DSE M.C. Questions - Transpiration, transport and support in plants
(sort by difficulty)

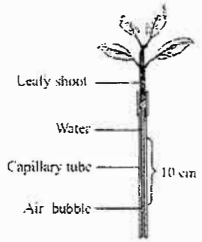
Challenging
/

Average

2012 Q.3 (68%)
Which of the following is the major cause that accounts for the ascent of water in trees?

A. the loss of water from leaves
B. the absorption of water in roots
C. the thickness of tree trunks
D. the diameter of xylem vessels

Directions: Questions 10 to 11 refer to the following set-up, which is used to investigate the effect of different environmental conditions on the rate of water loss from a leafy shoot:

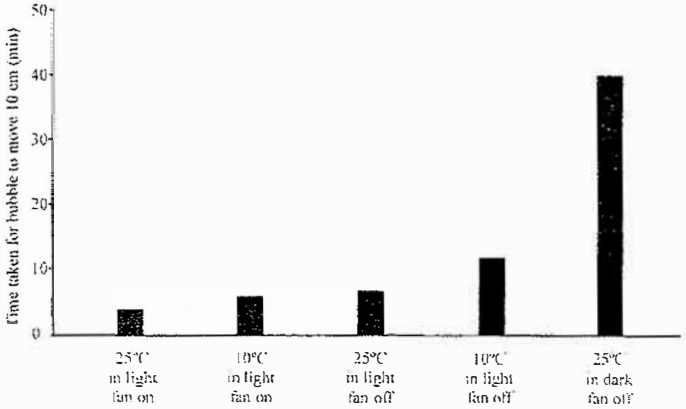


2012 Q.10 (69%)
It is important to cut the leafy shoot under water at the beginning of the experiment because this

A. allows the leafy shoot to adjust to the new environment.
B. prevents the drying up of the cut end of the leafy shoot.
C. avoids the forming of air bubbles in the xylem of the leafy shoot.
D. makes sure that there is no water loss from the leafy shoot before the experiment.

Average

2012 Q.11 (64%)
The results of the experiment conducted under different environmental conditions are shown in the bar chart below:



Which of the following changes in conditions results in the greatest decrease in water loss from the leafy shoot?

A. switching off the light
B. switching off the fan
C. increasing the temperature from 10°C to 25°C
D. decreasing the environment from 25°C to 10°C

2012 Q.12 (48%)
Leaves were taken from four different plants and the number of stomata was counted. The results are shown in the following table:

Plant	*Mean number of stomata per cm²*	
	Upper surface of the leaf	*Lower surface of the leaf*
P	4 000	28 000
Q	0	800
R	8 500	15 000
S	8 000	26 000

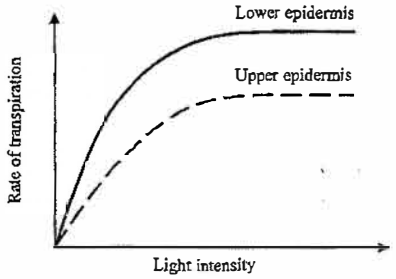
Which plant will wilt first when it is grown in a very dry region?

A. P B. Q C. R D. S

Average

2014 Q.21 (65%)

Directions: Questions 20 and 21 refer to the graph below, which shows how the transpiration rates through the upper and lower epidermis of a leaf vary with light intensity:



Which of the following methods can be used to measure the rate of transpiration through the upper epidermis of the leaf?

A. Peel the upper epidermis of the leaf and count the number of stomata under a microscope, and then repeat with the lower epidermis.
B. Put the leaf into warm water and then count the number of bubbles that appear on each side of the leaf in a fixed period of time.
C. Shine light on the upper epidermis of the leaf and measure the rate of water absorbed using a bubble potometer, and then repeat with the lower epidermis.
D. Smear the upper epidermis of the leaf with Vaseline and measure the rate of water loss using a weight protomer, and then repeat with the lower epidermis.

2014 Q.22 (73%)

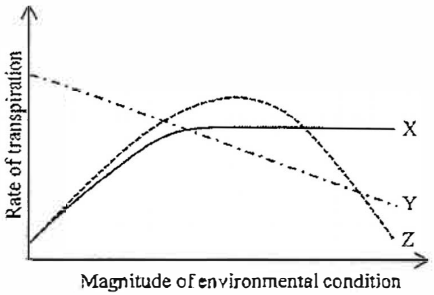
The transpiration rate of a tree is much higher than that of a herbaceous plant because the tree

A. is much taller than the herbaceous plant.
B. has many more roots than the herbaceous plant.
C. has many more leaves than the herbaceous plant.
D. has much more xylem than the herbaceous plant.

Average

2016 Q.11 (73%)

The graph below shows the changes of the transpiration rate of a plant under different environmental conditions:



Which of the following correctly matches the environmental conditions represented by X, Y and Z?

	X	*Y*	*Z*
A.	light intensity	wind speed	relative humidity
B.	wind speed	light intensity	relative humidity
C.	relative humidity	light intensity	wind speed
D.	light intensity	relative humidity	wind speed

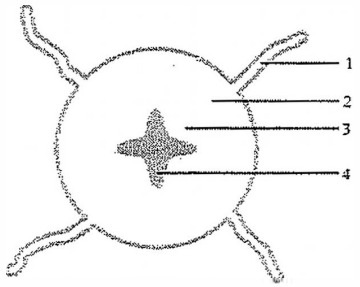
2016 Q.12 (69%)

A student wants to estimate the stomatal density of the upper and lower epidermis of a leaf using a microscope. Which of the following combinations correctly shows the magnification that should be used and the reason?

	Magnification	***Reason***
A.	low magnification	show a larger field of view
B.	low magnification	give a brighter image
C.	high magnification	show more cellular details
D.	high magnification	give a clearer image

Average

Directions: Questions 21 to 23 refer to the diagram below, which shows the cross section of a young dicotyledonous root:



2016 Q.21 (71%)

Which of the following parts provides rigidity to support the plant?

A. 1 B. 2 C. 3 D. 4

2016 Q.23 (73%)

Which of the following parts is most likely to have more mitochondria?

A. 1 B. 2 C. 3 D. 4

2017 Q.13 (57%)

Water absorbed by trees is mostly used

A. to replenish water loss.

B. for storage in vacuoles.

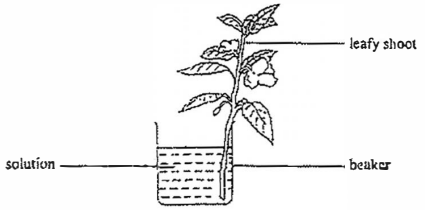
C. as a raw material in photosynthesis.

D. as a medium for reactions to take place.

Average

Directions:

Questions 14 to 16 refer to the set-up below, which is used to investigate the effect of environmental factors on the transpiration rate of a leafy shoot. The leafy shoot was put into a beaker of red-coloured solution. After five hours, cross-sections of the shoot were cut starting from the top until red colour appeared in the cut section. The length of the remaining shoot was then measured.



2017 Q.14 (53%)

Which of the following step(s) is/are necessary when preparing the set-up?

(1) Smear Vaseline onto the lower surface of the leaves.

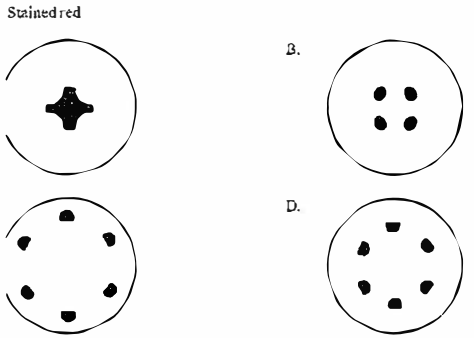
(2) Add a layer of oil on the surface of the red-coloured solution

(3) Cut the lower end of the leafy shoot under the red-coloured solution.

A. (1) only B. (3) only C. (1) and (2) only D. (2) and (3) only

2017 Q.16 (61%)

A section of the remaining shoot was observed under a microscope. Which of the following diagrams correctly shows the appearance of the shoot section?



Average

2017 Q.17 (51%)

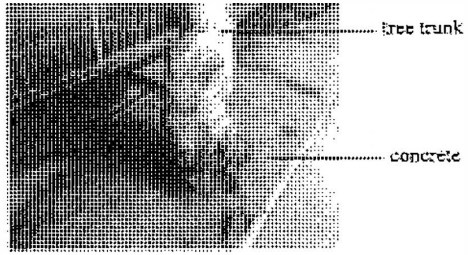
Which of the following cell types contribute(s) to the support of a leaf in a woody flowering plant?

(1) guard cells
(2) xylem vessels
(3) mesophyll cells

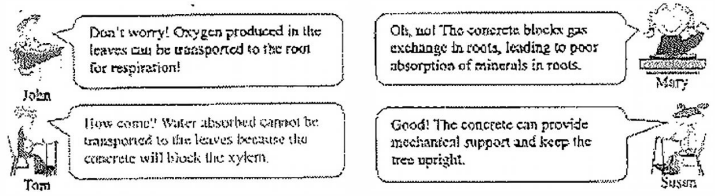
A. (2) only B. (1) and (3) only C. (2) and (3) only D. (1), (2) and (3)

2018 Q.24 (51%)

The following photograph shows a tree with roots covered by concrete:



Four students have expressed their views about this:



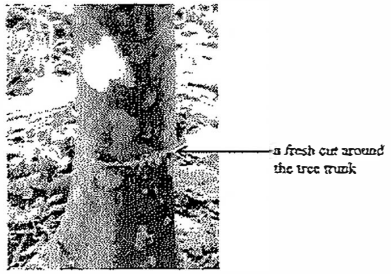
Whose view is correct?

A. John's view
B. Mary's view
C. Tom's view
D. Susan's view

Average

2019 Q.32 (50%)

The photograph below shows a fresh cut around the trunk near the bottom of a tree:



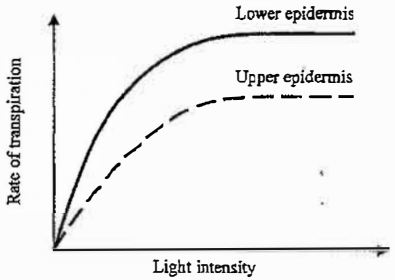
The tree eventually died. Which of the following is the most likely reason for the death of the tree?

A. Water could not be transported to the leaves for transpiration.
B. Water could not be transported to the leaves for photosynthesis.
C. Minerals could not be transported upward for protein synthesis.
D. Photosynthetic products could not be transported to the roots for respiration.

Easy

2014 Q.20 (78%)

Directions: Questions 20 and 21 refer to the graph below, which shows how the transpiration rates through the upper and lower epidermis of a leaf vary with light intensity:

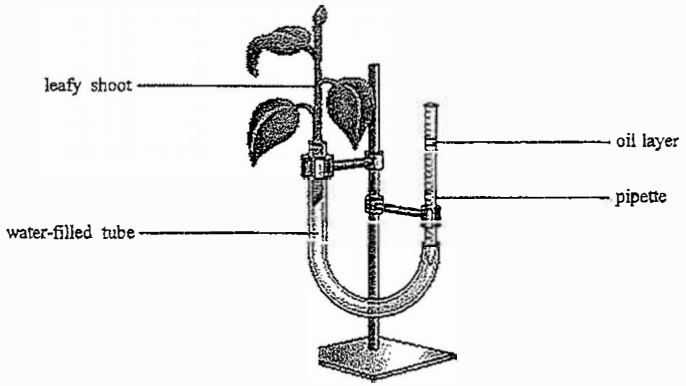


Which of the following accounts for the difference in the transpiration rates through the upper and lower epidermis shown above?

A. The mesophyll layer near the lower epidermis has more air spaces.
B. The upper epidermis is more exposed to light.
C. The air temperature below the leaf is lower.
D. The upper epidermis has fewer stomata.

Easy

Directions: Questions 17 and 18 refer to the set-up below, which is used to measure the rate of transpiration of a leafy shoot:



2015 Q.17 (75%)

The assumption behind the use of this set-up for measuring the rate of transpiration is that

A. the connections in the set-up are sealed off.
B. the rate of water uptake is equal to that of water loss.
C. the stomata of the leaves remain open throughout the experiment.
D. the cutting of the shoot does not introduce air bubbles into the xylem vessels.

2015 Q.18 (78%)

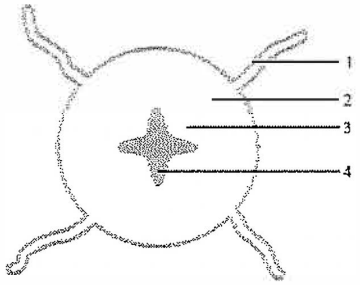
Which of the following variables has the greatest influence on the rate of transpiration of the leafy shoot?

A. the area of the leaves
B. the thickness of the leaves
C. the length of the leafy shoot
D. the number of xylem vessels

Easy

2016 Q.22 (85%)

Directions: Questions 21 to 23 refer to the diagram below, which shows the cross section of a young dicotyledonous root:

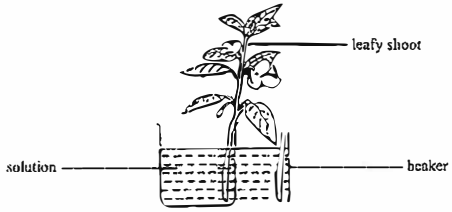


Which of the following parts is responsible for the transport of food?

A. 1 B. 2 C. 3 D. 4

Directions:

Questions 14 to 16 refer to the set-up below, which is used to investigate the effect of environmental factors on the transpiration rate of a leafy shoot. The leafy shoot was put into a beaker of red-coloured solution. After five hours, cross-sections of the shoot were cut starting from the top until red colour appeared in the cut section. The length of the remaining shoot was then measured.



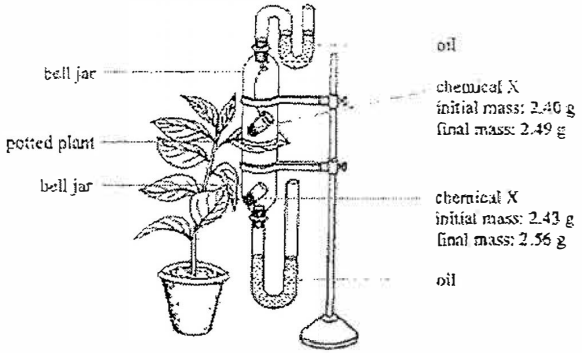
2017 Q.15 (76%)

The length of the remaining shoot will be the longest if the experiment is conducted in

A. hot and bright conditions.
B. hot and humid conditions.
C. cold and bright conditions.
D. cold and humid conditions.

Easy

Directions: Questions 30 and 31 refer to the set-up below. The set-up consists of two boll jars placed on above the ether with the leaf of a potted plant in between. Chemical X was placed into the jars to absorb water vapour. The whole set-up was made air-light. The masses of chemical X in the two jars were measured at the beginning and after five hours.



2018 Q.30 (76%)

The change in mass of chemical X was mainly caused by

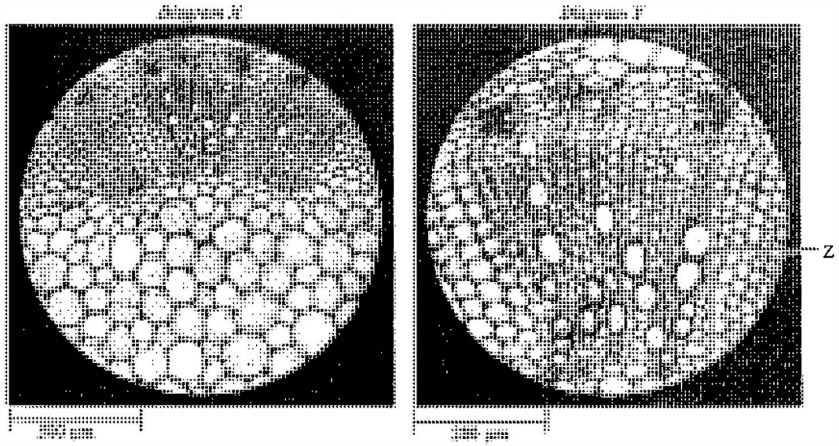
A. water uptake by the plant.
B. water Loss in transpiration.
C. water produced in respiration.
D. water consumed by photosynthesis.

2018 Q.31 (81%)

Which of the following conclusions can be drawn from the results?

A. Water absorption by the root is mainly driven by the lower epidermis of the leaf.
B. There are more stomata at the Lower epidermis than the upper epidermis of the leaf
C. The respiration rate is higher than the photosynthetic rate during the experiment
D. The photosynthetic rate of the upper layer of the leaf is higher than that of the lower layer.

Directions: Questions 22 to 24 refer to the photomicrographs below, which show the stem section of a plant observed under a microscope. Diagram Y shows a higher magnification of the vascular bundle (Vb) in Diagram X:



Key: Vb = vascular bundle

23. Which of the following descriptions of the function of tissue Z shown in Diagram Y is correct?

A. It transports proteins upwards.
B. It transports minerals upwards.
C. It transports water downwards.
D. It transports sugars downwards.

Answers

Challenging

Average

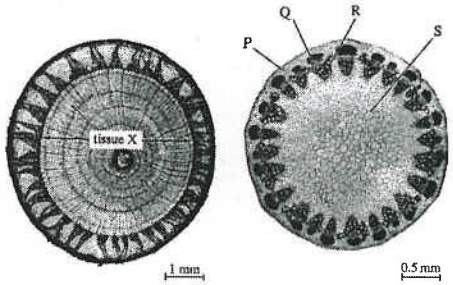
2012	2014	2016	2017	2018	2019
3 [A]	21 [D]	11 [D]	13 [A]	24 [B]	32 [D]
10 [C]	22 [C]	12 [A]	14 [B]		
11 [A]		21 [D]	16 [D]		
12 [D]		23 [A]	17 [C]		

Easy

2014	2015	2016	2017	2018	2020
20 [D]	17 [B]	22 [C]	15 [A]	30 [B]	23[B]
	18 [A]			31 [B]	

CE - 2001

3. (c) The photomicrographs below show the transverse sections of stems taken from two plants:



T.S. Stem of plant A *T.S. Stem of plant B*

(i) (1) Name tissue X. (1)

(2) Explain one way in which the cells in tissue X are structurally adapted to the function of transport. (2)

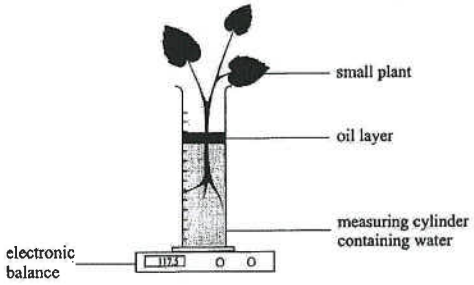
(ii) Which region(s) (P, Q, R, or S) in the stem of plant B contains tissue X? (1)

(iii) (1) On a hot sunny afternoon, plant B becomes wilted and its stem bends. Explain why this occurs. (4)

(2) In contrast to plant B, the stem of plant A remains upright under the same conditions. Account for this. (2)

CE - 2002

3. (a) The diagram below shows a set-up used to study the water balance of a small plant. The whole set-up was put in a well-ventilated and well-illuminated room for 8 hours:



The initial and final readings in the measuring cylinder and the balance are tabulated below :

	Initial reading	Final reading	Change in reading
Water level in the measuring cylinder (cm^3)	45.0	43.5	x
Reading of the balance (g)	117.5	116.3	y

(i) (1) Find values x and y. (1)

(2) With reference to the water balance of the plant, what do x and y represent respectively? (2)

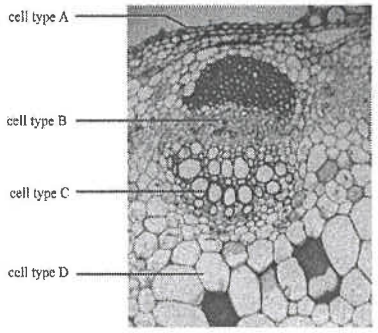
(3) Compare values x and y. Explain the significance of their difference to the healthy growth of the plant. (3)

(Given : 1 cm^3 of water weighs 1 g)

(ii) Predict, with reasons, the change in value x if the study is repeated with the leaves of the plant smeared with Vaseline on both surfaces. (4)

CE - 2003

3. (c) The photomicrograph below shows part of the transverse section of a herbaceous stem:



(i) Based on the photomicrograph, state two features that can be observed in cell type C but not in cell type B. (2)

(ii) Some insects use their tube-like mouthparts to obtain a continuous supply of carbohydrate from one of the cell types shown above. Using the letters in the photomicrograph, state which cell type it is. What is the main carbohydrate that can be obtained? (2)

(iii) When this stem is heavily infected by a fungus, cell type C is often blocked by the fungal hyphae.

(1) On a hot day, the infected stem droops and bends whereas an uninfected stem remains upright. Account for the appearance of the infected stem. (4)

(2) State the ecological relationship between the fungus and the infected plant. (1)

CE - 2006

9. (b) In 1890, a German scientist named Edward Strasburger conducted an experiment to study the transport of water in plants. He cut the stem of a woody plant and immersed the cut end in a poisonous solution. Upon contact, the poisonous solution killed all living cells in its way.

(i) Strasburger found that the plant continued to take up 30 litres of solution and transport the solution up to a height of 20 metres in two weeks. Based on his findings, what conclusion can you draw regarding the cells involved in water transport? (1)

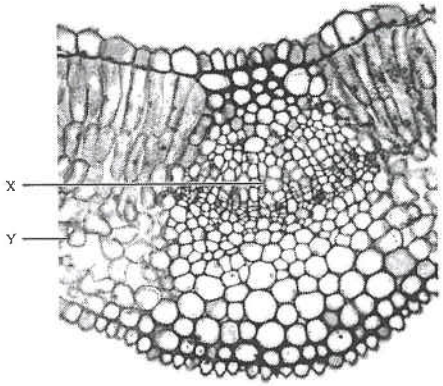
(ii) Based on present day knowledge of the mechanism of water transport in plants, explain why the treated plant can continue to transport the solution up the stem.(3)

(iii) Describe how you would carry out an investigation with a small dicotyledonoous plant that allows you to identify the cell type for water transport. (3)

(iv) Explain why the cut stem of the woody plant can remain upright even after the cells had been killed by the poisonous solution. (2)

CE - 2007

3. The photomicrograph below shows a cross section of a dicotyledonous leaf:



(a) With reference to the photomicrograph, give two structural differences between cell types X and Y. (2 marks)

(b) (i) In the presence of light, carbohydrates are formed and then stored in cell type Y.

(1) State the carbohydrate stored. (1 marks)

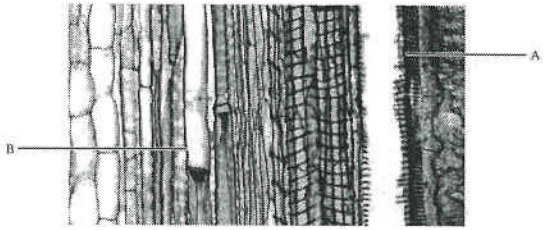
(2) If you have prepared a thin section of a leaf, how would you show the presence of the stored carbohydrate in it? (3 marks)

(ii) Explain why the stored carbohydrate in cell type Y disappears when the plant ~~presence of the stored carbohydrate in it?~~ is kept in darkness (3 marks)

(c) During transpiration, water evaporates from the surface of cell type Y. How does this help cell type Y to obtain minerals? (3 marks)

CE - 2008

5. The photomicrograph below shows a vertical section of a plant stem. Both cell types A and B are located in the tissues for transport.



(a) With reference to the photomicrograph, state ***two*** structural differences between cell types A and B. (2)

(b) Describe how the structure of cell type A facilitates its role in transport. (2)

(c) Transport of substances downward through the phloem is very important to roots. Explain why. (3)

CE - 2009

9. (b) Figure I and II show two plants, X and Y, from different plant groups. Figure III shows the cross-section of the stem of plant Y.

Figure I – plant X

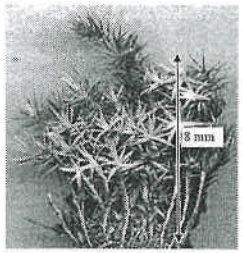


Figure II – plant Y

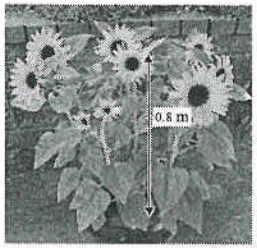
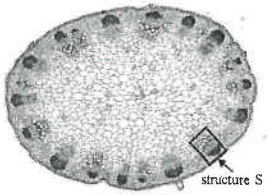


Figure III – cross-section of the stem of plant Y



(i) Structure S in Figure III is found in plant Y but not in plant X.

(1) What is structure S? (1 mark)

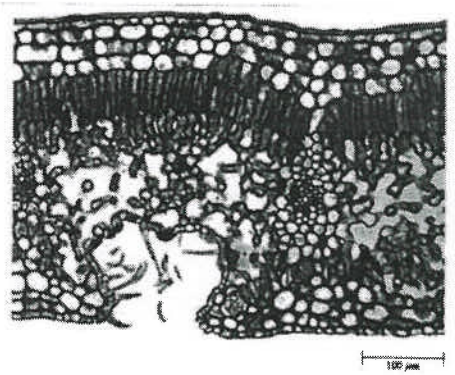
(2) With reference to Figure I, Figure II and your answer in (1), identify the groups to which plants X and Y belong. (2 marks)

(3) **Based on your knowledge of structure S,** suggest why plant Y can grow taller than plant X. (2 marks)

(ii) State one characteristic of the habitat of plant X. Explain your answer. (2 marks)

AL - 1998 1A

2. The following photomicrograph shows the transverse section of a leaf of plant X. Suggest a natural habitat for plant X. With reference to ***three*** features, describe how these features show adaptations to the habitat of plant X. (5)

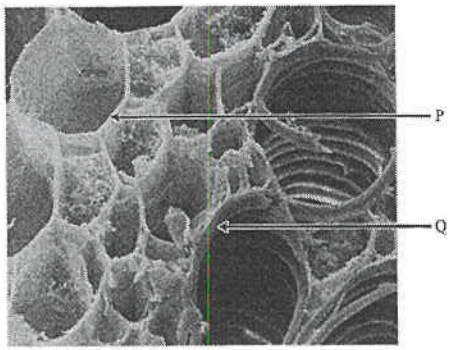


AL - 2009 2B

6. (c) A woody flowering plant has not been watered for a few days ,during which time the whether was dry and sunny. Account for the appearance of different parts of the leafy shoot of this plant. (5)

DSE – 2012 1B

3. The electron micrograph below shows part of the stem of a plant containing two cell types, P and Q:

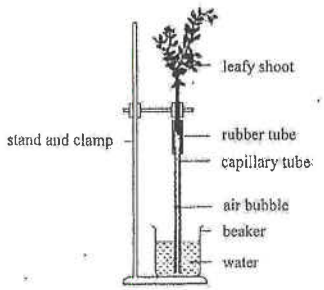


(a) Based on the photograph shown, state the difference between cell types P and Q in the structure indicated by the arrow heads. (1 mark)

(b) Describe how these cells contribute to the support of the plant. (4 marks)

HKDSE - 2013 1B

6. The following set-up can be used to determine the transpiration rate of a leafy shoot:

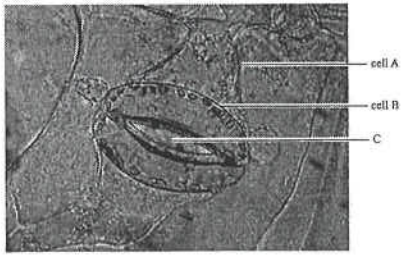


(a) In setting up this experiment, the lower end of the shoot should be cut under water. Why? (1 mark)

(b) Give one assumption for using this set-up to measure the transpiration rate. (1 mark)

(c) Explain how the transpiration rate will change if the fan placed near the shoot is switched on. (4 marks)

(d) The photomicrograph below shows the appearance of the surface of a leaf during daytime:

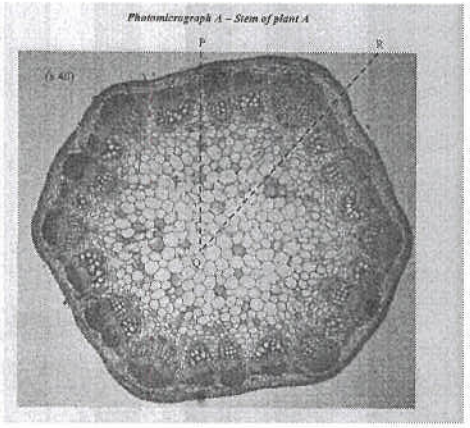


(i) In terms of sub-cellular structure, state two differences between cell A and cell B. (2 marks)

(ii) What will happen to the size of C at night? Discuss the functional significance of this change. (3 marks)

HKDSE - 2014 1B

4. Cross sections of the stems from two different dicotyledonous plants, A and B, are shown in Photomicrograph A and Photomicrograph B



(a) With reference to Photomicrograph A, draw a labelled low-power diagram of sector POR in the space below. (5 marks)

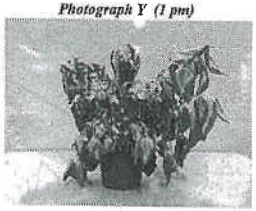
(b) With reference to the photomicrographs, deduce the major means of support in plants A and B. (4 marks)

HKDSE – 2015 1B

9. The photographs below show the appearance of the leaves of a well-watered potted plant at 9 am and 1 pm on a sunny day in summer.

Photograph X (9 am)

Photograph Y (1 pm)



(a) Briefly describe how the appearance of the leaves shown in photograph X is maintained. (2 marks)

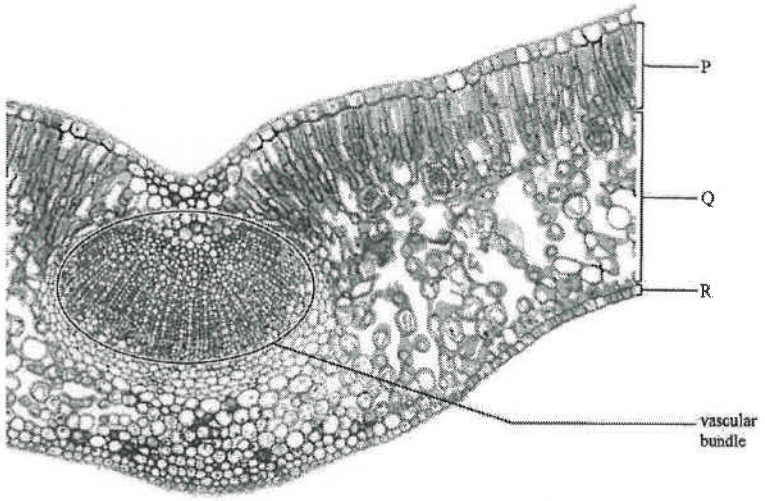
(b) Suggest an explanation for the appearance of the leaves at 1 pm (Photograph Y). (3 marks)

(c) With reference to the appearance of the leaves in the two photographs, which one is more effective for photosynthesis? Explain your answer. (4 marks)

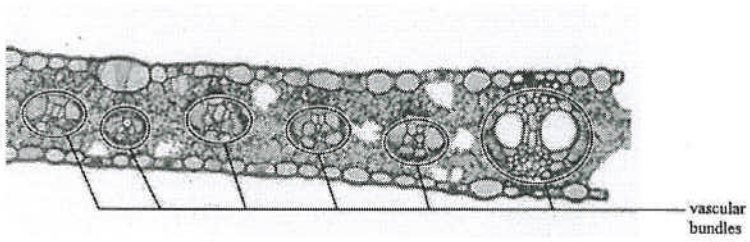
HKDSE – 2018 1B

3.

Photomicrograph X



Photomicrograph Y



(a) (i) Comparing the cell shapes of both leaves, which labelled tissue(P, Q or R) in photomicrograph X is absent from Photomicrograph Y? (1 mark)

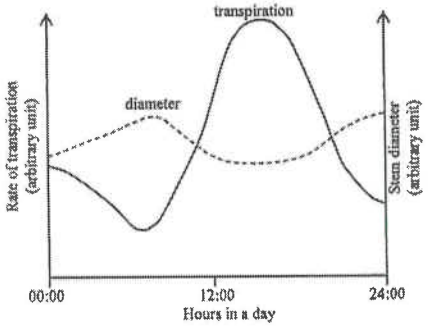
(ii) With reference to Photomicrograph X, what is the observable adaptive feature of the tissue identified in (i) ? What is the significance of this adaptive feature? (2 marks)

(b) The leaf in photomicrograph Y was taken from a plant species with leaves oriented vertically, as shown in the following photograph:

Explain how the distribution of the photosynthetic tissue in these leaves is related to the vertical orientation of the leaves. (3 marks)

HKDSE – 2019 1B

10. The graph below shows the change in the rate of transpiration and the change in stem diameter of a plant over 24 hours:



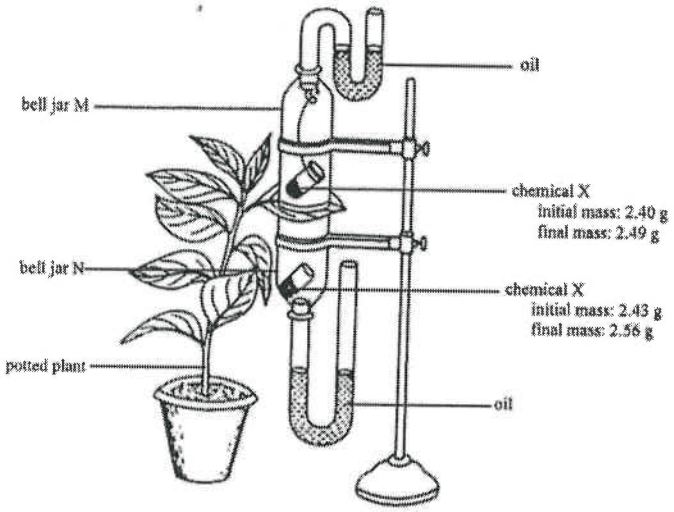
(a) Describe the relationship between the rate of transpiration and stem diameter. (1 mark)

(b) It is known that the change in stem diameter is related to the diameter of the xylem vessels. With reference to the way in which water is transported along the stem, explain the relationship between the rate of transpiration and stem diameter described in (a). (2 marks)

(c) Describe ad explain *two* adaptive features of xylem vessels as a structure for water transport. (4 marks)

HKDSE – 2020 1B

5. The diagram below shows an experimental set-up used to compare the transpiration rates of the upper and lower epidermis of the leaf of a potted plant. The set-up consists of two identical bell jars placed one above the other with the leaf of a potted plant in between. Chemical X was placed into the jars to absorb water vapour. The whole set-up was made air-tight. The masses of the chemical X in the jars were measured at the beginning and after five hours.



(a) (i) Which of the following parameters is used to measure the transpiration rate of the plant in this investigation? Put a '✓' in the appropriate box to indicate your choice. (1 mark)

- ☐ amount of water lost by the leaf
- ☐ amount of water absorbed by the leaf

(ii) How can the above set-up measure the parameter chosen in (a) (i)? (2 marks)

(b) List ***two*** variables which have been controlled by this set-up during the investigation. (2 marks)

(c) (i) Compare the changes in the mass of chemical X in bell jars M and N. What conclusion can you draw? (2 marks)

(ii) Suggest ***one*** possible explanation for the conclusion. (1 mark)

(iii) Propose ***one*** workable method to test your hypothesis in (c) (ii). (2 marks)

HKDSE – 2021 1B

8. The table below shows the average blade area, blade thickness and thickness of the palisade mesophyll of leaves collected from the upper and lower regions of a tree species:

Location of leaves	Average blade area (cm^2)	Average blade thickness (μm)	Average thickness of palisade mesophyll (μm)
Upper region	62	177	45
Lower region	72	152	33

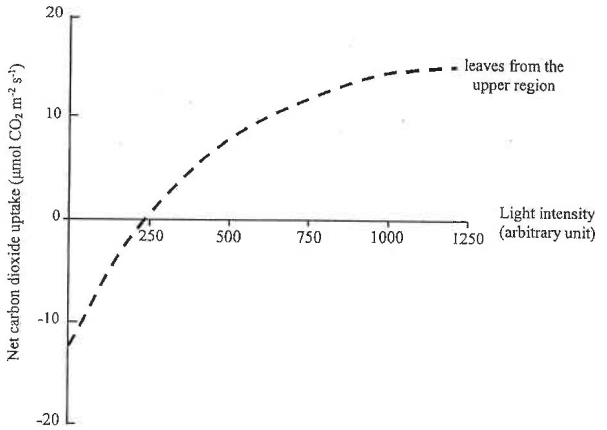
(a) Compare the average blade area of leaves from the upper region and that from the lower region. With respect to the difference in surface area, suggest ***one*** adaptive advantage of the leaves from the lower region. (2 marks)

(b) (i) Compare the average thickness of the palisade mesophyll of leaves from the upper region and that from the lower region. (1 mark)

(ii) Between the two types of leaves, suggest ***one*** possible structural difference which would lead to the difference stated in (b)(i). (1 mark)

(iii) How would you confirm your answer in (b)(ii)? (2 marks)

(c) Leaves at different regions of a tree are adapted to different light intensities. The graph below shows the change in the net carbon dioxide uptake by leaves from the upper region of a tree at different light intensities:



(i) Why are there negative values for net carbon dioxide uptake? (1 mark)

(ii) On the above graph, sketch a line to show the change in net carbon dioxide uptake by leaves from the lower region of a tree at different light intensities. (2 marks)
(Note: Neglect the difference in the average blade area between the two types of leaves when you sketch the line.)

Past Papers Marking Scheme – Transpiration, transport and support in plants

CE - 2001 Q.3 (c)

(i) (1) xylem 1

(2)

Structural feature	Adaptation
The xylem vessels in X have no cell content / no end walls / large lumen	This allows a free flow of water inside
The xylem vessels in X have thick cell wall	This can prevent the collapse of the xylem vessels

any one set 1+1

(ii) Region R 1

(iii) (1) The support of the stem of plant B is mainly due to the turgidity of cells in region S / thin-wall cells 1
Under a hot and sunny condition,
the rate of transpiration of the plant becomes greater than the rater of water absorption 1
The cells in region S lose water 1
and hence lose their turgidity / become flaccid 1
and thus causing the bending of the stem 1

(2) The support of the stem A is due to the presence of xylem / independent of the water content of the plant 1
because the xylem contains thick-wall cells 1

CE - 2002 Q.3 (a)

(i) (1) x = 1.5 y = 1.2 ½, ½

(2) x represents the amount of water absorbed by the plant 1
y represents the amount of water transpired / lost by the plant 1

(3) Value x is larger than value y 1
This indicates that there is a net gain of water by the plant 1
The water gained is essential for various life processes 1
e.g. formation of new cells, photosynthesis...

(ii) Value x would decrease 1
because Vaseline blocks the stomata and the leaf surfaces 1
so the rate of transpiration would drop 1
As transpiration enhances the absorption of water 1
less water would be absorbed by the plant

CE- 2003 Q.3 (c)

(i) Presence of thick / lignified cell wall 1
no cell content / empty lumen 1

(ii) B 1
sucrose 1

(iii) (1) As the fungal hyphae block the xylem vessels of the infected stem, water cannot be transported to the stem 1
On a hot day, the rate of transpiration is high 1
The water loss of the stem / plant becomes greater than the water gain 1
Thus cell type D becomes flaccid / loses turgidity 1
and can no longer give support to the stem 1

(2) Parasitism 1

CE - 2006 Q.9 (b)

(i) Living cells are not required in the transport in the transport of water up the stem 1

(ii) Water is transported up the stem mainly by transpiration pull 1
which is resulted from a physical process and thus can occur outside living cells 1
The transport of water occurs in dead xylem tissues 1
which remains functional even in the treated plants

(iii) Immerse the cut end of the small plant in a dye solution 1
After a few hours, cut a thin section of the upper part of the stem 1
Identify the cell type stained by the dye under the microscope 1

(iv) The woody stem is mainly supported by mechanical strength / rigidity / hardness 1
of the thick walls cells / xylem vessel 1

CE - 2007 Q.3

(a) Cell type X has no cellular content while cell type Y has 1
Cell type X has a thicker cell wall than cell type Y 1

(b) (i) (1) Starch 1

(2) Add a drop of iodine solution to the leaf section 1
Observe the leaf section under the microscope 1
The section turns blue black 1

(ii) In darkness, photosynthesis stops 1
The stored carbohydrate is converted to sugars 1
which are transported away to other parts of the plant / are used in respiration 1

(c) When water evaporates from cell type Y, a transpiration pull is set up 1
Water is drawn from xylem to cell type Y 1
together with dissolved minerals 1

CE - 2008 Q.5

(a) Cell type A has a thicker cell wall
There is no end wall for cell type A while there are end walls for cell type B
Cell type A is hollow / has no cell content while cell type A has cell content
} any two 1, 1

(b) It forms a hollow tube / has no cytoplasm / no end wall ..... 1 +
which offers less resistance to the transport of water 1

OR Any one set
It has rings of thickening / thicker cell wall ..... 1 +
to keep the tube open for transport / prevent collapsing 1

(c) Roots cannot carry out photosynthesis / cannot make food by themselves 1
Therefore, they rely on the transport of sugars / food / organic substances from the leaves 1
for respiration / growth / metabolism 1

CE - 2009 Q.9 (b)

(b) (i) (1) Vascular bundle — 1

(2) X: mosses — 1
Y: flowering plant — 1

(3) The vascular bundle contains xylem tissue . thick walled cells which provide support to the plant so that plant Y can grow taller — any one set
The vascular bundle contains xylem tissue which helps transport water up to a higher position so that plant Y can grow taller — 1, 1

(ii) Damp / moist / wet areas — 1
Plant X lacks cuticle to prevent water loss / lacks vascular tissue for transport of water — 1

AL - 1998 1A

2. Habitat : desert (½) — ½
(Any three features, 1½ marks each, 4½ marks max. for the features)

thick cuticle (½) : impermeable to water thus reduces water loss (1) / reduces water loss by evaporation — 1½

sunken stomata (½): space outside sunken stomata / hairs trap water vapour / moisture (½), lower diffusion gradient between mesophyll cells and the exterior (1), reduce transpirational water loss (½) — 3
and / or hairs in epidermal invagination (½)

multiple epidermis (½): increases diffusion distance / barrier to reduce water loss through the epidermis (1) — 1½ (max. 5)

AL - 2009 2B

6. (c)

	Leaves	Stem
Appearance	• drooped (1) / wilt	• remained upright (1) / erect
Reason	• excessive transpiration results in water loss from cells (1) / amount of water loss exceeds amount of water absorbed • the mesophyll cells and other thin-walled cells of the petiole will lose turgor (1) / turgidity which is the major means of support for the leaf blade and the petiole (1) respectively **(max. 2)**	• stem is mainly supported by mechanical tissues / xylem which is composed of cells with thick rigid cell wall (1)

(2) (max. 3)

(5)

DSE-2012 1B

3. (a) • the cell wall of cell type Q is much thicker than that of cell type P (1) (1)
(✓ accept other answers such as spiral thickening or thickened with ring structures)
(× cell type Q being hollow not accepted)

(b) • when there is ample supply of water (1) (1)
• cell type P provides turgidity to the plant (1) (1)
• cell type Q has thickened cell wall (1) (1)
• which provides rigidity to the plant (1) (1)

HKDSE - 2013 1B

6. (a) • avoid blockage of xylem by the air bubble (1) formed during cutting (1)

(b) • the rate of transpiration is the same as the rate of water absorption / the water absorbed is used for transpiration only (1) (1)

(c) • the transpiration rate will increase (1) (4)
• because the air current sweeps away the water vapour around the leafy shoot (1)
• the concentration gradient of water vapour between the atmosphere and the air space in the leaf becomes steeper (1)
• water vapour diffuses out to the atmosphere at a faster rate (1)

(d) (i) • cell B contains chloroplasts but cell A does not (1)
• the cell wall of cell B has uneven thickness while that of cell A is even (1) (2)

(ii) • the size of C will be reduced (1)
• to reduce transpiration / water loss (1)
• when the need for gas exchange decreases in the absence of photosynthesis (1) (3)

HKDSE - 2014 1B

4. (a) Title 1 mark
Drawing 1 mark (resemblance)
Labels 1 mark @, any three (5)
* epidermis, * vascular bundle, * xylem, * phloem, * cortex, * pith

(b) - the stem of plant A has a large proportion of thin-walled cells (1),
- therefore it is likely that plant A is mainly supported by turgidity of the thin-walled cells (1)
- while the stem of plant B has a large proportion of xylem / thick-walled cells / woody tissues (1) (4)
- **therefore it is mainly supported by mechanical or physical strength** / rigidity of the thick-walled cells / xylem / woody tissues (1)

9 marks

HKDSE – 2015 1B

9. (a) it is maintained by the ridgidity of the veins / vascular bundles / xylem running through the leaves (1)
and the turgidity of the mesophyll cells / thin-walled cells (1) 2

(b) a large amount of water is lost from the leaves by transpiration (1) / transpiration rate is very high
water absorption rate cannot keep up with the rate of water loss (1)
mesophyll cells become flaccid (1)
and thus can no longer support the leaves to maintain their upright position / so the leaves become drooped 3

(c) appearance shown in photograph X (1)
(if this part is wrong, no mark for the whole part (c))
the leaves are flat / fully extended (1)
(accept 'open', not accept 'broad')
And thus the exposed surface can be oriented towards the light source (1)
Therefore maximizing light absorption for photosynthesis (1) 4

HKDSE – 2018 1B

3. (a) (i) • P (1) (1)
(ii) • closely packed / located at the upper side facing the sun directly (1) (1+1)
• this maximizes light absorption for photosynthesis (1)

(b) • when the leaves are oriented vertically, both sides of the leaves have chance of receiving sunlight (1)
• therefore, the photosynthesis tissues are evenly distributed on both sides of the leaf (1)
• such that photosynthesis can be carried out effectively regardless of the change in the orientation of sun / the direction of illumination from sun during daytime (1) (3)

6 marks

HKDSE – 2019 1B

10. (a) • the diameter of the stem decreases as the rate of transpiration increases, or vice versa (1) (1)

(b) • water is transported up the stem by transpiration pull (1) / water transport results in negative pressure / tension / suction force / pull-up force (1) in xylem vessels.
• this pulls the xylem vessel's walls inwards (1), thus reducing the diameter of the xylem, hence the stem (2)

(c) • hollow tube*(1) to allow the passage of water with low resistance (0+1)
• thickened / lignified wall^ *[accept lignified cell; not accept thickened cell]* (1) to withstand the negative pressure of the transpiration pull / prevent the collapse of xylem vessels *[not accept maintain the shape of xylem vessel]* (0+1) (4)

*: *no end wall / no protoplast → incomplete answer, 0 mark*
^: *rigid / strong wall → insufficient answer, 0 mark*
Remark: wrong features, no marks. With incomplete or insufficient feature, proceed to mark the corresponding explanation.

7 marks