UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

9700 BIOLOGY

9700/35 Paper 3 (Advanced Practical Skills 1), maximum raw mark 40

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
ACE	Analysis, Conclusions and Evaluation (skills)
MMO	Manipulations, Measurement and Observation (skills)
PDO	Presentation of Data and Observations (skills)

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1 (a) (i)			[1]
MMO decisions 1	[1]	one temperature + 80(.0);	
		Additional guidance **A** any range 80 to 100 e.g. 80 to 85	

	(ii)		[2]
MMO decisions 2	[1]	equal volume or excess of Benedict's solution with respect to volume of sampling solution;	
		Additional guidance **A** not less than 2 cm^3 **A** 15 cm^3 or less **A** total volume 20 (not 21) cm^3 **R** whole number only	
	[1]	both must have units cm^3 or ml(s);	

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	(iii)	**[4]**
PDO recording 2	mp1	table with all cells drawn **AND** heading (top or left) with (reaction) time / min(utes);
		Additional guidance **A** no outer boundary **A** test-tube or S and E or sampling (solution) with mins **R** mins in body of table **R** test-tube number or test-tube alone **R** if convert to seconds **Ignore** test-tube / additional columns / rows
	mp2	(heading on any one time column or row including mean) time / seconds (s) (to first colour change);
		Additional guidance **Ignore** heading for test-tubes **R** headings for standardised variables e.g. volumes or temperature
MMO collection 2	mp3	records results for at least four sample times ;
		Additional guidance **A** 0 minutes **A** times or colours(blue to green to yellow to orange to orange/brown to red) **R** 'no change'
	mp4	records as times in whole seconds (numbers) only 'less than 601' time; (mark first column or row of recorded time taken)
		Additional guidance **A** minimum of four recorded times including 'more than 600'

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	(iv)		[1]
ACE interpretation **max 1**	max 1	Cause of error	WITH idea of error
	mp1	(dependent) (change of Benedict's solution) judge or observe or identifying colour	is difficult or varies or not same;
	mp2	timing as all test-tubes together or observing change in test-tube	is difficult or varies or not same;
	mp3	(standardised) glucose or sample solution from previous tube or contamination	is transferred on outside of Visking tubing bag to next test-tube;

	(v)	[1]
ACE improvement 1	[1]	boil enzyme (and sucrose) **Or** replace enzyme / **E** with water or use water / **W** instead of enzyme / **E** **Or** replace sucrose with water / **W** or use water instead of sucrose **Or** use sucrose and <u>water / **W**</u> **Or** use enzyme and <u>water / **W**</u>; (Ignore equal volume or 2 cm^3 of each) **Ignore** denature enzyme (needs how) **R** 0% sucrose or 0% enzyme

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(vi)			**[max 2]**
Mark first **three** ideas for any correct **two [max 2]**			
ACE improvements **max 2**	mp1	(independent variable) sample more often (e.g. every 2 minutes) or narrower (range);	
		Additional guidance **R** idea of wider range	
	mp2	(dependent variable) weigh mass of precipitate;	
		Additional guidance **R** colorimeter	
	mp3	(Benedict's) thermostatically-controlled water-bath or water-bath at a named temperature (80 to 100 / boiling);	
		Additional guidance **A** digital or electronic **A** description of use of heating and cooling with Bunsen or hot and cold water	
	mp4	(Benedict's) idea of heat or do each test-tube separately	
	mp5	replicate / repeat;	
		Additional guidance **A** more times/trials/readings or repeats or repeat **Ignore** mean	
	mp6	(standardised variables) use separate Visking tubing bags / one Visking tubing bag for 5 minutes, one for 10 minutes, one for 15 minutes, one for 20 minutes or test the water before putting in Visking tubing;	
	mp7	use a buffer;	
	mp8	check temperature of solution has reached temperature of water-bath or equilibrate enzyme or allow longer time for solutions to reach surrounding temperature in boiling tube;	

(b) (i)			**[1]**
ACE interpretation 1	[1]	missing value 7.82 or 7.8 or 8.0;	
		Additional guidance **R** 8	

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	(ii)		**[4]**
PDO layout 4	O	*x*-axis sucrose conc(entration) mol dm^{-3} **AND** *y*-axis change in mass/g or percentage (%) change in mass; **A** label anywhere on right side of grid	
		Additional guidance **Must have** units on x-axis **AND** y-axis **R** put both units g and % **R** mol/dm^{-3} **A** mol/dm^{3}	
	S	scale as *x*-axis 0.2 to 2 cm **AND** *y*-axis 10 to 2 cm ;	
		Additional guidance **A** no 0 label at origin and no end labels **R** awkward scale	
	P	correct plotting of each point to within half a square i.e. less than 1 mm from intersection i.e. plot has to be nearer than halfway from a line – up or down or either side OR if meant to be between two lines then must not be on line above or below or either side;	
		Additional guidance **A** small cross or dot in circle or cross in circle **A ecf** if *x*-axis not 0 if scale 20 to 2 cm. **R** awkward *y*-axis scale **R** blobs or dots alone **R** cross too large	
	L	ruled lines point to point or ruled lines of best fit **R** extrapolated **A** extrapolation from line of best fit to vertical or horizontal lines of plotted point only	**AND** quality clear sharp; **R if** • less than 5 plots • line 1 mm or thicker • any feathery line • irregular thickness
		Additional guidance **A ecf** from incorrect P	

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	(iii)		[1]
ACE interpretation 1	[1]	circle around 0.8 plotted point;	

	(iv)			[3]
		R if any incorrect ref. to sucrose solution.		
ACE interpretation 1	[1]	(Cell **A** no change in mass) take value for cell **A**	(Cell **B** losing mass) **AND** any value higher than value for cell **A**	(Cell **C** gaining mass) **AND** any value lower than cell **A**;
		example 0.4	example any value more than 0.4	example any value less than 0.4
		Additional guidance **Must have** mol dm^{-3} once		
PDO display 2	[1]	(Cell **A**) no change in <u>mass</u> or 0% change in <u>mass</u>;		
	[1]	(Cell **B**) losing mass or figures most negative change in mass Or idea of more water out / exosmosis Or less water in / endosmosis	**AND** (Cell **C**) gaining mass or positive quote most positive change in mass Or less water out / exosmosis Or more water in / endosmosis;	
		Additional guidance **Ignore** ref. to size		

	(v)		[2]
ACE conclusion 2	[1]	(cell **A**) no net <u>move</u>(ment) or diffusion or equal move(ment) or diffusion (of water) in and out; **R** 'no osmosis'	
	[1]	<u>water potential</u> is same inside and outside cell or no difference;	
			[Total: 22]

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2 (a) (i)		**[6]**
PDO layout 1	[1]	no shading **AND** length across widest point (top to bottom) is more than 50 mm **AND** (clear, sharp, unbroken lines) **Must have four** or more hand-drawn lines and / or enclosed areas (not cells) **R if** • drawn over the print of question • any line 1 mm or thicker • any feathery or broken / dashed • 3 'tails' or overlaps or gaps (ignoring gaps for stomata) • **any** ruled or dashed lines in drawing
MMO collection 3	[1]	no cells drawn **AND** drawn correct part of leaf **AND** one closed end;
	[1]	region across closed end or at least two stomata gaps;
	[1]	(outermost two lines) drawn with two lines closer than 4 mm at widest point **AND** at least three defined enclosed areas (not cells);
MMO decision 2	[1]	at least two of defined enclosed areas divided into two regions OR has three outside layers (four lines) (not including any line for palisade);
	[1]	correct label with one label line to each of palisade mesophyll layer and epidermis; label line to within a defined layer for the palisade mesophyll layer and label line to epidermis between any two lines outside this palisade layer or the outermost line.
		Additional guidance **R if** • any label which is biologically incorrect e.g. from incorrect organ or animal or cell structures • any label within drawn area • any label to open space, epidermis must have two lines

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(ii)		**[6]**
	Ignore any inclusion inside canal.	
PDO layout 1	[1]	no shading **AND** largest dimension of one cell larger than 30 mm in any direction **AND** (clear, sharp, unbroken lines for outer cell lines only) **Must have** five or more enclosed areas **R if** • drawn over the print of question • any line 1 mm or thicker or ruled • any feathery or broken/dashed line • any 'tails' or overlaps or gaps if two lines for cell walls • **any** ruled lines;
MMO collection 3	[1]	only (any) 6 cells touching AND form a single chain in an arc (semicircle or full circle);
		Additional guidance **R** any ruled lines
	[1]	(for innermost cells) cells not uniform size **AND** no extra line (canal lining as a line);
		Additional guidance **R** any ruled lines
	[1]	any one cell showing an inclusion; **R** any three cells with small inclusions / chloroplasts
PDO recording 1	[1]	cell walls as double lines with middle lamella between three adjacent cells;
MMO decision 1	[1]	<u>one</u> correct label (**F**) (with label line) to any <u>one</u> cell with enclosed area drawn inside;
		Additional guidance **R F** not totally inside when no label line **R** label line within cell **R** any label other than **F**

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	(iii)			[max 1]
ACE conclusion **max 1**	**max 1**	(thick) presence of cuticle / lignified / resin cells few air spaces / less spongy mesophyll few stomata or pores	prevents / reduces 'loss of water' or transpiration or evaporation or 'diffusion of water' or trap water;	
		sunken stomata	prevents / reduces diffusion or absorb or trap water or moisture or moist air increase humidity;	

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(b) (i) **[5]**

PDO recording 1 [1]

organise as a table / Venn diagram / ruled boxes **AND** headed L1 and Fig. 2.2 **AND** first difference opposite each other;

MMO decision 1 [1]

only **three** observable differences recorded;

ACE interpretation **max 3** **max 3**

mp	feature	L1	Fig. 2.2
1.	vascular bundle arrangement	in line / along centre / scattered	scattered / within columns random;
2.	vascular bundle number or closeness	few(er) or more or close	more or few(er) or further apart;
3.	air spaces / number of air spaces packing / number of cells	none many / more compact more cells / mesophyll	present few/less loose fewer cell / less mesophyll;
4.	canals or openings	present	none / absent;
5.	number of stomata / guard cells	many / more or few / less	few / less or many / more;
6.	distribution of stomata / guard cells	all round or both sides or upper and / or lower	one side or only upper epidermis or not lower epidermis;
7.	cuticle	present / thick / large	absent / thin / small;
8.	epidermal layers **R** cells	more than one layer / thick large	one layer / thin small;
9.	collenchymas / sclerenchyma	present	absent;
10.	palisade layer or cells	present	absent / not clear;
11.	overall shape	smooth	wavy / irregular;

[Total: 18]

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