Mark schemes

Q1.

(a) Correct answer for 2 marks = 14/14.02/14.024;;

Accept for 1 mark,
mean = 8.2

OR

uncertainty = 1.15

2

(b) 1. Sucrose actively transported (into phloem);

2. Lowering/reducing water potential

OR

More negative water potential;

3. Water moves (into phloem) by osmosis (from xylem);

3

(c) Phloem pressure falls as (rate of) water movement (in xylem) increases

OR

Inversely proportional;
Accept converse

1

(d) 1. High (rate of) transpiration/evaporation;

2. Water lost through stomata

OR

(High) tension in xylem;

3. (Causes) less water movement from xylem to phloem

OR

Insufficient water potential in phloem to draw water from xylem;

3

[9]

Q2.

(a) 1. Initial **and** final mass (of beaker and all contents);
Accept change in mass/weight
Ignore volume

Reject change in mass of celery/beaker/water alone

2. Number of (groups of) xylem vessels;
Accept amount for 'number'

2

(b) Prevent evaporation/water loss
OR
(So) evaporation/water loss/transpiration only from celery;

1

(c) 1. Water evaporates/is transpired (from leaves/ stalk/celery/plant);

2. Water potential gradient/lower water potential creates tension/pulls up water
OR
Osmosis creates tension/pulls up water;
Accept negative pressure for tension

3. Hydrogen bonds/cohesion/adhesion maintains column;

3

(d) 1. Cut away from body;
Accept description of cutting technique to avoid cutting fingers

2. Against hard/non-slip/flat surface;
Accept named hard surface eg tile/board

2

(e) Median (no mark)

1. (Presence of) outliers/80/70
OR
Small sample size/8 (measurements);
Accept anomalies / extremes for 'outliers'

2. 41;

Accept for 1 mark,

Mean of 47

OR

Mode of 35

2

[10]

Q3.

(a) Short diffusion pathway (to cells)
OR
It has a surface permeable (to water/ions into cells);
Accept the idea of not needing structural support as

supported by the water.

Ignore pores/stomata

1

Q4.

(a) 1. Used to compare effect of other treatments / as a baseline;

Accept for 2 marks, substance (X) and not agar / block / water that caused the difference in the number of roots.

Do not accept unqualified reference to "compare results".

2. Shows / Measures effect of substance (X);
OR

Accounts for effect of substances produced naturally;

Accept measures effect of independent variable

2

(b) 1. (**D** shows) substance (X) is not required for (some) root growth / production of roots;
OR
Substances (already) present in stem cause (some) root growth;

2. Substance X moves through plant;

Accept X moves through stem / phloem

3. (**E** shows) substance (X) causes / increases / doubles number of roots / root growth;

3

(c) **In support of mass flow hypothesis**

1. (**F** shows) phloem is involved;

2. (**G** shows) respiration / active transport is involved (in flow / movement);

3. Because 4 °C / cooling reduces / slows / stops flow / movement;

4. The agar block is the source;

5. Roots are the sink;

Against the mass flow hypothesis

6. No bulge above ringing (in **F**);

7. No (role for) osmosis / hydrostatic pressure / water movement;

Accept no turgor pressure

8. Movement could be due to gravity;

9. Roots still grow without (intact/functioning) phloem;

10. No leaves / sugars / photosynthesis to act as a source;

Each point must be clearly made in the context of support or against.

Ignore sugar / sucrose

3 max for "support" and 3 max for "against"

4 max

[9]

Q5.

(a) **EITHER**

1. The radioactively labelled carbon is converted into sugar/organic substances during photosynthesis;

For 'organic substance' accept named organic substance, eg glucose, sucrose, amino acid.

2. Mass flow/translocation in the phloem throughout the plant only in plants that were untreated/**B**/control
OR
Movement of sugar/organic substances in the phloem throughout the plant only in plants that were untreated/B/control;

*Accept 'translocation/mass transport in the phloem past the heat treatment only in the untreated plant/**B**/control'.*

Accept converse for heat-treated plant/A ie Movement of sugar/organic substances/mass flow/translocation in the phloem stops (beyond the heat treatment) in treated plants/A.

OR

3. Movement in phloem requires living cells/respiration/active transport/ATP;

4. Heat treatment damages living cells **so** transport in the phloem throughout the plant only in plants that were untreated/**B**/control
OR
Heat treatment stops respiration/active transport/ATP production **so** transport in the phloem throughout the plant only in plants that were untreated/**B**/control;

Do not mix and match – award either mp1 and mp2 or mp3 and mp4.

2

(b) 1. (The water content of the leaves was) not different because (means ± 2) standard deviations overlap;

For 'not different' accept 'difference is not significant' or 'difference due to chance'.

2. Water is (therefore) still being transported in the xylem (to the leaf)

OR
Movement in xylem is passive **so** unaffected by heat treatment;

2

(c) 1. Heat treatment has a greater effect on young leaves than old;
Accept description of no/little/(slight) increase effect in old leaves and change in young leaves.

2. Heat treatment damages the phloem;

3. Fe^{3+} moves up the leaf/plant;

4. (Suggests) Fe^{3+} is transported in the xylem in older leaf;

5. In young leaf, some in xylem, as some still reaches top part of leaf;

6. (Suggests) Fe^{3+} is (mostly) transported in phloem in young leaf
OR
Xylem is damaged in young leaf
OR
Xylem is alive in young leaf;

7. Higher ratio of Fe^{3+} in (all/untreated) old leaves than (all/untreated) young;
Accept 'more at the top' for 'higher ratio'.

8. All ratios show there is less Fe^{3+} in the top than the lower part of leaves;

9. (But) no statistical test to show if the difference(s) is significant;
Accept '(But) no standard deviations to show if the difference(s) is significant'.

4 max

[8]

Q6.

(a) 1. Water lost from leaf because of transpiration / evaporation of water (molecules) / diffusion from mesophyll / leaf cells;
OR
Transpiration / evaporation / diffusion of water (molecules) through stomata / from leaves;
2. Lowers water potential of mesophyll / leaf cells;
3. Water pulled up xylem (creating tension);
4. Water molecules cohere / 'stick' together by hydrogen bonds;
5. (forming continuous) water column;
6. Adhesion of water (molecules) to walls of xylem;
2. Accept Ψ or WP

5 max

Q7.

(a) Correct answer 23.55 – 24 two marks;
For one mark

5.9
OR
94.2;

2

(b) 1. Method for measuring area;
e.g. draw round (each) leaf on graph paper and count squares;
2. Of both sides of (each) leaf;
3. Divide rate (of water loss / uptake from potometer) by (total) surface area (of leaves);

3

(c) Plant has roots
OR
xylem cells very narrow;

Ignore references to air bubbles / mass flow / photosynthesis

Accept xylem damaged when cut

1

Q8.

(a) 1. In source / leaf sugars actively transported into phloem;
2. By companion cells;
3. Lowers water potential of sieve cell / tube and water enters by osmosis;
4. Increase in pressure causes mass movement (towards sink / root);
5. Sugars used / converted in root for respiration for storage.

Accept starch

4 max

(b) Respiration.

1

(c) 1. (About) 30 hours;
2. Time between peak ^{14}C at top of trunk and bottom.

2

(d) Length of trunk (between top and bottom).

1

[8]