

QUESTIONSHEET 1

- (a) (i) increased solute pressure;
lowers their water potential;
thus water enters by osmosis; max 2
- (ii) inner wall has extra thickening/uneven wall thickening;
causes differential expansion when cytoplasm presses on it (opening stoma); 2
- (b) process which returns system to the norm/equilibrium;
drying of cells leads to stomatal closure/converse;
fall in CO₂ concentration leads to stomatal opening/converse; max 3
- (c) loss of water kills plants/reduces leaf surface area/reduces light absorption;
but stomata must be open for entry/exit of CO₂/O₂;
also transpiration stream enables transport of salts /transpiration has a cooling function; max 2
- TOTAL 9**
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QUESTIONSHEET 2

- (a) obtain epidermal strip/impression using nail varnish or similar;
observe under low power light microscope with eyepiece/slide grid/micrometer;
count number of stomata in stated area;
repeat to obtain mean; 4
- (b) (i) B;
similar stomatal density on both surfaces in B; 2
- (ii) A;
has lowest stomata density/least stomata;
thus less chance of water loss occurring too quickly/less chance of wilting; 2
- TOTAL 8**
-

QUESTIONSHEET 3

- (a) X = tracheid;
Y = vessel; 2
- (b) large leaf surface area and many stomata;
result in much water loss by transpiration;
this must be replaced from transpiration stream;
vessels can transport greater volumes/faster than tracheids; 4
- (c) (i) phloem;
sieve tube;
companion cell;  3
- (ii) the bulk transport of materials from one point to another;
as a result of pressure difference between the two points; 2
- TOTAL 11**

QUESTIONSHEET 4

- (a) (i) potometer; 1
(ii) the rate of water uptake by the shoot; 1
(iii) movement of bubble indicates volume of water taken up by the shoot; 1
- (b) (i) cut shoot underwater;
keeping leaves dry;
set up complete apparatus underwater;
keep all joints air tight/prevent unwanted bubbles entering; max 3
- (ii) use a fan at different speeds for air currents;
allow at least 15 minutes to acclimatise;
set air bubble to start of scale using water in reservoir (and tap);
measure distance air bubble moves in a specific time;
repeat 3 times at each air speed and calculate means; max 4
- TOTAL 10**

QUESTIONSHEET 5

- (a) (i) A = vessel/vessel unit; 2
B = tracheid;
- (ii) xylem; 1
- (iii) parenchyma;
fibre/sclerenchymatous fibre; 2
- (iv) lignin;
to allow elongation during stem growth/if it was solid it would not stretch; 2
- (b) (i) conduction of water and salts;
mechanical support;
- (ii) cell contents have died so it is hollow allowing water flow;
end cell walls have broken down forming a continuous tube giving unimpeded water passage;
lignin gives rigidity giving some mechanical strength/keeping tube open; 3
- TOTAL 12**

QUESTIONSHEET 6

- (a) (i) A = guard cells;
B = accessory cells of stoma;
C = epidermal cells; 3
- (ii) to allow stomata to close to reduce water/transpiration loss/preventing wilting; } (to allow transpiration = 1)
to allow stomata to open to enable transpiration for cooling;
- to enable oxygen entry through stomata for respiration; } (to allow gas exchange = 1)
to enable carbon dioxide entry through stomata for photosynthesis; 4
- (iii) cells A can photosynthesise and thus accumulate sugars/use up CO₂ ;
which initiates the mechanism for stomatal opening; 2
- (b) (i) $\frac{4 \times 1.000}{0.0105} ; = 381$ (stomata mm²) ; (units in the question so not essential in the answer) 2
- (ii) assumption that the stomata are randomly distributed (and they may not be); 1

TOTAL 12

QUESTIONSHEET 7

- (a) (i) in angiosperms main xylem conducting tissue is vessels;
where as in gymnosperms it is tracheids;
angiosperms have broader leaves/more stomata than gymnosperms; **max 2**
- (ii) removal of bark removes phloem;
responsible for transport of sugars to fruit;
to enable fruit development/formation of food store in fruit; **max 2**
- (iii) movement/uptake/loading of sucrose from mesophyll cells to phloem is active/requires ATP;
metabolic inhibitors stop respiration/prevent ATP manufacture; **2**
- TOTAL 6**
-

QUESTIONSHEET 8

- (a) for storage;
to provide energy for fruit/tomato development;
to make fruits/tomatoes attractive to animals;
for animal dispersal; **max 3**
- (b) end walls of sieve tube elements are perforated/ref to sieve plates;
cytoplasm of sieve tube element is thin/peripheral/contains few organelles/has no nucleus;
cellulose cell walls allow exchange of substances across them;
ref to elongated sieve tubes; **max 3**
- TOTAL 6**
-

QUESTIONSHEET 9

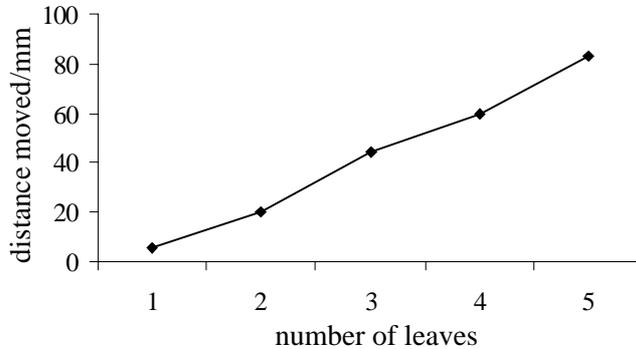
- (a) A: piliferous layer; (reject 'epidermis')
B: endodermis;
C: xylem;
D: phloem;
E: root hair; **5**
- (b) (i) B Function: control entry of water/salts into xylem ;
Adaptation: Casparian strip/lignin deposit in walls/on radial walls (blocks apoplastic path); **2**
- (ii) E Function: absorb water/salts;
Adaptation: large surface area/single cells/extensions of piliferous layer; **2**
- TOTAL 9**

QUESTIONSHEET 10

- (a) ensure all apparatus is full of water/contains no air;
cut shoot under water;
use grease/vaseline in all joints to prevent leakage;
keep leaves dry;

max 2

(b) (i)



- one for correct scale;
one for correct labelled axes; (no. of leaves on X-axis)
one for correct plot;
one for joining points with a ruled straight line; (IOB recommendations)

4

- (ii) distance moved by bubble decreases as number of leaves decreases;
as less water is lost from leaves by transpiration;
less water is drawn up the stem/xylem;
less water absorbed by shoot;

max 3

- (iii) that water uptake equals water lost from leaves;

1**TOTAL 10****QUESTIONSHEET 11**

- (a) thick epidermis on lower/abaxial/outer surface;
prevents diffusion of water;

no stomata on abaxial/lower/outer surface;
reduces evaporation/transpiration/diffusion loss of water;

leaf is rolled; confines/protects inner tissues/reduces/reduces diffusion gradient;

hairs; reduce air movement;

large epidermal/hinge cells; shrink to roll leaf when transpiration high;

sunken stomata; reduces transpiration; (any two pairs of mark points)

max 4

- (b) water evaporates from mesophyll cells into air spaces;
diffuses out of stoma;
loss of water from cells reduces their water potential relative to adjacent cell;
water moves from cell with higher water potential to cell with lower water potential (etc);
water drawn into mesophyll cells from xylem;
water drawn up xylem;
cohesive force between water molecules;
adhesion force between water molecules and xylem cells;
ref to water drawn across root cortex from root hairs to xylem;
ref apoplast/symplast/vacuolar pathways;

max 6**TOTAL 10**

QUESTIONSHEET 12

- (a) defoliation causes sugar concentration to fall;
suggests the source is the leaves; 2
- (b) sugars move from sources/leaves to sinks/storage areas/main stems;
sugars actively taken up by phloem companion cells;
and passed to sieve tubes;
water follows osmotically/along water potential gradient;
creates hydrostatic pressure;
sugars removed from phloem at sink and water follows;
hydrostatic pressure difference between source and sink creates mass flow; max 4

TOTAL 6
