DULWICH COLLEGE
FOUNDED 1619

Upper School entrance examination
SPECIMEN PAPER
Biology

Your Last Name	
Your First Name	
Date of birth	
Current school	

Time allowed for this paper 60 minutes

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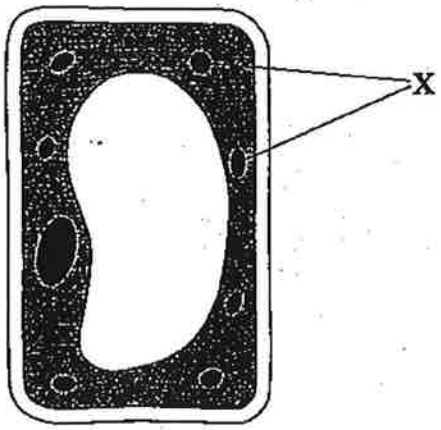
Answer **all** questions in the spaces provided.

1 The diagram shows a plant cell.



(a) Photosynthesis occurs inside structure **X**.

(i) Name structure **X**.

.....

(1 mark)

(ii) Complete the following equation for photosynthesis.

Carbon dioxide + ... → glucose + ...

(2 marks)

(b) Apart from structure **X**, name **two** other structures you can see in the diagram which are **not** present in an animal cell.

1 .....

2 .....

(2 marks)

5

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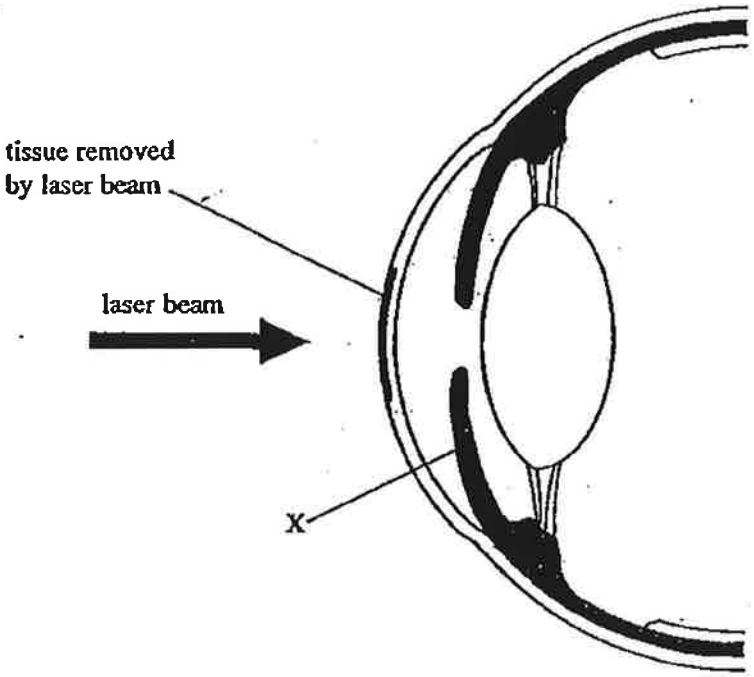
2 Lasers can be used to remove tissue from the front of the eye. This operation corrects short-sightedness.



(a) (i) Name the part of the eye from which tissue is removed by the laser.

.....

(1 mark)

(ii) Give one job of this part of the eye.

.....

.....

(1 mark)

(b) (i) Name the part of the eye labelled X on the diagram.

.....

(1 mark)

(ii) What is the job of this part of the eye?

.....

.....

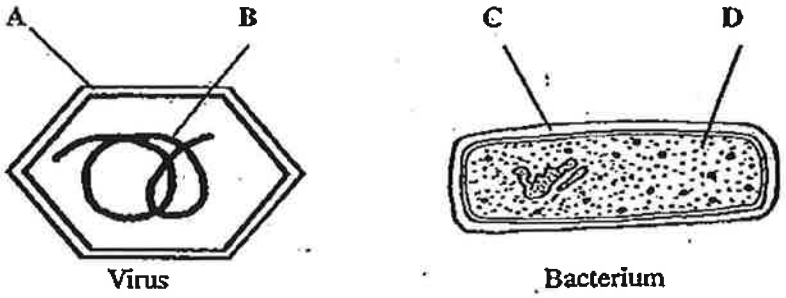
How does it do this job?

.....

.....

(2 marks)

3. (a) The diagrams show a virus and a bacterium (not drawn to the same scale).



Virus Bacterium

Use words from the list to identify parts A to D.

cell wall	**chloroplast**	**cytoplasm**
genes	**nucleus**	**protein coat**

A .....

B .....

C .....

D .....

(4 marks)

(b) Give two ways in which the body stops microbes getting in to it.

1 .....

.....

2 .....

.....

(2 marks)

(c) What is a mutation?

.....

.....

(1 mark)

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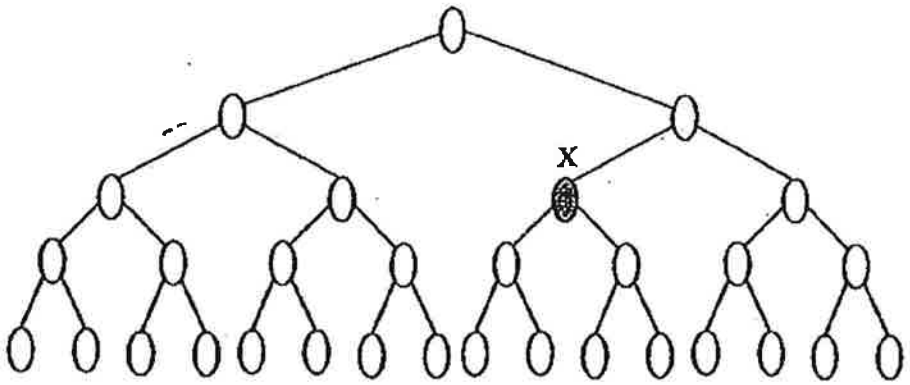
(d) In the diagram, the bacterial cell X undergoes a mutation that makes it resistant to the antibiotic penicillin. Bacteria multiply by asexual reproduction.
On the diagram, shade in all the other bacteria that will have the same mutation.



(1 mark)

TURN OVER FOR THE NEXT QUESTION

4. (a) A leaf on a potted plant had both green parts and white parts as shown in **Figure 1.**
In an experiment, part of the leaf was covered with a black card as shown in **Figure 2.**

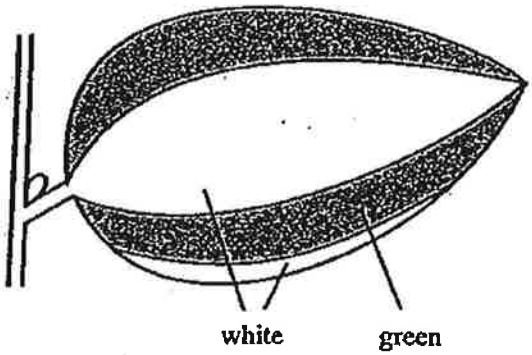


Figure 1

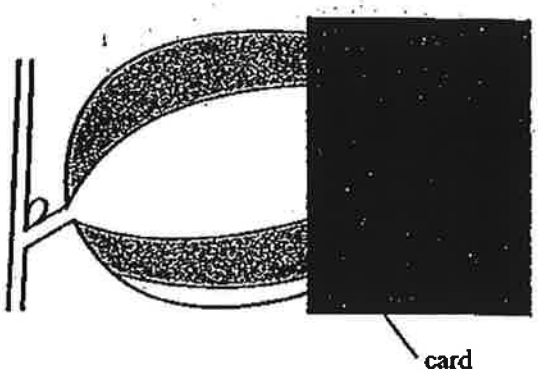
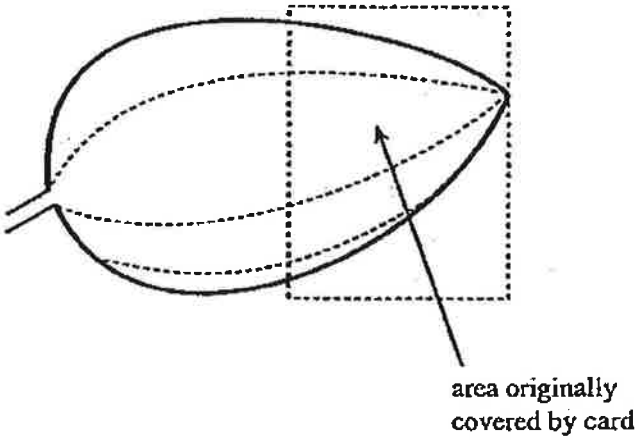


Figure 2

After eight hours in bright light, the leaf was cut off the plant and tested for starch.

On the diagram below, shade in the areas of the leaf that would contain starch.



(2 marks)

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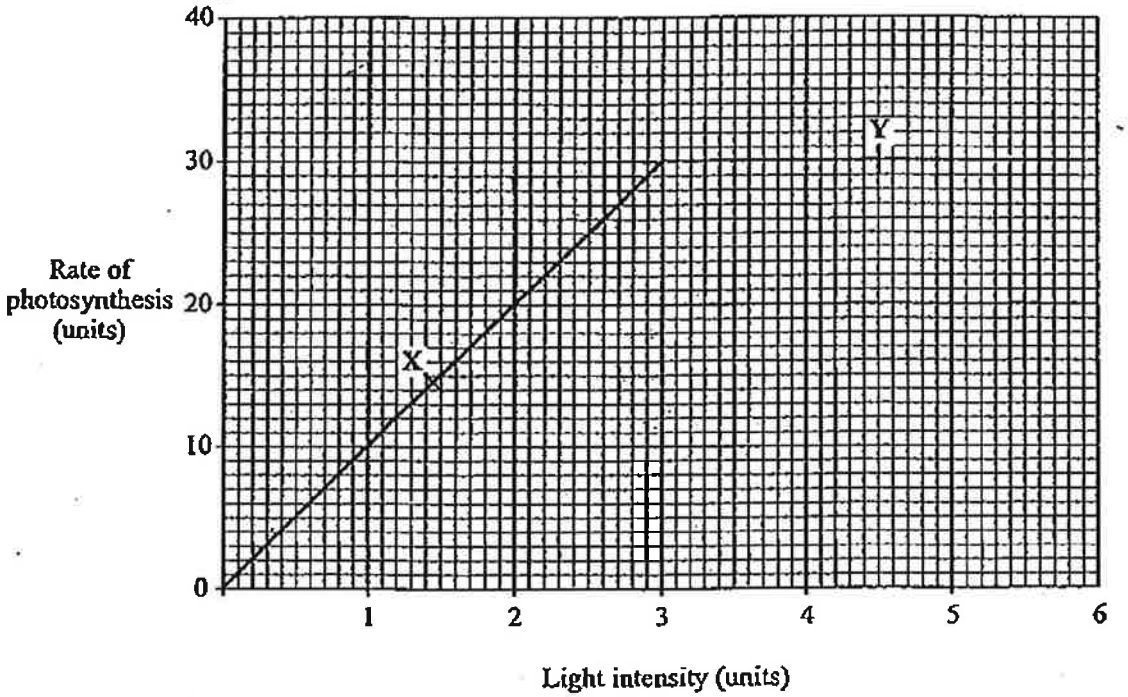
(b) The rate of photosynthesis of a well-watered plant in a glasshouse was measured at different light intensities.
The atmosphere of the glasshouse had a high concentration of carbon dioxide.
The temperature was constant at 15°C.
The results are shown in the graph.



(i) What was the maximum rate of photosynthesis measured in this investigation?

.....

(1 mark)

(ii) What factor was limiting the rate of photosynthesis:

at point X; .....

at point Y? .....

(2 marks)

TURN OVER FOR THE NEXT QUESTION

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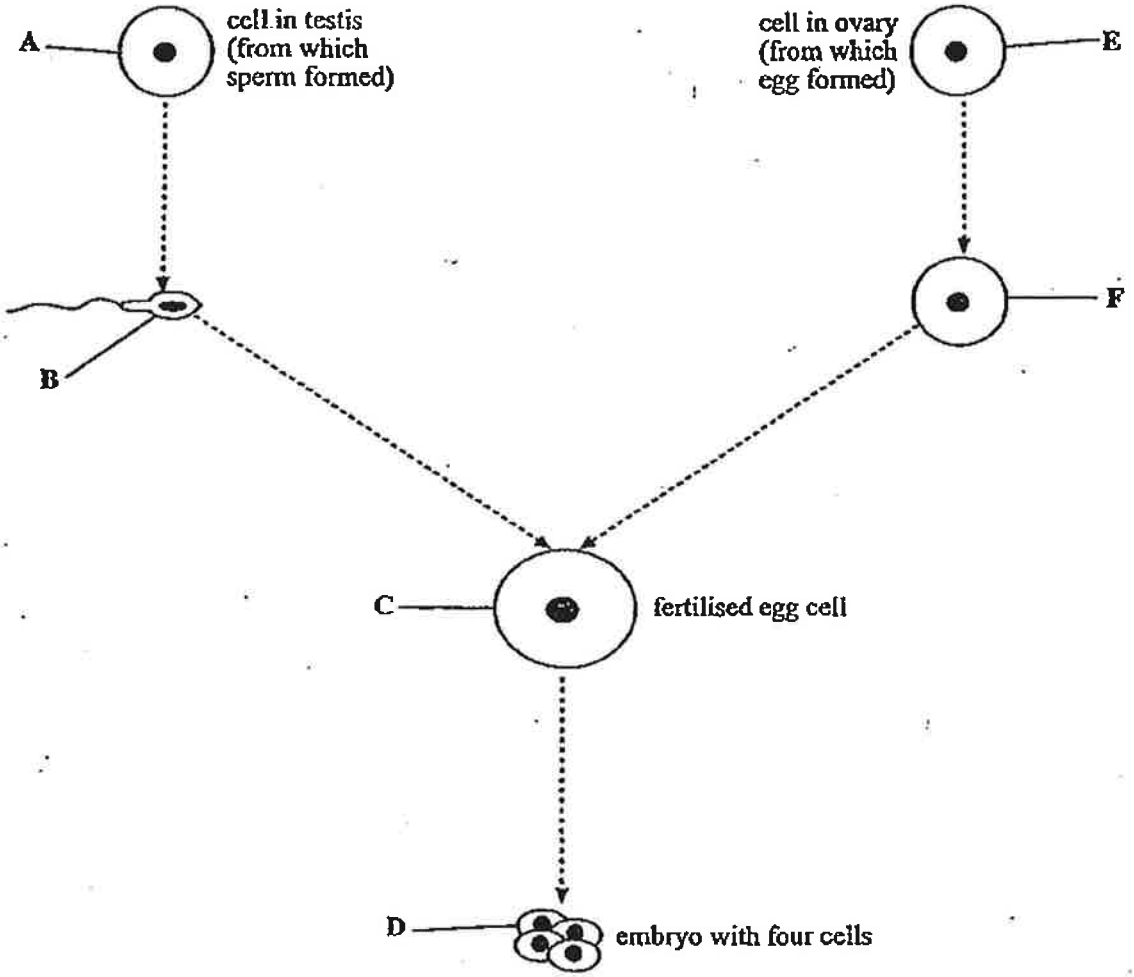
5. (a) The diagram shows some stages in sexual reproduction in a mammal.



Which of the cells, labelled A to F:

(i) are gametes; .....

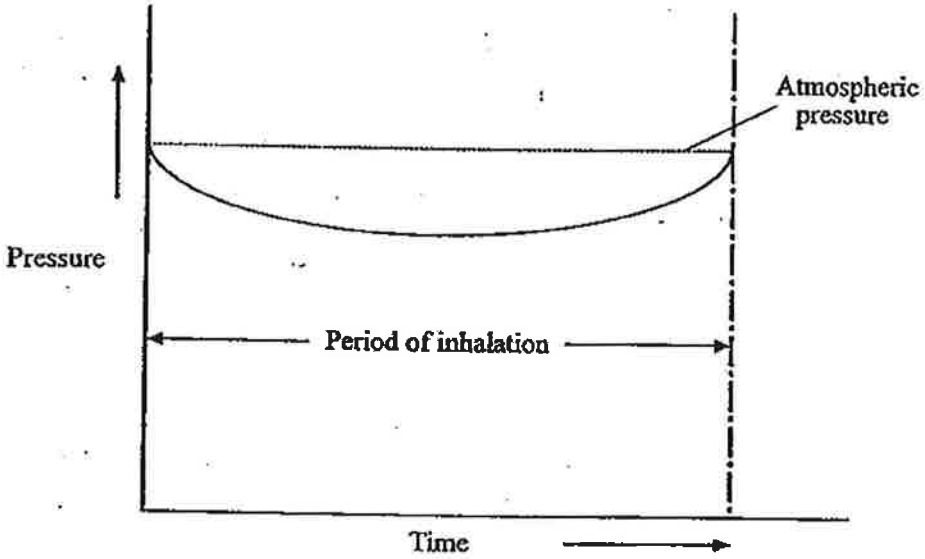
(ii) have chromosomes in pairs; .....

(iii) divide by meiosis; .....

(iv) have identical genetic information? .....

(4 marks)

6. (a) The graph shows changes in pressure in the lungs during one inhalation (breathing in).



(i) Explain why the pressure in the lungs falls during inhalation.

.....

.....

.....

.....

(2 marks)

(ii) Explain why the pressure inside the lungs is the same as the atmospheric pressure outside at the end of inhalation.

.....

.....

(1 mark)

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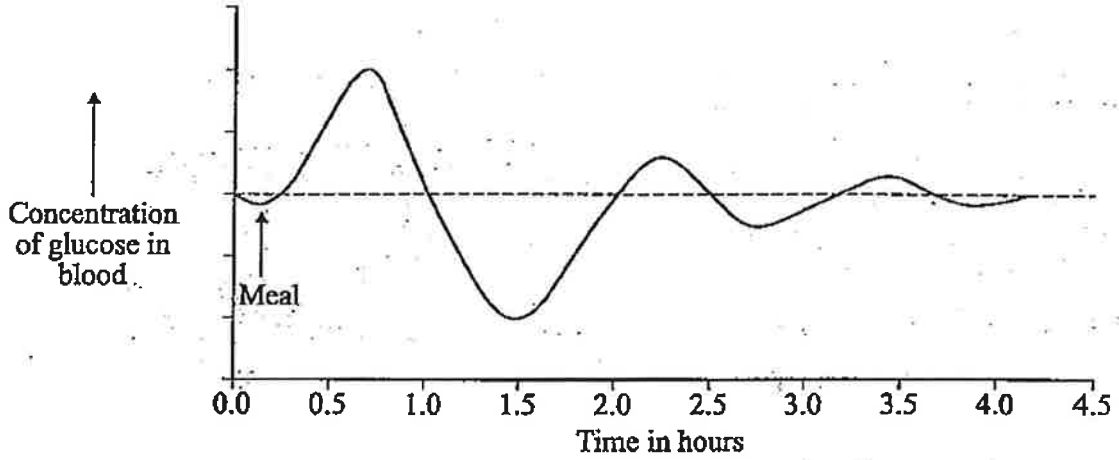
7. (a) The graph shows changes in the concentration of glucose in a person's blood following a meal.



Changes in the concentration of glucose are controlled by the hormones glucagon and insulin.

Write the letters **X** and **Y** on the graph to show:

X a time when glucagon secretion will be highest;

Y a time when insulin secretion will be highest.

(2 marks)

(b) Many diabetics require injections of insulin. The insulin is made by genetically-engineered bacteria which contain the gene for human insulin.

Suggest why treating diabetics with insulin made by genetically-engineered bacteria may be better than treating them with insulin made by pigs and cattle.

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(2 marks)

4

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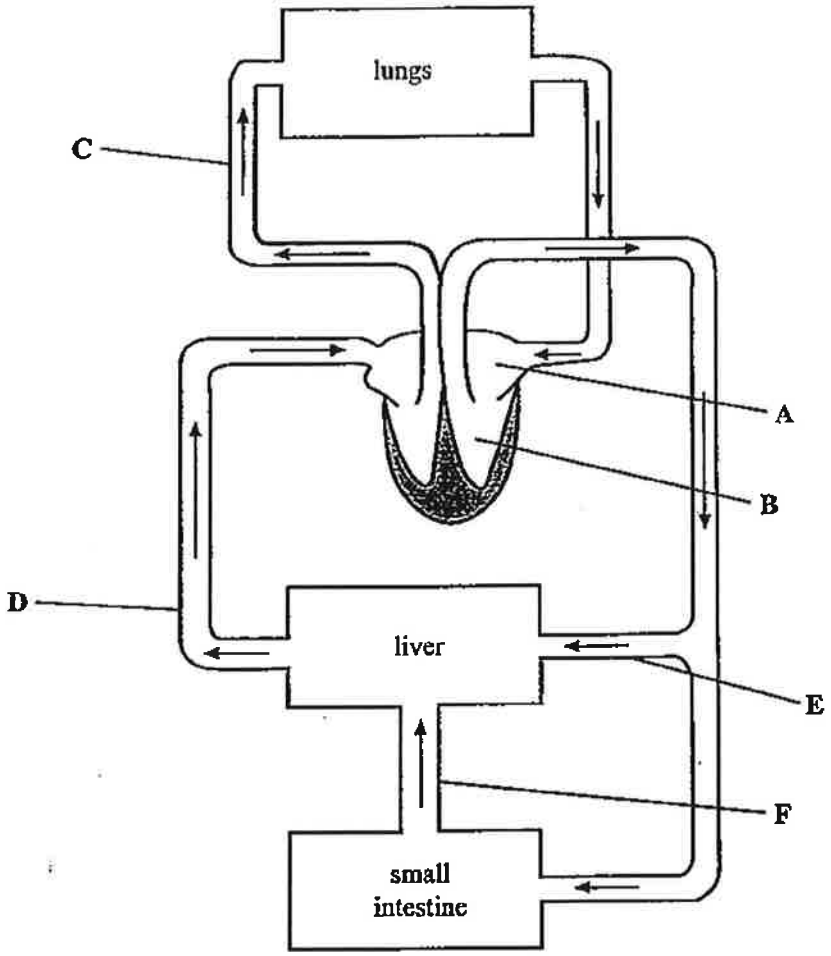
8. The simplified diagram shows part of the circulatory system.



(a) Name the parts of the heart labelled **A** and **B**.

A .....

B ..... *(2 marks)*

(b) Name the types of blood vessel labelled **C** and **D**.

C .....

D ..... *(2 marks)*

QUESTION CONTINUES ON THE NEXT PAGE

(c) The composition of blood leaving the liver differs from that of the blood entering the liver in several ways.
Give three ways in which the composition of the blood in vessel D differs from that in vessel E.

1 .....

.....

2 .....

.....

3 .....

.....

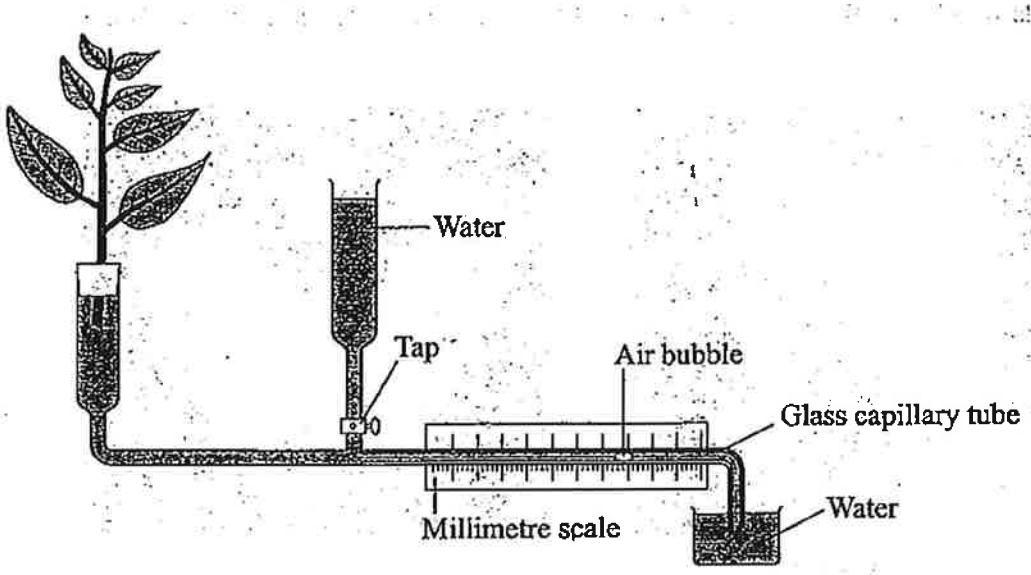
(3 marks)

(d) Give one way in which the composition of blood in vessel F might change soon after a meal.

.....

(1 mark)

9. The diagram shows the apparatus used to measure the uptake of water by a plant cutting.



A cutting was placed in the apparatus and was then treated, in turn, in four different ways:

Experiment **A**:	still, cool air
Experiment **B**:	a cool wind
Experiment **C**:	a warm wind of the same speed as that in experiment **B**
Experiment **D**:	still, cool air, but with vaseline on the lower surfaces of the leaves

The position of the air bubble was recorded at $\frac{1}{2}$-minute intervals for each experiment. After each experiment, the air bubble was returned to the right-hand end of the scale.

The results for experiment **C** are given in the table.

Time in minutes	**Experiment C: warm wind**
	Position of air bubble in mm
0.0	0
0.5	28
1.0	56
1.5	84
2.0	112

(a) The results for experiments **A** and **D** are shown in the graph on the opposite page.

(i) Draw a graph of the data obtained from experiment **C**. Draw this on the same graph paper.

(3 marks)

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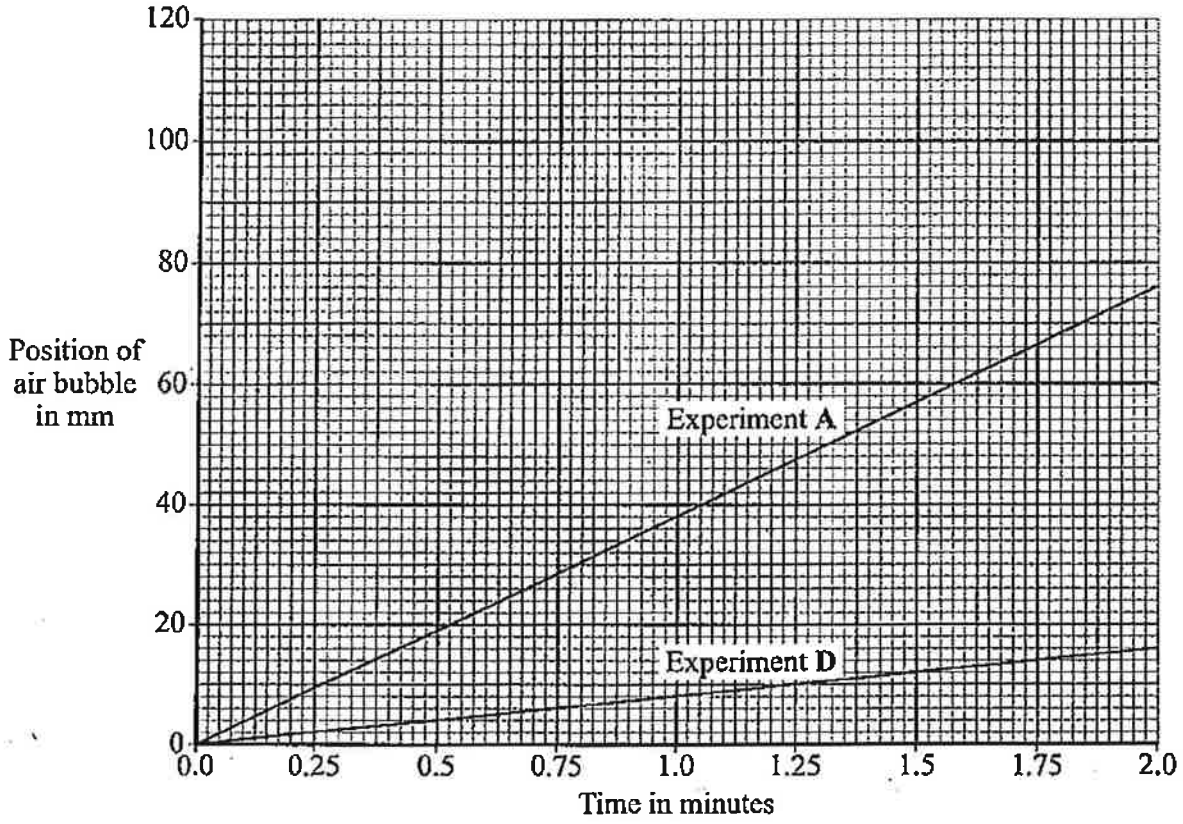

(ii) Sketch a line on the graph to show the approximate results you would expect for experiment **B**.

(1 mark)

(b) In the species of plant used in the investigation, stomata are found only on the lower surfaces of the leaves.

(i) Explain why there was very little water uptake in experiment **D**.

.....

.....

(1 mark)

(ii) What conditions resulted in the fastest rate of water uptake by the plant cutting?

.....

(1 mark)

(c) (i) Name the process by which water is lost from a plant leaf.

.....

(1 mark)

(ii) Name the tissue which transports water to the leaves of a plant.

.....

(1 mark)

Turn over ▶

10. (a) Red blood cells contain haemoglobin.
Describe what happens to haemoglobin in the lungs.

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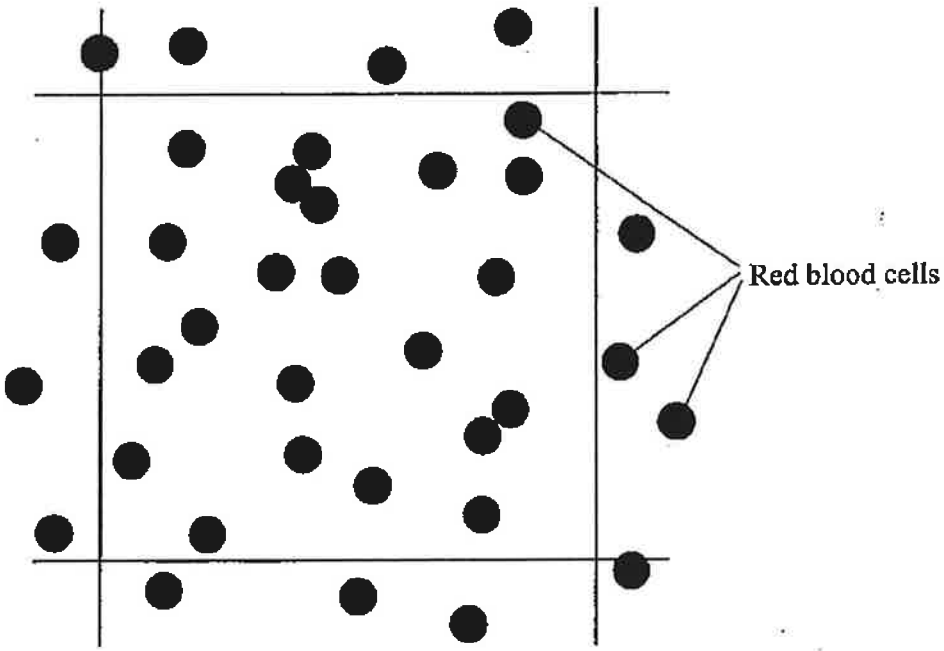
(2 marks)

(b) A sample of human blood was diluted with sodium chloride solution.
The blood was diluted to 1/1000 of its original strength.
Some of the diluted blood was placed into a special counting chamber.
The diagram shows the appearance of the counting chamber under a microscope.



The volume of diluted blood shown in the square is 0.004 mm^3.

Calculate the number of red blood cells in 1 mm^3 of undiluted blood. Use information from the diagram. Show clearly how you work out your final answer.

.....

.....

.....

Number of red blood cells per mm^3 undiluted blood = ...

(3 marks)

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(c) (i) In a second experiment, some blood was diluted using pure water. The cells burst.

Explain what caused this.

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(4 marks)

(ii) Plant cells placed in pure water do not burst.

Explain why.

.....

.....

(1 mark)