

**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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Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

Question	Expected Answers	Additional Guidance	Marks
<b>1 (a) (i) Decide how often you will take samples. You should not sample for longer than 20 minutes.</b>			
MMO decisions 2	4 or more numbers; Ignore units.	Range: longest time must be 10 or more minutes	[1]
	even range of times;		[1]
<b>(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.</b>			
PDO recording 2	1 table with all cells drawn no outer boundary needed.	<b>(heading top or left)</b> <b>AND <u>sampling</u> or <u>sample</u> time or time removed;</b>	[1]
	2 <b>(heading for one <u>other</u> column or row)</b> <b><u>time</u> with units;</b>		[1]
MMO collection 2	3 (ignore headings on results columns) sample time plus result column = other result column;	Must be clear units <b>Reject 1.24</b>	[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>(b) (i) Describe a suitable control for this investigation.</b>			
ACE interpretation 1	1 boil and cooled enzyme OR 2 no enzyme and replace with water;		[1]

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

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<b>(c) (i) Identify two significant sources of error in this investigation</b>				
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;	<b>Reject</b> temperature <b>Reject</b> pH <b>Reject</b> evaporation		
<b>(ii) State one variable which was not controlled in this investigation and how it could be controlled.</b>				
ACE improvement 1	temperature	<b>AND</b> use thermostatically-controlled water-bath or water-bath at constant temperature;	<b>Reject</b> if more than one variable	[max 1]
	pH	<b>AND</b> use buffer;		

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

Question	Expected Answers	Additional Guidance	Marks												
<b>(d) (i) Plot a graph to show the results in Table 1.1.</b>															
PDO layout 4  <table border="1" style="margin-left: 20px;"> <tr><td>60</td><td>0.32</td></tr> <tr><td>120</td><td>0.64</td></tr> <tr><td>180</td><td>0.95</td></tr> <tr><td>300</td><td>1.55</td></tr> <tr><td>400</td><td>2.05</td></tr> </table>	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 <b>AND</b> mass of (reducing) sugars (/) mg;	Must have units	[1]
	60	0.32													
	120	0.64													
	180	0.95													
300	1.55														
400	2.05														
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.	<b>Reject</b> if awkward scale	[1]											
P	correct plotting using crosses/dots in circle only;	Intersection of cross must be clear to show plot.	<b>Reject</b> plotting if scale is awkward  <b>Reject</b> if only blobs/dots/blobs in circles	[1]											
L	straight line through points;	Quality – not thick, not feathery for the complete line. Joining plots – <ul style="list-style-type: none"> <li>• <u>Ruled lines plot to plot</u></li> <li>• <u>Straight line through most plots</u></li> <li>• <u>Straight line extrapolated to 0</u></li> </ul> Extrapolation <ul style="list-style-type: none"> <li>• Not beyond x- or y-axis</li> </ul>	<b>Reject</b> if not five plots	[1]											

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

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<b>(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.</b>			
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	<b>AND</b> divided by time up to 400 s;	[1]
	any answer rounded to <u>maximum</u> of three significant figures OR five decimal places OR standard form;		[1]
<b>(iii) Explain why the mass of reducing sugars increased and then remained the same.</b>			
ACE conclusion 2	<u>enzyme</u> ;	<b>Reject</b> 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) <b>AND</b> idea that all substrate hydrolysed or broken down or used up;	<b>Reject</b> enzyme active sites full or enzyme used up	[1]
			<b>[Total: 21]</b>

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

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<b>2 TS oesophagus</b>					
<b>(a) (i) Draw a large plan diagram of a quarter of the tube as shown in Fig. 2.1</b>					
PDO layout 1	1 clear, sharp, unbroken lines	<b>AND</b> no shading	<b>AND</b> <b>Allow</b> only for 3 or more lines;	<b>Reject</b> if overlaps text of question	[1]
MMO collection 1	2 no cells	<b>AND</b> Drawn detail for only correct quarter; Minimum of one layer needed.		<b>Reject</b> 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]

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	GCE AS/A LEVEL – May/June 2010	9700	31

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

Page 8	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

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



Page 9	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2010	9700	31

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<b>(iv) Suggest how the structures in Fig. 2.2 are adapted for absorption.</b>					
ACE conclusion	large surface area or microvilli or brush border or <u>good</u> or extensive blood supply or capillary network or lacteals or lymph vessels or selectively permeable;		[1]		
<b>(c) Make a large, labelled drawing of the complete cells shown in the sector on Fig. 2.3.</b>					
PDO layout 1	<b>1</b> clear, sharp, unbroken lines	<b>AND</b> no shading	<b>AND</b> large;	<b>Reject</b> if overlaps text of question	[1]
MMO collection 2	<b>2</b> cells drawn as a group	<b>AND</b> narrower at base than top;			[1]
	<b>3</b> nucleus to right hand side goblet cell touching the membrane	<b>AND</b> nucleus tapers;			[1]
MMO decision 2	<b>4</b> triangular shape (goblet cell);				[1]
	<b>5</b> <b>Reject</b> 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;			<b>Reject</b> if any writing on drawing <b>Reject</b> if drawn organelles other than nucleus or nucleolus	[1]
					<b>[Total: 19]</b>