UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9700 BIOLOGY

9700/31 Paper 31 (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.

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Question	Expected Answers	Additional Guidance	Marks
1 (a) (i) Decide how often you will take samples. You should not sample for longer than 20 minutes.			
MMO decisions 2	4 or more numbers; Ignore units.		[1]
	even range of times;	Range: longest time must be 10 or more minutes	[1]
(ii) Prepare the space below to record: time you remove sample, time at which end-point is reached and time taken to reach the end-point.			
PDO recording 2	1 table with all cells drawn no outer boundary needed. (**heading** top or left) **AND** sampling or sample time or time removed;		[1]
	2 (**heading** for **one** other column or row) time with units;	**Reject** units in body of table	[1]
MMO collection 2	3 (ignore headings on results columns) sample time plus result column = other result column;	Must be clear units **Reject** 1.24	[1]
	4 (trend correct) figure for last sample less than figure for first sample;		[1]
MMO decision 1	5 (end-point result column) whole seconds or whole minutes for at least three results;		[1]
(b) (i) Describe a suitable control for this investigation.			
ACE interpretation 1	1 boil and cooled enzyme OR 2 no enzyme and replace with water;		[1]

Question	Expected Answers	Additional Guidance	Marks
(c) (i) Identify two significant sources of error in this investigation			
ACE interpretation 2	1 timing with reason why causes an error e.g. removal of samples AND adding to potassium permanganate OR timing end-point OR two lots of timing;		[max 2]
	2 judging or detecting end-point or colour change;		
	3 idea of volume of reaction mixture or AW decreasing with each sample;	**Reject** temperature **Reject** pH **Reject** evaporation	
(ii) State one variable which was not controlled in this investigation and how it could be controlled.			
ACE improvement 1	temperature **AND** use thermostatically-controlled water-bath or water-bath at constant temperature;	**Reject** if more than one variable	[max 1]
	pH **AND** use buffer;		

Question	Expected Answers			Additional Guidance	Marks
(d) (i) Plot a graph to show the results in Table 1.1.					
PDO layout 4 60 0.32 120 0.64 180 0.95 300 1.55 400 2.05	O	*x*-axis time (/) s or sec(ond)s	*y*-axis **AND** mass of (reducing) sugars (/) mg;	Must have units	[1]
	S	scale as 100 s to 2 cm ECF if no labels for O. Allow at origin 50 as long as scale 100 s to 2 cm	AND 0.5 mg to 2 cm; Allow 0.25 at origin but must label origin.	**Reject** if awkward scale	[1]
	P	correct plotting using crosses/dots in circle only;	Intersection of cross must be clear to show plot.	**Reject** plotting if scale is awkward **Reject** if only blobs/dots/blobs in circles	[1]
	L	straight line through points;	Quality – not thick, not feathery for the complete line. Joining plots – • Ruled lines plot to plot • Straight line through most plots • Straight line extrapolated to 0 Extrapolation • Not beyond *x*- or *y*-axis	**Reject** if not five plots	[1]

Question	Expected Answers		Additional Guidance	Marks
(ii) Use the graph to find the rate of hydrolysis of the sucrose by finding the gradient of the line. Show on your graph where you took your readings.				
MMO collection 1	shows on graph at least one time and mass;			[1]
MMO decision 1	two masses and two times;			[1]
PDO display 2	shows mass up 2.05 mg	**AND** divided by time up to 400 s;		[1]
	any answer rounded to maximum of three significant figures OR five decimal places OR standard form;			[1]
(iii) Explain why the mass of reducing sugars increased and then remained the same.				
ACE conclusion 2	enzyme;		**Reject** use of enzyme in incorrect biological context	[1]
	(context of increase or up to 400 s) idea that non-reducing sugar or sucrose being converted (context of remaining the same or after 400 s) AND idea that all substrate hydrolysed or broken down or used up;		**Reject** enzyme active sites full or enzyme used up	[1]
				[Total: 21]

Question	Expected Answers	Additional Guidance	Marks
2 TS oesophagus **(a) (i) Draw a large plan diagram of a quarter of the tube as shown in Fig. 2.1**			
PDO layout 1	1 clear, sharp, unbroken lines **AND** no shading **AND** **Allow** only for 3 or more lines;	**Reject** if overlaps text of question	[1]
MMO collection 1	2 no cells **AND** Drawn detail for only correct quarter; Minimum of one layer needed.	**Reject** if drawn incorrect quarter	[1]
MMO decision 2	3 innermost layer is thinner (+ or – 1 mm) than outermost thick layer;		[1]
	4 first two lines folded;		[1]

Question	Expected Answers	Additional Guidance	Marks
(b) (i) Calculate the actual length, shown by line X, of one of the structures.			
MMO collection 2	measures line **X** correctly in mm or cm; **Reject** m	<table><tr><th>mm</th><th>cm</th></tr><tr><td>54.(0)</td><td>5.4</td></tr><tr><td>54.5</td><td>5.45</td></tr><tr><td>55.(0)</td><td>5.5</td></tr><tr><td>55.5</td><td>5.55</td></tr><tr><td>56.(0)</td><td>5.6</td></tr><tr><td>56.5</td><td>5.65</td></tr><tr><td>57.(0)</td><td>5.7</td></tr></table>	[1]
	shows their measurement divided by or / or ÷ 50 **AND** × 1000 or 10^3 (mm) or 10000 or 10^4 (cm) or × 10 × 1000;	**Reject** use or conversion to metres **Reject** if no units	[1]
(ii) Explain how you would find the mean length of the structures shown in Fig. 2.2			
ACE improvements 2	measure all OR any number five or more;	**Reject** calculate	[1]
	add together and divide by the number measured;		[1]

Question	Expected Answers			Additional Guidance	Marks
(iii) Prepare the space below so that it is suitable for you to compare and contrast the cells in *J1* and Fig. 2.2.					
PDO recording 2	(organise) table/ venn diagram/ ruled connected boxes	(heading for differences) any appropriate heading e.g **J1** and Fig. 2.2	all differences statements opposite each other;	**J1** Fig. 2.2	[1]
	heading , similarities;				[1]
ACE interpretation 3	**feature:**	**J1:**	**Fig. 2.2:**	Must have at least 1 similarity **Allow** D5 or S1 not both Ticks and crosses require a key	[max 3]
	D1. folds no. OR packing or gaps or spaces OR surface area (to volume ratio)	fewer loosely packed/widely spaced or large gaps small(er)	more densely packed/closely packed or small gaps larg(er);		
	D2. fold shape **Ignore** length or height	wider or thicker/flat at top or round(ed)	thinner or pointed end;		
	D3. number of layers	more or larg(er)	few(er);		
	D4. group of folds	different shapes	similar shapes;		
	D5. lumen/ hollow/ space	present	absent;		
	Similarities/compare clear as 'both are'				
	S1. lumen/hollow/ space	present;			
	S2. folds	present;			
	S3. layers	present or many/multi-;			

Question	Expected Answers	Additional Guidance	Marks
(iv) Suggest how the structures in Fig. 2.2 are adapted for absorption.			
ACE conclusion	large surface area or microvilli or brush border or good or extensive blood supply or capillary network or lacteals or lymph vessels or selectively permeable;		[1]
(c) Make a large, labelled drawing of the complete cells shown in the sector on Fig. 2.3.			
PDO layout 1	**1** clear, sharp, unbroken lines **AND** no shading **AND** large;	**Reject** if overlaps text of question	[1]
MMO collection 2	**2** cells drawn as a group **AND** narrower at base than top;		[1]
	3 nucleus to right hand side goblet cell touching the membrane **AND** nucleus tapers;		[1]
MMO decision **2**	**4** triangular shape (goblet cell);		[1]
	5 **Reject** if any label is biologically incorrect e.g. cell wall one correct label with label line from nucleus nuclear membrane nucleolus cytoplasm cell membrane microvilli brush border goblet cell columnar epithelium cilia;	**Reject** if any writing on drawing **Reject** if drawn organelles other than nucleus or nucleolus	[1]
			[Total: 19]