Answers to EOCQs

Chapter 7

The mark schemes, suggested answers and comments that appear in this CD-ROM were written by the author(s). In examinations, the way marks would be awarded to answers like these may be different.

Notes about mark schemes

A or **accept** indicates an alternative acceptable answer.

R = reject. This indicates a possible answer that should be rejected.

; The **bold** semi-colon indicates the award of 1 mark.

/ This indicates an alternative answer for the same mark. The alternatives may be separated from the rest of the answer by commas.

( ) Text in brackets is not required for the mark.

<u>Underlining</u> This is used to indicate essential word(s) that must be used to get the mark.

AW means 'alternative wording'. It is used to indicate that a different wording is acceptable provided the essential meaning is the same, and is used where students' responses are likely to vary more than usual.

AVP means 'additional valid point'. This means accept any additional points given by the student that are not in the mark scheme, provided they are relevant. But accept only as many additional points as indicated by the bold semi-colons, e.g. **AVP;;** means award a maximum of 2 extra marks.

ORA means 'or reverse argument' and is used when the same idea could be expressed in the reverse way. For example: 'activity increases between pH 2 and pH 5 **ORA**' means accept 'activity decreases between pH 5 and pH 2'.

max. This indicates the maximum number of marks that can be given.

1 A**;**   [1]

2 B**;**   [1]

3 C**;**   [1]

4 **a** *refer to pages 131–132 1 mark for each valid point up to a max of 3*   [3]

   b *refer to pages 129–131 1 mark for each valid point up to a max of 4*   [4]

   c *refer to pages 127–129 1 mark for each valid point up to a max of 3*   [3]

   [Total: 10]

5 **a i** vessel <u>elements</u>**;**
            tracheids**;**
            parenchyma**;**
            fibres**;**   [max. 3]

      ii sieve (tube) <u>elements</u>**;**
            companion cells**;**
            parenchyma**;**
            fibres**;**   [max. 3]

   b *vessel element*:
       transport of water / support / transport of mineral ions**;**
       tracheid:
       transport of water / support / transport of mineral ions**;**
       sieve element:
       transport of, sucrose / organic solutes**;**
       companion cells:
       loading / unloading, phloem (sieve element) / forms functional unit with sieve element**;**
       parenchyma:
       storage / gas exchange**;**
       fibres:
       support / mechanical strength**;**
                                         [max. 4]
                                      [Total:10]

6 soil solution > root hair cell > xylem vessel contents > mesophyll cell > dry atmospheric air**;**   [1]

7 a the lower the relative humidity, the **higher** the tension / the **lower** the hydrostatic pressure, in the xylem**;**
more evaporation from leaf (mesophyll cells) when low relative humidity**;**
results in lower water potential in leaf (mesophyll cells)**;**
therefore more water moves from xylem (vessels to replace water lost from leaf)**;**
down a water potential gradient**;**
sets up tension in the xylem vessels**;** [max. 4]

b lowest / most negative, hydrostatic pressure is at the top of the tree**; ORA**
because water is being lost at the top of the tree**;**
this sets up a tension which is greatest at the top of the tree**;**
there is a, hydrostatic pressure / tension, gradient in the xylem vessels**;**
some pressure is (inevitably) lost on the way down the tree**;** [max. 3]
[Total: 7]

8 transpiration / loss of water vapour / loss of water by evaporation, from the leaves occurs during the day**;**
because the stomata are open**;**
this results in tension in the xylem (vessels)**;**
walls of xylem vessels are pulled slightly inwards / vessels shrink slightly**; AW**
overall effect is for diameter of whole trunk to, shrink / get smaller**;**
stomata close at night, so no transpiration at night**;** [max. 3]

9 a the loss of water <u>vapour</u>**;**
from the leaves / from the surface of a plant**;** [2]

b light intensity**;**
temperature**;** [2]

c rate of water uptake shows the same pattern as rate of transpiration**; AW**
but there is a time delay, with changes in rate of transpiration occurring before changes in water uptake**; AW** [2]

d transpiration causes water uptake**;**
loss of water (by transpiration) sets up a water potential gradient in the plant**;**
water potential in roots is lower than water potential in soil**;**

therefore water enters plant through roots**;**
time delay between rate of transpiration and rate of water uptake is due to time taken for effect of transpiration to be transmitted through the plant**; AW** [max. 4]
[Total: 10]

10 a to rinse out / remove, any existing K^+ ions from the root**;**
present in the apoplast**;** [2]

b there is a rapid initial uptake of K^+ ions**;**
lasts for about 10 minutes**; accept** 10–20 minutes**;**
the rate of uptake then slows down and remains steady / linear / continuous**;** [3]

c rapid uptake of K^+ ions for first 10–20 minutes / as Expt A for first 10–20 minutes**;**
but not quite as rapid as Expt A / at 25 °C**;**
then no further uptake**;** [3]

d initial rapid phase of uptake is due to uptake of K^+ ions into the apoplast**;**
by mass flow**;**
or by diffusion**;**
second phase / after 10–20 minutes due to active transport**;**
which happens as soon as uptake starts (0 minutes)**;**
at 0 °C enzyme activity is reduced / stops**;**
therefore no active transport (because active transport depends on respiration which is controlled by enzymes)**;** [max. 5]

e no further uptake of K^+**;** [1]

f inhibits respiration, therefore inhibits active transport**;**
which is dependent on ATP produced during respiration**;** [2]
[Total: 16]

11 a hydrogen ions are actively transported out of the, sieve element–companion cell**;** [1]

b there are more hydrogen ions / there is a build-up of hydrogen ions, outside the sieve element–companion cell units compared with inside**;**
hydrogen ions are positively charged**;** [2]

c ATP is needed for the active transport of hydrogen ions out of the tubes**;** [1]
[Total: 4]

12 **a** actual length = observed length/
magnification **or** $A = I/M$**;**
observed length of sieve element = 50 mm
(allow ±1 mm)**;**
actual length = 50 mm/150 = 0.50 mm**; accept**
conversion of mm to µm: answer = 500 µm [3]

b i 1 metre = 1000 mm**;**

1000/0.50 = 2000**;**

or

1 metre = 1 000 000 µm**;**

1 000 000/500 = 2000**;**   [2]

ii to maintain the pressure gradient inside
the sieve tubes**;**

without the sieve plates the different
pressures at source and sink would
quickly equilibrate**;**   [max. 1]

iii sieve pores**;**   [1]

c (sieve element is 0.50 mm long)
(1 hour = 3600 seconds)
3600 seconds to travel 1 metre**;**
therefore: 0.50/1000 × 3600 seconds to travel
0.50 mm**;**
= 1.8 seconds (to one decimal place)**;**
Accept 500 µm and 1 000 000 (µm) instead of
0.50 mm and 1000 (mm).   [3]
                [Total: 10]

13 **a i** when seed is forming / just after
fertilisation**;**   [1]

ii germination**;**   [1]

iii young immature leaf / leaf that is still
growing**;**   [1]

iv mature photosynthesising leaf**;**   [1]

v when food is being accumulated / when
storage organ is growing (in size) /
developing / end of plant's growing season
/ just before winter**;**   [1]

vi when plant starts to grow (using food from
the storage organ)**;**   [1]

b i to make starch**;**

respiration**;**   [2]

ii to make cellulose**;**

respiration**;**   [2]
                [Total: 10]