CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2012 series

9700 BIOLOGY

9700/34 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.

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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)
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)		[3]
MMO decisions 3	mp 1	(0).8 **AND** (0).6 **AND** (0).4 **AND** (0).2;
	mp 2	(for correct concentration) **Ignore** 1 % cm^3 or mls shown at least once **AND** at least three correct volumes of E with 0.2 % difference between concentrations; No ecf if incorrect concentrations.
	mp 3	values for at least **three E** and **W** add up to 5;
(ii)		[max 1]
MMO decisions max 1		Idea of • replace enzyme with water • W/water either as beaker or added to test-tube • W/water and S/milk; **Do not give mark for** more than one idea
(iii)		[5]
PDO recording 2	mp 1	table with all cells drawn **AND** heading (top row or column to left of recorded data) percent(age) or % conc(entration) of E or enzyme; **Can have** • no outer boundary **Ignore** • test-tube/additional columns • notes outside area **Do not give mark if** • % in cells of headed column • other units e.g. mol dm^{-3} • no percentage or % • two rows in one cell for multiple trials
	mp 2	(heading for any column/row including mean) only time (with) s or sec(onds); • if have columns/rows for test-tubes or observations e.g. colour • any notes outside area **Ignore** • heading for test-tubes • t or T **Do not give mark if** • units in cells of this column/row • e.g. 45' (units) • min(utes) • headings for volumes or method information or in cells • e.g. volumes and concentrations in same cells
MMO colle	mp 3	(mark first column/row of recorded time) records whole numbers only for ANY four (concentrations including control/0) that is any whole number between 3 and 240 or records > or more than 240;

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		Do not give mark if • < or less than 240 • e.g. 0:45 or 50:45
	mp 4	(mark first column/row of recorded time for recording correct pattern) recorded time for <u>1%</u> is shorter time/lower value than lowest concentration; **Ignore** control/0
		Must have • units for time recorded somewhere e.g. seconds with tenths or min:sec
MMO decision 1	mp 5	records control or 0 <u>'> or more than 240' (seconds/s)</u>

(iv) [1]

ACE interpretation 1	cause of error	WITH idea of error
	end-point or when goes clear OR <u>time in water-bath</u> OR <u>temp</u>	judging or observing seeing or figuring out or varies or subjective different or varies or not the same or drops or changes;

(v) [3]

ACE improvements 3	mp 1	(independent) at least 3 pHs or at least 3 examples or low pH and high pH and neutral/pH7; OR Idea of keep enzyme conc same/use E **AND** range of/different pHs;
		Do not give mark if • change more than one variable
	mp 2	(method to change pH) (for all pHs) use <u>buffers</u>;
	mp 3	(dependent) rate from data <u>divide 1 by time</u> or <u>divide 1000 by time</u> or plot graph of <u>pH against time</u>;

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(b) (i) [4]

PDO layout 4	O	*x*-axis time (/) min(utes) **AND** *y*-axis area of gelatine(/) mm^2;
	S	scale on *x*-axis 20 to 2 cm labelled each 2 cm except origin and 100 **AND** *y*-axis 50 to 2 cm labelled each 2 cm except origin and 200;
	P	correct plotting of • points **Ignore** plots at 200 • as small cross (use square on grid) **o**r dot (in circle use grid) **or** cross in circle to within half a square;
	L	plots joined with ruled lines exactly point to point **AND** (quality) smooth line less than 1 mm thick **AND** (for each line) a label with correct pH or key;

Additional guidance:

O	**Ignore** abbreviations e.g. t/T or A/a	
S	**ecf** if no labels for O or if reverse O then scale must use more than half grid for both *x* and *y* axes **Must have** • label of value of origin if zero not at origin	**Do not give mark if** • awkward scale e.g. to each 2 cm

Time /mins	Area/mm^2
15	40
18	80
25	
30	
40	

P	**Can have** **ecf** if *x*-axis not 0 if scale 20 to 2 cm even **Do not give mark if** • awkward scale • any blobs or dots alone • any cross too large	
L	**Can have** • **ecf** from incorrect **P**	**Do not give mark if** • any feathery line • any irregular thickness • any extrapolation either end

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	(ii) **Ignore** ref to enzyme activity **Do not give mark if** wrong context	[2]
ACE interpretation 2	mp 1	Idea of as/with increasing/longer <u>time</u> <u>area/gelatine /protein</u> decreases more in pH4 than pH6.4 OR pH 4.0 more area/gelatine /protein hydrolysed/broken down in same time/faster OR area/gelatine /protein decreases quicker/more **ora** pH 6.4 less area/gelatine /protein hydrolysed/broken down in same time/slower/it OR area/gelatine /protein decreases slower/less;
	mp 2	(pH 4) goes to zero or all area/gelatine/protein hydrolysed/broken down or no area/gelatine/protein left OR (pH 6.4) area/gelatine/protein goes to half or 100 (mm^2); OR Ref to other quoted figures so pH 4 with time and area **AND** pH 6.4 with ref to same time and area **Ignore** units
	(iii)	[3]
ACE conclusions 3	mp 1	(pH 4) nearer/almost or at <u>optimum</u>;
	mp 2	(pH 4/acidic/lower pH) enzyme/it is more active or the activity higher/faster or works best/digests more or more (ESCs) or more (substrate binds to enzyme/active sites) **ora** (pH 6.4 or alkali or higher pH) enzyme/ it is less active or the activity lower/slower or few (ESCs) or few (er) (substrate molecules bind to active sites) OR pH 4.0 is fast and pH 6 is slow;
	mp 3	correct ref. to for either pH enzyme substrate complexes or ESCs idea that substrate (molecules) bind go into <u>active sites</u>; **Ignore** collision(s)/effective collisions OR (pH 6.4) idea of enzyme denatured Idea of enzyme shape/structure/molecule altered or bonds disturbed
		[Total: 22]

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2 (a) (i)	**Ignore** additional lines/circle round drawing of specimen [5]	
PDO layout 1	mp 1	quality of plan diagram; **Do not give mark if** • drawn over the print of question or <u>any</u> shading or <u>any</u> ruled lines • smaller than 50 mm across widest point of midrib – 5 squares on grid **AND** (clear, sharp, unbroken lines) • stomata/breaks open-ended • less than four enclosed areas any of the line of enclosed area under outermost enclosed outline has • <u>any</u> line 1 mm or thicker • <u>any</u> feathery or broken/dashed line or gaps • <u>any</u> 'tails' or overlaps
MMO collection 3	mp 2	no cells drawn **AND** complete leaf drawn;
	mp 3	at least five lines counted across leaf as line through middle of central region across (upper to lower epidermis); **Ignore** lines for vascular bundle
	mp 4	central region drawn with at least 3 enclosed areas in shape which is not a symmetrical oval top to bottom;
MMO decision 1	mp 5	labels <u>xylem</u> with line touching line around enclosed area or ending inside enclosed area in vascular bundle with at least two regions;
		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 written within drawn area

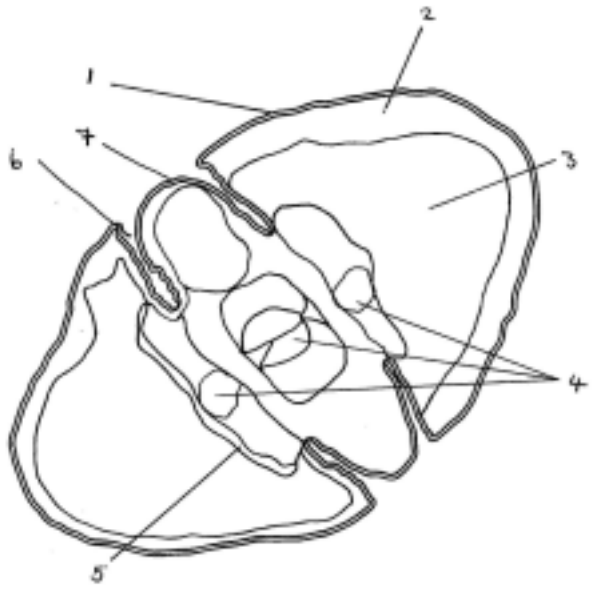
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(ii)		[5]
PDO layout 1	mp 1	quality of drawing; **Do not give mark if** • drawn over the print of question or <u>any</u> shading or <u>any</u> ruled lines • smaller than 50 mm across widest cell **AND** (clear, sharp, unbroken lines) • less than 3 cell outlines any of outermost lines have (even if more than 3) • <u>any</u> line 1mm or thicker • <u>any</u> feathery or broken/dashed line or gaps • <u>any</u> 'tails' or overlaps
MMO collection 2	mp 2	only three complete cells drawn **AND** cells must touch another cell at least at one point to form one group;
	mp 3	at least one cell has at least four internal enclosed areas drawn;
		Do not give mark if • additional organelles e.g. mitochondria, etc • lines/dots drawn within chloroplast enclosed areas
PDO recording 1	mp 4	cell walls drawn as double lines with middle lamella between two complete adjacent cells;
MMO decision 1	mp 5	at least two cells must contain at least five small randomly scattered enclosed areas and labels <u>only one</u> chloroplast in any one cell with label line touching outermost line of chloroplast or into middle of chloroplast;
		Do not give mark if • small enclosed areas form single line around most of boundary of any two cell • any label other than chloroplast • any label within drawn lines

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(b)		[3]
MMO collection 1	mp 1	shows unit as <u>mm</u> on measurements for **both** (**Y** and **Z**) or larger and smaller values **AND** measures **Y** and **Z** lines correctly; ***Y*** *allow one of:* *120(.00) or 120.5(0) or 121(.00) or 121.5(0) or 122(.00) or 122.5(0) or 123.(00)* ***Z*** *allow one of:* *75(.00) or 75.5(0) or 76(.00) or 76.5(0) or 77(.00)*
PDO display 2	mp 2	shows any value of **Y** divided by any value of **Z** OR shows multiplication of both **Y** and **Z** by same number to give whole numbers;
		Do not give mark if • use <u>different</u> units for **Y** and **Z** • conversions to metres • conversions to μm
	mp 3	as larger whole number **<u>:</u>** or <u>to</u> smaller whole number to <u>lowest common denominator</u>;
		Do not give mark if • no measurements or working • if units

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(c) (i)		[2]
(ii)		[3]
PDO recording 1	mp 1	(plan <u>no cells</u>) has at least one line following outline in at least one 'wing' **AND** central region contains at least three enclosed areas;
MMO decision 1	mp 2	label lines and labels **P**, **Q** and **R** to three different features;
		

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ACE interpretation max 3

Award marks from **only one column** for each mark point. [max 3]

Labelled region	Fig 2.1	M1
mp 1 [2 marks] overall shape number of tissues/regions	has 'wings' or divided into two or irregular/ symmetrical/oval/AW; more;	oval or more round or straight or regular/asymmetrical/triangular; few;
mp 2 [1 mark] **Do not give mark if** membrane	thin(ner) layer or one cell thick or less/fewer cells or loosely packed cells or no thickened layer/cells or cells not as round/AW or rough or hair(s) or trichomes;	thick(er) layer or more cells or more compact/closely-packed or cells rounder shape or smooth or no hairs/trichomes;
mp 3 + 4 [max 2 marks] **Ignore** general shape of cells	Idea of thick layer; darker stained /contain more staining; OR longer /thinner/oval or more/closely packed cells OR (palisade cells/layer) missing/absent at **5**;	Idea of thin layer; less stained; round(er) cells or few/loosely packed cells;
mp 5 [1 mark] **Do not give mark if** vacuole/s	more (air/intercellular) spaces or fewer cells more (spongy mesophyll) cells or larger area;	less spaces or more cells few (spongy mesophyll) cells/small area;
mp 6 + 7 [max 2 marks] **Do not give mark if** vessel	two/divided/four/more areas more xylem/cells (vessels) more xylem to phloem ; OR xylem inside phloem/xylem in centre phloem outside; OR cross-shape /butterfly shape; OR labels cells around it as present;	one/single/ less; phloem one side only or not around xylem; round or oval shape; no /few cells ;
mp 7 + 8 [max 2 marks]	cross shape/butterfly shape; bundle sheath present or absent or layer or cells present/absent;	round or oval or absent; bundle sheath present/absent or layer/cells present/absent;
mp 9 [1 mark]	indent or gap or curled or sunken stoma(ta) or present;	straight or no indent or no gap or not curled or absent;
mp 10 [1 mark]	fold or ridge or lobe or present;	no fold or no wings or absent;

[Total: 18]

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