UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

9700 BIOLOGY

9700/51 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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.

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Mark scheme abbreviations:

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

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Question	Expected answer	Extra guidance	Mark
1 (a)	*independent:* (composition of the growth) medium ; *dependent:* growth / length, of the pollen (tube) **and** (percentage) germination ;		[2]
(b) (i)	3 of: 1. ref. to suitable magnification (in context of looking at pollen) ; 2. ref. to use of, an eye-piece graticule / AW (to measure the length of the pollen tubes) ; 3. ref. to calibrating eye-piece with stage, micrometer / graticule / AW ; 4. to find the value in mm of an eyepiece unit ; 5. ref. to conversion of, mm / eye-piece units / EP(G)U, to μm ;	1. e.g. ×40 – ×400 high / low / medium, power. Accept 'Adjust to suitable power / AW' 3. Allow description 3. Allow as formula: stage divided by eye-piece 5. Accept × 10^3	[3]
(ii)	*Idea of*: allows comparisons (to be made between samples with different starting number) ;		[1]
(c) (i)	mean / $\bar{x}$ (of each sample) **and** the standard deviation / *s* (of each sample) ;	Allow identified in *t*-test formula Ignore standard error	[1]
(ii)	ref. to 10 (in each sample) and subtracting 1 from each (sample number) ;	Allow as a formula (10 – 1) + (10 – 1) / 20 – 2	[1]

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(iii)	3 of: 1. ref. to critical value (at p >0.05) is 2.10 ; 2. ref. to A + B (1) **and** A + C (2), have values greater than, the critical value / 2.10 **OR** ref. to B + C (3) has value less than, critical value / 2.10 ; 3. A + B / A + C results are, significant / not due to chance / caused by an environmental factor **OR** ora for B + C ; 4. ref. to A + C (also) significant at >p = 0.01 / AW ;	1. allow if critical value clearly marked on table. e.g. ringed etc. if > used must be correct. Accept 5% 3. allow if refer to differences in the media as an environmental factor allow if identified via *t* value	[3]
(d) (i)	4 of: *support:* 1. the pollen / tubes, grow, longer / better, with calcium in media / in, B / C ; 2. ref. to (pollen) germination is (almost) the same, with and without calcium / in, all media / A & B & C ; 3. ref. to pollen germination occurs with sucrose alone / in (medium) A ; *does not support:* 4. ref. to boric acid could be causing an effect on pollen tubes ; 5. ref. medium C has, magnesium / potassium / sulphate, that may be increasing pollen tube growth ; 6. ref. to all media have sucrose (so no way of knowing its effect) / no control without sucrose ;	Ignore refs to time 1. **ora** 2. looking for idea that presence of calcium has little / no effect on pollen tube germination 3. looking for idea that pollen germination can occur without anything other than sucrose 5. allow if say additional components / components other than calcium and boric acid	[4]

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(ii)	1. ref. to making another growth medium without sucrose ; 2. *idea of* repeating the rest of the procedure (for both germination and growth of pollen) ;	*DO NOT award mp 1 if other constituents have been changed* 1. allow water only allow making up all media without sucrose allow 0 concentration taken from a range. do not allow ref. to control unqualified 2. allow if use descriptors of the method given in the question	[2]
(iii)	*1. for pollen germination* *idea of*: little / less / no, germination ; *2. for pollen tube growth* *idea of*: growth should be, similar / the same ;	1. allow ecf from range of sucrose concentrations in **(d)(ii)**, e.g. predicted result could be germination increases with concentration, decreases or stays the same *Ignore any other predictions*	[2]
			[Total: 19]
2 (a) (i)	ref. to idea of a means of supplying air / oxygen ; ref. to idea of spreading the air / oxygen through the buffer ;	e.g. oxygen cylinder / pump / named type of pump / (gas) syringe ; Allow: named chemical reaction in another tube as source, but NOT if added directly to the buffer e.g. diffuser / bubbler / bubbling / magnetic stirrer. allow stirring by hand	[2]
(ii)	temperature / idea of known time for absorption or sampling / concentration / mass, of sugars added ;	ignore volume of the buffer / oxygen concentration / pH ignore amount (of sugars)	[1]

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(b) (i)	3 of: 1. ref. to adding known, concentration / mass of glucose to buffer ; 2. ref. to leaving for specified time / AW ; 3. ref. to a method of removing contents of, the intestinal bag / external sample ; 4. ref. to a method of identifying presence of glucose ; 5. ref. to method of quantifying glucose ;	1. ignore 'amount' 2. do not allow 'time' unqualified – need a stated time value / idea of set time. Allow e.g. 'about 5 minutes' 3. e.g. using a pipette / syringe / AW. allow pouring out / emptying 4. e.g. Benedict's test / clinistix / dipsticks / AW 5. e.g. colour / mass, comparison with standards **or** use of biosensor **N.B** use a biosensor = 2 marks mps 4 & 5	[3]
(ii)	1. ref to calculating a rate by dividing a value for sugar by time ; 2. *idea of* calculating both rates and, making them comparative / compare ;	1. can be carried down from (b)(i) 3. ref.to difference in the original and final concentration in known time ; 4. ref. to dividing by the original external concentration ;	[2]
(c)	3 of: 1. without respiratory inhibitor glucose uptake is (much) higher / approx. × 3 ; 2. fructose uptake is not affected by inhibitor ; 3. with inhibitor uptake of both is (about) the same ; **ora** 4. both sugars are absorbed by (facilitated) diffusion ; 5. the rate of (facilitated) diffusion for both sugars is (about) the same ; 6. glucose is (also) absorbed by active transport / AW ; 7. more glucose is absorbed by active transport than by (facilitated) diffusion ; 8. intestine has active transport carriers for glucose ; 9. active transport of glucose requires oxygen ;	1. glucose to glucose comparison. Allow **ora** 3. **ora** – without inhibitor glucose uptake is greater than fructose 4. allow 'by a passive process / no energy needed' 6. allow 'requires, energy / ATP' **ora** fructose is <u>only</u> passive	[3]
			[Total: 11]

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