

Model Answers: Hard

Q1

The correct answer is **A** because:

- The **xylem** is still **intact** as in dicotyledonous plants the xylem runs through the **middle** of the stem, so water transport to all leaves will be unaffected and none of the leaves should wilt.
- As the **phloem** is located in **rings** around the outer **edge** of the stems of dicotyledonous plants, it has been **removed** from part of the trunk and consequently the lower branch may get less sucrose and amino acids as it can no longer receive any from further up the plant; this could cause **reduced growth**. The leaves higher up the plant will probably receive more light (as lower leaves may be shaded) so have a higher rate of photosynthesis and produce more sucrose as a result.

B is incorrect as	the leaves are unlikely to wilt as the xylem is still intact. Growth in the lower branches is unlikely to be normal.
C is incorrect as	the leaves are unlikely to wilt as the xylem is still intact. Growth in the upper branches is likely to be normal whilst in the lower branches it is likely to be reduced.
D is incorrect as	growth in the upper leaves is unlikely to be affected.

Q2

The correct answer is **B** because:

- **Xylem** vessels are **dead** cells which contain **no** organelles or **cytoplasm**.
- They **lose** their **end walls** during development to form **continuous tubes**.
- Both of these adaptations mean **water** can **flow** through them easily in a continuous stream, as a result of the upwards pull created by **transpiration** in the leaves.

Q3

The correct answer is **A** because:

- **Humidity** is a measure of how concentrated the air is with water vapour.
- When humidity **decreases**, the air surrounding the leaf holds **less water** vapour. A diffusion **gradient** between the air spaces inside the stomatal pores and the air outside the leaves **increases**.
- So as **humidity decreases**, diffusion of water vapour out of the leaf occurs at a **higher** rate. It is much easier for water vapour to diffuse into drier air. This is shown in graph A.

B & C are incorrect as	both graphs show the rate of transpiration increasing as humidity increases, which would mean the rate of transpiration increases when the air surrounding the leaf becomes more saturated with water.
D is incorrect as	graph D shows the rate of transpiration remaining constant as humidity increases, which would suggest no relationship between them.

Q4

The correct answer is **B** as shoot **B** has leaves and so transpiration will occur. The water level in the tube will decrease, leading to a loss in mass.

Shoot **A** has no leaves, so no transpiration will occur and the water level in the tube will remain the same, so there will be no change in mass.

Q5

The correct answer is **D** as:

- **Transpiration** takes place via **stomata**, so the plant that has the lowest stomatal density will have the lowest rate of transpiration.
- **D** has the lowest total surface area (number of leaves x average surface area of one leaf) and also the lowest density of stomata per mm², with each stoma being fairly small in diameter.

Q6

The correct answer is **C** as:

- The **phloem** carries sucrose (and amino acids) in **all directions** from **sources** (which depending on the time of year could be leaves or storage organs like roots) to **sinks** (other areas of the plant where the amino acids and sucrose will be used or stored).
- The **xylem** transports **water** (and mineral ions) in **one direction** up the plant, from the roots to the leaves, driven by the pulling **force** generated by **transpiration** in the leaves.

A is incorrect as	transport in the xylem is unidirectional.
B is incorrect as	the direction of transport in the phloem and the xylem is the wrong way around.
D is incorrect as	transport in the phloem occurs in both directions.