

MARK SCHEME for the October/November 2012 series

9700 BIOLOGY

9700/36

Paper 3 (Advanced Practical Skills 2),
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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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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)
<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
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) [3]			
MMO decisions 3	[1]	cuts two blocks which are different from $10 \times 10 \times 5$ mm (400 mm^2)	AND dimensions OR surface area of blocks 2 and 3 are smaller than block 1;
	[2]	each surface area column correctly completed;;	
(ii) [5]			
PDO recording 2	mp 1	table with all cells drawn	AND heading (top row or column to left of recorded data) <u>surface area (/) mm^2</u> ;
		Can have <ul style="list-style-type: none"> no outer boundary Ignore <ul style="list-style-type: none"> block/additional columns (results for U) notes outside the area 	Do not give mark if <ul style="list-style-type: none"> units mm^2 in cells of headed column other units e.g. cm^2 no heading for surface area or cm^2 SA two rows in one cell
	mp 2	(heading for any column/row including mean) <u>only time</u> (with) <u>s</u> or <u>sec(onds)</u> ; e.g. time and observation in same heading	
		Ignore <ul style="list-style-type: none"> if have columns/rows for blocks or observations e.g. colour any notes outside area headings for blocks t or T 	Do not give mark if <ul style="list-style-type: none"> volume units in cells of this column/row/other notation e.g. 35' min(utes) ref. to width/length/depth or method information or in cells e.g. width, length, depth and surface area in the one cell ref. to U ref. to temperature
MMO collection 2	mp 3	(mark first column/row of recorded time) records <u>whole numbers only for ANY three</u> (surface areas/blocks) that is any whole number less than 360 or records > or 'more than 360';	
		Must have <ul style="list-style-type: none"> <u>whole</u> numbers between 3 and 360/'more than 360' 	Do not give mark if <ul style="list-style-type: none"> 'less than 360' time recorded as 0:51
	mp 4	replicates for all three surface areas (six times);	

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MMO decision 1	mp 5	calculates mean OR rate for all surface areas;	
	(iii)		
ACE interpretation max 2		cause of error	WITH idea of error
	mp 1	loss of colour/or describe	judge observe see identify determine subjective different/varies/not same;
	mp 2	handling e.g. using the mounted needle	gave 'hole' describes damage/ increases or changes surface area;
	mp 3	temperature	different/varies/not same drops/decreases/changes;
	mp 4	blue colour/staining of blocks or orientation in test-tube/ block touches the sides of the test tube	not dark enough/uneven or blotchy/ decreases/changes the surface area;
	mp 5	cutting the blocks	difficult to get <u>correct size/accurate</u> ;
(iv)			[3]
ACE improvements max 3	mp 1	idea of using more or different or wider/narrower range of surface areas/sizes or examples OR repeats/replicates//more readings;	
	mp 2	(method to keep surface area constant) use 'cutter'/use a machine use sharper (scalpel) use Vernier calliper use moulds;	

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	mp 3	(standardised variables) (how water temperature is maintained) temperature maintained in thermostatically(-controlled) water-bath or described using heating or different/'fresh' water at desired temperature;	
		Can have thermostatic/electr(on)ic/incubator	
	mp 4	staining for longer/shorter/use darker/lighter stain;	
	mp 5	use a flat/shallow container/beaker and make sure blocks same way up;	
	mp 6	use spoon/forceps to prevent damage to block;	
(b) (i) If draw chart then max 1 for O.			[4]
PDO layout 4	O	x-axis <u>time (/) s(econds)</u> AND y-axis <u>speed of (the) bubble (/) cm s⁻¹ or cm/s or cm per second;</u>	(R cm/s ⁻¹)
	S	scale on x-axis <u>5 to 2cm labelled each 2 cm</u> except origin and 30 AND y-axis <u>2 to 2 cm labelled each 2 cm</u> except origin and 8;	ecf if no labels for O or if reverse O then scale must use more than half grid for both x and y Allow speed of bubble 1 to 2 cm (3 at origin) AND time 10 to 2 cm ONLY Ignore symbol for break in y-axis Must have • label of value of origin if zero not at origin Do not give mark if • awkward scale
	P	correct plotting of • <u>5</u> points • as small cross (lines less than 4 mm each) or dot (in circle) or cross in circle to <u>within</u> half a square Can have • ecf if x-axis not 0 if scale 5 to 2cm even	Do not give mark if • the plot for the reading-off point is the same as for the five plotting points • awkward scale. • ANY blobs or dots alone • ANY cross too large

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	L	<p>five plots with <u>ruled</u> lines exactly point to point</p> <p>AND (quality)</p> <p><u>smooth line less than 1 mm thick;</u></p> <p>Can have</p> <ul style="list-style-type: none"> • ecf from incorrect P 	<p>Do not give mark if</p> <ul style="list-style-type: none"> • any feathery line • any irregular thickness • any extrapolation either end
(ii)		[2]	
MMO collection 1	mp 1	shows on graph where reading taken off at 10 seconds;	
		<p>Can have mark if</p> <ul style="list-style-type: none"> • same as other plotted points • one or two lines • on graph with x and y axes incorrectly orientated 	<p>Do not give mark if</p> <ul style="list-style-type: none"> • shown two lines on graph (given choice of two lines anywhere on graph)
ACE interpretation 1	mp 2	correct reading from graph accurate to value of half square	<p>AND</p> <p><u>(cm s⁻¹ or cm/s or cm per second);</u></p> <p>(Do not give cm/s⁻¹)</p>
		<p>Can have mark if</p> <ul style="list-style-type: none"> • line crosses at halfway between horizontal lines then MUST read half square value e.g. 0.1 • line crosses nearer right horizontal then can have only either half square value or value of right horizontal • line crosses nearer left horizontal then can have only either value of left horizontal or half way value • apply same idea if drawn on incorrect scale • units incorrect on graph then allow ecf for units here 	

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(iii)		[3]
ACE conclusions 3	mp 1	(between 12 and 17 seconds) starch is being hydrolysed/broken down by the enzyme;
	mp 2	(between 25 and 30 seconds) hydrolysis (almost) ended/almost finished/no more starch or starch all hydrolysed/broken down or limiting (factor) or nearly zero/hardly any left;
	mp 3	(either 12-17 seconds or 25-30 seconds) correct ref. to active sites used or ESCs (substrate binding); Do not give mark for <ul style="list-style-type: none"> • colliding • effective collision
		[Total: 22]



2 (a) (i)		[5]
PDO layout 1	mp 1	quality of plan diagram with clear, sharp, unbroken lines; Do not give mark if <ul style="list-style-type: none"> • drawn over the print of question • <u>any</u> shading anywhere • <u>any</u> ruled lines • smaller than 60 mm across widest point (from outermost line to innermost line) • if less than three hand drawn lines AND at least one enclosed area (best vascular bundle) if any of the three outermost lines and any one outer line of enclosed area has <ul style="list-style-type: none"> • <u>any</u> line 1mm or thicker • <u>any</u> feathery line or broken/dashed line or gaps • <u>any</u> 'tails' or overlaps

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MMO collection 2	mp 2	no cells drawn AND sector plus at least one vascular bundle drawn;	
		Ignore • outline being curved	
	mp 3	the outermost line AND at least three inner lines comprising the ‘epidermal layers’;	
MMO decision 2	mp 4	(vascular bundle) drawn with at least three enclosed areas AND tapering (inner phloem narrower than outer phloem, NOT symmetrically oval);	
	mp 5	labels <u>phloem</u> with ruled line touching line around enclosed area or ending inside enclosed area in vascular bundle with at least three regions where middle region is the widest (either outer or inner region);	
		Ignore • any labels identifying tissues associated with plant	Do not give mark if • any label which is biologically incorrect e.g. from animal • any label within drawn area
(ii)			[4]
PDO layout 1	mp 1	quality of drawing with clear, sharp, unbroken lines; Do not give mark if • drawn over the print of question • enclosed in an outline (VB) • <u>any</u> shading anywhere • <u>any</u> ruled lines • if smaller than 50mm across widest cell • if less than 3 cell outlines either of the outermost lines of the two largest enclosed areas have • <u>any</u> line 1mm or thicker (use grid) • <u>any</u> feathery line or broken/dashed or gaps • <u>any</u> ‘tails’ or overlaps	
MMO collection 2	mp 2	only two largest enclosed areas drawn AND at least two smaller vessels;	for the two largest enclosed areas do not give mark if • any enclosed areas/cell structures • regions of vascular bundles are drawn (see exemplar E in standardisation)
	mp 3	for both largest enclosed areas the cell walls must have double lines;	
MMO decision 1	mp 4	labels <u>lumen</u> with ruled line inside enclosed area within xylem cell; Do not give mark if • any label (apart from xylem vessels and xylem cells) other than lumen • any label within drawn lines	

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(b) (i)		[4]
MMO decision 1	mp 1	shows at least three large values OR shows at least three large values AND the same number of smaller values all less than the large values AND draws and measures a line across at least five cells;
MMO collection 1	mp 2	for width and length shows at least once on raw data OR where added up units <u>mm</u> or <u>cm</u> AND either whole number mm or to 0.5 mm OR whole cm or to 0.05 cm;
PDO display 2	mp 3	shows either for width AND length shows addition and division by number of measurements OR for width one measurement divided by the number of cells AND for length addition and division by number of measurements; Do not give mark if <ul style="list-style-type: none"> • use different units for width and length • conversion to metres • conversion to μm
	mp 4	any number shown to <u>lowest common denominator</u> either as larger whole number: or <u>to</u> smaller whole number OR as a fraction, larger number over smaller number; Do not give mark if <ul style="list-style-type: none"> • only give ratio with no working shown

(ii)		[5]																												
PDO recording 2	mp 1	<p>organise as a table with only three columns or rows separated by lines (no cells needed) Ignore number column</p> <p>AND headings in any order only <u>cortex</u> and <u>xylem</u></p> <p>AND third column contains features;</p> <p> <u>features</u> <u>cortex</u> <u>xylem</u> either way round and other column to left, right or in middle</p>																												
	mp 2	<p><u>only observable</u> differences (at least two) recorded;</p> <p>Do not give mark if</p> <ul style="list-style-type: none"> • any similarities or <u>function</u> recorded • living versus dead • ref. to cell membrane • ref. to end walls/pits/pores 																												
ACE interpretation max 3	[max 3]	<table border="1"> <thead> <tr> <th>mp</th> <th>feature</th> <th>cortex</th> <th>xylem</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>nuclei</td> <td>visible/present (ignore more nuclei)</td> <td>not visible/absent; (ignore fewer nuclei)</td> </tr> <tr> <td>2</td> <td>ratio of length to width/ length width</td> <td>low(er) shorter wider</td> <td>high(er) longer narrower;</td> </tr> <tr> <td>3</td> <td>cell wall</td> <td>thin</td> <td>thick;</td> </tr> <tr> <td>4</td> <td>bands (of lignin)/ staining/colour</td> <td>absent/brown/ different</td> <td>present/red/different;</td> </tr> <tr> <td>5</td> <td>cell contents/ cytoplasm/ vacuole/lumen/hollow</td> <td>present any difference</td> <td>absent any difference;</td> </tr> <tr> <td>6</td> <td>number of cells/packing</td> <td>more/closely packed</td> <td>few(er)/loosely packed;</td> </tr> </tbody> </table>	mp	feature	cortex	xylem	1	nuclei	visible/present (ignore more nuclei)	not visible/absent; (ignore fewer nuclei)	2	ratio of length to width/ length width	low(er) shorter wider	high(er) longer narrower;	3	cell wall	thin	thick;	4	bands (of lignin)/ staining/colour	absent/brown/ different	present/red/different;	5	cell contents/ cytoplasm/ vacuole/lumen/hollow	present any difference	absent any difference;	6	number of cells/packing	more/closely packed	few(er)/loosely packed;
	mp	feature	cortex	xylem																										
	1	nuclei	visible/present (ignore more nuclei)	not visible/absent; (ignore fewer nuclei)																										
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6	number of cells/packing	more/closely packed	few(er)/loosely packed;																											
		[Total: 18]																												