

Paper Reference(s) 1BI0/2F

**Pearson Edexcel Level 1/Level 2
GCSE (9–1)**

**Biology
Paper 2
Foundation Tier**

Monday 11 June 2018 – Morning

**Time: 1 hour 45 minutes plus your
additional time allowance**

INSTRUCTIONS TO CANDIDATES
**Write your centre number, candidate
number, surname, other names and your
signature in the boxes below. Check
that you have the correct question paper.**

Centre No.					
Candidate No.					
Surname					
Other names					
Signature					
Paper Reference	1	B	I	0	/ 2 F

- **Use BLACK ink or ball-point pen.**
- **Answer ALL questions.**
- **Answer the questions in the spaces provided – there may be more space than you need.**
- **Calculators may be used.**
- **Any diagrams may NOT be accurately drawn, unless otherwise indicated.**
- **You must SHOW ALL YOUR WORKING OUT with YOUR ANSWER CLEARLY IDENTIFIED at the END OF YOUR SOLUTION.**

**MATERIALS REQUIRED FOR
EXAMINATION**

Calculator, ruler

**ITEMS INCLUDED WITH QUESTION
PAPERS**

Nil

(Instructions continue on next page)

(Turn over)

INFORMATION FOR CANDIDATES

- **The total mark for this paper is 100.**
- **The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**
- **In questions marked with an **ASTERISK (*)**, marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.**

ADVICE TO CANDIDATES

- **Read each question carefully before you start to answer it.**
- **Try to answer every question.**
- **Check your answers if you have time at the end.**

(Turn over)

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

(Questions begin on next page)

(Turn over)

1 Insulin is produced by an endocrine gland and is transported in the blood.

**(a) (i) Which row shows the endocrine gland and the target organs for insulin?
(1 mark)**

	endocrine gland	target organs
<input type="checkbox"/> A	adrenal	liver and muscles
<input type="checkbox"/> B	adrenal	small and large intestines
<input type="checkbox"/> C	pancreas	liver and muscles
<input type="checkbox"/> D	pancreas	small and large intestines

(Question continues on next page)

(Turn over)

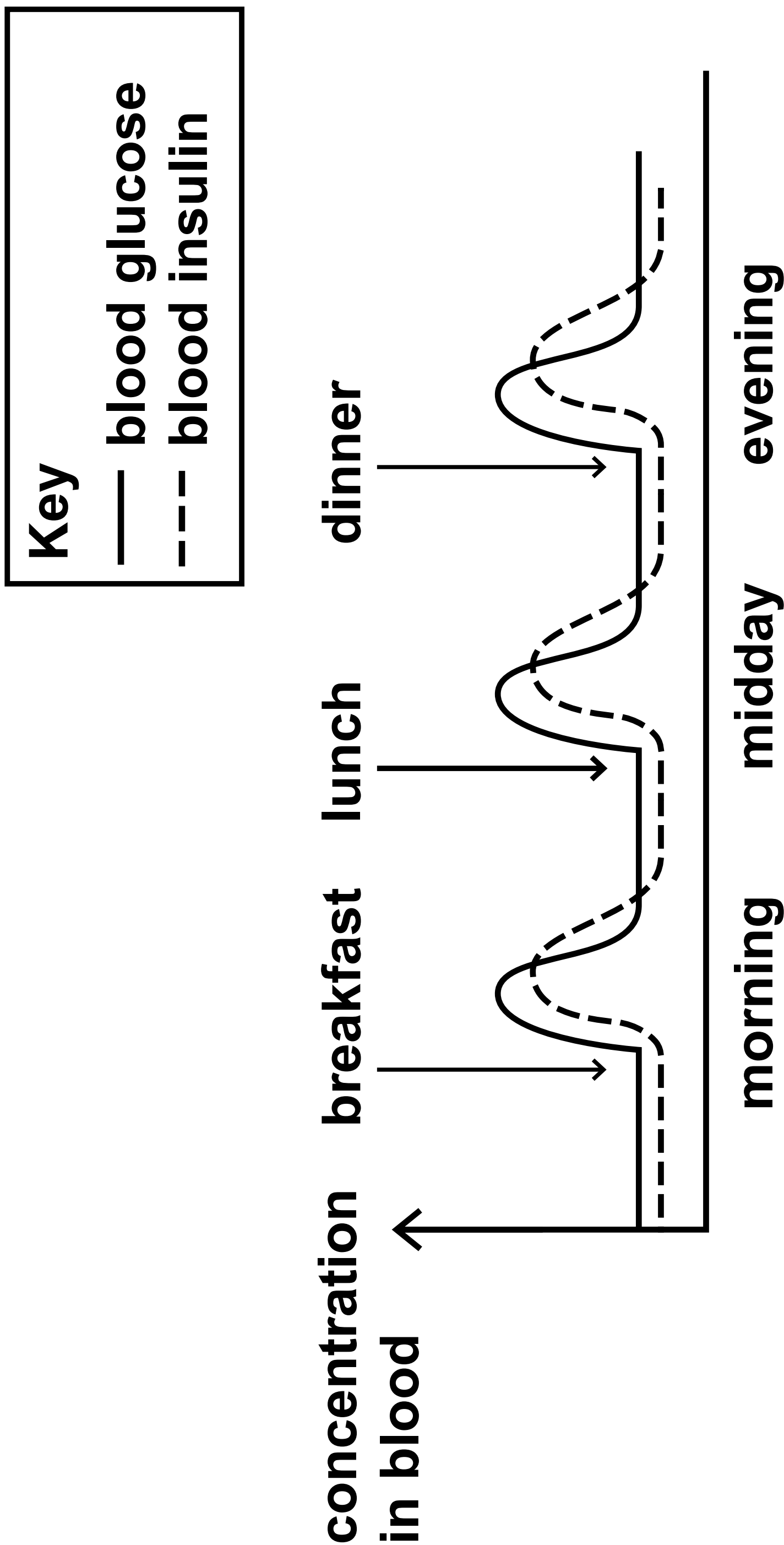
(ii) Which part of the blood transports insulin to its target organs? (1 mark)

- ☐ **A plasma**
- ☐ **B red blood cells**
- ☐ **C white blood cells**
- ☐ **D platelets**

(Question continues on next page)

(Turn over)

(b) Figure 1 shows the blood glucose and blood insulin concentration for a healthy person during one day.



7

Figure 1

(Question continues on next page) (Turn over)

8

The blood glucose concentration increases after a meal.

**Explain why the blood glucose concentration then decreases.
(2 marks)**

(Question continues on next page)

(Turn over)

(c) State ONE cause of type 1 diabetes. (1 mark)

(d) Explain how controlling the diet can be used to treat type 2 diabetes. (2 marks)

**(Question continues on next page)
(Turn over)**

(e) A scientist is planning to test a new treatment for type 2 diabetes.

She selects 300 volunteers who have type 2 diabetes.

**State TWO other factors that the scientist should consider when selecting the 300 volunteers.
(2 marks)**

1 _____

2 _____

(Total for Question 1 = 9 marks)

(Questions continue on next page)

(Turn over)

- 2 (a) Figure 2 shows alveoli from a healthy lung.**



Figure 2

Smoking can cause a condition called emphysema.

Figure 3 shows alveoli from a person with emphysema.



Figure 3

**(Question continues on next page)
(Turn over)**

Use words from the box to complete the following sentences. (2 marks)

breathing

diffusion

larger

osmosis

smaller

thicker

The alveoli from the person with emphysema have a

surface area than the alveoli from a healthy lung.

The surface area of the alveoli will affect how much oxygen moves into the blood by the process of

(Question continues on next page)
(Turn over)

- (b) The graph in Figure 4 shows the volume of oxygen an athlete absorbs at different running speeds.

oxygen absorbed in
 dm^3 per minute

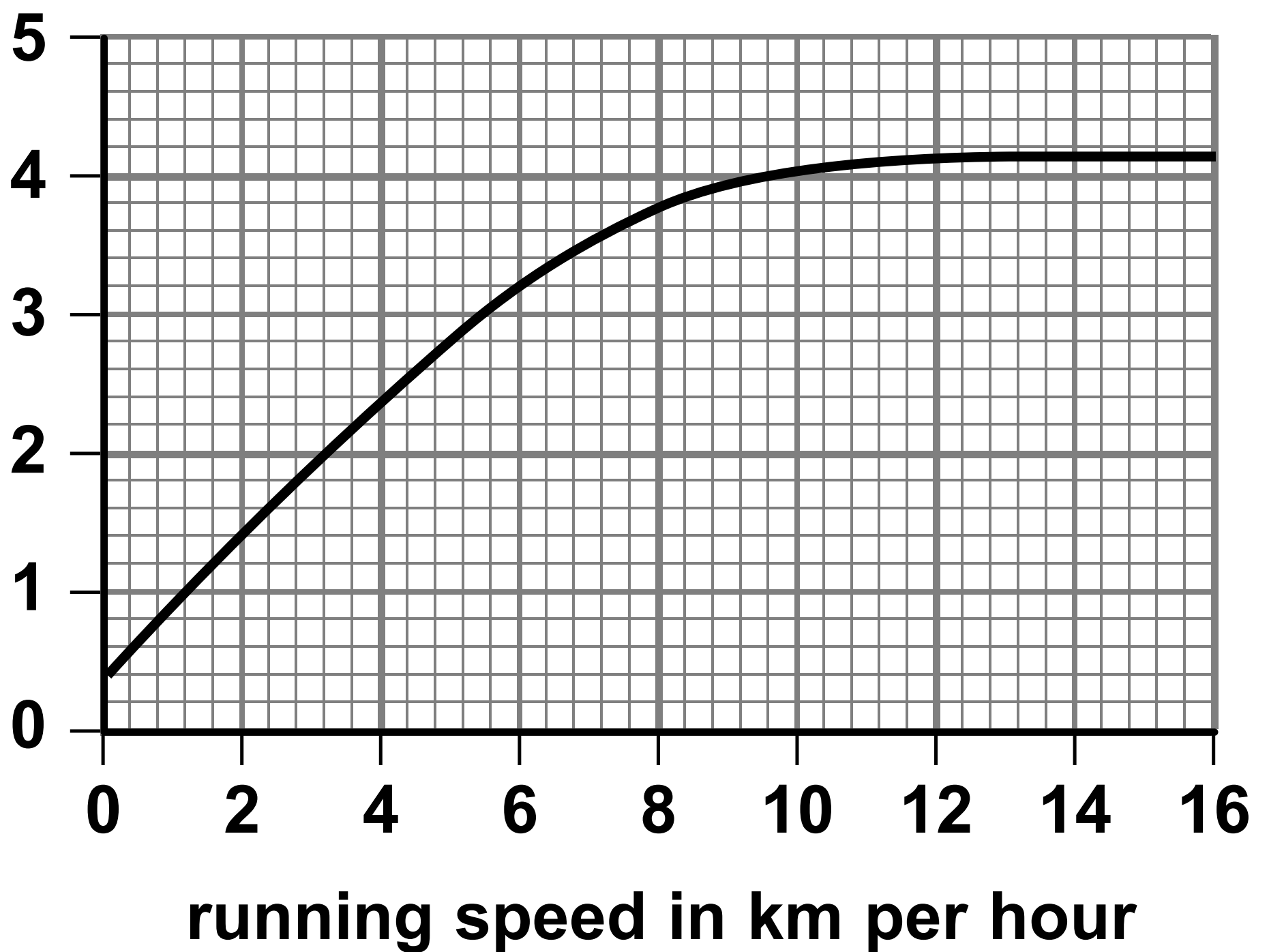


Figure 4

(Question continues on next page)

(Turn over)

(i) Describe the trend shown in Figure 4. (2 marks)

(Question continues on next page)

(Turn over)

(ii) Which uses more oxygen when the running speed of the athlete changes from 4 to 6 km per hour? (1 mark)

- ☐ **A increasing aerobic respiration**
- ☐ **B increasing anaerobic respiration**
- ☐ **C decreasing aerobic respiration**
- ☐ **D decreasing anaerobic respiration**

(Question continues on next page)

(Turn over)

- (iii) Explain why the athlete produces lactic acid when running at 14 km per hour. (2 marks)**

(Total for Question 2 = 7 marks)

(Questions continue on next page)

(Turn over)

3 The effect of temperature on decomposition was investigated.

30 leaves were collected. The mass of five leaves was recorded and the leaves were placed into a net bag. This was repeated five more times.

Figure 5 shows one of these bags.

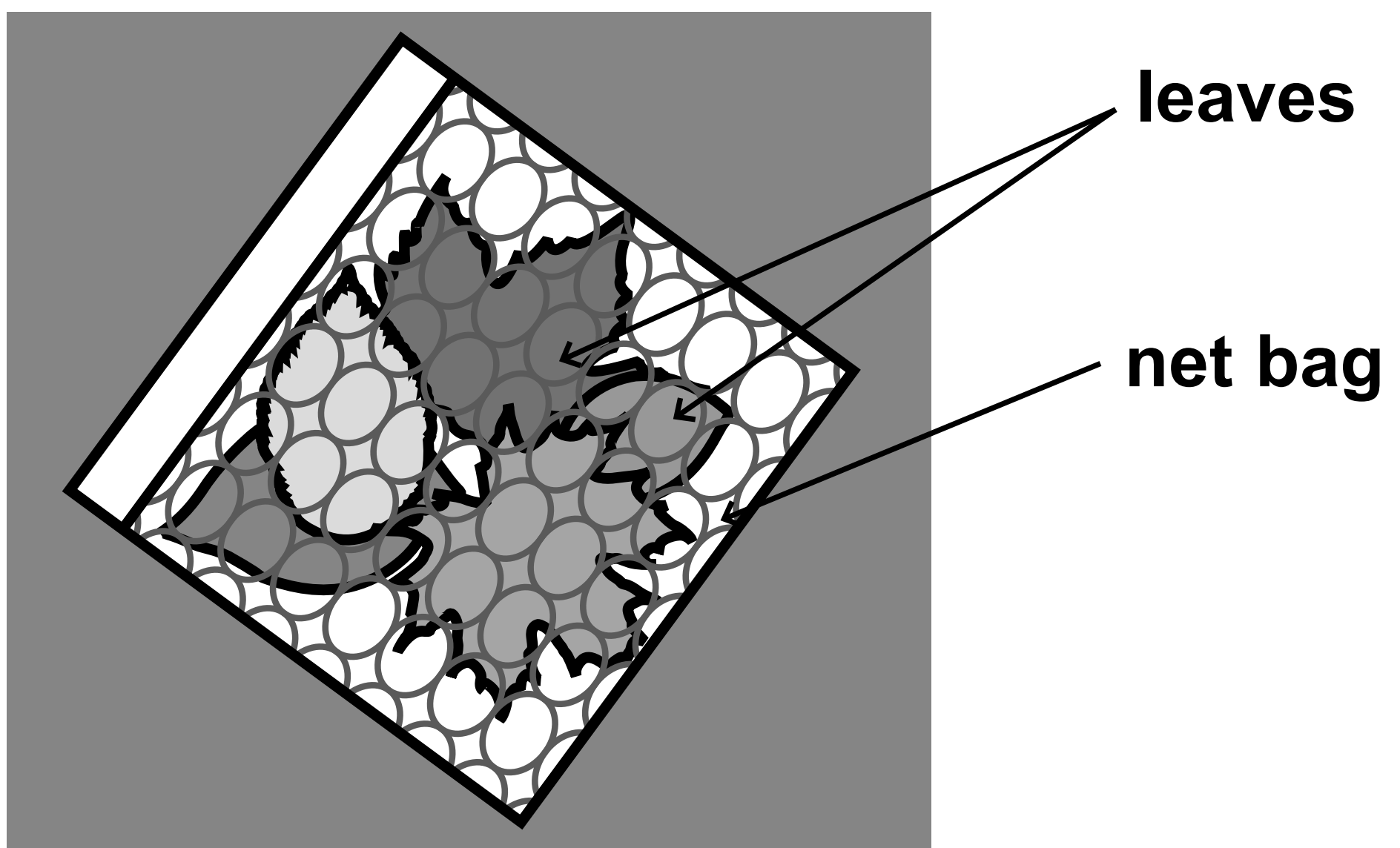


Figure 5

(Question continues on next page)

(Turn over)

The net bags were then put in trays and covered in soil as shown in Figure 6.

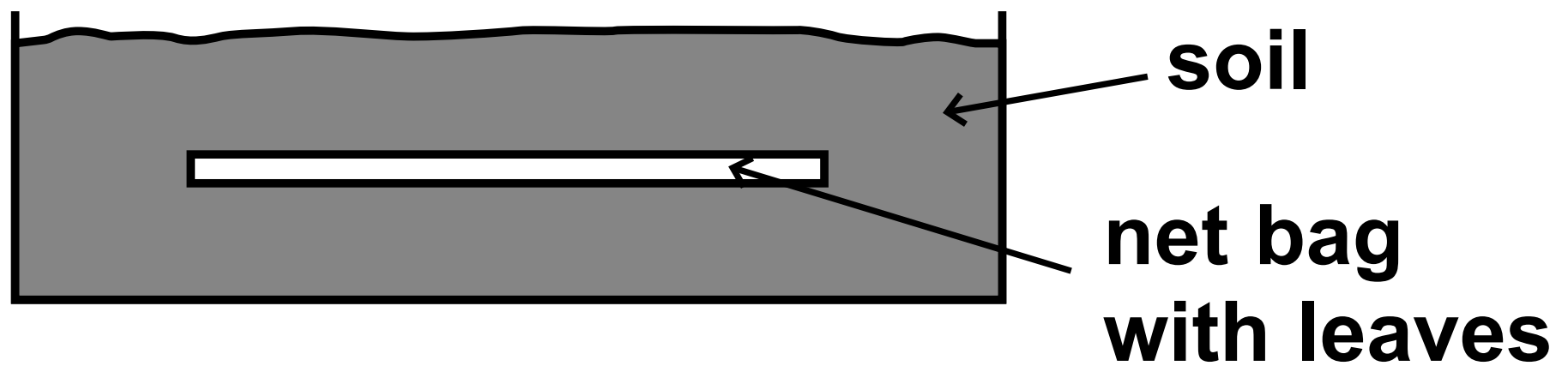


Figure 6

(a) Which type of tray should be used so that the leaves are in the best conditions for decomposition? (1 mark)

- ☐ **A tray with air holes and dry soil**
- ☐ **B airtight tray with dry soil**
- ☐ **C tray with air holes and moist soil**
- ☐ **D airtight tray with moist soil**

(Question continues on next page)
(Turn over)

(b) Each tray was kept at a different temperature.

The mass of the leaves was recorded again after 25 days.

On page 20 Figure 7 shows the results of this investigation.

(Question continues on next page)

(Turn over)

temperature in °C	mass of leaves in g		decrease in mass in g	percentage decrease in mass (%)
	at start	after 25 days		
10	5·3	4·9	0·4	7·5
25	4·9	4·2	0·7	14
40	5·2	4·0	1·2	23
55	4·8	3·2	1·6	33
70	5·0	3·7	1·3	26
85	5·4	5·2	0·2	?

Figure 7

(Question continues on next page)

(Turn over)

- (i) Calculate the percentage decrease in mass for the leaves at 85 °C.

Give your answer to two significant figures.
(2 marks)

_____ %

(Question continues on next page)

(Turn over)

- (ii) Explain which temperature was the best for the decomposition of the leaves. (2 marks)**

(Question continues on next page)

(Turn over)

(iii) State TWO improvements to the method for this investigation. (2 marks)

1 _____

2 _____

(Total for Question 3 = 7 marks)

(Questions continue on next page)

(Turn over)

4 (a) Plants use nitrate ions to make proteins and chlorophyll.

**(i) What effects will a low nitrate ion concentration in soils have on plants?
(1 mark)**

- ☐ **A reduced growth and darker green leaves**
- ☐ **B reduced growth and lighter green leaves**
- ☐ **C increased growth and darker green leaves**
- ☐ **D increased growth and lighter green leaves**

(Question continues on next page)

(Turn over)

**(ii) Which organisms convert nitrogen to nitrate ions during the nitrogen cycle?
(1 mark)**

☐

A bacteria

☐

B mammals

☐

C fungi

☐

D worms

(Question continues on next page)

(Turn over)

(b) Figure 8 shows part of a root as seen using a light microscope.

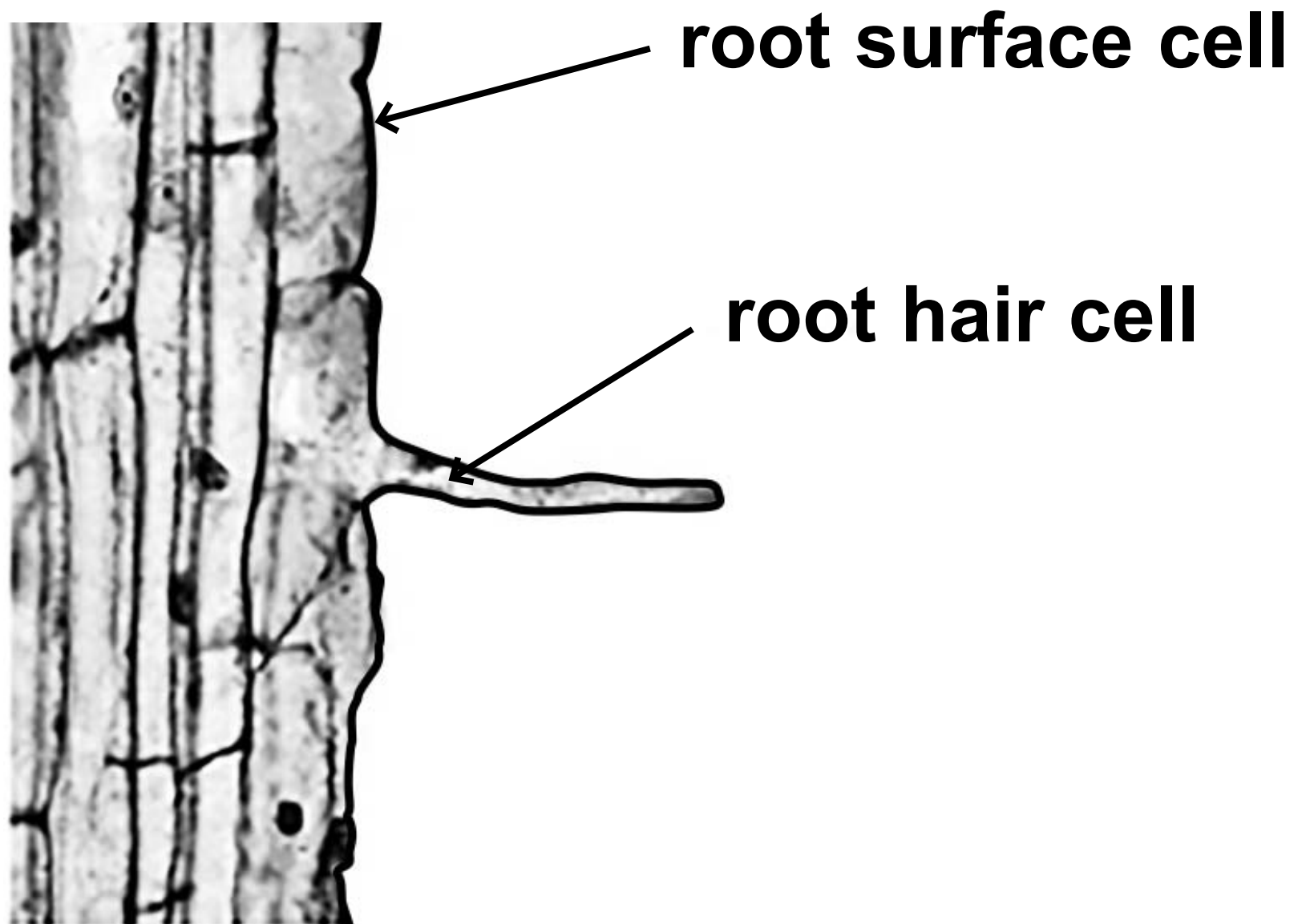


Figure 8

(Question continues on next page)

(Turn over)

Figure 9 shows information about the two types of cell labelled in Figure 8.

type of cell	surface area in μm^2	volume in μm^3	surface area to volume ratio
root surface cell	5 000	250 000	1 : 50
root hair cell	36 000	288 000	?

Figure 9

(Question continues on next page)

(Turn over)

- (i) Calculate the surface area to volume ratio of the root hair cell. (2 marks)**

(Question continues on next page)

(Turn over)

- (ii) Explain the benefit to the plant of having root hair cells. (2 marks)**

- (c) Algae are green plants.**

On page 30 Figure 10 shows the number of algae in a lake in the United Kingdom during one year.

(Question continues on next page)

(Turn over)

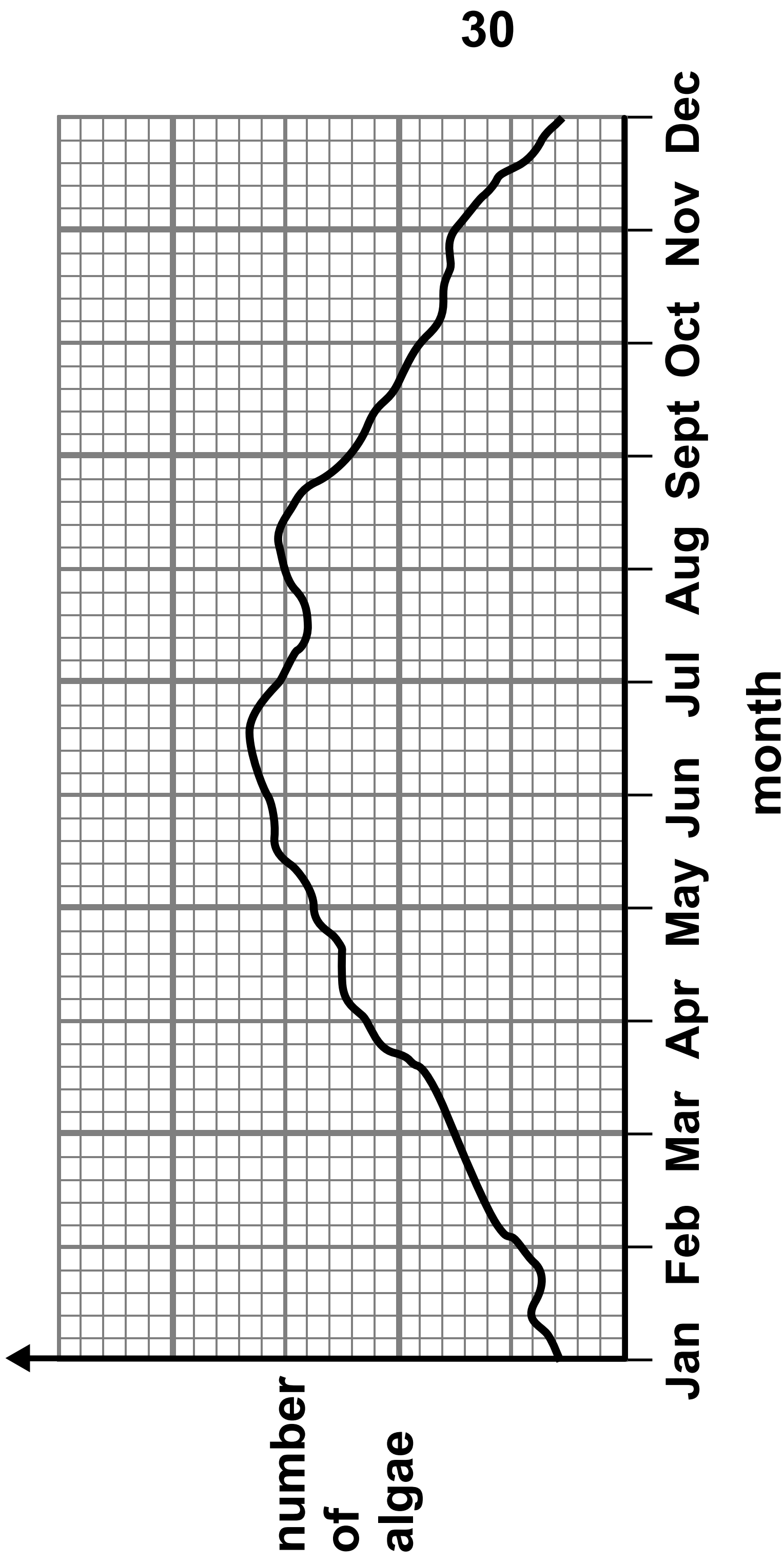


Figure 10

(Question continues on next page)

(Turn over)

Explain the changes in the number of algae in the lake from February to June. (3 marks)

[illegible]

(Questions continue on next page)
(Turn over)

5 Figure 11 shows a British glow-worm.

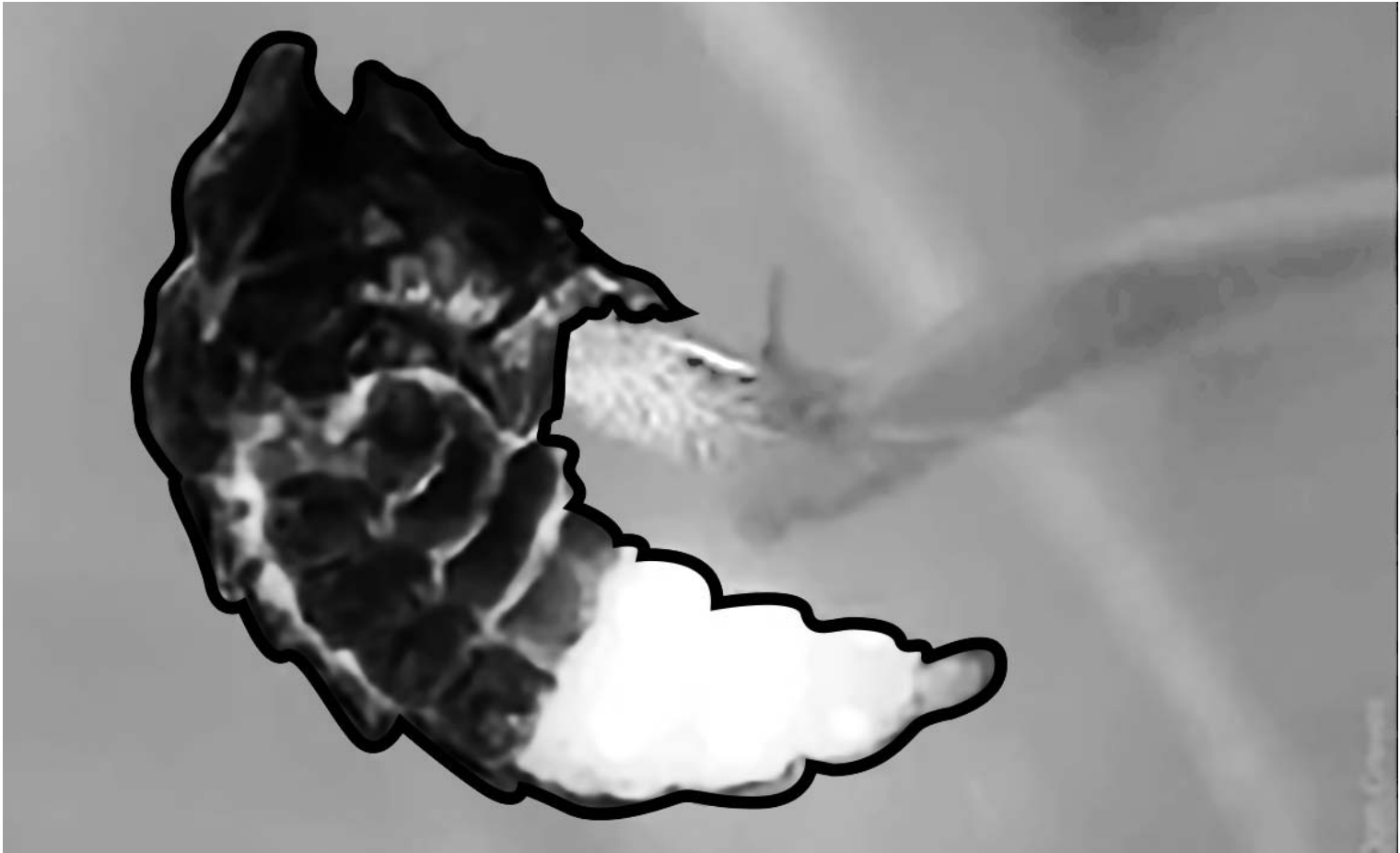


Figure 11

Read the following extract before answering the questions.

Female glow-worms produce bright lights in the summer to attract males. Glow-worm larvae are predators of slugs and snails, but adult glow-worms do not feed. Females only have a few weeks to attract a mate and lay eggs, before the females die.

(Question continues on next page)

(Turn over)

**(a) What will happen if the population of snails decreases?
(1 mark)**

- ☐ **A the population of glow-worms will increase**
- ☐ **B adult glow-worms will eat more snails**
- ☐ **C glow-worm larvae will eat more slugs**
- ☐ **D adult female glow-worms will glow more brightly**

(Question continues on next page)

(Turn over)

- (b) Female glow-worms have an enzyme called luciferase. The glow is produced when this enzyme catalyses a reaction between oxygen and a protein.**

A scientist devised a plan to investigate the effect of oxygen concentration on this reaction.

The scientist had:

- **five flasks of water each with a different concentration of dissolved oxygen**
- **a solution of the protein**
- **a solution of the enzyme.**

The first step of this plan is:

Step 1. Add some of the protein solution to each of the five flasks.

**(Question continues on next page)
(Turn over)**

- (i) Describe the next TWO steps that should be in this plan to obtain results for this investigation. (2 marks)

Step 2 _____

Step 3 _____

(Question continues on next page)

(Turn over)

**(ii) Which procedure would improve the investigation?
(1 mark)**

- ☐ **A change the concentration of the protein solution in each flask**
- ☐ **B change the volume of the protein solution added to each flask**
- ☐ **C keep the concentration of dissolved oxygen the same in each flask**
- ☐ **D keep the volume of each solution the same in each flask**

(Question continues on next page)

(Turn over)

(iii) The enzyme luciferase works best at pH 8.

Explain why the activity of the enzyme decreases at pH 5. (2 marks)

(Question continues on next page)

(Turn over)

(c) Female glow-worms are found attached to grass plants in a large field.

(i) Describe a sampling technique to find the MEAN number of female glow-worms in 1 m^2 of the field. (3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

- (ii) The mean number of female glow-worms in 1 m^2 of the field is 5.**

The field has a total area of 800 m^2 .

Estimate the number of female glow-worms in the whole field. (1 mark)

(Total for Question 5 = 10 marks)

(Questions continue on next page)

(Turn over)

- 6 (a) Figure 12 shows a cross section through a leaf.

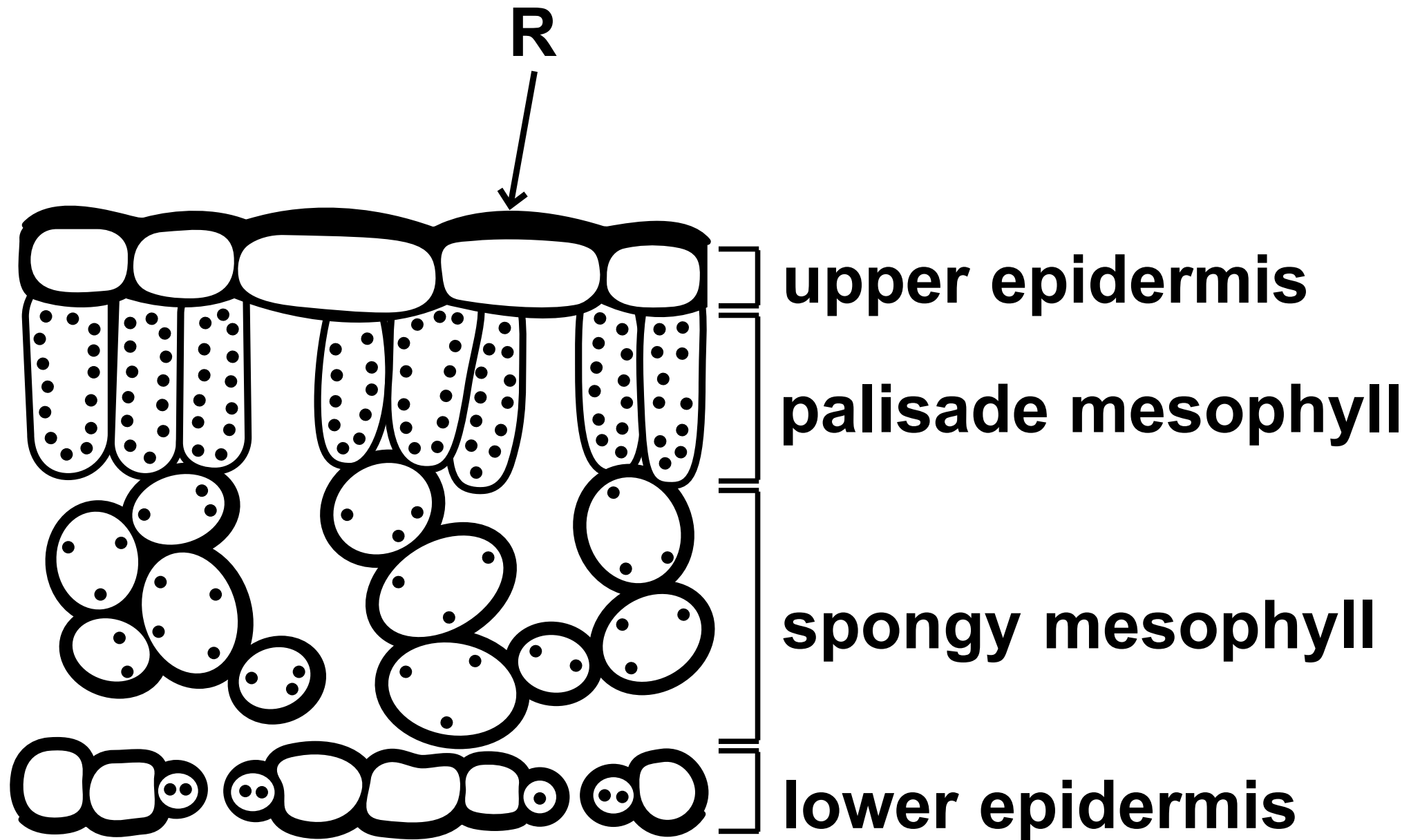


Figure 12

(Question continues on next page)

(Turn over)

(i) What is the name of the part labelled R in Figure 12? (1 mark)

- ☐ **A cell wall**
- ☐ **B cytoplasm**
- ☐ **C stomata**
- ☐ **D waxy cuticle**

(ii) On page 43 Figure 13 shows the mass of glucose produced in each layer of a leaf per hour.

(Question continues on next page)

(Turn over)

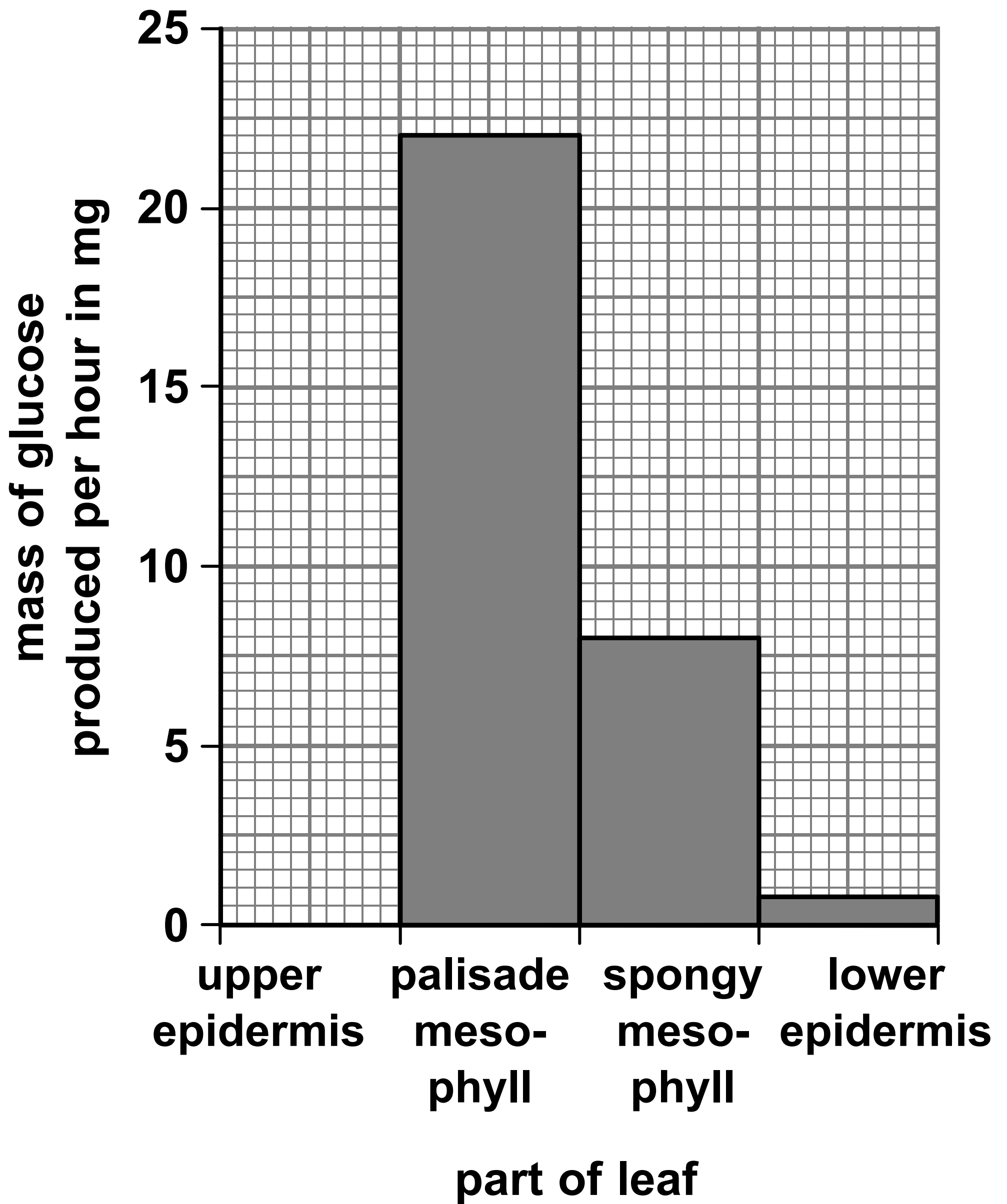


Figure 13

(Question continues on next page)

(Turn over)

**Describe the difference in the mass of glucose produced per hour in the palisade mesophyll and the mass of glucose produced in the spongy mesophyll shown in Figure 13.
(2 marks)**

(Question continues on next page)

(Turn over)

(b) Figure 14 shows how light intensity changed during one day.

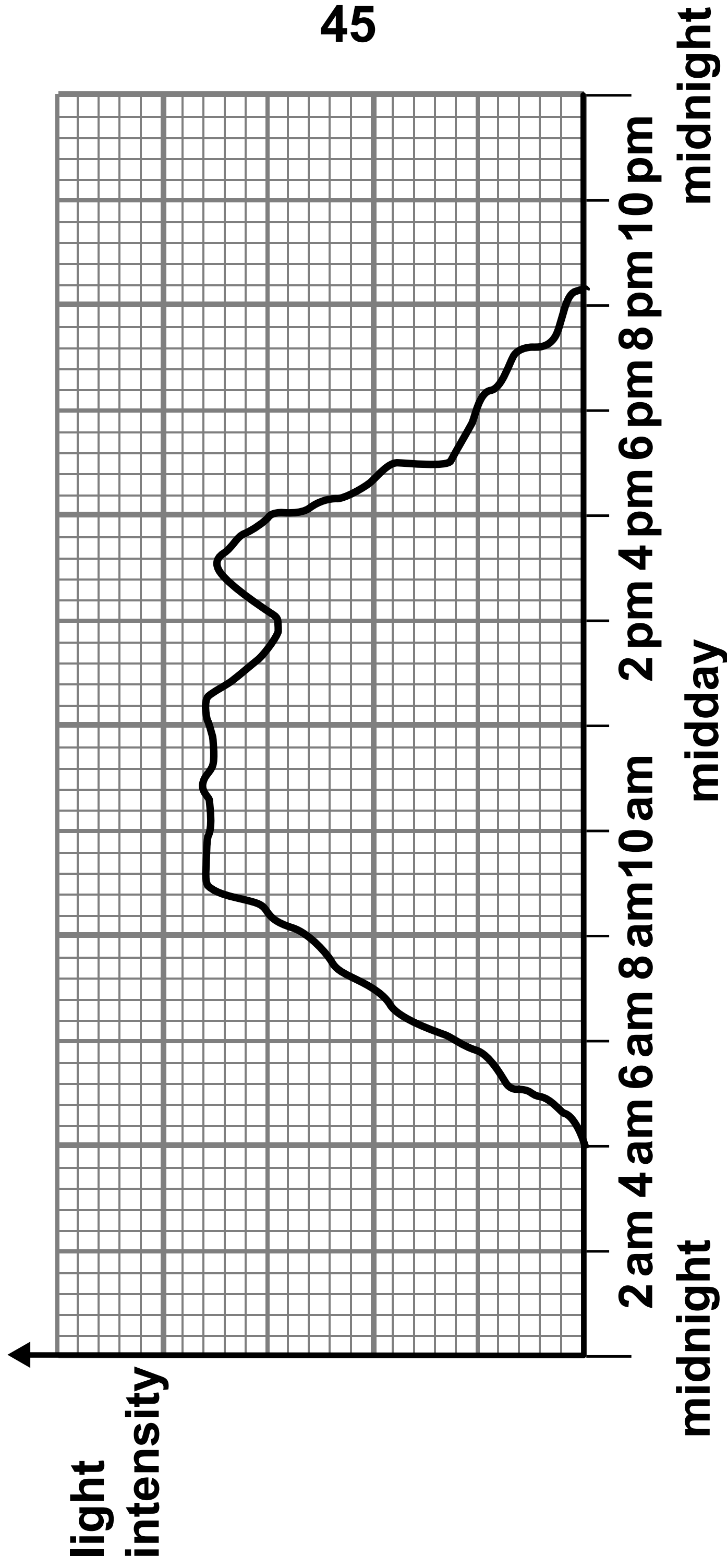


Figure 14

(Question continues on next page)

(Turn over)

Use information in Figure 14 to explain why oxygen moved out of the leaf between 9 am and midday. (2 marks)

(Question continues on next page)

(Turn over)

- (c) (i) Glucose is produced in a leaf.**

Glucose is a (1 mark)

- ☐ **A vitamin**
- ☐ **B protein**
- ☐ **C lipid**
- ☐ **D carbohydrate**

(Question continues on next page)

(Turn over)

**(ii) Describe a test for glucose.
(2 marks)**

(Question continues on next page)

(Turn over)

(d) Figure 15 shows an enzyme and three substrates found in plant cells.

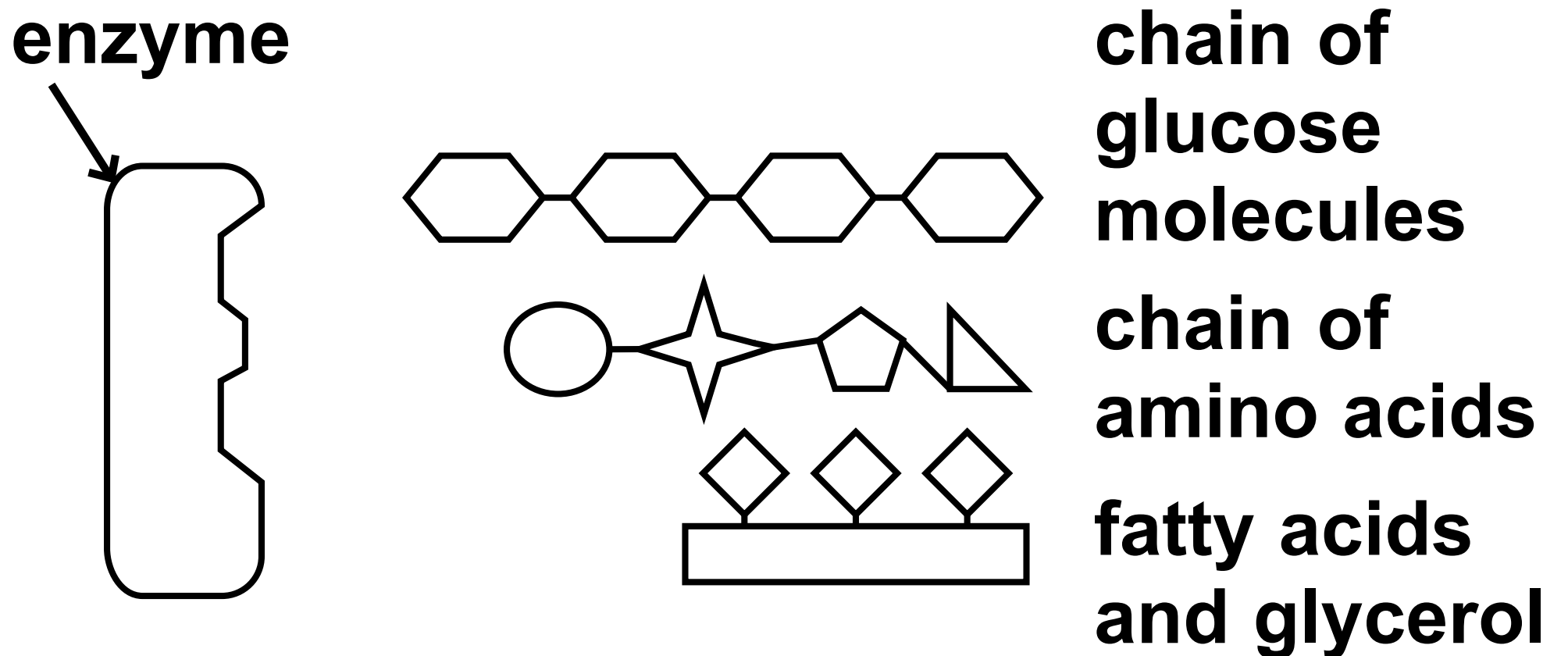


Figure 15

The enzyme will only break down one of these substrates.

(Question continues on next page)

(Turn over)

50

**State the name of this enzyme.
(1 mark)**

(Total for Question 6 = 9 marks)

(Questions continue on next page)

(Turn over)

- 7 Figure 16 shows the urinary system of a human.**

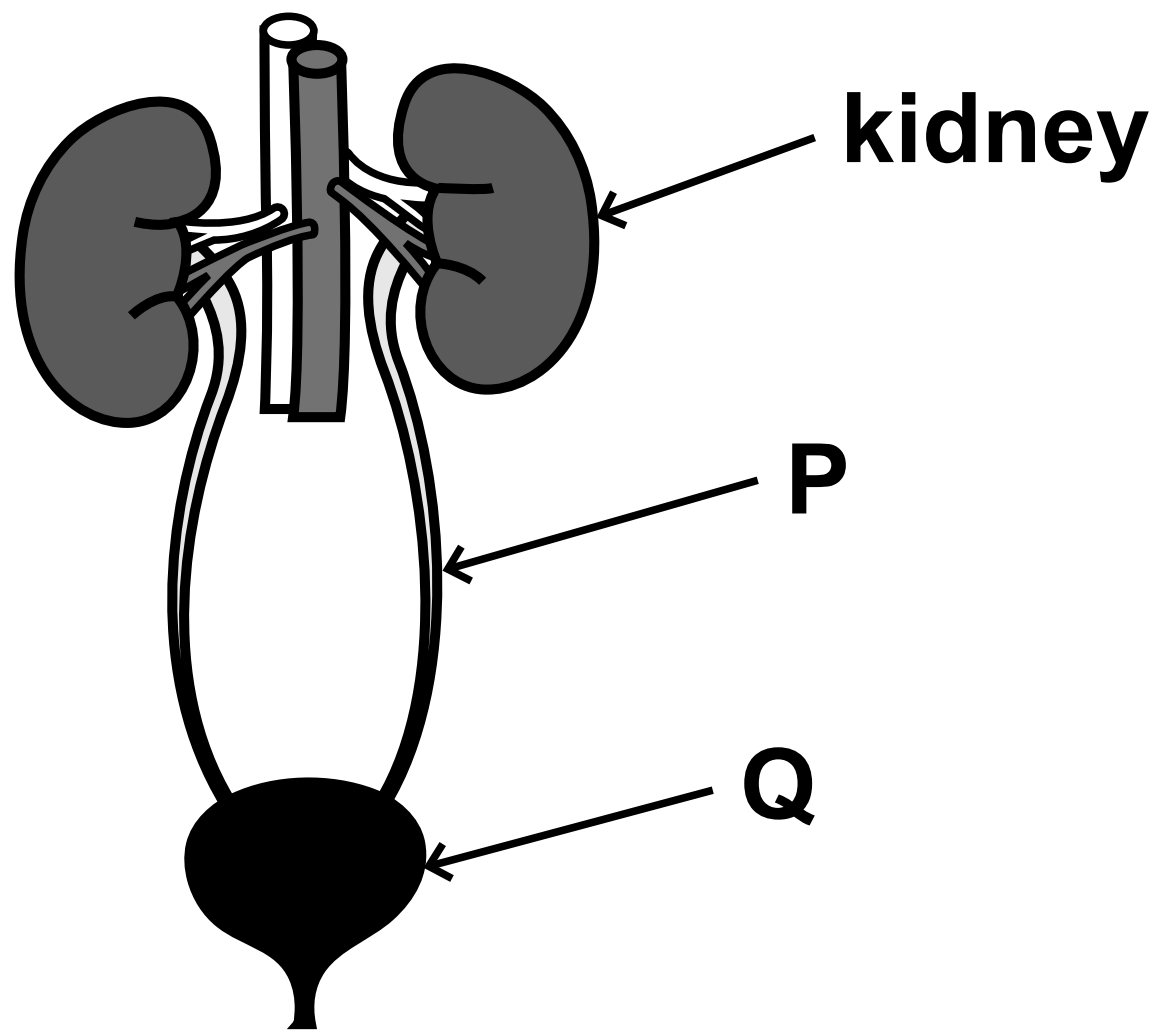


Figure 16

- (a) Name the structures labelled P and Q. (2 marks)**

P _____

Q _____

(Question continues on next page)

(Turn over)

(b) The kidney contains nephrons.

Figure 17 shows the concentration of glucose and protein found in the blood plasma and in the filtrate inside a nephron.

	concentration in the blood plasma	concentration in the filtrate in the nephron
glucose	1 mg per cm³	1 mg per cm³
protein	47 g per dm³	0 g per dm³

Figure 17

(Question continues on next page)

(Turn over)

- (i) Explain the difference in the concentration of protein in the blood plasma and in the filtrate in the nephron. (2 marks)**

(Question continues on next page)

(Turn over)

(ii) Explain how glucose moves from the blood plasma into the nephron. (3 marks)

(Question continues on next page)

(Turn over)

***(c) Figure 18 shows a patient undergoing kidney dialysis.**

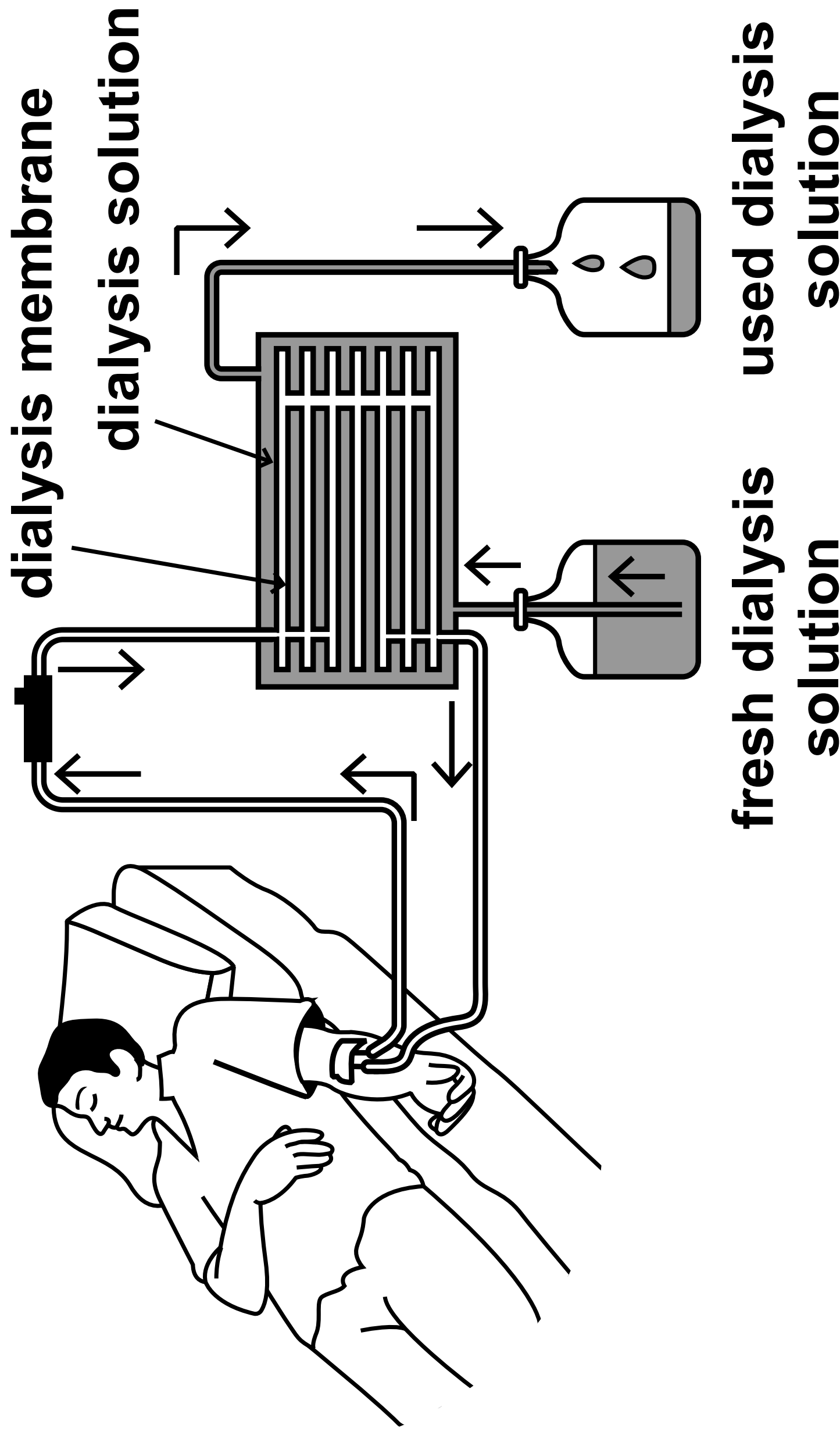


Figure 18

(Question continues on next page)

(Turn over)

Describe how dialysis removes unwanted substances from the blood.

**Include examples of unwanted substances in your answer.
(6 marks)**

**(Continue your answer on next page)
(Turn over)**

(Continue your answer on next page)
(Turn over)

(Total for Question 7 = 13 marks)

(Questions continue on next page)

(Turn over)

- 8 (a) Figure 19 shows a diagram of a red blood cell from a turtle and a diagram of a red blood cell from a human.

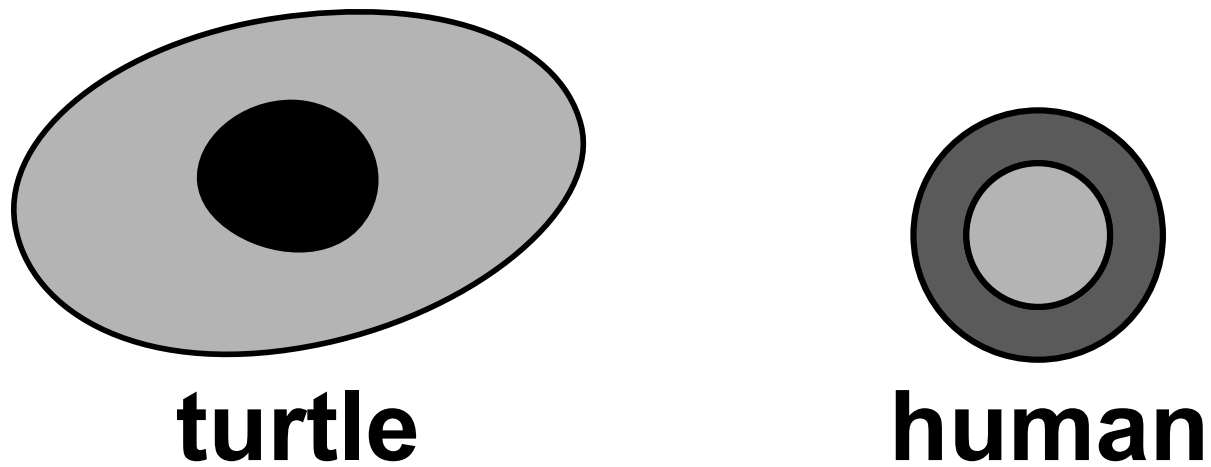


Figure 19

- (i) These cells are animal cells.

Animal cells do not have
(1 mark)

- ☐ A cytoplasm
- ☐ B a cell membrane
- ☐ C a cell wall
- ☐ D mitochondria

(Question continues on next page)
(Turn over)

- (ii) The actual length of the red blood cell from a turtle is $20.5\text{ }\mu\text{m}$.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified $400\times$. (2 marks)

_____ μm

(Question continues on next page)

(Turn over)

- (iii) The width of the human red blood cell, when magnified $400\times$, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form.
(2 marks)

_____ mm

(Question continues on next page)

(Turn over)

- (b) Red blood cells are carried in veins and arteries.

Figure 20 shows the equipment used to measure the elasticity of an artery.

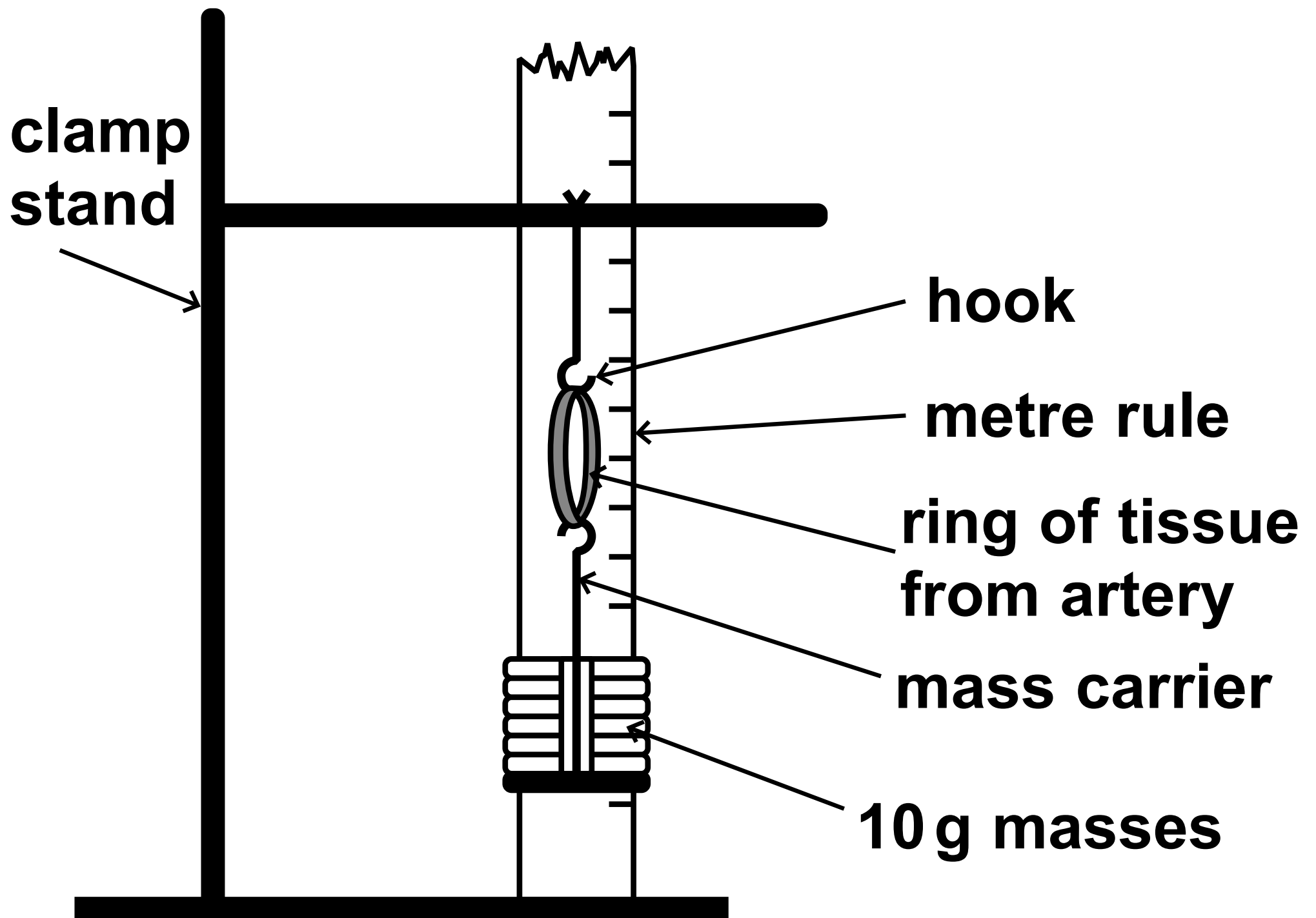


Figure 20

(Question continues on next page)

(Turn over)

- (i) Describe a method you could use to see how much the ring of tissue from an artery could stretch before it no longer returned to its original size. (3 marks)

- (ii) Give ONE safety precaution you need to take when handling animal tissue such as blood vessels. (1 mark)**

(Question continues on next page)

(Turn over)

(c) Figure 21 shows the circulatory system of a frog.

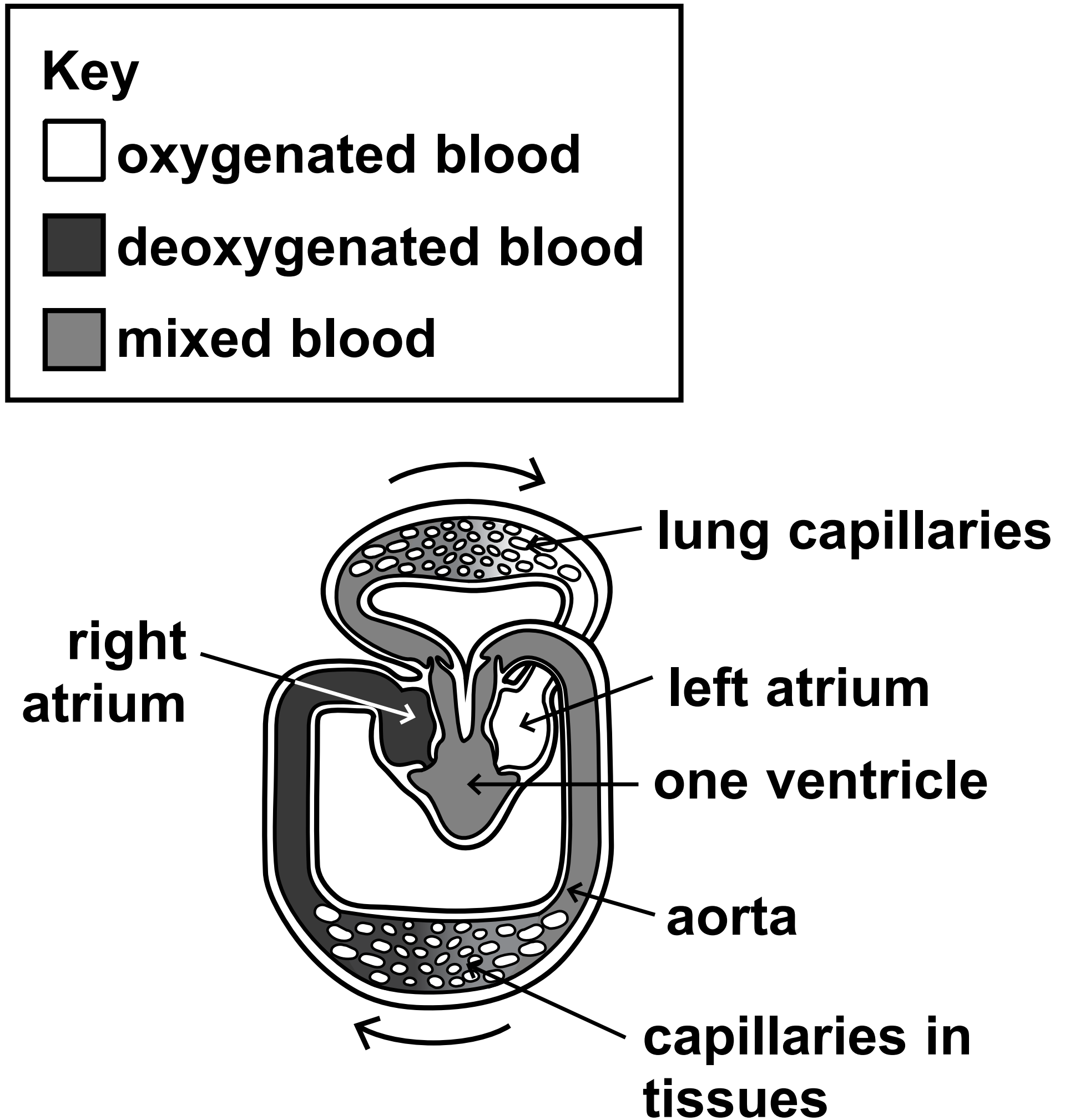


Figure 21

(Question continues on next page)

(Turn over)

Explain why the circulatory system of a frog is less efficient at carrying oxygen to the tissues than the circulatory system of a human. (3 marks)

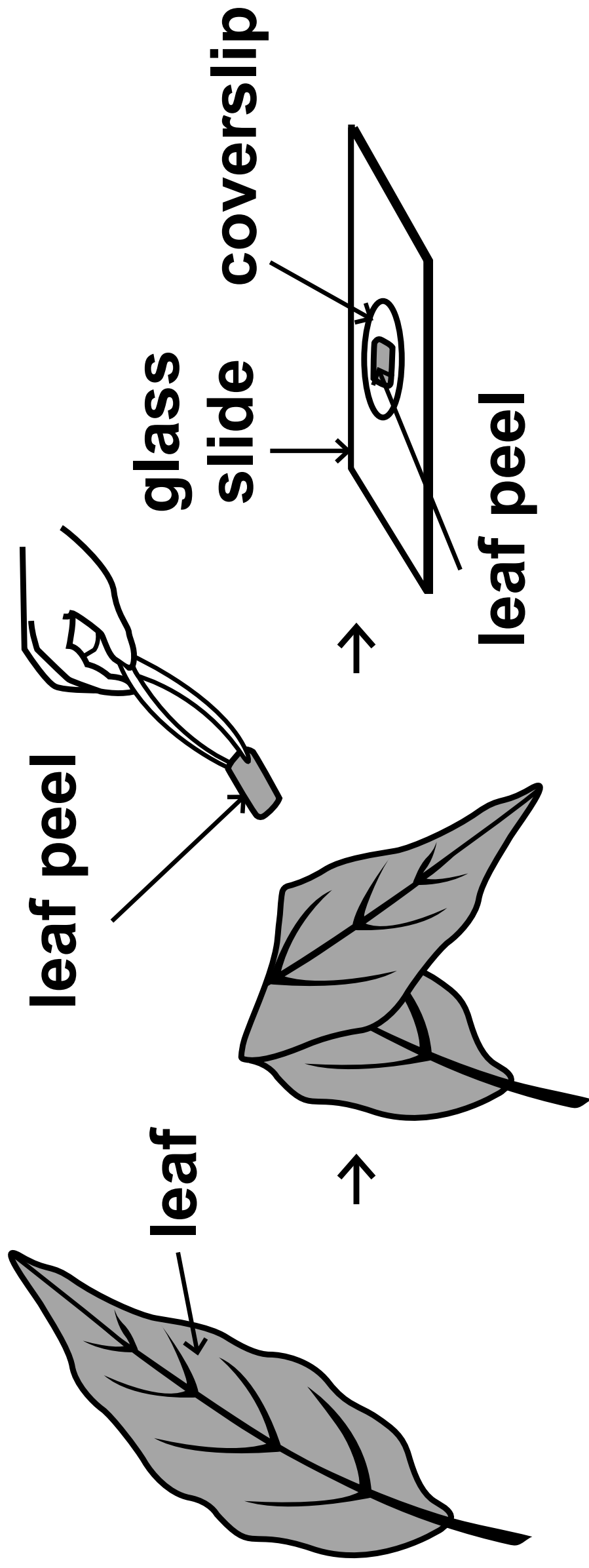
(Continue your answer on next page)
(Turn over)

(Total for Question 8 = 12 marks)

(Questions continue on next page)

9 A student compared the number of stomata on the upper and lower surfaces of a leaf.

She completed a leaf peel as shown in Figure 22.



68

leaf coated with clear nail varnish
layer of nail varnish removed
layer of nail varnish placed on a microscope slide

Figure 22

(Question continues on next page)

(Turn over)

The layer of nail varnish shows an impression of the cells on the surface of the leaf.

- (a) (i) State why a coverslip is placed on top of the leaf peel. (1 mark)**

(Question continues on next page)

(Turn over)

- (ii) Explain why the leaf peel rather than the whole leaf was viewed with a microscope. (2 marks)**

(Question continues on next page)

(Turn over)

- (b) The student drew a biological diagram of the leaf peel taken from the underside of the leaf.**

Figure 23 shows this diagram.

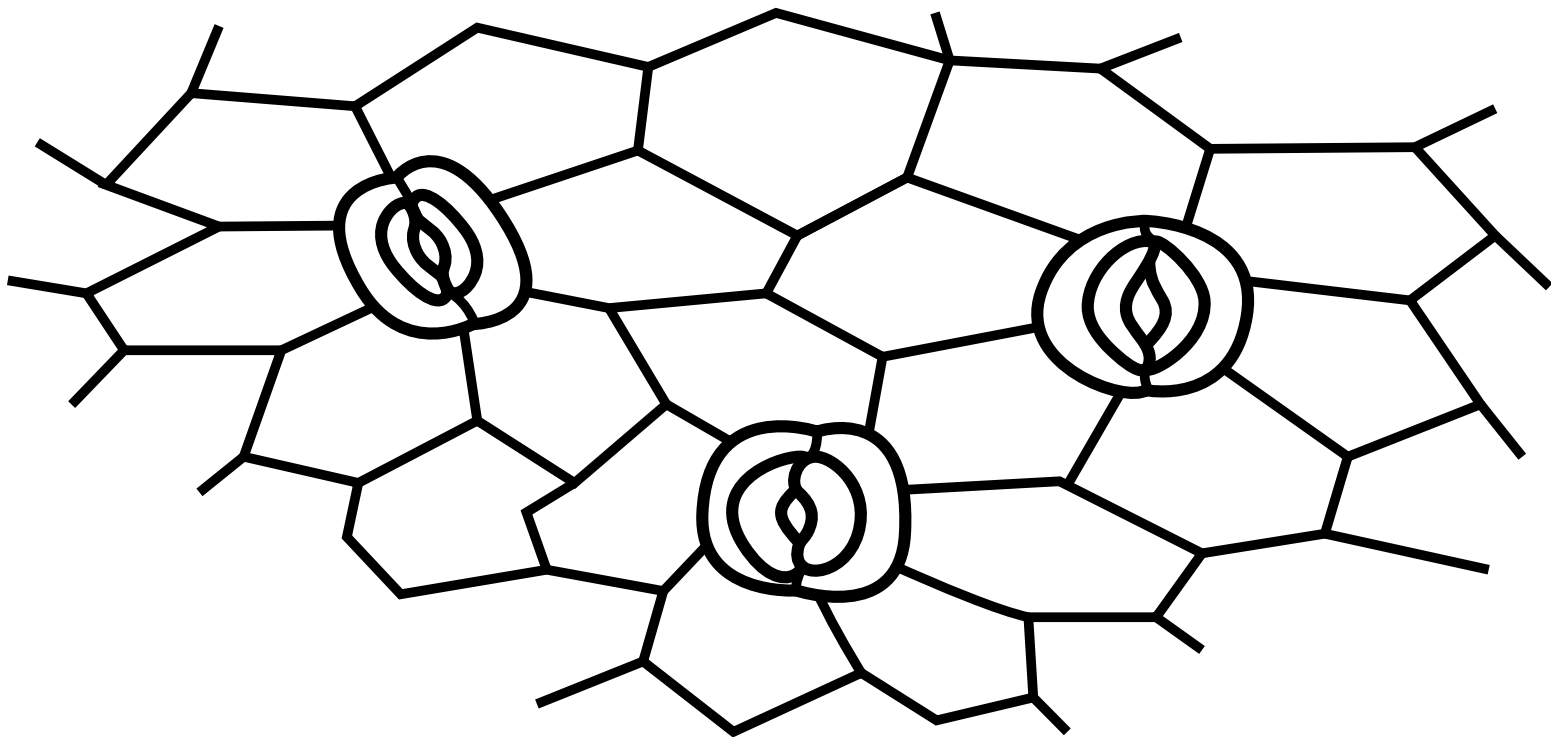


Figure 23

- (i) State the number of stomata visible on Figure 23.**
(1 mark)

(Question continues on next page)

(Turn over)

- (ii) The student observed that the stomata were open.

**Describe how stomata open.
(3 marks)**

(Question continues on next page)

(Turn over)

***(c) Figure 24 shows xylem and phloem.**

Xylem and phloem are involved in the transport of substances through a plant.

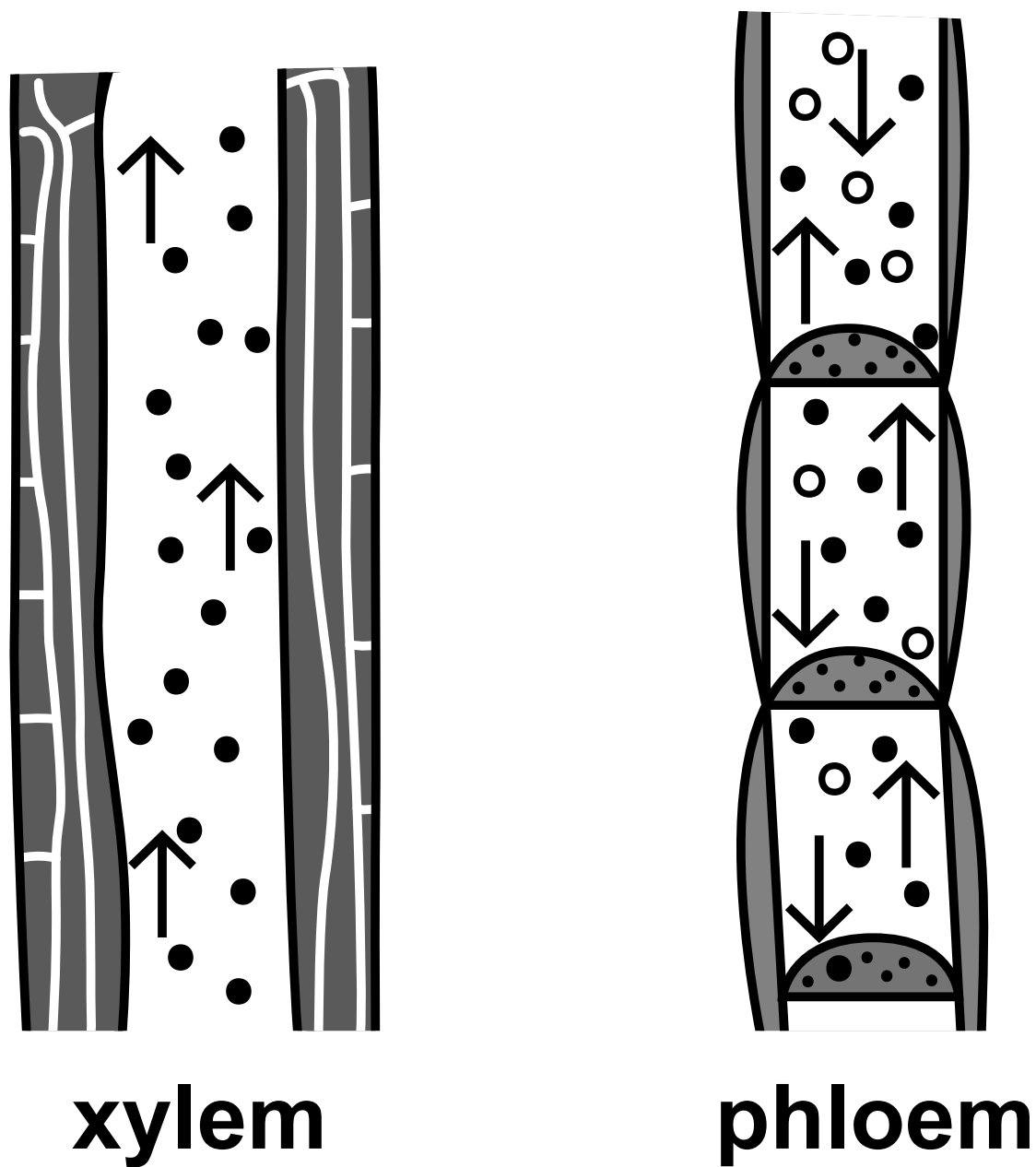


Figure 24

(Question continues on next page)

(Turn over)

**Use Figure 24 to help you
describe how water and sucrose
move through a plant. (6 marks)**

**(Continue your answer on next page)
(Turn over)**

(Continue your answer on next page)

(Turn over)

76

(Total for Question 9 = 13 marks)

(Questions continue on next page)

(Turn over)

- 10 Since 2003, in France, people have been buying Siberian chipmunks as pets but then releasing them into the wild when they are no longer wanted.**

They are now classified as an invasive species.

Figure 25 shows a Siberian chipmunk (*Tamias sibiricus*).



Figure 25

(Question continues on next page)

(Turn over)

- (a) Siberian chipmunks eat acorns, which are the seeds of oak trees.**

In Siberia, the natural predators of Siberian chipmunks are wild dogs.

(Question continues on next page)

(i) **Figure 26 shows the biomass of three organisms in a food chain from one area of Siberia.**

organisms	biomass in kg
acorns	20 650
chipmunks	2 200
wild dogs	230

Figure 26

Draw a pyramid of biomass for this food chain. (2 marks)

(Question continues on next page)

(Turn over)

- (ii) In France, Siberian chipmunks have very few natural predators.**

**Describe how this affected the Siberian chipmunk population in France.
(2 marks)**

(Question continues on next page)

(Turn over)

- (iii) The percentage of energy transferred from the acorns to the chipmunks is 9.5%.**

The energy contained in the acorns is 97 500 kJ.

Calculate the amount of energy transferred to the chipmunks.

**Give your answer to the nearest whole number.
(3 marks)**

_____ kJ

(Question continues on next page)

(Turn over)

- (b) The black-legged tick (*Ixodes scapularis*) is a parasite that feeds on the blood of animals including Siberian chipmunks and humans.

The tick transmits the Lyme disease pathogen.

Figure 27 shows the number of cases of Lyme disease in humans in France in 2003 and 2015.

Number of cases of Lyme disease in humans in France	
2003	2015
9 500	27 000

Figure 27

(Question continues on next page)

(Turn over)

- (i) Calculate the percentage increase in the number of cases of Lyme disease in humans in France from 2003 to 2015. (2 marks)**

_____ %

(Question continues on next page)

(Turn over)

- (ii) Explain why there has been an increase in the number of cases of Lyme disease in humans in France.
(2 marks)

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS
END