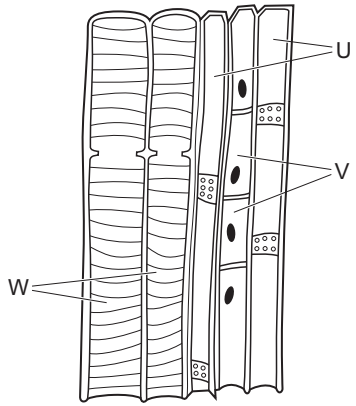
26 The diagram shows a vertical section through part of the stem of a dicotyledonous plant. Three types of structures are labelled.



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

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

1 Lignin forms an incomplete secondary wall.

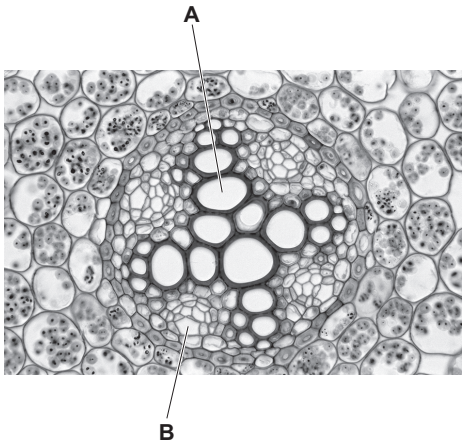
2 There are **no** cross walls between the vessel elements.

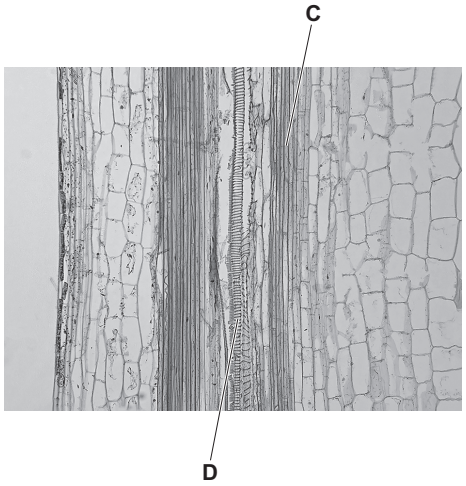
3 The xylem vessels form narrow tubes.

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

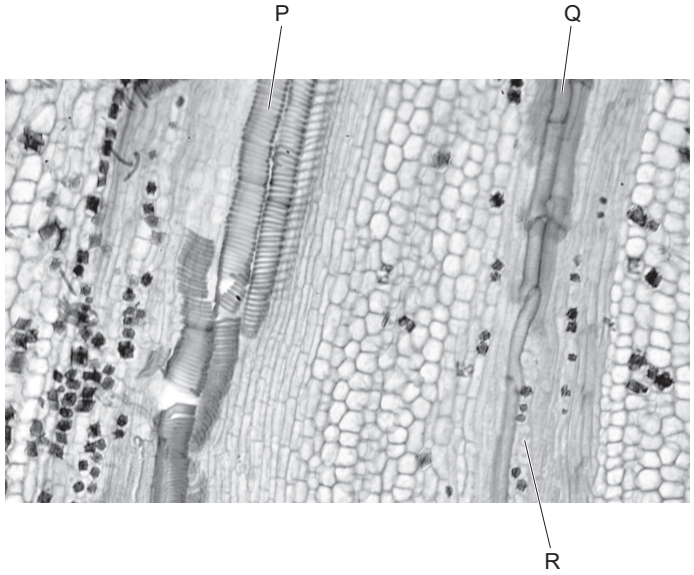
28 The photomicrographs show sections of two organs of a plant.

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





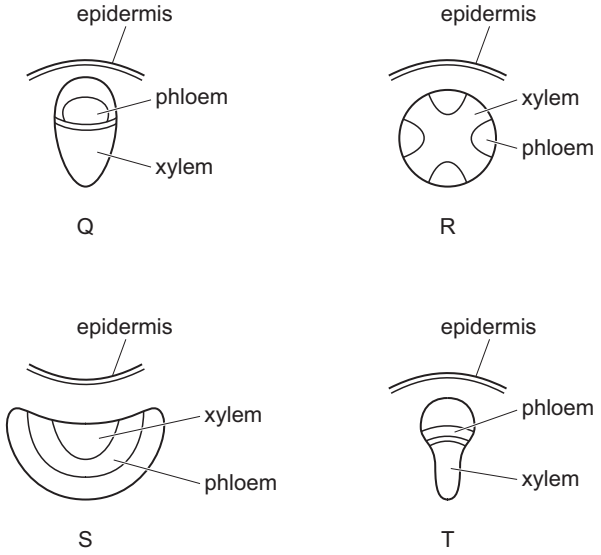
28 The photomicrograph shows a longitudinal section of part of a plant stem.



Which row correctly identifies structures P, Q and R?

	P	Q	R
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

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



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

	Q	R	S	T
A	leaf	root	stem	root
B	root	stem	root	leaf
C	stem	stem	leaf	root
D	stem	root	leaf	stem

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.

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

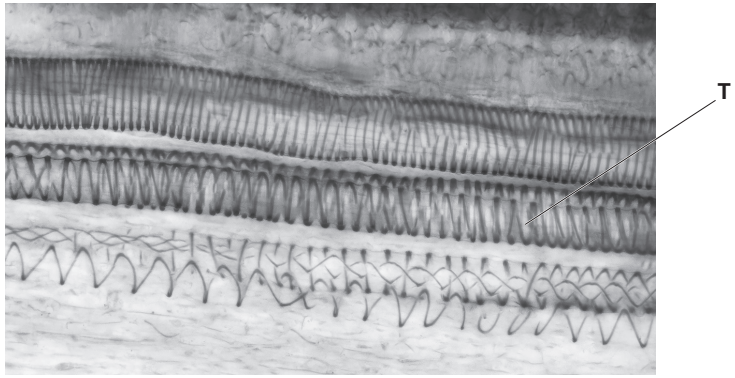


Fig. 5.1

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

..... [1]

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

..... [1]

(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 /°C	**rate of transpiration of *T. aestivum* / mmol m^{-2} s^{-1}**	**rate of transpiration of *G. hirsutum* / mmol m^{-2} s^{-1}**
25	7	9
30	12	10
35	15	11
40	22	12
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.

.....

.....

.....

.....

.....

.....

..... [3]

(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.

.....

.....

..... [1]

(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.

.....

.....

.....

..... [1]

(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.

.....

.....

.....

..... [1]

[Total: 8]

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.

[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.

[5]

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

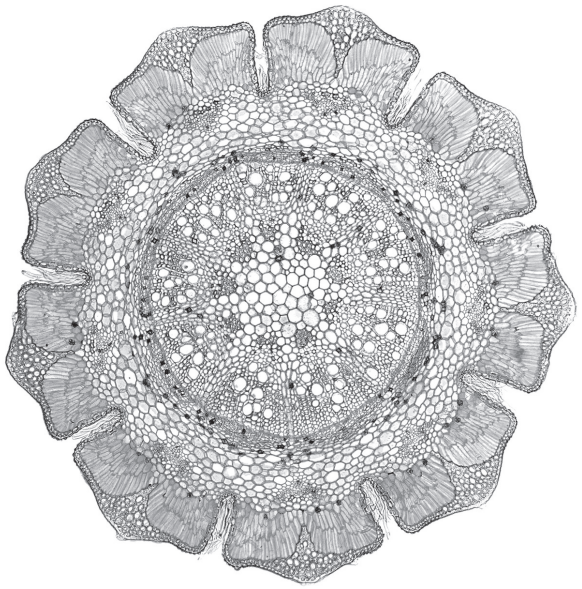


Fig. 2.1

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

feature	J1	Fig. 2.1
1		
2		
3		

[3]

(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.

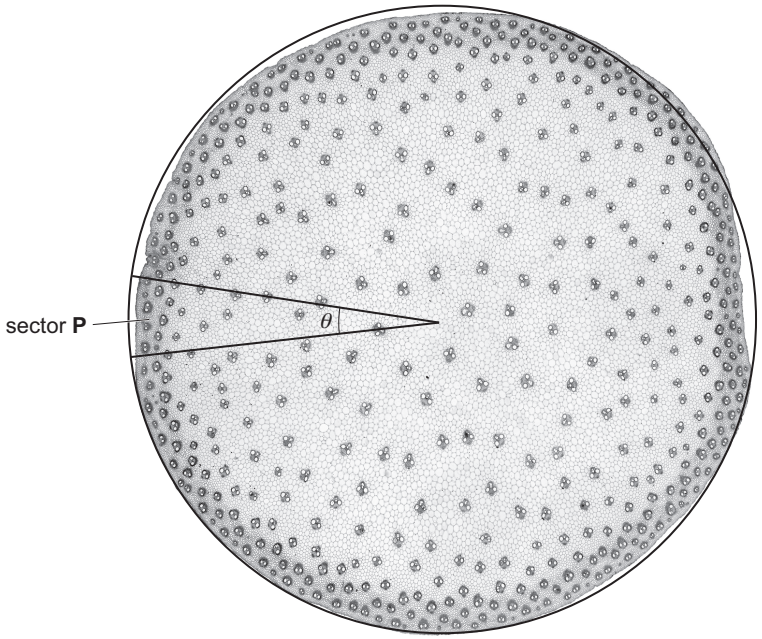


Fig. 2.2

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

number of whole vascular bundles in sector **P** = ... [1]

(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 $\theta = 15°$

Show your working.

total number of vascular bundles = ...
[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.

vascular bundle density = ... mm^{-2}
[2]

[Total: 18]