Transport in Plants

Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in plants
Sub Topic	
Booklet	Multiple Choice
Paper Type	Question Paper 2

Time Allowed :   **42   minutes**

Score   :   **/ 35**

Percentage   :   **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 The movement of water through xylem vessels is affected by external factors.

A decrease in which external factor would result in an increase in water movement?

A atmospheric humidity

B external temperature

C light intensity

D wind velocity

2 A leafy shoot was attached to a potometer and exposed to a variety of conditions. The time taken for the meniscus to move 50 mm along the capillary tubing was recorded for each set of conditions.

temperature /°C	humidity	air movement	time taken to move 50 mm /s
20	dry	still	125
20	dry	moving	71
30	dry	still	40
20	humid	still	166
20	humid	moving	83
30	humid	still	55

Which shows the slowest and fastest rates of water uptake?

	slowest /mm s^{-1}	fastest /mm s^{-1}
A	0.3	1.3
B	0.3	3.3
C	3.3	0.3
D	1.3	0.8

3   The diagram shows four plant cells.
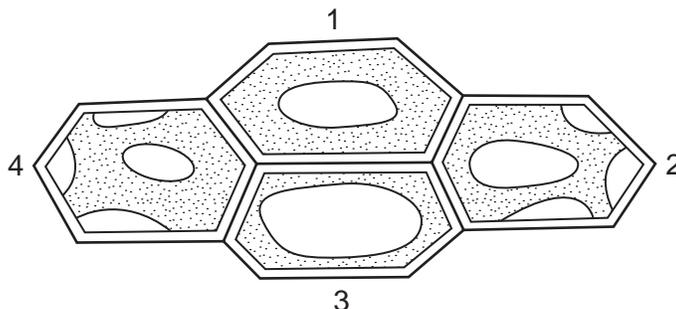
In which direction could there be net movement of water by osmosis?

A   1 to 2 and 1 to 4

B   1 to 3 and 1 to 2

C   2 to 1 and 1 to 4

D   4 to 1 and 2 to 3

4   How will the root pressure in a plant be affected by waterlogged soil?

A   It will not be affected.

B   It will decrease due to a lack of oxygen in the soil.

C   It will increase due to a lower water potential in the soil.

D   It will increase due to a higher rate of transpiration.

5   A region of a plant containing the vascular tissue is treated with a metabolic poison.

How will this treatment affect the transport between roots and leaves via xylem and phloem?

	xylem	phloem
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = transport continues

✗ = transport stops

6   Which row is correct?

	needs energy from ATP	transfers heat energy	carries assimilates
A	translocation	mass flow	xylem vessel element
B	translocation	transpiration	phloem sieve tube element
C	transpiration	mass flow	xylem vessel element
D	transpiration	translocation	phloem sieve tube element

7   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 carry extra water as a plant grows

   C   there are no cross walls between vessel elements

   D   vessel elements join to form narrow tubes

8 An investigation was carried out into the effect of light intensity on the rate of transpiration. All other variables were standardised. A student was asked to explain the results shown in the graph below.
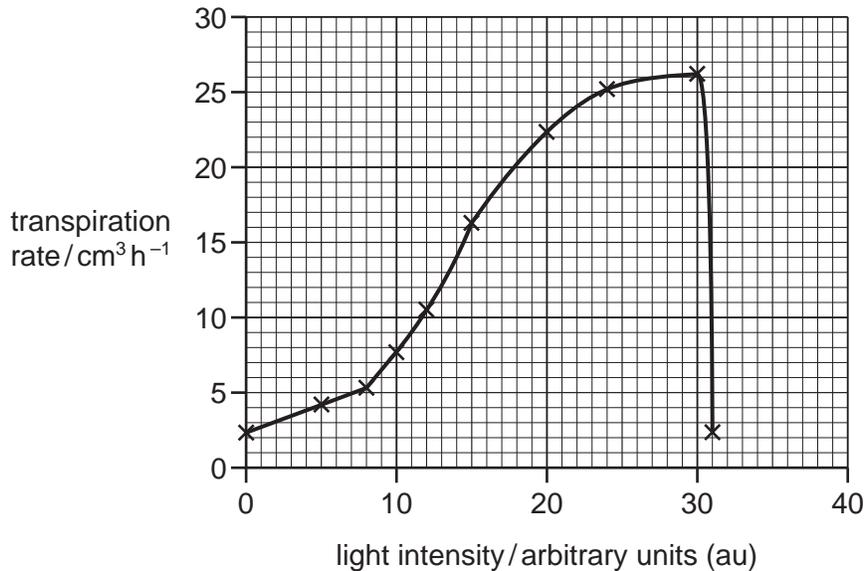
Which explanation is correct?

A   At light intensities above 30 au the stomata close rapidly.

B   The rate of transpiration increases as the light intensity increases.

C   The rate of transpiration never falls to $0\,cm^3$ because some stomata are always open.

D   Water uptake by the plant increases as the light intensity increases from 0 to 30 au.

9 Different substances, such as sucrose and amino acids, can move in different directions in the phloem sieve tubes.

Which statement explains this?

A   Active transport occurs in some phloem sieve tubes and mass flow occurs in other phloem sieve tubes.

B   Both active transport and mass flow occur in each individual phloem sieve tube.

C   Mass flow occurs in both directions at the same time in each individual phloem sieve tube.

D   Mass flow occurs in different directions in different phloem sieve tubes at the same time.

10 Which feature of a plant cell is an adaptation for water uptake from the soil solution?

    A   waxy cuticle

    B   large numbers of mitochondria

    C   long, thin extension to the cell

    D   thick cellulose cell wall

11 A student used a potometer to measure the rate of water loss from a plant by transpiration.

The internal diameter of the capillary tube and the distance moved by the bubble in 30 seconds were recorded.

The results are shown in the table.

internal diameter of capillary tube / mm	distance bubble moved in 30 s / mm
1.8	4

The volume of water moved = πr^2 x distance moved by the bubble.

Which calculation correctly shows how to determine the rate of transpiration in $mm^3 s^{-1}$?

    A $\dfrac{\pi(1.8^2 \times 40.0)}{30}$

    B $\pi(1.8^2 \times 40.0) \times 30$

    C $\dfrac{30}{\pi(0.9^2 \times 40.0)}$

    D $\dfrac{\pi(0.9^2 \times 40.0)}{30}$

12 What determines the rate of water movement from the roots to the leaves?

    A   absorption of water through the root hair cells

    B   development of a less negative water potential in the leaves

    C   diffusion of water through the stomata

    D   evaporation of water from the mesophyll cell walls

13   The diagram shows a partially plasmolysed plant cell.
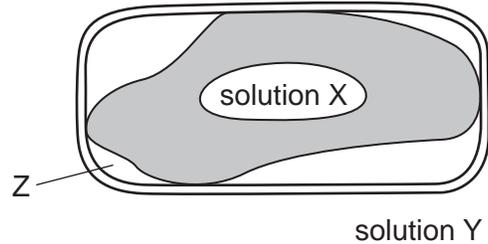
solution Y

What is found at Z?

A   air

B   solution X

C   solution Y

D   water

14   What is transpiration and which advantage does it give to a plant?

|	transpiration	advantage to a plant
A	evaporation of water from leaf surfaces	maintains the water potential
B	evaporation of water from leaf surfaces	stomata are open for gas exchange
C	loss of water vapour from leaves	maintains the water potential
D	loss of water vapour from leaves	stomata are open for gas exchange

15   Which feature of xylem vessel elements allows them to stay open as transpiration increases?

A   new vessel elements carry extra water as a plant grows

B   there are no cross walls between vessel elements

C   vessel elements form narrow tubes

D   walls of vessel elements contain lignin

16 What occurs in the apoplast and symplast pathways?

	water enters cytoplasm through cell surface membrane	water enters vacuoles	water moves from cell to cell through intercellular spaces
A	apoplast	apoplast	symplast
B	apoplast	symplast	symplast
C	symplast	apoplast	apoplast
D	symplast	symplast	apoplast

17 The diagram shows a model which can be used to demonstrate mass flow.
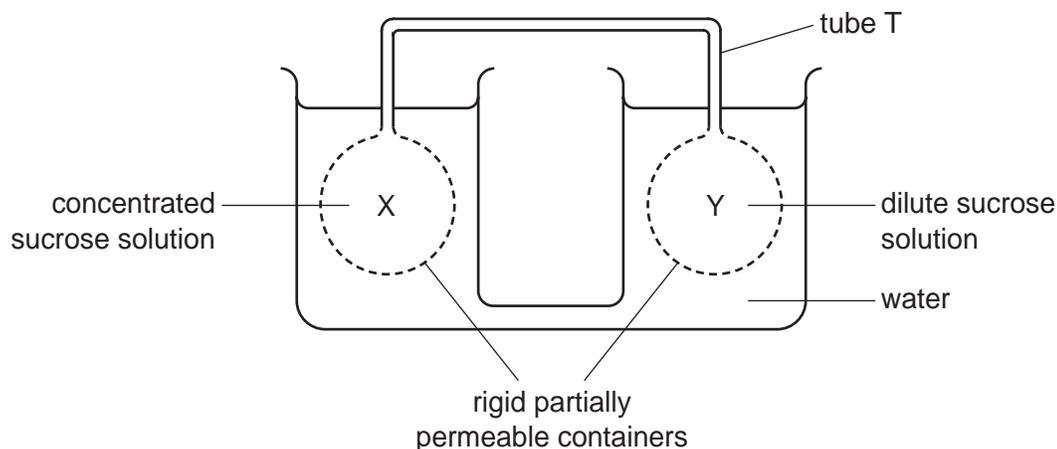
X and Y are filled with sucrose solutions of different concentrations, causing water to move in or out of X and Y by osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through tube T joining X and Y.

Which description is correct?

	water potential in X compared with Y	direction of movement of sucrose solution in tube T
A	less negative	from X to Y
B	less negative	from Y to X
C	more negative	from X to Y
D	more negative	from Y to X

18 Which of the following statements explain why a stem is both cut and connected to a potometer under water?

      1   To prevent plasmolysis of xylem vessel elements

      2   To prevent the collapse of xylem vessel elements

      3   To prevent air entering xylem vessel elements

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

19 What is correct about the uptake and transport of water in plants?

      1 water transported by the symplast pathway enters root hair cells down a water potential gradient

      2 water is transported in xylem by the symplast and apoplast pathways to reach the leaves

      3 water transported by the apoplast pathway through plasmodesmata must pass through cell surface membranes of endodermal cells

A   1 only

B   3 only

C   1 and 3 only

D   2 and 3 only

20 Which combination of conditions increases the rate of transpiration in plants?

	light intensity	humidity	temperature
A	high	high	low
B	high	low	high
C	low	high	low
D	low	low	high

21 Which statement explains why sucrose, rather than glucose, is transported by phloem?

    A   Sucrose can pass through plant cell surface membranes more easily.

    B   Sucrose is a disaccharide and is more easily converted to starch.

    C   Sucrose is a larger molecule.

    D   Sucrose is a non-reducing sugar, so is less reactive.

22 How do single-celled organisms survive without a specialised transport system?

    A   Their cell surface membranes are totally permeable.

    B   They do not move very often.

    C   They do not need to absorb oxygen.

    D   They have a large surface area to volume ratio.

23 What occurs during the movement of water through the apoplast pathway?

    1   water enters cell wall

    2   water enters cytoplasm through plasma membrane

    3   water enters vacuoles

    4   water moves from cell to cell through plasmodesmata

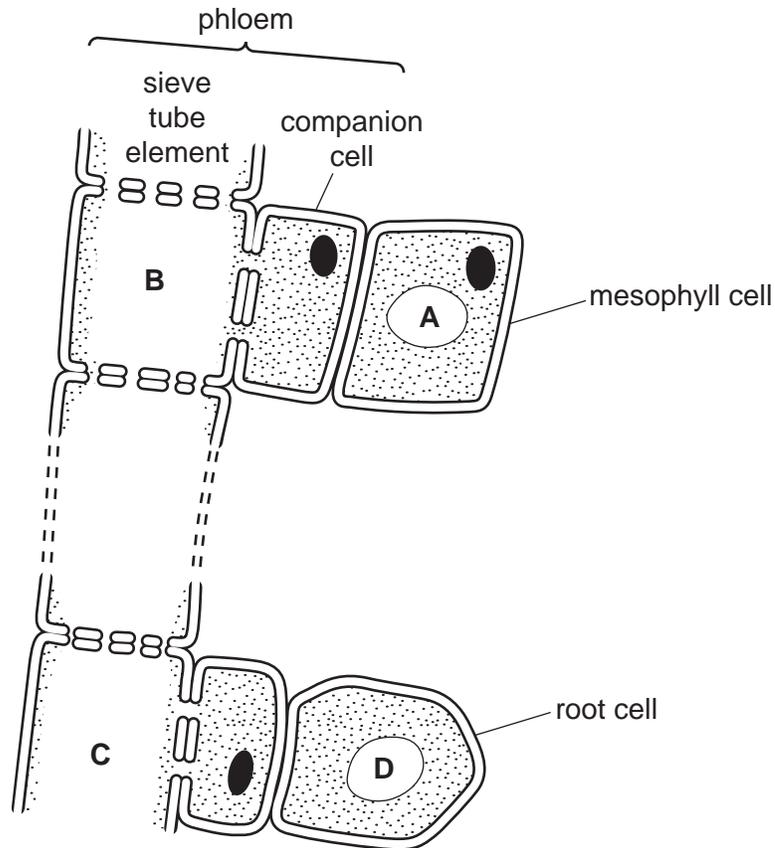   5   water moves from cell wall to cell wall through intercellular spaces

    A 1 and 3   **B** 2 and 4   **C** 1, 3 and 4   **D** 2, 3 and 5

24 The diagram shows the tissues involved in the transport of sucrose in a plant.

Where is the highest concentration of sucrose?

25 Which evidence supports the cohesion-tension theory for the movement of water in flowering plants?

1   When the rate of transpiration of a tree is maximum, the diameter of the trunk is minimum.

2   When a plant shoot is removed close to the base of the stem, sap leaks out from the cut.

3   Evaporation of water from a porous pot can exert a force that draws water up a glass tube attached underneath the pot.

4   Droplets of water form at the edge of leaves of plants growing in conditions of soil with high water content and air with high humidity.
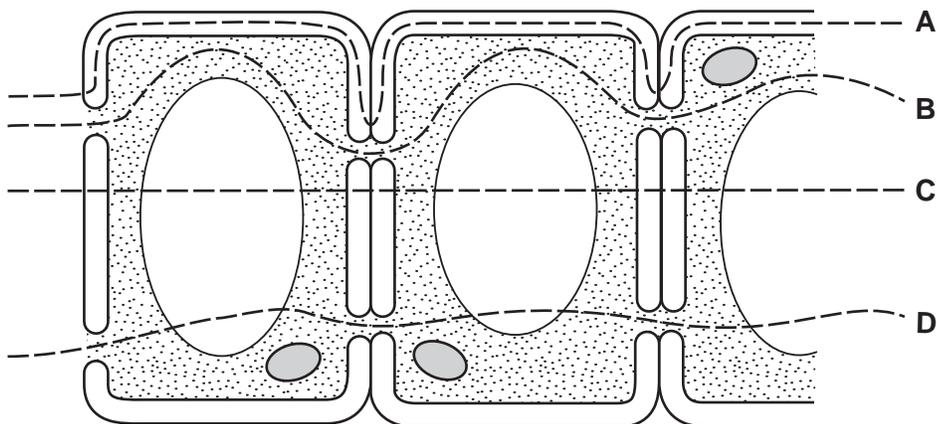
A   1 and 2   **B**   1 and 3   **C**   2 and 3   **D**   2 and 4

26 The diagram shows some adjacent cells from the root of a plant.

Which is the apoplastic pathway of water movement?

27 What determines the rate of water movement from the roots to the leaves?

A   absorption of water through the root hair cells

B   development of a less negative water potential in the leaves

C   diffusion of water through the stomata

D   evaporation of water from the mesophyll cell walls

28 Which processes are involved in transpiration?

     1   the diffusion of water vapour from stomata

     2   the mass flow of water through the xylem

     3   the evaporation of water from spongy mesophyll cells

     4   the evaporation of water vapour from exposed leaves

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

29 What is the sequence of events in the translocation of assimilates?

   A active loading of sucrose into sieve elements via companion cells at the source, increased hydrostatic pressure, mass flow, unloading at the sink

   B hydrolysis of storage compounds in sinks, lowered water potential in sink, unloading of sucrose from sieve elements down the water potential gradient, mass flow from the source

   C lowered pressure in sieve elements at the source, movement of sucrose down the pressure gradient from companion cells, mass flow down a diffusion gradient to the sink

   D mass flow of dissolved sucrose via companion cells into the sieve element at the source, lowered hydrostatic pressure, diffusion of sucrose down concentration gradient to sink, active unloading

30 Some antibacterial drugs can affect the synthesis of proteins.

antimicrobial drug	rifampicin	streptomycin	tetracycline
mode of action	binds to RNA polymerase	genetic code misread during translation	prevents binding of tRNA to ribosome

Which is the correct set of immediate effects of these drugs?

antimicrobial drug	rifampicin	streptomycin	tetracycline
A	defective protein synthesised	mRNA does not bind to ribosome	amino acids not added to growing chain
B	mRNA not synthesised	defective protein synthesised	amino acids not added to growing chain
C	mRNA not synthesised	mRNA does not bind to ribosome	transcription prevented
D	transcription prevented	defective protein synthesised	mRNA does not bind to ribosome

31 During transpiration, what is the site of evaporation of water in the leaves?

   A air spaces

   B mesophyll cell walls

   C stomata

   D walls of xylem vessels

32   Which adaptation would increase the efficiency of active transport of carbohydrates from a plant cell?

   A   areas where the cell wall is thin

   B   increased permeability of the cell wall

   C   large surface area of the cell surface membrane

   D   large volume of the cell vacuole

33   Turgid plant tissue is placed in a solution which has the same solute potential as the contents of the cells. The diagram shows a cell after one hour.
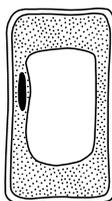
   Which equation describes the value of the pressure potential for this cell?

   A   pressure potential = solute potential of the cell

   B   pressure potential = solute potential of the external solution

   C   pressure potential = water potential of the cell

   D   pressure potential = zero

34   Which combination of features is characteristic of phloem sieve tubes?

	solute concentration of the cell content	lignification of the cell wall
A	high	absent
B	high	present
C	low	absent
D	low	present

35 In which combination of environmental conditions are the stomata of a plant most likely to close?

	atmospheric humidity	soil water potential	wind speed
A	high	high	high
B	high	low	low
C	low	high	low
D	low	low	high