Cambridge International AS & A Level

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BIOLOGY **9700/51**

Paper 5 Planning, Analysis and Evaluation **May/June 2016**

MARK SCHEME

Maximum Mark: 30

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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)
underline	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)

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** *ref. to* distance from starting point **A** distribution / abundance / numbers, of the plants	[2]
(ii)	*any 8 from:* 1 use a (named) transect ; 2 method of measuring, transect / line ; 3 *ref. to* distance / length, of transect ; 4 *ref. to* selecting where around pond to place the transect(s) ; 5 *ref. to* suitable sampling technique ; 6 *ref. 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** *idea of* use of either one or two measuring tapes, e.g. string with measured marks **A** *idea of* until the plants no longer change **A** stated distance, 10 m minimum e.g. (frame) quadrat / point frame / point quadrat **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	

	8 *ref. to* method to identify (the different) species **;**	e.g. photographs / (dichotomous) key / app / expert / nature guide / book / AW **A** species identified as A, B, C, etc.	
	9 *ref. to* method of estimating abundance / distribution **;**	counting / density / percentage cover / frequency / abundance scale (ACFOR or equivalent) / cover-abundance scale (Braun-Blanquet) / presence or absence / AW	
	10 *ref. to* care taken not to miss, low growing / AW, species **;**		
	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 *safety* *any 1 from:* • *ref. to* injury / getting lost **and** staying with a group **;** • allergy to plants **and** wearing gloves / protective clothing **;** • allergy to pollen / hay fever **and** wearing mask or taking medication **;** • *ref. to* dangerous environment described / hazardous plants / hazardous animals **and** wearing suitable shoes / protective clothing / repellent **;**	*need risk plus precaution* **I** low / high risk	[max 8]

(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 *ecf from* ***(b)(i)*** *ecf to max 1 if one or both of calculations* $(6 \times \Sigma D^2 =)$ *and* $(n^3 – n =)$ *are wrong*	[2]
(iii)	there is a negative correlation / as soil water increases the number of species decreases / ora **;**	*ecf from* ***(b)(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)	*idea that* Spearman's rank correlation only shows there is a relationship not a cause / effect **;** *any 1 from*: • 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)*	

	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 *ref. to* stats e.g. need to take account of standard error	[max 2]
		Total:	**[18]**
2 (a) (i)	*any 3 from:* 1 body, mass / weight ; 2 age ; 3 number in each (test) group ; 4 *ref. to* 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 *throughout* **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	

	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)	*control groups 1 and 5* to see if / show that / test that, topiramate is, causing the effect / blocking secretion of dopamine / blocking secretion of (pleasure and reward) chemicals **;** *control group 4* 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** *idea of* 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 *if clear which is which* **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 ecf if graph misread *for one mark*	[2]
(c)	*any 3 from:* 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	

	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 *any 1 from:* • 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 ; *idea that* 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]**