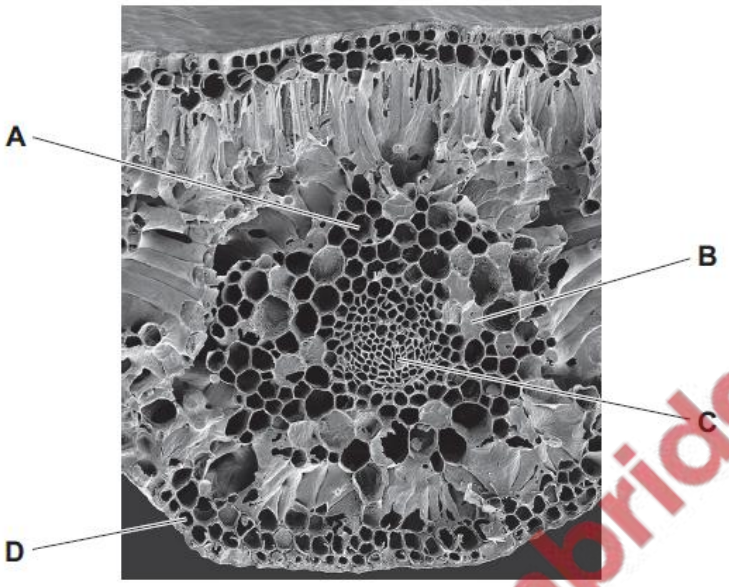
Transport in plants – AS 9700 Biology Nov 2022

1. Nov/2022/Paper_11/No.26

The electron micrograph shows a cross-section of a leaf vein and some neighbouring cells.

Which structure contributes to mass flow by the use of proton pumps?



2. Nov/2022/Paper_11/No.27

The diagrams show some tissue types in plant organs.

Which row identifies the tissue types?

	1	2	3	4
A	phloem	phloem	phloem	xylem
B	phloem	xylem	phloem	xylem
C	xylem	phloem	xylem	phloem
D	xylem	xylem	phloem	xylem

3. Nov/2022/Paper_11/No.28

Which description of xylem vessel elements is correct?

A cells joined to form a tube, pits at intervals, sieve plates between cells, surrounded by the endodermis in roots

B contains cells joined end to end, containing cytoplasm, cell walls with lignin, located to the outside of phloem in vascular bundles

C contains elongated cells with end walls broken down, located in vascular bundles in the stem and leaves

D dead elongated cells, lignified cell walls with pits at intervals, associated with companion cells in the roots only

4. Nov/2022/Paper_11/No.29

Which properties of lignin are important for the function of xylem vessels in the stem of a tall plant, such as a tree?

1 It is inflexible so does not bend easily.

2 It is not permeable to water.

3 It is strong to resist collapse under pressure.

4 It has weaker adhesion to water molecules than cellulose.

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

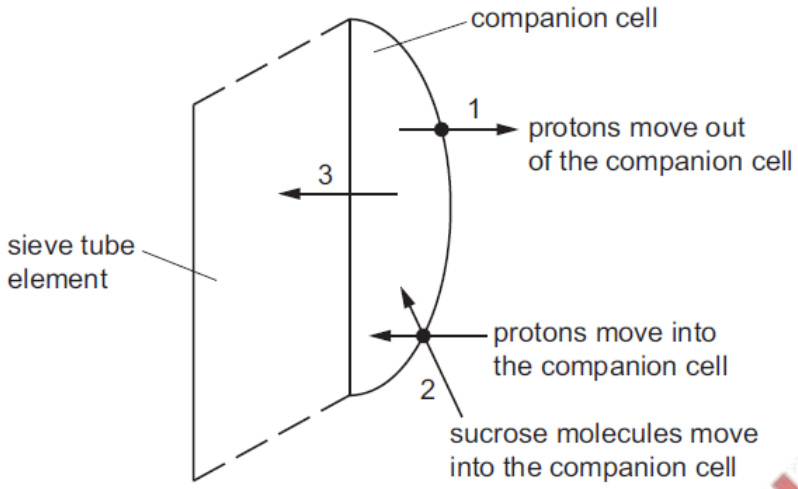
5. Nov/2022/Paper_11/No.30

Which row is correct for the sucrose concentrations and the water potentials in a source and a sink in a potato plant, at 12:00 p.m.?

	sucrose concentration		water potential	
	source	sink	source	sink
A	higher	lower	higher	lower
B	higher	lower	lower	higher
C	lower	higher	higher	lower
D	lower	higher	lower	higher

6. Nov/2022/Paper_11/No.31

The diagram shows one possible way in which sucrose may be loaded into a sieve tube element.

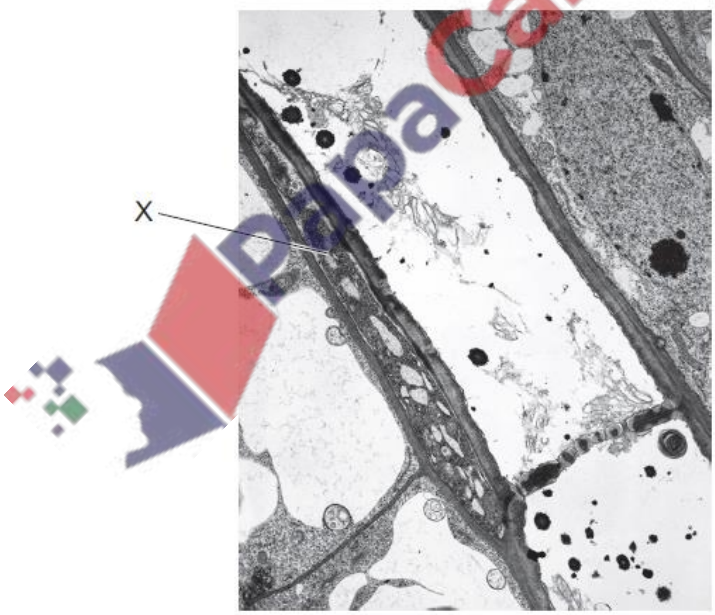


Which steps require ATP?

A 1 and 2 **B** 1 and 3 **C** 1 only **D** 3 only

7. Nov/2022/Paper_12/No.26

The electron micrograph shows a longitudinal section through part of a plant stem.



What is X?

A xylem vessel element

B stem cell

C phloem sieve tube element

D companion cell

8. Nov/2022/Paper_12/No.27

Sodium chloride is added to a culture solution containing freshwater single-celled plant cells.

What happens to the water potential of the culture solution when the sodium chloride is added and what may happen to the plant cells after 5 minutes?

	water potential of the culture solution when sodium chloride added	single-celled plant cells after 5 minutes
A	becomes less negative	become plasmolysed
B	becomes less negative	become turgid
C	becomes more negative	become plasmolysed
D	becomes more negative	become turgid

9. Nov/2022/Paper_12/No.28

Which statements correctly describe transport pathways in dicotyledonous plants?

1 In the apoplast pathway, water may move through plasmodesmata.

2 In the symplast pathway, water may move through intercellular spaces.

3 The apoplast pathway may be blocked by the Casparian strip.

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

10. Nov/2022/Paper_12/No.29

Which statement about the movement of water from roots to leaves is **not** correct?

A A continuous column of water is partly maintained by the attraction of water molecules to cellulose.

B Hydrogen bonding between water molecules enables mass flow of water.

C Hydrostatic pressure in xylem vessel elements is higher in roots than in leaves.

D Water potential changes throughout the length of the xylem vessel elements.

11. Nov/2022/Paper_12/No.30

Which terms describe the method by which water is transported within xylem vessel elements?

1 cotransport

2 cohesion-tension

3 osmosis

A 1 and 2 **B** 1 and 3 **C** 2 only **D** 3 only

12. Nov/2022/Paper_12/No.31

What is the main function of a companion cell in phloem tissue?

A providing cytoplasmic contact with the sieve tube element for loading

B providing structural support for the sieve tube element

C providing the nucleus for cell division in the phloem

D providing the source of assimilates for storage

13. Nov/2022/Paper_13/No.26

The photomicrograph shows a section through a plant organ.

Which statement could be used to describe this organ?

A The central region of this organ has supporting tissue.

B The endodermis tissue is a thick layer around the edge of the organ.

C The epidermis tissue in this organ has extensions (trichomes).

D The xylem tissue is found in greatest density in the centre of the organ.

14. Nov/2022/Paper_13/No.28

Which xerophytic adaptations reduce the water potential gradient between leaf surface and atmosphere?

1 rolled leaves

2 hairy leaves

3 sunken stomata

4 fewer stomata

5 fleshy leaves

A 1, 2, 3, 4 and 5

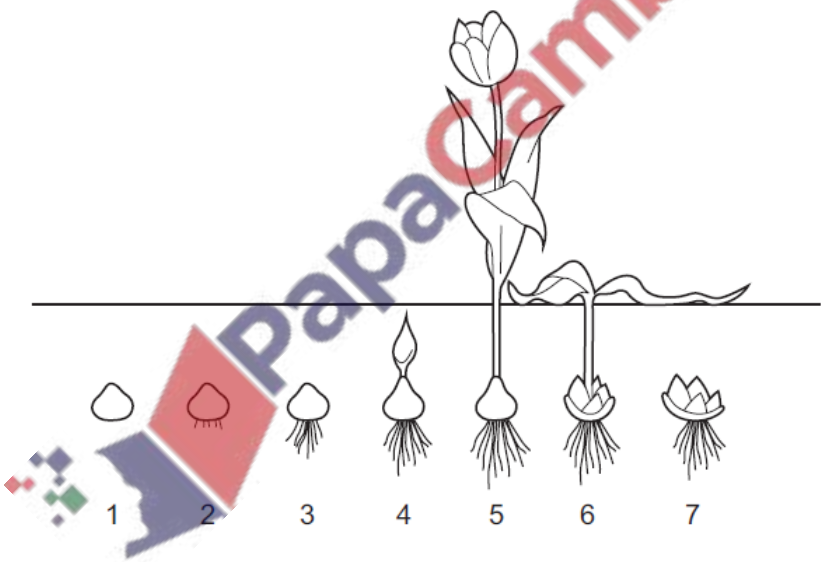
B 1, 2 and 3 only

C 1, 3 and 4 only

D 2 and 5 only

15. Nov/2022/Paper_13/No.29

The diagram shows seven stages of a tulip bulb's growth.



Which row identifies the correct stages in which the tulip bulb is acting as a source only or as a sink only?

	source only	sink only
A	1	5
B	3	4
C	4	6
D	5	7

16. Nov/2022/Paper_13/No.30

What would be changed if mitochondrial activity was inhibited by a metabolic poison acting on cells in the phloem tissue?

1 concentration of hydrogen ions in the cell wall of companion cells

2 concentration of sucrose in the cytoplasm of cells in a leaf

3 hydrostatic pressure gradient in the phloem sieve tube

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

17. Nov/2022/Paper_13/No.31

By which process does sucrose move through phloem sieve tube elements?

A active transport

B diffusion

C facilitated diffusion

D mass flow

18. Nov/2022/Paper_21/No.5(a_ d)(i)

(a) When water molecules enter a plant through the roots, the molecules cross the cortex and enter the xylem tissue to be transported to other parts of the plant.

There are two pathways that water can take when crossing the root to the xylem tissue.

Complete Table 5.1 with information about the two pathways.

Table 5.1

name of pathway	outline of pathway
	movement of water from cell to cell through plasmodesmata

[2]

(b) Fig. 5.1 is a photomicrograph of a transverse section through the stem of a flowering plant.

On Fig. 5.1, draw a label line and the letter **T** to identify xylem tissue. [1]

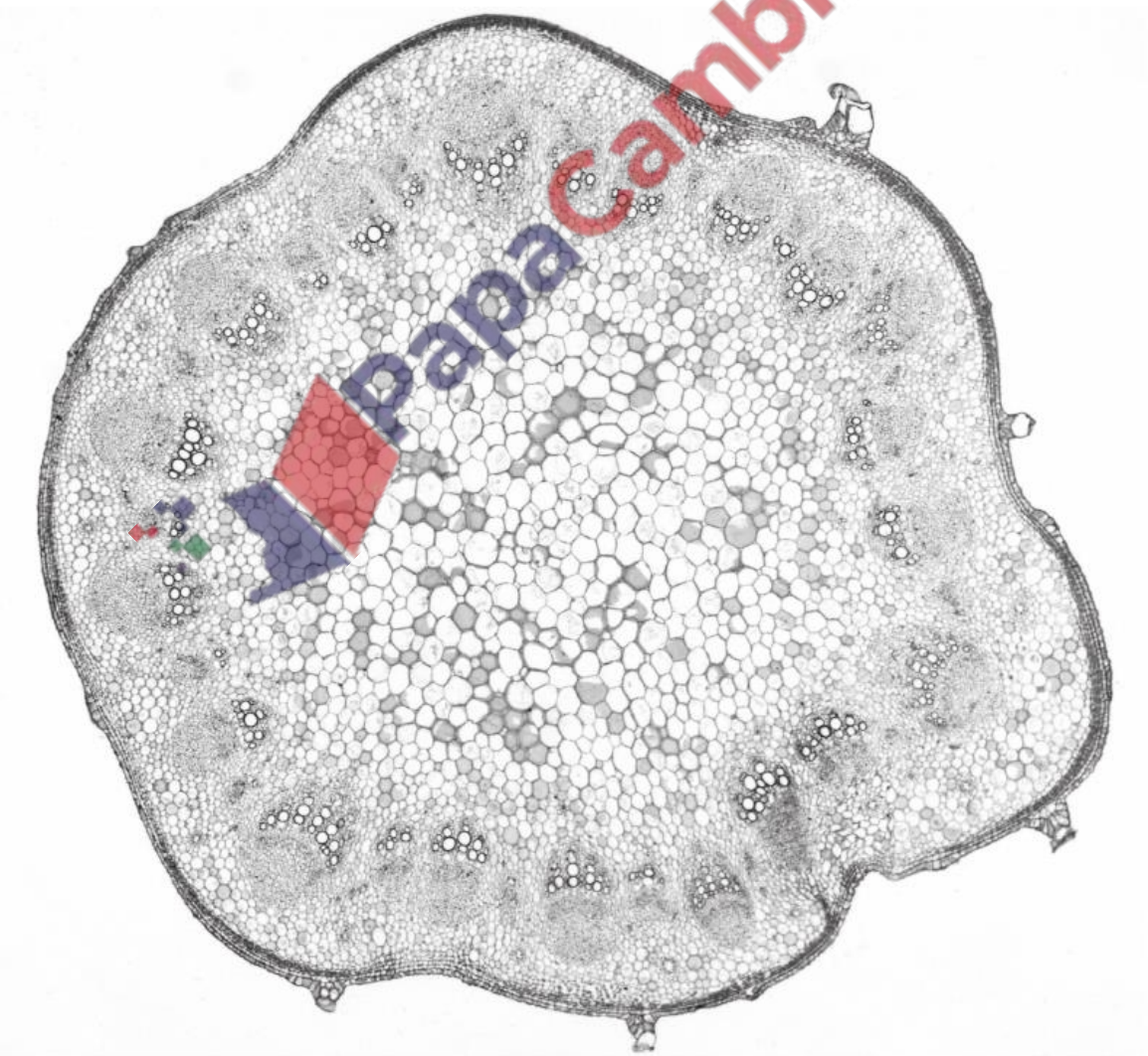


Fig. 5.1

(c) Scientists have studied the process of cell death that occurs during the development of the cells that become mature xylem vessel elements.

During this development, the tonoplast ruptures (bursts) and releases hydrolytic enzymes contained in the vacuole into the cytoplasm.

(i) Name an organelle found in animal cells that has a similar function to the vacuole in the developing xylem vessel elements.

..... [1]

(ii) The rupture of the tonoplast during development of xylem vessel elements is due to changes in permeability of the tonoplast.

Suggest how the permeability of the tonoplast changes **and** explain how this change could result in the rupture of the tonoplast.

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..... [3]

(iii) During development of the xylem vessel elements the pH of the cytoplasm decreases. This change in pH activates enzymes in the cytoplasm that cause organelles to swell.

Suggest how a change in pH of the cytoplasm can activate enzymes.

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..... [2]

(d) Some insects are vectors of disease.

(i) When an insect feeds on the xylem fluid it can act as a vector of plant diseases such as Pierce's disease. This bacterial disease affects many fruit trees causing the leaves to turn brown and drop from the plant, resulting in much less fruit being produced.

Explain why Pierce's disease can be described as an infectious disease.

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.....[2]

19. Nov/2022/Paper_22/No.6

Xylem and phloem are the transport tissues of plants. Both tissues have more than one cell type.

The conducting cells of xylem contain xylem sap and those of phloem contain phloem sap.
The composition of xylem sap differs from the composition of phloem sap.

(a) The main component of xylem sap and phloem sap is water.

Explain why water is the main component of xylem sap and phloem sap.

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..... [2]

(b) Three types of cell associated with the translocation of sucrose are:

- companion cell
- mesophyll cell
- phloem sieve tube element.

A, **B** and **C** are three events that occur at the source. Each event refers to '**the cell**' but does not name the type of cell concerned.

A Sucrose moves through plasmodesmata into **the cell**.
B Hydrogen ions are transported out of **the cell**.
C Sucrose moves into **the cell** through cotransporter proteins.

Complete Table 6.1 by matching the event with a correct cell type.

Each cell type may be identified once, more than once, or not at all.

Table 6.1

event	cell type
A	
B	
C	

[3]

[Total: 5]

20. Nov/2022/Paper_23/No.3(a, b)

(a) During translation, a polypeptide is synthesised when amino acids are added to a growing chain of amino acids.

Fig. 1.1 shows part of a growing chain of amino acids and the amino acid cysteine.

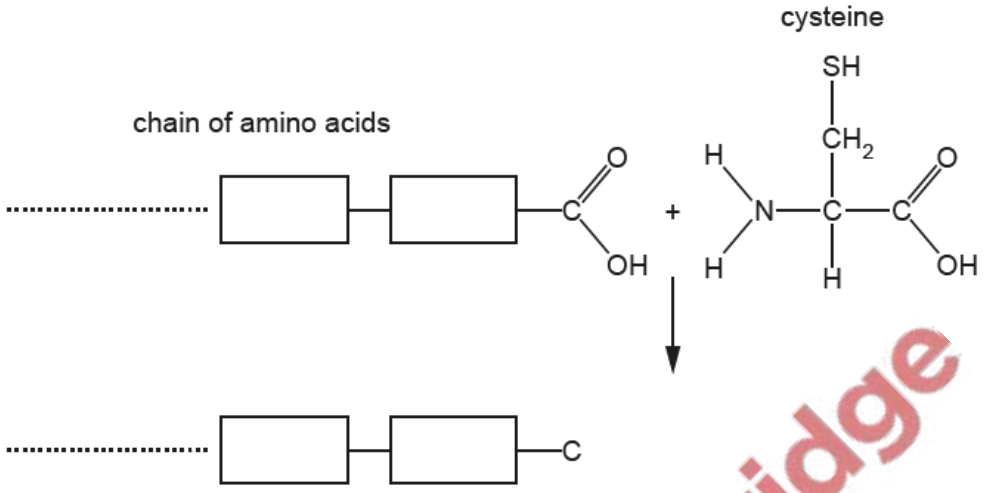

Fig. 1.1

(i) Complete Fig. 1.1 by showing the formation of the bond between cysteine and the growing chain of amino acids in the process of translation. [3]

(ii) State the name of the covalent bond that forms when cysteine is added to the growing chain of amino acids.

..... [1]

(iii) State the organelle where the reaction shown in Fig. 1.1 takes place.

..... [1]

(b) Fig. 1.2 is a ribbon diagram showing the three-dimensional structure of a protein from the bacterium *Streptococcus*.

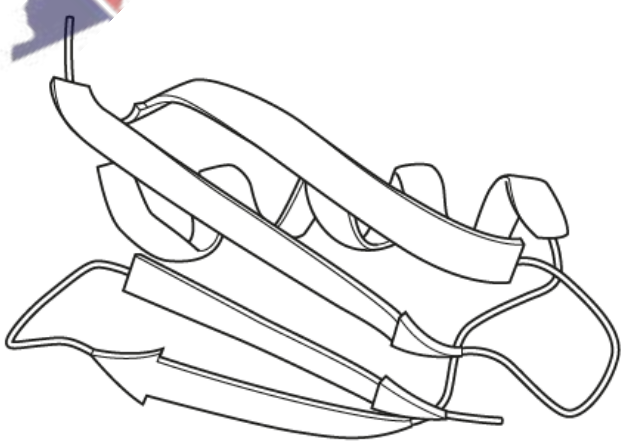

Fig. 1.2

(i) Describe the secondary structure of the protein shown in Fig. 1.2.

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(ii) Explain why the protein shown in Fig. 1.2 has tertiary structure, but not quaternary structure.

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(iii) An analysis of the amino acid composition of the protein in Fig. 1.2 showed that it does **not** contain any cysteine residues.

Explain how the three-dimensional structure of the protein shown in Fig. 1.2 is held in place.

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..... [3]