

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Subsidiary Level and GCE Advanced Level**

**MARK SCHEME for the October/November 2009 question paper  
for the guidance of teachers**

**9700 BIOLOGY**

**9700/33**

Paper 33 (Advanced Practical 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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UNIVERSITY of CAMBRIDGE  
International Examinations

Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

Question		Expected Answers				Marks	Additional Guidance	
<b>1 (a) (i) Complete table to show how you will carry out the tests on each solution.</b>								
MMO	decisions 4	(Starch) iodine AND				[1]		
		(reducing sugar) Benedict's AND						
		(protein) Biuret or sodium/Na/potassium/K/hydroxide/OH <u>and</u> copper sulfate;						
		same volume/quoted volume for solution		AND		same/quoted volume or excess volume for Benedict's;	[1]	<b>Reject</b> amounts or drops.
		(Benedict's) heats to at least 80° C/boils		AND		same time 10 minutes or less ; <b>Reject</b> less than 1 minute	[1]	<b>Must have units</b>
(starch)		(reducing sugar)		(protein)		[1]	<b>Reject</b> no change/colourless/negative/positive	
orange to yellow brown	blue/black <b>Reject</b> purple	blue to	orange/brown/red	blue to	violet/lilac/purple mauve; <b>Reject</b> pink			

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

Question	Expected Answers	Marks	Additional Guidance		
<b>(ii) Prepare the space below and record your observations of the tests on all the solutions.</b>					
PDO	recording 3	all cells drawn AND <b>Allow</b> three tables  samples in separate cells and different tests in different cells. <b>Allow</b> repeats tests.	sample/S1, S2, S3, S4, S5 as heading for top row or left column ;	[1]	<b>If more than one table</b> for points 1 and 2 <b>all</b> tables must be correct.
		(heading for top row or left) observations/colour/result/s ;		[1]	
		observations for <u>all</u> solutions and <u>all</u> tests (15 readings);		[1]	
MMO	collection 3	(starch) S3 blue/black;		[1]	<b>Reject</b> positives/negatives/ticks/ crosses for points 4,5 and 6
		(reducing sugar) S2 any positive colour more than S3;		[1]	<b>Reject</b> no colour change
		(protein) S2 and S5 <b>only</b> positive i.e. violet/lilac/mauve/purple;		[1]	<b>S1, S3 and S4 NOT</b> purple
<b>(iii) Use your observations to state the two solutions that should be mixed in equal volumes to provide the correct mixture to feed the young mammal.</b>					
ACE	conclusion 1	(S)3 and (S)5;		[1]	

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

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<b>(b) (i) Plot these data shown in Table 1.1.</b>			
PDO layout 4	<b>O</b> x-axis time (/) min AND	y-axis number/no. (of) individuals;	[1] <b>Reject</b> min <sup>-1</sup>
	<b>S</b> scale for <b>chart</b> x-axis times evenly spaced and uses more than half grid and 2 to 2 cm y-axis	scale for <b>line</b> 5 mins to 2 cm and 2 to 2 cm on y;	[1] <b>If incorrect O</b> then must use half or more of grid with sensible scale.
	blocks even width <b>AND</b> correctly plotted for day 1; No more than half a square above value	plotting crosses or dot in circle <b>ONLY</b> <b>AND</b> plots correct for day 1; No cross larger than X dot must fit inside o on any one point.	[1] <b>Do not credit</b> blobs in or out of circles or a dot and cross in circle. <b>Credit</b> xs in circles.
	<b>L</b> thickness of lines <b>AND</b> blocks for day 1 and 2 together <b>AND</b> shading/writing and key;	thickness of lines <b>AND</b> for both graphs ruled/straight lines joined point to point OR curve through points <b>AND</b> labelled/key; No extrapolation either end.	[1] <b>Do not credit</b> if plot blocks as two separate groups. <b>Allow</b> if blocks for different times are touching If space between pairs this must be the same.
<b>(ii) Describe the patterns in the results.</b>			
ACE interpretation 3	(in context of no. of individuals) increases then decreases/AW; peak then drops	[1]	
	(use of data) any quote of data using time with no. of individuals;	[1]	
	comparison between day 1 and day 2 day 2 digestion earlier or faster or day 1 slower/AW time less day 2/time more day 1/AW ;	[1]	

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

Question	Expected Answers	Marks	Additional Guidance
<b>(iii) Suggest a reason for the difference between the results for day 1 and day 2.</b>			
ACE	conclusions 1  (mammals) just eaten/different food eaten/different time of day/concentration of enzyme different/health/ (method used) volume of saliva/pH/AW  temperature different <b>Allow</b> in any context or no context.	[1]	
<b>(iv) Suggest how you might control the variables in this investigation to compare a different species of mammal with the mammal studied.</b>			
ACE	improvements 3  (mammals) same age/healthy/sex/mass/weight/AW;	[1]	<b>Reject</b> size
	(treatment/environment) (food) eaten/fed/diet same/time after meal the same	[1]	
	live in same conditions/environment/example of variable temperature;	[1]	
	(method) same volume/example of volume of <u>saliva</u> ;  same number/25 or same volume/5 cm <sup>3</sup> starch or same concentration/1% starch;  temperature in water-bath/pH using buffer;	[max 2]	<b>Reject</b> amounts
	<b>Total</b>	<b>[22]</b>	

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

Question	Expected Answers		Marks	Additional Guidance		
<b>2 (a) (i) Draw a large low-power plan diagram of the midrib of the leaf as shown in the shaded area in Fig. 2.1. Label upper surface and one vascular bundle.</b>						
PDO	layout 1	clear, sharp, AND unbroken lines  <b>Allow</b> 3 or fewer entire drawing.	no shading AND	shape of section as shown in fig. 2.1 does <b>not</b> fit inside grid; <b>Ignore</b> additional lamina drawn.	[1]	
MMO	collection 2	no cells drawn AND	definite bulge at bottom of midrib;	[1]		
		<b>Ignore</b> trichomes		[1]		
		region of cells at tip of bulge OR any triangular shape from upper epidermis towards vascular bundle;				
MMO	decisions 2	complete vascular bundle in lower half of midrib;		[1]		
		(in correct context of midrib) upper surface/epidermis AND vascular bundle labelled;		[1]	<b>Ignore</b> cuticle	
<b>(ii) Describe one visible adaptation of this leaf and suggest a possible advantage to the plant.</b>						
MMO	decision 1	selects observable feature/curling/rolled/trichomes/hairs/no stomata on upper surface/stomata only on lower/sunken stomata/cuticle;  <b>Allow</b> lots of/densely packed chloroplasts/palisade cells;		[1]		
ACE	conclusion 1	suggests an appropriate advantage reduces, less AND water loss/evaporation/transpiration; <b>Allow</b> traps water/absorbs water/reduces air movement		[1]		

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

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<b>(iii) Find the ratio of the thickness of the midrib compared to the thickness of the lamina.</b>						
MMO	collection 1	shows midrib measurement larger than lamina;			[1]	<b>Reject</b> any units mm/other units anywhere than eyepiece graticule units.
PDO	display 2	ratio larger number on left to or : smaller number;			[1]	
		<b>Allow</b> as fraction of larger number over smaller number;				
		final answer whole numbers only;			[1]	
<b>(b) (i) Make a large, high-power drawing of a group of three cells from the upper epidermis and the cells touching them.</b>						
PDO	layout 1	clear, sharp unbroken lines AND	no shading in epidermal cells only AND	whole group does not fit in 6 cm grid;	[1]	
MMO	collection 2	<b>only three</b> epidermal cells drawn as a chain AND		no spaces/gaps between adjacent cells;	[1]	
		thinnest (epidermal) cell equal or less than half depth of longest cell in layer below;			[1]	
MMO	decision 1	label cell wall correctly;			[1]	

Page 8	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A/AS LEVEL – October/November 2009	9700	33

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<b>(ii) Prepare the space below so that it is suitable for you to record the observable differences between the upper and lower epidermis of the leaf.</b>																																				
PDO	recording 1	organise as a table/ venn diagram/ ruled connected boxes	headed upper and lower	no similarities recorded;	[1] <u>upper</u> <u>lower</u> OR venn circles labelled, overlap  empty																															
ACE	interpretation 3	<table border="1"> <thead> <tr> <th>feature</th> <th>(upper)</th> <th>(lower)</th> </tr> </thead> <tbody> <tr> <td>surface</td> <td>smooth/flat/even/regular</td> <td>rough/bumpy/irregular;</td> </tr> <tr> <td>cell shape</td> <td>regular/flattened/rectangular</td> <td>irregular/angular/pointed;</td> </tr> <tr> <td>cell wall</td> <td>thick</td> <td>thin;</td> </tr> <tr> <td>cell/epidermis size</td> <td>large/thick</td> <td>small/thin;</td> </tr> <tr> <td>number packing</td> <td>few dense/tight</td> <td>lots short/loosely;</td> </tr> <tr> <td>trichome/hairs</td> <td>none/few</td> <td>has/some/lots;</td> </tr> <tr> <td><b>Reject</b> spikes/thorns</td> <td></td> <td></td> </tr> <tr> <td>stomata/sunken/openings/gaps/pores</td> <td>none/absent/no <b>Reject less</b></td> <td>has/present;</td> </tr> <tr> <td>cuticle</td> <td>present/thick</td> <td>none/thin;</td> </tr> </tbody> </table>			feature	(upper)	(lower)	surface	smooth/flat/even/regular	rough/bumpy/irregular;	cell shape	regular/flattened/rectangular	irregular/angular/pointed;	cell wall	thick	thin;	cell/epidermis size	large/thick	small/thin;	number packing	few dense/tight	lots short/loosely;	trichome/hairs	none/few	has/some/lots;	<b>Reject</b> spikes/thorns			stomata/sunken/openings/gaps/pores	none/absent/no <b>Reject less</b>	has/present;	cuticle	present/thick	none/thin;	[max 3]	
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		<b>Total</b>			<b>[18]</b>																															