Questions

Q1.

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

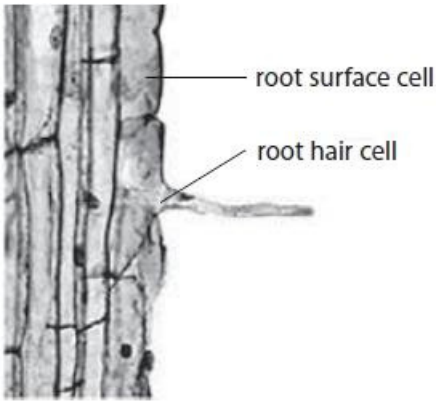

Figure 8

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

type of cell	surface area in μm²	volume in μm³	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)

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

(2)

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(Total for question = 4 marks)

Q2.

(i) Water enters a plant through root hair cells.

Root hair cells have

(1)

- ☒ A a small surface area and thin cell walls
- ☒ B a small surface area and thick cell walls
- ☒ C a large surface area and thin cell walls
- ☒ D a large surface area and thick cell walls

(ii) Explain how water in the root is transported to the leaves of the plant.

(2)

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(Total for question = 3 marks)

Q3.

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)

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(Total for question = 2 marks)

Q4.

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.

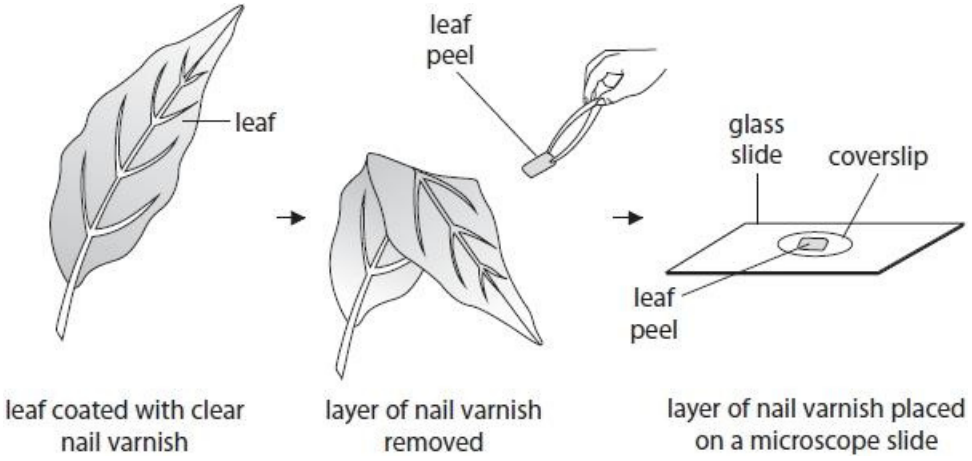

Figure 22

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

* Figure 24 shows xylem and phloem.

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

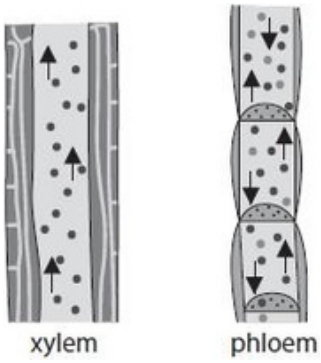

Figure 24

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

(6)

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(Total for question = 6 marks)

Q5.

Figure 14 shows a diagram of a plant root hair cell.

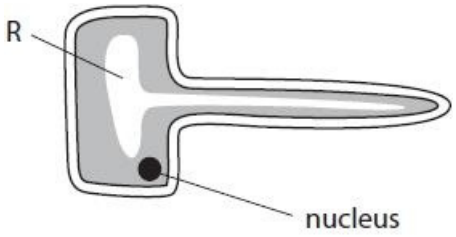

Figure 14

(i) Name the part labelled R.

(1)

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

(2)

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(Total for question = 3 marks)

Q6.

* Explain how substances are moved through a plant by transpiration and translocation.

(6)

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(Total for question = 6 marks)

Q7.

Figure 15 shows the results of this investigation.

seedling in test tube	length at the start in mm	length after 7 days in mm
1	4	11
2	6	17
3	5	26

Figure 15

(i) Explain why there are differences in the change in the lengths of the seedlings.

(2)

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(ii) Explain how nitrate ions were absorbed by the seedling in test tube 3.

(3)

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(Total for question = 5 marks)

Q8.

How is sucrose transported from the leaves to other parts of the plant?

(1)

- ☒ A by osmosis through the phloem
- ☒ B by osmosis through the xylem
- ☒ C by translocation through the phloem
- ☒ D by translocation through the xylem

(Total for question = 1 mark)

Q9.

Scientists can measure how much water is lost by the leaves of a plant.

(i) What is the movement of water molecules from an area with a low solute concentration to an area with a high solute concentration called?

(1)

- ☒ A active transport
- ☒ B diffusion
- ☒ C osmosis
- ☒ D transpiration

(ii) What structure transports water through the stem of the plant?

(1)

- ☒ A guard cell
- ☒ B phloem
- ☒ C stomata
- ☒ D xylem

(Total for question = 2 marks)

Q10.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

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

Figure 18

(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 mitochondrian

☒ 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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(Total for question = 4 marks)

Q11.

Figure 6 shows a root hair cell from a strawberry plant.

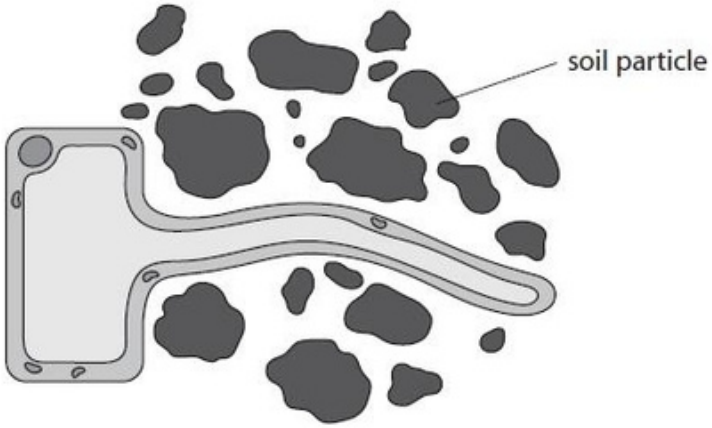

Figure 6

(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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(Total for question = 3 marks)

Q12.

Figure 9 shows a cross section through a pine leaf.

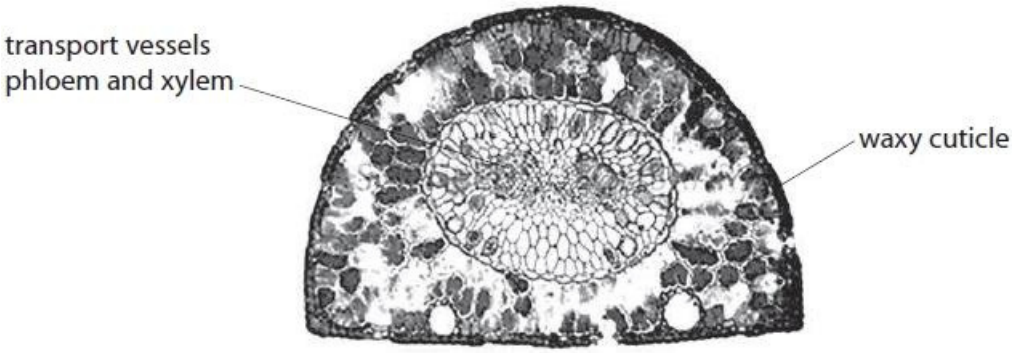

Figure 9

(i) Explain why the waxy cuticle is important for this pine leaf.

(2)

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(ii) The transport vessels are labelled on Figure 9.

Which row of the table is correct for the movement of sucrose through the plant?

(1)

	method of transport of sucrose through the plant	structure through which sucrose is transported
☐ A	transpiration	xylem
☐ B	transpiration	phloem
☐ C	translocation	xylem
☐ D	translocation	phloem

(Total for question = 3 marks)

Q13.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 1 shows xylem and phloem from the stem of a plant.

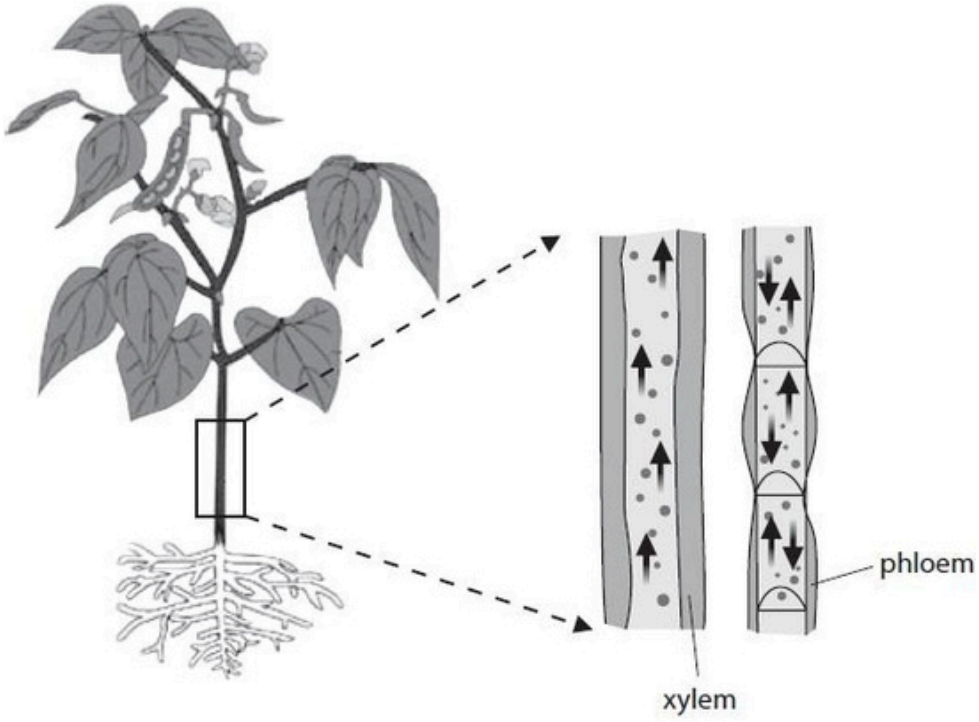

Figure 1

(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 1.

(2)

1 .....

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2 .....

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(Total for question = 3 marks)

Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)	Substitution: 288 000 ÷ 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
(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

Q2.

Question number	Answer	Mark
(i)	**C a large surface area and thin cell walls** **A.** *is not correct because root hair cells have a large surface area* ***B*** *is not correct because root hair cells have thin walls* ***C*** **The only correct answer is C** ***D*** *is not correct because root hair cells have thin walls*	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking two from: • through the {root/cells} by osmosis (1) • (then up) the xylem (1) • by transpiration / evaporation of water (from the leaves) (1)	 ignore phloem accept by capillary action	**(2)** AO1 1

Q3.

Question Number	Answer	Additional guidance	Mark
	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**

Q4.

Question number	Indicative content	Mark
*	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.

Q5.

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

Question Number	Answer	Additional guidance	Mark
(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**

Q6.

Question number	Indicative content	Mark
*	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. **AO1 (marks)** Transpiration • the movement of water • from the root through the plant • through the lignified cells/dead cells • of the xylem • driven by evaporation of water from the leaves • through the stomata • flow is only in one direction • by capillary action • according to the cohesion-tension theory Translocation • the movement of sugars from the leaves • through the plant • as sucrose • through the living sieve cells • of the phloem • flow is bidirectional • to sinks in the plant where the sucrose is needed	**(6)** AO 1 1

Level	Descriptor
	No rewardable material.
Level 1	• 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	• 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	• 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.

Q7.

Question number	Answer		Mark
(i)	An explanation linking: • largest amount of growth seen with the highest concentration of nitrates / the higher the concentration of nitrates the more growth /ORA (1) • nitrates are needed to make proteins (1)	accept faster growth for more growth accept nitrates stimulate growth accept amino acids	(2) AO 3 2a AO 3 2b

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that links the following: • by the roots/ root hair cells (1) AND • by diffusion (1) • from a high concentration to a low concentration / down the concentration gradient (1) OR • by active transport (1) • from a low concentration to a high concentration / against the concentration gradient / using energy (1)	 reject osmosis reject osmosis	(3) AO 2 1

Q8.

Question number	Answer	Mark
	C by translocation through the phloem **A.** *is not correct because sucrose does not move by osmosis only water does* ***B*** *is not correct because sucrose is transported through the phloem and not by osmosis* ***C*** **The only correct answer is C** ***D*** *is not correct because sucrose is transported through the phloem*	(1) AO1 1

Q9.

Question number	Answer	Mark
(i)	C	(1)

Question number	Answer	Mark
(ii)	D	(1)

Q10.

Question number	Answer	Mark
(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)** AO1.1

Question number	Answer	Mark
(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)** AO1.1

Question number	Answer	Additional guidance	Mark
(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) AO1.2

Q11.

Question number	Answer	Additional Guidance	Mark
(i)	Label to any part or the edge of the vacuole	accept an answer / letter written inside vacuole	(1) A01.1

Question number	Answer	Mark
(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) AO1.1

Q12.

Question number	Answer	Mark
(i)	An explanation that makes reference to: identification – knowledge (1 mark) and reasoning /justification – knowledge (1 mark): • it surrounds the pine leaf (1) • so prevents water loss from the pine leaf/prevents dehydration (1)	(2)

Question number	Answer	Mark
(ii)	D	(1)

Q13.

Question Number	Answer	Mark
(i)	**B mitochondria** **The only correct answer is B** ***A*** *is not correct because vacuoles do not release energy* ***C*** *is not correct because nuclei do not release energy* ***D*** *is not correct because ribosomes do not release energy*	**(1)** **AO1 1**

Question Number	Answer	Additional Guidance	Mark
(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**