Exam Papers Practice

9.2 Transport in the Phloem of Plants

Mark Schemes

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

To be used by all students preparing for DP IB Biology HL
Students of other boards may also find this useful

1

The correct answer is **A**. A sprouting potato tuber will utilise its starch reserves for the growth and development of the root and shoot and will therefore be considered a source at this stage instead of a sink, unlike a young, growing tuber which will be building up those starch reserves.

- In **B**, developing fruit will act as a sink while sprouting potato tubers will act as a source for the growing shoots
- In **C**, the growing potato tubers will act as a sink as starch is stored there, while the mature leaves will have a high rate of photosynthesis and act as a source
- In **D**, the growing apples will act as a sink as they are utilising resources from the plant

2

The correct answer is **B**.

Organic compounds are actively loaded into phloem sieve tubes which increases the solute concentration within the tubes. This draws water in from nearby xylem vessels by osmosis, which increases the hydrostatic pressure at the source. This causes phloem sap to flow towards sinks.

3

The correct answer is **D**.

Statement I is incorrect since the transport of organic compounds will always be from the source to sink. **Statement II** is incorrect as it is xylem vessels that provide mechanical support to plant structures, not phloem sieve tubes.

4

The correct answer is **A**, which is the only passive process listed.

B, **C** and **D** are all part of the apoplastic pathway, which is an active process since ATP is required to move sucrose and H^+ ions against their concentration gradients.

5

The correct answer is **D**.

Statement II is not part of the apoplast route because when sucrose travels along plasmodesmata it forms part of the symplast route for loading sucrose into the phloem sieve tubes.

6

The correct answer is **C**.

The conversion of sucrose to starch happens at sinks (such as storage tissues) and requires sucrose to be unloaded from the phloem sieve tubes, which lowers the solute concentration. This causes water to leave the phloem sieve tubes which in turn lowers the hydrostatic pressure.

7

The correct answer is **B**.

Xylem forms the inner part of the vascular bundles in the stem of a plant and therefore remains intact during girdling / ring-barking. Water and mineral salts can therefore still be transported from the roots to the leaves. It is the phloem that is removed and therefore the plant cannot transport sugars to the roots anymore, which kills the plant over a period of time.

8

The correct answer is **C**.

A represents the cortex of the root while **B** and **D** are xylem vessels. Remember that in a dicotyledenous root, the xylem is located at the middle of the centre core of the vascular bundle, while the phloem is located in alternate radial positions on the edges of the centre core.

9

The correct answer is **C** as the incompressibility of water, along with the rigid cell wall, contributes to a build-up of pressure in phloem sieve elements near the source.

- **A** and **B** are incorrect as the hydrostatic pressure at a sink is low due to the unloading of sucrose out of phloem sieve elements followed by water
- **D** is incorrect as there is high hydrostatic pressure at the source due to a high solute concentration in the sieve tube elements, which draws water in from nearby xylem vessels

10

The correct answer is **A**.

B and **C** refers to the use of radioisotopes in investigating carbon fixation in photosynthesis, whereas this question relates to translocation only. **D** is incorrect because translocation refers to the transport of organic solutes in phloem sieve tube elements, not xylem vessels.