Transport In Plants

Transport in Plants

2 lants produce glucose in leaves and convert some of it to sucrose.

(a) (i) xplain how glucose is produced in leaves.

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..... [3]

(ii) State the name of the process that plants use to move sucrose from a source to a sink.

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(iii) oots can be an example of a sink.

xplain why sometimes roots act as a source rather than a sink.

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(c) esearchers used carbon dioxide that contained a traceable source of carbon (^{13}C) to investigate translocation of sucrose from the leaves of bean plants, *Phaseolus vulgaris*.

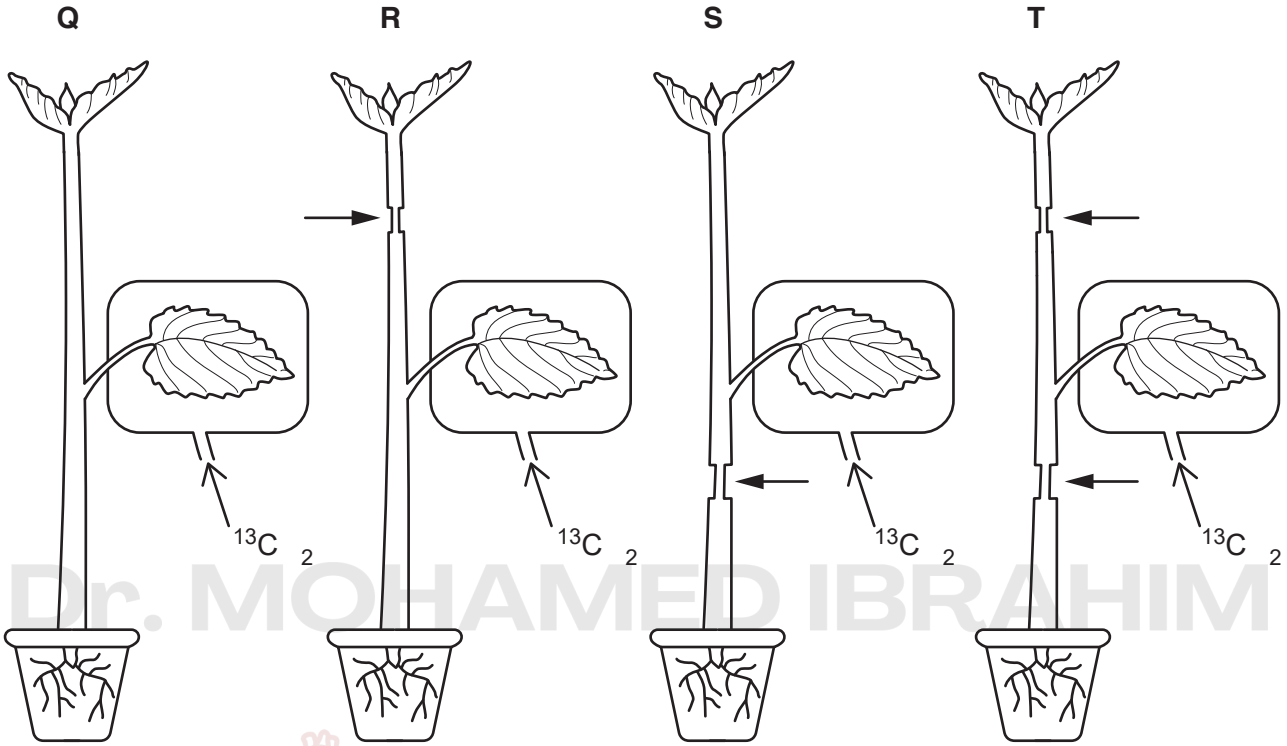
Fig. 2.2 shows that glucose produced in photosynthesis is converted to sucrose for translocation.

carbon dioxide ⟶ glucose ⟶ sucrose

Fig. 2.2

esearchers selected four plants, **Q**, **R**, **S** and **T**, which had leaves that were of similar si es. The leaves on the four plants were supplied with $^{13}C_2$.

After the leaves had started to make sucrose, the researchers cut away a ring of tissue in different places as shown in Fig. 2.3. The rings of tissue that were removed from plants **R**, **S** and **T** contained the phloem.



ey ⟶ the positions on the stems where rings of tissue containing phloem were removed.

Fig. 2.3

The quantities of sucrose containing ^{13}C in the shoot tips and in the roots were determined.

The results are shown in Table 2.1.

Table 2.1

plant	quantity of sucrose containing ^{13}C / arbitrary units	
	shoot tip	root
Q	3.24	0. 4
R	0.00	0.44
S	4.14	0.00
T	0.00	0.00

escribe **and** explain the effect of removing the phloem on the translocation of sucrose in plants **Q**, **R**, **S** and **T**.

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[Total 10]

(a) (i) escribe **and** explain the results shown in Fig. 5.1.

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(ii) The investigation was repeated on a day when the air humidity was higher.

Suggest **and** explain the effect that this would have on the results.

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(b) Stomata are found on the lower surface of broad bean leaves.

escribe the function of stomata.

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(c) More than 40 years ago, botanists studied the leaves of broad bean plants and discovered that guard cells control the opening and closing of stomata. They found that stomata were open when the guard cells were turgid.

Table 3.1 shows some of their measurements.

Table 3.1

	closed stomata	open stomata
ion concentration in guard cells / pmol	0.3	2.5
guard cell volume / μm^3	4000.0	6500.0
turgor pressure in the guard cells / M a	2.0	4.8
width of stomatal opening / μm	0.0	8.0

(i) ons move into guard cells by active transport.

escribe how the ions move into the guard cells.

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(ii) escribe **and** explain how the change in ion concentration causes the guard cell volume to change. se the information in Table 3.1 in your answer.

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(iii) The botanists left the broad bean plants unattended for three days. uring this time the broad bean plants wilted.

Suggest **two** environmental factors that can cause plants to wilt.

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2 .....[2]

[Total 18]

3 **(a)** Fig. 3.1 is a photomicrograph of some xylem vessels.

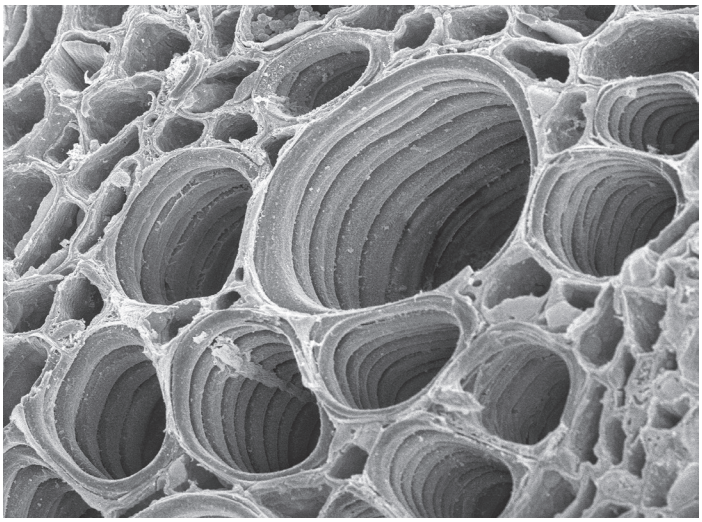

Fig. 3.1

(i) State **one** structural feature of xylem vessels and explain how this is related to the function of water transport.

feature .....

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explanation .....

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[2]

(ii) xplain the mechanism that is responsible for the movement of water in xylem vessels.

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..... [4]

(iii) State **one** role of xylem vessels **other than** transport.

..... [1]

(b) The rate of transpiration is affected by several factors including the temperature and the humidity of the air.

State **and** explain the effect of an increase in temperature on the rate of transpiration.

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[Total 10]

(b) hen water is in short supply, plants can wilt as shown in Fig. 3.2.

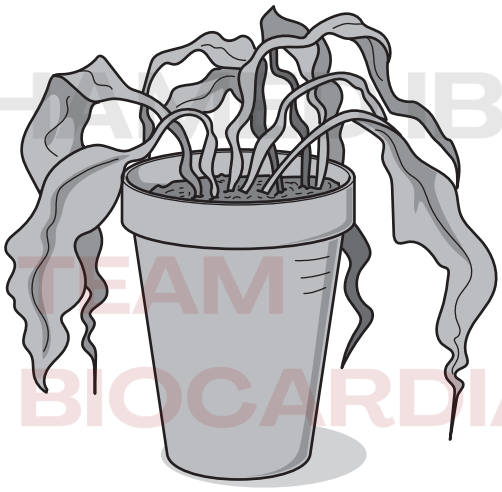

Fig. 3.2

(i) State **two** conditions that are likely to increase the chances of wilting.

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[2]

(ii) Explain what happens to the cells of a leaf to cause wilting.

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(iii) Wilting may look harmful, but it is often a strategy for survival.

Suggest the advantages to a plant of wilting.

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[Total: 15]

3 A student cut a section of a root and made an outline drawing of the distribution of tissues as shown in Fig. 3.1.

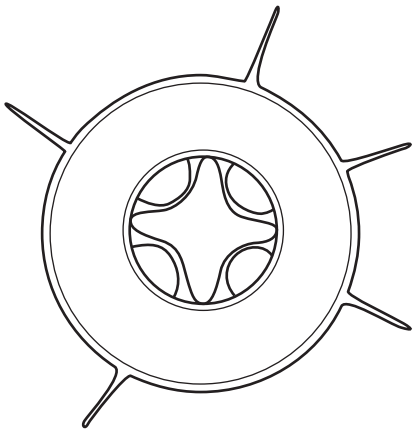

Fig. 3.1

(a) **(i)** Identify the position of the xylem tissue by drawing a label line and the letter **X** on Fig. 3.1. [1]

(ii) State why xylem is a tissue.

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.....[2]

(b) Water absorbed by the roots moves through the stem and enters the leaves. Most of this water is lost in transpiration.

Explain how the internal structure of leaves results in the loss of large quantities of water in transpiration.

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[Total: 6]