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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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<table>
<tr><th colspan="2">Question</th><th colspan="6">Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td colspan="10">1 (a) (i) Complete table to show how you will carry out the tests on each solution.</td></tr>
<tr><td>MMO</td><td>decisions 4</td><td colspan="6">(Starch) iodine AND

(reducing sugar) Benedict's AND

(protein) Biuret or sodium/Na/potassium/K/hydroxide/OH <u>and</u> copper sulfate;</td><td>[1]</td><td></td></tr>
<tr><td></td><td></td><td colspan="3">same volume/quoted volume for solution AND</td><td colspan="3">same/quoted volume or excess volume for Benedict's;</td><td>[1]</td><td>Reject amounts or drops.</td></tr>
<tr><td></td><td></td><td colspan="3">(Benedict's) heats to at least 80^o C/ boils AND</td><td colspan="3">same time 10 minutes or less ;

Reject less than 1 minute</td><td>[1]</td><td>Must have units</td></tr>
<tr><td></td><td></td><td colspan="2">(starch)</td><td colspan="2">(reducing sugar)</td><td colspan="2">(protein)</td><td>[1]</td><td rowspan="2">Reject
no change/colourless/negative/positive</td></tr>
<tr><td></td><td></td><td>orange to yellow brown</td><td>blue/black

Reject purple</td><td>blue to</td><td>orange/brown/ red</td><td>blue to</td><td>violet/ lilac/ purple mauve;
Reject pink</td><td></td></tr>
</table>

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Question		Expected Answers		Marks	Additional Guidance
(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 samples in separate cells and different tests in different cells. **Allow** repeats tests.	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.
		(heading for top row or left) observations/colour/result/s ;		[1]	
		observations for all solutions and all 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 live in same conditions/environment/example of variable temperature;	[1] [1]	
		(method) same volume/example of volume of saliva; 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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Question		Expected Answers	Marks	Additional Guidance
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 **Ignore** trichomes definite bulge at bottom of midrib;	[1]	
		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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Question		Expected Answers			Marks	Additional Guidance
(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; **Allow** as fraction of larger number over smaller number;			[1]	
		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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<table>
<tr><th colspan="2">Question</th><th colspan="3">Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td colspan="7">(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.</td></tr>
<tr><td>PDO</td><td>recording 1</td><td>organise as a table/
venn diagram/
ruled connected boxes</td><td>headed
upper and lower</td><td>no similarities recorded;</td><td>[1]</td><td><u>upper</u> <u>lower</u> OR venn circles labelled, overlap

empty</td></tr>
<tr><td>ACE</td><td>interpretation 3</td><td colspan="3"><table>
<tr><th>feature</th><th>(upper)</th><th>(lower)</th></tr>
<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

Reject
spikes/thorns</td><td>none/few</td><td>has/some/lots;</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>
</table></td><td>[max 3]</td><td></td></tr>
<tr><td></td><td></td><td colspan="3">Total</td><td>[18]</td><td></td></tr>
</table>

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