UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

9700 BIOLOGY

9700/53 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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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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)	8 of: *independent variable:* 1. ref. to making a range of 0.2, 0.4, 0.6, 0.8, 1.0 mol dm^{-3} sucrose solution / making separate solutions of 0.2, 0.4, 0.6, 0.8, 1.0 mol dm^{-3} from sucrose and water ; 2. ref. to using distilled / deionised water (for making dilutions); 3. ref. to leaving plant tissue for suitable time – minimum of 20 min *dependent variable:* 4. ref. to a suitable method of timing the movement of the drop ; 5. ref. to marking the centre / start point of the solution (to measure drop) ; 6. ref. to how the drop is released ; *standardising variables **(max 3):*** 7. ref. to using same volume of each solution for soaking ; 8. ref. to same volume of each solution used for timing the drop ; 9. ref. to using same number / mass / volume of tissue ; 10. ref. to suitable method of keeping constant temperature ; 11. ref. to same time for soaking tissue discs ; *safety:* 12. ref. to low risk investigation / any suitable safety precaution ;	1. allow a general statement of making 5 (min) solutions from 0-1 mol dm^{-3} allow any volumes in correct proportions for making sucrose solutions do not allow if refer to serial dilutions unless it would give the concs. stated by the candidate ignore ref. to 0.0 as a sucrose solution 3. allow in terms of 'long enough for osmotic changes to occur' Ignore keeping in water/solution before using 4. allow stop clock / stop watch / timer 5. allow the idea of using a ruler / graduated test tube 6. e.g. keeping the drop as small as possible / care in releasing the drop ignore same volume 7 and 8. needs to clear what the solution is being used for to award the mark 9. allow surface (area) Ignore size / amount 10. e.g. water bath / incubator . allow room temp. do not allow air conditioning 11. allow 'fixed time' could be subsumed in 3 12. e.g. cutting away from hands / cutting on a tile, allergy to plants and wearing gloves ignore water and electrics	

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	reliability: 13. ref. to at least 2 / several / many replicates and a mean / average ; 14. ref. to increasing number of intermediates / repeating with more values close to water potential ;	13. allow reference to anomalous results 14. allow figures (e.g.0.6 (mol dm^{-3}) to 0.2 (mol dm^{-3})) allow mp1 if not already given and 5 dilutions are made.	[8]
(b) (i)	mm s^{-1} / mm / s(ec) / mm per s(ec) / millimetres per second ;	allow cm instead of mm for all versions of the units do not allow min(utes) if several are given, all must be correct	[1]
(ii)	(draw (best fit) line through the points to) find intersection with x axis / find the concentration (of sucrose) at which there is little / no movement of the drop ; (this sucrose) concentration / solution is the water potential equivalent of the tissue / cells ;	allow if line is drawn in Fig. 1.2 ignore units / ref. to rates allow - water potential of the tissues / cells is the same as that of this (sucrose) concentration	[2]
(c) (i)	*independent*:concentration / molarity of the sucrose (solutions) ; *dependent*: direction **and** rate of drop / dye moment ;	do not allow amount of sucrose / sugar	[2]
(ii)	2 of: size / volume of droplet ; finding the centre position of the solution or position of drop by eye / ruler measurement ; ref. to tissue varying as cutting may not be exact ; ref. to source of tissue being different ; ref. to removal of pipette ;	ignore temperature and pressure ignore number of drops ref. to parallax error must be in the correct context of finding the position of the drop allow as surface (area) / mass / volume ignore size / amount e.g. from different storage organs e.g. being careful not to mix the solution / moving to the side of the tube	[2]
(iii)	*drop*: idea of: larger drops would move at different rate from smallest (thus give false readings) ; *centre of solution*: idea of: drops have less / more distance to travel so making results inaccurate ;	allow the idea of introducing variables that cannot be measured and this reducing accuracy allow any ref. to under or overestimating related to a specific variable allow ecf for a correct explanation, related to the investigation, for a variable that could have been controlled e.g. temperature	

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<table>
<tr><td></td><td>surface / mass / volume / source of tissue:
will change the volume of water movement / density of the solution ;</td><td colspan="3">changes rate of diffusion / osmosis
temperature changes kinetic energy so speed of drop changes
different volumes of bathing solution / different times changes the water movement / density</td><td>[1]</td></tr>
<tr><td>(d) (i)</td><td>0.2 molar – turgid and
0.8 molar – (almost) plasmolysed / flaccid ;</td><td colspan="3">allow descriptions of plasmolysis and turgidity
allow correct reference to size of cells
allow drawings of cells</td><td>[1]</td></tr>
<tr><td>(ii)</td><td>correct ref. to a water / solute potential gradient of either cell ;
correct ref. to the direction of water movement for either cell ;</td><td></td><td>water potential</td><td></td><td rowspan="5">[2]</td></tr>
<tr><td></td><td></td><td>cells/tissue</td><td>solution</td></tr>
<tr><td>0.2 mol dm^{-3}</td><td>lower / more negative / hypertonic</td><td>higher / less negative / hypotonic</td></tr>
<tr><td>0.8 mol dm^{-3}</td><td>higher / less negative / hypotonic</td><td>lower / more negative / hypertonic</td></tr>
<tr><td colspan="3">If both cells are described, both must be correct.
allow ecf if answer in (i) the changes in the cells are reversed</td></tr>
<tr><td></td><td></td><td colspan="3">Total:</td><td>[19]</td></tr>
</table>

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2 (a) (i)	to stimulate the growth / development of follicles (containing oocytes);	allow increases follicles / oocytes available allow ref. to injection is only possible in vivo do not allow causes / increases ovulation do not allow increases the production of follicles / oocytes	[1]
(ii)	ref. to idea of all oocytes starting at the same point for investigation ;	e.g. oocytes are all at the same stage of meiosis	[1]
(b)	the closeness of the sample mean to the population mean / the reliability of the estimate of the mean ;	allow ref. to a measure of the accuracy of the calculated mean value do not allow spread of values around the mean or general references to reliability	[1]
(c) (i)	idea of there is no (significant) difference in the stimulation of meiosis by FF-MAS compared to other compounds ;	do not allow the idea of 'does not stimulate meiosis'	[1]
(ii)	(student) *t*-test ; comparing means of (two) populations/ data has a normal distribution / data is continuous ;	do not allow 'it is a continuous variable'	[2]
(iii)	1 of: the activator / FF-MAS is causing a change in the stimulation of meiosis ; there (is less than) 0.05 / 5% chance that the difference (from the control) was caused by chance ;	do not allow 'the null hypothesis is rejected' allow 'there is (more than) 0.95 / 95% chance that the difference is due to other factors other than chance. allow 'it is not due to chance'	[1]
(d) (i)	No, the (known) LXR alpha receptor activators do not stimulate meiosis ;	must have a correct reason for their answer, no without an explanation does not gain credit e.g. because the % FF- MAS is higher than all the others e.g. because none of the others are doing any stimulation	[1]

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(ii)	3 of : 1. FF-MAS above 0.07 at 0.7/at 7.0 μmol dm^{-3}/stimulates meiosis ; 2. increasing the concentration of FF-MAS by x10 (more than) doubles the stimulation of meiosis ; 3. FF-MAS may activate a different receptor / mechanism of action is not known ; 4. none of the other activators / named activator tested stimulate meiosis ; 5. 22R-HC at 7.0 μmol dm^{-3} may inhibit meiosis ; 6. ref. to the reliability of the data sets ;	1. allow general statement 'as the conc. of FF-MAS increases so does stimulation of meiosis' or 'FF-MAS has the greatest effect on meiosis' 3. allow FF-MAS is not stimulating the LXR receptor 4. allow in the context of 'little effect as the error bars overlap' do not allow – the other activators stimulate by the same amount 6. e.g. 0.7 μmol dm^{-3} data set / 25 HC is most reliable as SM has smallest values e.g. FF-MAS data set is least reliable as SM has largest values	[3]
		Total:	**[11]**

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