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BIOLOGY

9700/53

Paper 5 Planning, Analysis and Evaluation

May/June 2016

MARK SCHEME

Maximum Mark: 30

Published

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Mark scheme abbreviations:

;	separates marking points
/	alternatives answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or extra guidance)
AW	alternative wording (where responses vary more than usual)
<u>underline</u>	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
ecf	error carried forward
I	ignore
mp	marking point (with relevant number)

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Question	Expected answer	Extra guidance	Mark
1 (a) (i)	distance from the pond ; distribution / abundance / numbers, of (different), species of plant / types of plant / sorts of plant / land plants ;	A position from pond I <i>ref.</i> to distance from starting point A distribution / abundance / numbers, of the plants	[2]
(ii)	<i>any 8 from:</i> 1 use a (named) transect ; 2 method of measuring, transect / line ; 3 <i>ref.</i> to distance / length, of transect ; 4 <i>ref.</i> to selecting where around pond to place the transect(s) ; 5 <i>ref.</i> to suitable sampling technique ; 6 <i>ref.</i> to sampling intervals (in context of transect / line) ; 7 use of, same / stated size, quadrat / frame / point frame / sample area ;	A belt (interrupted or continuous) or line transect. A description in terms of a line / AW A <i>idea of</i> use of either one or two measuring tapes, e.g. string with measured marks A <i>idea of</i> until the plants no longer change A stated distance, 10 m minimum e.g. (frame) <u>quadrat</u> / point frame / point <u>quadrat</u> A description A diagram I quadrant / quadrent I a square / square shape, unqualified A look at / observe, what is touching the line for a line transect A continuous sampling A (stated) regular intervals for an interrupted transect I fixed intervals unless qualified R any random placing, e.g. throwing / use of random numbers A if size of quadrat / frame / sample area is stated as between 0.25 m ² – 1 m ² size I controlled size unqualified	

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8	<i>ref. to method to identify (the different) species ;</i>	e.g. photographs / (dichotomous) key / app / expert / nature guide / book / AW A species identified as A, B, C, etc.	
9	<i>ref. to method of estimating abundance / distribution ;</i>	counting / density / percentage cover / frequency / abundance scale (ACFOR or equivalent) / cover-abundance scale (Braun-Blanquet) / presence or absence / AW	
10	<i>ref. to care taken not to miss, low growing / AW, species ;</i>		
11	replicate transect (at least once) ;	I repeat in the same transect A repeat, steps / the transect / the experiment at a different (start) point (round the pond)	
12	sample at different times of, year / seasons ;		
13	<i>safety</i> <i>any 1 from:</i> <i>ref. to injury / getting lost and staying with a group ;</i> - allergy to plants and wearing gloves / protective clothing ; - allergy to pollen / hay fever and wearing mask or taking medication ; <i>ref. to dangerous environment</i> described / hazardous plants / hazardous animals and wearing suitable shoes / protective clothing / repellent ;	<i>need risk plus precaution</i> I low / high risk	
[max 8]			

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(b) (i)	$\Sigma D^2 = 317$;	A 317.0/317.00	[1]
(ii)	$(6 \times \Sigma D^2 =) 1902$ and $(n^3 - n =) 990$; $r_s = (1 - 1.92 =) -0.92$;	A one mark for the formula: $r_s = \frac{1 - 1902}{990}$ A -0.9 or -0.921 R -.90 <i>ecf from (b)(i)</i> <i>ecf to max 1 if one or both of calculations $(6 \times \Sigma D^2 =)$ and $(n^3 - n =)$ are wrong</i>	[2]
(iii)	there is a negative correlation / as soil water increases the number of species decreases / ora ;	<i>ecf from (b)(i)</i> A correct interpretation of r_s value calculated A negative association / inverse relationship / inversely proportional, for correlation I significant / not significant I qualifications 'strong' or 'weak'	[1]
(c) (i)	evidence that the students used the probability table for 10 pairs of data ; the r_s value is greater than the critical values at 5% and at 1% / ora ;	A if critical values 0.648 and 0.794 are used A r_s value is greater than actual critical values 0.648 and 0.794 A ecf for wrong number of pairs A r_s value is greater than actual values at p / probability = 0.05 and 0.01 I ref. to left / right	[2]
(ii)	<i>idea that Spearman's rank correlation only shows there is a relationship not a cause / effect ;</i> <i>any 1 from:</i> - sampling / transect(s), may be unrepresentative of the whole area ; - other (named) biotic / abiotic / environmental	I ref. to 'not due to chance' (must have positive idea of correlation / relationship) I do more samples / not enough replicates were taken I other factors influence the data (factor must be qualified)	

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	factors may be contributing to distribution of plants ;	A other environmental / biotic / abiotic / factors influence the data named factors : soil pH, light / light intensity, slope, temperature, (soil) moisture / water, grazing, wind, minerals / ions / mineral salts / salts / humus, soil organisms, pathogens, effluent / herbicide I nutrients I any <i>ref. to</i> stats e.g. need to take account of standard error	[max 2]
		Total:	[18]
2 (a) (i)	<i>any 3 from:</i> 1 body, mass / weight ; 2 age ; 3 number in each (test) group ; 4 <i>ref. to</i> sex (composition of the groups) ; 5 species / variety / type / genetic strain / breed / AW (of rat) ; 6 factor that might affect dopamine secretion ; 7 volume of nicotine used ; 8 concentration of saline ; 9 volume of saline ; 10 volume of topiramate ; 11 each high concentration of topiramate (should be the same concentration) ; 12 time between giving the, treatments / topiramate or	I amount <i>throughout</i> I mass / weight unqualified A mass / weight of rats I biomass of rats / size of rats A all same sex or equal numbers of each sex A gender A stress / diet / food / water / environmental temperature I body temperature A each low concentration (Group 2) should be the same for each rat I concentration of topiramate unqualified A time treatments are given	

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	saline, and nicotine ; 13 time between giving, treatments / nicotine / topiramate / saline, and measuring the concentration of dopamine ; 14 method of administration of, nicotine / topiramate / treatment ;		[max 3]
(ii)	<i>control groups 1 and 5</i> to see if / show that / test that, topiramate is, causing the effect / blocking secretion of dopamine / blocking secretion of (pleasure and reward) chemicals ; <i>control group 4</i> to show any effect that topiramate has, on its own / without nicotine ;	A to show that saline solution on its own does not have an effect on / block secretion of dopamine / (pleasure and reward) chemicals R increase in dopamine A to see if there is a relationship between topiramate and dopamine secretion A <i>idea of</i> in context of, rats never given nicotine / 'normal' rats	[2]
(b)	group 5 pre-treatment = 280 (% increase) and group 1 no pre-treatment = 64 (% increase) ; 35:8 ;	A figures in a formula A 8:35 <i>if clear which is which</i> A 4.375:1 / 4.38:1 / 4.4:1 / 4:1 A quotients 4.375 / 4.38 / 4.4 / 4 A fractions 35/8 / 4.375/1 / 4.38/1 / 4.4/1 / 4/1 R units or % in final ratio e cf if graph misread <i>for one mark</i>	[2]
(c)	<i>any 3 from:</i> 1 (topiramate / it), reduces the release of dopamine (from the brain) ; 2 the higher the concentration of topiramate, the greater the reduction / the lower the secretion (of dopamine) ;	A inhibits / blocks A reduces the (dopamine) response / AW A inhibits / blocks	

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	3 (the, percentage) reduction / drop, in dopamine secretion, is lower in the rats pre-treated with nicotine (280% to 120% = 57%) (than in rats not pre-treated with nicotine) (64% to 16% = 75%) ora ; 4 <i>any 1 from:</i> • in pre-treated rats / group 6, (high concentration of) the topiramate reduces the response by 160% ; • in rats without pre-treatment / group 2, (low concentration of) the topiramate reduces the response by 40% ; • in rats without pre-treatment / group 3, (high concentration of) the topiramate reduces the response by 48% ;	A references to addicted / non-addicted rats A by 57% / by approximately half A by 63% / by approximately two thirds A by 75% / by three quarters	[max 3]
(d)	(topiramate / it) inhibits / reduces / blocks, pleasure / reward / AW, so smokers, gain less from smoking / less enjoyment / become less addicted / likely to smoke fewer cigarettes / AW ; <i>idea that</i> topiramate affects, more than one / all / three brain chemicals and so has a cumulative / additive effect (on suppressing the addiction) ;	A because it has an effect on more than one chemical it has a, bigger / larger / further / AW, effect	[2]
		Total:	[12]