

Transport in Plants

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in plants
Sub Topic	
Booklet	Multiple Choice
Paper Type	Question Paper 1

Time Allowed : 42 minutes

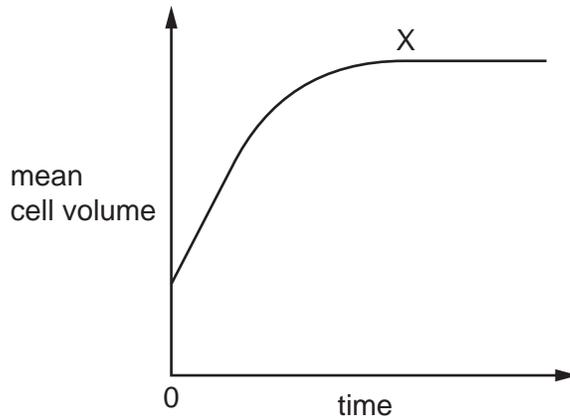
Score : / 35

Percentage : /100

Grade Boundaries:

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

- 1 A tissue composed of plasmolysed plant cells was put into distilled water. The graph shows how the mean cell volume changes with time.



What is the cause of the plateau at X?

- 1 water potential in the plant cell has become more negative
- 2 cells have become fully turgid
- 3 no net movement of water into cells

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

- 2 Where does water evaporate from during transpiration?

- A** inside the guard cells
- B** the outer surface of the epidermal cell layer
- C** the sub-stomatal cavity
- D** the surface of spongy mesophyll cell walls

- 3 Which changes to the water potential and the volume of liquid in the phloem occur when amino acids are taken out of a sink in a phloem sieve tube?

	water potential in phloem sieve tubes	volume of liquid in phloem sieve tubes
A	higher	decreased
B	higher	increased
C	lower	decreased
D	lower	increased

- 4 The statements are about the properties of water.

- 1 requires a lot of heat to evaporate
- 2 holds a lot of heat
- 3 is able to form hydrogen bonds with other water molecules
- 4 is able to form hydrogen bonds with other polar molecules

Which properties are important for translocation in phloem?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 and 4

- 5 Which feature of transport in xylem depends on the use of energy?

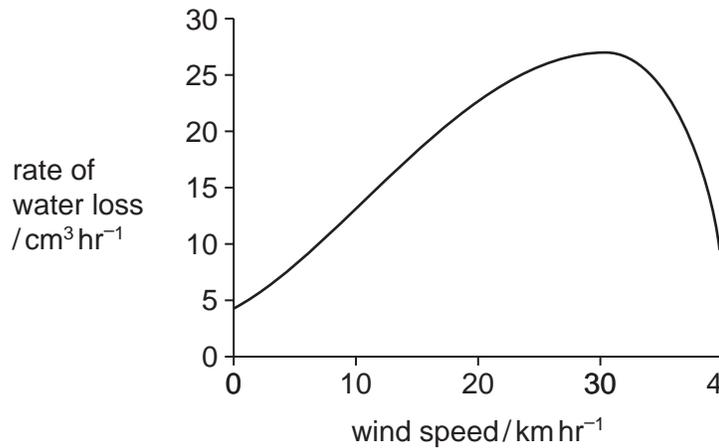
- A** mass flow of water to the leaves
- B** osmosis of water into xylem
- C** uptake of ions into the root
- D** transpiration of water from the leaves

6 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 the surface of mesophyll cells
- 4 the evaporation of water vapour from air spaces

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

7 The graph shows the results of using a potometer to measure the effect of wind speed on the rate of water loss in a plant.



Which statement explains the results obtained from the investigation?

- A** As wind speed increases, it becomes harder for the plant to obtain carbon dioxide. At high wind speeds the stomata are fully open so rate of water loss is high.
- B** As wind speed increases, moist air around the stomata is removed and replaced by dry air. At high wind speeds the transpiration rate is lower.
- C** As wind speed increases, the rate of water loss increases due to an increased diffusion gradient. At high wind speeds, the stomata close.
- D** As wind speed increases, transpiration rate and rate of photosynthesis increases. At high wind speeds more water is used for photosynthesis.

- 8 Land flooded by the sea is not suitable for growing plants after the salty flood water has drained away.

Which values of water potential in the xylem and soil water help to explain why the land flooded with salty water is unsuitable for growth of plants?

	water potential / kPa	
	xylem	water
A	-1800	-700
B	-700	-1800
C	-700	-300
D	0	-1800

- 9 Single-celled animals that live in fresh water have a vacuole that contracts regularly to remove excess water. Single-celled plants that live in fresh water do not have a similar vacuole.

Which statement explains why these animals need this vacuole but plants do not?

- A** Plant cell cytoplasm and animal cell cytoplasm both have a lower water potential than fresh water.
- B** Plant cell sap has the same water potential as fresh water, animal cytoplasm has a lower water potential than fresh water.
- C** Plant cell walls are impermeable to water, animal cell surface membranes are permeable to water.
- D** Plant cell walls restrict the entry of water, animal cell membranes allow the entry of water.

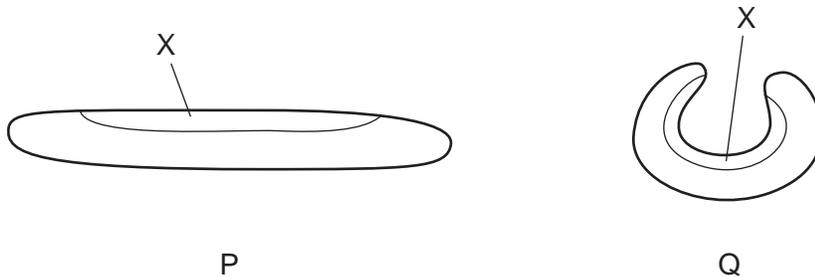
- 10 Some plant species can take up heavy metal contaminants that are dissolved in soil water and then transport them within the plant. Within plant cells, the heavy metals accumulate mainly in the vacuole.

Which are valid suggestions about the transport and accumulation of heavy metals?

- 1 After initial entry into the root, some of the heavy metals can pass through the tonoplast to be stored in the vacuole of cortical cells.
- 2 The heavy metals take an apoplastic pathway in the xylem but at the endodermis must take a symplastic pathway.
- 3 The rate of accumulation of the heavy metals in leaf cells will be faster at night, when photosynthesis is not occurring, than during the day.
- 4 The presence of the heavy metal will inhibit active transport, causing the transpiration stream to slow down and reduce the rate of transpiration.

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

- 11 The diagram shows a xerophytic leaf in different conditions, P and Q.



Which statements about the cells in layer X of the leaf in each of the conditions P and Q are correct?

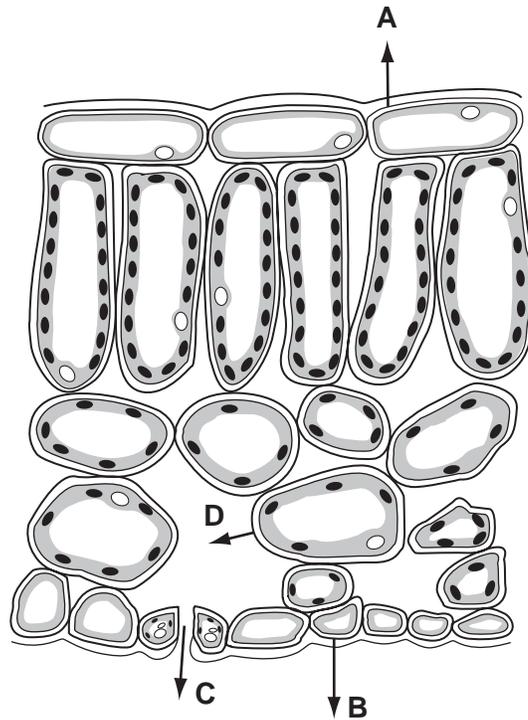
- 1 less negative water potential in P than Q
- 2 cells may be turgid in P and plasmolysed in Q
- 3 cells less turgid in P than Q
- 4 no net diffusion of water into X in either P or Q

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

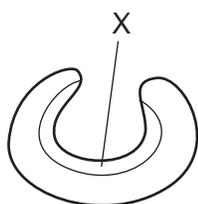
- 12 Which feature of water is **least** likely to affect the life of an animal in a tropical rain forest?
- A adhesion with other molecules
 - B cohesion between water molecules
 - C low viscosity
 - D maximum density at 4 °C

- 13 The diagram shows part of a transverse section of a leaf.

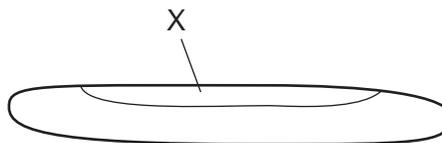
Where does evaporation of water occur during transpiration?



14 The diagram shows a xerophytic leaf in different conditions, P and Q.



P



Q

Which statements describe the difference between the cells in layer X in conditions P and Q?

- 1 More negative water potential in P than Q.
- 2 More cells plasmolysed in P.
- 3 Cells less turgid in Q.
- 4 Water potential becomes zero in Q.

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

15 A potometer can be used to measure transpiration rates in a plant.

Why is the plant stem cut under water before attaching to the potometer?

- A** to maintain the turgidity of the xylem vessels
- B** to prevent collapse of the xylem vessels
- C** to stop air entering the xylem vessels
- D** to stop water loss from the xylem vessels

16 During transpiration, from where does the evaporation of water occur?

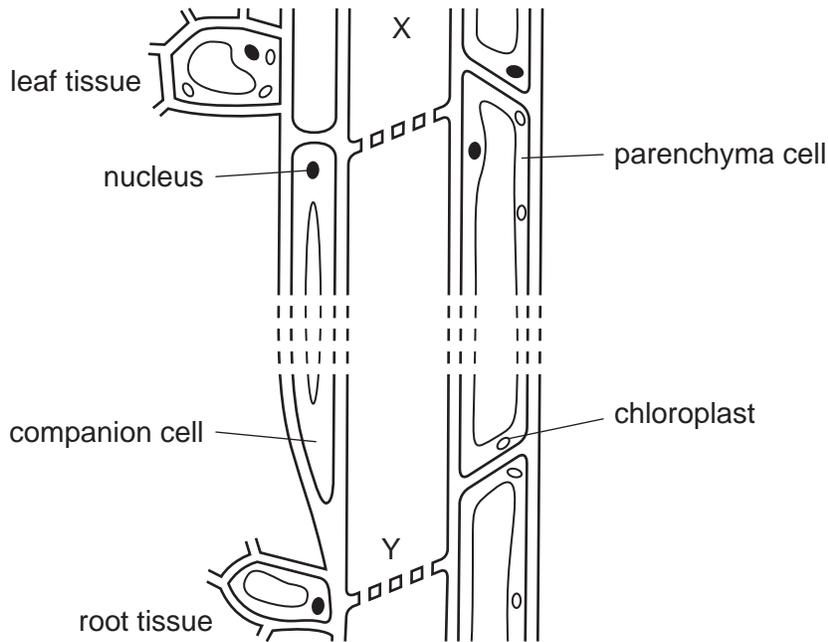
- A** intercellular spaces
- B** leaf surface
- C** mesophyll cell walls
- D** stomatal pores

17 When transpiration is at a maximum rate, tree trunks decrease in diameter.

Which statement explains this?

- A There is decreased suction pressure in the leaves.
- B There is less adhesion between water and xylem vessel walls.
- C There is less water in the xylem vessels.
- D The water in the xylem vessels is under increased tension.

18 Sucrose is transported in solution in the phloem of plants. Transport takes place from sources to sinks. The process depends on differences in hydrostatic pressure between the sources and the sinks.



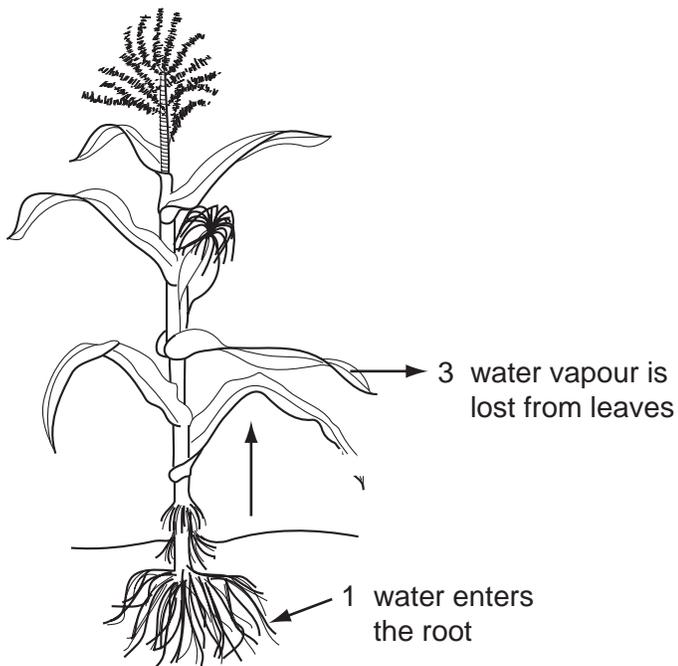
Which tissues are either a source or a sink and what is the hydrostatic pressure at X and Y within the phloem?

	tissue		hydrostatic pressure	
	leaf	root	high	low
A	sink	source	X	Y
B	sink	source	Y	X
C	source	sink	X	Y
D	source	sink	Y	X

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

- A air spaces
- B guard cell walls
- C mesophyll cell walls
- D stomata

20 The diagram represents the movement of water through a plant.



Which row identifies the processes involved during the stages of water movement shown?

	cohesion and adhesion	transpiration	osmosis
A	1	2	3
B	1	3	2
C	2	1	3
D	2	3	1

21 Which processes are involved in transport in both phloem and xylem?

- 1 diffusion
- 2 mass flow
- 3 osmosis

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

22 Which features of xerophytes are adaptations to reduce water loss by transpiration?

	rolled leaves	fleshy leaves	sunken stomata	thick waxy cuticles
A	✓	✗	✗	✓
B	✗	✓	✓	✓
C	✓	✓	✓	✗
D	✓	✓	✓	✓

key

✓ = reduces water loss

✗ = no effect on water loss

23 Water that is present inside a root hair cell may leave the cell and pass to the xylem.

Through which pathway **must** the water travel?

- A** apoplast
- B** plasmodesmata
- C** symplast
- D** vacuoles

24 Some soil-borne fungi cause wilting in crop plants by growing within the xylem vessels.

Which process will be directly affected by these fungi?

- A cohesion between water molecules
- B development of root pressure
- C mass flow during translocation
- D uptake of water by root hair cells

25 What is transpiration and which advantage does it give to the plant?

	transpiration	advantage to the 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

26 Which statement explains why the circumference (girth) of a tree is less at midday and increases at night?

- A Mineral uptake by the root hair cells decreases during the night because root pressure has decreased.
- B Stomata close during the night and there is a build-up of water in the vascular tissue within the stem.
- C The phloem sieve tubes fill with dissolved solutes because the translocation rate reduces during the night.
- D There is less tension in the xylem vessels during the night because the rate of transpiration is at a minimum.

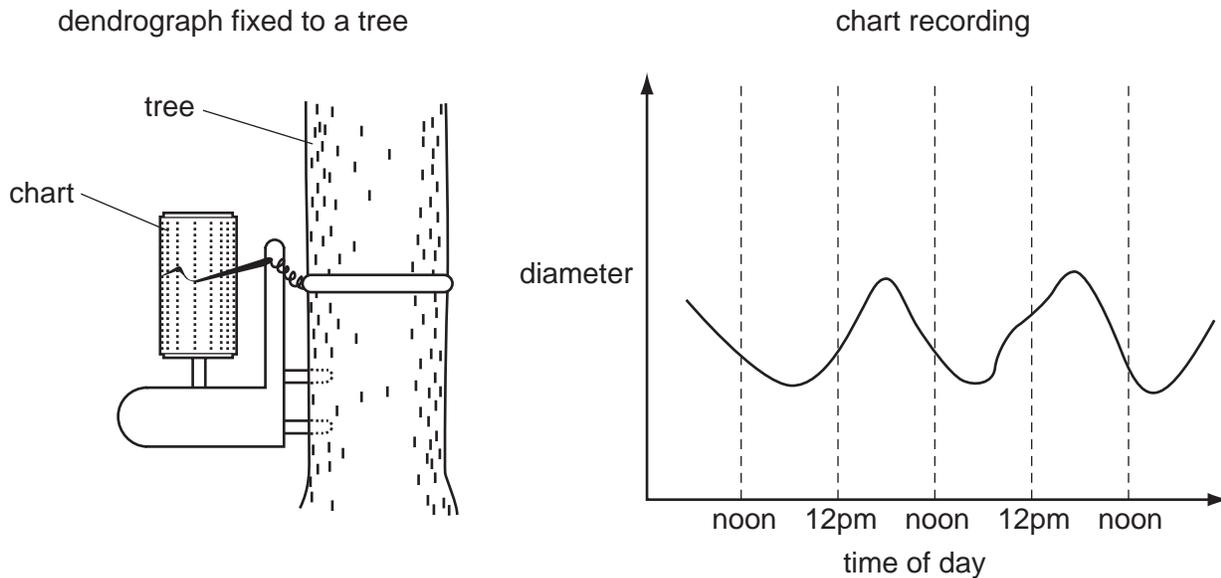
- 27 Different substances, such as sucrose and amino acids, can move in different directions in the phloem sieve tubes.

Which statement explains this?

- A Active transport occurs in some phloem sieve tubes and mass flow 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 once in each individual phloem sieve tube.
- D Mass flow occurs in different directions in different phloem sieve tubes at the same time.

- 28 The diagram shows a dendrograph fixed to a tree. The dendrograph records changes in the diameter of the tree.

Some results are shown on the chart recording.



What explains the diameter changes recorded during the day and night?

- A cohesive tension forces increased during the day
- B mass flow of sucrose increased during the night
- C root pressure decreased during the day
- D thermal expansion and contraction of water in the tree

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

	solute potential of the cell content	lignification of the cell wall
A	high	ab
B	high	pre
C	low	abs
D	low	pres

30 Which features of xerophytes reduce water loss by transpiration?

	rolled leaves	swollen leaves	sunken stomata	thick waxy cuticle
A	✓	✗	✓	✓
B	✗	✓	✓	✓
C	✓	✓	✗	✗
D	✓	✓	✓	✓

31 What occurs in the apoplast and symplast pathways?

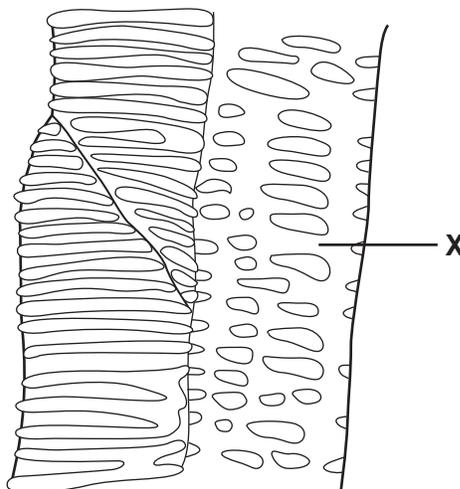
	water enters cell wall	water enters cytoplasm through plasma membrane	water enters vacuoles	water moves from cell to cell through plasmodesmata	water moves from cell to cell through intercellular spaces
A	apoplast	apoplast	apoplast	symplast	symplast
B	apoplast	symplast	symplast	symplast	apoplast
C	symplast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

32 When cylinders of potato tissue were immersed in a 0.35 mol dm^{-3} sucrose solution, they showed no change in mass.

What will happen when cylinders are immersed in a 0.1 mol dm^{-3} sucrose solution?

- A** The pressure potential of the cells will become more positive.
- B** The solute potential of the cell will become more negative.
- C** The water potential of the cells will become more negative.
- D** The water potential of the solution will become less negative.

33 The diagram shows a longitudinal section through transport tissue in a plant stem.



What are the names of the structure labelled **X** and the tissue in which it is found?

	structure X	tissue
A	sieve tube	phloem
B	sieve tube	xylem
C	vessel	phloem
D	vessel	xylem

34 What is responsible for the movement of water up xylem vessels in plants?

- A** active loading of water against the water potential gradient in the roots and osmosis in the vessels
- B** increasing water potential at the top of xylem vessels, and osmosis in the roots
- C** decreasing water potential at the top of the xylem vessels, with cohesion of water in the vessels
- D** translocation in the leaves, with capillarity in the xylem vessels

35 Why is the mass flow of sap through sieve elements described as an active process?

- A** Phloem sap is able to flow in sieve elements against the pull of gravity.
- B** Sucrose is loaded into a sieve element against a concentration gradient.
- C** Sucrose passes out of the phloem into regions where cells are dividing.
- D** Water follows sucrose into a sieve element down a water potential gradient.