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

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.

(Instructions continue on next page)

- **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.**

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)

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
☐ A	adrenal	liver and muscles
☐ B	adrenal	small and large intestines
☐ C	pancreas	liver and muscles
☐ D	pancreas	small and large intestines

(Question continues on next page)

(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)

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

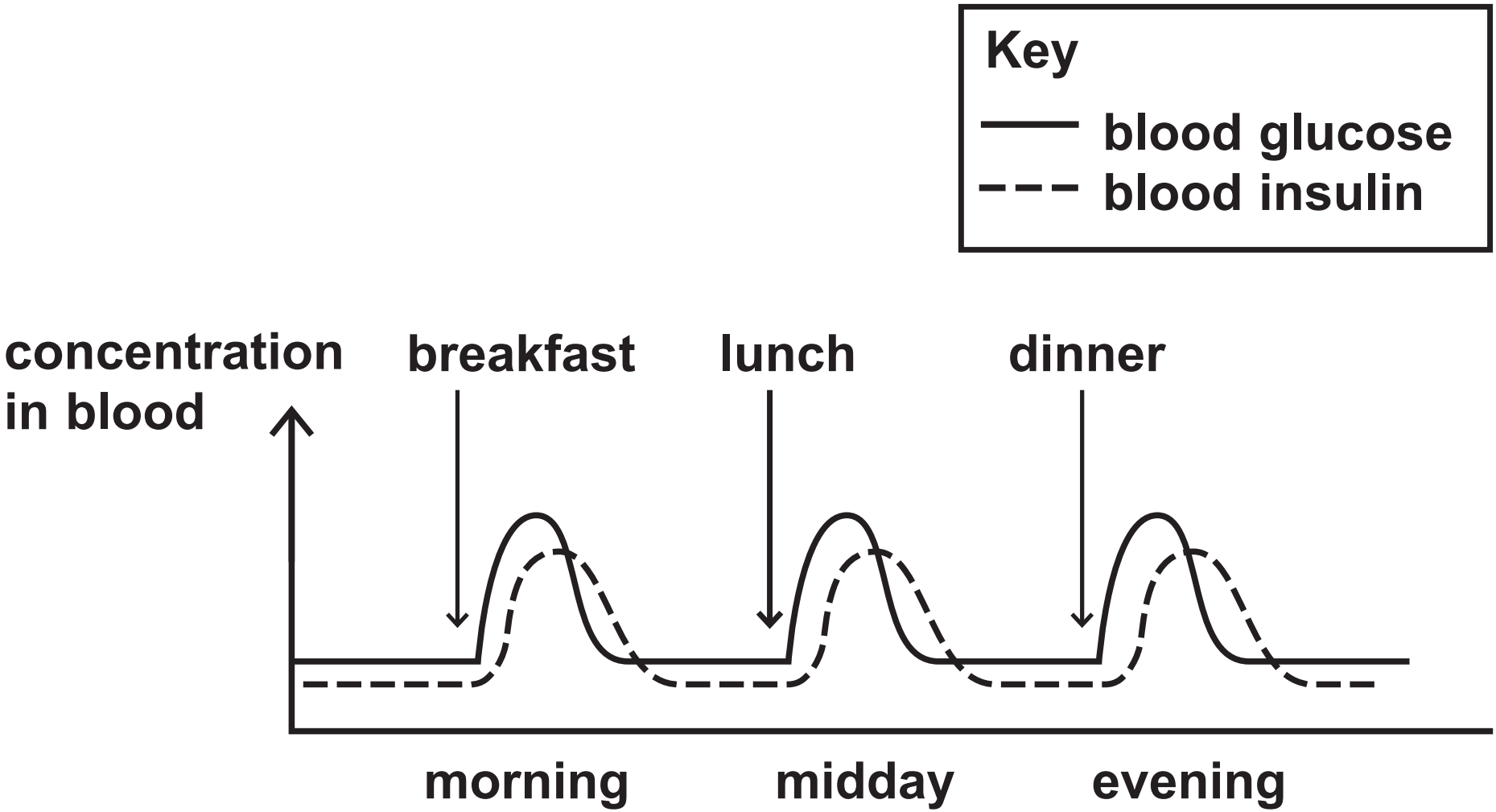


Figure 1

(Question continues on next page)

(Turn over)

The blood glucose concentration increases after a meal.

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

(Question continues on next page)

(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)

(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)

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)

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)

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

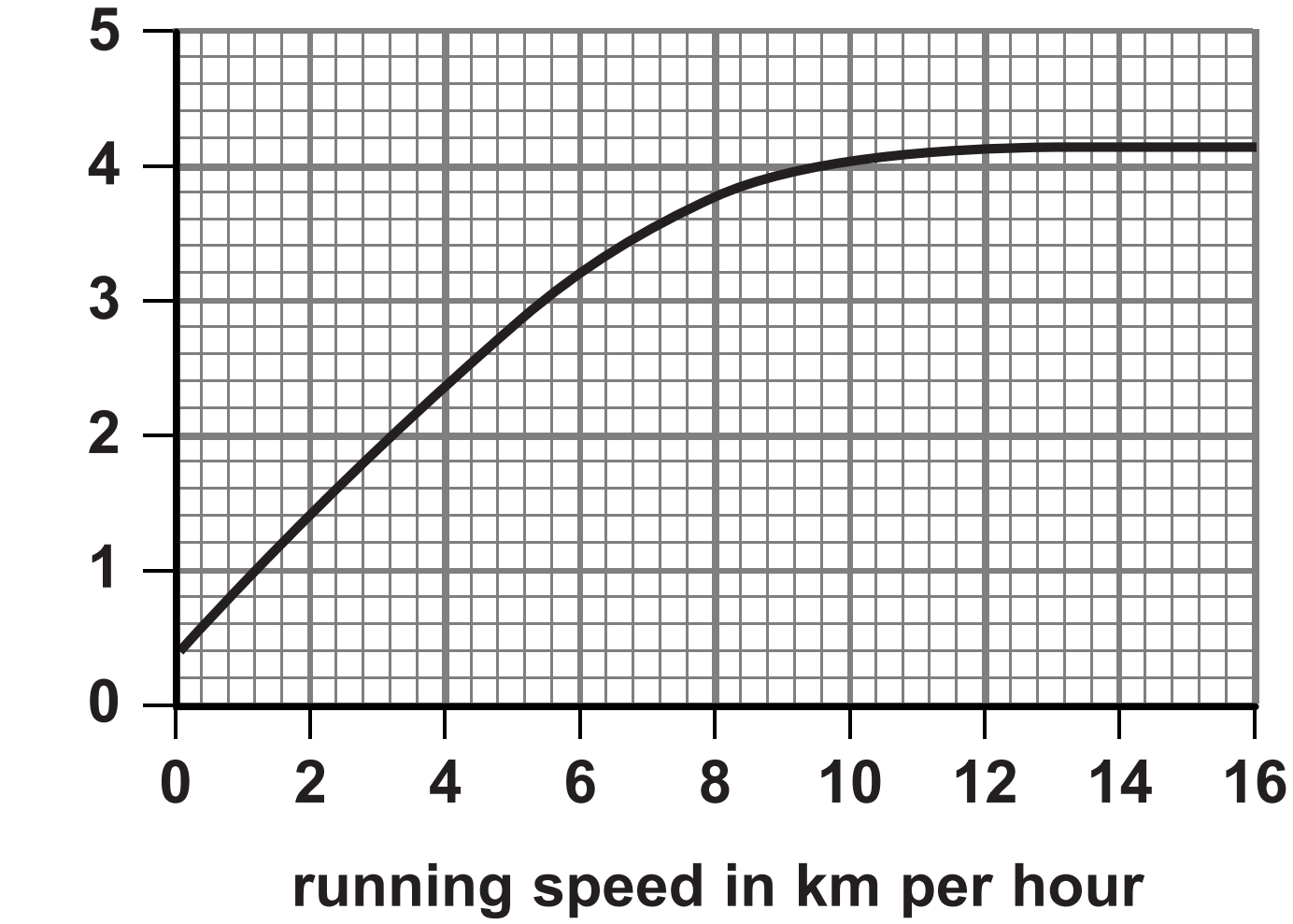


Figure 4

(Question continues on next page)

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

(Question continues on next page)

(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)

(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)

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.

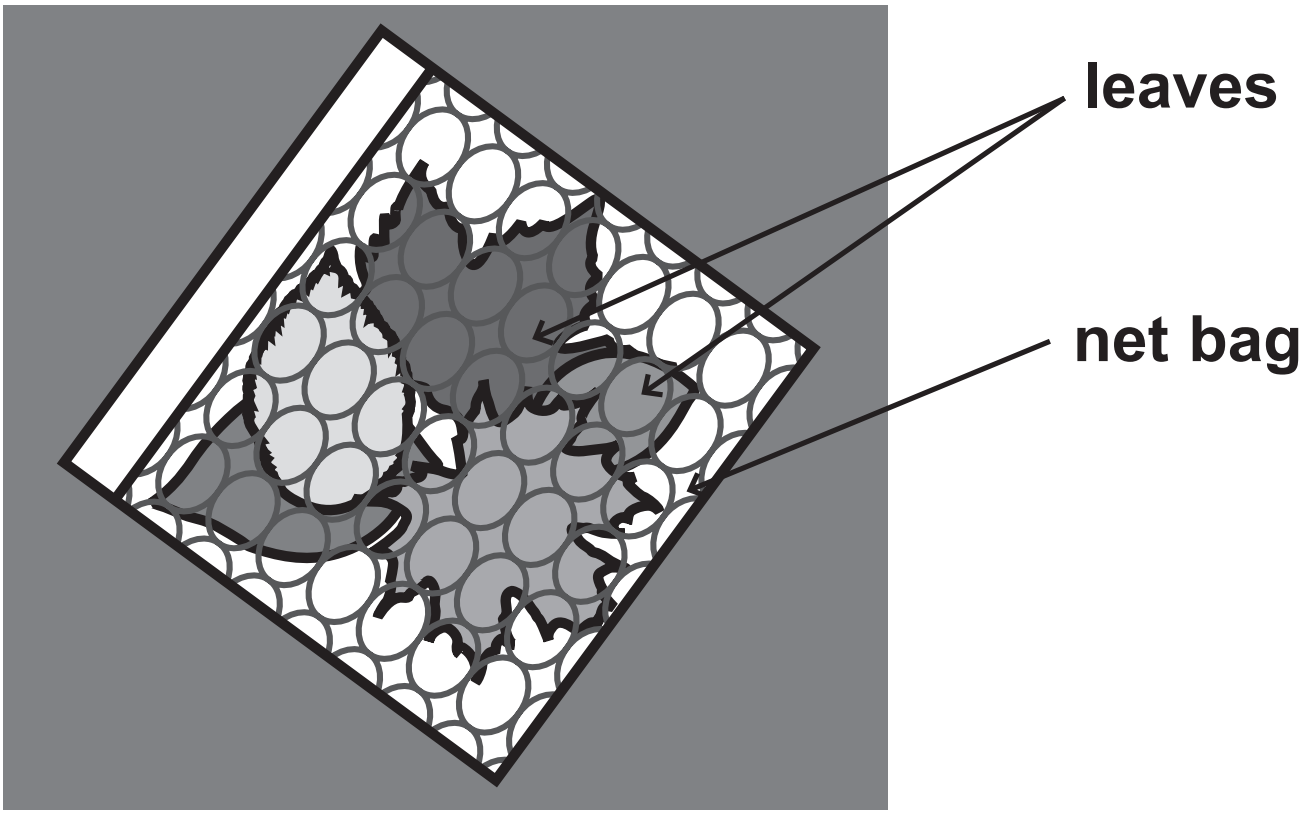


Figure 5

(Question continues on next page)

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

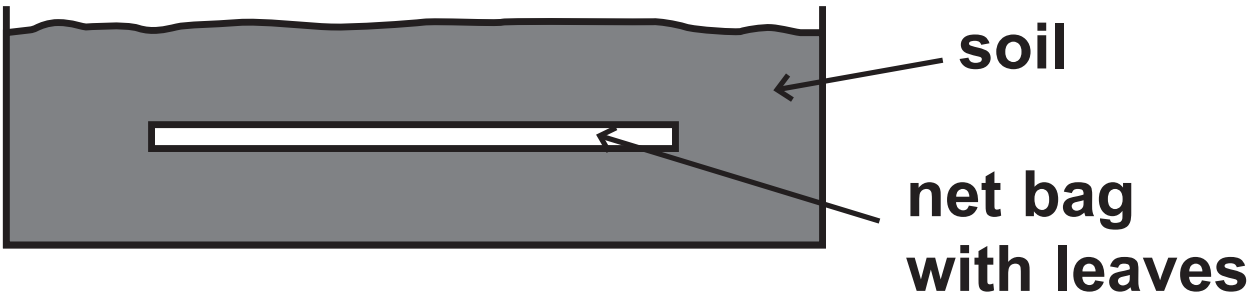


Figure 6

(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)

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

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

Figure 7 shows the results of this investigation.

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)

(i) Calculate the percentage decrease in mass for the leaves at 85 ^{o}C.

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

_____%

(Question continues on next page)

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

(Question continues on next page)

(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)

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)

(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)

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

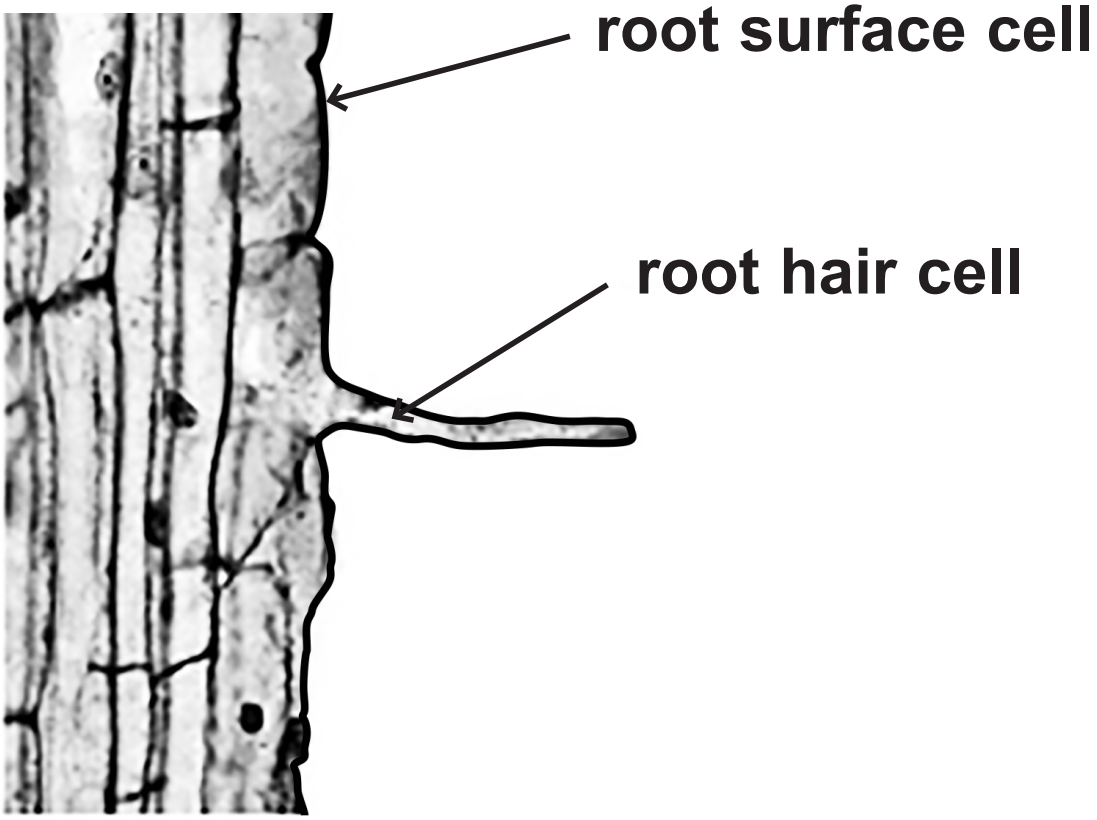


Figure 8

(Question continues on next page)

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)

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

(Question continues on next page)

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

(c) Algae are green plants.

On page 29 Figure 10 shows the number of algae in a lake in the United Kingdom during one year.

(Question continues on next page)

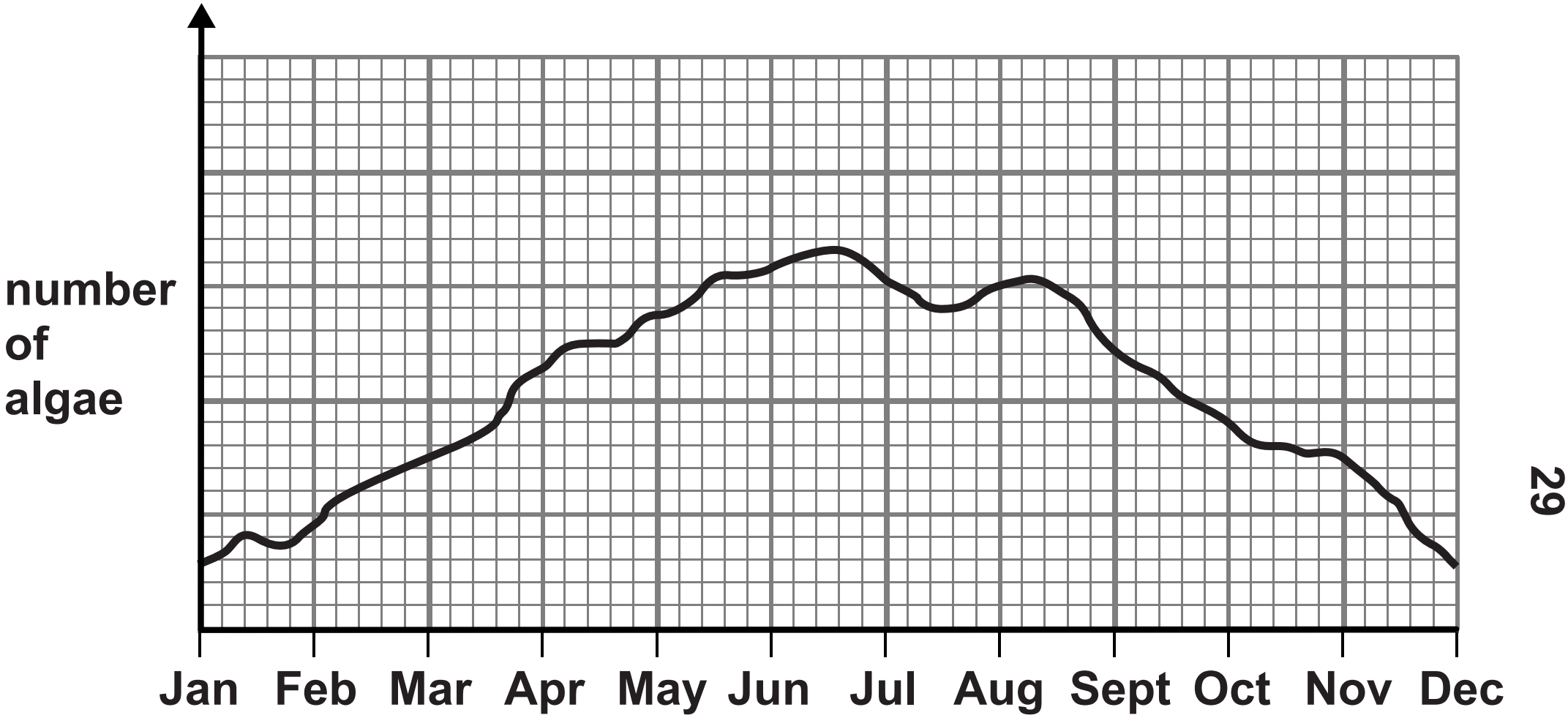


Figure 10

(Question continues on next page)

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

(TOTAL FOR QUESTION 4 = 9 MARKS)

(Questions continue on next page)

5 Figure 11 shows a British glow-worm.

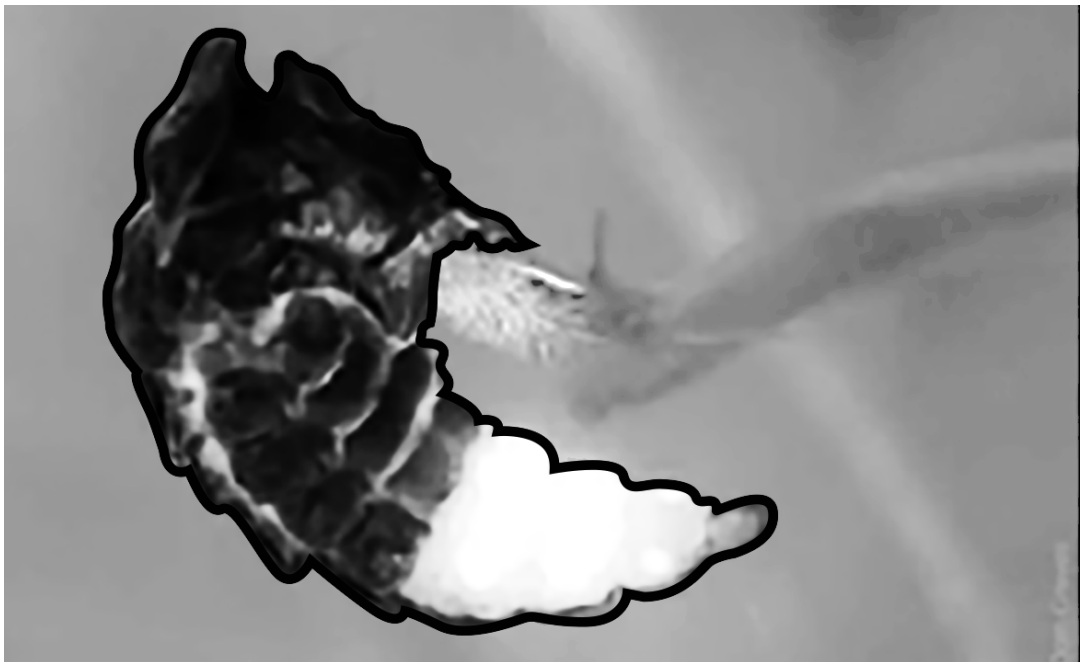


Figure 11

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)

(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)

(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)

(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)

(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)

(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)

(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)

(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)

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

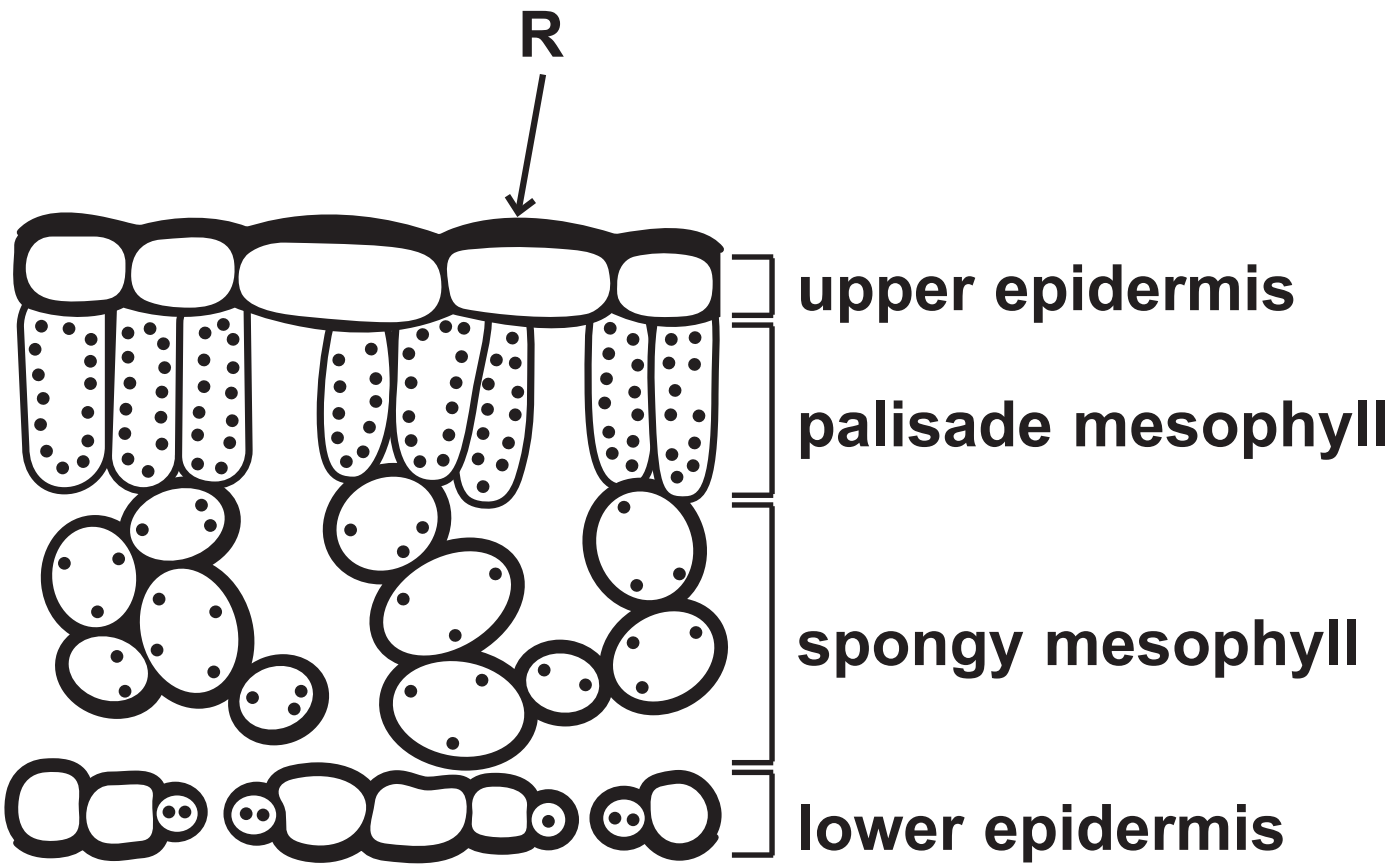


Figure 12

(Question continues on next page)

(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 41 Figure 13 shows the mass of glucose produced in each layer of a leaf per hour.

(Question continues on next page)

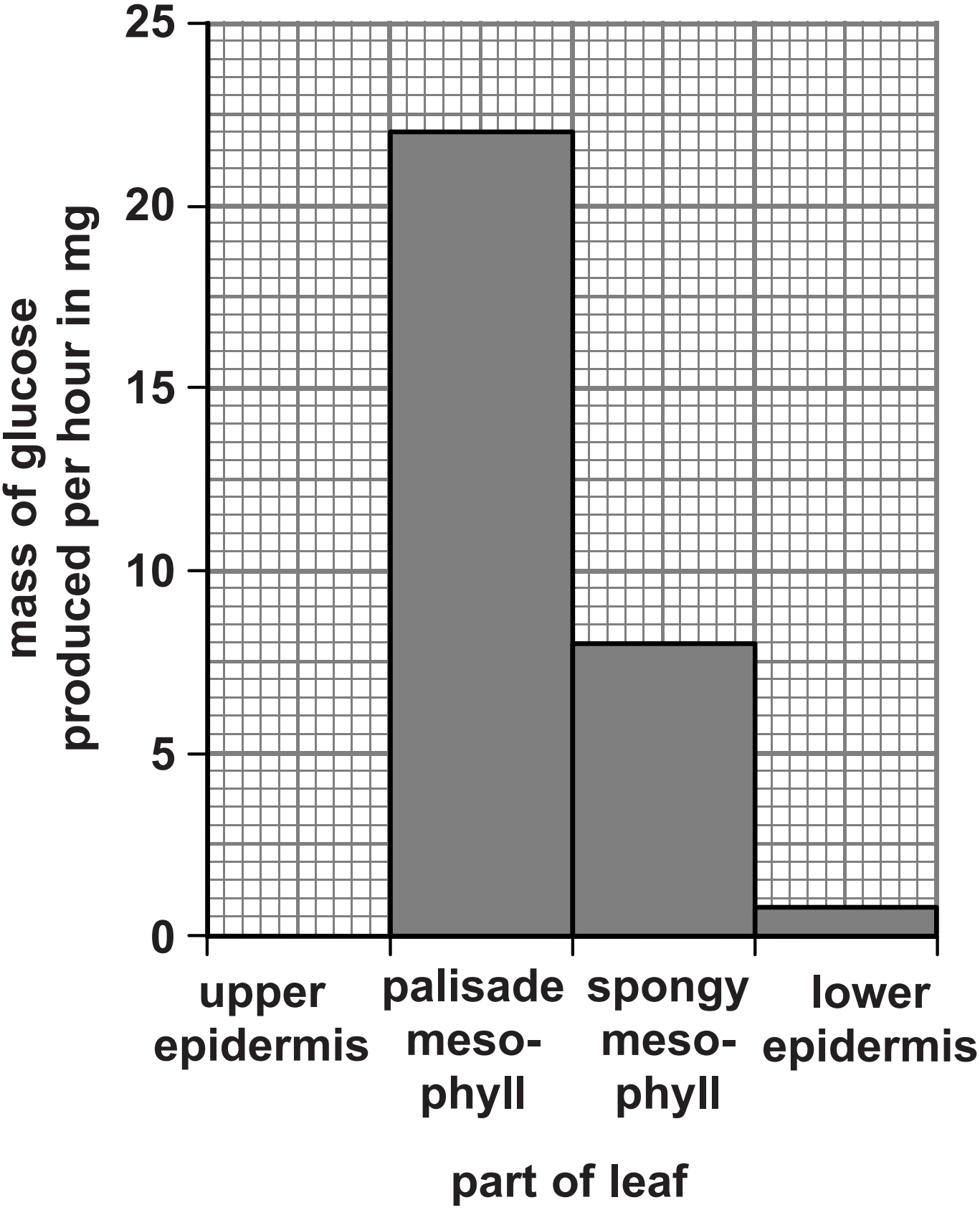


Figure 13

(Question continues on next page)

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)

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

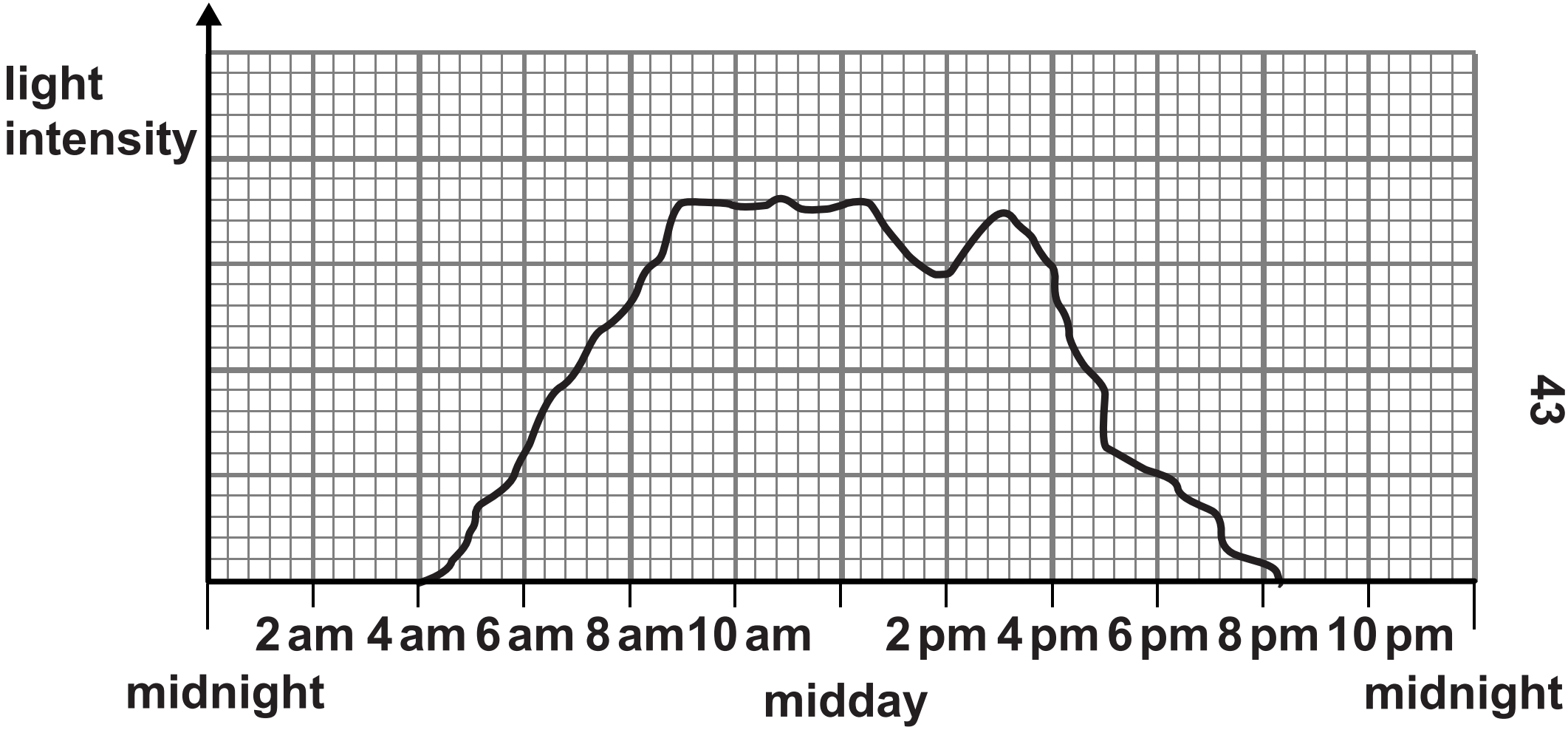


Figure 14

(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)

(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)

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

(Question continues on next page)

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

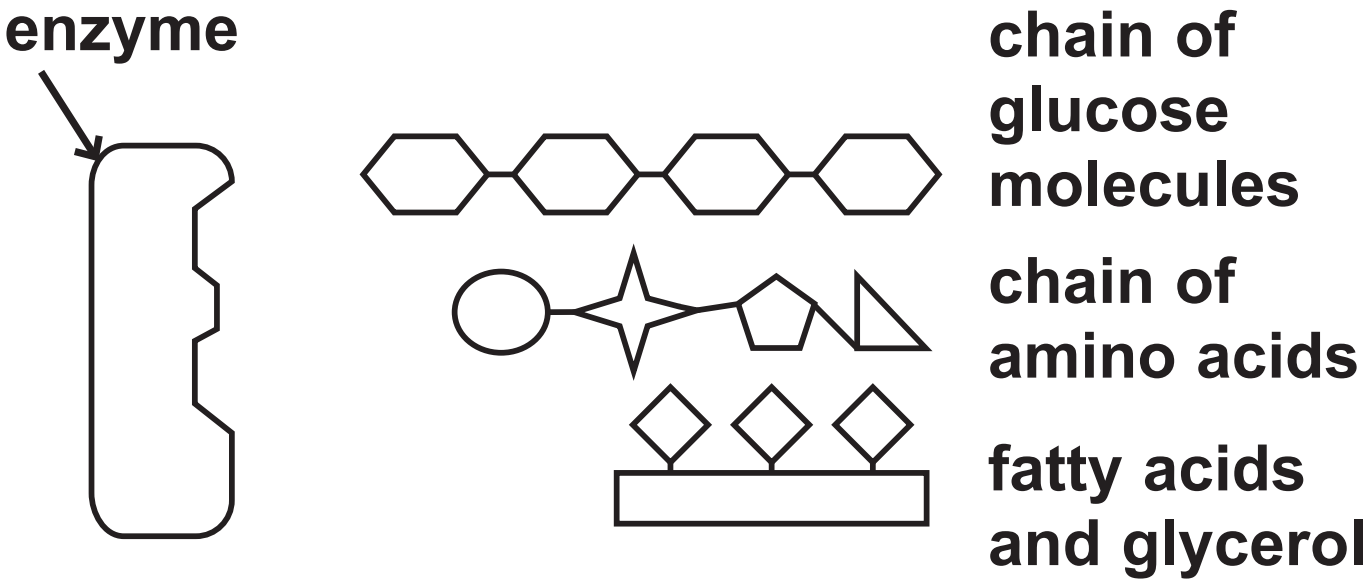


Figure 15

The enzyme will only break down one of these substrates.

State the name of this enzyme.
(1 mark)

(TOTAL FOR QUESTION 6 = 9 MARKS)

(Questions continue on next page)

7 Figure 16 shows the urinary system of a human.

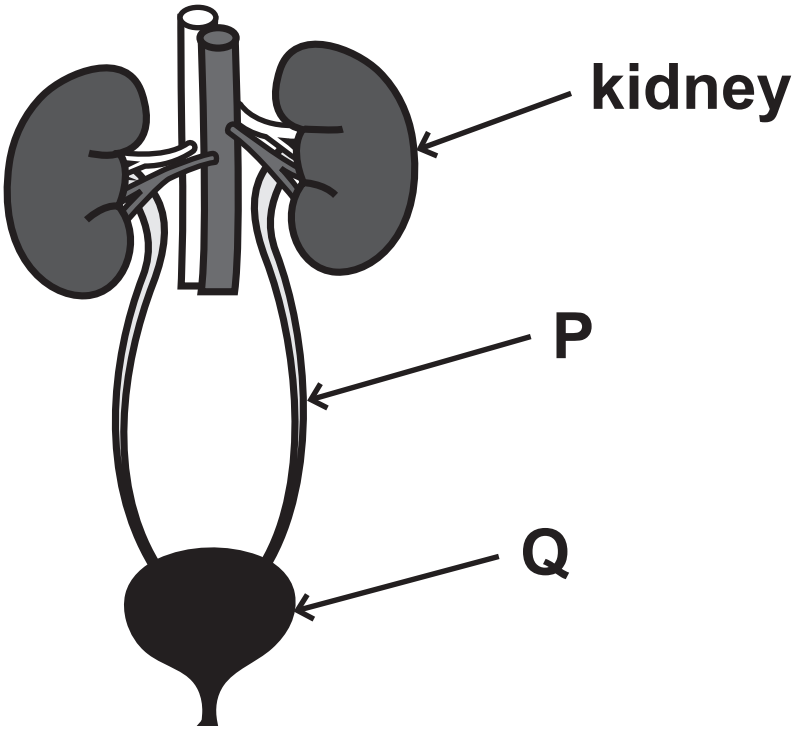


Figure 16

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

P_____

Q_____

(Question continues on next page)

(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 cm^3	1 mg per cm^3
protein	47 g per dm^3	0 g per dm^3

Figure 17

(Question continues on next page)

(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)

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

(Question continues on next page)

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

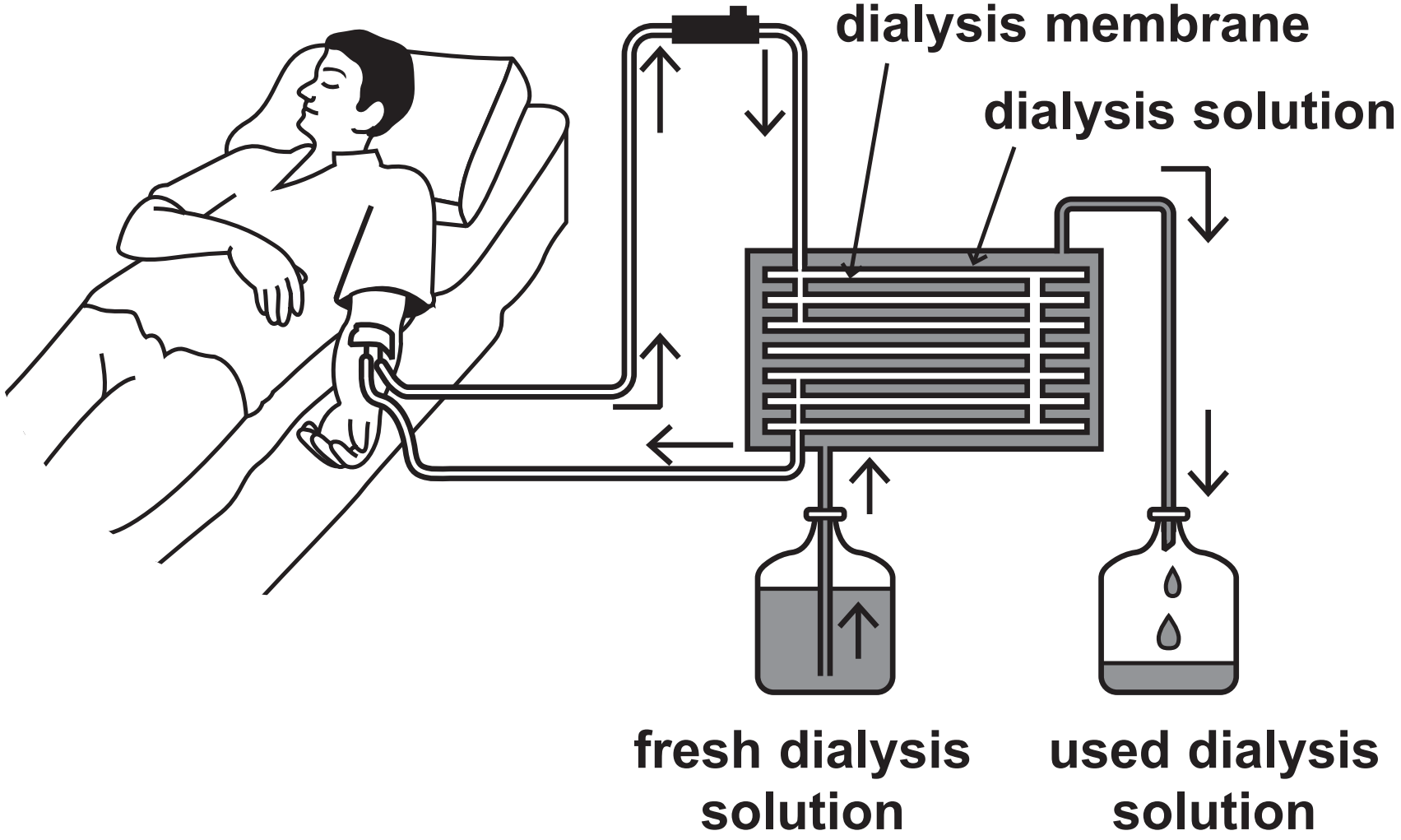


Figure 18

(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)

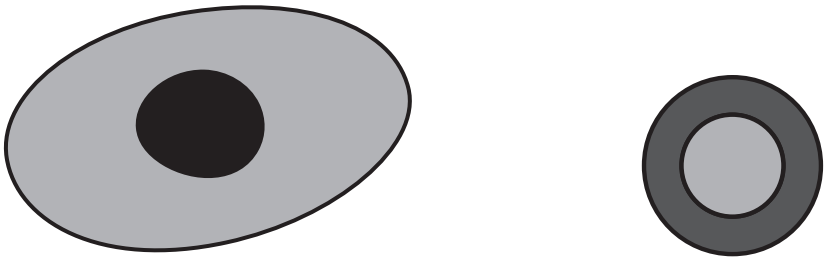
(Continue your answer on next page)

(Continue your answer on next page)

(TOTAL FOR QUESTION 7 = 13 MARKS)

(Questions continue on next page)

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.



turtle 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)

(ii) The actual length of the red blood cell from a turtle is 20·5 μm.

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

_____ μm

(Question continues on next page)

(iii) The width of the human red blood cell, when magnified 400 ×, 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)

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

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

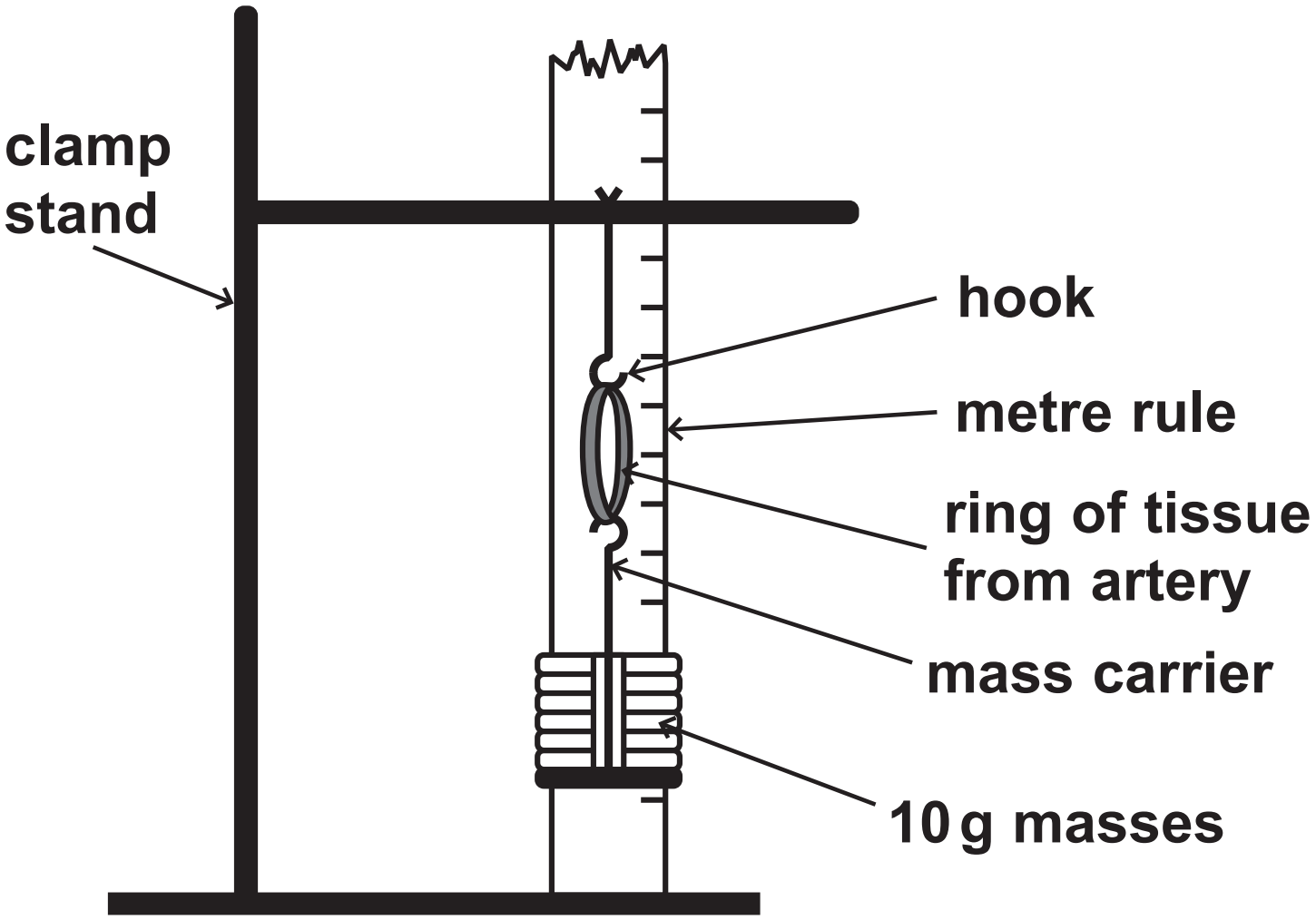


Figure 20

(Question continues on next page)

(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)

(Question continues on next page)

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

_____

_____

_____

(Question continues on next page)

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

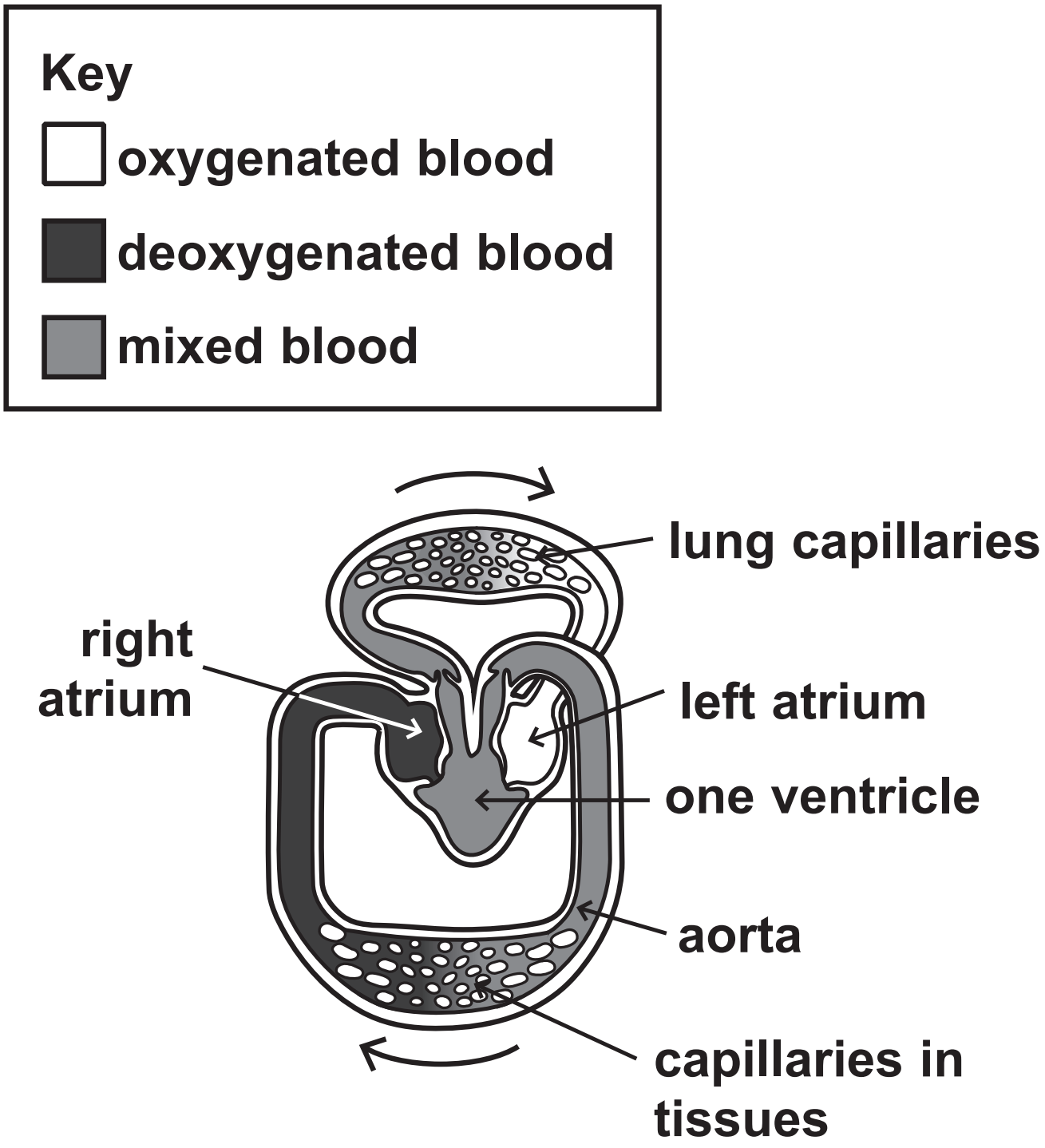


Figure 21

(Question continues on next page)

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)

(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.

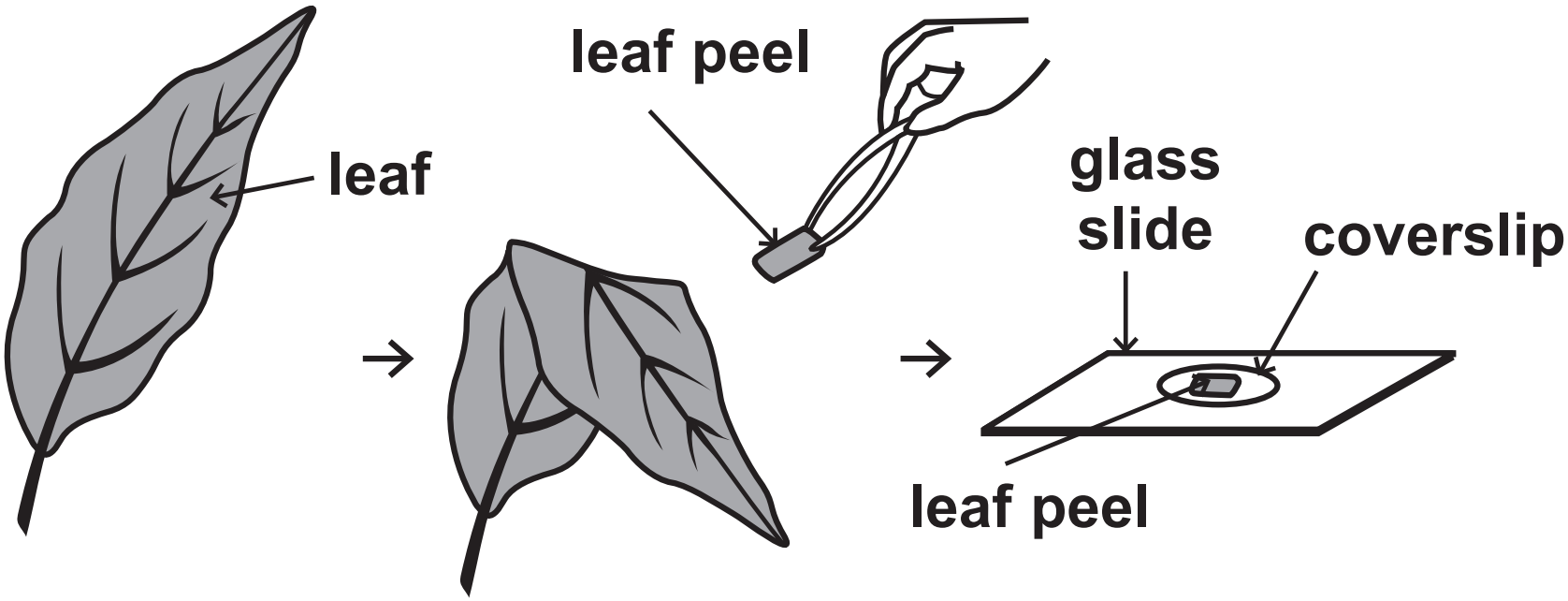


Figure 22

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)

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

(Question continues on next page)

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

Figure 23 shows this diagram.

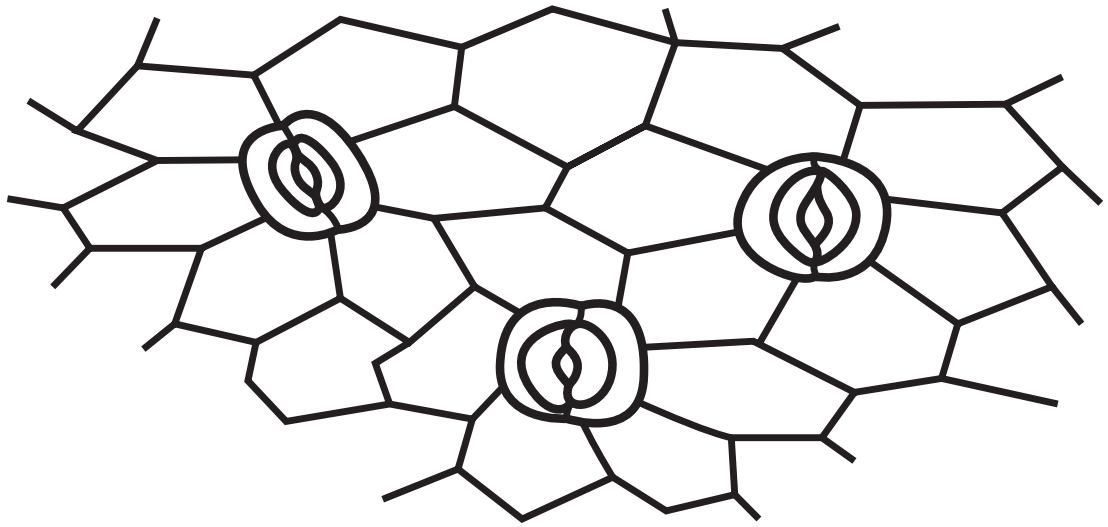


Figure 23

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

(Question continues on next page)

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

Describe how stomata open.
(3 marks)

(Question continues on next page)

*(c) Figure 24 shows xylem and phloem. Xylem and phloem are involved in the transport of substances through a plant.

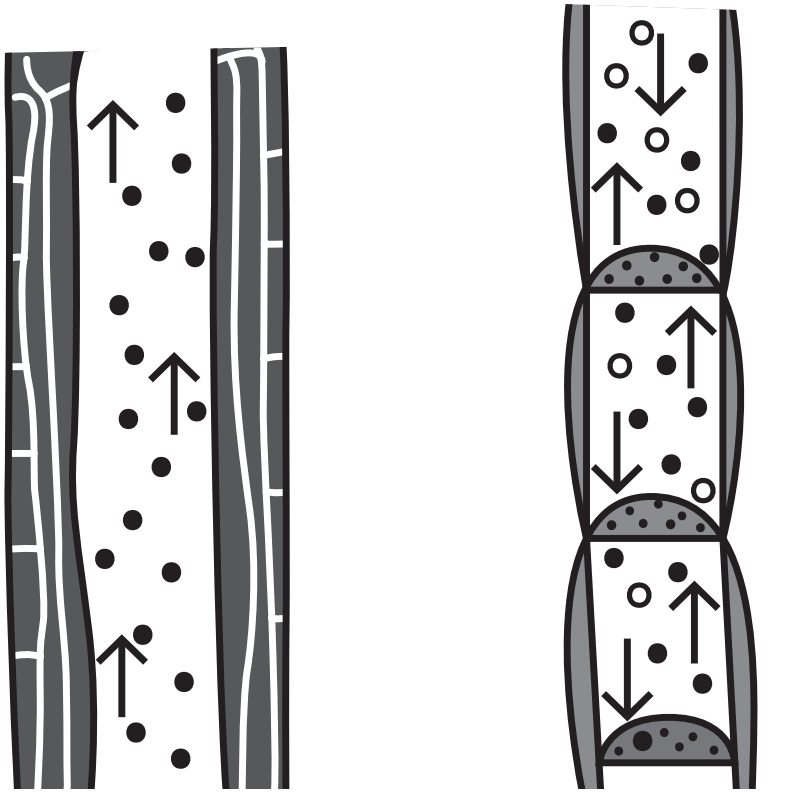


Figure 24

(Question continues on next page)

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

(Continue your answer on next page)

(Continue your answer on next page)

(TOTAL FOR QUESTION 9 = 13 MARKS)

(Questions continue on next page)

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

(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)

(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)

(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)

(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)

(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)

(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