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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

9700/51

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.

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

• Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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Mark scheme abbreviations:

; separates marking points

I 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)

<u>underline</u> 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	1. allow a general statement of making 5 (min) solutions	
	sucrose solution / making separate solutions from sucrose	from 0-1 mol dm ⁻³	
	and water;	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	
	2 rof to using distilled / deignised water (for making dilutions):	ignore ref. to 0.0 as a sucrose solution	
	2. ref. to using distilled / deionised water (for making dilutions);3. ref. to leaving plant tissue for suitable time – minimum of 20	3. allow in terms of 'long enough for osmotic changes to	
	min;	occur'	
	,	ignore keeping in water/solution before using	
	dependent variable	ignore reciping in water/colution before doing	
	4. ref. to using tuber from each region in separate containers of	4. look for containers. But give if done for one set	
	each molar solution ;		
	5. ref. to weighing before and after immersion in sucrose		
	solutions;		
	standardising variables (max 3):		
	6 ref. to using same, number / mass / weight /volume, of potato;	6. 'same size'. Ignore amount. Allow (surface) area /	
		description	
	7. ref. to known / same volume of each molar solution ;	7. allow idea of tissue totally immersed	
	8. ref. to same time in solutions;	8. can be awarded in the context of mp3	
	9. ref. to blotting tissue dry before reweighing;		
	10. ref. to suitable method of keeping temperature constant;	10. e.g. water bath, incubator, temperature controlled room.	
		allow room temperature. ignore air conditioning	
	11. ref to standardising the source of material;	11. e.g. same species/variety or clearly same tuber	
	safety:		
	12. ref. to low risk investigation / any suitable safety precaution;	12. e.g. cutting away from hands / using tile for cutting.	
		e.g. plant allergy gloves or mask etc. ignore gloves for	
		cutting.	
		ignore water and electricity	

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	reliability 13. ref. to minimum of three repeats and a mean;	allow reference to 3 repeats in terms of spotting anomalous results	[8]
(b) (i)	final mass – original mass x 100; original mass	allow as a description or difference in mass allow alternatives to multiplication sign	[1]
(ii)	idea of the proportional change from the original mass /allows comparisons to be made if the starting masses are not exactly the same;	allow: 'easier to compare', 'takes into account original mass'	[1]
(c) (i)	comparing mean values of (two) sets of data / data is continuous / data has a normal distribution;	do not allow 'it is a continuous variable' allow: idea that sample is an appropriate size for (<i>t</i> -test)	[1]
(ii)	 2 of: 1. idea of using a probability table at 0.05 / 5% probability; 2. to see if the <i>t</i>-value is higher or lower than the critical value or if value of <i>t</i> is higher than critical value it is significant ora; 3. using 38 degrees of freedom; 	 allow if refer to 'the right or left of the critical value' or 'above or below'. allow reject null hypothesis ora allow if use formula (20-1) +(20-1) 	[2]
(d)	 Support: 2 of: old tuber at growing shoot equilibrates at the greatest concentration of sugar / sucrose solution (so has lowest water potential); old tuber at growing shoot shows greatest change in mass at low concentrations (of sucrose) / less than 0.5 mol dm⁻³ ora; water potential in central old tuber is lower than new suggesting more solutes / sucrose / sugar than in new tuber; water potential in new tuber is the highest suggesting least number of solutes / sucrose / sugar; Against: 2 of: evidence shows there is a change in solutes, not which solutes are used / AW; insufficient data collected / not enough replicates; insufficient intermediates / too few data points; 	 4. allow higher / less 2. allow ref. to no repeats 3. do not allow 'range not wide enough' 	[3]

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(e)	ref. to appropriate named tests for starch / sugar / sucrose ; ref. to suitable quantitative / semi-quantitative method ; ref. to testing over time ;	allow idea of finding the 'amount' for starch: allow thiosulfate titration / starch calibration curve iodine test - idea of using colour intensity to find concentration for sugar: allow Benedict's test to estimate precipitate or colour change to find concentration.	[2]
(f)	younger tubers would have high concentrations of inhibitor; older tubers have low concentrations of inhibitor;	as the tuber get older the concentration of inhibitor decreases = 2 marks younger tubers have high <u>er</u> concentrations = 2 marks ora allow any valid idea e.g. another growth regulator increases and promotes growth	[2]
		Total:	[20]

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2	(a)	ref. to idea adding a stain ; ref. to protein or DNA stain ;	ignore practical details that apply to plants, e.g. boiling in alkali/acid allow correct named stain. allow refs to DNA/protein invisible related to stain use	[2]
	(b) (i)	Independent variable concentration of organo-mercury compound; Dependent variable (fraguency of) type of mitopic (chaptrood);	do not allow 'amount'	
		(frequency of) type of mitosis (observed);		[2]
	(ii)	(cells) without any organo-mercury compound;	allow untreated cells	[1]
	(iii)	x-axis – independent variable : concentration organo-mercury compounds µm dm ⁻³ and y-axis – dependent variable : frequency of normal mitosis ; correct plots ; appropriate line ;	do not allow if no units on <i>x</i> -axis allow if use number of cells instead of frequency no marks if any error (+/- half square) allow best fit or point to point	[3]
	(c) (i)	ref. to enzyme inhibitor / inhibits centrioles / inhibitor of microtubule formation / inhibitor of spindle contraction / cycle stops at prophase or metaphase;	allow if refer to protein precipitation / inhibition do not allow mutation	[1]
	(ii)	idea of large number of cells counted for each concentration;	allow wide range of concentrations	[1]
			Total:	[10]