Q1. In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Plants transport many substances between their leaves and roots.

The diagram below shows the direction of movement of substances through a plant.

Describe how ions, water and sugar are obtained and transported through plants.

In your answer you should refer to materials moving upwards in a plant and to materials moving downwards in a plant.

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M1. Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

Level 3 (5–6 marks):
Processes used for obtaining specified materials are given.
and
correctly linked to the vessels that the materials are transported in
or
correctly linked to a description of the direction of movement of the materials.
For full credit, in addition to the above descriptors at least one of the processes must be linked to the vessel that the material is transported in and the direction of the movement of the material.

Level 2 (3–4 marks):
At least one process for obtaining a specified material is given
and
is correctly linked to the vessel that the material is transported in
or
correctly linked to a description of the direction of movement of the material

Level 1 (1–2 marks):
At least one process (P) for obtaining a material is given
or
at least one vessel (V) and the material it carries is given
or
there is a description of the direction of movement (M) for at least one material

0 marks:
No relevant points are made

examples of points made in the response ions:
(P) taken up by diffusion or active transport
• from an area of high to low concentration (diffusion) or an area of low to high concentration (active transport)
(V) travels in the xylem
(M) to the leaves or from the roots / soil

Water:
(P) taken up by osmosis
• from an area of low to high concentration
  allow high concentration of water to low concentration of water
  allow from high water potential to low water potential
  ignore along a concentration gradient
(V) travels in the xylem
(M) to the leaves or from the roots / soil
(P) transpiration stream
• movement replaces water as it evaporates from leaves
(V) in the xylem

Sugar:
(P) made during photosynthesis
(V) travels in the phloem
(M) to other parts of the plant or to storage organs or travels up and down.
E1. Foundation

This QWC question was well attempted and over half of all students gained credit in level 1. A small percentage gained credit in level 2, and very few gained credit in level 3. Only a small percentage did not attempt an answer.

Students were able to access some of the marks in this question fairly easily. Students who were able to link a process with a movement direction or vessel linked to the correct material accessed level 2 and those students that were able to make links with two processes and their movement or correct vessel were able to access level 3.

Many students linked water and ions with the movement from roots to leaves but did not as frequently link this with the processes involved, ie osmosis and active transport. This movement was however more frequently linked with the transpiration stream. Xylem was frequently connected with the transport of water and less frequently with the transport of ions.

The link between photosynthesis and the production of sugar was commonly known and some students knew that sugar was carried in the phloem, but the direction in which the sugars were moved was often vague with statements that said water and sugars were moved up and down the plant.

A large number of students started their answer to this question by stating that sugars, water and ions were transported in the xylem and phloem. Unless later in their answer it was made clear which vessels transported which material, then students were unable to score marks for connecting the vessel with the material it transports.

Higher

This QWC question discriminated well and the division of marks gained in levels 1, 2 and 3 were evenly distributed at approximately a third of all students scoring in each level. Only a very small percentage did not attempt an answer.

There were many excellent answers gaining the full number of marks available despite the question being plant biology, which is often not as favoured by students as other animal biology questions.

Students seemed to understand how ions and water were obtained from soil and how they
were transported to the leaves. The best answers often separated the three substances and discussed each one separately. In these answers students were less likely to lose marks for incorrect processes or transportation detail. Commonly students did not gain credit because they described ions and sugar travelling in the phloem or for stating that ions, water and sugar are taken up from the soil via the roots.

It was clear that many students understand the transpiration story and gave excellent detail referring to the evaporation of water from the stomata, which draws water up through the xylem. Descriptions relating to sugar were rather less well understood and a significant number seemed to think that sugar is obtained from the soil. The role of xylem was better described than phloem. In the best answers students did appreciate that movement in phloem is bidirectional.

The Quality of Written Communication element of this question did not often cause any problems, and the quality of punctuation, spelling and organisation at least matched the level of biological knowledge expressed.