UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

9700 BIOLOGY

9700/34 Paper 32 (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.

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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
AVP	Alternative valid point (examples given as guidance)

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Question 1		Expected Answers	
(a) (i)			[3]
MMO decisions 3	**mp 1**	100	**AND** • (simple dilution) next four concentrations (five concentrations in total) with four even intervals; e.g. 100, 80, 60, 40, 20 e.g. 100, 90, 80, 70, 60 e.g. 100, 75, 50, 25, 0 • (serial dilution) e.g. 100,50, 25,12.5, 6.25 e.g. 100,10,1,0.1 and 0.01
			Do not give mark if • rounds up or down e.g.12 or 13 or 6.3 • if no concentrations
	mp 2	for <u>first four</u> concentrations shows the use of 100% or plant extract / correctly • plant extract / P / 100 into <u>all</u> simple dilution • plant extract / P / 100 <u>only for first one</u> in a serial dilution	**AND** (P) cm^3 ;
			Do not give mark if • if no concentrations
	mp 3	for first four concentrations total final volume <u>10</u> ;	

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(a) (ii) [6]

PDO recording 2	**mp 1**	table with all cells drawn	**AND** heading (top or left of recorded data column) percentage concentration (of) plant extract or P;
		Do not give mark if • % in cells of headed column • other units mol dm^{-3} • no units	
	mp 2	(heading – column or row including mean) time (/)s or sec(onds);	
		Do not give mark if • units in cells of this column / row • min(utes) • additional method information either headings for columns / rows variables or in cells e.g. volumes and concentration in same cells	
MMO collection 2	**mp 3**	(mark first column / row of recorded time taken) for at least four concentrations records whole seconds numbers less than 180 or '> or more than 180';	
		Must have • whole numbers • numbers 180 or less	
	mp 4	(mark first column / row of recorded time taken) (records correct pattern) highest concentration recorded is shorter time than lowest concentration ;	
MMO decision 2	**mp 5**	at least two readings per concentration **or** six or more concentrations;	
	mp 6	mean / average recorded or rate recorded for two or more concentrations;	

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(a) (iii) [max 3]

Mark as incorrect idea that any errors which affect all tubes equally.

ACE interpretation MAX 3		cause of error	WITH idea of error
	mp 1	(independent variable – different concentrations of plant extract, catalase) plant extract (on paper)	not even **or** bubbles / foam on side; (do not give if gas bubbles/oxygen)
	mp 2	volume or amount or concentrations of extract time of dipping or soaking extract left on paper thickness of paper	*idea of* different (different pieces of paper) not the same not removed varies;
	mp 3	(dependent variable – different times for paper to rise in hydrogen peroxide solution) timing	paper sinking to bottom variable time for paper to reach bottom paper rises flat **or** paper on edge **or** foam on paper;
	mp 4	hydrogen peroxide	not the same (concentration) for each square of paper or lost has P (from previous concentration) idea of used up or not new / fresh;
	mp 5	paper	*idea of* sticking to sides;
	mp 6	temperature of hydrogen peroxide	rises;

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(a) (iv) [max 3]

ACE improvements MAX 3

mp 1	(concentration of extract) idea of using more concentrations or serial dilution **or** repeat;	
	Ignore mean or average	
mp 2	(standardised variables) use same piece / source of paper same time for soaking or dipping into plant extract;	
mp 3	pH	use buffers to keep constant;
mp 4	hydrogen peroxide	use fresh hydrogen peroxide / renew for each square (so 'not used up');
mp 5	container or squares	use deeper / wider container so squares do not touch sides smaller or as circles;

(b) (i) [4]

PDO layout 4

mp 1	*x*-axis percentage concentration hydrogen peroxide or H_2O_2	**AND** *y*-axis time (/) s or sec(onds) to collect oxygen or O_2;
mp 2	scale as *x*-axis 5 to 2 cm labelled each 2cm	**AND** *y*-axis 10 to 2 cm labelled each 2cm ;
mp 3	correct plotting of • **five** points only • as small cross (does not go outside square on grid) **or** dot (in circle) **or** cross in circle to within half a square;	
mp 4	**five** plots with ruled lines exactly point to point **or** curve through five points	**AND** (quality) smooth line less than line thickness on grid;
		Do not give mark if • any extrapolation

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(b) (ii)			[3]
ACE conclusion 3	**mp 1**	**either** ref. to increase or more hydrogen peroxide or substrate reacts with or binds to enzyme or catalase; **or** low hydrogen peroxide or substrate so does not react with or bind to enzyme or catalase;	
	mp 2	correct ref. to use of active site(s) or ESC(s) or enzyme-substrate complexes;	
	mp 3	(at high hydrogen peroxide) Idea of • <u>limiting factor</u> (**or** hydrogen peroxide <u>not</u> limiting factor) • too few active sites / ESCs or active sites full / allow 'enzyme saturated' • temperature or pH;	
			Do not give mark if • ref. to idea of reaction slows or slowing down or decreases
			[Total: 22]

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<table>
<tr><th colspan="2">Question 2</th><th colspan="3">Expected Answers</th></tr>
<tr><td colspan="5">(a) (i) [5]</td></tr>
<tr><td rowspan="1">PDO layout 1</td><td>mp 1</td><td>not drawn over the print of question
AND
no shading</td><td>AND
largest blood vessel larger than 50 mm</td><td>AND
clear, sharp, unbroken lines for all outermost enclosed areas ;
Do not give mark if
• less than two outermost enclosed areas
or if any outermost line has
• any ruled or compass lines
• any line more than1 mm
• feathery or broken or dashed or gap
• any 'tail' or overlap</td></tr>
<tr><td rowspan="3">MMO collection 3</td><td>mp 2</td><td>no cells</td><td colspan="2">AND drawn at least two complete vessels;</td></tr>
<tr><td>mp 3</td><td colspan="2">drawn different vessels
must be only two complete vessels</td><td>AND
different shapes;</td></tr>
<tr><td>mp 4</td><td colspan="2">(at least one complete vessel drawn with at least two layers (minimum three lines)</td><td>AND in this vessel inner lining crinkled or corrugated all round;</td></tr>
<tr><td rowspan="2">MMO decision 1</td><td rowspan="2">mp 5</td><td colspan="3">correct label muscle or tunica media with label line to layer touching endothelium (inner line) of complete vessel with thickest wall;
Must have minimum of three enclosed areas, line must touch middle line or be between the middle and inner line</td></tr>
<tr><td colspan="2">If label both vessels with muscle or tunica media then both must be correct</td><td>Do not give mark if
• any label which is biologically incorrect e.g. from incorrect organ or plant e.g. epidermis
• any label within drawn area</td></tr>
</table>

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(a) (ii) [5]

PDO layout 1	**mp 1**	not drawn over the print of question **AND** no shading	**AND** larger than 50 mm across widest point of inner enclosed area on any alveolus	**AND** clear, sharp, unbroken lines for all inner enclosed areas**;** **Do not give mark if** • less than two hand drawn inner enclosed areas **any of the inner enclosed areas has** • any ruled lines • any line more than 1mm • any feathery line or broken or dashed or gap in line • any 'tails' or overlaps or gaps
MMO collection 2	**mp 2**	only two inner enclosed areas **Ignore** double lines	**AND** with shared adjacent wall	**AND** with outer line partly drawn to show each end of the shared wall;
	mp 3	at least 2 complete alveoli of different shapes;		
MMO decision 2	**mp 4**	drawn all shared walls with all other alveoli (all round both alveoli)		**AND** (walls with) at least **three** nuclei drawn enclosed in the alveolar wall; **Do not give mark if** draw cells
	mp 5	only correct label gas exchange membrane with label line(s) which • touches the line or between two lines;		
				Do not give mark if • any label is biologically incorrect e.g. from incorrect organ or plant e.g. epidermis or non-observable structures e.g. cilia • label within drawn area

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(a) (iii) [3]

MMO collection 1	**mp 1**	shows at least one value for each of **C**, **D**, **E**, **F**, and **G AND** correct unit mm anywhere which match values; **Ignore** use of metres or mm		
PDO display 2	**mp 2**	shows addition of five values	**AND** shows division by 5;	
			Do not give mark for • *Σx/n unless x and n have key*	
	mp 3	shows at least <u>one</u> conversion of mm to mm by showing • multiplication by ×1000 or 10^3; or conversion from cm to mm • ×10 000 or 10^4	**AND** shows figure divided by / or ÷ 95 or $\frac{\quad}{95}$	
			Do not give mark if • metres anywhere • no mm or cm anywhere	

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(b) [max 5]

PDO recording 1

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
Fig. 2.2 / healthy and
Fig. 2.3 / unhealthy

AND
third column or row contains features;

MMO decision 1

mp 2

only observable differences (at least two) recorded;

Do not give mark if
- any similarities recorded
- any function e.g. 'for gas exchange' or not observable tar
- surface area to volume ratio
- healthy and unhealthy / bursting / damaged

ACE interpretation MAX 3

	feature	Fig. 2.2 healthy lung	Fig. 2.3 unhealthy lung
mp 1	size (of air space / lumen / diameter) surface area / gas exchange membrane alveolar wall	Small / small(er) larg(er) more	Large / larg(er); small(er) few(er) or less
mp 2	number	many	few(er);
mp 3	shape of alveolus or wall	wavy / irregular / more folded	smooth / even / less folded;
mp 4	thickness	thin(ner)	thick(er);
mp 5	number of nuclei	many / more	few(er) / less;
mp 6	black particles **ignore** tar	absent or no(one) or has not or some	present or yes or has or more;

Ignore
- functions
- ref. to colour
- shape of cell or nucleus
- 3-D descriptions such as spherical, biconcave, ball, disc
- tick and cross without a key
- diagrams

Do not give ACE marks if
- for each feature the difference is not opposite each other unless comparative statement e.g. more or -er

  Fig. 2.2 difference i
  difference ii
  Fig. 2.3 difference i
  difference ii

[**Total: 18]**

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