OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B4.4 HOW IS PLANT GROWTH CONTROLLED? (HIGHER)

SCORE	PERCENTAGE
/26	%

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Question			Answer/Indicative content	Marks	Guidance
1	a		1000 000 000 or 10^9; *If no correct answer allow working for 1 mark* Understand that $10^{?6}$ is one millionth / 0.000001 / $\frac{1}{1\ 000\ 000}$ OR 1000 is 10^3	2	Correct answer = 2 marks Examiner's Comments Many candidates were confused by this question. In this question the candidates were required to work out the difference between two auxin concentrations. It was very poorly answered and many candidates were unable to perform the calculation involving standard form. Many answers contained a string of 9s from some rather strange subtractions! They incorrectly interpreted 10^{-6} and ended up with answers 10 or 100 times less than they should. Another common error involved subtracting 10^3 from 10^6 or 10^{-6}. Some candidates did manage to gain 1 working mark and some did manage to perform the calculation correctly to gain full marks.

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Question			Answer/Indicative content	Marks	Guidance
				3	Ignore units
	b		Any three from: % stimulation occurs from concentrations of $10^{?4}$ / $10^{?3}$ OR no % stimulation below $10^{?4}$ / $10^{?3}$; % stimulation occurs between $10^{?4}$ / $10^{?3}$? 80; % stimulation increases in range from $10^{?4}$? 8; % stimulation decreases from 8; Maximum / peak / optimum, % stimulation at 8; Above 80 (ppm) shoot growth inhibited / 100% OR maximum inhibition at 1000; increasing auxin concentration **does not always** result in more growth;		**Accept** growth for % stimulation throughout the answer **Accept** 70 – 90 (ppm) for 80 throughout **Accept** 6 – 10 (ppm) for 8 throughout **Accept** 70 – 90 (ppm) for 80 **Examiner's Comments** In this question candidates were asked to interpret a graph showing the effect of auxin concentration on the growth of shoots. They could gain 3 marks from 7 marking points; it was not well answered with many candidates scoring 0 or 1 mark._Six of the seven mark points required figures to back up a statement. In many responses either no figures were quoted or the figures were not within the acceptable ranges. E.g. the % stimulation increases up to 8ppm, the range of 6-10 was acceptable but many candidates were giving 5 or very commonly, 1-10ppm._ Similarly, 70-90 was acceptable for 80 ppm where % stimulation equals 0 but many candidates were quoting 100ppm. Quite a lot of candidates mistakenly commented on root growth and others compared root and shoot growth.

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Question			Answer/Indicative content	Marks	Guidance
	c		*Any four from:* Auxin produced in tip; diffuses (downwards); accumulates on dark side / away from light; (on dark side) more growth / cells elongate; plant / shoot, bends / grow towards light;	4	**Accept** made / released **Ignore** moves / faces **Examiner's Comments** Candidates were asked to explain how auxin caused phototropism in shoots. This question was well answered in general. Many candidates gained marks 'auxins go to the shady side, make cells here elongate and cause the shoot to grow towards the light'. Some did not gain the last mark because they described the shoot 'moving/facing/turning' towards the light which was not acceptable. Only a tiny handful of candidates recognised that auxins were produced in the shoot tip and a few more mentioned diffusion. A few failed to gain credit because they talked about negative phototropism in roots but this was usually part of a weaker response and they often managed the 'shoot grows towards the light' mark. Some students failed to recognise the effect of the higher auxin level on one side and did not mention cell elongation or more/faster cell growth.
			Total	9	

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Question			Answer/Indicative content	Marks	Guidance
2			**Level 3 (5–6 marks)** Good **explanation** of the effect of hormone on **growth** of shoots A, B and C. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Good account of the **mechanism** involved. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Good **description** of the appearance of the shoots. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	This question is targeted at grades up to A* Indicative scientific points may include: Explanation • link between **hormones** and cell elongation / growth • **more** growth beneath the block • **more** growth on one side in shoot A / B and so curves • **equal** growth across shoot C Mechanism • the hormone is an auxin • the hormone leaves / diffuses out of the agar block • shoot A receives more hormones on the right side • shoot B receives more hormones on the left side • shoot C receives an even distribution of hormones Description • shoot A bends / curves / grows to the left • shoot B bends / curves / grows to the right • shoot C appears / grows straight • shoot A / B bends / curves / grows away from block **ignore** references to **light** up to and including L2 but candidates at L3 must not refer to light as a basis of their explanation Use the L1, L2, L3 annotations in Scoris; do not use ticks. Examiner's Comments

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Question			Answer/Indicative content	Marks	Guidance
					This was the second of the six-mark extended-writing questions. It was encouraging to observe some effective descriptions of the appearance of the three shoots. It was unfortunate that a number of candidates ignored the scenario with reference to the dark conditions and continued to give a response based on the direction of light. Some excellent responses were given for this question — a third of candidates gained Level 3 marks.
			Total	6 1	
3		i	(positive) phototropism	1	do not accept negative phototropism ignore to find the sun / grow towards the sun / get closer to the light
		ii	*any one from:* increases chances of survival (1) increases the amount of sunlight (energy) received (for photos to increase (rate of) photosynthesis (1)		accept increases light intensity received maximum light / get lots of light / optimal light
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
4	a	i	Phototropism ✓	1 (AO 1.1)	ALLOW phototrophism/phototropic DO NOT ALLOW phototrophic
		ii	C - Only award if qualified with a correct explanation ✓ Any one from: There will be more auxin on the side in the shade ORA✓ There will be more cell elongation in the cells in the shaded side than the side in the light ✓	2 (AO 1.1 x 2)	comparison must be clear ALLOW correct use of reasons to justify why B and A are wrong, e.g it can't be B as the auxin is only present on the shaded/left hand side Examiner's Comments Candidates found this question one of the more difficult questions on the paper, with very few. The vast majority of candidates incorrectly identified diagram B as the showing the correct distribution of auxins. Candidates then explained that the auxin would move to the side of the shoot in the dark so this side would grow. They did not appreciate that there would still be auxin (less) on the side of the shoot in the light. Very few described the movement of the shoot as a result of greater cell elongation as a direct result of a greater concentration of auxin. This is certainly an area that centres should focus on and doing so will better prepare those candidates moving to study biology at a higher level.

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Question			Answer/Indicative content	Marks	Guidance
		iii	*idea* that one box of cress seedlings in an area with light/ use of light box to control light from single sources (all directions) ✓ this is the control ✓ *idea that* the second box in an area with light coming in from one direction only ✓ keep all other variables the same ✓ allow to grow several days ✓	4 (AO 3.3a x 4)	ALLOW alternative approach *idea that* one box of cress seedlings in an area with light without foil caps✓ this is the control ✓ *idea that* the second box of cress seedlings have foil caps to block light ✓ ALLOW named variables ALLOW time period from 24 hours to 2 weeks Examiner's Comments This question tested candidates' ability to recall an experiment that they should be familiar with. Candidates found this question difficult with many presenting an answer which included mix of experiments that they had conducted and been taught about (foil caps and light boxes). Very few candidates went on to consider the importance of variables when describing an experiment that could be carried out. Centres should be encouraged to provide candidates with the opportunity to describe the practicals they have conducted during this course and to focus on variables that may need to be controlled.

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Question			Answer/Indicative content	Marks	Guidance
	b		(No because) Should use ethene (promotes fruit ripening)✓ Gibberellins break seed dormancy / trigger bolting / promotes flowering ✓	2 (AO 1.1 x 2)	ALLOW ethylene ~~the explanation~~ No mark for saying “no”; the marks are for ALLOW allows germination Examiner’s Comments Question 4 (b) and 4 (c) tested new content to the biology specification. Both questions did not score as well as may have been anticipated. In 4 (b) those candidates that realised the wrong hormone had been chosen either identified why it was the wrong hormone OR stated that ethene should be used. Very few candidates gave both parts to their answers. Candidates should be encouraged to look at the number of marks available for the question to help guide them to the number of points needed to gain full marks.
			Total	9	

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