

**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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Question		Expected Answers				Marks	Additional Guidance	
1 (a) (i) Complete table to show how you will carry out the tests on each solution.								
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]	Reject amounts or drops.
		(Benedict's) heats to at least 80° C/boils		AND		same time 10 minutes or less ; Reject less than 1 minute	[1]	Must have units
(starch)		(reducing sugar)		(protein)		[1]	Reject no change/colourless/negative/positive	
orange to yellow brown	blue/black Reject purple	blue to	orange/brown/red	blue to	violet/lilac/purple mauve; Reject pink			

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

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

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Question	Expected Answers	Marks	Additional Guidance
(iii) Suggest a reason for the difference between the results for day 1 and day 2.			
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 Allow in any context or no context.	[1]	
(iv) Suggest how you might control the variables in this investigation to compare a different species of mammal with the mammal studied.			
ACE	improvements 3 (mammals) same age/healthy/sex/mass/weight/AW;	[1]	Reject 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 ³ starch or same concentration/1% starch; temperature in water-bath/pH using buffer;	[max 2]	Reject amounts
	Total	[22]	

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

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(iii) Find the ratio of the thickness of the midrib compared to the thickness of the lamina.						
MMO	collection 1	shows midrib measurement larger than lamina;			[1]	Reject any units mm/other units anywhere than eyepiece graticule units.
PDO	display 2	ratio larger number on left to or : smaller number;			[1]	
		Allow as fraction of larger number over smaller number;				
		final answer whole numbers only;			[1]	
(b) (i) Make a large, high-power drawing of a group of three cells from the upper epidermis and the cells touching them.						
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	only three 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]	

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(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.																																				
PDO	recording 1	organise as a table/ venn diagram/ ruled connected boxes	headed upper and lower	no similarities recorded;	[1] empty	<u>upper</u> <u>lower</u> OR venn circles labelled, overlap																														
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>Reject spikes/thorns</td> <td></td> <td></td> </tr> <tr> <td>stomata/sunken/ openings/gaps/ pores</td> <td>none/absent/no Reject less</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;	Reject spikes/thorns			stomata/sunken/ openings/gaps/ pores	none/absent/no Reject less	has/present;	cuticle	present/thick	none/thin;	[max 3]	
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