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EDEXCEL GCSE BIOLOGY: QUESTIONS BY TOPIC

Plant Structures and Their Functions (6)

GCSE Biology (Foundation) Topic 6

17 questions · 178 marks · Mark schemes included

Pearson Edexcel GCSE (9-1) Biology 1BI0, Foundation Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme.

Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

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QUESTIONS

17 questions · 178 marks · lowest tariff first



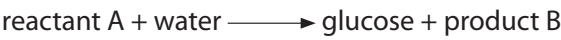
8-MARK QUESTIONS

2 questions in this booklet



2 Plants need light for photosynthesis.

(a) Part of the photosynthesis equation is shown below.

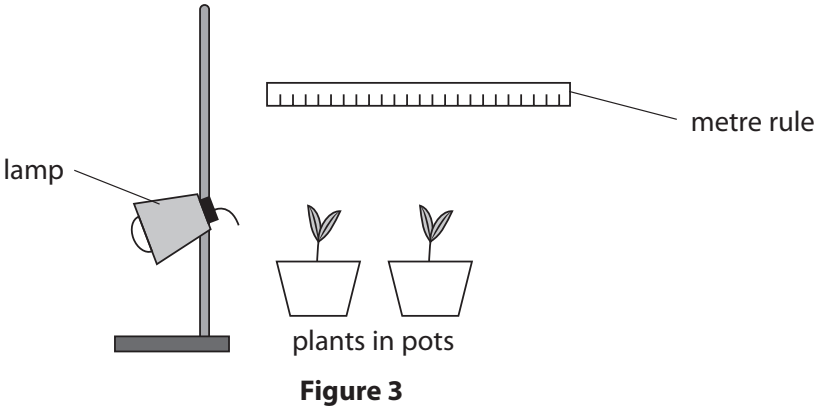


Which row in the table shows reactant A and product B? (1)

	reactant A	product B
☐ A	carbon dioxide	light
☐ B	light	oxygen
☐ C	oxygen	carbon dioxide
☐ D	carbon dioxide	oxygen

(b) Name the green chemical in chloroplasts that absorbs light. (1)

(c) (i) Plan an experiment to investigate if plants grow faster when they receive more light. Use the equipment shown in Figure 3. (3)



(ii) State **one** factor that you would keep the same in this experiment.

(1)

(iii) A plant was kept at a very high temperature of 60 °C.

Explain the effect of this temperature on photosynthesis.

(2)

(Total for Question 2 = 8 marks)



2 Plants produce glucose by photosynthesis.

(a) Complete the word equation for photosynthesis shown in Figure 2.

(2)

water + ... → glucose + ...

Figure 2

(b) (i) State why photosynthesis does **not** occur in the roots of plants.

(1)

.....

.....

(ii) Which is transported in the phloem?

(1)

- ☐ A starch
- ☐ B sucrose
- ☐ C urea
- ☐ D plasma

(c) Chlorophyll is found in green leaf cells.

Describe the role of chlorophyll in leaf cells.

(2)

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(d) A greenhouse contained an oil burning heater.

State **two** ways this could increase the rate of photosynthesis in the greenhouse.

(2)

1

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(Total for Question 2 = 8 marks)



9-MARK QUESTIONS

6 questions in this booklet



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)

- ☐ 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

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

(1)

- ☐ A bacteria
- ☐ B mammals
- ☐ C fungi
- ☐ D worms

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

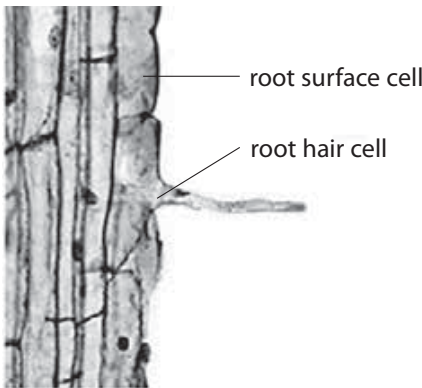


Figure 8

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

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

(2)

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

(2)

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(c) Algae are green plants.

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

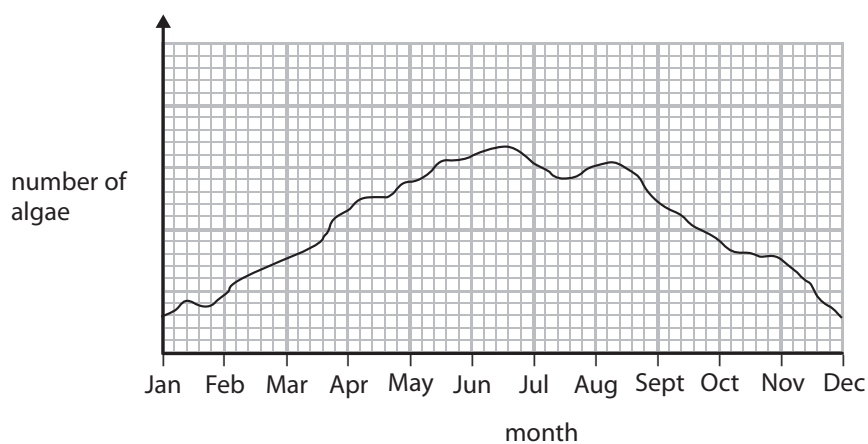


Figure 10

Explain the changes in the number of algae in the lake from February to June.

(3)

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(Total for Question 4 = 9 marks)

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

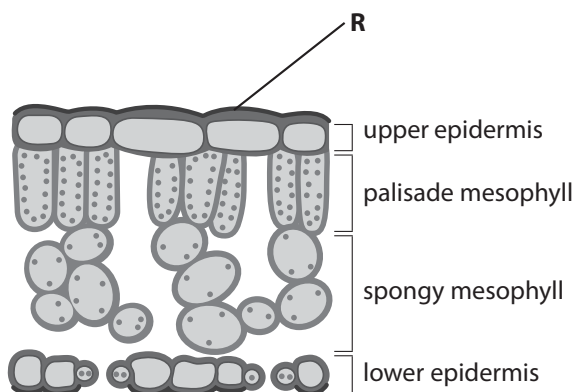


Figure 12

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

(1)

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

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DO NOT WRITE IN THIS AREA

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

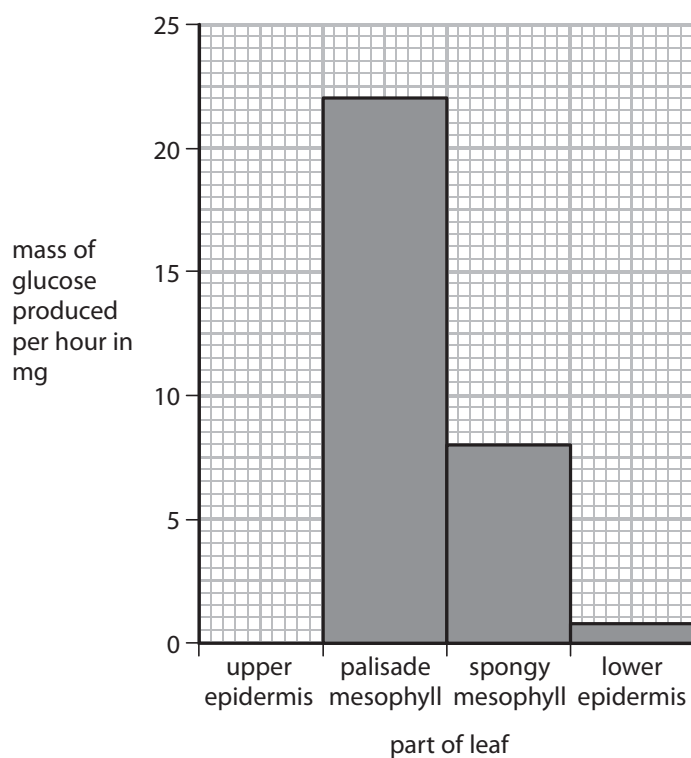


Figure 13

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)

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

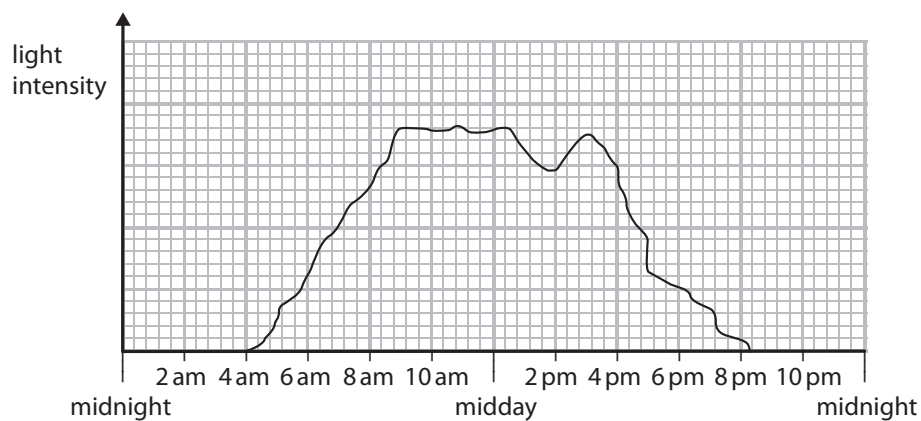


Figure 14

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

(2)

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

Glucose is a

(1)

- ☒ A vitamin
- ☒ B protein
- ☒ C lipid
- ☒ D carbohydrate

(ii) Describe a test for glucose.

(2)

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

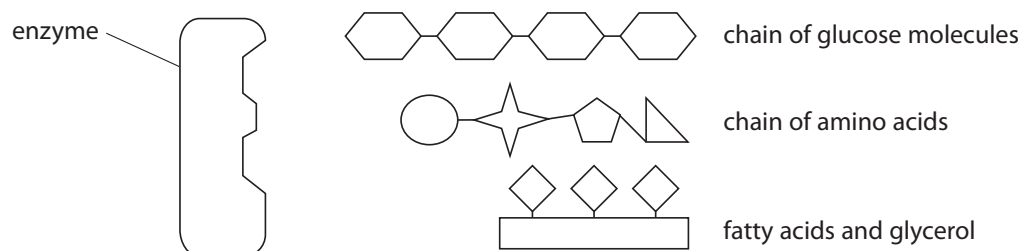


Figure 15

The enzyme will only break down one of these substrates.

State the name of this enzyme.

(1)

.....

(Total for Question 6 = 9 marks)

- 3 (a) Figure 6 shows a root hair cell from a strawberry plant.

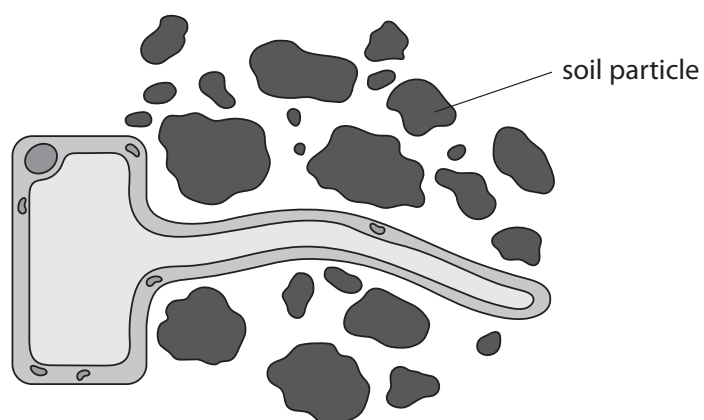


Figure 6

- (i) Label the cell vacuole in Figure 6.

(1)

- (ii) Explain how the structure of root hair cells increases water absorption from the soil.

(2)

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(b) Figure 7 shows fungus growing on strawberries.

The fungus is decomposing the strawberries.



© Catherine Eckert/Shutterstock

Figure 7

A scientist investigated the effect of temperature on the decomposition of strawberries.

The scientist spread fresh strawberries on six trays.

Each tray was kept at a different temperature.

After five days the scientist measured the area of fungus that had grown on each tray of strawberries.

The results are shown in Figure 8.

temperature in °C	area of fungus after 5 days in cm ²
5	8
10	25
15	36
20	48
25	60
30	72

Figure 8

- (i) The mean rate of growth of fungus at 25 °C was 12 cm² per day.

Calculate the mean rate of growth of fungus at 30 °C.

(2)

..... cm² per day

- (ii) State the effect of temperature on the growth of fungus on strawberries from 5 °C to 30 °C.

(1)

.....

.....



(c) Decomposition of strawberries can be prevented by boiling the strawberries with sugar to make jam.

(i) Enzymes in the fungus caused decomposition.

Explain how boiling stops the enzymes from working.

(2)

(ii) Cells from a fungus can land on jam.

The sugar solution inside the jam is more concentrated than the sugar solution inside the fungus cells.

State how osmosis causes the fungus cells to die.

(1)

(Total for Question 3 = 9 marks)



5 Figure 7 shows the structure of a leaf.

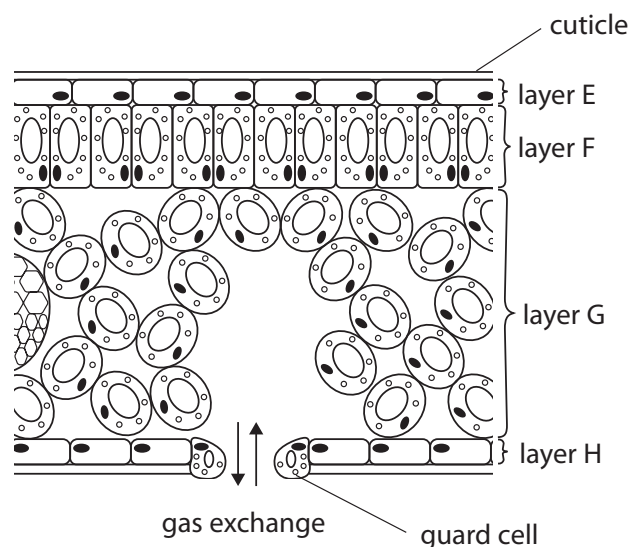


Figure 7

(a) (i) Which layer has the highest number of chloroplasts per cell?

(1)

- ☐ A layer E
- ☐ B layer F
- ☐ C layer G
- ☐ D layer H

(ii) When iodine solution was put onto these cells, small parts of the cells became blue-black.

Name the substance stored in the parts of the cells that turned blue-black.

(1)

(iii) State how the guard cells control the amount of gas exchange that occurs through the stomata.

(1)

(b) A scientist measured the thickness of the cuticle from the leaves of plants growing in soil that had a different percentage of water content.

The scientist measured six plants at each percentage of water content.

Figure 8 shows the results.

water content of soil (%)	thickness of the cuticle in μm						mean thickness of cuticle in μm
	plant 1	plant 2	plant 3	plant 4	plant 5	plant 6	
5	13.8	12.3	11.4	10.6	11.7	13.2	12.2
10	11.1	8.8	10.0	8.9	7.0	8.2	9.0
15	7.2	7.1	6.9	5.4	5.9	6.1	?
20	3.6	4.0	3.6	4.2	3.9	4.3	3.9

Figure 8

(i) Calculate the mean thickness of cuticle for the plants growing in soil containing 15% water.

Give your answer to one decimal place.

(3)

..... μm

(ii) Explain why the thickness of the cuticle is different when a plant is grown in soil with a higher water content.

(2)

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- (iii) State **one** other way that the leaves of plants are adapted to help plants grow in soil with low water content.

(1)

(Total for Question 5 = 9 marks)



- 5 (a) Figure 9 shows how adding fertiliser to the soil affects the yield of a food crop.

The area of a field is measured in hectares.

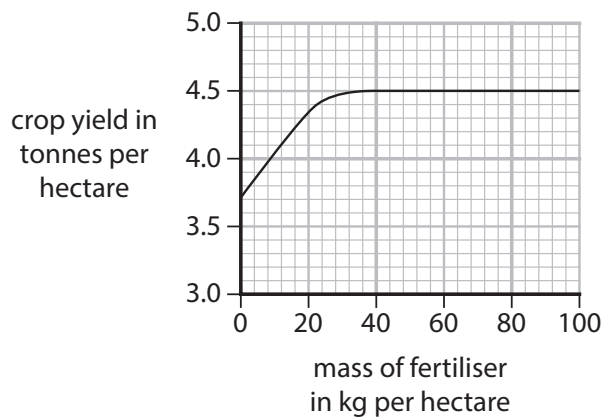


Figure 9

- (i) A farmer added 100 kg per hectare of fertiliser to a field.

Using Figure 9, calculate the increase in crop yield.

(2)

..... kg per hectare

- (ii) Explain why farmers should not add more than 40 kg per hectare of fertiliser to the soil.

(2)

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(b) Figure 10 shows part of a virus life cycle.

This virus infects bacterial cells.

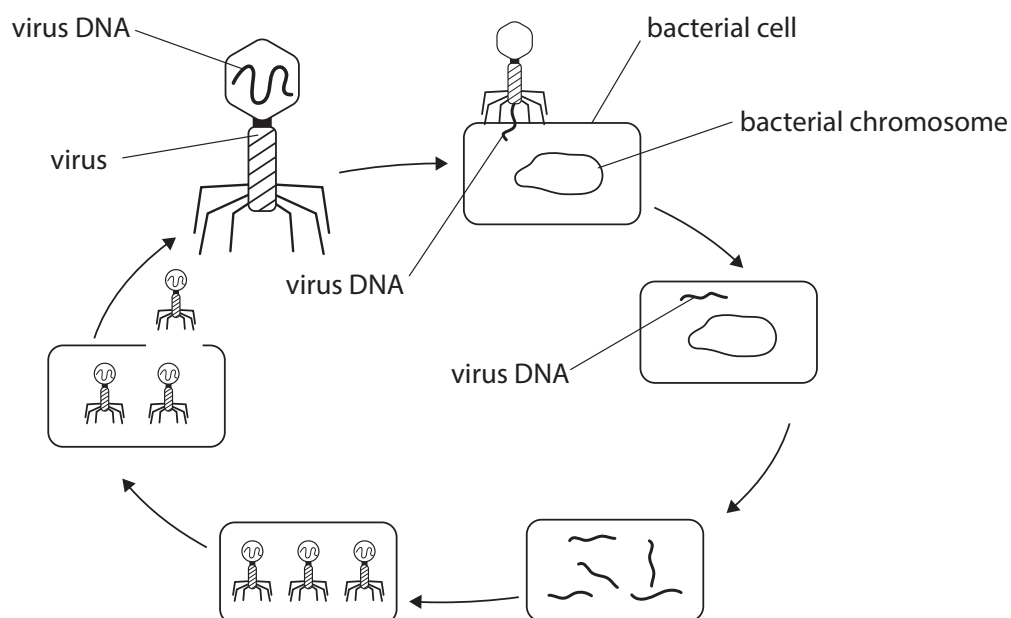


Figure 10

Use Figure 10 to describe how new viruses are made.

(4)

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(c) Plants can be affected by pests such as insects.

Give **one** way that plant pests can affect the food available for the human population.

(1)

(Total for Question 5 = 9 marks)



- 5 (a) Figure 9 shows a stoma on the lower epidermis of a leaf as seen using a light microscope.

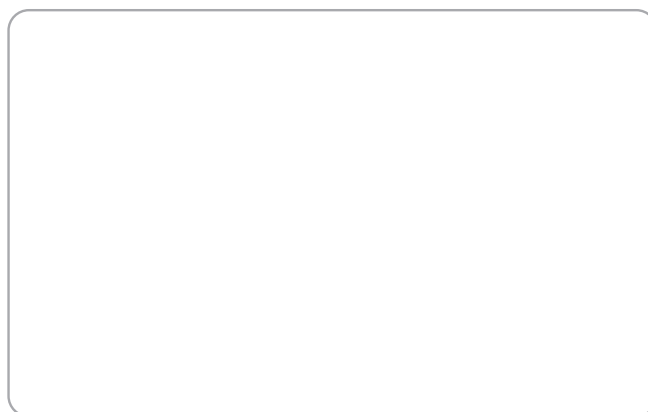


(Source: © Dew_gdragon/Shutterstock)

Figure 9

- (i) Draw the stoma and two cells around it in the box.

(2)



- (ii) Give the name of the two cells around the stoma.

(1)

(b) A student observed that a plant in a room had grown towards the light.

(i) Name the plant hormone that causes the plant to grow towards the light.

(1)

(ii) Name the type of tropism that causes the plant to grow towards the light.

(1)



(c) Figure 10 compares the root hair cells of two plants.

Plant A is adapted to growing in wet soil.

Plant B is adapted to growing in dry soil.

	soil condition	mean length of root hair cells in μm	mean number of root hair cells per 1 mm^2 of root surface
plant A	wet	221	40
plant B	dry	458	92

Figure 10

(i) Compare the root hair cells of Plant A with the root hair cells of plant B.

(2)

(ii) Figure 11 shows sections of a leaf from plant A and a leaf from plant B.

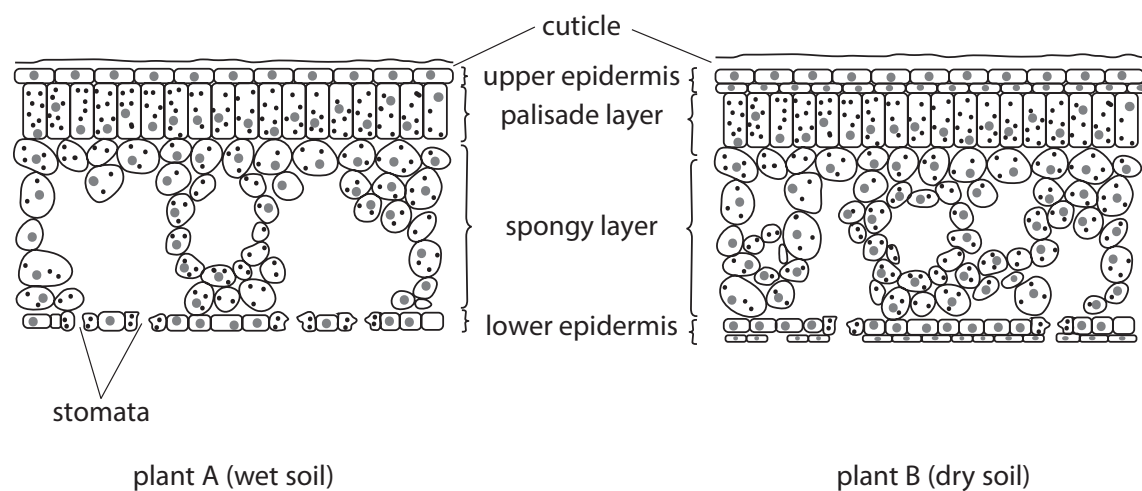


Figure 11

State **two** differences in the leaf structure shown in Figure 11 that help plant B to survive in a dry environment.

(2)

- 1
- 2

(Total for Question 5 = 9 marks)

11-MARK QUESTIONS

2 questions in this booklet



- 8 Figure 16 shows an area of woodland with some small plants growing in the ground between the trees.



(Source: © Maksym Holovinov/Shutterstock)

Figure 16

- (a) The leaves of the small plants are green.

Describe how these plants make glucose.

(2)

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- (b) Name a group of organisms that break down the dead leaves and release mineral ions into the soil.

(1)

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(c) The mineral ions are absorbed from the soil into the roots of plants.

Describe how these mineral ions are transported from the roots to the leaves of the plants.

(2)

(d) A scientist recorded the mean light intensity and the mean number of small plants per m^2 for six 25 m^2 areas of the woodland.

Figure 17 shows the results.

area of woodland	mean light intensity in lux	mean number of small plants per m^2
A	1500	2.7
B	1300	1.6
C	1000	1.1
D	800	0.6
E	550	0.3
F	350	0.1

Figure 17

(i) Explain the effect of light intensity on the number of small plants per m^2 .

(2)



- (ii) State **one** variable the scientist should have controlled to make sure the light intensity measurements could be compared.

(1)

- (e) The scientist selects an area near the edge of the woodland where many stinging nettles are growing.

This area is partly shaded by the trees.

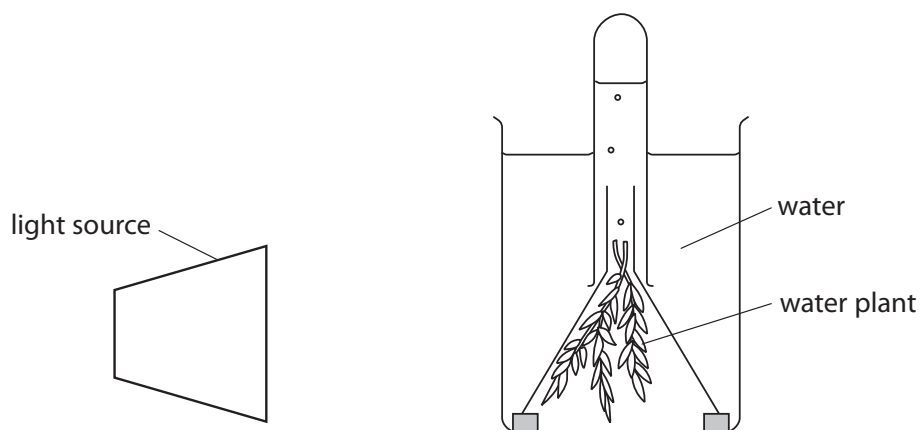
Describe how the scientist should use a belt transect to investigate how light intensity affects the growth of stinging nettles.

(3)

(Total for Question 8 = 11 marks)



- 6 (a) Figure 10 shows a method of investigating the rate of photosynthesis in a water plant.



(Source: © ghrzuzudu/Shutterstock)

Figure 10

- (i) What are the products of photosynthesis?

(1)

- ☐ **A** carbon dioxide and water
- ☐ **B** water and glucose
- ☐ **C** glucose and oxygen
- ☐ **D** oxygen and carbon dioxide

- (ii) The rate of photosynthesis can be measured by counting the number of bubbles of gas produced in one minute.

Figure 11 shows some results from this investigation in different light intensities.

Light intensity was changed by moving the lamp towards or away from the water plant.

light intensity in arbitrary units	rate of photosynthesis in bubbles per minute
25	19
31	43
39	46
50	95
69	125
100	222

Figure 11

Describe the effect of light intensity on the rate of photosynthesis. Use information from Figure 11 to help you.

(2)

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- (iii) The bubbles are different sizes and can be difficult to count.

Describe how the quality of the results from this investigation could be improved.

(2)

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(iv) Describe how this investigation could be changed to find the effect of temperature on the rate of photosynthesis.

(3)

(b) Increased nitrates can cause eutrophication in lakes.

Explain how eutrophication will affect the fish living in the lakes.

(3)

(Total for Question 6 = 11 marks)



12-MARK QUESTIONS

5 questions in this booklet



- 7 (a) The human population is increasing, so more food needs to be produced.

Farmers use fertilisers to increase the yield of wheat.

A farmer wants to find out the optimum concentration of fertiliser to use on his wheat plants.

He has a stock solution of concentrated fertiliser which is stated as 100%.
He dilutes the stock solution to make 5%, 10%, 15% and 20% solutions.

He makes 100 cm³ of each solution.

- (i) Describe how the farmer prepares 100 cm³ of the 20% solution.

(2)

- (ii) The farmer has 60 wheat plants.
Each plant is 20 mm in height.

Devise a plan to find the optimum percentage solution of fertiliser for the growth of these wheat plants.

(3)



(iii) The farmer improves this plan by controlling all the variables.

State **one** variable that the farmer should control when growing these wheat plants.

(1)

*(b) Explain how plants protect themselves from being eaten by pests and against diseases caused by pathogens.

(6)

(Total for Question 7 = 12 marks)



- 8 Figure 18 shows the leaves and flowers of water lily plants (*Nymphaea odorata*) on a lake.



© Oleksandr Shymanskyi/123RF

Figure 18

- (a) Water lilies have stomata on the upper surface of the leaves.

Explain why water lilies have no stomata on the lower surface of the leaves.

(2)

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(b) (i) The white petals of the water lily flowers cannot photosynthesise.

Which structure in leaf cells is the site of photosynthesis?

(1)

- ☐ A nucleus
- ☐ B vacuole
- ☐ C mitochondrion
- ☐ D chloroplast

(ii) Glucose is made by photosynthesis.

Glucose is converted to another sugar to be transported in the plant.

What is the name of this sugar?

(1)

- ☐ A glycerol
- ☐ B ribose
- ☐ C sucrose
- ☐ D starch

(iii) Describe how this sugar is transported from the leaves to the flowers of the water lily.

(2)

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(c) Figure 19 shows water lilies growing in a lake in Europe.



© lynn gladwell/123RF

Figure 19

- (i) One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 19.

Explain why this non-indigenous plant now covers the whole surface of the lake.

(3)

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(ii) Explain how the water lilies will affect the biodiversity of this lake.

(3)

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(Total for Question 8 = 12 marks)



7 Figure 12 shows how the leaves are arranged on a plant.

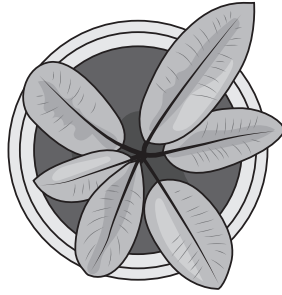


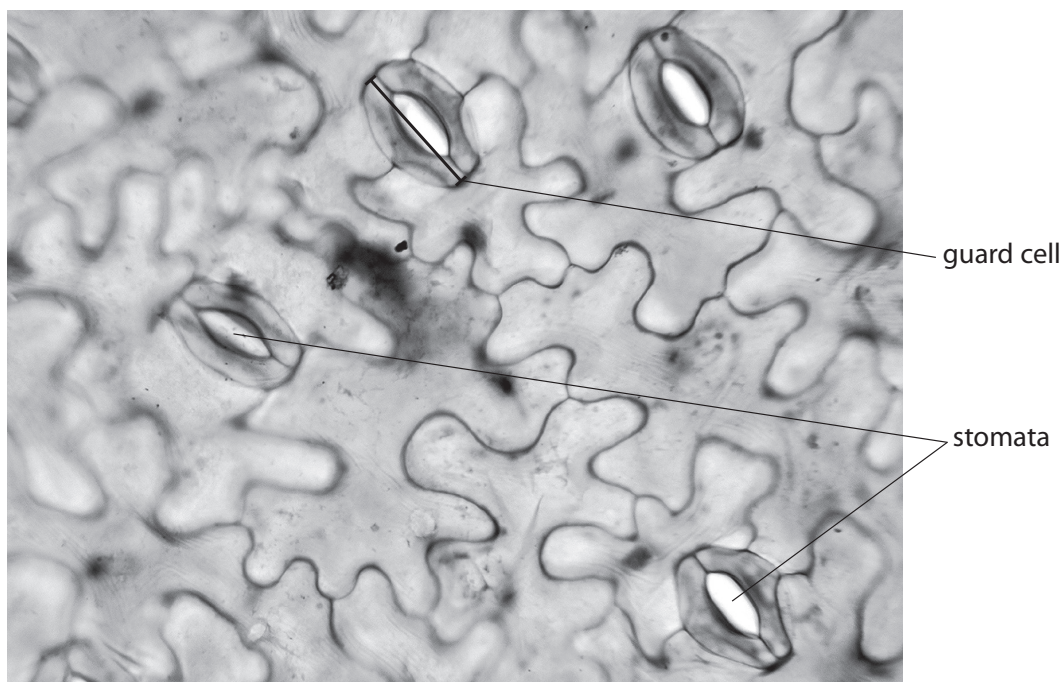
Figure 12

(a) Which reason explains why the leaves are arranged in this way?

(1)

- ☐ **A** the upper leaves allow more light to reach the lower leaves
- ☐ **B** the leaves do not need stomata
- ☐ **C** the phloem in the leaves will absorb more water
- ☐ **D** more insects will be attracted to the plant to eat the leaves

(b) Figure 13 shows guard cells and stomata on the lower surface of a leaf.



(Source: © Rattiya Thongdumhyu/Shutterstock)

Figure 13

Measure the length of the line on the labelled guard cell in mm.

The actual length of the labelled guard cell is 0.05 mm.

Calculate the magnification of this image.

(3)

magnification

- (c) Figure 14 shows the number of stomata per mm^2 on the lower surface of leaves from plants growing in soils with different water content.

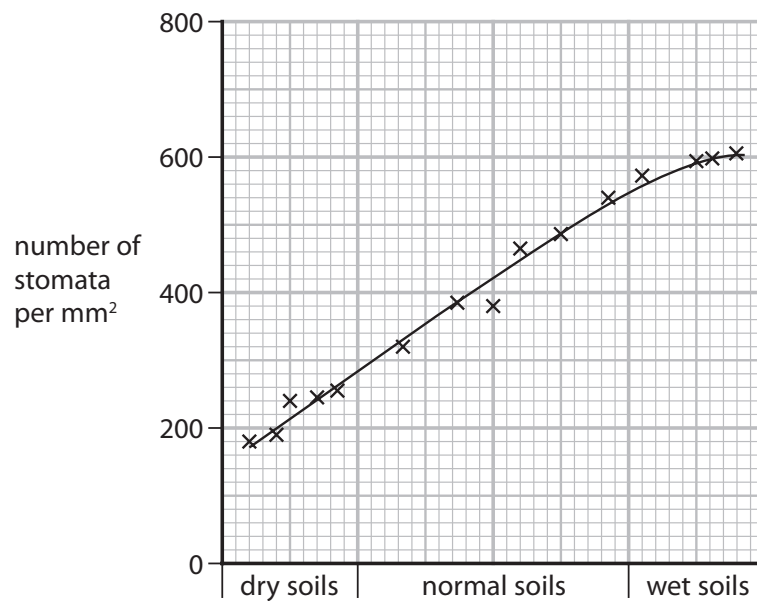


Figure 14

Explain the difference in the number of stomata per mm^2 on the leaves of the plants grown in dry and wet soils.

(2)

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*(d) Figure 15a shows a plant that has been placed on its side.

Figure 15b shows the same plant after 5 days.

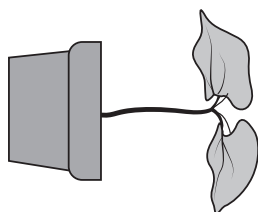


Figure 15a

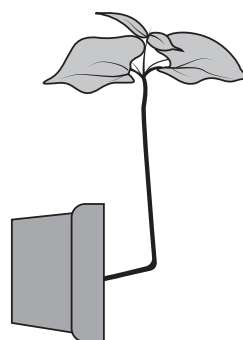


Figure 15b

Explain why the growth of the plant has changed.

(6)

(Total for Question 7 = 12 marks)

8 (a) Figure 14 shows a diagram of a plant root hair cell.

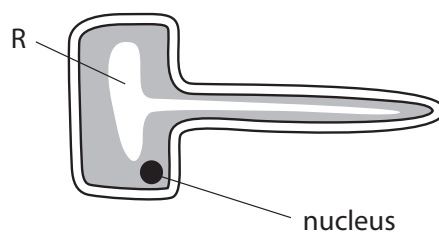


Figure 14

(i) Name the part labelled R.

(1)

(ii) Explain **one** adaptation of a root hair cell that increases the absorption of water and mineral ions.

(2)

(b) Figure 15 shows xylem and phloem from the stem of a plant.

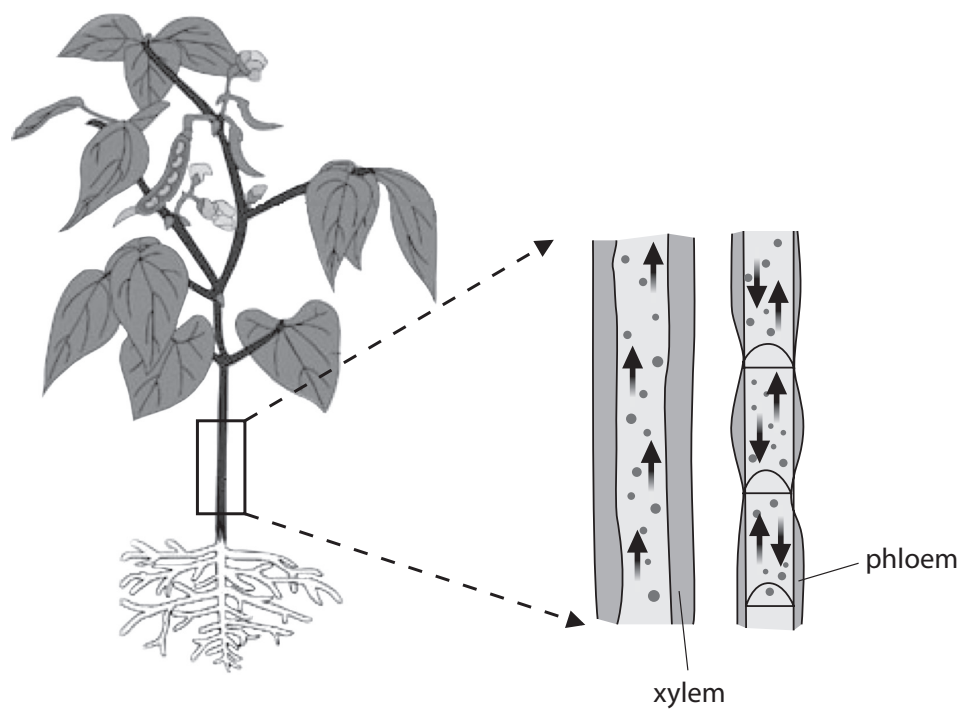


Figure 15

(i) Living cells in phloem use energy to transport sucrose.

Which organelles release energy in living cells?

(1)

- ☐ A vacuoles
- ☐ B mitochondria
- ☐ C nuclei
- ☐ D ribosomes

(ii) Describe **two** features of the structure of xylem vessels that can be seen in Figure 15.

(2)

1.
-
2.
-

- (c) A scientist investigated how the flow of air affected the rate of transpiration in a plant.

A fan was used to change the flow of air.

The volume of water taken up by the plant was measured.

Figure 16 shows the results of this investigation.

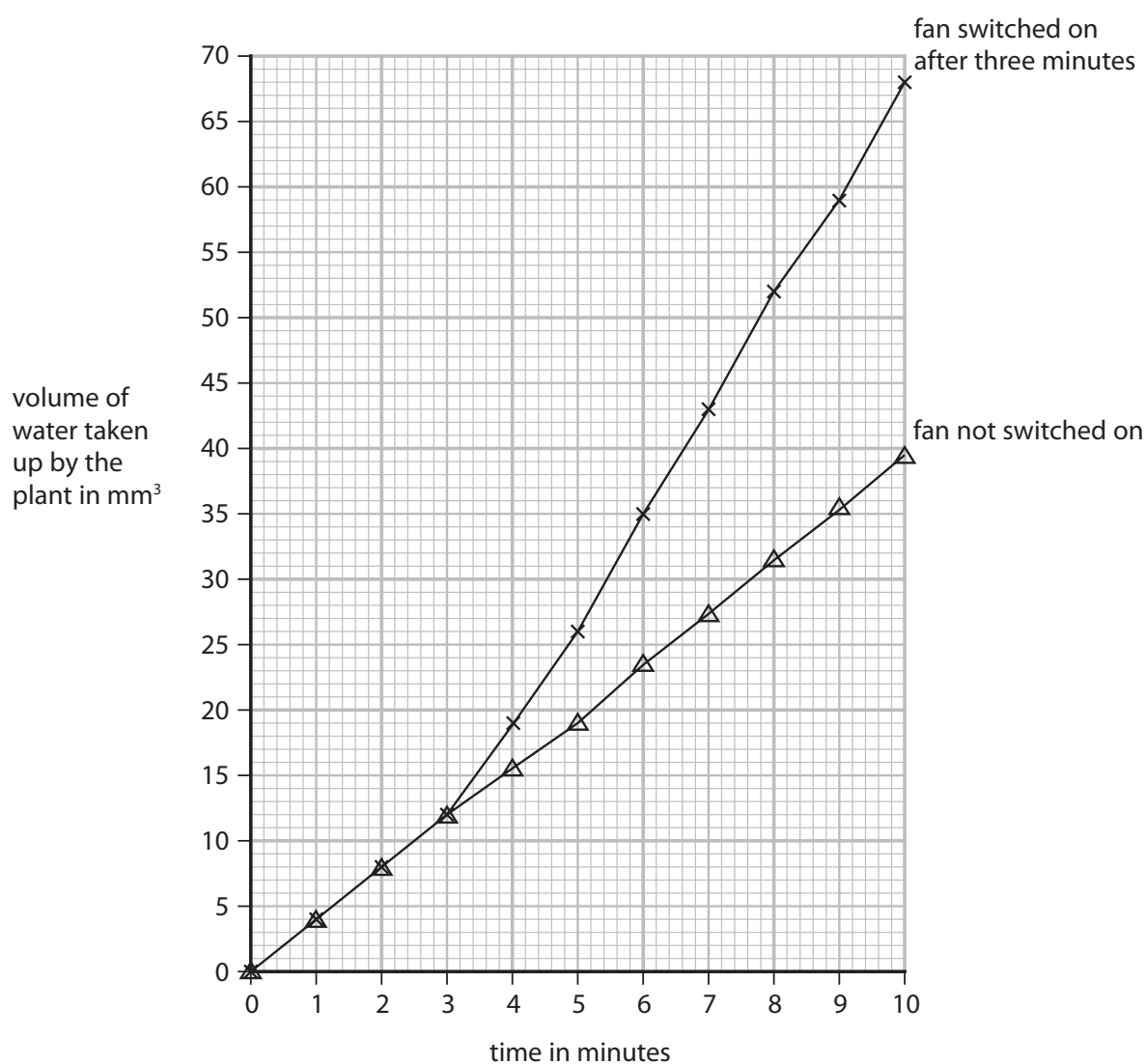


Figure 16

- (i) Explain why switching on the fan caused a change in the volume of water taken up by the plant.

(3)

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- (ii) Give **one** reason why the volume of water taken up by the plant was also measured when the fan was not switched on.

(1)

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- (iii) Calculate the rate of water uptake from 8 minutes to 10 minutes when the fan was switched on.

Use the equation

$$\text{rate of water uptake} = \frac{\text{volume of water taken up}}{\text{time taken}}$$

(2)

..... mm³ per minute

(Total for Question 8 = 12 marks)



- 7 The growth of crop plants, such as wheat, can be improved by the use of fertilisers and the control of pests.

Figure 13 shows the mass of grains produced by wheat plants grown in soil without fertiliser and in soil with fertiliser.

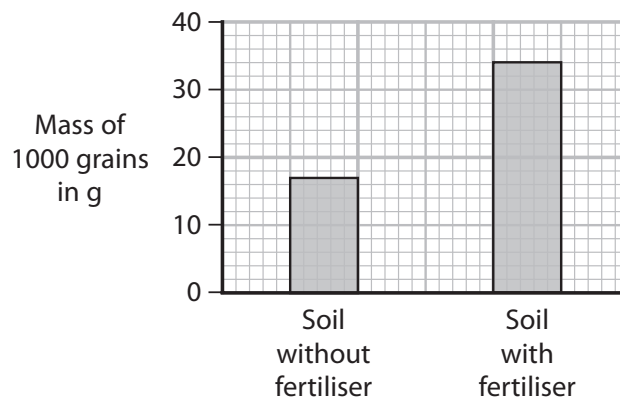


Figure 13

- (a) Give **one** effect on the grains produced, when wheat plants are grown in soil with fertiliser.

(1)

- (b) Explain why farmers measure the mass of 1000 grains rather than the mass of one wheat grain.

(2)

(c) Biological control can be used to reduce pest damage on crops.

(i) Which is the definition of biological control?

(1)

- ☐ **A** using antiseptics to control pests
- ☐ **B** using fertilisers to control pests
- ☐ **C** using predators to control pests
- ☐ **D** using pesticides to control pests

(ii) Figure 14 shows a crop being grown under a clear plastic cover and a crop being grown in a garden.

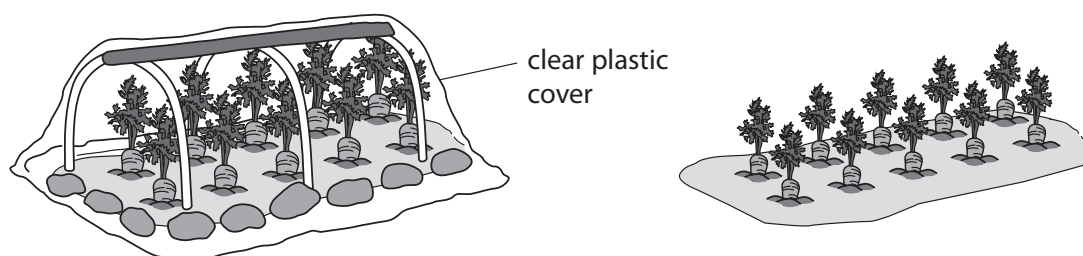


Figure 14

Explain why biological control would be more successful when a crop is grown under a clear plastic cover.

(2)

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13-MARK QUESTIONS

2 questions in this booklet



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- 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.

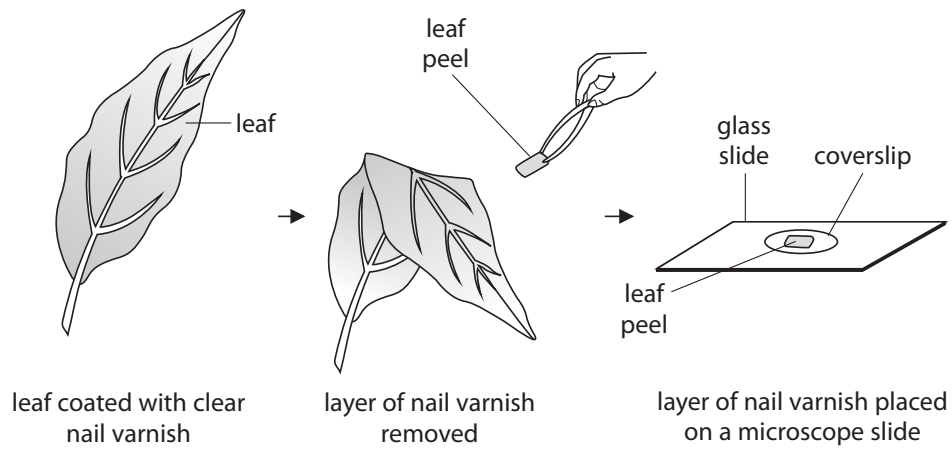


Figure 22

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)

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

(2)

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

Figure 23 shows this diagram.

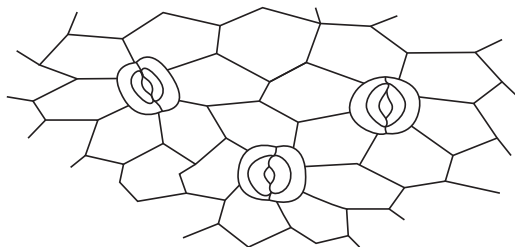


Figure 23

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

(1)

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

Describe how stomata open.

(3)

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*(c) Figure 24 shows xylem and phloem.

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

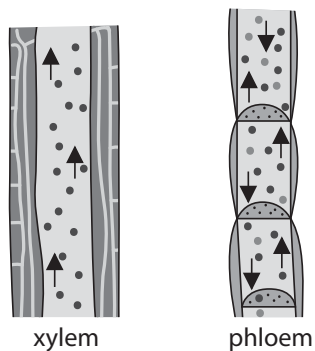


Figure 24

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

(6)

(Total for Question 9 = 13 marks)

9 (a) Figure 13 shows a root hair cell from a plant.

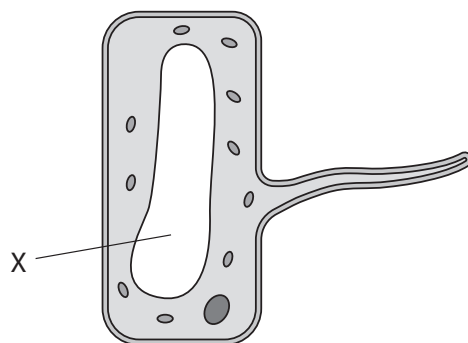


Figure 13

(i) Name the part labelled X.

(1)

(ii) State **one** way that the structure of the root hair cell increases the volume of substances it absorbs.

(1)

(iii) Explain why root hair cells do not contain chloroplasts.

(3)

(b) A student studied the water plant *Elodea*.

The student used a light microscope to observe the cells of the plant in tap water and in a 10% salt solution.

Figure 14 shows *Elodea* cells in tap water and in a 10% salt solution.

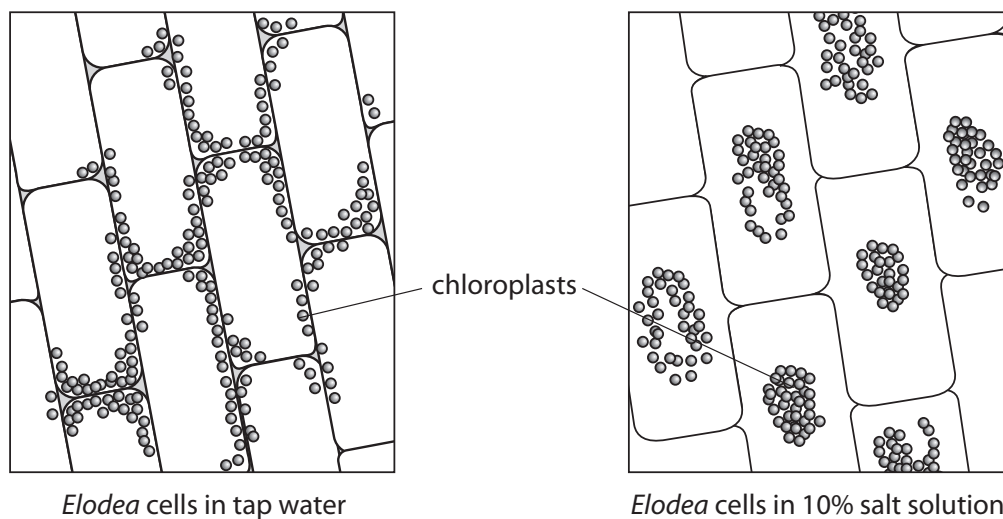


Figure 14

Describe **two** ways that the *Elodea* cells in the 10% salt solution are different from the *Elodea* cells in tap water.

(2)

- 1
- 2

MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number	Answer	Mark
2(a)	D carbon dioxide oxygen The only correct answer is D A is incorrect because light is not a product of photosynthesis B is incorrect because light is not a reactant for photosynthesis C is incorrect because oxygen is not a reactant and carbon dioxide is not a product of photosynthesis	(1)

Question Number	Answer	Mark
2(b)	chlorophyll accept phonetic spellings of chlorophyll	(1)

Question Number	Answer	Additional guidance	Mark
2(c)(i)	A plan including three from: - place the plants in different light levels / shine light on one plant / keep one in light and the other in the dark (1) - leave for a period of time (1) - water the plants (1) - measure the {height / mass} / count the number of leaves (1)	accept (use metre rule to) place a lamp at different distances from the plants if a time period is stated it should be for at least 1 day accept measure / see how much they have grown	(3)

Question Number	Answer	Additional guidance	Mark
2(c)ii	volume of water / temperature / size of plants / time period / type of soil	ignore amount for volume accept use the same type / species of plant	(1)

Question Number	Answer	Additional guidance	Mark
2(c)iii	An explanation including: - photosynthesis would stop (1) - because enzymes would be denatured / destroyed (1)	accept reduce accept enzymes wouldn't work / plants die / plants would dry out reject enzymes are killed ignore plants / plant cells denaturing	(2)

Total for question 2 = 8 marks



Question number	Answer	Mark
2(a)	(water) + carbon dioxide (1) $\longrightarrow$ (glucose) + oxygen (1)	(2)

Question number	Answer	Additional guidance	Mark
2(b)(i)	light doesn't (usually) reach the roots / photosynthesis needs light / root cells do not have chloroplasts (1)		(1)

Question number	Answer	Mark
2(b)(ii)	The only correct answer is B sucrose A is incorrect because starch is not transported in the phloem C is incorrect because urea is not transported in the phloem D is incorrect because plasma is not transported in the phloem	(1)

Question number	Answer	Additional guidance	Mark
2(c)	A description linking two from: • found in chloroplasts (1) • which absorbs light (1) • for photosynthesis (1)		(2)

Question number	Answer	Additional guidance	Mark
2(d)	Two from: (the oil burning heater) • produces carbon dioxide (1) • increases temperature (1) • produces water (vapour) (1)	accept increases humidity accept produces light (1)	(2)

Total for Question 2 = 8 marks

Question number	Answer	Mark
4(a)(i)	B reduced growth and lighter green leaves 1. The only correct answer is B <i>A is not correct because low nitrate ion concentration in soils will not cause darker green leaves</i> <i>C is not correct because low ion nitrate concentration in soils will not cause neither increased growth or darker green leaves</i> <i>D is not correct because low nitrate ion concentration in soils will not cause increased growth</i>	(1) AO 2 1

Question number	Answer	Mark
4(a)(ii)	A bacteria 1. The only correct answer is A <i>B is not correct because mammals do not convert nitrogen to nitrate ions</i> <i>C is not correct because fungi do not convert nitrogen to nitrate ions</i> <i>D is not correct because worms do not convert nitrogen to nitrate ions</i>	(1) AO 2 2

Question number	Answer	Additional guidance	Mark
4(b)(i)	Substitution: $288\,000 \div 36\,000 (= 8) (1)$ Evaluation: 1:8	award full marks for correct ratio with no working	(2) AO 2 2

Question number	Answer	Additional guidance	Mark
4 (b)(ii)	An explanation including: - increases the surface area (1) - for absorption of (more) mineral ions / named mineral ions / water (1)	accept increases anchorage (1)	(2) AO 1 1

Question number	Answer	Mark
4(c)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (2 marks): Judgement: - the number of algae increase (1) Two reasons: - increased {temperature / light intensity} / longer daylight (1) - for (more) photosynthesis (for growth) (1) OR - increased minerals / nitrate ions / eutrophication in the lake (1) (more) protein / chlorophyll (for growth) (1)	(3) AO 3 2a AO 3 2b

Total for Question 4 = 9 marks

Question number	Answer	Mark
6(a)(i)	D waxy cuticle 1. The only correct answer is D <i>A is not correct because R is not the cell wall</i> <i>B is not correct because R is not cytoplasm</i> <i>C is not correct because R is not the stomata</i>	(1) AO 2 1

Question number	Answer	Additional guidance	Mark
6(a)(ii)	A description including: - more glucose produced in the palisade (mesophyll) layer (1) - correct manipulation of data – e.g. 14 mg more / 2.75 times more (1)	accept more than double / almost three times more.	(2) AO 3 1a AO 3 1b

Question number	Answer	Mark
6(b)	An explanation which includes the following: (between 9 and midday) light intensity is high / highest (1) - so more photosynthesis occurs (which produces oxygen) (1) OR (more) photosynthesis is occurring (1) - so oxygen moves out of the leaf by diffusion / description of diffusion (1)	(2) AO 2 1

Question number	Answer	Mark
6(c)(i)	D carbohydrate 1. The only correct answer is D <i>A is not correct because glucose is not a vitamin</i> <i>B is not correct because glucose is not a protein</i> <i>C is not correct because glucose is not a carbohydrate</i>	(1) AO 1 1

Question number	Answer	Mark
6(c)(ii)	A description including the following • (heat with) Benedict's reagent / solution (1) • turns (from blue) to green/yellow/orange/ (brick-)red (1)	(2) AO 1 2

Question number	Answer	Mark
6(d)	• carbohydrase / amylase (1)	(1) AO 2 1

Total for Question 6 = 9 marks

Question number	Answer	Additional Guidance	Mark
3(a)(i)	Label to any part or the edge of the vacuole	accept an answer / letter written inside vacuole	(1)

Question number	Answer	Mark
3(a)(ii)	An explanation linking: • has a long / thin / finger like projection (1) • which increases the (surface) area (1) OR • cell wall is thinner (1) • (so) the distance water travels is shorter (1)	(2)

Question number	Answer	Additional guidance	Mark
3(b)(i)	• substitution $72 \div 5$ (1) • evaluation $= 14.4$ (cm² per day)	accept 14 (cm ² per day) Award full marks for correct answer with no working.	(2)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	The growth / area of fungus increases	accept it goes up accept manipulated data e.g. the area is 9 times larger accept the higher the temp, the bigger (the area of) the fungus.	(1)

Question number	Answer	Additional guidance	Mark
3(c)(i)	An explanation linking two of the following: - enzymes are heat sensitive (1) - the shape of the enzyme / active site changes (1) (enzymes) become denatured (1) - substrate(s) will not fit in the active site (1)	reject kill enzyme.	(2)

Question number	Answer	Mark
3(c)(ii)	Water moves out (of the fungus cells) / cells become dehydrated	(1)

Total for question 3 = 9 marks

Question Number	Answer	Mark
5 (a) (i)	B layer F The only correct answer is B A is incorrect because 'layer E' has no chloroplasts C is incorrect because the cells in layer G have fewer chloroplasts than the cells in layer F D is incorrect because cells in layer H have fewer chloroplasts than the cells in layer F	(1)

Question Number	Answer	Mark
5 (a) (ii)	starch accept phonetic spellings of starch	(1)

Question Number	Answer	Mark
5 (a) (iii)	(the guard cells) {open / close / change the size of} the stomata	(1)

Question Number	Answer	Additional guidance	Mark
5 (b) (i)	substitution $7.2+7.1+6.9+5.4+5.9+6.1 = 38.6$ (1) evaluation $(38.6) \div 6 = 6.43$ to 1 decimal place $= 6.4$	accept correct answer on answer line for 3 marks accept their total correctly divided by 6 for 1 mark 6.43 / 6.43 on the answer line for 2 marks ecf for a calculated number correctly rounded to 1 decimal place for 1 mark	(3)

Question Number	Answer	Additional guidance	Mark
5 (b) (ii)	An explanation including two from: - the cuticle is thinner (1) - as the plant has plenty of water / doesn't need to conserve {so much water / as much water as plant growing in dry soil} (1) - as the cuticle is waterproof (1)		(2)

Question Number	Answer	Mark
5 (b) (iii)	has {smaller leaves / curled leaves / spines / fewer stomata / smaller stomata / fleshy leaves / smaller surface area (to volume ratio) / store water}.	(1)

Total for question 5 = 9 marks



Question number	Answer	Additional guidance	Mark
5(a)(i)	Identification 3.75 or 4.5 (1) Evaluation $(4.5 - 3.75) = 0.75$	award full marks for the correct answer with no working accept any number between 3.7 and 3.8 accept any number between 0.7 and 0.8	(2) AO3 2a 2b

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation linking two from: (40 kg per hectare) produces the maximum yield (1) - so above 40 kg per hectare the crop yield stays the same / adding more fertiliser does not make a difference to yield (1) - so using more than 40 kg per hectare would {cost more / reduce profit} (1)	accept 40 kg per hectare is the optimum quantity accept fertiliser would be wasted accept more than 40 kg per hectare would damage the soil (1)	(2) AO2 1

Question number	Answer	Additional guidance	Mark
5(b)	A description including four from: • virus attaches to {host / (bacterial) cell} / infects the (bacterial) cell (1) • virus DNA injected (into host cell) (1) • virus DNA copied / more virus DNA produced (1) • more viruses produced (1) • host cell bursts open (1) • (many) virus (particles) released (1) • lytic cycle (1)	accept new viruses accept lysis	(4) AO2 1

Question number	Answer	Additional guidance	Mark
5(c)	less food available / lower crop yield / (insects) {eat / destroy} crops	accept spread diseases to the crop	(1) AO2 1

Total for question 5 = 9 marks

Question number	Answer		Mark
5(a)(i)	A diagram showing: - the basic shape of both guard cells (1) (basic shape of) stoma clearly seen (1)		(2)

Question number	Answer	Mark
5(a)(ii)	guard cell(s)	(1)

Question number	Answer	Mark
5(b)(i)	auxin	(1)

Question number	Answer	Mark
5(b)(ii)	phototropism accept phonetic spellings	(1)

Question number	Answer	Additional guidance	Mark
5(c)(i)	an answer linking: - Plant A has fewer root hair cells (per mm²) (1) - Plant A has shorter root hair cells (1)	ORA	(2)

Question number	Answer	Mark
5(c)(ii)	Any two from: plant B / plant in the dry soil has • a thicker cuticle (1) • fewer stomata (1) • more layers / two layers of cells in the upper epidermis (1) • smaller air spaces / more cells in spongy layer (1) • more layers / two layers of cells in the lower epidermis (1)	(2)

Total for Question 5 = 9 marks



Question Number	Answer	Additional guidance	Mark
8(a)	A description including two from: • have chlorophyll / chloroplasts (1) • (by) photosynthesis (1) • absorbing / using (sun)light (1) • (to react) water with carbon dioxide (1)	accept symbol / word equations	(2) AO2 1



Question Number	Answer	Additional guidance	Mark
8(b)	Any one from bacteria / fungi / decomposers / prokaryotes	accept microorganisms accept named decomposing organisms e.g. worms	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
8(c)	A description including two from: • (dissolved) in water (1) • diffusion through the root (1) • (so water moves) through the xylem (1) • by transpiration (stream) (1) • into leaves by diffusion (1)	accept active transport through the plant reject phloem accept evaporated from the leaves	(2) AO2 1

Question Number	Answer	Additional guidance	Mark
8(d) (i)	An explanation linking: • as light intensity decreases the number of (small) plants (per m²) decreases (1) • because the (small) plants will not be able to photosynthesise enough (1)	accept reverse argument	(2) AO3 1ab

Question Number	Answer	Additional guidance	Mark
8(d) (ii)	Any one from: • same time of day (1) • same meter (1) • same position(s) in area / measure the same size area (1) • same person makes the readings (1) • meter held vertically each time (1)	accept other valid variables that should be controlled	(1) AO3 1ab

Question Number	Answer	Additional guidance	Mark
8(e)	A description including three from: - place a quadrat along a {rope / tape} measure (1) - tape measure to measure along the transect (1) - measure light intensity at different distances (from the wood) (1) - measure the stinging nettles {along the transect / at different light intensities} (1) - way of measuring growth of stinging nettles (in the quadrats) (1)	reject quadrant accept good descriptions of quadrats – e.g. ½ metre wire square accept use a light meter/lux meter accept named examples – e.g. {height / mass/ dry mass / number of leaves / number of plants}	(3) AO3 3a

(Total for question 8 = 11 marks)

Question Number	Answer	Additional guidance	Mark
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Question Number	Answer	Mark
6(a)(i)	C glucose and oxygen The only correct answer is C <i>A is not correct because carbon dioxide and water are not products of photosynthesis</i> <i>B is not correct because water is not a product of photosynthesis</i> <i>D is not correct because carbon dioxide is not a product of photosynthesis</i>	(1) AO1 1

Question Number	Answer	Mark
6(a)(ii)	Any two from: - increasing light intensity increases rate of photosynthesis / number of bubbles per minute (1) - credit specific examples using manipulated data from the table (1)	(2) AO3 1a 1b

Question Number	Answer	Mark
6(a)(iii)	A description including two from: • video the investigation / plant (1) • play back (in slow motion) and count the bubbles (1) OR • collect bubbles / gas produced / use a (gas) syringe (1) • measure volume of gas (collected) (1) OR • repeat the investigation (at each light intensity) (1) • calculate a mean (1)	(2) A03 3b

Question Number	Answer	Mark
6(a)(iv)	A description including three from: • change temperature of water (1) • use thermometer / temp probe (to monitor temperature of water) (1) • use a water bath (to keep each temperature constant) (1) • count the bubbles at each temperature (for set time) (1) • control a variable, e.g. keep pond weed / light intensity / volume of water the same (1)	(3) A03 3a

Question Number	Answer	Mark
6(b)	An explanation linking: • nitrates cause algal bloom / {rapid / excessive / over} growth of algae (1) • algae / water plants (lower in the water) are deprived of light (1) • these algae / water plants die (1) • oxygen concentration in water decreases (due to decomposition) / less photosynthesis (1) • so fish die (1)	(3) A01 1

(Total for question 6 = 11 marks)



Question number	Answer	Mark
7(a)(i)	• measure 20 cm³ of the stock solution (1) • mix with 80 cm³ of water (1)	(2) AO 2 2

Question number	Answer	Mark
7(a)(ii)	Any three from: • divide wheat plants into (equal sized) groups (1) • add a different fertiliser solution to each group (1) • measure the height of the plants after a period of time (and calculate the mean increase in height) (1) • The optimum fertiliser concentration is the weakest solution that allows for maximum average growth (1)	(3) AO 3 3a

Question number	Answer	Mark
7(a)(iii)	Any one improvement from: light intensity/temperature/moisture level of the soil/volume of fertiliser (solution)/type of fertilizer/soil nutrient level/variety of wheat (1)	(1) AO 3 3b

Question number	Indicative content	Mark
7(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are therefore not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. - Plants have physical and chemical defences Physical defences - Plant leaves have waxy cuticles - Waxy cuticles are impermeable - Plant cells have cell walls - Cell walls are made of cellulose and are difficult for pests or pathogens to penetrate - Leaf cuticle and cell walls are physical defences - Some plants have spines or hairs which deter pests Chemical defences - Chemicals can deter pests - Production of chemicals which are toxic to pests and pathogens - Chemicals have anti-microbial properties - Unpleasant taste which deters pests - Unpleasant smell which deters pests	(6) AO 1 1
Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	- Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) - Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	- Demonstrates elements of biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) - Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	- Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) - Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Total for Question 7 = 12 marks



Question number	Answer	Additional guidance	Mark
8(a)	An explanation including the following: - lower surface (of leaf) is not in contact with air / is in water (1) - so gas exchange cannot occur (1)	accept water would enter the stomata accept oxygen /carbon dioxide /water (vapour) accept reduced/no transpiration	(2)

Question number	Answer	Mark
8(b) (i)	D chloroplast The only correct answer is D chloroplast A is incorrect because the nucleus does not photosynthesise B is incorrect because the vacuole does not photosynthesise C is incorrect because the mitochondrion does not photosynthesise	(1)

Question number	Answer	Mark
8(b)(ii)	C sucrose The only correct answer is C sucrose A is incorrect because glycerol is not a sugar B is incorrect because although ribose is a sugar this is found in DNA D is incorrect because starch is not a sugar	(1)

Question number	Answer	Additional guidance	Mark
8(b)(iii)	A description including two from: • in the phloem (1) • dissolved (in water) (1) • by translocation (1) • using active transport (1)	reject xylem accept by diffusion	(2)

Question number	Answer	Mark
8(c)(i)	An explanation linking three from the following: • because {conditions / named conditions} are suitable for {growth / photosynthesis} / conditions similar to native conditions / it is adapted to the conditions (1) • it outcompeted the natural plants (1) • therefore, it {grows / reproduces} (1) • as no natural herbivores {eat it / restrict it} (1)	(3)

Question number	Answer	Mark
8(c)(ii)	An explanation linking three of the following: • biodiversity is reduced / fewer {plants / plant species} / reduced number of {animals / animal species} (1) • (fewer plants because) less light reaches the water (1) • so less photosynthesis in plants below lilies (1) • lower oxygen concentration in water / oxygen is used up by decomposers (1) • (fewer animals because) less food for animals (1)	(3)

Total for question 8 = 12 marks



Question Number	Answer	Additional guidance	Mark
7(a)	A the upper leaves allow more light to reach the lower leaves The only correct answer is A <i>B is not correct because the arrangement of leaves does not affect the need for stomata.</i> <i>C is not correct because the phloem does not absorb water and would not explain the leaf arrangement.</i> <i>D is not correct because the leaves would not be arranged to increase the amount of leaf eaten by insects.</i>		(1) AO2.1

Question Number	Answer	Additional guidance	Mark
7(b)	measurement 20 mm (1)	accept ± 2 mm	(3)



Question Number	Answer	Additional guidance	Mark
7(c)	An explanation including - there are fewer stomata in plants in dry soils (so) less water is lost by plants in dry soils / (because) plants lose water through stomata OR - there are more stomata in plants in wet soils (1) (as) more water can be lost by plants in wet soils / (because) plants lose water through stomata (1)	accept as the soils get wetter the number of stomata increases accept as the soils get wetter the number of stomata increases	(2) AO3.1ab

Question Number	Indicative content	Mark
7(d)*	AO1	(6)

	Observations - the plant stem bends - the stem is longer/taller - the plant is now growing upwards / towards light - plant has more leaves explanations - plant hormone / auxin - more hormone / auxin on shaded side - cell elongation (on shaded side) (positive) phototropism (negative) gravitropism - more cells / cell division - growing towards light - so (the leaves) are not in shade (e.g. of other plants) - to absorb more light - for photosynthesis	A01.1
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Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	- Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. - Presents an explanation with some structure and coherence.
Level 2	3–4	- Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. - Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5–6	- Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. - Presents an explanation that has a well-developed structure which is clear, coherent and logical.



Question Number	Answer	Mark
8(a)(i)	vacuole / cell sap / sap accept: phonetic spellings of vacuole do not accept vacuum	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	An explanation linking two from: • being long (1) • has a large surface area / gives more area (1) • to increase rate for absorption. (1) OR • root hair has a thin (cell) wall (1) • to reduce the distance water and mineral ions have to travel (1) • to increase rate for absorption. (1)	accept contains many mitochondria (1) to release energy / for active transport (1)	(2) AO1 1

Question Number	Answer	Additional guidance	Mark
8(b)(i)	B mitochondria The only correct answer is B <i>A is not correct because vacuoles do not release energy</i> <i>C is not correct because nuclei do not release energy</i> <i>D is not correct because ribosomes do not release energy</i>		(1) AO1 1

Question Number	Answer		Mark
8(b)(ii)	An answer including: • thick walls (1) • continuous / hollow tubes/no end walls (1)	accept no cytoplasm accept made of lignin / made of dead cells (1)	(2) AO2 1

Question Number	Answer	Mark
8 (c)(i)	An explanation including three from: - fan causes air to move / creates wind / increased air flow (1) - water (vapour) removed (from around leaf) (1) increased {rate of diffusion/evaporation/transpiration} (of water vapour from leaf) (1) - causing the plant to take up (more) water (1)	(3) AO2 2

Question Number	Answer		Mark
8(c)(ii)	to compare (the effect) / as a control	accept to get a baseline measurement	(1) AO2 2

Question Number	Answer	Additional guidance	Mark
8(c)(iii)	68 – 52 / 16 (1) (16 ÷ 2) 8 (mm³ per minute)	award full marks for correct answer with no working e.c.f. for incorrect graph readings for 1 mark	(2) AO2 1

(Total for question 8 = 12 marks)



Question Number	Answer	Additional guidance	Mark
7(a)	(using fertiliser) produces a larger one thousand grain mass / {bigger / heavier} grains		(1) A03 1a

Question Number	Answer	Additional guidance	Mark
7(b)	An answer including: (single) grains are {very small / have a small mass / have different masses} (1) - so the mass of single grains would not allow a reliable comparison (of fertiliser treatments) to be made (1)	accept reverse argument accept to calculate an average (grain mass) (1)	(2) A02 2

7(c)(i)	C using predators to control pests The only correct answer is C <i>A is not correct because biological control is not using antiseptics to control pests</i> <i>B is not correct because biological control is not using fertilisers to control pests</i> <i>D is not correct because biological control is not using pesticides to control pests</i>	(1) A01 1
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Question Number	Answer	Additional guidance	Mark
7(c)(ii)	An explanation linking two from: • (biological control agent) is enclosed / cannot escape if crop is under cover (1) • so (biological control agent) more likely to {find / eat / destroy} pests (1) • (therefore) less crop damage / more yield (if under cover) (1)	accept predator / parasite / named predator e.g ladybirds	(2) A02 2



Question number	Indicative content	Mark
7(d)*	- GM plants have their genome modified - genes introduced into their genome, e.g. <i>Bt</i> corn Advantages - resistance to insects means less crop damage - so there is a larger yield - GM corn plants produce a toxin that kills insects - the toxin is not released into the environment - so {safer for farmers / beneficial insects not killed} - less / no {insecticide / pesticide} needed - so cheaper to manage pests (long term) - corn can be sprayed with weedkiller (to kill weeds) without affecting the crop - crop grows better / larger yield because no weeds Disadvantages - GM seeds are more expensive - genes for {insect / weedkiller} resistance could become incorporated into {wild plants / weeds} - decreasing weeds / insect populations could impact biodiversity / food chains - over time insects could become resistant to the toxin produced by the GM corn - so concerns that weeds / pest could be more difficult to control in the future	(6) AO2 1



Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	- The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. - Lines of reasoning are unsupported or unclear.
Level 2	3-4	- The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. - Lines of reasoning mostly supported through the application of relevant evidence.
Level 3	5-6	- The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. - Lines of reasoning are supported by sustained application of relevant evidence.





Level	Mark	Additional Guidance	General additional guidance The level is determined by the areas of indicative content covered within the response. The mark within the level is determined by the detail and/or use of biological terms within each explanation.
	0	No rewardable material	
Level 1	1-2	Makes simple statements about an advantage or a disadvantage of growing GM corn plants.	<u>Possible candidate responses</u> - Seeds for GM corn plants are expensive. - Seeds for GM corn plants are expensive so may not be affordable to some farmers.
Level 2	3-4	Makes simple statements to explain an advantage and a disadvantage of GM corn plants and makes some logical connections between points.	<u>Possible candidate responses</u> - Less pesticide are needed for GM corn plants. A disadvantage is that the seeds are expensive. - Less pesticide is needed for GM corn plants. A disadvantage is that the seeds are expensive, but farmers spend less money on pesticides.
Level 3	5-6	Explains advantages and disadvantages of GM corn plants and makes logical connections between points.	<u>Possible candidate responses</u> - Less pesticide is needed for GM corn plants. The corn can be sprayed with weedkiller without affecting the crop. A disadvantage is that this can reduce the biodiversity. Seeds are also expensive to buy. - Less pesticide is needed for GM corn plants. The corn can be sprayed with weedkiller without affecting the crop so a large yield will be produced. A disadvantage is that weedkillers can reduce biodiversity. Seeds are also expensive to buy, so farmers will not buy them and will continue to use pesticides.

(Total for Question 7 = 13 marks)



Question number	Answer	Additional guidance	Mark
9(a)(i)	Any one from: - keep leaf peel flat (1) - keep leaf peel in place (1) - protect the (objective) lens (1) - protect the specimen (1)	ignore to prevent drying out	(1) AO 2 2

Question number	Answer	Additional guidance	Mark
9(a)(ii)	An explanation linking two of the following: - the leaf peel is thin / leaf is too thick (1) - as the leaf peel allows light to pass through it/the leaf would not allow light to shine through it (1) - to enable the {stomata / cells/ guard cells} to be identified (1)	accept leaf would be opaque accept to see stomata / cells	(2) AO 2 2

Question number	Answer	Additional guidance	Mark
9(b)(i)	3 / three		(1) AO 2 2

Question number	Answer	Additional guidance	Mark
9(b)(ii)	A description including three of the following points: - guard cells (1) - take in water (1) - by osmosis (1) (guard cells) become turgid/change shape/swell (1)	accept uneven thickness of guard cell walls leads to bulging	(3) AO 1 1

Question number	Indicative content	Mark
*9(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. Xylem • made of dead cells • cells with lignin • forming narrow/hollow tubes • carries water / mineral ions / named mineral ion • from roots up to leaves / shoots / buds • driven by transpiration • where water evaporates from the leaves • cell to cell/into/out of xylem by osmosis Phloem • made from living cells • have sieve tubes • this carries sugars / sucrose (in water) • from the leaves • down to roots • up to buds / flowers • movement by translocation • cell to cell/into out of phloem by active transport	(6) AO 1 1

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail • Presents an explanation with some structure and coherence
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and fully developed. • Presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • Presents an explanation that has a well-developed structure which is clear, coherent and logical.

Total for Question 9 = 13 marks



Question Number	Answer	Mark
9(a)(i)	vacuole / large vacuole / permanent vacuole accept phonetic spellings	(1)

Question Number	Answer	Mark
9(a)(ii)	Any one from: • it has a large surface area / it is long / large surface area : volume (1) • thin (cell) wall (1) • many mitochondria (1)	(1)

Question Number	Answer	Additional guidance	Mark
9(a)(iii)	An explanation linking: • (root hair cells grow) underground (1) • where there is no sunlight / light (1) • so they can't photosynthesise (1)	accept roots grow underground / in the soil accept roots can't photosynthesise / chloroplasts are needed for photosynthesis	(3)



Question Number	Answer	Additional guidance	Mark
9(b)	A description including two of the following: • in tap water chloroplasts are near the {cell wall / cell membrane / edge of the cell} (1) • in salt water chloroplasts are in the middle of the cells / chloroplasts clump together (1)	accept reverse argument about cells not in salt solution accept cells appear larger / cells are more magnified (in salt water) (1)	(2)



Question number	Indicative content	Mark
9 *(c)	AO1 6 marks Roots • water enters the roots • into root hair cells • which have a projection / large surface area • by osmosis • from a dilute solution in the soil to a more concentrated solution in the root cells. Stem/trunk • through xylem • which are long / thin / hollow / lignified / dead cells • because water is being pulled up • because of transpiration Leaves water moves into the leaves • by osmosis • because the leaf cell contents are more concentrated than in the xylem • water evaporates / water moves out of the leaves • through the stomata • (into the air) by diffusion • reference to transpiration	(6)



Level	Mark	Descriptor
	0	• no rewardable material.
Level 1	1-2	• demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	• demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	• demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • presents an explanation that has a well-developed structure which is clear, coherent and logical.



Level	Mark	Additional guidance	General additional guidance
	0	No rewardable material.	The level is driven by the areas covered in the response. The mark within the level is determined by the detail.
Level 1	1-2	The answer refers to part of the route taken by water through the plant / tree The response includes a basic explanation of how water moves through the plant	<u>Possible candidate responses</u> • water leaves the plant through the leaves • water leaves the plant via evaporation from the leaves
Level 2	3-4	The answer refers to more than one part of the route taken by water through the plant / tree The response includes an explanation of how water is moved into the roots, through the plant or through the leaves	<u>Possible candidate responses</u> • water moves into the root and up the stem • water moves into the root via osmosis and up the stem
Level 3	5-6	The answer is detailed and refers to water moving into the roots, through the stem / branches and out of the leaves The response includes a detailed explanation of how water is moved into the roots, through the plant or out of the leaves	<u>Possible candidate responses</u> • water moves into the root. Water then moves up the stem in the xylem out of the leaves. • water moves into the root. Water then moves up the stem in the xylem to the leaves where it is lost to the air via transpiration

Total for question 9 = 13 marks

