## **Transport in Plants** Mark Scheme 3

Level	IGCSE
Subject	Biology
Exam Board	CIE
Торіс	Transport in Plants
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 3

## <u>CHEMISTRY ONLINE</u>

Time Allowed:	57 minutes
Score:	/47
Percentage:	/100

Question	E Answers	Marks	Guidance
<sup>1</sup> (a) (i)	any time within the range 06.00 – 06.30 / 6.00 – 6.30 (am) ;	[1]	<b>A</b> in (i) and (ii) if 0600 etc
(ii)	08.00 / 8.00 (am) , 19.00 / 7.00 (pm) ;	[1]	A within range 18.45 to 19.00
(iii)	one of the following plant (only) respires rate of respiration > rate of photosynthesis no photosynthesis, only respiration ;	[1]	IGNORE anaerobic respiration (in plants) A only respire at night R 'respires instead of photosynthesises'
(iv)	<ol> <li>(carbon dioxide) required for photosynthesis / making food / released in respiration ;</li> <li>photosynthesis / food made, in day is greater than, respiration / food use / energy release, at night ;</li> <li>so surplus food produced / surplus energy / growth is possible ; ora</li> <li>if rate of uptake during the day and release at night are the same ;</li> <li>no, growth / no surplus / no food / no glucose / no energy ;</li> <li>A not enough, for growth / food / glucose / energy</li> </ol>	[max 2]	note that CO <sub>2</sub> is in the question <b>R</b> comments on [CO <sub>2</sub> ] in atmosphere ACCEPT descriptions of photosynthesis and respiration ACCEPT respiration and photosynthesis might balance
(b) (i)	award two marks if the correct answer (12.56 / 12.6 / 13) is given if answer missing or incorrect, award one mark for correct working (95.0 - 84.4 = 10.6) $\frac{10.6}{84.4} \times 100$ 12.56 / 12.6 / 13 ;;	[2]	INE

Question	Expected Answers	Marks	Guidance
(ii)	1 (taller plants / more leaves) = more yield ;		look for idea of more / increase where indicated in
1	2 height more, flowers / fruits / tomatoes / leaves ;		some of the MPs
	3 ref to competition for light / access to more light ;		1 question says 'affects' so description is OK
	4 <i>leaves</i> increase surface area;		2 A more space for tomatoes to grow
	5 more, chlorophyll / chloroplasts ;		3 more chance of pollination
	6 for, absorption / trapping, of light ;		
	7 more stomata for uptake of carbon dioxide ;		
	8 more photosynthesis ;		
	9 production of more, sugars / food / starch / AW ;	[max 3]	9 <b>R</b> 'making energy'
(c)	1 planted at same time / same growing period / same age or size at		IGNORE light intensity / carbon dioxide concentration
	planting ;		/ temperature / humidity /
	same		air movement
	2 specie / variety / strain / type, of plant; <b>R</b> same seeds unqualified;		
	3 soil type ;		
	4 soil pH ;		
	5 distance between plants / planting density ;		
	6 soil water / quantity of water applied / AW ;		
	7 type of, fertiliser / minerals / nutrients ;		
	8 quantity of, fertiliser / minerals / nutrients ;		
	9 ref to protection against, pests / diseases ;		<b>9 A</b> spraying (named) pesticide
	10 AV ; e.g. soil, quantity / depth ;	[max 3]	
(d)	1 ref to, sensor(s) / thermostat / AW ;		examples of AVP
	2 computer control / negative feedback / automated control ;		protection from, wind / hail / gales / extreme weather
	3 ref to, reducing / controlling, effect of <u>limiting factors</u> ;		easier to control, pests / diseases
	4 provide (artificial) light (when light intensity is low);		can control / exclude, (named) grazers
	5 provide shade ;		easier to control, weeds / competitors
	6 temperature control / heating / cooling / ventilation / air conditioning ;	TT	TATES
	7 <u>carbon dioxide</u> , enrichment; <b>A</b> method described;		
	8 control numiaity / misting ;		R ref. to day length / photoperiod
	9 watering;		κ use animals to give oπ carbon dioxide
	10 soil-less cultivation / nydroponics / described ; A sterile conditions		
	1 rei lo, ierliisers / minerais / nutrients ;	[mov 4]	
	12 AVP;		
		i otal: 1/]	

Question	Answer	Mark	Additional Guidance
2 (a)	guard (cells) ;	[1]	
(b) (i	oxygen is a (waste/by) product of photosynthesis ; more oxygen is produced than used in respiration ; concentration inside the leaf is greater than outside ; ref to air spaces inside the leaf ; oxygen moves down its concentration gradient ; by <u>diffusion</u> ; <i>idea that</i> the rate of photosynthesis is greater than the rate of respiration ;	max [3]	A word equation/symbol equation
(ii	<pre>passes through air spaces ; carbon dioxide dissolves in water (in cell wall) ; (spongy/palisade) mesophyll ; passes/diffuses, through, cell wall/cell membrane ; passes/diffuses, into/through, cytoplasm ; enters chloroplast/used in chloroplast ; reacts with water (to form glucose) ;</pre>	max [3]	A palisade cells <b>ignore</b> spongy cells A correct equation



Question     Answer		Mark	Additional Guidance
2 (c) (i)	stomata on, both sides of the leaf/both upper and lower epidermis ; fewer stomata overall (however expressed) ; fewer stomata on upper epidermis than water lily/ <b>ora</b> ; fewer stomata on lower epidermis than myrtle/ <b>ora</b> ; more stomata on lower epidermis than water lily/ <b>ora</b> ; more stomata on upper epidermis than myrtle/ <b>ora</b> ; <i>idea that</i> about the same number on each surface whereas the numbers are very different on the surfaces of the other plants ;	max [2]	A use of numbers to make comparisons with units used at least once in the answer mp7 also gains mp1
(ii)	white water lily (all) stomata (on upper surface) in contact with air/AW ; for absorption of, carbon dioxide/oxygen ; no stomata (on lower epidermis) in contact with water ; <u>diffusion</u> (much) faster in air (than in water) ; (large number of stomata as) plant does not need to restrict, transpiration/water loss/AW ; <i>common myrtle</i>		<b>A</b> gas exchange / diffusion of gases
	(all) stomata (on lower surface), in the shade/away from the sun/out of the heat/in a cooler place ; <b>ora</b> reduces/restricts/less, <u>transpiration/evaporation</u> ; <b>ora</b> so, less water is lost/water is conserved ;	max [5]	ignore if explained in terms of waxy cuticle only R 'prevents'
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Question		Answer		Marks	Additional Guidance
3 (a)					mark nucleus and next 3 answers
	structural feature	animal cell	plant cell		
	cell wall	×	×		
	nucleus	~	√;		
	(cell) membrane	~	√;		
	cytoplasm	~	√;		
	chloroplast	×	√;		R chlorophyll
	(large) vacuole	×	√;		
	vacuolar sap	×	√;		
	vacuolar membrane/ tonoplast	×	√;		
	nuclear membrane	~	, , , , , , , , , , , , , , , , , , ,		
	nucleolus	~	√;	ONT	INTE
		<b>UHE</b>	MISIKY	max 4	INE

3 (k	<b>)</b>	water moves (in) by <u>osmosis;</u> down a water <u>potential</u> gradient/from high water <u>potential</u> to low water <u>potential;</u> through partially permeable membrane; (both cells/vacuole) enlarge/swell/increase in volume; <u>animal</u> cell bursts; <u>plant</u> cell becomes turgid/AW;	max 4	<ul> <li>I water concentration</li> <li>A semi / selectively</li> <li>A cell wall prevents bursting</li> </ul>
(c	:) (i)	phloem;	1	
	(ii)	(transport of sucrose out of the leaves) is low(er) in, B/magnesium-deficient plants; ORA any data quote about B; (sucrose concentration in the leaves) is high(er) in, B/magnesium- deficient plants; ORA any data quote about B;	4	assume "it" refers to B A – B = 2.4 – 2.6, A is 3 – 4 times more B > 100, A – B = approx 90, A approx 10 times more
	(iii)	max 2 for symptoms yellowing leaves / chlorosis / necrosis; less / stunted, growth; more sugar in leaves; max 2 for explanation plants that are deficient in magnesium make, less / no, chlorophyll; less photosynthesis; less (named) sugar available to plant (due to reduce photosynthesis / reduced sucrose transport);	max 3	I stunted roots A magnesium is part of chlorophyll I energy/food (for sugar)
			[Total: 16]	