CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2012 series

9700 BIOLOGY

9700/31 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.

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
/	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 decision 1		volume 20 up to and including 30 (cm^3);
(ii)		[3]
MMO decision 3	mp1	(labels under correct sequence of beakers) (0).5 **AND** (0).25 **AND** (0).125 **AND** (0).0625;
		Do not give mark if incorrect units e.g. mol dm^{-3}
	mp2	(solution G) cm^3 or ml(s) shown at least once **AND** shows transfer of 10 (cm^3) of 0.5 (%) to next dilution or shown by arrow with 10 (cm^3) **AND** 10 (cm^3) transferred from third beaker to fourth beaker and from fourth beaker to fifth beaker;
		Do not give mark if incorrect concentrations contradiction on units e.g. cm and cm^2
	mp3	cm^3 or ml(s) shown at least once **AND** adds 10 (cm^3) of (distilled) water/ **W** to each of four beakers **AND** must add previous concentration to fourth and fifth beakers;
		Do not give mark if contradiction on units e.g. cm and cm^2
(iii)		[4]
PDO recording 2	mp1	table with all cells drawn **AND** heading (percent(age) conc(entration) (of) glucose or **G** or [**G**] or [glucose];
		Do not give mark if % in cells of headed column other units e.g. mol dm^{-3} more than one row in one cell
	mp2	(heading for any column/row including mean) **only** time (with) s or sec(onds);
		Do not give mark if units in cells of this column/row headings for volumes or method information or in cells e.g. volumes and concentrations in same cells
MMO collection 2	mp3	(mark first column/row or recorded results) records at least four results as whole numbers only that is any whole number between 3 and 120 or records > or more than 120;
		Do not give mark if '< or less than 120' e.g. 0:45 or 50:45
	mp4	(mark **first** column/row of recorded time for recording correct pattern) records 1% is the shorter/lower value than lowest concentration; (if numbered test tubes/ solutions only check aii for concentration)
		Must have units for time recorded somewhere e.g. seconds with tenths or min:sec minimum two recorded time including 'more than 120'

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(iv)		[2]
MMO collection 1	mp1	shows 0.25% in the centre of the scale line **AND** 0.125% half way between 0.25% and 0.0625%;
ACE interpretation 1	mp2	(from their results) puts **S** in correct position on scale;
		Must have at least one concentration label either side of **S**
		Do not give mark if shows values in the wrong order from their results no value for **S** in results
(v)		[3]
/	mp 1	(independent variable) Idea of more/ wider/higher/lower concentrations of **G**;
	mp 2	(dependent variable)replicate or repeat experiment;
		Ignore mean
	mp 3	(dependent variable) use a white tile or glucose dipstick or measure mass of precipitate;
	mp 4	(standardised variables) thermostatically (-controlled) water bath for Benedicts test;
		Do not give mark if temperature controlled room/ air conditioning
	mp 5	(standardised variable) leave the visking tubing in the water for a longer time;
(b) (i)		[4]
PDO layout 4	O	*x*-axis concentration of glucose solution (inside the visking tubing) or [glucose] / arbitrary units or au **AND** *y*-axis absorbance of light (by the coloured solution) (/) arbitrary units or au;
	S	scale as *x*-axis 5 to 2 cm labelled each 2 cm except origin and 30 minutes **AND** *y*-axis 0.5(00) to 2 cm labelled each 2 cm except origin and 1.900;
	P	correct plotting of • five points • as small cross (use square on grid)) **o**r dot (in circle use grid) **or** cross in circle to within half a square;
	L	five plots with ruled lines exactly point to point or curve through set of 5 points **AND** (quality) smooth line less than 1 mm thick use grid;

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Additional guidance		
	O	
	S	**Must have** label of value of origin if zero not at origin
		ecf if no labels for O but figures show orientation is correct then must have required scale **ecf** if reverse O scale *x*-axis 0.5 to 2 cm and *y*-axis 10 to 2 cm.
	P	Do not give mark if **ANY** blobs or dots alone
	L	Can have ecf from incorrect P extrapolation to zero Do not give mark if any feathery line or gap in the line or dashed line any irregular thickness extrapolation above 30 au
(ii)		[1]
ACE conclusion 1		(at 15 au) idea of faster diffusion or more diffusion or steeper diffusion gradient or (at 10 au) idea of slower diffusion or less diffusion or less steep concentration/diffusion gradient;
(iii)		[1]
ACE conclusion 1		(between 25 and 30 au) diffusion can't go any faster/at highest rate or there is a limiting factor or example of limiting factor e.g. volume of water, surface area of visking tubing or temperature or idea that dye now opaque or dye has deepest intensity of colour (so no further increase in light absorption);
(iv)		[1]
ACE interpretation 1		(smallest division 0.2 cm^3 ÷ 2) (0).1;
		[Total: 20]
2 (a) (i)		[1]
ACE conclusion 1		Stele or central xylem/vascular tissue;

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(ii)			[4]
PDO layout 1	mp1	Do not give mark if	drawn over the print of the question or any shading anywhere or any ruled or compass lines smaller than 60 mm across the widest dimension less than three enclosed areas the outer most enclosed area has: <u>any</u> line 1 mm or thicker (use grid) <u>any</u> feathery or dashed or gap in line <u>any</u> 'tails' or overlaps
MMO collection 2	mp2	no cells drawn **AND** drawn whole section;	
	mp3	the xylem tissue is drawn as a irregular enclosed area inside one central enclosed area;	
MMO decision 1	mp4	labels <u>cortex</u> with label line touching either innermost line of the epidermis or ending inside the enclosed area between epidermis and stele;	
		Do not give mark if	any label which is biologically incorrect e.g. from animal any label within drawn area
(iii)		**Ignore** additional lines/circle round drawing of specimen	[5]
PDO layout 1	mp1	Do not give mark if	drawn over the print of the question or <u>any</u> shading anywhere or <u>any</u> ruled or compass lines smaller than 40 mm across widest cell; less than four cell outlines any outermost lines have (even if more than 4): <u>any</u> line thicker 1 mm or thicker <u>any</u> feathery line dashed or gap in the line <u>any</u> 'tails' or overlaps
MMO collection 2	mp2	<u>only four</u> complete vessel outlines drawn **AND** each vessel outline must touch at least one other vessel outline at least one point to form one group;	
		Do not give mark if	any ruled or compass lines
	mp3	all cells drawn have cell walls drawn as double lines all the way round (inner line can touch but not cross/overlap the outer line) **AND** (between any 2 adjacent cells middle lamella drawn) 3 lines at least 4 mm across at widest point;	
		Do not give mark if	drawn EM organelles e.g. mitochondria 7 or more cells

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MMO decision 2	mp4	labels lumen with labelled line inside enclosed area within xylem cell; Do not give mark if any label within drawn area
	mp5	correct annotation with a label line description of cell wall e.g. stained red, thick or (lumen) empty/ no cell contents/hollow/large/wide;
(b) (i)		[3]
MMO decision 1	mp1	(answer to step 2) 0.01(0) (mm) OR expressed in standard from 1×10^{-2};
PDO display 1	mp2	(either box in step 2) 1000 or 10^3 **AND** answer from step 1 in other box; **ecf** any answer to step 1
ACE interpretation 1	mp3	μm **AND** answer from step 1 × 1000; **Ignore** mp2
(b) (ii)		[max 2]
MMO collection 1	mp1	measures correctly in eyepiece graticule units 23, 24, 25, 26, 27 (epg units); Do not give mark if μm or mm or cm or m
PDO display 1	mp2	(shows multiplication by answer from bi) any value multiplied by answer from step 2; Do not give mark if division shown
PDO recording 2	mp3	organise as a table with only **three** columns or rows separated by lines (no cells needed) **Ignore** number column **AND** headings in any order only **J1/**slide and **Fig. 2.3** **AND** third column contains features;
(c)		[5]
	mp1 mp2	features J1 Fig.2.3 (either way round and other column to left, right or in middle) only differences (at least two) recorded;
		Can have with no table even if incorrect
		Do not give mark if any similarities any functions

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ACE interpretation MAX 3

Max 1	mp3	**feature**	**J1**	**Fig.2.3**
		shape vascular bundles or tissues e.g. xylem	cross shape or not in a ring or irregular	ring/circular or regular;
		vascular tissue/xylem position	in centre or inner or near endodermis/ pericycle or phloem tissue surrounds xylem	near edge/epidermis or phloem tissue outside xylem;
		quantity of xylem/vascular tissue	few(er)/less	more;
		cambium	absent	present;
Max 2	mp4	pith or middle or centre	none/absent /no	has/present;
	mp5	endodermis or pericycle or stele	yes or present or has	no or absent or has not;
	mp6	cortex	large(r)/wid(er)/thick(er) or more air spaces (between cells) or cells irregular shapes	small(er)/narrow(er)/thin (ner) or few(er) air spaces (between cells) or cells regular shape/circular/oval;
	mp7	epidermis	thick(er) or wid(er) or larg(er) or irregular shaped cells	thin(ner) or narrow(er) or regular shaped cells;
	mp8	collenchyma	absent	present;

[Total: 20]

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