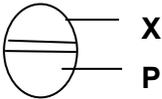


Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	<u>Stoma</u> (ta) ;	1	
	(a)	(ii)	<p><i>idea of:</i> unevenly thickened (cell) <u>wall</u> ;</p> <p>able to, change shape / bend ;</p> <p>transport proteins / ion pumps, in plasma membrane ;</p> <p>(presence of) chloroplasts (to provide, ATP / energy) ;</p>	2 max	<p>Statement should be comparative CREDIT wall beside pore <u>thicker</u> / wall is <u>thicker</u> on one side ACCEPT refs to: thick inner and thin outer walls / inner wall <u>thicker</u> / outer wall <u>thinner</u> ACCEPT thickened for thicker</p> <p>CREDIT so can bend DO NOT CREDIT 'contract' 'recoil' 'move' IGNORE functions such as 'open / close stoma' 'flexible' 'expand' 'stretch' 'bulge'</p> <p>ACCEPT mitochondria IGNORE chlorophyll DO NOT CREDIT 'produce / make energy'</p>
	(a)	(iii)	epidermis / cuticle ;	1	<p>Mark the first answer. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT guard cell IGNORE 'surface'</p>

Question		Expected Answers	Marks	Additional Guidance
	(b)	<u>water potential</u> ; <u>osmosis</u> ; selectively / partially / differentially, <u>permeable</u> ; <u>turgidity / turgor (pressure)</u> ;	4	Mark the first answer on each prompt line. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks DO NOT CREDIT water potential gradient IGNORE ψ IGNORE diffusion DO NOT CREDIT semi permeable ACCEPT 'turgidness' IGNORE shape / rigidity / stability

Question		Expected Answers	Marks	Additional Guidance
	(c)	<p><u>evaporation</u> at top of, plant / xylem ;</p> <p>(creates) tension in <u>xylem</u> ;</p> <p>water <u>molecules</u>, stick together / are cohesive / form a chain or column ;</p> <p>(column / chain) pulled up (by tension);</p>	3 max	<p>IGNORE refs to adhesion / capillarity</p> <p>ACCEPT leaf or named part of leaf</p> <p>IGNORE ref to transpiration / loss of water vapour</p> <p>IGNORE xylem (vessels) under tension</p> <p>CREDIT water molecules, attracted together / (hydrogen) bonded together / form a continuous stream</p> <p>IGNORE column, moves up / sucked up</p> <p>ACCEPT column drawn up</p> <p>ACCEPT description if linked to tension at top e.g. tension at top forces water up</p> <p>DO NOT CREDIT chain 'pushed' up xylem</p>
		Total	11	

Question			Answer	Mark	Guidance
2	(a)	(i)	letter X marking upper part of vascular bundle and letter P marking lower part of vascular bundle ;	1	 <p>ACCEPT Xylem & Phloem DO NOT CREDIT Y</p>
		(ii)	vascular bundle / vein ;	1	IGNORE tissue / midrib
	(b)	(i)	(the charged particles are) hydrogen ions / H^+ / protons ; (ions are) moved out of the cells / move into surrounding (solution) ;	2	<p>IGNORE descriptions of observations 2 and / or 3 IGNORE ref to OH^- / alkaline substances</p> <p>Note do not need to refer to hydrogen ions for mp 2</p> <p>Note that 'hydrogen ions move out of the cell' = 2 marks</p>
		(ii)	active transport involved / cyanide prevents active transport / (mechanism) is active / (mechanism) needs energy / (mechanism) needs ATP ;	1	<p>IGNORE descriptions of observation 4 e.g. no ATP is made</p> <p>IGNORE 'mechanism / active loading, does not work in presence of cyanide' as too vague</p>
	(c)	(i)	active transport ; concentration / pH / H^+ / proton / electrochemical ; facilitated ; diffusion ; amino acids ;	5	<p>Mark the first answer. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE active loading</p> <p>IGNORE high DO NOT ACCEPT diffusion</p> <p>ACCEPT facilitated diffusion</p> <p>ACCEPT plasmodesmata DO NOT CREDIT facilitated diffusion</p> <p>DO NOT CREDIT glucose / fructose / ions</p>

Question		Answer	Mark	Guidance
	(ii)	many / large, <u>mitochondria</u> ; plasmodesmata (between companion cell and sieve tube) / described ; many ribosomes / extensive RER ; many proteins in the, plasma / cell surface, membrane ;	2	IGNORE qualification of type of protein
		Total	12	

3	(a)	<p><i>transpiration</i> loss of water <u>vapour</u> / evaporation of water ; from, aerial parts of plant / leaves / stomata ;</p> <p><i>transpiration stream</i> movement of water (up xylem vessels) ; from roots to, leaves / air surrounding leaves ;</p>	max 3	IGNORE evaporation of water vapour										
	(b)	F ; G ; K ;	3	Only one tick per set – if more than one tick then apply CON IGNORE crosses and hybrid crosses										
	(c)	<table border="1" data-bbox="424 529 974 843"> <thead> <tr> <th data-bbox="424 529 711 566">Xylem</th> <th data-bbox="711 529 974 566">Phloem</th> </tr> </thead> <tbody> <tr> <td data-bbox="424 566 711 635">(named) mineral(s) / salts</td> <td data-bbox="711 566 974 635">sucrose / amino acids ;</td> </tr> <tr> <td data-bbox="424 635 711 704">no, end / cross, walls</td> <td data-bbox="711 635 974 704">;</td> </tr> <tr> <td data-bbox="424 704 711 773">lignin</td> <td data-bbox="711 704 974 773">;</td> </tr> <tr> <td data-bbox="424 773 711 843">(bordered) pits</td> <td data-bbox="711 773 974 843">Plasmodesmata ;</td> </tr> </tbody> </table>	Xylem	Phloem	(named) mineral(s) / salts	sucrose / amino acids ;	no, end / cross, walls	;	lignin	;	(bordered) pits	Plasmodesmata ;	4	Award 1 mark for a correct row. IGNORE ions unqualified / nutrients IGNORE proteins / sugars / minerals / salts for phloem DO NOT CREDIT glucose IGNORE continuous tube DO NOT CREDIT holes / pores
Xylem	Phloem													
(named) mineral(s) / salts	sucrose / amino acids ;													
no, end / cross, walls	;													
lignin	;													
(bordered) pits	Plasmodesmata ;													
		Total	10											

Question			Answer	Marks	Guidance
4	(a)	(i)	<u>units</u> ; mm s^{-1} ; raw data ; leaf area ;	2 max	<p>ACCEPT mm min^{-1} / cm min^{-1} / cm s^{-1} / written in words ACCEPT $\text{mm}^3 \text{min}^{-1}$ / $\text{cm}^3 \text{min}^{-1}$ / $\text{cm}^3 \text{s}^{-1}$ / written in words</p> <p>e.g. individual trial results / the repeat readings / data used to calculate the mean</p> <p>IGNORE only the mean is shown IGNORE 'how many repeats were done'</p>

Question		Answer	Marks	Guidance
	(ii)	<p><i>description</i> as number of leaves increases the (rate of) bubble movement increases ; (pair of) figs to illustrate the change ;</p> <p><i>explanation</i> larger (surface) area ; more stomata ; more / fast(er), evaporation / transpiration / loss of water <u>vapour</u> ; more / fast(er), uptake of water (by shoot) ;</p> <p><i>idea that:</i> (some) bubble movement with no leaves as not all uptake due to transpiration from leaves ;</p>	3 max	<p>ACCEPT ORA throughout IGNORE refs to more bubbles / photosynthesis</p> <p>must be pair of figures illustrating change eg 7 bubble movement with 0 leaves and 92 bubble movement with 8 leaves</p> <p>ACCEPT calculated difference e.g. increase of 21 between 2 & 4</p> <p>ACCEPT 'surface area increases'</p> <p>IGNORE 'many stomata' OR 'more stomata open'</p> <p>NOTE e.g. more, stomata / surface area for transpiration = 2 marks (as more transpiration implied)</p> <p>e.g some loss from other parts of stem / uptake into cells</p>

Question		Answer	Marks	Guidance
	(b)	<p><i>statement 1</i> <u>surface area / SA</u>, of leaves is different</p> <p>OR</p> <p>different number of stomata ;</p> <p>(choose shoot(s) with), similar sized leaves / similar surface area</p> <p>OR</p> <p>repeats to calculate mean ;</p> <p><i>statement 2</i> reduces water (vapour) potential gradient (between inside and outside of leaf) ;</p> <p>assemble without wetting leaves / dry the leaves / wait until leaves dry ;</p> <p><i>statement 3</i> (increased temperature) will increase, evaporation / transpiration / loss of water vapour ;</p> <p>control the temperature / carry out in room with controlled temperature ;</p>	6	<p>IGNORE 'surface area to volume ratio' (as a phrase)</p> <p>ACCEPT measure surface area of each leaf and calculate rate of movement per unit area ACCEPT measure leaves to check they are same size DO NOT CREDIT cut or trim leaves to size</p> <p>ACCEPT water potential outside leaf is too high OR WP outside higher than inside</p> <p>IGNORE ref to light</p> <p>ACCEPT do it in constant temperature CREDIT suitable practical method of achieving this IGNORE 'pull blinds down' / 'open the window' / 'general ref to environment or conditions', without mentioning temperature or heat</p>
		Total	11	

Question			Answer	Marks	Guidance
5	(a)	(i)	<p><u>sucrose</u> and <u>phloem</u> ;</p>	1	<p>Both needed for one mark Mark the first answer on each line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks DO NOT CREDIT sucrose DO NOT CREDIT phloem sieve tubes / companion cells</p>
		(ii)	<p>1 hydrogen ions / H⁺ / protons, pumped out of companion cells ;</p> <p>2 increases, hydrogen ion / H⁺ / proton, concentration (gradient) (outside companion cell) ;</p> <p>3 hydrogen ions, re-enter / flow back into, companion cells ;</p> <p>4 sucrose / sugar, moves with hydrogen ions / AW ;</p> <p>5 down <u>concentration</u> gradient ;</p> <p>6 ref. cotransporter proteins / cotransport(ation) ;</p> <p>7 by <u>facilitated</u> diffusion ;</p> <p>8 sucrose / sugar, diffuses into sieve tube (element) ;</p> <p>9 through plasmodesmata ;</p>	3 max	<p>1 ACCEPT hydrogen ions leave companion cells using ATP</p> <p>2 ACCEPT creates gradient</p> <p>2 DO NOT CREDIT increase, hydrogen ion / H⁺ / proton concentration, in sieve tube element</p> <p>3 ACCEPT diffuse / move</p> <p>4 DO NOT CREDIT glucose (penalise once)</p> <p>4 DO NOT CREDIT sucrose follows H⁺</p> <p>8 IGNORE sucrose diffuses into <i>phloem</i></p>

Question	Answer	Marks	Guidance
(b)	<p>1 active transport requires ATP ;</p> <p><i>at low temperatures:</i></p> <p>2 (molecules have) little kinetic energy ;</p> <p>3 (therefore) less, respiration / ATP made ;</p> <p>4 less active transport or less, movement / loading, of sugars into sieve tube (element) ;</p> <p>5 less, osmosis / movement of water, into sieve tube (element) ;</p> <p>6 low (hydrostatic) pressure created ;</p> <p><i>as temperature increases:</i></p> <p>7 (molecules have) more kinetic energy ;</p> <p>8 (therefore) more, respiration / ATP made ;</p> <p>9 more active transport or more, movement / loading, of sugars into sieve tube (element) ;</p> <p>10 more , osmosis / movement of water, into sieve tube (element) ;</p> <p>11 higher / more (hydrostatic) pressure created ;</p> <p>12 at high temperature (plant), enzymes / proteins, denatured ;</p>	3 max	<p>1 ACCEPT loading / uptake for transport</p> <p>3 IGNORE no respiration / no ATP made / no loading of sucrose</p> <p>4 ACCEPT slow active transport / slow loading</p> <p>9 ACCEPT faster active transport / faster loading</p> <p>12 DO NOT CREDIT cells denatured</p> <p>12 CREDIT change to tertiary structure, damage to proteins</p>
	Total	7	

Question			Answer	Marks	Guidance
6	(a)	(i)	increases / rises / goes up ; use of figures to illustrate ;		figures must include mean values for two comparative points within the range either stated or calculated. eg (between 20 and 50) it rises from 5.7 to 32.3 eg (between 20 and 50) rate rises by 26.6 eg between 30 and 40 rate rises from 11.7 to 24.3 eg between 20 and 50 rate rises by 467% IGNORE units Note: as light intensity goes from 20 to 50, the rate increases from 5.7 to 32.3 = 2 marks DO NOT ACCEPT figures that include 10 a.u. (as not asked for in the question)
		(ii)	stomata are (nearly) closed ; <i>idea that.</i> light <u>intensity</u> not high enough ;	2 1 max	ACCEPT no extra stomata are opened / stomata are not opened wider
	(b)	(1 stomata are open ; 2 allow, gaseous exchange / entry of carbon dioxide / exit of oxygen ; 3 for photosynthesis ; 4 water <u>vapour</u> leaves (the leaf) ; 5 down a water (vapour) potential gradient ; 6 high(er) temperatures (during the day) ; 7 causes greater <u>evaporation</u> / some water vapour loss through leaf surface all the time ;	3 max	DO NOT CREDIT if gases are described moving in wrong direction IGNORE ref to respiration ACCEPT description of light independent stage ACCEPT Ψ for water potential

Question	answer	Marks	Guidance
	<p>(ii)</p> <p>1 <u>thick</u> , cuticle / waxy or layer ;</p> <p>2 leaf is, folded / rolled / curled / curved / AW ;</p> <p>3 reduces (exposed) surface area (for evaporation) ;</p> <p>4 hairs ;</p> <p>5 reduces, evaporation / diffusion through leaf, surface / epidermis) ;</p> <p><i>for points 6, 7 & 8 credit only in context of folded leaf or hairs:</i></p> <p>6 trap water vapour ;</p> <p>7 creates high water (vapour) potential outside (stomata) ;</p> <p>8 reduces water (vapour) potential gradient ; max 4</p> <p>Q QWC – two technical terms used and spelt correctly ; 1</p>	5 max	<p>IGNORE ref to moisture / moist air IGNORE ref to sunken / small / closed / few stomata</p> <p>ACCEPT waterproof for waxy</p> <p>DO NOT CREDIT ref to surface area to vol ratio / SA:Vol</p> <p>DO NOT CREDIT if hairs described in wrong place eg on palisade DO NOT CREDIT cilia DO NOT CREDIT evaporation of water vapour</p> <p>ACCEPT water <u>vapour</u> builds up in enclosed area ACCEPT stop wind blowing, water vapour / diffusion shells, away</p> <p>ACCEPT humid air collects in enclosed space</p> <p>ACCEPT Ψ for water potential DO NOT CREDIT high water potential gradient outside stoma</p> <p>any 2 from: cuticle (derivatives of) evaporation water vapour potential gradient epidermis area diffusion</p>
	Total	11	