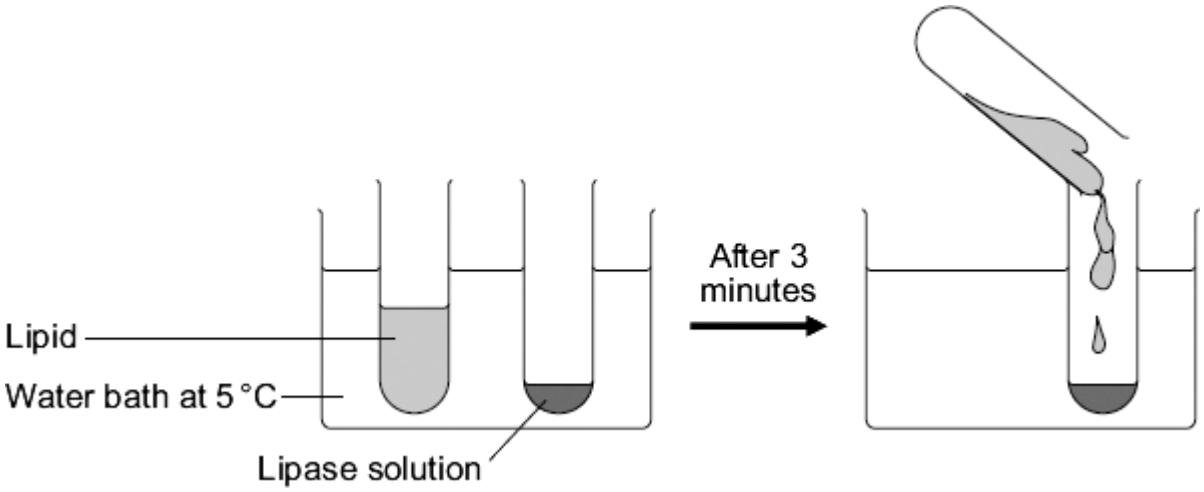
(Total 8 marks)

Q26.

A group of students investigated the effect of temperature on the action of the enzyme lipase.

The students:

- put 1 cm^3 of lipase solution into a test tube
- put 5 cm^3 of lipid into a different test tube
- put both tubes in a water bath at 5 °C for 3 minutes
- mixed the lipid with the lipase solution.



Every five minutes the students tested a sample of the mixture for lipid, until no lipid remained.
The students repeated the experiment at different temperatures.

(a) To make their investigation fair the students needed to control some variables.

Give **one** variable the students controlled in their investigation.

_____

(1)

(b) The tubes of lipase solution and lipid were kept separately in the water bath for 3 minutes before mixing. Why?

Tick (✓) **one** box.

So that the lipase broke down the lipid quickly ☐

So that the lipase and the lipid reached the right temperature ☐

To give enough time for the lipase to break down the lipid ☐

To give enough time for the water bath to heat up ☐

(1)

The table shows the students' results.

Temperature in C	**Time taken until no lipid remained in minutes**
5	40
20	15
35	5
50	30
95	lipid still there after 120 minutes

(c) Describe the effect on the breakdown of the lipid of increasing the temperature from 5 °C to 50 °C.

_____

_____

_____

_____

(2)

(d) Suggest **two** ways in which the students could have improved their investigation.

Use information from the students' method and the results table to help you.

1. _____

_____

_____

2. _____

_____

_____

(2)

(e) (i) The lipase did **not** break down the lipid at 95 °C.

Why?

_____

_____

(1)

(ii) At 35 °C the lipase broke down the lipid after 5 minutes.

What new substances will be in the tube?

Draw a ring around **one** answer.

amino acids **fatty acids and glycerol** **sugars**

(1)

(Total 8 marks)

Q27.

A student removed three similar leaves from a plant. The student spread petroleum jelly (a waterproofing substance) on some of the leaves, as follows:

Leaf A: on the lower surface

Leaf B: on the upper surface

Leaf C: none.

The student placed each leaf in a separate beaker. He weighed each beaker at intervals. The results are shown in the table.

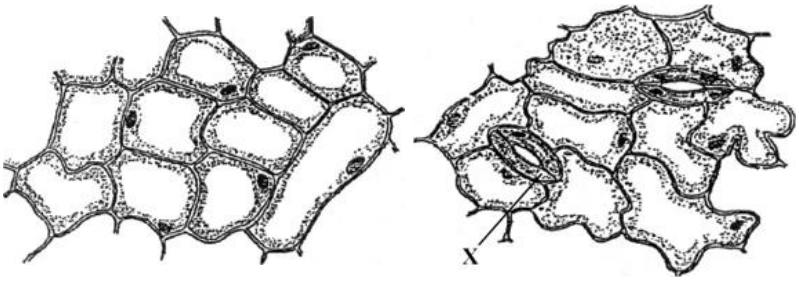
Time in hours	Mass of leaf + beaker in grams		
	Leaf A	Leaf B	Leaf C
0	50.00	55.01	51.99
0	49.99	54.95	51.90
3	49.97	54.90	51.85
5	49.95	54.86	51.80

(a) Which leaf, **A**, **B** or **C**, lost most water? ☐

(1)

(b) The diagram shows the appearance of the upper and lower surfaces of one of the leaves under a microscope.

Upper surface of leaf **Lower surface of leaf**



(i) Name cell **X**. _____

(1)

(ii) The petroleum jelly had a greater effect when it was spread on the lower surface
than when it was spread on the upper surface.

Use information from the diagram to explain why.

_____

_____

_____

_____

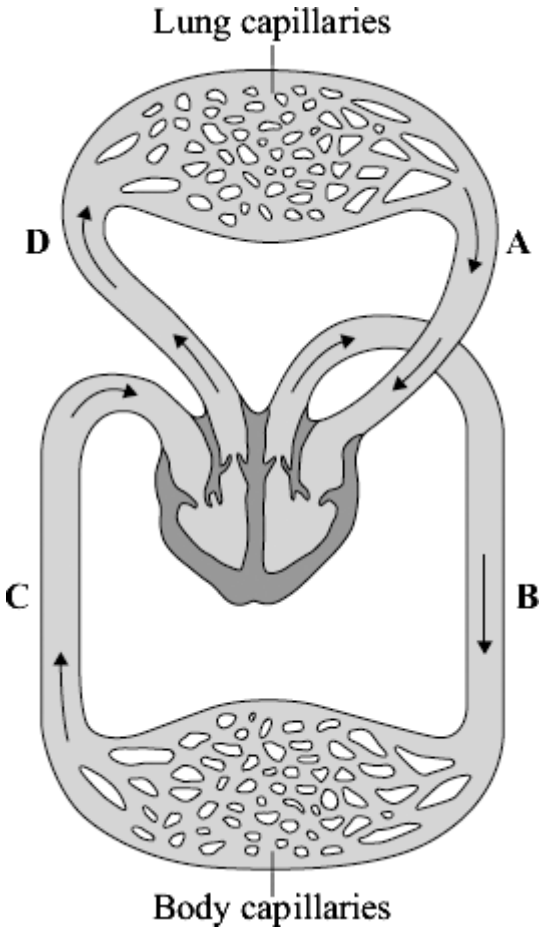
_____

(2)

(Total 4 marks)

Q28.

The diagram shows the human circulation system.



(a) (i) Give the letter of **one** blood vessel that is an artery.

(1)

(ii) Give the letter of **one** blood vessel that carries oxygenated blood.

(1)

(b) During exercise, the heart rate increases.

Explain, as fully as you can, why this increase is necessary.

_____

_____

(4)

(Total 6 marks)

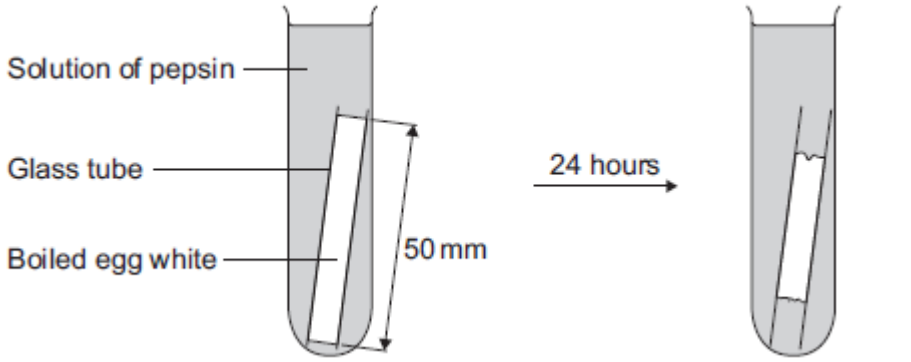
Q29.

Some students investigated the effect of pH on the digestion of boiled egg white by an enzyme called pepsin. Egg white contains protein.

The students:

- put a glass tube containing boiled egg white into a test tube
- added a solution containing pepsin at pH 7
- set up six more tubes with solutions of pepsin at different pH values
- left the test tubes for 24 hours at room temperature.

The image below shows one of the test tubes, at the start and at the end of the 24 hours.



(a) (i) Name the product of protein digestion.

_____

(1)

(ii) What type of enzyme digests protein?

Tick (✓) **one** box.

amylase ☐

lipase ☐

protease ☐

(1)

(b) The egg white in each tube was 50 mm long at the start of the investigation.
The table below shows the students' results.

pH	Length in mm of boiled egg white after 24 hours
1	38
2	20
3	34
4	45
5	50
6	50
7	50

(i) At which pH did the pepsin work best?

pH _____

(1)

(ii) The answer you gave in part **(b)(i)** may not be the exact pH at which pepsin works best.

What could the students do to find a more accurate value for this pH?

_____

_____

_____

_____

(2)

(iii) There was no change in the length of the egg white from pH 5 to pH 7.

Explain why.

_____

_____

_____

_____

(2)

(c) Pepsin is made by the stomach.

Name the acid made by the stomach which allows pepsin to work well.

_____

(1)

(Total 8 marks)

Q30.

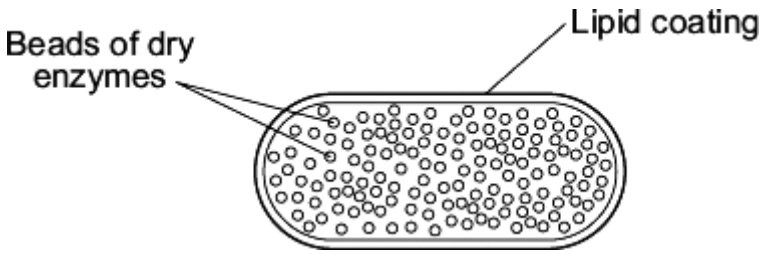
A patient has a disease. The disease damages his pancreas.

A doctor prescribes a course of treatment for the patient:
'Take one capsule with each meal.'

Each capsule contains hundreds of small, dry beads.

The beads are made of enzymes. The pancreas normally produces these enzymes.

The outer coating of the capsule is made of lipid.



(a) One enzyme in the beads is lipase.

In a healthy person, lipase is made in the pancreas.

Name **two** other enzymes made in the pancreas of a healthy person.

1. _____

2. _____

(2)

(b) The lipid coating on the capsule makes sure that the enzymes are not released until the capsule reaches the small intestine.

Explain how.

_____

_____

_____

_____

_____

(2)

(c) The lipase in the beads does **not** digest the lipid coating around the capsule.

Suggest why.

_____

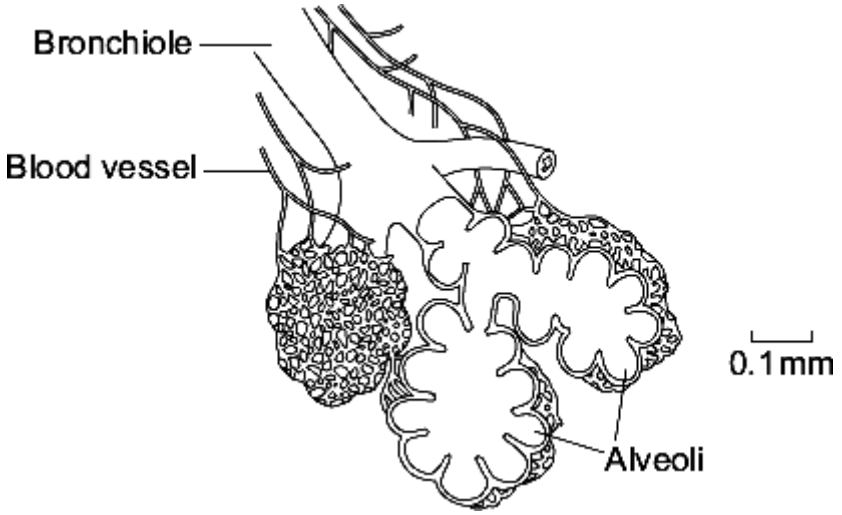
_____

(1)

(Total 5 marks)

Q31.

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)

Q32.

Scientists estimate that about one third of cancers in the UK may be linked to obesity.

Name **two** diseases linked to obesity.

Do **not** give cancer as one of your answers.

1. _____

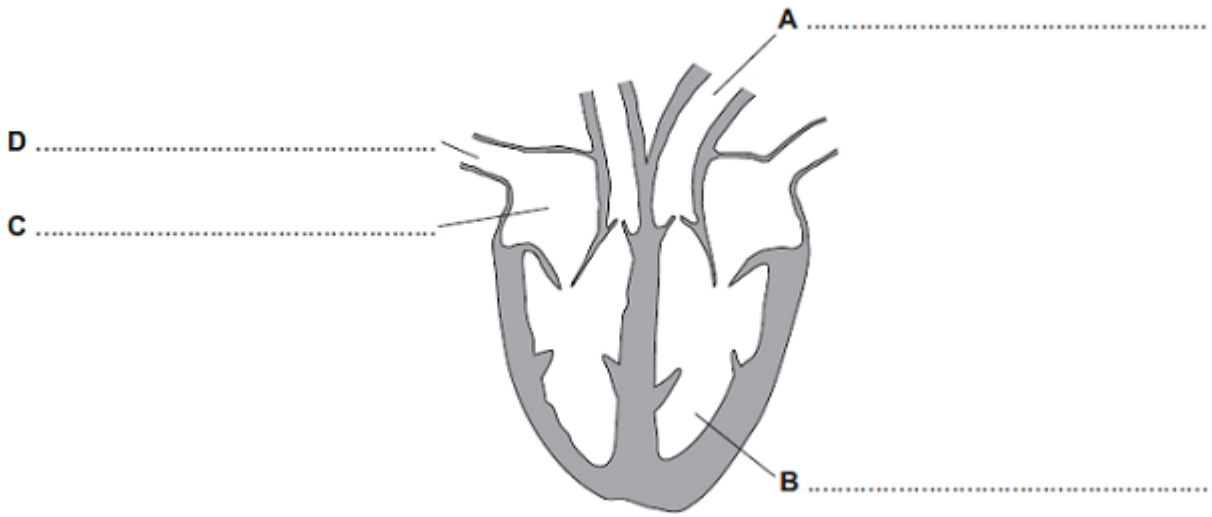
2. _____

(Total 2 marks)

Q33.

Diagram 1 shows a section through the heart.

Diagram 1



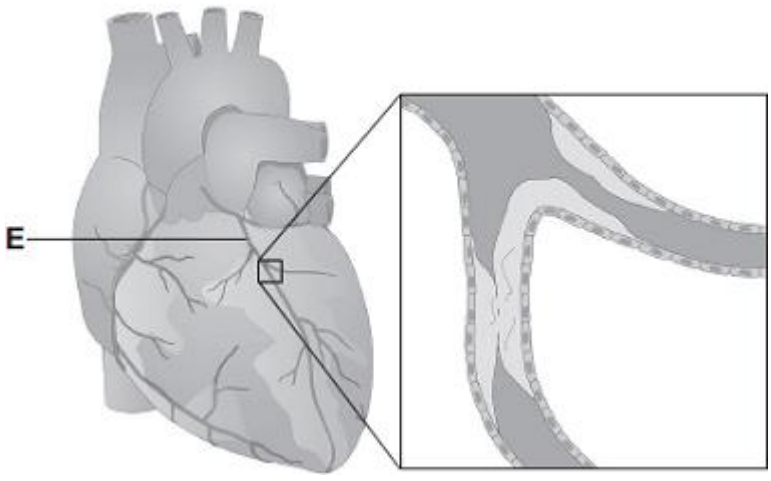
(a) On the diagram, name the parts labelled **A**, **B**, **C** and **D**.

(4)

(b) **Diagram 2** shows the blood vessels that supply the heart muscle.

Part of one of the blood vessels has become narrower.

Diagram 2



(i) Name blood vessel **E**.

_____

(1)

(ii) Give **one** method of treating the narrowed part of blood vessel **E**.

_____

(1)

(iii) Explain how the method of treatment works.

_____

_____

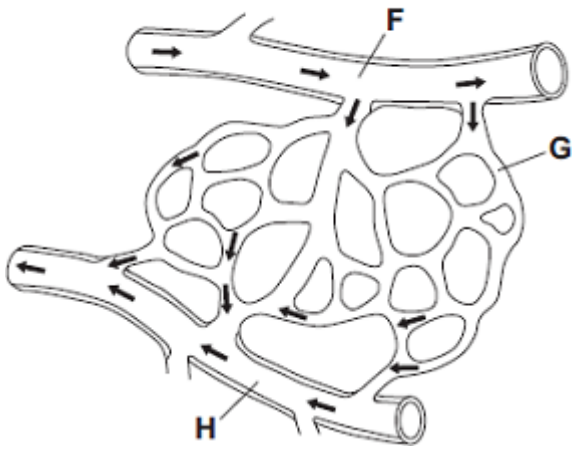
_____

_____

(2)

(c) **Diagram 3** shows part of the blood supply in the lungs.

Diagram 3



(i) Name the types of blood vessel labelled **F**, **G** and **H**.

F _____

G _____

H _____

(3)

(ii) Give **one** way in which the composition of the blood in vessel **F** is different from the composition of the blood in vessel **H**.

_____

_____

(1)

(Total 12 marks)

Q34.

Scientists at a drug company developed a new pain-killing drug, drug **X**.

(a) Painkillers do **not** cure infectious diseases.

Why?

_____

(1)

(b) The scientists compared drug **X** with two other pain-killing drugs, drug **A** and drug **B**.

In their investigation the scientists:

- chose 600 volunteers. The volunteers were all in pain
- gave 200 of the volunteers a standard dose of drug **A**
- gave 200 of the volunteers a standard dose of drug **B**
- gave 200 of the volunteers a standard dose of drug **X**.

Over the next seven hours the volunteers recorded how much pain they felt.

To get valid results the three groups of volunteers should be matched for as many factors as possible.

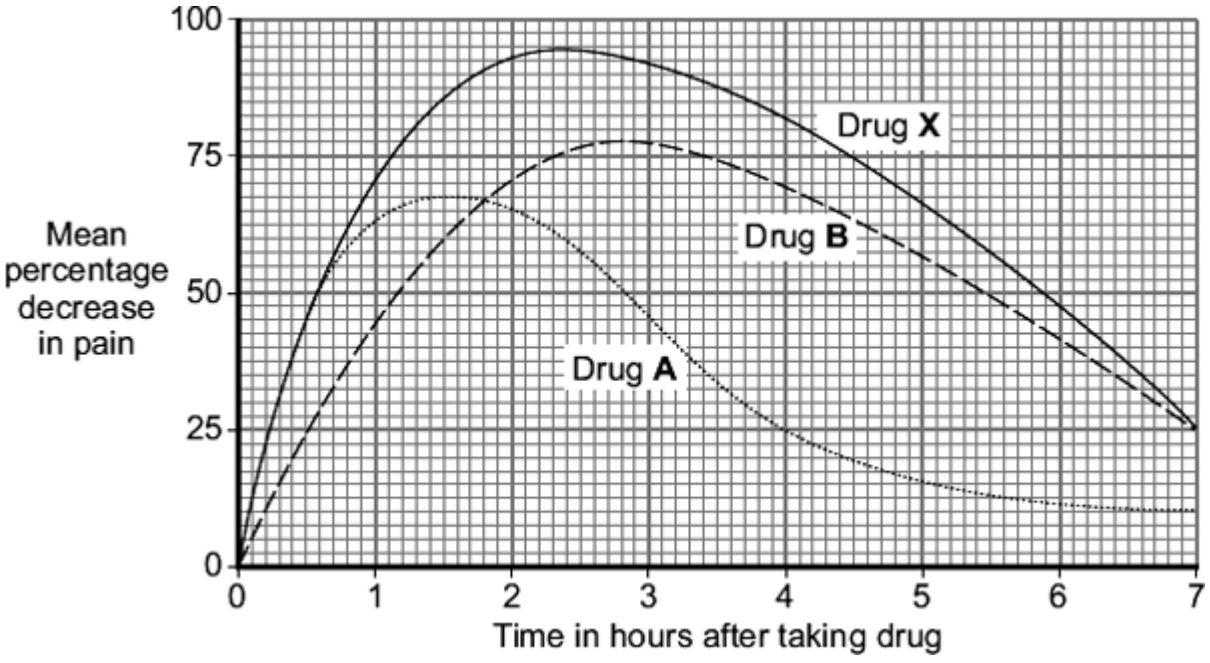
Suggest **two** of the factors that should be matched.

_____

_____

(2)

(c) The graph shows the results of the investigation.



(i) How much pain did the volunteers still feel, four hours after taking drug **A**?

_____ percent

(1)

(ii) Give **one** advantage of taking drug **A** and **not** drug **B**.

_____

_____

(1)

(iii) Give **two** advantages of taking drug **B** and **not** drug **A**.

_____

_____

_____

_____

(2)

(d) Drug **X** is much more expensive than both drug **A** and drug **B**.

A pharmacist advised a customer that it would be just as good to take drug **A** and drug **B** together instead of drug **X**.

Do you agree with the pharmacist's advice?

Give reasons for your answer.

_____

_____

_____

_____

_____

_____

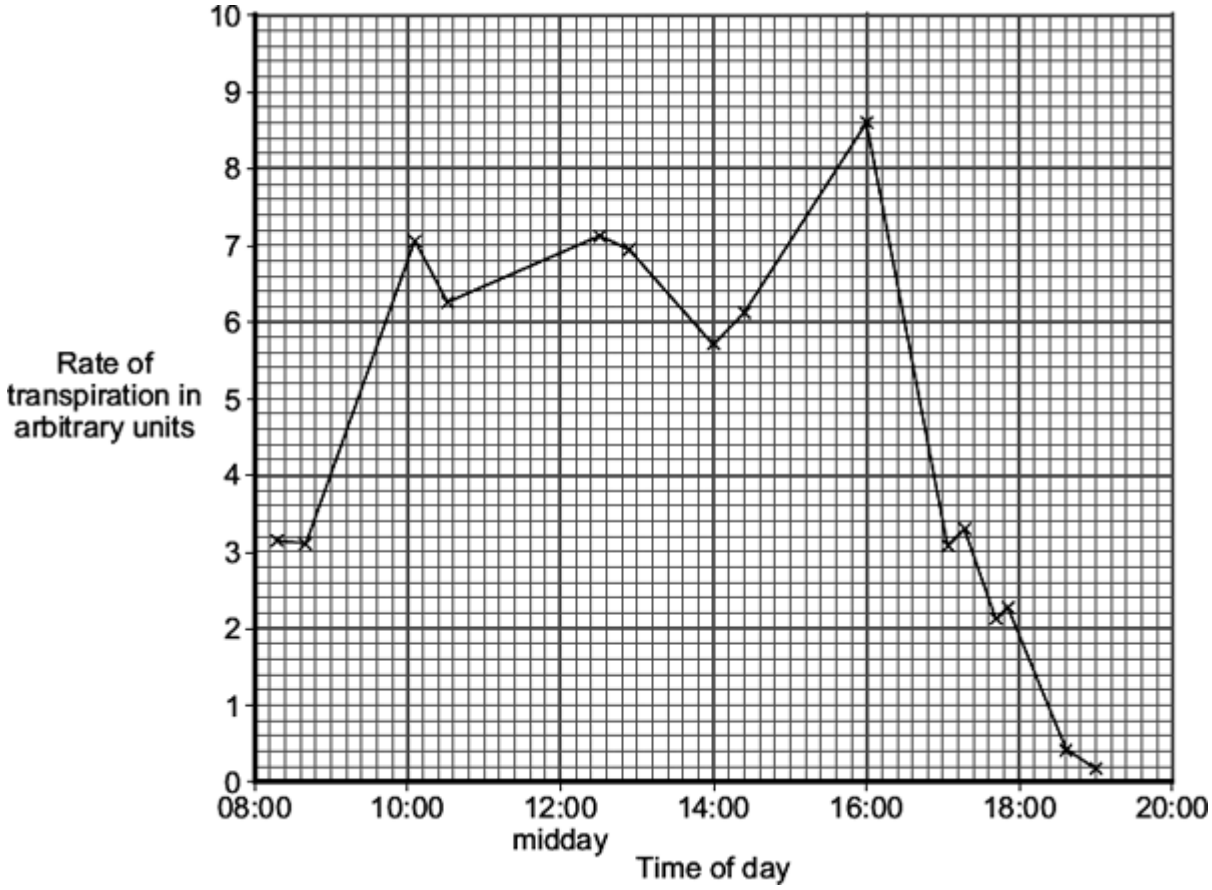
_____

(3)

(Total 10 marks)

Q35.

The graph shows the rate of transpiration from a plant at different times of the day.



Transpiration occurs mainly in the leaves of a plant.

(a) (i) What is *transpiration*?

_____

_____

_____

_____

(2)

(ii) Through which part of a leaf does most transpiration occur?

_____

(1)

(b) In this investigation, the rate of transpiration decreases between 16:00 hours and 19:00 hours.

(i) Calculate the average rate of decrease per hour in the rate of transpiration over this time.

Show clearly how you work out your answer.

_____

_____

_____

_____

Rate = _____ arbitrary units per hour

(2)

(ii) Suggest **one** explanation for the decrease in the rate of transpiration between 16:00 hours and 19:00 hours.

_____

_____

_____

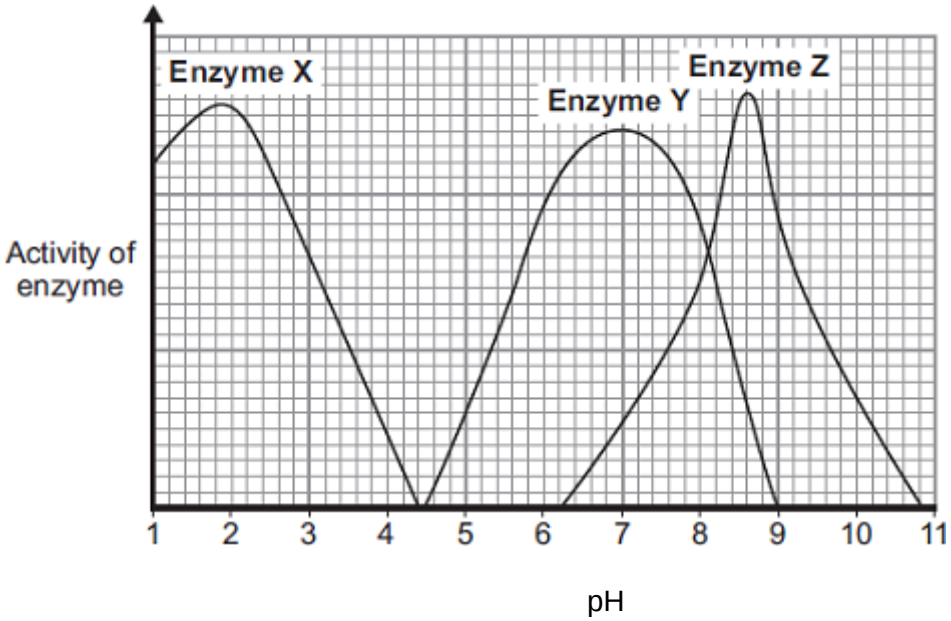
_____

(2)

(Total 7 marks)

Q36.

(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)

(b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Different parts of the human digestive system help to break down molecules of fat so that they can be absorbed into the body.

Describe how.

To gain full marks you should refer to:

- the enzyme and where the enzyme is produced
- the products of digestion
- any other chemicals involved.

(6)

(Total 9 marks)

Q37.

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.

_____

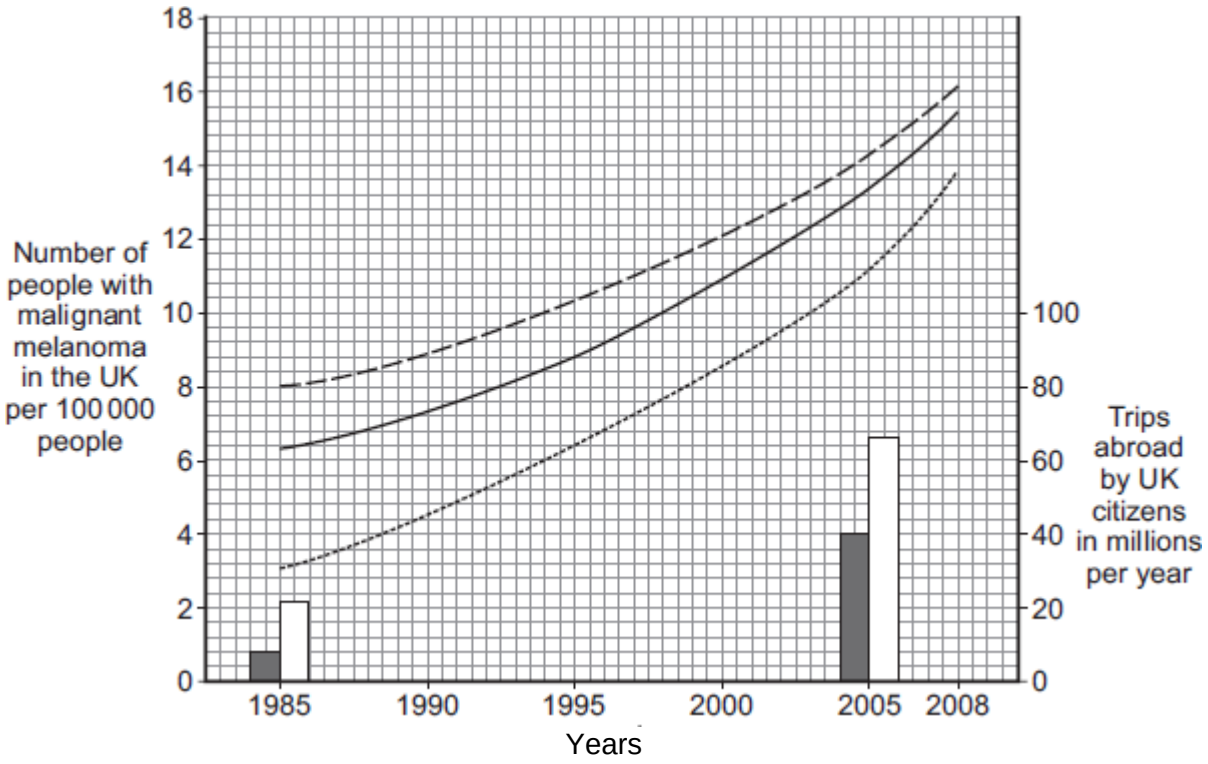
_____

(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)

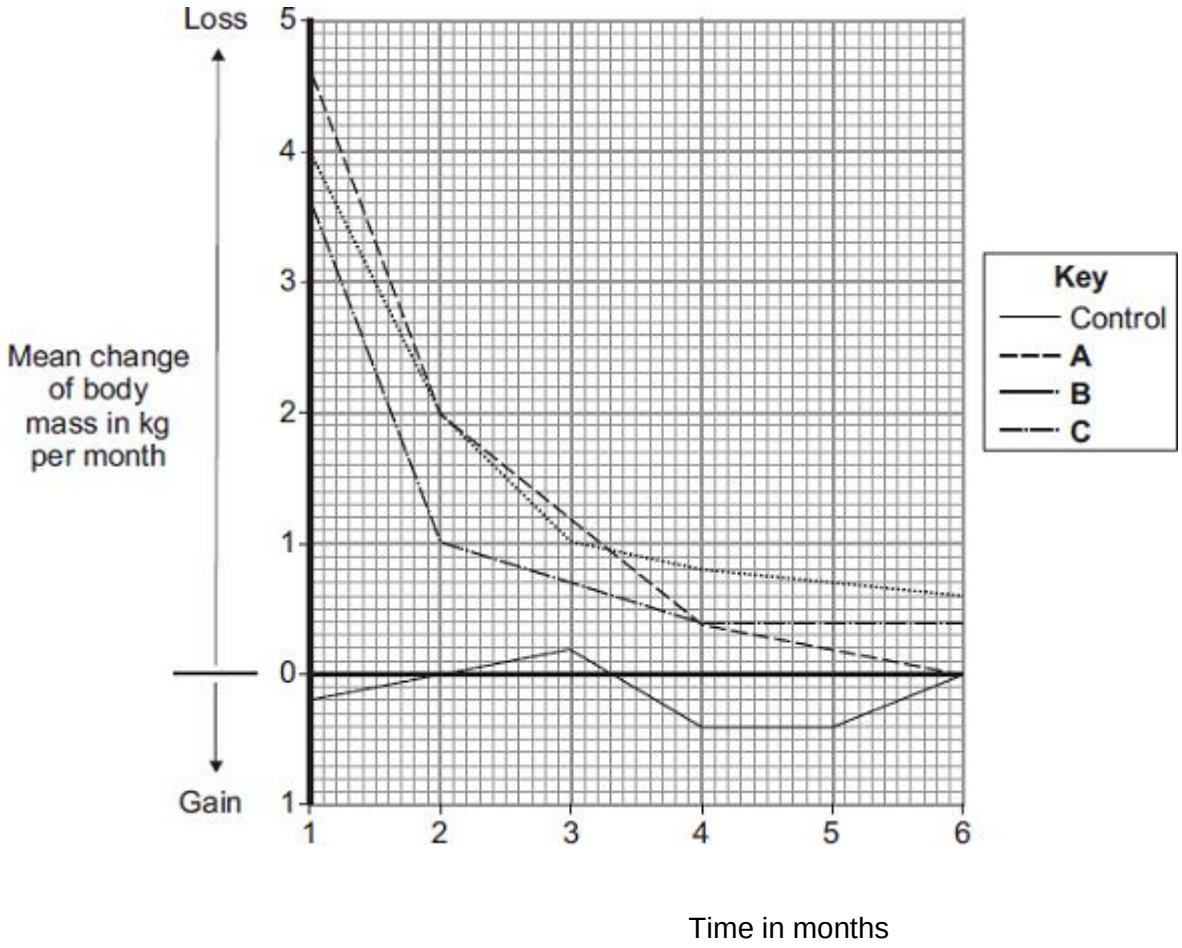
(Total 8 marks)

Q38.

Scientists investigated the effectiveness of three slimming programmes, **A**, **B** and **C**.

The scientists recorded the body mass of four groups of volunteers each month for 6 months. Three of the groups were each given a different slimming programme. The fourth group was a control group.

The graph shows the mean change of body mass each month for all four groups.



(a) (i) What should the control group eat?

_____

_____

(1)

(ii) Why did the scientists include a control group in this study?

_____

_____

(1)

(b) (i) The three groups of volunteers using the slimming programmes each showed a similar pattern of body mass loss over the 6 months.

Describe this pattern.

_____

_____

_____

_____

(2)

(ii) All the slimming programmes seemed to be effective.

How does the information in the graph show this?

_____

_____

(1)

(Total 5 marks)

Q39.

One factor that may affect body mass is *metabolic rate*.

(a) (i) What is meant by *metabolic rate* ?

_____

_____

(1)

(ii) Metabolic rate is affected by the amount of activity a person does.

Give **two** other factors that may affect a person's metabolic rate.

1. _____

_____

2. _____

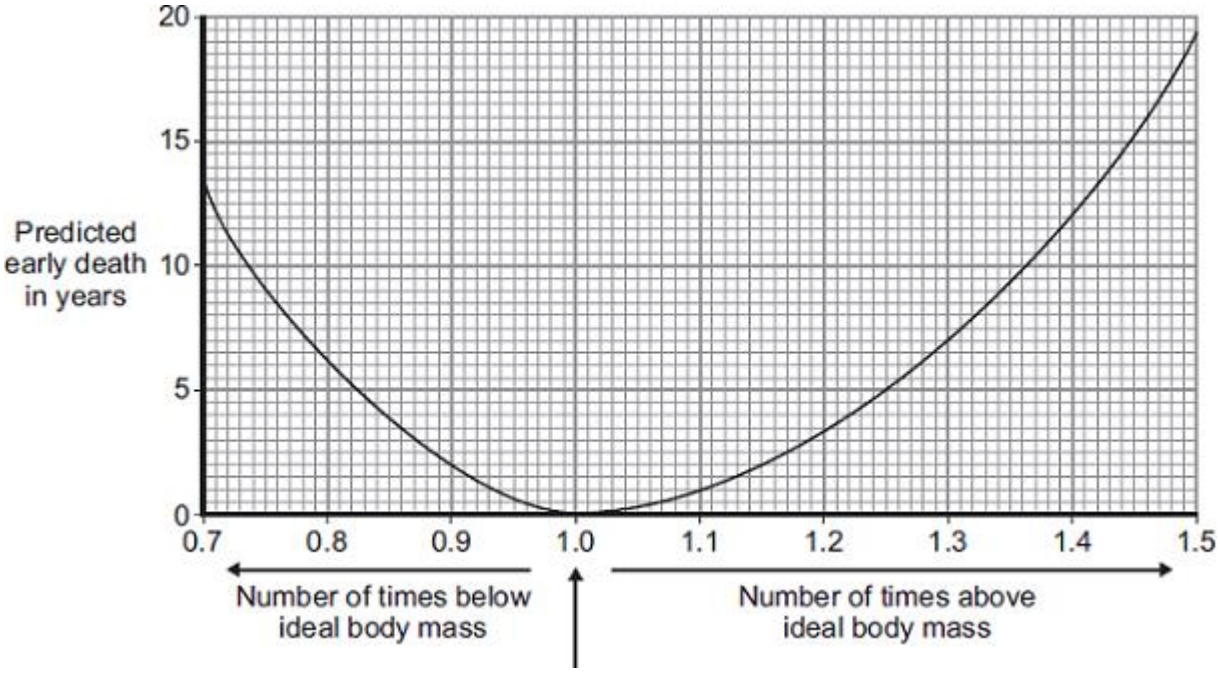
_____

(2)

(b) Predicted early death is the number of years that a person will die before the mean age of death for the whole population. The predicted early death of a person is affected by their body mass.

Scientists have calculated the effect of body mass on predicted early death.

The graph shows the results of the scientists' calculations.



The number of times above or below ideal body mass is given by the equation:

$$\frac{\text{Actual body mass}}{\text{Ideal body mass}}$$

In the UK the mean age of death for women is 82.

A woman has a body mass of 70 kg. The woman's ideal body mass is 56 kg.

(i) Use the information from the graph to predict the age of this woman when she dies.

_____

_____

_____

Age at death = _____ years

(2)

(ii) The woman could live longer by changing her lifestyle.

Give **two** changes she should make.

1. _____

_____

2. _____

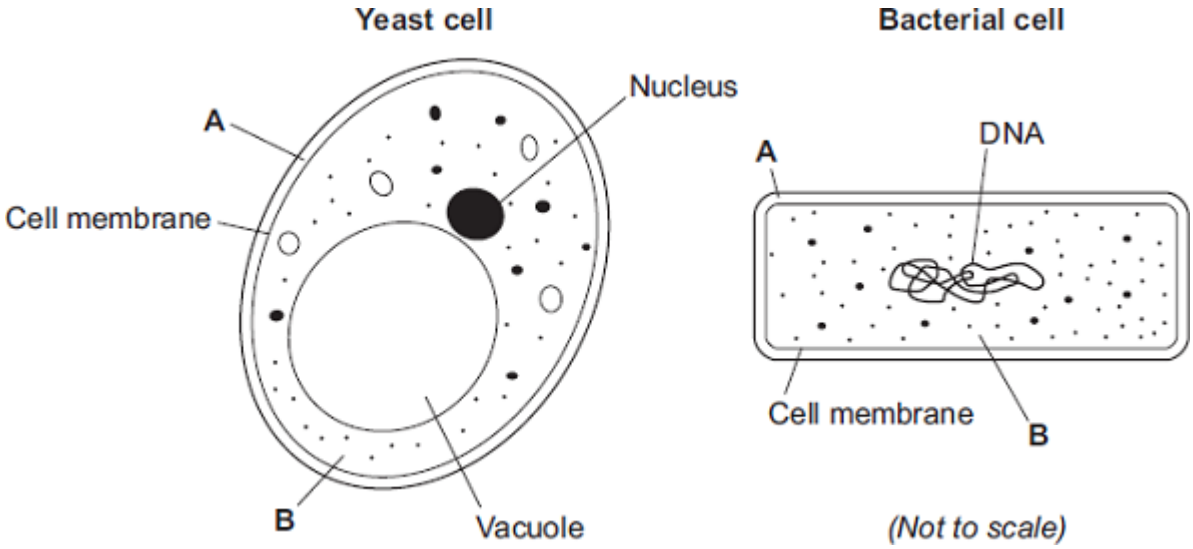
_____

(2)

(Total 7 marks)

Q40.

(a) The diagrams show the structures of a yeast cell and a bacterial cell.



(i) Both the yeast cell and the bacterial cell have structures **A** and **B**.

Name structures **A** and **B**.

A _____

B _____

(2)

(ii) The yeast cell and the bacterial cell have different shapes and sizes.

Give **one** other way in which the structure of the bacterial cell is different from the structure of the yeast cell.

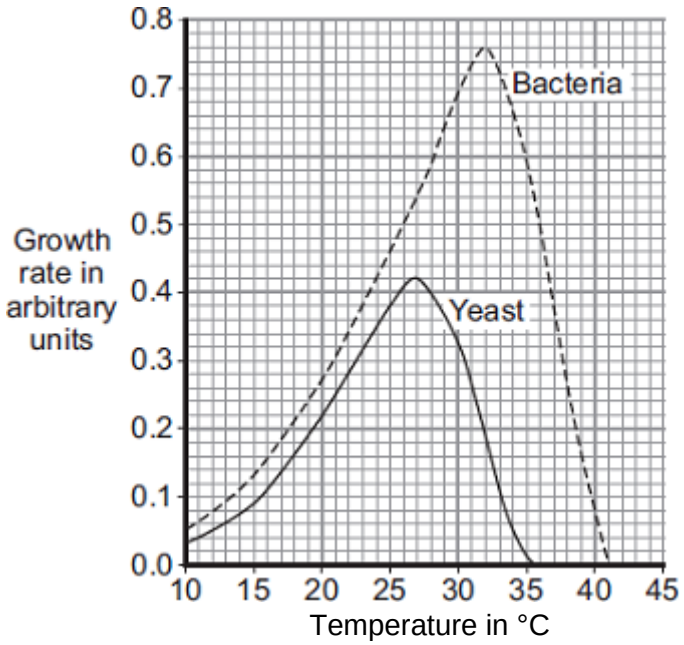
_____

_____

(1)

(b) Sourdough bread is light in texture and tastes slightly sour. The bread is made using two types of microorganism, a yeast and a bacterium. The bacterium can make acids such as lactic acid. The acid makes the bread taste sour.

The graph shows how the growth rates of the yeast and the bacteria change with temperature.



(i) Sourdough bread rises fastest at 27°C.

Use information from the graph to explain why.

_____

_____

_____

_____

(2)

(ii) The bread tastes most sour if it rises at 32°C.

Use information from the graph to explain why.

_____

_____

_____

_____

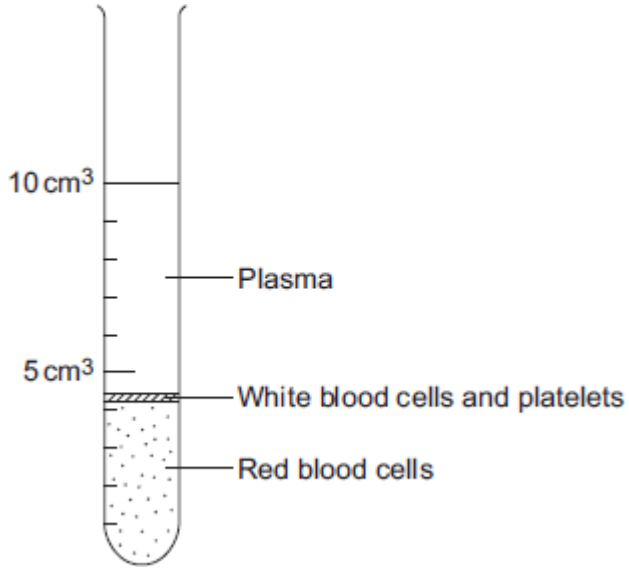
(2)

(Total 7 marks)

Q41.

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)

(c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

White blood cells are part of the immune system. White blood cells help the body to defend itself against pathogens.

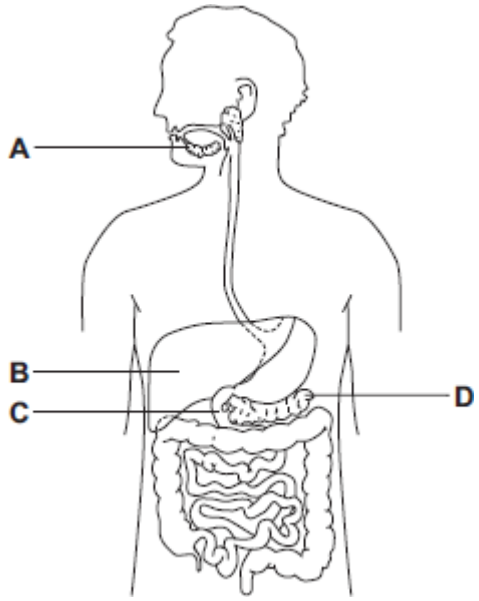
Describe how pathogens cause infections **and** describe how the immune system defends the body against these pathogens.

(6)

(Total 11 marks)

Q42.

The diagram shows part of the human digestive system.



(a) Name the parts of the digestive system labelled **A**, **B**, **C** and **D**.

A _____

B _____

C _____

D _____

(4)

(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.

_____

_____

_____

_____

_____

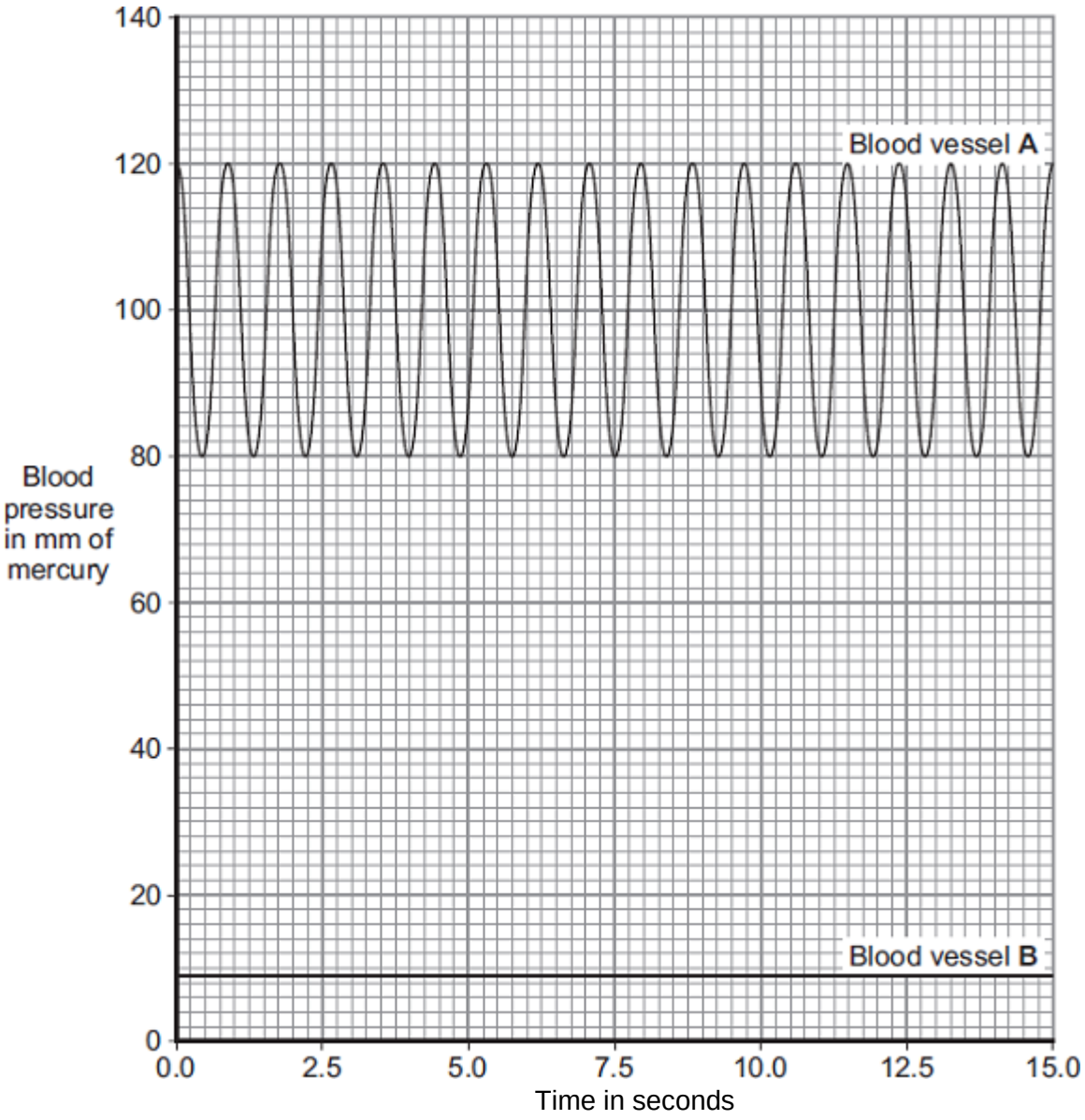
(3)

(Total 15 marks)

Q43.

The heart pumps the blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



(a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel _____

Give **two** reasons for your answer.

Reason 1 _____

_____

Reason 2 _____

_____

(2)

(b) Use information from the graph to answer these questions.

(i) How many times did the heart beat in 15 seconds? _____

(1)

(ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

_____

_____

Heart rate = _____ beats per minute

(1)

(c) During exercise, the heart rate increases.

The increased heart rate supplies useful substances to the muscles at a faster rate.

Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1. _____

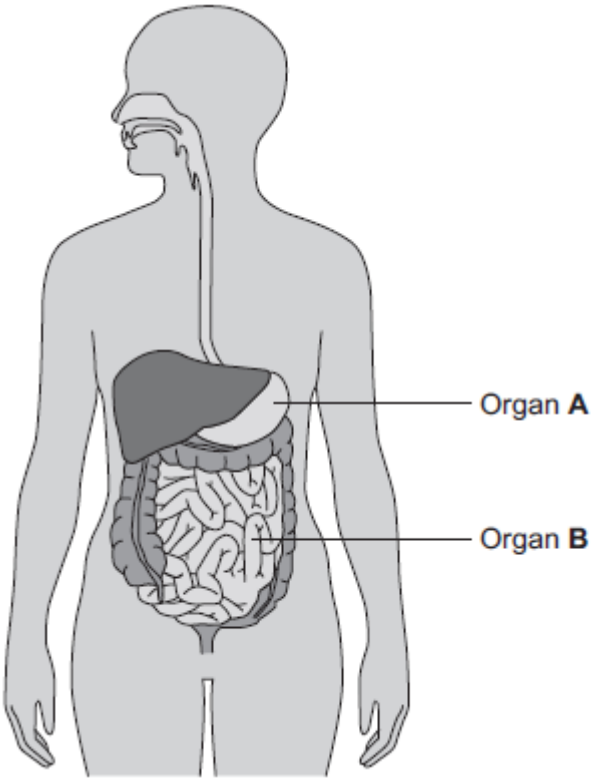
2. _____

(2)

(Total 6 marks)

Q44.

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)

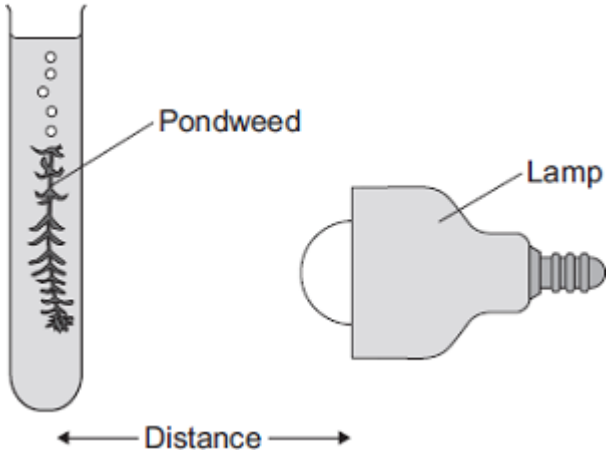
(Total 8 marks)

Q45.

Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

Diagram 1



The students:

- placed the lamp 10 cm from the pondweed

- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

(a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

_____

_____

(1)

(b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

(i) At distances between 15 cm and 50 cm, light was a limiting factor for photosynthesis.

What evidence is there for this in the table?

_____

_____

(1)

(ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10 cm and 15 cm.

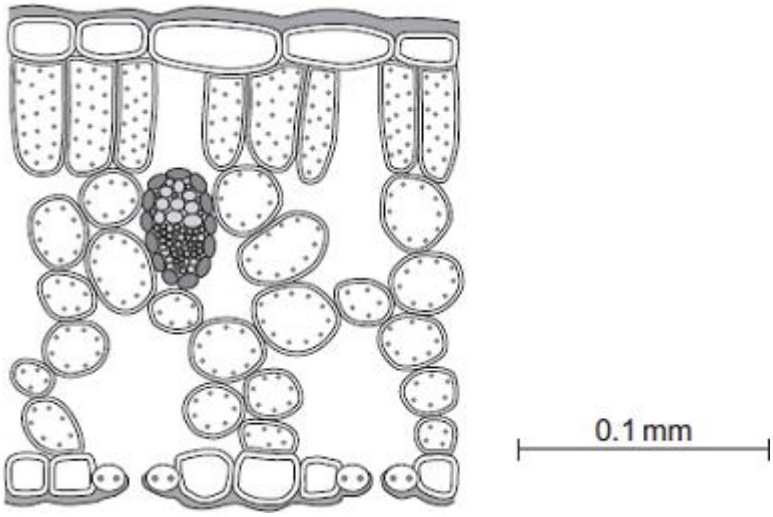
_____

(1)

(c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Diagram 2 shows a section through a plant leaf.

Diagram 2



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

(6)

(Total 9 marks)

Q46.

Plant roots absorb water from the soil by osmosis.

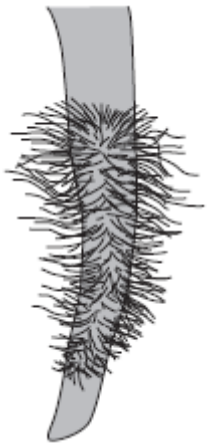
(a) What is osmosis?

_____

_____

(3)

(b) The image below shows part of a plant root.



The plant root is adapted for absorbing water from the soil.

Use information from the diagram to explain how this plant root is adapted for absorbing water.

_____

_____

_____

_____

_____

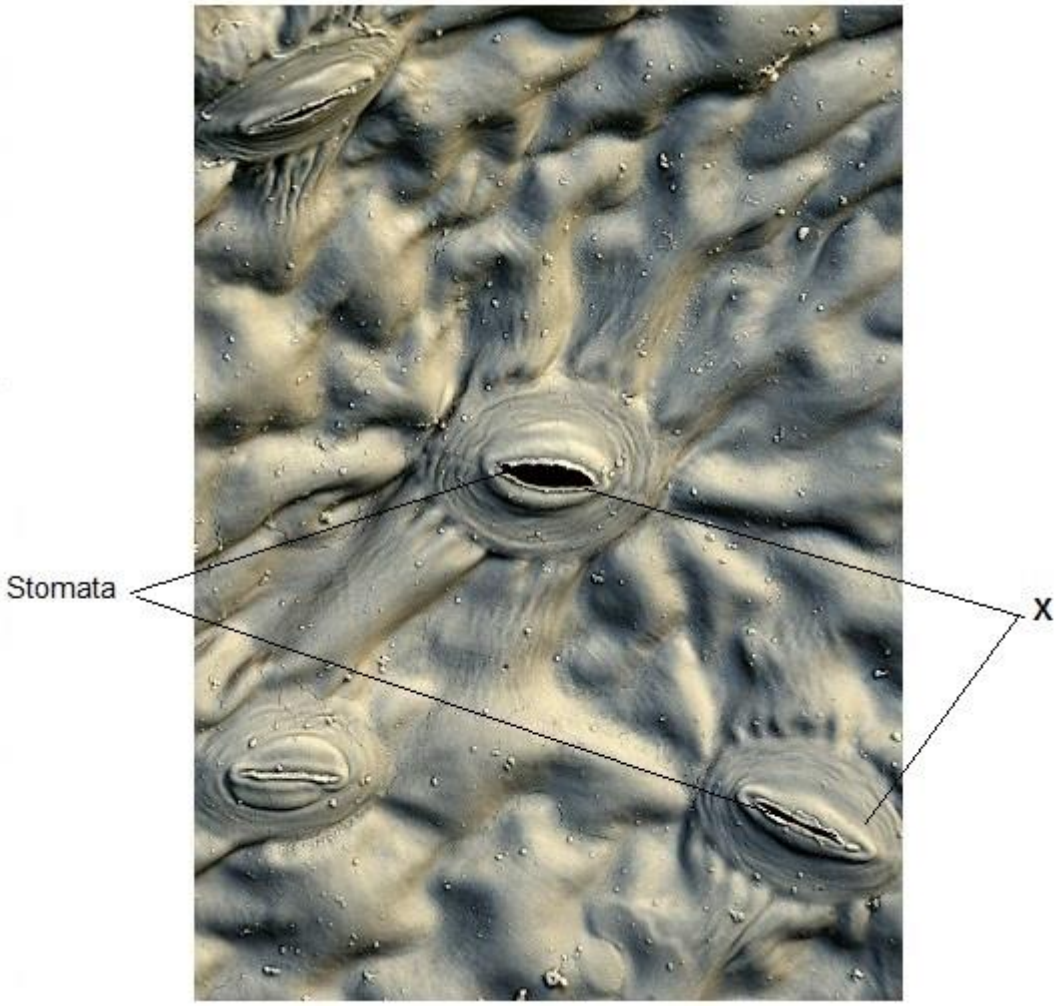
_____

(3)

(Total 6 marks)

Q47.

The image below shows some cells on the lower surface of a leaf.



(a) What are the cells labelled **X** called?

Draw a ring around the correct answer.

guard cells **palisade cells** **mesophyll cells**

(1)

(b) Water loss by evaporation from leaves is called **transpiration**.

A student set up an experiment to investigate water loss from leaves.

The student:

- took two leaves, **A** and **B**, from a plant
- put Vaseline (grease) on both sides of **Leaf B**; did nothing to **Leaf A**
- wrote down the mass of each leaf
- attached the leaves onto a string as shown in the diagram below.

Leaf A (no treatment)	**Leaf B** (both surfaces covered in Vaseline)

- left the leaves for 48 hours
- wrote down the mass of each leaf again
- calculated the percentage (%) change in mass for each leaf.

(i) Give **one** variable that the student controlled in this investigation.

_____

_____

(1)

(ii) The mass of **Leaf A** was 1.60 g at the start of the investigation. After 48 hours it was 1.28 g.

Calculate the % decrease in mass over 48 hours.

_____

_____

% decrease = _____

(2)

(c) Vaseline blocks the stomata.

The % change in mass of **Leaf B** was less than **Leaf A** after 48 hours.
Explain why.

_____

_____

_____

(1)

(d) Give **three** environmental conditions that would increase transpiration.

1. _____

2. _____

3 _____

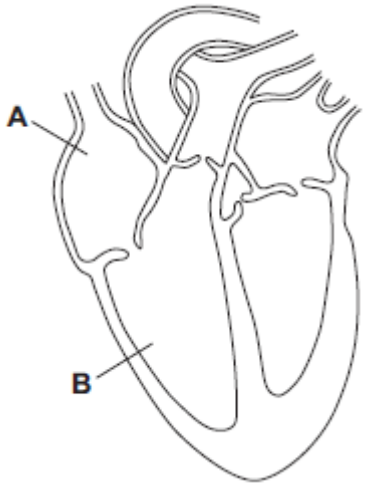
(3)

(Total 8 marks)

Q48.

Diagram 1 shows a section through the heart.

Diagram 1



(a) Use words from the box to name the structures labelled **A** and **B** on **Diagram 1**.

arota	**atrium**	**pulmonary artery**	**ventricle**

A _____

B _____

(2)

(b) The tissue in the wall of the heart contracts.

(i) What type of tissue is this?

Tick (✓) **one** box.

muscular ☐

glandular ☐

epithelial ☐

(1)

(ii) What does the heart do when this tissue contracts?

_____

_____

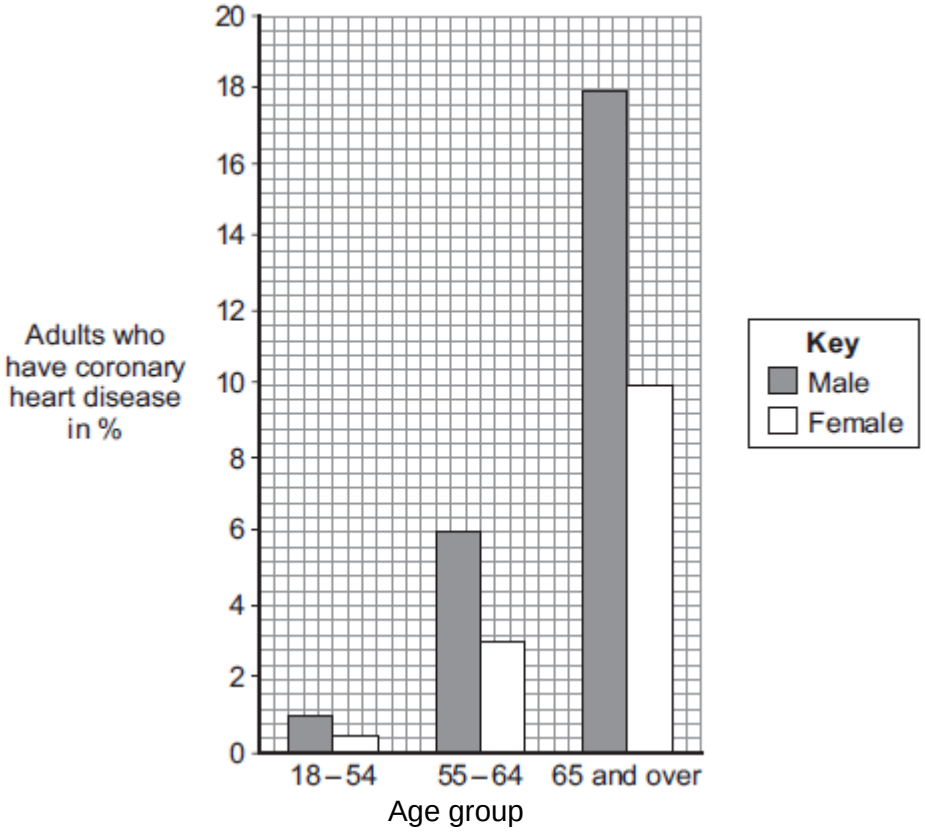
(1)

(c) Draw arrows on **Diagram 2** to complete the route taken by deoxygenated blood through the heart.

Diagram 2

(2)

(d) The graph shows the percentage (%) of adults in the UK who have coronary heart disease.



(i) Look at the graph.

Which group of people is **most** at risk of having coronary heart disease in the UK?

_____

(2)

(ii) Explain what happens to the heart in coronary heart disease.

_____

_____

_____

_____

_____

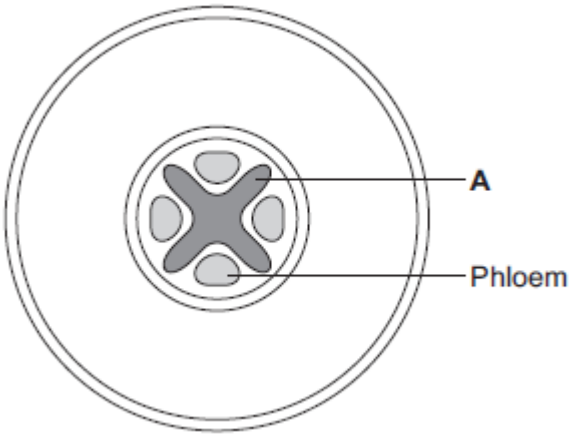
_____

(3)

(Total 11 marks)

Q49.

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.

_____

_____

_____

_____

_____

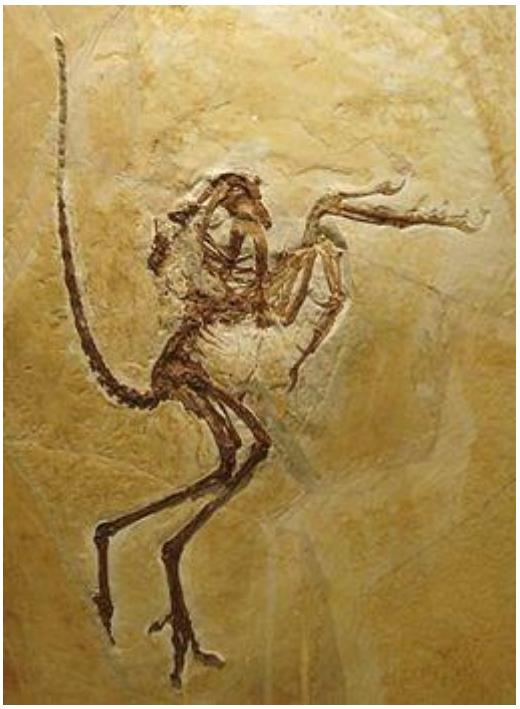
_____

(2)

(Total 9 marks)

Q50.

The photograph shows a fossil of a prehistoric bird called *Archaeopteryx*.



By Ghedoghedo (own work) [CC-BY-SA-3.0 (http://creativecommons.org/licenses/BY-SA-3.0) or GFDL (http://www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons; By Steenbergs from Ripon, United Kingdom (Small Fishing Boat In North Sea) [CC-BY-2.0 (http://creativecommons.org/licenses/by/2.0)], via Wikimedia Commons.

(a) Describe **three** ways fossils can be made.

_____

_____

_____

_____

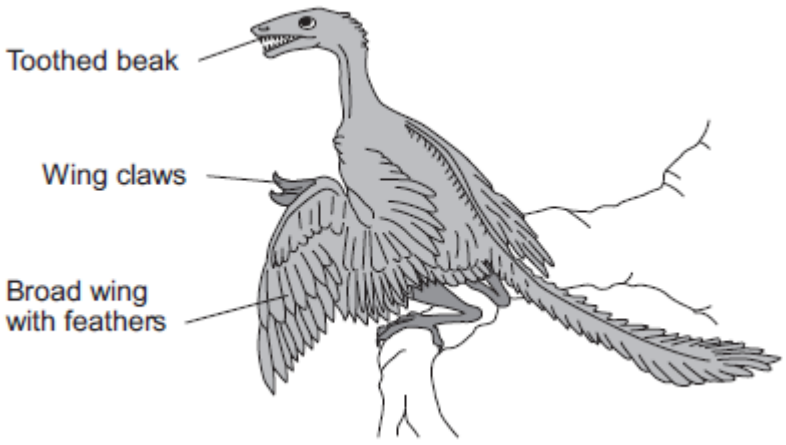
_____

_____

(3)

(b) The drawing shows what an *Archaeopteryx* might have looked like when it was alive.

Scientists think that *Archaeopteryx* was a predator.



(i) Look at the drawing.

Write down **three** adaptations that might have helped *Archaeopteryx* to catch prey.

How would **each** adaptation have helped *Archaeopteryx* to catch prey?

Adaptation 1 _____

How it helps _____

_____

Adaptation 2 _____

How it helps _____

_____

Adaptation 3 _____

How it helps _____

_____

(3)

(ii) *Archaeopteryx* is now extinct.

Give **two** reasons why animals may become extinct.

1. _____

_____

2. _____

_____

(2)

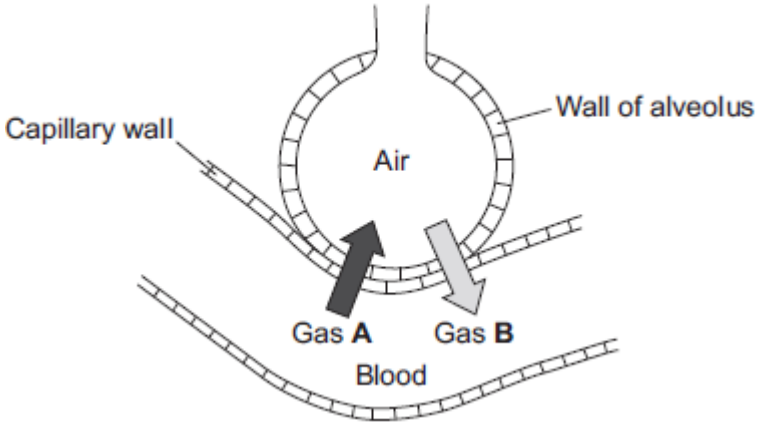
(Total 8 marks)

Q51.

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)

(Total 6 marks)

Q52.

The circulatory system transports substances such as glucose and oxygen around the body.

(a) Name **two** other substances that the circulatory system transports around the body.

1. _____

2. _____

(2)

(b) (i) Blood is a tissue. Blood contains red blood cells and white blood cells.

Name **two** other components of blood.

1. _____

2. _____

(2)

(ii) The heart is part of the circulatory system.

What type of tissue is the wall of the heart made of?

_____

(1)

(c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Every year, many patients need to have heart valve replacements.

The table gives information about two types of heart valve.

Living human heart valve	Cow tissue heart valve
• It has been used for transplants for more than 12 years. • It can take many years to find a suitable human donor. • It is transplanted during an operation after a donor has been found. • During the operation, the patient's chest is opened and the old valve is removed before the new valve is transplanted.	• It has been used since 2011. • It is made from the artery tissue of a cow. • It is attached to a stent and inserted inside the existing faulty valve. • A doctor inserts the stent into a blood vessel in the leg and pushes it through the blood vessel to the heart.

A patient needs a heart valve replacement. A doctor recommends the use of a cow tissue heart valve.

Give the advantages and disadvantages of using a cow tissue heart valve compared with using a living human heart valve.

Use information from the table and your own knowledge in your answer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 11 marks)

Q53.

Lipase is an enzyme that digests fat.

(a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + _____

(1)

(ii) Name **one** organ that makes lipase.

_____

(1)

(b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:

1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

1. _____

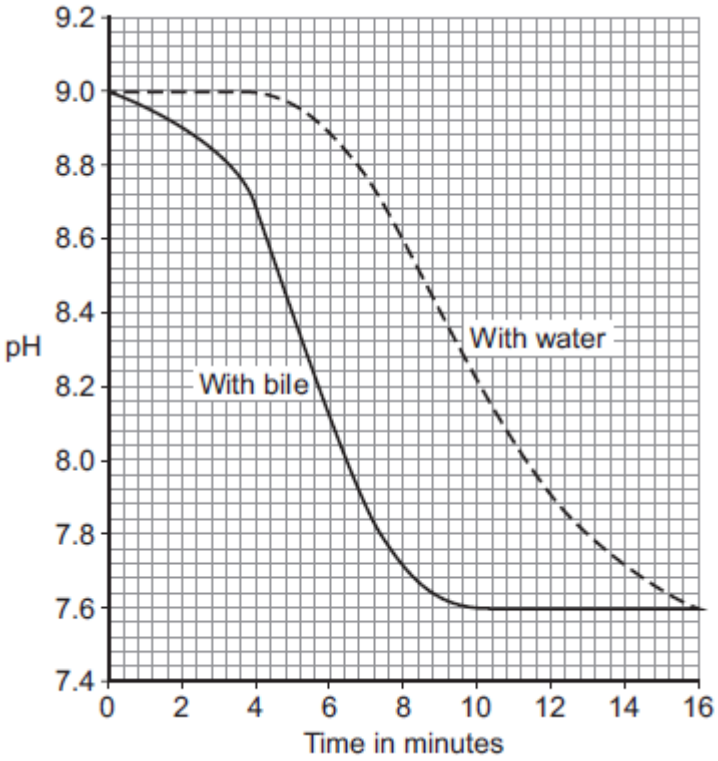
_____

2. _____

_____

(2)

(c) The graph shows the students' results.



(i) Why did the pH decrease in both investigations?

_____

_____

(1)

(ii) Bile helps lipase to digest fat.

What evidence is there in the graph to support this conclusion?

_____

_____

(1)

(iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

_____

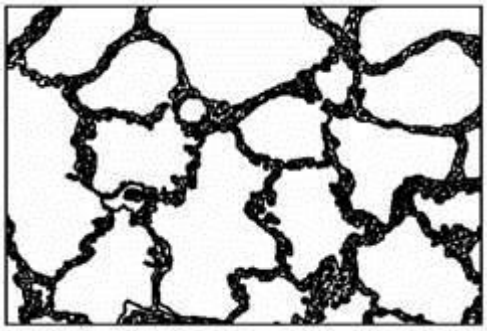
_____

(1)

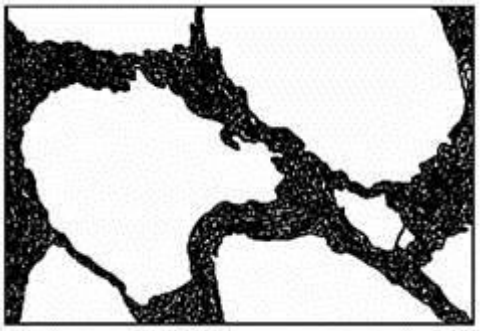
(Total 7 marks)

Q54.

Emphysema is a disease of the lungs. People who smoke cigarettes are more likely to suffer from emphysema. The diagrams show lung tissue from a healthy person and lung tissue from a person with emphysema. The diagrams are drawn to the same scale.



Lung tissue from a healthy person



Lung tissue from a person with emphysema

Explain how emphysema reduces the amount of oxygen which diffuses into the blood

_____

_____

_____

(Total 2 marks)

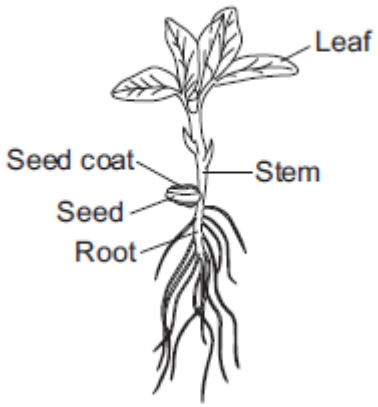
Q55.

Catalase is an enzyme found in many different tissues in plants and animals.It speeds up the rate of the following reaction.

$$\text{hydrogen peroxide} \xrightarrow{\text{catalase}} \text{water + oxygen}$$

Figure 1 shows a 25-day-old broad bean seedling.

Figure 1



Some students investigated whether different parts of bean seedlings contained different amounts of catalase.

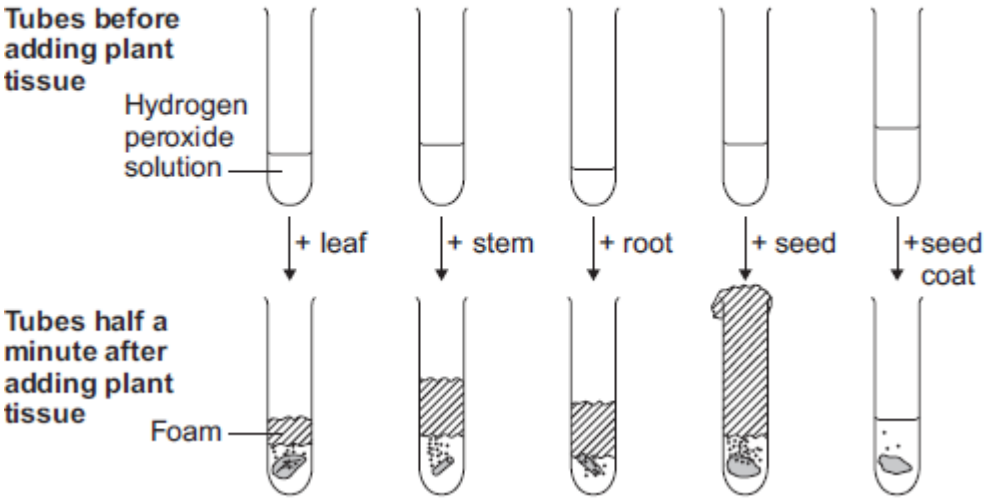
The students:

- put hydrogen peroxide into five test tubes
- added a different part of a bean seedling to each tube
- recorded the results after half a minute.

If there was catalase in part of the seedling, oxygen gas was given off.
When oxygen gas is given off, foam is produced in the tubes.

Figure 2 shows the results.

Figure 2



The students made the following conclusions:

- most parts of a bean seedling contain catalase
- the seed contains a lot of catalase
- stems and roots have quite a lot of catalase
- the leaves have a little bit of catalase
- the seed coat has hardly any catalase.

The students' teacher said that the students needed to improve their investigation in order to make valid conclusions.

(a) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe how you would carry out an investigation to compare the amounts of catalase in different parts of bean seedlings.

You should include details of how you would make sure your results give a valid comparison of the amounts of catalase.

_____

(6)

(b) Scientists investigated the effect of pH on the activity of the enzyme catalase in a fungus.

The table below shows the scientists' results.

pH	Enzyme activity in arbitrary units					
	Test 1	**Test 2**	**Test 3**	**Test 4**	**Test 5**	**Mean**
3.0	0	0	0	0	0	0
4.0	6	5	8	4	7	6
5.0	38	65	41	42	39	
5.5	80	86	82	84	88	84
6.0	100	99	96	103	102	100
6.5	94	92	90	93	91	92
7.0	61	63	61	62	63	62
8.0	22	22	21	24	21	22

(i) Calculate the mean enzyme activity at pH 5.0.

_____

_____

Mean = _____ arbitrary units

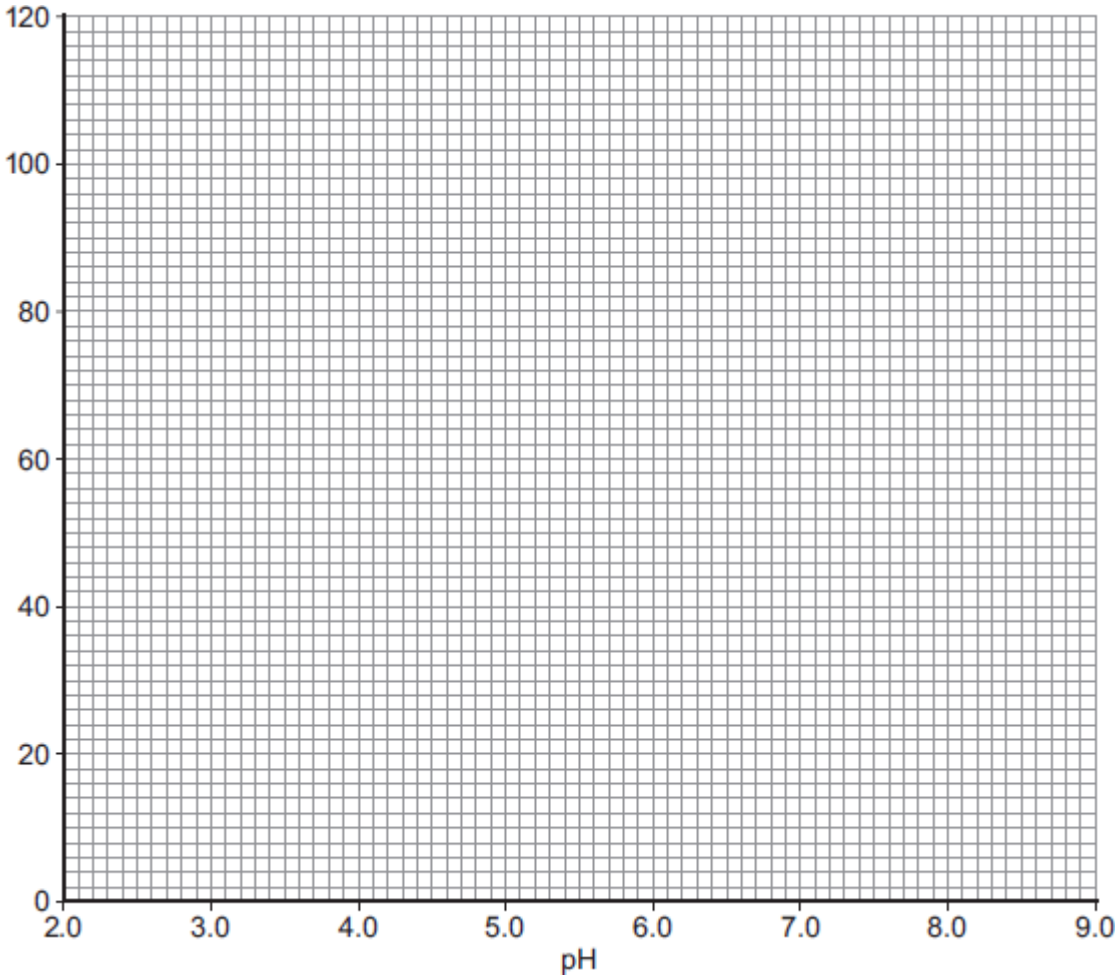
(2)

(ii) On the graph paper in **Figure 3**, draw a graph to show the scientists' results.

Remember to:

- add a label to the vertical axis
- plot the mean values of enzyme activity
- draw a line of best fit.

Figure 3



(4)

(iii) At what pH does the enzyme work best?

_____

(1)

(iv) Predict the activity of the enzyme at pH 9.0.

_____ arbitrary units

(1)

(v) Suggest why the enzyme's activity at pH 3.0 is zero.

_____

_____

(1)

(Total 15 marks)

Q56.

Statins are drugs used to treat coronary heart disease (CHD).

New drugs must be trialled before they can be licensed for use.

Some scientists trialled two different types of statin.

The scientists:

- conducted the trial on 325 patients with a history of CHD in their family
- used a double-blind trial method
- measured the change in blood cholesterol levels over two years
- measured the change in thickness of an artery wall over two years.

(a) During the trials the statins are tested for side effects.

Give **two** other reasons why the statins are trialled before use.

1. _____

_____

2. _____

_____

(2)

(b) Describe how the double-blind method is used in this trial.

_____

_____

_____

_____

(2)

(c) The results of drug trials are **peer reviewed** before they are published.

Why are peer reviews important in drug trials?

Tick **one** box.

To calculate the best dose	☐
To check the drug works	☐
To make sure the scientist gets credit	☐
To prevent false claims	☐

(1)

(d) The table below shows the results of the trial.

	Drug A	**Drug B**
Number of patients who died during the trial	1	2

Number of patients who reported aching muscles	16	17
Number of patients who reported mild abdominal cramps	18	16
Change in blood cholesterol level in percentage	–50.5	–41.2
Change in thickness of artery wall in mm	–0.0033	+0.032

Drug **A** is more effective than Drug **B**.

Give **two** reasons that support this conclusion.

Use information from the table above.

1. _____

_____

2. _____

_____

(2)

(e) A scientist concludes that Drug **A** is a safer drug than Drug **B**.

Give **two** reasons why this is **not** a valid conclusion.

_____

_____

_____

_____

(2)

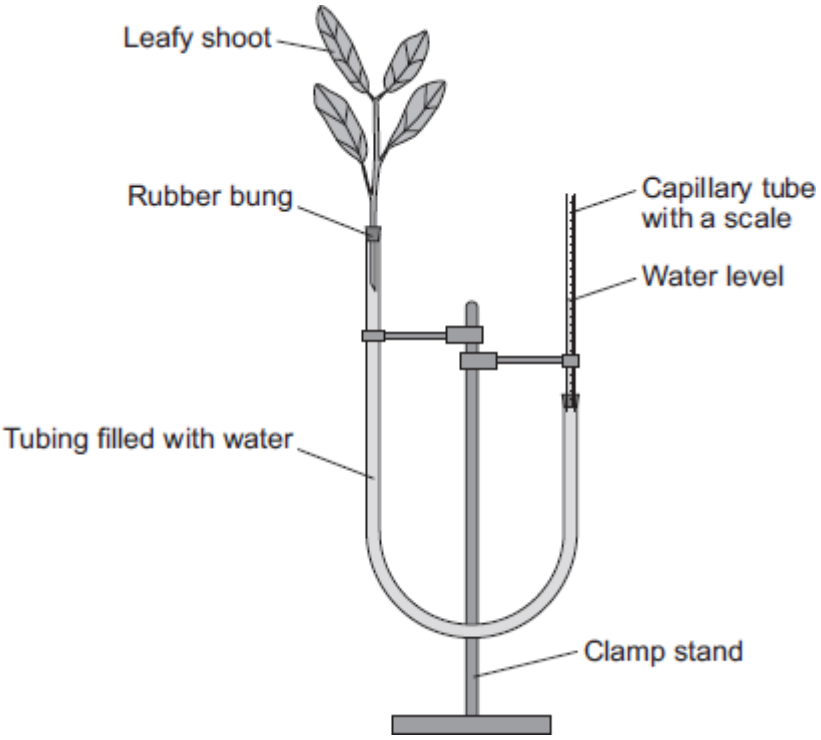
(Total 9 marks)

Q57.

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.**

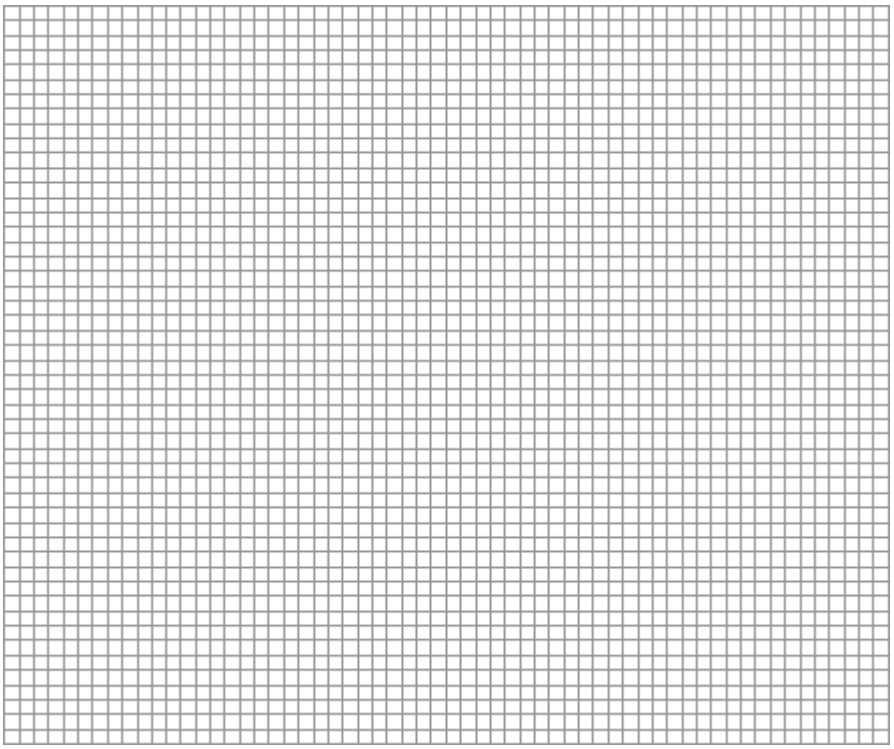
Table 2

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)

Q58.

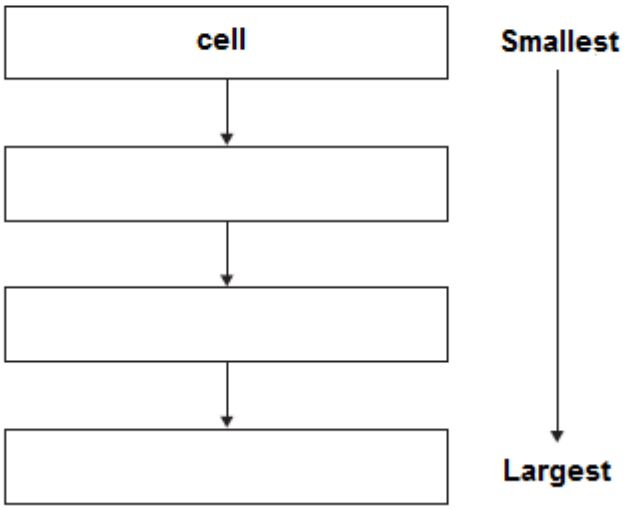
The human body is organised to carry out many different functions.

(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)

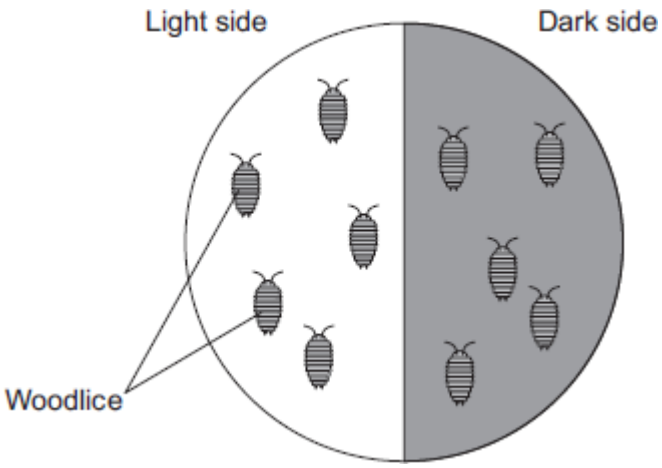
(c) Animals can react to their surroundings because they have nervous systems.

A student investigated the behaviour of small animals called woodlice.

The student set up the investigation as shown in **Figure 2.**

- The student covered one half of a Petri dish with black paper to make that side of the Petri dish dark.
- The other side had no cover.
- The student put five woodlice into each side of the dish and then put the clear Petri dish lid back on the dish.

Figure 2



After 30 minutes, all the woodlice had moved to the dark side of the Petri dish.

(i) In this investigation, what is the **stimulus** that the woodlice responded to?

_____

(1)

(ii) In this investigation, what is the **response** that the woodlice made?

_____

(1)

(iii) The student concluded that woodlice prefer dark conditions.

Give **two** ways in which the student could improve the investigation to be sure that his conclusion was correct.

1. _____

_____

2. _____

_____

(2)

(Total 9 marks)

Q59.

Amylase is an enzyme that digests starch.

A student investigated the effect of pH on the activity of amylase.

This is the method used.

1. Mix amylase solution and starch suspension in a boiling tube.
2. Put the boiling tube into a water bath at 25 °C.
3. Remove a drop of the mixture every 30 seconds and test it for the presence of starch.

4. Repeat the investigation at different pH values.

The table below shows the students' results.

pH	Time when no starch was detected in minutes
5.0	7.0
5.5	4.5
6.0	3.0
6.5	2.0
7.0	1.5
7.5	1.5
8.0	2.0

(a) The student concluded pH 7.25 was the optimum pH for the amylase enzyme.

This is **not** a valid conclusion.

Suggest **two** reasons why.

1. _____

_____

2. _____

_____

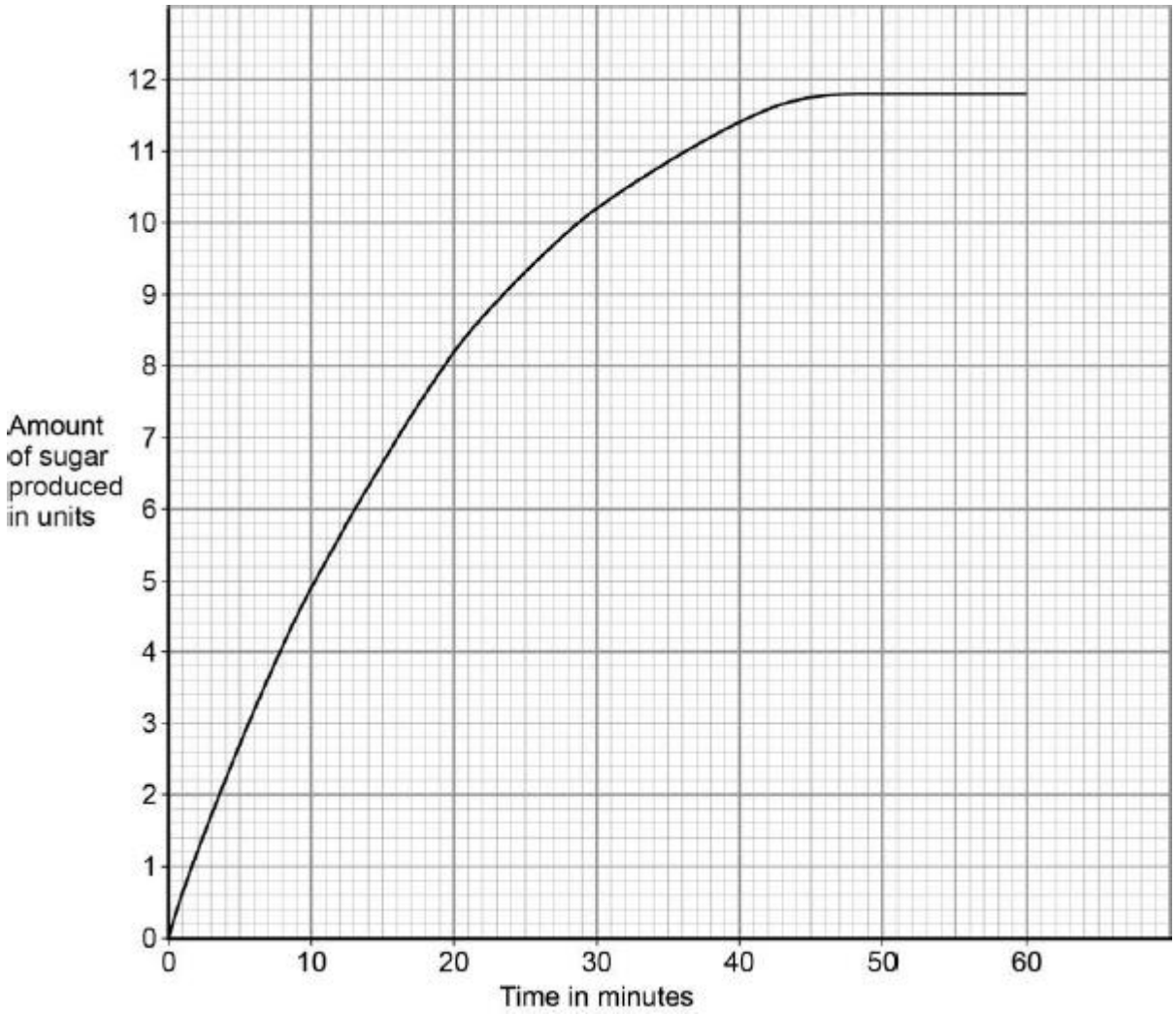
(2)

(b) The student did another investigation.

This is the method used.

1. Put amylase solution and starch suspension into a boiling tube.
2. Make the pH 7.25.
3. Put the boiling tube into a water bath at 25 °C.
4. Measure the amount of sugar produced every 30 seconds.

The results are shown in the figure below.



Calculate the mean rate of sugar produced per minute during the first 5 minutes.

_____

_____

Mean rate = _____ units per minute

(2)

(c) Iodine solution is added to a sample taken from the boiling tube after 10 minutes and 60 minutes.

Suggest what you would see in these samples.

After 10 minutes _____

_____

.After 60 minutes _____

_____

(2)

(d) The scientist repeated the investigation at 37 °C.

Draw a line on the figure above to show the predicted results.

(2)

(Total 8 marks)

Q60.

The table shows the volume of blood flowing through different organs at three levels of exercise.

Organ(s)	Volume of blood flowing through organ(s) in cm^3 per minute		
	Light exercise	**Moderate exercise**	**Heavy exercise**
Gut	1 100	600	300
Kidneys	900	600	250
Brain	750	750	750
Heart muscles	350	750	1 000
Skeletal muscles	4 500	12 500	22 000
Skin	1 500	1 900	600
Other	400	500	100
Total	**9 500**	**17 600**	**25 000**

(a) (i) Which organ has a constant flow of blood through it?

_____

(1)

(ii) Which organ has the greatest reduction in the volume of blood supplied during heavy exercise compared with light exercise?

_____

(1)

(iii) What proportion of the blood flows through the heart muscle during heavy exercise?

_____

(1)

(b) The volume of blood flowing through the skeletal muscles increases greatly during exercise.

Give **two** ways in which the body brings about this increase.

1. _____

2. _____

_____

(2)

(c) During exercise, the concentration of carbon dioxide in the blood increases.

Explain what causes this increase.

_____

_____

_____

_____

_____

_____

(3)

(Total 8 marks)

Mark schemes

Q1.

(a) A

no mark – can be specified in reason part
if B given = no marks throughout
if unspecified plus two good reasons = 1 mark

high(er) pressure in A

allow opposite for B
do not accept 'zero pressure' for B

1

pulse / described in A

accept fluctuates / 'changes'
allow reference to beats / beating
ignore reference to artery pumping

1

(b) (i) 17

1

(ii) 68

accept correct answer from candidate's (b)(i) × 4

1

(c) (i) oxygen / oxygenated blood

allow adrenaline
ignore air

1

glucose / sugar

extra wrong answer cancels eg
sucrose / starch / glycogen / glucagons / water
allow fructose as an alternative to glucose
ignore energy
ignore food

1

(ii) carbon dioxide / CO_2 / lactic acid

allow CO2 / CO^2
ignore water

1

[7]

Q2.

(a) A – artery
B – capillary
C – vein

3

(b) transport OWTTE

1

(c) increased oxygen decreased carbon dioxide

2

[6]

Q3.

(i) the mass got less

accept it got lighter

*award **1** mark for water was lost from the plant*

1

water was taken into the plant **or** roots absorbed water

*do **not** accept soaked into plant*

1

and lost through transpiration **or** the leaves **or** evaporated from the leaves **or** stomata

1

(ii) to check the effect of the plant **or** to act as a control **or** to show that it was not due to evaporation from water

*do **not** accept to keep it fair **or** to check that it was fair*

*do **not** accept fair test*

1

[4]

Q4.

(i) liver

1

(ii) liver **or** B stores glycogen **or** pancreas **or** D makes insulin

1

clear description of link

1

[3]

Q5.

(i) any **two** from:

urea

carbon dioxide

water

lactic acid

2

(ii) higher concentration of glucose **or** more glucose in blood than cells

1

<u>diffuses</u> across

1

[4]

Q6.

(a) liver

1

mouth or salivary glands **or**
duodenum **or** small intestine **or**
pancreas

1

pancreas

*accept duodenum **or** ileum **or** small intestine*

*do **not** accept stomach*

1

stomach **or** duodenum **or** ileum **or** small intestine **or** pancreas

1

(b) teeth breakdown food

accept chewing

1

amylase **or** saliva (breaks down starch)

1

(c) produces <u>bile</u> (salts)

1

emulsifies (fat) **or** produces droplets **or** disperses fat)

1

[8]

Q7.

(a) (i) light **or** solar

*do **not** credit sun's energy*

*do **not** credit radiant*

1

(ii) chlorophyll

1

(iii) chloroplast

1

(iv) CO_2 **+** H_2O

reactants identified (accept words)

1

$C_6H_{12}O_6 + O_2$

products identified (accept words)

1

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

balanced equation

1

(b) any **two** from:

increased CO_2 concentration

increased water supply

increased temperature (up to a point)
increased light intensity

*do **not** accept heat or warmth*

altered light quality by less green **or**
increasing other colours

2

(c) any **four** points

- palisade (mesophyll)
- lots of chloroplasts **or** chlorophyll
  or main site for photosynthesis
  or absorb maximum amount of light
- guard cells
- CO_2 in **or** O_2 out **or** water vapour out
- controls size of stoma **or** pores in leaf

allow stomata

4

[12]

Q8.

(a) **A** white blood cell/leucocytes / phagocytes / lymphocytes

SEPARATE MARKING POINTS

1

make/contain antibodies/antitoxins
or
destroy/engulf/kill bacteria

*do **not** accept fight infection*
*do **not** accept fight disease*

1

B platelets

1

help clot the blood

*do **not** accept stick together*
*do **not** accept from scabs*

1

C plasma

1

carries/transports all the cells/digested food/waste products/hormones/carbon

dioxide/platelets/dissolved minerals/antibodies/antitoxins/water

allows blood to flow

1

(b) any four from:

(oxygen) diffuses

1

has affinity for/combines with oxygen / forms oxy-haemoglobin

*do **not** accept absorbed*

1

in areas of high oxygen concentration

n.b. 'pick up oxygen' is stem of question

1

in conditions of low oxygen concentration it breaks down and releases the oxygen

low oxygen concentration can be implied e.g. active muscles

1

[10]

Q9.

(a) water [1]

oxygen [1]

(sun) light or solar [1]

*do **not** accept sun's*

chlorophyll [1]

*do **not** accept chloroplasts*

4

(b) any **two** from:

stored as fructose
stored as sucrose
stored as starch
stored as oil **or** lipid
moved or transported away <u>in the phloem</u>

*do **not** accept "stored" by itself*

respired or burnt up for energy or
fuel changed to protein
changed to cellulose
changed to fructose
changed to starch
changed to oil or lipid

*do **not** accept "food for plant"*
*do **not** accept "used up" by itself*

2

(c) (i) roots or root hair (cells)

1

(ii) the mineral salts are (dissolved) in water [1]

water transports salts throughout the plant
or water enables osmosis or diffusion to take place [1]

2

(d) (i) plants grow better with some nutrients than none
or
plants grow better with nitrates than without

comparison is needed

accept "faster" as equivalent to "better"
accept don't grow well with only water

1

(ii) 0.14(g)

*units **not** needed*

1

(iii) making protein **or** amino acids

*do **not** accept help them grow*

*accept named protein **or** DNA **or** chlorophyll*

1

any **two** from:

(iv) type **or** variety **or** starting weight **or**

2

(iii) size of seedlings

keep the environment the same
*only if light **or** temperature **or** day length not already credited*

light
temperature not heat
time of growth

*do **not** accept the same equipment*
*do **not** accept help them grow*

1

day length
amount of culture solution **or/**size of

accept named protein, DNA chlorophyll

boiling tube
number of seedlings per tube
pH
CO_2
humidity

[15]

Q10.

(a) (i) count the pulse **or** count beats in artery in wrist neck **or** feel the pulse **or** take the pulse **or** find the pulse

*accept use of heart monitor **or** heart meter*

1

(ii) 80

2 marks for correct answer

*1f answer incorrect allow **1** mark for showing 8000 divided by 100 **or** indicating cardiac output divided by stroke volume*

2

(iii) Increased activity stroke volume
falls / gets less / should get higher / reach a peak

*accept does not increase **or** changes from 134 cm^3 to 127 cm^3*

1

(iv) 1ncreased / more ventricle contractions

*accept heart beat faster **or** it beats faster **or** more powerful contractions*

1

(b) (stronger heart muscle) increases cardiac output **or** increases stroke volume

*accept pumps more blood (per beat) **or** pumps blood faster*
ignore heart bigger

1

so more (oxygenated) blood can be sent <u>to muscles</u>

accept more oxygen sent to muscles

1

[7]

Q11.

(a) (i) liver

1

(ii) <u>on diagram</u>:

'**X**' on liver

must be unambiguous (eg not overlapping gall bladder)
intersection of X in liver

1

(b) stomach

1

<u>small</u> intestine

accept duodenum or ileum
extra wrong answers cancel the mark,
eg small intestine (colon) = no marks

1

(c) amylase not produced by stomach

accept no starch digesting enzymes in the stomach
accept correct enzyme not in stomach
accept <u>only</u> proteases in stomach
*do **not** accept protease does not digest starch*

1

acid / low / wrong pH in stomach **or** enzyme would be denatured in stomach **or** amylase only works in neutral / alkaline conditions

incorrect extra information cancels mark
*do **not** accept amylase does not work in the stomach*

1

[6]

Q12.

(a) (i) haemoglobin / oxyhaemoglobin

must be phonetic

1

(ii) carries oxygen **or** forms oxyhaemoglobin

Ignore references to CO_2 / iron
cancel if extras like food / glucose

1

from lungs to tissues

1

(b) no nucleus **or** biconcave disc (described)

ignore references to size
ignore vague references to being 'round' / 'donut' shaped etc.

1

[4]

Q13.

(a) (i) lower – **B** loses less (water / mass) than **C**
or
described in terms of petroleum jelly

*accept converse re Leaf **C***

1

(ii) yes - **B** and **C** lose less than **D** **or**
B and **C** lose more than **A** **or**
D loses the most **or**
A loses the least

*do **not** accept just 'all leaves lose some weight'*

1

(b) (i) **X** = stoma

accept stomata / stomatal pore
*do **not** accept air space*

1

Y = guard cell

1

(ii) petroleum jelly blocks stomata / pores
or petroleum jelly prevents water loss
or petroleum jelly waterproofs

*allow pores are blocked in **B***

1

water (mainly) lost via stomata / pores / **X**
or stomata on lower surface only

1

[6]

Q14.

(a) (i) protease

accept peptidase ***or*** *named protease*
e.g. pepsin / trypsin
allow 'proteinase'

1

(ii) amino acids

accept peptides / polypeptides / peptones

1

(b) points plotted accurately

± $\frac{1}{2}$ *square*

deduct ***1*** *mark per error*

2

best fit curve **or** ruled point-to-point

if double line within $\frac{1}{2}$ *square*
allow sharp apex
do ***not*** *allow single straight line*
if no points line defines points
if (5,0) not plotted only penalise ***1*** *mark*
bar graph wide bars – ***no*** *marks*

bar graph ± $\frac{1}{2}$ *square max* ***2*** *for points*

1

(c) (i) 2 **or** correct from candidate's graph

± $\frac{1}{2}$ *square*

1

(ii) stomach

1

(d) proteins are large / product is small

1

proteins (may be) insoluble / product is soluble

1

cannot be absorbed / cannot enter blood **or** cannot pass through gut lining

accept reverse referring to product

1

[10]

Q15.

(a) **B**

1

(**B** has) low(est) number of stomata
or no stomata on upper surface
or <u>only</u> 800 (on lower surface)

1

less transpiration / evaporation / water loss owtte
or water (vapour) is lost via stomata

only allow zero water loss if linked to no stomata on upper surface / linked to leaf B upper surface

ignore references to leaf surface area

1

(b) reduce loss / amount of water (vapour)

accept converse

or
reduced transpiration (from upper surface)

*do **not** allow <u>no</u> water is lost*

1

warmer above leaf

accept converse

or wilted leaf folds over lower surface

or lower leaf in shade

ignore reference to dust

or less light / heat / sun on lower side

1

[5]

Q16.

(a) any **two** from:

- large surface / area **or** many villi **or** have microvilli

  accept big surface / area

- thin surface **or** thin wall **or** surface 1-cell thick **or** capillaries near surface **or** permeable **or** partially permeable

  accept they are thin

  *do **not** allow thin **cell** wall*

- <u>many</u> blood vessels **or** <u>many</u> capillaries **or** capillary <u>network</u> **or** <u>good</u> blood supply

  ignore 'constant blood flow' owtte

  ignore extras eg moist or reference to gases

- have enzymes

  ignore release enzymes

  - *accept reference to lacteal as 5th point*
  - *allow reference to having mitochondria*

2

(b) (i) small(er) (surface area) / flat(ter) / short(er)
or not as folded
or fewer capillaries owtte

allow small(er) lacteal

ignore references to wide / thick / spread out etc

1

(ii) less absorption (of digested food) / less digestion / diffusion

accept slower for less
accept description of less digestion
accept less food can get in
*do **not** allow zero absorption*
*do **not** allow 'collection' of nutrients*

1

[4]

Q17.

(a) lipase

allow phonetic spelling
allow lipidase

1

(b) (i) fall **then** rise owtte eg down **then** up

*allow faster **then** slower*
ignore explanations

1

minimum / least / fastest / best / optimum at 39–41(°C)

allow it falls to 40(°C)
*if no other marks gained, 'falls to an optimum' gains **1** mark*

1

(ii) (yes)

there is no mark for circling 'yes'
*maximum **1** mark if No is circled*

any **two** from:

- less heat / energy / electricity / power required / used / wasted
  ignore lower temperature
- conserves fuel supplies
  or less fuel used
- less pollution from power stations
  owtte
  accept less global warming
  or
  less CO_2 / carbon emissions / greenhouse gases
  or
  less SO_2 / acid rain
  ***NB** only direct effects*
  less pollution only is not enough

2

(c) any **two** from:

*max **1** mark for reference to cell*

- enzyme / lipase
  accept any named enzyme

- destroyed / denatured
  allow damaged / broken down
  ***not** 'killed'*

- reference to (specific) shape changed
  ignore detergent / it

2

[7]

Q18.

(a) diet **or** description

1

(b) exercise
or group meetings
or same number of kilocalories per day
or time
or group size

1

(c) any **two** from: eg

- scientists didn't observe amount of exercise
  or volunteers cheated on exercise(*)

- scientists didn't observe the amount of food
  or volunteers cheated on food(*)
  *(*)if no marks awarded for first 2 bullet points allow don't stick to plan **or** cheated for **1** mark*

- mass of subjects not controlled

- age of subjects not controlled

- gender of subjects not controlled

- occupation of subjects not controlled

- different proportions of subjects completed course
  allow not all completed course

- low number of subjects
  ignore not repeated

2

(d) any **two** from: (yes)

- low carbohydrate / Group 1 / people / they lost more mass
  ignore more people lost weight
  allow greater change in mass

- low carbohydrate / Group 1 / people / they lost more body fat
  ignore more people lost body fat
  allow greater change in body fat

- low carbohydrate diet / Group 1 / people / they resulted in more HDL
  allow better HDL to LDL balance
  allow greater change in HDL

2

[6]

Q19.

(a) any **two** from:

- transport up / against concentration gradient / low to high concentration
- uses energy
- use of protein / carrier

2

(b) microvilli – large(r) surface area
accept have carriers

1

mitochondria – release energy **or** make ATP
*do **not** accept 'makes energy'*

1

[4]

Q20.

(a) any **three** from:

- rose <u>rapidly</u> (during exercise) / use of approximate figures
- then more slowly (during exercise)
  accept rate (of increase) slows down
- to max 126 / at 5 minutes / end of exercise
- <u>rapid</u> fall (during recovery) **or** use of approximate numbers
- then less rapid fall / use of approximate numbers
- returned to resting rate (60 bpm) by 11 minutes

3

(b) arteries dilate / widen
accept muscle in wall relaxes

1

(c)

any **four** from:

- muscles using more energy **or** more energy released
- muscles respire faster
- supply more oxygen
- supply more glucose / sugar
- remove more CO_2
- remove lactic acid
- remove heat / to cool

do **not** accept energy produced

allow for aerobic respiration **or** to prevent anaerobic respiration

'more' needed ONCE only for full marks

4

[8]

Q21.

(a) any **two** from:

- arthritis
  allow damaged joints
- diabetes
  accept high blood sugar
- high blood pressure
- strokes
  allow blocked blood vessels / thrombosis
- allow breathing difficulties
  ignore cancer
  ignore high cholesterol

2

(b) (i) any **two** from:

to gain marks there must be a comparison
ignore comparison at single age

- lower number of women deaths up to age of 75-80
- higher number of women deaths after 80
  *ignore women die older **or** men die younger*
- men's peak higher
- men's peak at an earlier age
- men's death start earlier than women
- more men than women die of heart disease

2

(ii) any **two** from:

- men smoke more (cigarettes)

ignore alcohol

- more men smoke
- men under more stress
- men less active
- more men overweight / eat more / less diet conscious **or** different fat distribution
  ignore reference to body size
- genetic factors
- men might have lower metabolic rate
  ignore references to hormones
- men less likely to visit doctor even though they have symptoms

2

(c) *points can be in any order*

laboratory tests / tests on tissues
or
tests on animals
or
tests for toxicity
ignore computer simulations

1

tests for <u>side effects</u> on volunteers / healthy people / small numbers

1

widespread testing
or
testing for optimum dose
or
test on patients / sick people
or
test to see if it is effective
accept use of placebo

1

[9]

Q22.

(a) transpiration / evaporation / diffusion
ignore osmosis

1

(b) (i) D

1

(ii) any **two** from:

- <u>more / faster</u> diffusion **or** evaporation **or** transpiration
- molecules move faster
- maintains concentration gradient

or keeps water concentration low in the air
or brings in more dry air
or removes damp air / water

2

[4]

Q23.

(a) B

no mark for ÉBÉ, alone

large(r) surface / area **or** large(r) membrane

accept reference to microvilli
accept reasonable descriptions of the surface
*do **not** accept wall / cell wall*
ignore villi / hairs / cilia

1

(b) (i) any **one** from:

- insulin / hormone
  if named hormone / enzyme must be correct for pancreas
- enzyme / named enzyme

1

(ii) <u>many</u> ribosomes

1

(ribosomes) produce protein

accept insulin / hormone / enzyme named is (made of) protein

or

allow <u>many</u> mitochondria (1)

provide energy to build protein **or** to make protein (1)

accept ATP for energy

1

[4]

Q24.

(a) (i) 19 800

for correct answer ignore working or lack of working
*165 × 120 but no answer / wrong answer = **1** mark (<u>ignore extras</u>)*

2

(ii) any **two** from:

- for respiration
  ignore oxygen debt
- energy released
  allow energy produced

- prevents anaerobic respiration
- prevents build-up of lactic acid

2

(b) any **two** from:

- increased breathing rate(*)
- increased depth of breathing **or** deep breathing(*)
  *(*)more breathing is max **1** mark*
  ignore increase in heart rate
  allow heavier breathing
  *do **not** allow harder breathing*
- dilation of arteries / vasodilation
  allow blood vessels dilate
  *do **not** allow veins / capillaries dilate*
- blood diverted from elsewhere
  ignore name of organ

2

[6]

Q25.

(a) any **two** from:

- age
- gender
- mass
- number in group
- time

2

(b) any **two** from:

- highest (mean) mass loss on Rosemary Conley **or** Rosemary Conley most effective
- least (mean) mass loss in control group **or** <u>mean</u>

2

(c) (Atkins)

costs least

1

mass loss very similar to other diets **or** second highest mass loss **or** as effective as other diets

1

(d) any **two** from:

- (exercise) increases metabolic rate / respiration

ignore sweating

- (exercise) needs / uses energy / calories
  allow burns fat / calories
  *do **not** accept energy <u>for</u> respiration*
- (this) energy comes from food / fat
- less food / energy/ calories converted to fat

2

[8]

Q26.

(a) any **one** from:

*ignore reference to recording results every 5 minutes **or** concentrations of lipid / lipase*

- (same) volume / amount / 1 cm^3 lipase
  allow amount of solution
- (same) volume / amount / 5 cm^3 lipid
  allow keep same volumes in the test tubes
- mixed after 3 minutes / same time before mixing
  *do **not** accept temperature*

1

(b) so that the lipase and the lipid reached the right temperature

1

(c) any **two** from

ignore explanations

- decrease in time **or** faster (breakdown)
- <u>then</u> increase in time **or** <u>then</u> slower (breakdown)
- fastest / least time / optimum at 35°C

2

(d) any **two** from:

ignore 'test at more temperatures' unqualified

- test more regularly eg test every minute
  any interval < 5min
- test at smaller temperature intervals
  any value <15°C
  allow test more temperatures in the range
- test between 50 (°C) and 95 (°C)
  any value in range, eg test at 70
- repeat at same temperatures
  or repeat the investigation
  or compare results with others
  *allow do **it** again*

2

(e) (i) (lipase / it) denatured / destroyed / changed shape

allow damaged / deformed

*do **not** accept killed*

ignore broken (down)

1

(ii) fatty acids and glycerol

1

[8]

Q27.

(a) C

1

(b) (i) guard (cell)

1

(ii) temperature water movement / transpiration through stomata / pores / holes /(region) X

or

petroleum jelly blocks / covers stomata / pores / holes / X

1

stomata / pores / holes / X found on lower surface

1

[4]

Q28.

(a) (i) B **or** D

1

(ii) A **or** B

1

(b) any **four** from:

more / faster must be implied at least once for full marks

- increased blood (flow)

  ignore reference to breathing

- (more) oxygen supplied **or** aerobic respiration

  *allow less anaerobic (respiration) **or** and prevents oxygen debt*

- (more) glucose / sugar / food supplied

  ignore feeding

- (higher rate of) respiration

- (more) energy needed / released

  allow made

- (more) carbon dioxide <u>removed</u>

- (muscles) doing (more) work **or** muscles contracting
- remove heat / cooling
- remove lactic acid **or** less lactic acid formed

4

[6]

Q29.

(a) (i) amino acid(s)

accept peptide(s)

*do **not** allow polypeptide(s)*

1

(ii) protease

1

(b) (i) 2

1

(ii) repeat

do not allow other enzyme / substrate

1

using smaller pH intervals between pH1 and pH3

allow smaller intervals on both sides of / around pH2

allow smaller intervals on both sides of / around answer to (b)(i)

1

(iii) <u>enzyme / pepsin</u> denatured / shape changed

*do **not** allow enzyme killed*

allow enzyme 'destroyed'

1

<u>enzyme / pepsin</u> no longer fits (substrate)

allow enzyme / pepsin does not work

1

(c) hydrochloric (acid)

allow phonetic spelling

accept HCl

allow HCL

ignore hcl

*do **not** allow incorrect formula –e.g. H_2Cl / HCl_2*

1

[8]

Q30.

(a) protease

allow trypsin / peptidase

*do **not** allow pepsin*

1

carbohydrase / amylase

*do **not** allow sucrase / maltase / lactase*

1

(b) no lipase produced / found

1

in stomach / mouth / before small intestine
OR
accept lipase only produced / found (1)
in small intestine / pancreas (1)

*if no other mark is awarded lipid is not broken down in the stomach **or** lipid is digested in small intestine gains **1** mark*

1

(c) enzymes only work in solution / when dissolved
or
because enzyme / lipase / it is dry

*allow enzymes only work in presence of water **or** enzymes do not work when dry*

ignore other physical conditions

1

[5]

Q31.

(a) large surface / large area

1

thin / short distance (from air to blood) / one cell thick / two cells thick

1

good blood supply / many capillaries / capillary network / many blood vessels

ignore moist surface

1

(b) (i) diffusion

ignore gaseous exchange

1

(ii) brings (more) oxygen / air into the lungs / alveoli

1

keeps O_2 level high in alveoli

or

maintains concentration difference (between alveoli and blood) / keeps O_2 concentration in alveoli > O_2 concentration in blood gains **2** marks

1

[6]

Q32.

any **two** from:

- arthritis

ignore descriptions

- diabetes

- high blood pressure
- heart / blood vessel disease

ignore cholesterol

[2]

Q33.

(a) A aorta

ignore left and right

1

B ventricle

1

C atrium

allow atria

1

D vena cava

1

(b) (i) (coronary) artery

allow arteriole

1

(ii) stent / description

accept (coronary) by-pass operation
allow statins
allow diets low in cholesterol
allow balloon (angioplasty)

1

(iii) (stent) keeps artery open

must relate to (b)(ii)

1

or

ignore reference to capillary / vein

(by-pass) new blood vessel / vein connecting around narrowed region;

or

(statins / low cholesterol diet) remove some of the cholesterol blockage

or

(balloon) widens / opens the blood vessel

1

which allows (more) blood through or allows blood to go around the blockage

(c) (i) F artery

accept arteriole / branch of pulmonary artery

1

G capillary

1

H vein

H accept venule / branch of pulmonary vein;

1

(ii) F (Pulmonary artery) has less oxygen / more carbon dioxide / more glucose / sugar

accept F (Pulmonary artery) is deoxygenated

accept converse for H (Pulmonary vein)

'It' refers to F

1

[12]

Q34.

(a) don't kill pathogens / bacteria / viruses / microbes / microorganisms

allow don't contain antibiotics

ignore antibodies / attack / fight

allow only treat symptoms / pain

ignore kill disease / germs

1

(b) any **two** from:

- age
- gender
- extent / severity of pain
  or how long had pain before trial
- type of pain / illness / site of pain

  *accept 'the pain' for **1** mark, if neither extent or type given*

  ignore pain threshold
- (body) mass / weight / height

  allow body size / physique
- other medical issues / drugs taken / health / fitness
- ethnicity

2

(c) (i) 75

ignore calculations / %

1

(ii) faster pain relief / decrease

allow pain relief sooner
***or** it works quicker*

***or** more pain relief at start / in first 1 / 1 $\frac{3}{4}$ hours*

1

(iii) decrease of pain higher / more

ignore more effective unless qualified by time > 1 $\frac{3}{4}$ hours
allow effect lasts longer

1

decrease of pain is longer lasting

1

(d) any **three** from:

ignore yes or no

(Yes because)

- rapid pain relief (from A)
- long lasting pain relief (from B)
- and it costs less
- the sum of the pain relief (from A + B) is greater (than X)

(No because)

- drug X gives more pain relief
- (A + B / they) might interact with each other
- could result in overdose
- could be more / new side effects

if neither points gained
allow (more) dangerous

3

[10]

Q35.

(a) (i) water loss

extra substance(s) cancel
*if transpiration stream described max **1** mark*

1

as a vapour / by evaporation

ignore stomata

1

(ii) stomata / stoma / guard cells

ignore epidermis

1

(b) (i) 2.8

*correct answer with or without working gains **2** marks*
if answer incorrect:
*allow **1** mark for (8.6 - 0.2) ÷ 3 **or** 8.4 ÷ 3*

2

(ii) warmer at 16:00 / gets cooler

***or** reverse argument for 19.00*

1

faster diffusion / evaporation

accept sun setting as equivalent to heat or light marking points

or

lighter at 16:00 / gets darker (1)

if no environmental factor still allow reason mark

stomata open / more open (1)

eg 'stomata close later in the day

or

(more) windy at 16:00 / gets less windy (1)

removal of (more) water vapour / steeper gradient (1)

or

air is less humid at 16.00 (1)

allow rain at 19.00

faster diffusion or steeper gradient (1)

1

[7]

Q36.

(a) (i) 8.6

accept value in range 8.5 to 8.7

1

(ii) hydrochloric acid / HCl

accept HCL

accept hydrogen chloride

ignore hcl / etc.

1

(iii) X

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a simple description of part of a process or a reference to at least one of: mechanical digestion, lipase, product of enzyme action, bile, site of production or site of digestion

Level 2 (3-4 marks)
There is a description of at least one process linking ideas

Level 3 (5-6 marks)
There is a clear description of the process including reference to the majority of: mechanical digestion, lipase, bile, where they are produced, products, function of bile and site of digestion / absorption

Examples of biological points made in the response:

- mechanical breakdown in mouth / stomach
- fats →fatty acids and / or glycerol
- by lipase
- (produced by) pancreas
- and small intestine
- fat digestion occurs in small intestine
- bile
- produced by liver
- neutralises acid from stomach
- produces alkaline conditions in intestine
- refs. to increased surface area related to emulsification or chewing
- products are small molecules / water-soluble
- products absorbed by small intestine

6

[9]

Q37.

(a) (i) (as a result of) uncontrolled / abnormal growth / division of cells

ignore mutation

allow cells dividing with no contact inhibition

1

(ii) benign tumours do not invade / spread to other tissues / do not form secondary tumours

accept converse for malignant

accept benign tumours do not metastasise

1

(b) via the blood / circulatory system

accept via lymphatic system

1

(c) (i) incidence is increasing

1

more rapidly (over the years)

ignore figures

1

difference between rich and poor areas is getting less

or

the incidence is rising fastest in people from poor areas
accept converse for people from rich areas

1

(ii) risk factor is UV from sunlight
ignore ionising radiation

1

more UK citizens going abroad or taking holidays in the Sun

or

poorer people can afford holidays in the Sun

or

more poorer people are taking holidays in the Sun

1

[8]

Q38.

(a) (i) idea of 'normal' food / diet
e.g. 'the same as usual' or 'the same as before'
allow balanced diet
allow none of the slimming programmes
ignore healthy diet

1

(ii) for comparison
accept to show the test is valid
allow to show the effect of the slimming programmes
allow to see if the slimming programmes work
ignore idea of fair test / reliable
*do **not** allow accurate / precise*

1

(b) (i) (at first) large / rapid (loss / change of body mass)

1

then small (loss / change) / levelling off
*accept 'loss of mass decreased' for **2** marks*

1

(ii) all lost body mass (compared to the control group)

1

[5]

Q39.

(a) (i) <u>rate of</u> chemical reaction<u>s</u> (in the body)

1

(ii) any **two** from:

- heredity / inheritance / genetics

- proportion of muscle to fat **or** (body) mass
  allow (body) weight / BMI
- age / growth rate
- gender
  accept hormone balance or <u>environmental</u> temperature
  ignore exercise / activity

2

(b) (i) 77

*correct answer with or without working gains **2** marks*
*allow **1** mark for 70 / 56 **or** 1.25 **or** 5*

2

(ii) increase exercise

accept a way of increasing exercise

1

reduce food intake

accept examples such as eat less fat / sugar
*allow go on a diet **or** take in fewer calories*
ignore lose weight
ignore medical treatments such as gastric band / liposuction

1

[7]

Q40.

(a) (i) A = (cell) wall

ignore cellulose

1

B = cytoplasm

1

(ii) any **one** from:

accept has DNA instead of a nucleus, but not just has DNA

- bacterial cell / it has no nucleus
  allow no mitochondria
- DNA free in cytoplasm
  ignore size
- has no vacuole / no vesicles
  ignore strands of DNA

1

(b) (i) <u>yeast</u> grows best / better / well **or** optimum temperature for <u>yeast</u> / more <u>yeast</u> present

allow <u>yeast</u> works best / better / well

1

(yeast) makes CO_2 **or** respires / respiration

allow fermentation

1

(ii) bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium

ignore microorganisms / microbes

allow works / respires best / better / well

1

(bacterium) makes (lactic) acid

*do **not** allow wrong acid*

1

[7]

Q41.

(a) 55%

***2** marks for correct answer alone*

accept 54 − 56

*5.5 / 10 × 100 alone gains **1** mark*

2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol
- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

ignore blood cells and platelets

ignore oxygen

max 1 named example of each for ions and hormones

allow minerals

3

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
There is a description of pathogens with errors or roles confused.
or
the immune response with errors or roles confused.

Level 2 (3 – 4 marks)
There is a description of pathogens **and** the immune response with some errors or confusion

or
a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)
There is a good description of pathogens **and** the immune response with very few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens
  credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
  credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
  credit memory cells / correct description
- this leads to immunity from that pathogen.

6

[11]

Q42.

(a) **A** − saliva(ry) gland

1

B − liver

1

C − duodenum
ignore small intestine

1

D − pancreas
accept phonetic spellings

1

(b) (i) any **three** from:
- chewing / muscle contraction / mechanical digestion
  allow churning
- protease enzymes
  allow pepsin / trypsin
- in stomach / small intestine / duodenum / from pancreas
- (break down protein) into amino acids
  allow (poly)peptides

3

(ii) neutralises acid pH / makes conditions alkaline

1

so lipase can work

1

emulsifies fat

1

to give large(r) surface area for lipase / enzyme action

1

(c) (i) starch

ignore carbohydrate

1

(ii) breakdown stops

allow slows down

1

because stomach produces / contains acid / has low pH

1

and amylase cannot work in acid / low pH

accept amylase is denatured / changes shape

1

[15]

Q43.

(a) A

no mark - can be specified in reason part
if B given - no marks throughout
if unspecified + 2 good reasons = 1 mark

high(er) pressure in A

allow opposite for B
*do **not** accept 'zero pressure' for B*

pulse / described in A

accept fluctuates / 'changes'
allow reference to beats / beating
ignore reference to artery pumping

2

(b) (i) 17

1

(ii) 68

accept correct answer from student's (b)(i) × 4

1

(c) oxygen / oxygenated blood

allow adrenaline
ignore air

glucose / sugar

extra wrong answer cancels - eg sucrose / starch / glycogen / glucagon / water
allow fructose

ignore energy
ignore food

2

[6]

Q44.

(a) (i) stomach

1

(ii) small intestine

1

(b)

	salivary glands	stomach	pancreas	small intestine
amylase	✓	×	✓	✓
lipase	×	×	✓	✓
protease	×	✓	✓	✓

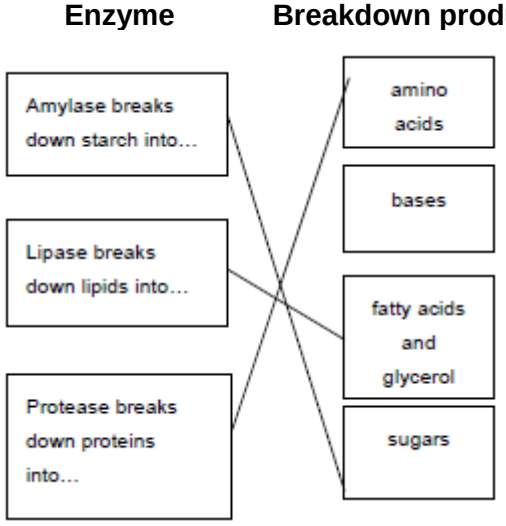
***1** mark per correct row*
or
*if no correct row max **1** mark for any one correct column*

2

(c) enzyme / protease / pepsin most effective in acid conditions / low pH
accept optimum / correct pH
do not accept ref to incorrectly named enzymes
ignore killing bacteria
ignore acid breaks down food

1

(d)



3

[8]

Q45.

(a) any **one** from:

ignore 'check temperature'

- add a water bath
- heat screen
- use LED
- low energy bulb / described

1

(b) (i) rate / number of bubbles decreases

*accept converse with reference to increasing light **or** shorter distance*

or

less oxygen / gas released

ignore reference to rate of photosynthesis

1

(ii) temperature / CO_2 (concentration)

*accept 'it was too cool' **or** not enough CO_2*

accept number of chloroplasts / amount of chlorophyll

allow heat

allow CO2

*do **not** allow CO^2*

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a brief description of at least 1 tissue **or** at least 1 function of an indicated part of the leaf.

The account lacks clarity or detail.

Level 2 (3-4 marks)
There is a clear description which includes at least 1 named tissue and at least 1 correct function described for an indicated part of the leaf.

Level 3 (5-6 marks)
There is a detailed description of most of the structures and their functions.

Examples of responses:

- epidermis
- cover the plant
- mesophyll / palisade
- photosynthesises

- phloem
- xylem
- transport.

The following points are all acceptable but beyond the scope of the specification:

- (waxy) cuticle – reduce water loss
- epidermis – no chloroplasts so allows light to penetrate
- stomata / guard cells – allow CO_2 in (and O_2 out) **or** controls water loss
- palisade (mesophyll) – many chloroplasts to trap light

  – near top of leaf for receiving more light
- spongy (mesophyll) – air spaces for rapid movement of gases

6

[9]

Q46.

(a) any **three** from:

- (water through a) partially permeable

  accept 'semi permeable' / selectively permeable
- membrane
- from dilute to (more) concentrated solution

  allow 'from a high concentration of water to a lower concentration (of water)'
  allow 'from high water potential to low water potential'
  allow 'down a concentration gradient of water'

  *do **not** accept 'along a concentration gradient of water'*
- (it's a) passive (process)

  allow requires no energy

3

(b) (there are) many hairs **or** thin hairs **or** hairs are one cell thick

1

(which gives) large / increased surface area **or** short diffusion pathway

1

(so there is) more diffusion / osmosis (of water into the root)

ignore absorption

1

[6]

Q47.

(a) guard cells

1

(b) (i) any **one** from:

- species / plant
- length of time

ignore temperature and size of leaves

1

(ii) 20

*correct answer = **2** marks*

accept $\frac{1.6 - 1.28}{1.6} \times 100$

or $\frac{0.32}{1.6} \times 100$

*for **1** mark*

2

(c) less water loss / transpiration / evaporation

1

(d) hot

1

ignore bright / sunny conditions

dry / low humidity

1

wind(y)

1

[8]

Q48.

(a) A - atrium

ignore references to right / left

1

B - ventricle

1

(b) (i) muscular

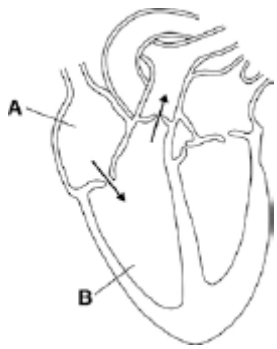
1

(ii) push blood

accept pump / force

1

(c)



arrows approx as indicated

1

arrow(s) showing flow from A to B
from B out / up / to artery

1

(d) (i) male

1

65 and over

1

(ii) fatty deposits / material in (coronary) arteries

allow correct points made about heart attacks

1

narrows / blocks / reduces flow

1

decreases oxygen supply (to heart muscle)

1

[11]

Q49.

(a) (i) xylem

1

(ii) water

1

minerals / ions / named example(s)

ignore nutrients

1

(b) (i) movement of (dissolved) sugar

allow additional substances, eg amino acids / correct named sugar (allow sucrose / glucose)

allow nutrients / substances / food molecules if sufficiently qualified

ignore food alone

1

(ii) sugars are made in the leaves

1

so they need to be moved to other parts of the plant for respiration / growth / storage

1

(c) (i) mitochondria

1

(ii) for movement of minerals / ions

Do not accept 'water'

1

against their concentration gradient

1

[9]

Q50.

(a) any **three** from:

- parts of organisms have not decayed
  accept in amber / resin
  allow bones are preserved
- conditions needed for decay are absent
  accept appropriate examples, eg acidic in bogs / lack of oxygen
- parts of the organism are replaced by other materials as they decay
  accept mineralised
- or other preserved traces of organisms, eg footprints, burrows and rootlet traces
  allow imprint or marking of organism

3

(b) (i) teeth for biting (prey)
must give structure + explanation

1

claws to grip (prey)
accept sensible uses

1

wing / tail for flight to find (prey)

1

(ii) any **two** from:

- new predators
- new diseases
- better competitors
- catastrophe eg volcanic eruption, meteor
- changes to environment over geological time
  accept climate change
  allow change in weather
- prey dies out **or** lack of food
  allow hunted to extinction

2

[8]

Q51.

(a) (i) diffusion

1

(ii) carbon dioxide
accept CO_2 / CO2
*do **not** accept CO^2*

1

(iii) red blood cells

1

(b) 70
if no / incorrect answer then
70 000 000
or

*280 x 0.25 gains **1** mark*
ignore doubling the answer

2

(c) allows more gas / oxygen / CO_2 (exchange)

*do **not** accept air*

1

[6]

Q52.

(a) any **two** from:

- carbon dioxide / CO_2
- urea
- protein
- water / H_2O
- hormones / insulin.

ignore food / waste / alcohol / drugs / enzymes
ignore glucose and oxygen
*allow **two** correct hormones for 2 marks*
*allow **two** correct food components for 2 marks*
allow antibodies
allow antitoxins

2

(b) (i) plasma

1

platelets

1

(ii) (cardiac) muscle

allow muscular

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content

Level 1 (1−2 marks)
There is a description of at least one advantage of the cow tissue valve
or
a description of at least one disadvantage of the cow tissue valve.

Level 2 (3−4 marks)
There is a description of at least one advantage of the cow tissue valve
and
at least one disadvantage of the cow tissue valve.

Level 3 (5−6 marks)
There is a description of the advantages and disadvantages of the cow tissue valve
or

a description of several advantages of the cow tissue valve and at least one disadvantage.

Examples of the points made in the response

Advantages of cow tissue valve:

- abundant supply of cows
- so shorter waiting time

  ignore can take many years to find a suitable human donor
- no need for tissue typing
- quicker operation
- less invasive **or** shorter recovery time
- cheaper operation costs
- less operation / anaesthetic risks.

Disadvantages of cow tissue valve:

- made from cow so possible objections on religious grounds

  ignore ethical arguments
- new procedure so could be unknown risks

  allow possible transfer of disease from cow
- risks of using a stent eg. blood clots, stent breaking or valve tearing
- not proven as a long term treatment
- may be rejected

  ignore information copied directly from the table without value added.

6

[11]

Q53.

(a) (i) glycerol

1

(ii) pancreas / <u>small</u> intestine

accept duodenum / ileum

ignore intestine unqualified

1

(b) any **two** from:

- type of milk
- volume / amount of milk
- vol. bile equals vol. water
- volume of lipase
- concentration of lipase
- temperature

ignore time interval

ignore solution unqualified

*do **not** allow pH*

ignore starting pH

ignore volume / amount of bile / water

ignore concentration of bile

accept amount of lipase if neither volume nor concentration given

2

(c) (i) fatty acid (production)

1

(ii) faster reaction / digestion (with bile)
or
pH decreases faster (with bile)
or
takes less time (with bile)
or
steeper fall / line (with bile)
allow use of data
ignore easier

1

(iii) all fat / milk digested
or
same amount of fatty acids present
or
(lower pH) denatures the enzyme / lipase
allow all reactants used up
ignore reference to neutralisation
allow enzyme won't work at low pH
*do **not** allow enzyme killed*

1

[7]

Q54.

thicker surface

1

reduced surface area
accept fewer alveoli

1

[2]

Q55.

(a) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1−2 marks)
The method described is weak and could not be used to collect valid results, however does show some understanding of the sequence of an investigation.

Level 2 (3−4 marks)
The method described could be followed and would enable some valid results to be collected, but lacks detail.

Level 3 (5−6 marks)
The method described could be easily followed and would enable valid results to be collected.

Examples of the points made in the response:

- bean seedlings of same age
- cut material from same part of each organ (for repeats) e.g. top 1 cm of stem / a whole cotyledon / seed
- equal mass of each organ

  accept weight for mass
- grind / homogenise
- in equal amounts of water / buffer
- equal volumes of hydrogen peroxide solution
- equal concentrations of hydrogen peroxide solution
- same temperature
- temperature maintained in water bath
- quantitative measure of gas production eg height of foam in mm / collect gas in graduated syringe in cm^3
- for same time period
- repetitions (3+ times)
- calculate mean for each.

6

(b) (i) correct answer: 40

1 *mark for 45 as the anomalous result has been included in the calculation*

or

1 *mark for* $\frac{(38 + 41 + 42 + 39)}{4}$

or $\frac{160}{4}$

2

(ii) vertical axis correctly labelled:
'Enzyme activity in arbitrary units'

allow ecf from (b)(i)

1

points plotted correctly ±1 mm

*deduct **1** mark for each incorrect plot*

2

suitable line of best fit

not feathery, not point to point

1

(iii) 6.0 / 6

allow ± 0.1

if 6.0 not given, allow correct for candidate's graph ± 0.1

1

(iv) in range 0 to 14 units

allow correct for candidate's graph

1

(v) enzyme denatured / enzyme (active site) shape changed

allow substrate no longer fits (active site)

ignore reference to temperature

do not allow enzyme dies

1

[15]

Q56.

(a) any **two** from:

- to work out the correct dose to be given
- to check that the drug is working correctly
- to check for toxic effects.

2

(b) patients are randomly allocated to receive statin or a placebo

1

so neither patient nor doctor knows who has received which

1

*answer in terms of only the drug company knows who is taking the statin or the placebo gains **2** marks*

(c) To prevent false claims

1

(d) drug **A** reduced the blood cholesterol level more than drug **B**

1

drug **A** reduced the thickness of the artery **or** drug **B** increased the thickness of the artery

*allow drug **A** made the artery thinner **or** drug **B** made the artery thicker*

1

ignore side effects

(e) differences in number of patients reporting side effects are very similar

1

we don't know what the patients died of

1

[9]

Q57.

(a) (i) 5.0

1

(5 × 0.8) **or** 4

allow ecf from distance

1

0.4

allow ecf from 10-min volume

1

(ii) increased (rate of uptake)

1

more transpiration / evaporation

1

(b) correct scales

allow reversed axes

1

correctly labelled axes with units

1

correct points

*one plot error = max **1** mark*

2

curved line of best fit

allow correct straight line

1

(c) leaves <u>wilt</u>

1

because plants lose too much water (by evaporation)

1

through the <u>stomata</u>
or
because cells become <u>plamolysed</u>
or
<u>stomata</u> close
controlled by <u>guard cells</u>
to prevent <u>wilting</u>

1

[13]

Q58.

(a) tissue → organ → organ system

*one right for **1** mark*

*three right for **2** marks*

2

(b) **Epithelial tissue** → covers the outside and the inside of the stomach

more than one line from a tissue = no mark

1

Glandular tissue → produces digestive juices

1

Muscular tissue → allows food to be churned around the stomach

1

(c) (i) light

ignore dark

1

(ii) moving (to the dark)

1

(iii) any **two** from:

- use more woodlice
- repeat the experiment
- run for a longer time

2

[9]

Q59.

(a) any **two** from:

- same result at pH 7 and 7.5
  or
  could be any pH between 7 and 7.5
  or
  not tested at pH 7.25
  or
  need to test at smaller pH intervals (between 7 and 7.5)
- accuracy of result only to nearest 0.5 minutes
- no repeats
- difficult to determine end point (colour)

2

(b) 2.7 / 5

1

0.54 (units per minute)

*allow 0.52 with no working shown for **2** marks*

1

*allow **1** mark for 0.52 **or** 0.56*

(c) (after 10 minutes) solution goes black

1

(after 60 minutes) solution stays the same
or
does not go black
or
goes slightly orange

1

(d) steeper curve

1

levels off at 11.8 units **and** before 45 minutes

1

[8]

Q60.

(a) (i) brain

1

(ii) skin

1

(iii) 1/25 **or** 4% **or** 0.04 **or** 1 in 25 **or** 1:25 **or** 1 out of 25

allow $\frac{1000}{25000}$

1

(b) any **two** from:

- increased / high heart rate / pulse rate
  *do **not** allow pumps more blood unqualified*
- dilation / widening of <u>arteries / arterioles</u> (to skeletal muscles)
  accept vasodilation unqualified
  *do **not** accept reference to veins / capillaries*

or
less blood flow to other organs

- increased stroke volume / described

2

(c) *ignore references to breathing*

more respiration / description
or
more energy required **or** to provide more energy

1

respiration / process described → CO_2
*do **not** accept anaerobic respiration*

1

CO_2 diffuses into blood

1

[8]