

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	as a control / as a comparison with no petroleum jelly		1	AO2 2.3.2
01.2	balance	do not accept scales	1	AO2 2.3.2
01.3	points plotted correctly	allow one plotting error plots to $\pm 1$ mm	2	AO2 2.3.2
	smooth curve of best fit		1	MS4c
01.4	D water is lost from both surfaces		1	AO2
			1	2.3.2
02.1	stoma labelled (gap between cells on the lower surface of the leaf)		1	AO2 2.3.2
02.2	when less water is available the guard cells close this reduces rate of diffusion of water vapour out of leaf / plant loses less water through transpiration	accept converse	1	AO1
			1	2.3.2
02.3	30 $\mu\text{m}$	accept answer in range 25 – 40 $\mu\text{m}$ $\left(\frac{250}{(6-8)}\right)$	1	AO2 2.3.2 MS1d
03.1	loss of water vapour from leaves of plants by evaporation from the surface of cells and diffusion through the stomata		1	AO1
			1	2.3.2

Question	Answers	Extra information	Mark	AO / Specification reference
03.2	rate of transpiration < rate of water uptake some water taken in is used in photosynthesis		1 1	AO2 2.3.2
03.3	points plotted correctly straight line of best fit	line must include 0,0	1 1	AO2 MS4a
03.4	<u>directly</u> proportional	do not accept simply 'proportional'	1	AO2 2.3.2
03.5	12.5 min	accept in range 12 – 13 min	1	AO2 2.3.2 MS4a
03.6	rate = change / time $= \frac{8}{10}$ = 0.8 mm/min	give mark if implied by the calculation	1 1 1 1	AO2 2.3.2 MS3d
03.7	gradient would be steeper as the rate of transpiration would be greater		1 1	AO2 2.3.2 MS4a
04.1	vascular bundle		1	AO1 2.3.2
04.2	movement of (dissolved) sugars (from the leaves to the rest of the plant)		1	AO1 2.3.2

Question	Answers	Extra information	Mark	AO / Specification reference
<b>04.3</b>	any <b>four</b> from: <ul style="list-style-type: none"> <li>• phloem – living, xylem – dead</li> <li>• xylem contains lignin</li> <li>• which builds up in spirals in cell walls</li> <li>• forms one continuous hollow tube</li> <li>• phloem contains sieve plates</li> <li>• phloem cells supported by companion cells</li> </ul>		4	AO1 2.3.2 1.1.3
<b>04.4</b>	phloem contains dissolved sugars (which the greenfly feed on)		1	AO2 2.3.2
<b>05.1</b>	place several strips of (nail) varnish on the leaf/several leaves and allow to dry peel the varnish off the leaf and place on a microscope slide observe the strip of varnish (under a set magnification) and count stomata in the field of view		1 1 1	AO2 2.3.2
<b>05.2</b>	$\frac{36+42+35+41+37}{5}$ = 38	award 2 marks for correct answer with no working shown award 1 mark for 38.2	1 1	AO2 2.3.2 MS 2a, b
<b>05.3</b>	upper surface is exposed to the sun / greater heat which would cause greater rate of evaporation if stomata were on top side	accept converse	1 1	AO1 2.3.2

Question	Answers	Extra information	Mark	AO / Specification reference
06.1	palisade mesophyll		1	AO2 2.3.2
06.2	contains chloroplasts		1	AO1 1.1.3 2.3.2
06.3	osmosis from a region of high water concentration to a region of lower water concentration		1 1	AO1 1.3.2 2.3.2
06.4	<b>Level 3:</b> The descriptions are detailed and accurate. The reasons given are clear and coherent.		5–6	AO1 1.1.3 2.3.2
	<b>Level 2:</b> The descriptions are correct, although lack detail. Reasons are given for some, although these may not be clearly explained.		3–4	
	<b>Level 1:</b> The descriptions lack clarity and coherence		1–2	
	<b>No relevant content.</b>		0	

Question	Answers	Extra information	Mark	AO / Specification reference
	<p><b>Indicative content:</b></p> <p><b>top of leaf:</b></p> <ul style="list-style-type: none"> <li>• (tightly packed) palisade cells</li> <li>• contain many chloroplasts for photosynthesis</li> <li>• upper cells protected by epidermis</li> <li>• waxy surface reduces water loss from upper surface</li> </ul> <p><b>middle of leaf:</b></p> <ul style="list-style-type: none"> <li>• spongy mesophyll cells</li> <li>• have large air spaces / surface area to maximise gas exchange</li> <li>• xylem supplies water for photosynthesis</li> <li>• phloem transports dissolved sugars from photosynthesis to plant</li> </ul> <p><b>lower part of leaf:</b></p> <ul style="list-style-type: none"> <li>• stomata open or close through action of guard cells</li> <li>• to let carbon dioxide diffuse in</li> </ul> <p>to allow oxygen / water vapour to diffuse out</p>			
<b>07.1</b>	<p>large surface area available for water / minerals to move into the cell</p> <p>large permanent vacuole to speed up movement of water into cell by osmosis</p> <p>many mitochondria to release energy needed for active transport of mineral ions into the cell</p>		<p>1</p> <p>1</p> <p>1</p>	<p>AO1</p> <p>1.1.3</p> <p>2.3.2</p>

Question	Answers	Extra information	Mark	AO / Specification reference
07.2	process Y – active transport concentration of mineral ions is usually lower in soil than in plant cells		1 1	AO2 1.3.1 1.3.3 2.3.2
07.3	xylem		1	AO1 1.1.3 2.3.2
07.4	any <b>one</b> from: <ul style="list-style-type: none"> <li>• magnesium – for chlorophyll manufacture</li> <li>• nitrates – to produce amino acids / proteins</li> </ul>	both mineral and use required for mark accept other correctly named mineral and its use	1	AO1 1.3.3 2.3.2
08.1	radius = 0.20 mm area visible = $\pi r^2$ area = $\pi \times 0.20^2 = 0.13 \text{ mm}^2$ density = $\frac{\text{number}}{\text{area}}$ $= \frac{6}{0.13}$ = 46(.1) stomata / $\text{mm}^2$	award 3 marks for $0.13 \text{ mm}^2$  ecf for incorrectly calculated area  46.1 stomata / $\text{mm}^2$ scores 5 marks	1 1 1  1  1	AO2 2.3.2 MS1c MS3d
08.2	trace shape of leaf onto ( $\text{cm}^2$ ) graph / squared paper count squares contained within outline – count $\frac{1}{2}$ square or more, ignore $< \frac{1}{2}$ square	accept answer which converts complex shape into simple shapes (rectangles / triangles), area is sum of area of shapes	1 1	AO3 MS5c

Question	Answers	Extra information	Mark	AO / Specification reference
08.3	$46(.1) \text{ stomata} / \text{mm}^2 = 4600 \text{ stomata} / \text{cm}^2$ total stomata = density $\times$ area $= 4600 \times 8$ $= 36\,800$	ecf for incorrectly calculated density	1 1 1	AO2 MS3d
08.4	fewer stomata because upper surface is exposed to the sun / greater heat which would cause greater rate of evaporation if stomata on top side		1 1 1	AO2 2.3.2
09.1	loss of water vapour from leaves of plants by evaporation from the surface of cells and diffusion through the stomata		1 1	AO1 2.3.2
09.2	Impermeable		1	AO1 2.3.2
09.3	Rolled shape reduces surface area exposed to less humid air / wind / heat Leaf hairs / rolled shape trap moist air, increasing the humidity within the structure Stomata in pits minimise surface area / exposure to ambient air for diffusion		1 1 1	AO3 2.3.2

Question	Answers	Extra information	Mark	AO / Specification reference
10.1	length = 50 mm	accept 48 – 52 mm	1	AO2
	magnification = $\frac{\text{apparent size}}{\text{actual size}}$		1	1.1.5 2.3.1
	= $\frac{50}{0.25}$ = $\times 200$		1	2.3.2 MS 1c MS3d
10.2	xylem vessels have a larger diameter		1	AO2 2.3.1 2.3.2
10.3	lignin		1	AO1 2.3.1 2.3.2
10.4	add stain to water and place stem of plant into water		1	AO2
	leave for water to be taken into the stem / absorbed via the xylem vessels / move due to transpiration stream		1	2.3.1 2.3.2
	cut a cross section of stem to view the stained vascular bundle (using a microscope)		1	

Question	Answers	Extra information	Mark	AO / Specification reference
10.5	any six from: <ul style="list-style-type: none"> <li>• if deer eat new growth / shoots, there are fewer leaves for photosynthesis</li> <li>• to produce food / energy for the plant to grow</li> <li>• if deer eat bark / rub antlers against bark to mark territory the phloem would be damaged / destroyed</li> <li>• phloem required to transport sugars made by photosynthesis around plant</li> <li>• by translocation</li> <li>• if phloem damaged, dissolved sugars will not be delivered so affecting / preventing growth of sapling as sugars are needed to produce new cells</li> <li>• lack of sugars prevent respiration in tree cells</li> <li>• reducing the energy available for growth</li> <li>• protective collar is placed to prevent new shoots / bark being eaten / antler damage to bark until the sapling is fully established</li> </ul>		6	AO3 2.3.2