

Transport in Plants

Mark Scheme 3

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

Time Allowed: 57 minutes

Score: /47

Percentage: /100

Question	E Answers	Marks	Guidance
I (a) (i)	any time within the range 06.00 – 06.30 / 6.00 – 6.30 (am) ;	[1]	A 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)	<i>one of the following</i> plant (only) respire rate of respiration > rate of photosynthesis no photosynthesis, only respiration ;	[1]	IGNORE anaerobic respiration (in plants) A only respire at night R 'respire instead of photosynthesises'
(iv)	1 (carbon dioxide) required for photosynthesis / making food / released in respiration ; 2 photosynthesis / food made, in day is greater than, respiration / food use / energy release, at night ; 3 so surplus food produced / surplus energy / growth is possible ; <i>ora</i> 2 if rate of uptake during the day and release at night are the same ; 3 no, growth / no surplus / no food / no glucose / no energy ; A not enough, for growth / food / glucose / energy	[max 2]	<i>note that CO₂ is in the question</i> R comments on [CO ₂] in atmosphere ACCEPT descriptions of photosynthesis and respiration ACCEPT respiration and photosynthesis might balance
(b) (i)	<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</i> (95.0 – 84.4 = 10.6) $\frac{10.6}{84.4} \times 100$ 12.56 / 12.6 / 13 ;;	[2]	

Question	Expected Answers	Marks	Guidance
1 (ii)	1 (taller plants / more leaves) = more yield ; 2 <i>height</i> more, flowers / fruits / tomatoes / leaves ; 3 ref to competition for light / access to more light ; 4 <i>leaves</i> increase surface area ; 5 more, chlorophyll / chloroplasts ; 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]	look for idea of more / increase where indicated in some of the MPs 1 question says 'affects' so description is OK 2 A more space for tomatoes to grow 3 more chance of pollination 9 R 'making energy'
(c)	1 planted at same time / same growing period / same age <i>or</i> size at planting ; <i>same</i> 2 specie / variety / strain / type, of plant ; R 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 ; 10 AV ; e.g. soil, quantity / depth ;	[max 3]	IGNORE light intensity / carbon dioxide concentration / temperature / humidity / air movement 9 A spraying (named) pesticide
(d)	1 ref to, sensor(s) / thermostat / AW ; 2 computer control / negative feedback / automated control ; 3 ref to, reducing / controlling, effect of <u>limiting factors</u> ; 4 provide (artificial) light (when light intensity is low) ; 5 provide shade ; 6 temperature control / heating / cooling / ventilation / air conditioning ; 7 <u>carbon dioxide</u> , enrichment ; A method described ; 8 control humidity / misting ; 9 watering ; 10 soil-less cultivation / hydroponics / described ; A sterile conditions 11 ref to, fertilisers / minerals / nutrients ; 12 AVP ;	[max 4]	examples of AVP protection from, wind / hail / gales / extreme weather easier to control, pests / diseases can control / exclude, (named) grazers easier to control, weeds / competitors R ref. to day length / photoperiod R use animals to give off carbon dioxide
		[Total: 17]	

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)	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) ;	max [3]	A palisade cells ignore 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 / ora ; fewer stomata on lower epidermis than myrtle / ora ; more stomata on lower epidermis than water lily / ora ; more stomata on upper epidermis than myrtle / ora ; <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)	<i>white water lily</i> (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> (all) stomata (on lower surface), in the shade / away from the sun / out of the heat / in a cooler place ; ora reduces / restricts / less, <u>transpiration</u> / <u>evaporation</u> ; ora so, less water is lost / water is conserved ;	max [5]	A gas exchange / diffusion of gases ignore if explained in terms of waxy cuticle only R 'prevents'
		[Total: 14]	

Question	Answer			Marks	Additional Guidance																																	
3 (a)	<table border="1"> <thead> <tr> <th data-bbox="353 371 689 470">structural feature</th> <th data-bbox="689 371 875 470">animal cell</th> <th data-bbox="875 371 1191 470">plant cell</th> </tr> </thead> <tbody> <tr> <td data-bbox="353 470 689 537">cell wall</td> <td data-bbox="689 470 875 537">x</td> <td data-bbox="875 470 1191 537">✓</td> </tr> <tr> <td data-bbox="353 537 689 604">nucleus</td> <td data-bbox="689 537 875 604">✓</td> <td data-bbox="875 537 1191 604">✓;</td> </tr> <tr> <td data-bbox="353 604 689 671">(cell) membrane</td> <td data-bbox="689 604 875 671">✓</td> <td data-bbox="875 604 1191 671">✓;</td> </tr> <tr> <td data-bbox="353 671 689 738">cytoplasm</td> <td data-bbox="689 671 875 738">✓</td> <td data-bbox="875 671 1191 738">✓;</td> </tr> <tr> <td data-bbox="353 738 689 805">chloroplast</td> <td data-bbox="689 738 875 805">x</td> <td data-bbox="875 738 1191 805">✓;</td> </tr> <tr> <td data-bbox="353 805 689 873">(large) vacuole</td> <td data-bbox="689 805 875 873">x</td> <td data-bbox="875 805 1191 873">✓;</td> </tr> <tr> <td data-bbox="353 873 689 940">vacuolar sap</td> <td data-bbox="689 873 875 940">x</td> <td data-bbox="875 873 1191 940">✓;</td> </tr> <tr> <td data-bbox="353 940 689 1038">vacuolar membrane/ tonoplast</td> <td data-bbox="689 940 875 1038">x</td> <td data-bbox="875 940 1191 1038">✓;</td> </tr> <tr> <td data-bbox="353 1038 689 1106">nuclear membrane</td> <td data-bbox="689 1038 875 1106">✓</td> <td data-bbox="875 1038 1191 1106">✓;</td> </tr> <tr> <td data-bbox="353 1106 689 1157">nucleolus</td> <td data-bbox="689 1106 875 1157">✓</td> <td data-bbox="875 1106 1191 1157">✓;</td> </tr> </tbody> </table>			structural feature	animal cell	plant cell	cell wall	x	✓	nucleus	✓	✓;	(cell) membrane	✓	✓;	cytoplasm	✓	✓;	chloroplast	x	✓;	(large) vacuole	x	✓;	vacuolar sap	x	✓;	vacuolar membrane/ tonoplast	x	✓;	nuclear membrane	✓	✓;	nucleolus	✓	✓;	<p>max 4</p>	<p>mark nucleus and next 3 answers</p> <p>R chlorophyll</p>
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<p>3 (b)</p>	<p>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;</p>	<p>max 4</p>	<p>I water concentration A semi/ selectively A cell wall prevents bursting</p>
<p>(c) (i)</p>	<p>phloem;</p>	<p>1</p>	
<p>(ii)</p>	<p>(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;</p>	<p>4</p>	<p>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</p>
<p>(iii)</p>	<p>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);</p>	<p>max 3</p>	<p>I stunted roots A magnesium is part of chlorophyll I energy/ food (for sugar)</p>
		<p>[Total: 16]</p>	