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

9700/32 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
ACE	Analysis, Conclusions and Evaluation (skills)
MMO	Manipulations, Measurement and Observation (skills)
PDO	Presentation of Data and Observations (skills)

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Expected Answers			
1 (a) (i)			[3]
MMO decisions 1	**mp1**	1.0(%)	**AND** (simple dilution) next 4 concentrations giving 4 intervals;
			Do not give mark if • rounds concentration e.g. 0.063 in the serial dilution
MMO decisions 2	**mp2**	(shows correct use of **E** in either simple or serial dilution) 1% / **E** used in first four concentrations for simple dilution or 1% / E used for first dilution only in a serial dilution	**AND** cm^3 once for **E**;
			Do not give mark if • if no concentrations
	mp3	(simple or serial dilution) for first four concentrations total final volumes made are between 2 and 10	AND the same volume for each concentration;

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(a) (ii) [5]

PDO recording 2	**mp 1**	table with all cells drawn	**AND** heading (<u>top row or left</u> of recorded data column) • <u>percentage concentration</u> of **<u>E</u>** / <u>enzyme</u>;
			Do not give mark if • units in cells of headed column / row
	mp 2	(heading for any column / row including mean) <u>time</u> (/) s or sec(ond)s;	
			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
MMO collection 2	**mp 3**	(mark first column / row of recorded time taken) for at least four concentrations records whole seconds (number less than 180 or > or 'more than 180');	
	mp 4	(mark **first** column / row of recorded time taken) (records correct pattern) highest concentration recorded is shorter time than lowest concentration ;	
MMO decision 1	**mp 5**	at least two readings per concentrations **or** six or more concentrations;	

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(a) (iii) [1]

ACE improvement 1		replace enzyme / **E** with water **or** use water / **W** instead of enzyme / **E**;	

(a) (iv) [1]

ACE interpretation 1		*(0.5 mm × 2 = 1) <u>+/- 1 mm</u>* **or** *(+/-)<u>5%</u>;*

(a) (v) [max 2]

		Cause of error	WITH idea of error
ACE interpretation MAX 2	**mp 1**	(dependent) colour change / end-point iodine colour	(idea of) difficult to judge or see or identify;
	mp 2	idea of reaction	too quick or describes more concentrated goes quickly;
	mp 3	(standardised) iodine staining **or** time paper left in iodine solution **or** iodine(solution)	not same or varies or different; loses colour
	mp 4	mixing of the solution	not same or varies or different;
	mp 5	paper **or** splint	drops off or sticks to sides difficult to cut / too thick to cut;

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(a) (vi) [2]

Do not give mark if *ref. to colorimeter*.

ACE interpretation MAX 2

mp 1	(independent variable) (concentration of enzyme) idea of use more or different or wider / narrower range of concentration(s) **or** repeat;	
mp 2	(standardised variables) stain each piece of paper for an equal time **or** stain all paper before cutting into pieces;	
mp 3	fresh iodine solution for each square **or** stronger / darker iodine **or** leave longer in the iodine;	
mp 4	(when adding **E** to test tube) mixing or stirring same <u>volume</u>	 using a stirrer or (electronic) mixer **AND** use <u>graduated</u> pipette **or** measuring cylinder **or** burette **or** syringe;
		Do not give mark if • making dilutions more accurate
mp 5	new test tube for each experiment which is the same size **or** use a straw instead of a splint;	
mp 6	pH	use buffer to keep constant;

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(b) (i) [4]

If draw a chart then only first mp can be given.

PDO layout 4	**mp 1**	*x*-axis bead diameter (/) mm	**AND** *y*-axis mass of product (in a minute) (/) mg min^{-1} or mg / min;
	mp 2	scale as *x*-axis 1.0 to 2cm labelled each 2cm except origin and 6.0	**AND** *y*-axis 10 to 2 cm labelled each 2 cm except origin and 60;
	mp 3	correct plotting of • five points • as small cross **o**r dot in circle **or** cross in circle to within half a square; **Do not give mark if** • plotted 2 cm with same symbol as other points • dots alone • if dot (in circle) bigger than 1mm diameter	
	mp 4	**five** plots with ruled lines exactly point to point **or** curve through 5 points	**AND** (quality) smooth line less than 1 mm thick;
			Do not give mark if • any extrapolation

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(b) (ii) [1]

ACE interpretation 1	**1**	correct reading from their graph **AND** mg min^{-1} or mg/min;	
		Can have mark if • line crosses at halfway between vertical lines then MUST read half square value e.g. 6.775 • line crosses nearer right vertical then can have only either half square value or value of right vertical • line crosses nearer left vertical then can have only either value of left vertical or half way value	

(b) (iii) [max 3]

mp 1, 2 and 3 *do not give mark if ref. to concentration of enzyme or volume of enzyme or surface area to volume ratio of beads or changing number of beads in same sentence as correct idea.*

ACE conclusion MAX 3	**mp 1 and 2**	larger beads **or** diameter increases **or** beads with more surface area	**AND** more active sites (bind / join to substrate) **or** more ES complexes*;;*
	mp 1 only	larger beads **or** diameter increases **or** beads with more surface area	**AND** have more enzyme / lactase;
	mp 3	(increase in mass of product slows) *idea of* limiting factor **or** the enzyme is not limiting **or** description e.g. not enough substrate **or** temp or pH*;*	
			Do not give mark if • idea of all substrate broken down

[Total: 22]

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2 (a) [5]

PDO layout 1	**mp 1**	not drawn over the print of question and no shading	**AND** largest innermost enclosed area more than 50mm across widest point	***AND*** clear, sharp, unbroken lines all inner enclosed areas; **Do not give mark if** • less than 2 hand drawn inner enclosed areas ***or if any inner enclosed area has*** • any ruled or compass lines • any line 1mm or thicker • any feathery or broken / dashed line or gap in line • any 'tails' or overlaps
MMO collection 2	**mp 2**	only two alveoli drawn with different irregular shapes shown by the inner most line;		
	mp 3	2 complete alveoli with different irregular shapes shown by the inner most line;		
MMO decision 2	**mp 4**	at least 3 nuclei drawn either within the alveolar wall or touching a wall line;		
				Do not give mark if • draw cells • nucleus larger than thickness of alveolus wall
	mp 5	only one correct label nucleus, with label line touching either the single line of a small enclosed area or into the enclosed area		**AND** enclosed area must be drawn either within the alveolar wall or touching a wall line;
				Do not give mark if • nucleus enclosed in a cell • nucleus larger than thickness of alveolus wall when drawn as double line • any label is biologically incorrect e.g. from incorrect organ or plant e.g. epidermis or non observable e.g. cilia • any label within drawn area

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(b) (i)			[1]
MMO decision 1		count or find the number of squares;	
(b) (ii)			[4]
MMO collection 2	**mp 1**	Shows a <u>whole number</u> • from 82 to 94 (whole lumen)	**AND** shows a whole number either from 48 to 59 (unblocked area) or from 29 to 42 (blocked area) ;
	mp 2	(records values as) squares **or** cm^2 **or** mm^2 anywhere once;	
		Do not give mark if contradiction with units e.g. squares and cm^3	
PDO display 2	**mp 3**	shows (29 to 42 divided by 82 to 94) × 100 **or** (82 to 94 minus 48 to 59) divided by 82 to 94 × 100	**or** 100 minus (48 to 59 divided by 82 to 94 × 100) **or** 100 minus (82 to 94 minus 29 to 42 divided by 82 to 94 × 100);
		Can have • alternative signs for multiplication (or *) and division	**Do not give mark if** only 100 minus(29 to 42 divided by 82 to 94 × 100)
	mp 4	answer as a whole number;	
		If do not put answer on answer line but at end of calculation must have %	

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(b) (iii) [4]

PDO layout 1	**mp 1**	not drawn over the print of question and no shading or dashed line inside cell	**AND** largest blood cell larger than 30 mm	**AND** clear, sharp, unbroken lines in all cell surface membranes drawn; **Do not give mark if** • less than 4 cell surface membranes **or if any cell surface membrane has** • two lines in the fish cells • any ruled or compass lines • any line 1mm or thicker (use grid) • any feathery or broken/dashed line or gap • any 'tails' or overlap
MMO collection 2	**mp 2**	only two of each drawn ;		
				Do not give mark if • any cell membrane drawn into another cell
	mp 3	largest fish cell drawn should be smaller than the smallest frog cell drawn; (widest dimension is at least 1 mm bigger)		
				Do not give mark if • internal structures other than nucleus inside cells e.g. vacuole / mitochondria
MMO decision 1	**mp 4**	correct label cell (surface) membrane with label line which must touch but not cross the outermost line of a red blood cell;		
				Do not give mark if • more than one fish or frog cell labelled • any labels are not of cell structure e.g. epidermis or epithelium • any label within drawn area

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(b) (iv) [4]

PDO recording 2

mp 1	organise as a table with only three columns or rows separated by lines (no cells needed)	**AND** headings in any order Fig 2.2 or Fish and Fig 2.3 or Frog	**AND** third column or row contains features;
mp 2	only observable **differences** (at least two) recorded ;		
		Do not give mark if • any function or not observable e.g haemoglobin or organelles other than nucleus. • surface area to volume ratio • any similarities recorded	

ACE interpretation MAX 2

max 2

	feature	Fig 2.2 fish	Fig.2.3 frog
mp 1	size of cells	small(er)	large(r);
mp 2	number of cells	lots / more	few(er);
mp 3	size of nucleus	small(er)	large(r);
mp 4	shape of cell or shape of nuclei	most / more circular or round **or** describes mixed shapes	most / more oval **or** describes mixed shapes;
mp 5	grouping	*idea of* together / group / sticky / clump / closely packed / overlapping or fewer gaps between cells / more spaces	separate / less closely packed / not overlapping / separate or more gaps between cells / less space ;

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

Can have difference on one side if e.g. use more or – er with vague answer in other column

Do not give ACE mark if
- for each feature the difference is not opposite each other unless comparative statement e.g. more or -er
- or e.g. Fig 2.2 difference i
difference ii
Fig 2.3 difference i
difference ii

[Total: 18]

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