

Past-paper walk-through

Transport mechanisms ■ 7.2

eXercise

Questions in this set

- 9700/11 N25 Q28 ■ 1 mark
- 9700/11 N25 Q29 ■ 1 mark
- 9700/12 N25 Q29 ■ 1 mark
- 9700/12 N25 Q30 ■ 1 mark
- 9700/12 N25 Q31 ■ 1 mark
- 9700/13 N25 Q29 ■ 1 mark
- 9700/13 N25 Q30 ■ 1 mark
- 9700/14 N25 Q28 ■ 1 mark
- 9700/14 N25 Q30 ■ 1 mark
- 9700/24 N25 Q6 ■ 6 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 28

9700/11 N25 ■ Q28 ■ 1 mark

28 What causes water to move from the root hair cells to the endodermis?

- A** diffusion through cell walls and osmosis down a water potential gradient in the cytoplasm
- B** diffusion through the symplast and osmosis and root pressure through the apoplast
- C** osmosis from cell vacuole to cell vacuole and active transport into the endodermis
- D** osmosis through the intercellular spaces and diffusion in cell walls and cytoplasm

Solution 28

Answer: **A**

Why

- Water crosses the root cortex down a water potential gradient.
- Through the cell walls that is the apoplast pathway – effectively diffusion.
- Through the cytoplasm from cell to cell it is osmosis down the gradient.

Question 29

9700/11 N25 ■ Q29 ■ 1 mark

29 Which changes occur as carbohydrate is moved into a sink?

	water potential of the sieve tube element becomes	volume of liquid of the sieve tube element
A	lower	decreases
B	lower	increases
C	higher	decreases

Question 29

D	higher	increases
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Solution 29

Answer: **C**

Why

- At a sink the sucrose is unloaded from the sieve tube.
- Removing solute makes the water potential *higher* (less negative).
- Water then leaves the sieve tube by osmosis, so the volume decreases.

Question 29

9700/12 N25 ■ Q29 ■ 1 mark

- 29** Which row correctly describes the pressure in the xylem and the water potential in the root hair cells used in the transport of water in a transpiring plant?

	pressure in the xylem	water potential in root hair cells
A	positive	negative
B	positive	positive
C	negative	negative
D	negative	positive

Solution 29

Answer: **C**

Why

- Transpiration pulls water up the xylem, putting the water column under *tension*.
- Tension is a negative pressure.
- Root hair cells must have a water potential lower than the soil solution for water to enter them.

Question 30

9700/12 N25 ■ Q30 ■ 1 mark

30 Which row correctly identifies the definitions for each of the key terms used in transpiration?

	attraction between water molecules and walls of the xylem vessel	effect created by evaporation of water from the surface of the leaf
A	cohesion	adhesion
B	adhesion	tension
C	cohesion	tension
D	tension	cohesion

Solution 30

Answer: **B**

Why

- Cohesion is attraction between water molecules themselves.
- Adhesion is attraction between water and the xylem wall.
- Evaporation from the leaf creates the tension that pulls the column up.

Question 31

9700/12 N25 ■ Q31 ■ 1 mark

- 31** Which combination of features is characteristic of a phloem sieve tube element immediately after it is loaded from a source?

	water potential of the phloem sieve tube element	lignification of the cell wall
A	higher than source	not present
B	higher than source	present
C	lower than source	not present
D	lower than source	present

Solution 31

Answer: **C**

Why

- Loading sucrose at the source lowers the water potential inside the sieve tube.
- Water then follows by osmosis, raising the hydrostatic pressure.
- Sieve tubes are never lignified – that is a xylem feature.

Question 29

9700/13 N25 ■ Q29 ■ 1 mark

- 29** Which statement about the pathway taken by a water molecule travelling from the soil to the xylem is correct?
- A** A water molecule in a cortex cell that takes the symplast pathway must enter the next cortex cell by passing between two adjacent phospholipid molecules in a cell surface membrane.
 - B** A water molecule can pass into xylem vessels either through pits or through the cell wall of the xylem vessel elements by osmosis.
 - C** A water molecule would pass into the cytoplasm of the endodermal cell if it always takes the apoplast pathway all the way to the xylem.
 - D** A water molecule that has left the endodermal cells can travel by either the apoplast pathway or symplast pathway.

Solution 29

Answer: **D**

Why

- The symplast route passes from cytoplasm to cytoplasm through plasmodesmata.
- So it does *not* cross a phospholipid bilayer between adjacent cortex cells.
- The apoplast route goes through the cell walls until the Casparian strip forces it into the symplast.

Question 30

9700/13 N25 ■ Q30 ■ 1 mark

30 Amino acids move from a phloem sieve tube element into a root cell.

What are the changes to the water potential and the volume of liquid in the phloem sieve tube element at the sink, when this event is happening?

	water potential in the phloem sieve tube element	volume of liquid in the phloem sieve tube element
A	becomes higher	decreases
B	becomes higher	increases
C	becomes lower	decreases
D	becomes lower	increases

Solution 30

Answer: **A**

Why

- Unloading amino acids at a sink removes solute from the sieve tube.
- That raises the water potential (makes it less negative).
- Water then leaves by osmosis, so the volume of liquid falls.

Question 28

9700/14 N25 ■ Q28 ■ 1 mark

28 Which statement describes movement through a plant in the apoplast pathway?

- A** Water moves through the cell walls.
- B** Water moves through the cytoplasm.
- C** Water moves through the plasmodesmata.
- D** Water moves through the vacuoles.

Solution 28

Answer: **A**

Why

- The apoplast pathway is the route through the cell walls and the spaces between them.
- It does not enter the cytoplasm at all.
- Plasmodesmata and vacuoles belong to the symplast and vacuolar routes.

Question 30

9700/14 N25 ■ Q30 ■ 1 mark

- 30** Which row shows the cause of mass flow in the phloem and the direction of movement of phloem sap by mass flow?

	cause of mass flow in the phloem	direction of movement of phloem sap by mass flow
A	hydrostatic pressure gradient	sink to source
B	hydrostatic pressure gradient	source to sink
C	water potential gradient	sink to source
D	water potential gradient	source to sink

Solution 30

Answer: **B**

Why

- Loading at the source and unloading at the sink creates a hydrostatic pressure gradient.
- Water follows the sucrose in by osmosis at the source, raising the pressure there.
- The sap therefore flows from source to sink down that pressure gradient.

Question 6

9700/24 N25 ■ Q6 ■ 6 marks

- 6 (a) State **and** explain why the same leaf of a plant can be described as a source or as a sink, depending on the stage of maturity (age) of the leaf.

Question 6

(b) Fig. 6.1 lists seven types of plant cell found in leaves.

- 1 epidermal cell
- 2 guard cell
- 3 palisade mesophyll cell
- 4 phloem sieve tube element
- 5 sclerenchyma cell
- 6 spongy mesophyll cell
- 7 xylem vessel element

Question 6

Fig. 6.1

Match the correct type of cell from the list in Fig. 6.1 with each statement, **A** to **E**.

Each cell type can be used once, more than once, or not at all.

The first match has been done for you.

Question 6

[4]

[Total: 6]

Solution 6

(a) Mark scheme

- any two features for sink = 1 mark
- leaf is a sink when
- it is growing
- it is, immature / young / developing / new A before it is mature
- it is not (yet) photosynthesising / cannot make its own sugars / cannot make its own organic compounds / named
- receives, assimilates / photosynthates / organic compounds / named
- it needs energy(-containing compounds)

Solution 6

- any two features for source = 1 mark
- leaf is a source when
- it is mature / not young / developed
- photosynthesising / synthesising assimilates / AW
- translocating assimilates / described e.g. provides assimilates / named, to, other parts of the plant / sinks
- I starch if other correct named, otherwise R
- one mark if only 1 correct feature for sink and 1 correct feature for source
- 2

Solution 6

(b)

Mark scheme

- $B = 2$;
- $C = 4$;
- $D = 3$;
- $E = 1$; A 2 A 1 and 2/4