

9.2 Transport in the Phloem of Plants

Question Paper

Course	DP IB Biology
Section	9. Plant Biology (HL Only)
Topic	9.2 Transport in the Phloem of Plants
Difficulty	Medium

Time allowed: 20
Score: /10
Percentage: /100

Question 1

Which of the following correctly identifies a source and a sink in a plant?

	Source	Sink
A	Sprouting potato tubers	Growing apples
B	Growing apples	Sprouting potato tubers
C	Young, growing potato tubers	Mature leaves
D	Growing apples	Young, growing potato tubers

[1 mark]

Question 2

The following steps describe the process of translocation.

- I. The solute concentration in the phloem sieve tubes increases
- II. The increase in hydrostatic pressure causes phloem sap to flow towards sinks
- III. Organic compounds are actively loaded into phloem sieve tubes
- IV. Water moves into phloem vessels by osmosis

What is the correct order of the steps?

- A. III → II → IV → I
- B. III → I → IV → II
- C. I → III → IV → II
- D. I → IV → III → II

[1 mark]

Question 3

Which of the following statements apply to phloem sieve tubes?

- I. They transport organic compounds from sink to source
- II. They provides mechanical support to the plant
- III. They are closely associated with companion cells to assist with loading of sucrose
- IV. They consist of living cells that form a continuous tube for the transport of phloem sap

- A. I only
- B. II and III only
- C. I, II and IV
- D. III and IV only

[1 mark]

Question 4

Why can the symplastic pathway for loading sucrose be considered a passive process?

- A. Sucrose moves from the companion cell into the sieve tube through plasmodesmata
- B. Sucrose is carried against its concentration gradient into the companion cell through a co-transporter protein
- C. H^+ ions are pumped out of companion cells by proton pumps
- D. Transfer cells contain many mitochondria to provide energy for the proton pumps to work

[1 mark]

Question 5

Which of the following describes the apoplast route along which sucrose is loaded into phloem sieve tubes?

- I. H^+ ions are actively pumped out of the companion cell
- II. Sucrose travels along plasmodesmata to the companion cell
- III. H^+ ions flow down their concentration gradient through a co-transporter protein
- IV. Sucrose is carried across a sieve tube membrane

- A. I only
- B. I and II only
- C. I, II and IV
- D. I, III and IV

[1 mark]

Question 6

Which of the following does **not** contribute to generating a high hydrostatic pressure at the source?

- A. A high solute concentration in phloem sieve tubes due to the loading of sucrose
- B. The incompressibility of water molecules
- C. The rate at which sucrose is converted to starch in storage tissue
- D. Rigid plant cell walls made of cellulose

[1 mark]

Question 7

Girdling, or ring-barking, involves the removal of a strip of bark around the entire circumference of a tree trunk. This removes the outer part of the vascular bundles which results in the death of the entire tree over time.

What could be a possible explanation for this?

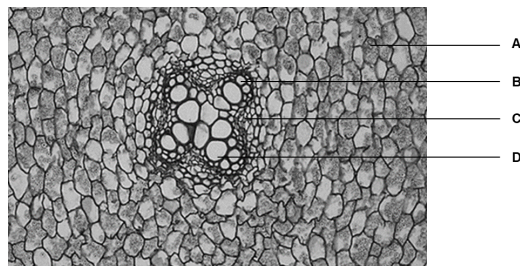
- A. Xylem is removed from the vascular bundles, so water and mineral salts cannot be transported to the leaves
- B. Phloem is removed from the vascular bundles, so sugars cannot be transported to the roots
- C. Xylem is removed from the vascular bundles, so sugars cannot be transported to the roots
- D. Phloem is removed from the vascular bundles, so water and mineral salts cannot be transported to the leaves

[1 mark]

Question 8

The following photomicrograph shows the vascular bundle in a root.

Which letter identifies the phloem?



[1 mark]

Question 9

Aphid stylets can be used to measure phloem transport rates in plants. It was found that the transport rate in stylets located close to a source was much higher compared to those located close to a sink.

What could be a possible explanation for this?

- A. The hydrostatic pressure at a sink is low due to the buildup of sucrose in the phloem sieve elements
- B. The hydrostatic pressure at a sink is high due to water moving into phloem sieve elements by osmosis
- C. There is a high hydrostatic pressure at the source due to the incompressibility of water
- D. There is a low hydrostatic pressure at the source due to a low solute concentration in the sieve tube elements

[1 mark]

Question 10

Why are radioisotopes considered to be such important tools in studying translocation?

- A. It provides a way to track the distribution of molecules between sources and sinks in a plant
- B. To determine the order in which carbon compounds are generated
- C. It provides a way to determine the rate of carbon fixation in a plant
- D. Radioactive molecules contribute to the hydrostatic pressure in xylem vessels

[1 mark]