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GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2012 series

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.

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)		[3]
MMO decision 3	mp 1	(labels for concentration under correct sequence of beakers) (0).3 **AND** (0).03;
	mp 2	(for dilution of C) cm^3 or ml(s) shown **AND** shows transfer of 1 (cm^3) of 0.3 (%) to next dilution or shown by arrow;
		Do not give mark if incorrect concentrations
	mp 3	(for water) adds 9 cm^3 of (distilled) water /**W** to each of the two beakers **AND** must add previous concentration to third beaker;
(ii)		[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 C or copper sulfate or [C] **OR** only time (with) s or sec(onds);
		Can have: • no outer boundary **Ignore**: • test-tube /additional columns • notes outside area • t or T **Do not give mark if**: • % in cells of headed column • other units e.g. mol dm^{-3} • no percentage or % • units in cells of this column/row e.g. 45' (units) • min(utes) • more than one row in one cell for multiple trials
	mp 2	(heading for any column/row including mean) temp(erature) (/) °C;
		Ignore: • if have columns/rows for test-tubes or observations e.g. effervescence • any notes outside area • heading for test-tubes/heading for time • t or T **Do not give mark if**: • headings for volumes or method information or in cells e.g. volumes and concentrations in same cell

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MMO collection 3	mp 3	(mark first column / row) records at least four results as whole numbers or to half a degree only for 30 seconds that is any whole number or 0.5 °C, which is less than 35 and more than 15;
	mp 4	(mark first column / row of recorded temperature for recording correct pattern) for **W/** water / 0, temperature at 210 seconds higher than temperature at 30 seconds;
		Must have units for temperature recorded somewhere, e.g. °C
	mp 5	in column / row for concentration/solution the order is **W** and then from their lowest concentrations to **3%**; (water to left for row or top if column)
(iii)		[1]
ACE conclusion 1		**Must have** results for water, 0.03% and 3% **AND** results for lowest temperature recorded e.g. initial temperature / 30 seconds **AND** results for 210 seconds;
		(if change in temperature from 0 to 210 seconds for 3% is **LESS** compared to water/0.03%) inhibition/ (reaction) slows down/less active/fewer ESCs/describes blocking active sites/denatured
		(if change in temperature from 0 to 210 seconds for 3% is **MORE** compared to water/0.03%) more active/reaction speeds up/more active/ more ESCs/ cofactor
		(if change in temperature from 0 to 210 seconds for 3% is **SAME** compared to water/0.03%) (allow 0.5°C difference) no effect

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(iv)			[max 2]
ACE interpretation max 2		cause of error	WITH idea of error
	mp 1	starting / initial temperature	not same / different / changes;
	mp 2	thermometer position	not same / different / changes;
	mp 3	mixing (of **W**, **H** and **Y** and/or **C**, **H** and **Y**)	not same for each test-tube / different / changes;
	mp 4	concentration of hydrogen peroxide / substrate	changes / decreases;
(v)			[max 3]
ACE improvements max 3	mp 1	use thermostatically (controlled) water bath;	
		Do not give if temperature controlled room / air conditioning	
	mp 2	(dependent variable) use data logger with temperature sensor / digital thermometer / thermometer with narrower calibration;	
	mp 3	use magnetic stirrer / mechanical stirrer (to standardise stirring);	
	mp 4	(standardised variables) cover or use 'fresh' / from bottle hydrogen peroxide;	
	mp 5	(independent variable) more / wider / narrower range of concentrations (of **C)**;	
	mp 6	(dependent variable) record for longer OR for <u>longer intervals</u> OR repeats / replicate experiment / multiple tests;	
	mp 7	insulate test-tubes / describes method;	
(vi)			[1]
MMO decision 1		*Idea of*	• replace **C** / copper sulfate with water • **W**/water and **Y** / yeast suspension and **H** / hydrogen peroxide • replace **Y** / yeast suspension with water/beads;
		Do not give	• just remove **C** / copper sulfate • boil enzyme / **Y**

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(vii)		[1]
ACE interpretation 1		half of smallest division (whatever stated as smallest division); **Do not give** for any figure less than (0).25

(b) (i)			[4]
PDO layout 4	O	*x*-axis conc(entration) of catalase (/) arbitrary units / (au) **AND** *y*-axis absorbance of light (by the coloured solution) (/) arbitrary units (au);	
	S	scale as *x*-axis 20 to 2 cm labelled each 2 cm except origin and 100 need not be labelled **AND** *y*-axis 0.2(0) to 2 cm labelled each 2 cm except origin and 1.4(0) need not be labelled;	
	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 joined with ruled lines exactly point to point **AND** (quality) smooth line less than 1 mm thick (use grid);	
Additional guidance:			
O			
S	**Must have** label of value of origin if zero not at origin **ecf** if no labels for O but numbers show orientation is correct then must have scale as normal. If reverse orientation then only *x*-axis 0.4 to 2 cm *y*-axis 20 to 2 cm		
P	Can have		• **ecf** if *x*- and *y*-axis reversed if *x*-axis 0.4 to 2 cm *y*-axis 20 to 2 cm
	Do not give if		• any blobs or dots • any cross too large with any part of cross outside square on grid or dot larger than circle on grid

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L	Can have **Do not give if**	• ecf from incorrect **P** • any feathery or gap in line • any irregular thickness • any extrapolation either end
	(ii)	[2]
ACE conclusions 2	mp 1	more enzyme-substrate-complexes / ESCs / more active sites binding to hydrogen peroxide / substrate;
	mp 2	less hydrogen peroxide / substrate available / all gone / none left / hydrogen peroxide limiting factor;
		[Total: 22]
2	**(a)**	[max 5]
PDO layout 1	mp 1	quality of plan diagram; **Do not give if** • drawn over the print of question or <u>any</u> shading or wiggly lines anywhere or <u>any</u> ruled or compass lines • complete section • drawn both walls • thickness of wall smaller than 60 mm across widest point **AND** (clear, sharp, unbroken lines) ; • less than **5** hand drawn lines the outermost line and innermost line • <u>any</u> part of the line 1mm or thicker • <u>any</u> feathery or dashed or gap in line • <u>any</u> 'tails' or overlaps
MMO collection 2	mp 2	no cells drawn **AND** only sector of wall drawn;
		Do not give if • two walls (not sector drawn) • complete sector
	mp 3	drawn 5 layers (6 lines);

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MMO decision 2

mp 4: labels lumen with label line into the space below innermost line;

Ignore
- any labels identifying tissues associated with animal

Do not give if
- label is written between the innermost and outermost lines
- any label which is biologically incorrect e.g. plant
- any label written between the innermost and outermost lines

mp 5: correct annotation with at least one label line;

inner wall	outer wall
folded rough irregular	not folded smooth regular
tightly packed cells	loosely packed cells
many nuclei	fewer nuclei/no nuclei
no cells	cells present
difference in density/colour of staining	

(b) (i) [3]

MMO decision 1

mp 1: (Step 1) answer (= .. mm) must be 0.004 (0) OR expressed in standard form 4×10^{-3};

PDO display 1

mp 2: (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

mp 3: μm **AND** answer from step 1 x 1000;

freestanding mark in isolation from answers to boxes in step 2

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(ii)		[2]
MMO collection 1	mp 1	measures correctly in eyepiece graticule units <u>51 to 65</u> (epg units); **Do not give if** • μm or mm or cm or m
PDO display 1	mp 2	shows multiplication by answer from **(b) (i)** any one value (multiplied by) <u>x</u> by <u>answer from **(b) (i)** step 2;</u> Can have • alternative signs . or * **Do not give if** • if any division shown
(c)		[4]
PDO layout 1	mp 1	quality of drawing; **Do not give if** • drawn over the print of question or <u>any</u> shading anywhere or<u>any</u> ruled or compass lines smaller than 50 mm across widest cell less than 4 cell outlines • any of outermost lines have • <u>any</u> line 1 mm or thicker (use grid) • <u>any</u> feathery or dashed line or gap in line • <u>any</u> 'tails' or overlaps
MMO collection 2	mp 2	<u>only</u> <u>four</u> complete cells drawn **AND** cell 1 must touch cells 2 and 3; **Do not give if** • any ruled or compass lines
	mp 3	at least two nuclei with both drawn either in contact with a single line (either side of a line) or within two lines; **Do not give if** • drawn EM organelles e.g. mitochondria • all cells drawn separately
MMO decision 1	mp 4	labels <u>only one</u> nucleus with ruled label line touching either outer line of enclosed area or ending inside enclosed area*;* **Do not give if** • any label other than nucleus, **ignore** label lines and **P** • any label within drawn area

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(d) [4]

PDO recording 2

mp 1

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 **L1 / slide** and **Fig. 2.6 AND** third column/row contains list of features;

(features) L1 Fig. 2.6 (L1 or Fig. 2.6 either way round and other column to left, right or in middle

mp 2

only differences (all recorded);

Do not give if
- any similarities recorded
- any functions
- any EM features

ACE interpretation max 2

max 2

Do not give if any ref. to membranes/vacuoles/tunica

	feature	L1/slide	Fig. 2.6
1	(number of folds / folding) (inner layer / surface)	highly folded / more / many	less folded / less/few(er);
2	(size of folds / innermost layer)	large(r) / thick(er)	small(er)/ thin(ner)
	(shape of folds / lumen)	rough / less smooth / irregular/ wavy	more smooth / regular/rectangular
3	contents of lumen	has/present	none
4	cartilage (‘middle tissue’)	no (one) / absent/has not continuous	yes / present/has discontinuous / has break;
5	number of layers	either way;	
6	nuclei	more	less

[Total 18]

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