

Past-paper walk-through

Structure of transport tissues ■ 7.1

eXercise

Questions in this set

- 9700/11 N25 Q26 ■ 1 mark
- 9700/11 N25 Q27 ■ 1 mark
- 9700/12 N25 Q28 ■ 1 mark
- 9700/13 N25 Q28 ■ 1 mark
- 9700/14 N25 Q26 ■ 1 mark
- 9700/14 N25 Q27 ■ 1 mark
- 9700/21 N25 Q5 ■ 8 marks
- 9700/31 N25 Q2 ■ 18 marks

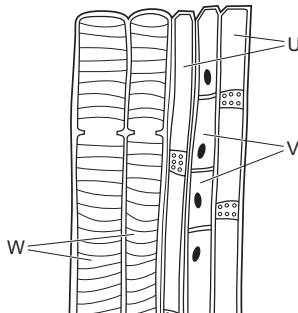
Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 26

9700/11 N25 ■ Q26 ■ 1 mark

- 26** The diagram shows a vertical section through part of the stem of a dicotyledonous plant. Three types of structures are labelled.



Question 26



What are the structures U, V and W?

	companion cells	phloem sieve tube elements	xylem vessel elements
A	U	W	V
B	V	U	W
C	U	V	W
D	W	V	U

Solution 26

Answer: **B**

Why

- Xylem vessel elements are the widest, with thick lignified walls and no contents.
- Phloem sieve tube elements are large and empty-looking, with sieve plates at their ends.
- Companion cells are the small, dense cells lying alongside the sieve tubes.

Question 27

9700/11 N25 ■ Q27 ■ 1 mark

27 Which features of xylem vessels help to reduce the resistance to water flow?

- 1 Lignin forms an incomplete secondary wall.
- 2 There are **no** cross walls between the vessel elements.
- 3 The xylem vessels form narrow tubes.

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

Solution 27

Answer: **C**

Why

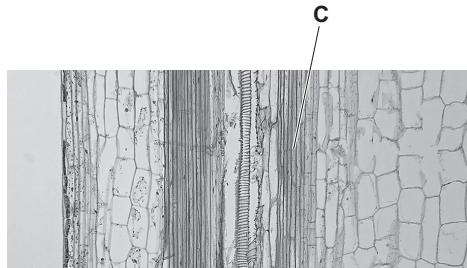
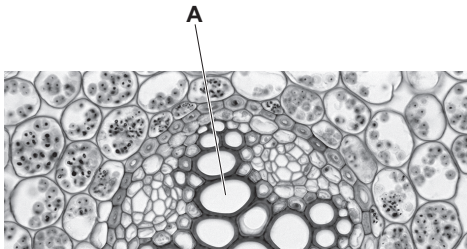
- Xylem vessels lose their end walls, so the vessel becomes one continuous open tube.
- That is what removes the obstruction to flow.
- Lignin gives strength rather than reducing resistance, and narrow tubes would *increase* resistance.

Question 28

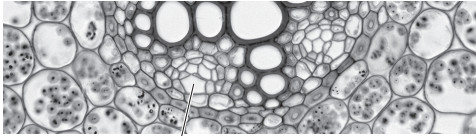
9700/12 N25 ■ Q28 ■ 1 mark

28 The photomicrographs show sections of two organs of a plant.

Which letter identifies a cell found with companion cells in a tissue in a root?



Question 28



B



D

Solution 28

Answer: **B**

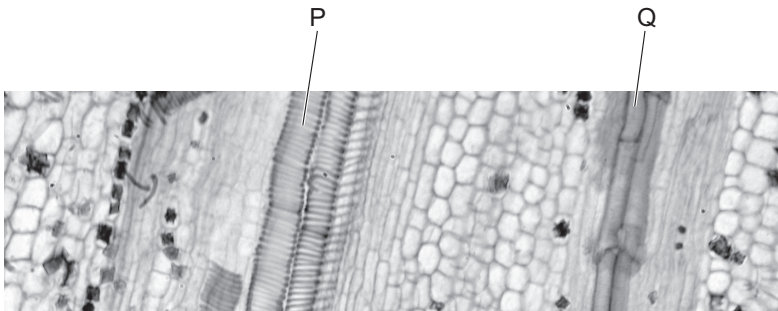
Why

- Companion cells lie immediately beside phloem sieve tube elements.
- So find the phloem tissue first, then look for the small dense cell next to the large empty one.
- In a root the phloem lies between the arms of the central xylem.

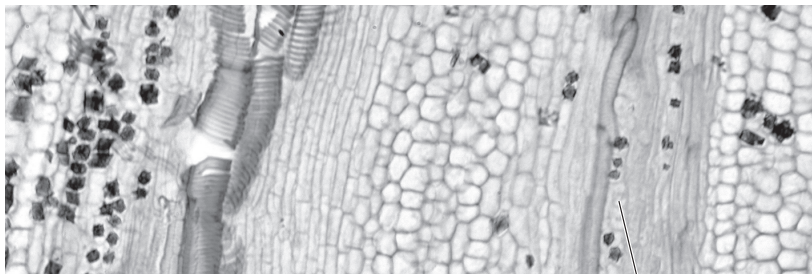
Question 28

9700/13 N25 ■ Q28 ■ 1 mark

28 The photomicrograph shows a longitudinal section of part of a plant stem.



Question 28



R

Which row correctly identifies structures P, Q and R?

	P	Q	R
--	---	---	---

Question 28

	I	Q	W
A	phloem sieve tube element	companion cell	xylem vessel element
B	phloem sieve tube element	xylem vessel element	companion cell
C	xylem vessel element	phloem sieve tube element	companion cell
D	xylem vessel element	companion cell	phloem sieve tube element

Solution 28

Answer: **C**

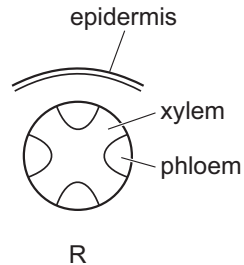
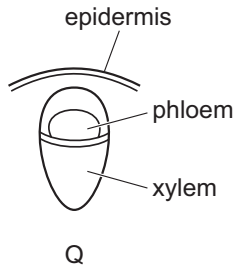
Why

- Xylem vessel elements are wide, thick-walled and empty.
- Phloem sieve tube elements are large but thin-walled, with sieve plates.
- Companion cells are the small dense cells packed against the sieve tubes.

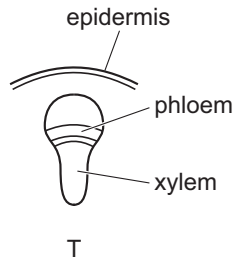
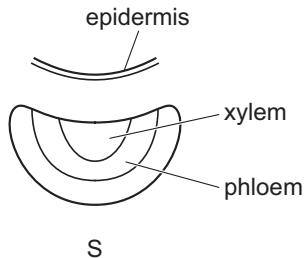
Question 26

9700/14 N25 ■ Q26 ■ 1 mark

26 The diagrams show the arrangements of phloem and xylem tissues in some plant organs.



Question 26



Where will arrangements Q, R, S and T be found in plants?

	Q	R	S	T
A	leaf	root	stem	root

Question 26

B	root	stem	root	leaf
C	stem	stem	leaf	root
D	stem	root	leaf	stem

Solution 26

Answer: **D**

Why

- In a root the xylem forms a central star with phloem between its arms.
- In a stem the vascular bundles form a ring, with phloem outside the xylem.
- In a leaf the bundle sits in the midrib with xylem above the phloem.

Question 27

9700/14 N25 ■ Q27 ■ 1 mark

- 27** Which feature of xylem vessel elements allows them to have reduced resistance to water movement?
- A** Lignin forms an incomplete secondary wall.
 - B** New vessels transport extra water as a plant grows.
 - C** There are no cross walls between vessel elements.
 - D** Vessel elements join to form narrow tubes.

Solution 27

Answer: **C**

Why

- Vessel elements lose their end walls entirely, forming one continuous hollow tube.
- That is what removes the obstruction to water flow.
- Lignin adds strength, and narrower tubes would increase resistance, not reduce it.

Question 5

9700/21 N25 ■ Q5 ■ 8 marks

- 5 (a) Fig. 5.1 is a photomicrograph of a longitudinal section through part of the stem of a plant.

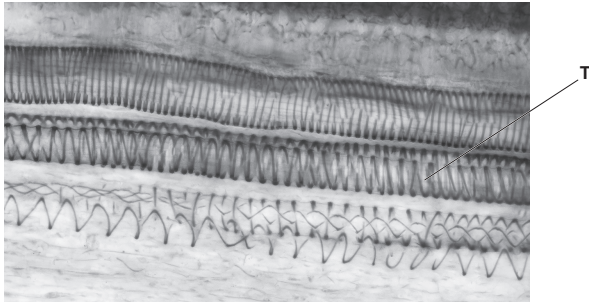


Fig 5.1

Question 5

Fig. 5.1

- (i) Name **one** substance transported in **T** in Fig. 5.1.

Question 5

- (ii) State the name of the substance that forms the spiral thickening around the structure labelled **T** in Fig. 5.1.

Question 5

- (b) A scientist studied the effect of leaf temperature on the rate of transpiration from the leaves of the wheat plant, *Triticum aestivum*.

The scientist repeated the investigation using the cotton plant, *Gossypium hirsutum*.

The results of the investigation are shown in Table 5.1.

Table 5.1

leaf temperature / $^{\circ}\text{C}$	rate of transpiration of <i>T. aestivum</i> / $\text{mmol m}^{-2}\text{s}^{-1}$	rate of transpiration of <i>G. hirsutum</i> / $\text{mmol m}^{-2}\text{s}^{-1}$
25	7	9
30	12	10
35	15	11

Question 5

| 40 | 22 | 12 |

Question 5

40	44	48
45	31	14

- (i) Suggest explanations for the relationship between leaf temperature and the rate of transpiration of *T. aestivum* as shown in Table 5.1.

Question 5

- (ii) Suggest **one** difference between the structure of the leaves of *T. aestivum* and the leaves of *G. hirsutum* that could explain the results shown in Table 5.1.

Question 5

- (c) Nematodes are microscopic animals that infect a wide range of economically important plant crops including cotton plants. Nematodes feed on the roots of plants, limiting their growth.

When root cells become infected, the nematodes disrupt the plant mitotic cell cycle. This causes the formation of a special type of feeding cell (cell **G**) in the plant, from which the nematodes absorb nutrients. Cell **G** is formed as a result of multiple cell cycles without any cytokinesis.

- (i) Suggest how cell **G** differs from cells produced during a mitotic cell cycle that has **not** been disrupted by a nematode.

Question 5

- (ii) Nematodes can also stimulate a process called endoreplication. This process causes a plant cell to go through multiple S phases during one cell cycle without entering mitosis or undergoing cytokinesis.

State how the nucleus of a cell that has been through endoreplication may differ from the nucleus of a cell in the same plant that has **not** been affected by the nematode.

Question 5

[Total: 8]

Solution 5

(a)(i)

Mark scheme

- any one from:
- water ;
- mineral ions ; A any named appropriate ion
- AVP ; e.g. plant hormone
- 1

Solution 5

(a)(ii)

Mark scheme

- lignin ;
- 1

Solution 5

(b)(i) Mark scheme

- any three from:
- as temperature increases, rate of water vapour loss from leaf increases ;
- A transpiration for water vapour loss
- idea that more heat energy absorbed by leaf ;
- more (heat) energy to evaporate water molecules / increased temperature for latent heat of vaporisation ;
- A more energy to break hydrogen bonds
- higher rate of evaporation / AW, from, surfaces / walls, of spongy mesophyll cells ;

Solution 5

- water vapour molecules have more kinetic energy ;
- higher rate of diffusion of water vapour out of leaf / steeper water potential gradient ;
- more stomata are open at higher temperatures so more water vapour is able to diffuse out of leaf ;
- 3

Solution 5

(b)(ii) Mark scheme

- any one from:
- cotton leaves have fewer stomata (per unit area) ;
- idea that cotton leaves have a thicker (waxy) cuticle ;
- cotton leaves have trichomes ;
- A hairs for trichomes
- cotton leaves are curled ;
- A rolled / folded
- cotton leaves have, sunken stomata ;

Solution 5

- A other examples e.g. stomata in, grooves / crypts / chambers / pits
- cotton leaves have, multilayered epidermis / hypodermis / thick walled epidermis ;
- AVP ; e.g. suggestion that cotton leaves only have stomata on lower epidermis
- smaller stomatal aperture
- 1

Solution 5

(c)(i) Mark scheme

- any one from:
- more than one nucleus in each cell / more chromosomes ;
- larger cells ;
- more organelles ;
- 1
- 9700/21
- October/November 2025

Solution 5

(c)(ii)

Mark scheme

- any one from:
- nucleus will contain more chromosomes / more than 2 copies of each chromosome ;
- A more DNA molecules / more chromatin
- AVP ; e.g. ref. to polyploidy
- (proportionately) larger nuclei
- 1

Question 2

9700/31 N25 ■ Q2 ■ 18 marks

2 **J1** is a slide of a stained transverse section through a plant stem.

(a) (i) Draw a large plan diagram of the whole section on **J1**. Use a sharp pencil.

Use **one** ruled label line and label to identify the xylem.

Question 2

[5]

- (ii) Observe the epidermis of the stem on **J1**.

Select a group of **four** adjacent epidermal cells.

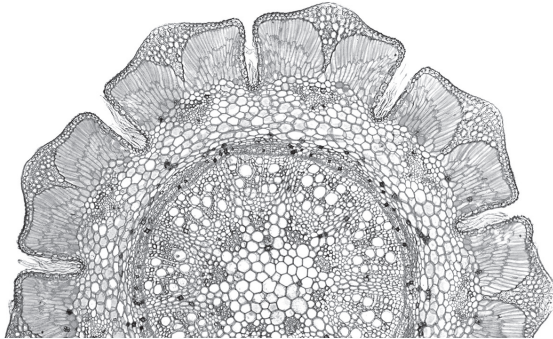
Each cell must touch at least **one** other cell.

- Make a large drawing of this group of **four** epidermal cells and waxy cuticle.
- Use **one** ruled label line and label to identify the waxy cuticle.

Question 2

[5]

- (iii) Fig. 2.1 is a photomicrograph of a stained transverse section of a stem from a different type of plant from **J1**.



Question 2



Question 2

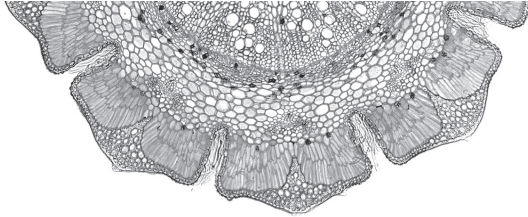


Fig. 2.1

Identify **three** observable differences, other than colour, between the stem section on **J1** and the stem section in Fig. 2.1.

Record these **three** observable differences in Table 2.1.

Table 2.1

Question 2



Question 2

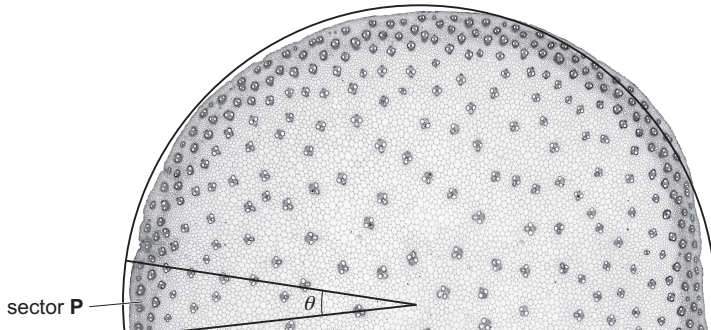
feature	J1	Fig. 2.1
1		
2		
3		

[3]

Question 2

- (b) Fig. 2.2 is a photomicrograph of a stained transverse section of a stem from a different type of plant.

You will calculate the density of vascular bundles in the stem section. The circle represents the area of the stem.



Question 2

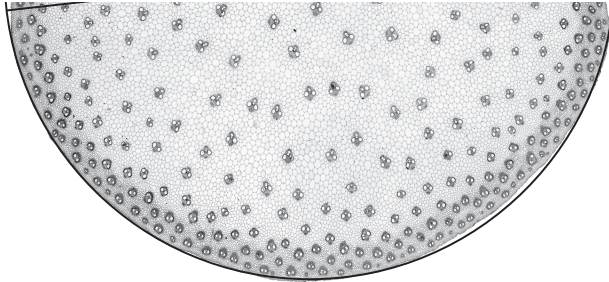


Fig. 2.2

- (i) To calculate the density of vascular bundles you will first need to count the number of whole vascular bundles in sector **P**.

Question 2

- (ii) Use your answer to **(b)(i)** to estimate the total number of vascular bundles in the stem section shown in Fig. 2.2.

angle $\theta = 15^\circ$

Show your working.

Question 2

[2]

- (iii) The stem section shown in Fig. 2.2 has an actual area of 44 mm^2 .

Use your answer in **(b)(ii)** to calculate the density of vascular bundles in the stem section.

Give your answer to **two** significant figures.

Show your working.

Question 2

[2]

[Total: 18]

Solution 2

(a)(i) Mark scheme

- 1
 - uses most of the available space and the correct number of tissues ;
- 2
 - draws whole stem and no cells ;
- 3
 - draws the vascular tissue correctly ;
- 4
 - draws details of the tissue layers ;

Solution 2

- 5
- label line to identify the xylem and the label xylem ;
- 5

Solution 2

(a)(ii) Mark scheme

- 1
- drawing of a minimum size and lines continuous, thin and sharp and no shading ;
- 2
- draws only four cells and each cell touching at least one other cell ;
- 3
- cell wall drawn as two lines ;
- 4
- correct shapes of the cells ;

Solution 2

- 5
- label line to identify the waxy cuticle and the label waxy cuticle ;
- 5

Solution 2

(a)(iii) Mark scheme

- (differences) 1, 2 and 3 ; ; ;
- Any three from :
- feature
- J1
- Fig. 2.1
- cuticle
- thicker
- thinner ;

Solution 2

- presence of trichomes
- absent
- present ;
- size of cortex cells
- smaller
- larger ;
- central tissue
- larger
- smaller ;
- 3

Solution 2

- 9700/31
- October/November 2025

Solution 2

(b)(i)

Mark scheme

- states number of whole vascular bundles in sector P ;
- 1

Solution 2

(b)(ii)

Mark scheme

- 1
- shows 360 divided by 15 ;
- 2
- correct calculation of 24 multiplied by value from Q2(b)(i) ;
- 2

Solution 2

(b)(iii)

Mark scheme

- 1
- shows value from Q2(b)(ii) divided by 44 ;
- 2
- correct answer given to two significant figures ;
- 2