UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

9700 BIOLOGY

9700/35 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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UNIVERSITY of CAMBRIDGE International Examinations

Question		Expected Answers			Additional guidance
1 (a) (i)		**Decide which other concentrations of ascorbic acid to make and complete Table 1.2, including the concentrations from Table 1.1.** **[3]**			
MMO decisions 3	[1]	0.1% and 0.08%	**AND** any two other concentrations	**AND** all in ascending or descending order;	
	[1]	for two other concentrations correct volumes to make 20 cm^3		**AND** correct %;	
	[1]	any three consecutive concentrations with two even intervals the same e.g. 0.08, 0.06, 0.04 or serial dilution by half;			
	(ii)	**Prepare the space below to show the concentration of ascorbic acid and record your results including samples X and Y.** **[6]**			
PDO recording 3		**Reject** • if units for % in the body of table			
	[1]	table with all cells drawn	**AND** heading (top or left) percentage conc(entration);		
		Reject • if units for volume /drops in body of table • if any additional headings for method e.g. volume of ascorbic acid			.
	[1]	(heading) volume/vol cm^3;			
	[1]	volumes recorded to 2 decimal places;			
MMO collection 3	[1]	volume or drops decrease from highest concentration to next highest;			
	[1]	**Reject** if records less than 3 concentrations result for **Y** (water/0%) records lowest volume;			
	[1]	replicate recorded;			

(iii) Plot a graph of the results. **[4]**

PDO layout 4	O [1]	*x*-axis percentage conc(entration)	**Reject** v **AND** *y*-axis vol(ume) cm^3;	Must have units
	S [1]	**Reject** if awkward scale scale as 0.02% to 2 cm	**AND** sensible volume to 2 cm and uses more than half grid;	
	P [1]	**Reject** plotting if scale awkward if only blobs/dots/blobs in circles if extra plot for **X** value correct plotting using crosses/dots in circle only;	intersection of cross must be clear to show plot.	
	L [1]	straight line through points; error carried forward if scale or plotting incorrect	quality – no thicker than on grid, not feathery for the complete line. joining plots – • ruled lines plot to plot • line of best fit two plots plus even plots (+1) either side or even plots either side • curve through all plots	line of best fit must end either at the horizontal line or the vertical line for each of the end plots i.e. highest and lowest concentration **Reject** if any extrapolation

(iv) Use your graph to estimate the ascorbic acid concentration of sample X. Show clearly on your graph how you obtained the ascorbic acid concentration. **[3]**

MMO collection 1	[1]	shows clearly on graph result for **X** e.g. as single line from volume for **X** or as extra plot;		
ACE interpretation 2	[1]	correct reading of ascorbic acid concentration	**AND** answer to no more than 4 decimal places or three significant figures if 4 decimal places last figure must be 5 (or 0);	
	[1]	%;		

(v) Identify *two* significant sources of error when finding the concentration of ascorbic acid in sample X. [2]

ACE interpretation max 2

	cause of error	error	
	(dependent variables)	idea of	
[1]	drops stick to sides	volume/number of drops/not counted/not	
	too many drops	included/too high/not accurate	
		too many at once/end-point missed	
[1]	volume for **Y**	too small	
	colour change or same colour	judging	
		determining	
		seeing	
		when;;	
	(standardised variables)		
[1]	drop size/different pressure on syringe/syringe sticking/	not same/vary/different;	
[1]	mixing		
[1]	iodine evaporating/exposed to light		
	(independent variable)		
[1]	(ascorbic acid) evaporates or mixes with air	changes concentration/reacts;	
[1]	concentrations	more/wider/narrower/different needed;	max 2

	(vi) Suggest how you would make *three* improvements to this investigation.		**[3]**
ACE improvements max 3	[1]	more/wider/narrower/different/examples range of concentrations (ascorbic acid) use graduated pipette or smaller/more divisions/calibration syringe/burette;	
	[1]	device/described for making drops/burette/titrate;	
	[1]	(to identify the end-point) use colorimeter or have a standard colour to compare to or use white tile/paper;	
	[1]	put drops in nearer to mixture or use a smaller test-tube/container or use a wider/larger test-tube/beaker/AW;	
	[1]	replicate/repeat/take more readings (each concentration);	max 3
		[Total: 21]	

Question		Expected Answers			Additional guidance
2 (a) (i)		**Draw a large plan diagram of the sector shown in Fig. 2.1 to include the outline of two vascular bundles. No details of the internal tissues of the vascular bundles are required. [5]**			
PDO layout 1		**Reject** • if drawn over the print of question			
	[1]	**Reject** • thick lines • feathery lines • 3 'tails' or overlaps or gaps clear, sharp, unbroken lines	**AND** no shading	**AND** uses most of the space provided;	
MMO collection 2	[1]	no cells drawn	**AND** only two vascular bundles drawn in outline only;		
	[1]	rounded/pointed end;			
MMO decisions 2	[1]	longest vascular bundle is less than half width at widest point of section;			
		Reject • if any label is biologically incorrect e.g. cell wall or regions belonging to other organs or animals. • additional label(s) within drawn area			
	[1]	correct label C (can be within drawn area) to tissue below upper or lower epidermis;			

Question		Expected Answers			Additional guidance
(ii)		**Using high-power, draw a large plan diagram to show one large vascular bundle in detail. Label the phloem.**			**[5]**
PDO layout 1	[1]	**Reject** • if drawn over the print of question			
		Reject • thick lines • feathery lines • 4 'tails' or overlaps or gaps	**AND** no shading	**AND** uses most of space provided;	
		clear, sharp, unbroken lines			
PDO recording 1	[1]	(details of) two regions separated from each other and from each cap;			
MMO collection 1	[1]	no cells	two caps withdrawn;		
MMO decisions 2	[1]	proportion of longest length of one cap is equal to or more than half the longest length between the caps;			
	[1]	**Reject** • if any label is biologically incorrect e.g. regions belonging to other organs or animals. • label within drawn area			
		correct label with label line to phloem;			

Question		Expected Answers		Additional guidance
(b) Calculate the ratio of the thickness of the layer labelled B compared to the total thickness of the layer labelled A as shown in Fig. 2.2.				**[3]**
MMO collection 1	[1]	**Reject** • if no units • metres.		
		two measurements of A one between 17 to 19 mm and one between 12 to 14 mm or one combined measurement between 28 and 33 mm	**AND** one measurement between 38 to 40 mm;	
PDO display 2	[1]	shows larger figure to smaller figure;		**Reject** if converts to other units (than mm or cm) or standard form
	[1]	(needs working) answer rounded to correct ratio e.g. 39 : 29;		**Reject** if put units

<table>
<tr><th colspan="2">Question</th><th>Expected Answers</th><th>Additional guidance</th></tr>
<tr><td colspan="4">(c) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on slide L1 and in Fig. 2.2. [3]</td></tr>
<tr><td>MMO decision 1</td><td>[1]</td><td>only observable differences;</td><td></td></tr>
<tr><td>ACE interpretation max 2</td><td>[1]
[1]
[1]
[1]
[1]
[1]
[1]
[1]
[1]</td><td>Ignore
• tick and cross without a key
• ref.to non-observable features
• 3 D shapes
<table><tr><th>feature</th><th>L1</th><th>Fig. 2.2</th></tr><tr><td>vascular bundles
number
arrangement
relative sizes</td><td>
lots/more
chain
different sizes or large and small</td><td>
few/one/two
centre
same sizes;</td></tr><tr><td>caps shape
cap</td><td>semicircles /AW</td><td>not semicircles or one end only;</td></tr><tr><td></td><td>yes/present</td><td>no/none/absent;</td></tr><tr><td>stomata numbers</td><td>none/not visible or few(er)</td><td>yes/more;</td></tr><tr><td>position</td><td>top/bottom/one side</td><td>all round/sides;</td></tr><tr><td>sunken</td><td>no/none/absent</td><td>yes/present;</td></tr><tr><td>leaf shape</td><td>tapered/pointed/elongated</td><td>semicircle/rounded;</td></tr><tr><td>surface Reject regular</td><td>irregular/rough</td><td>smooth;</td></tr><tr><td>extra ring/inner layer/allow endodermis</td><td>no/none/absent</td><td>yes/present;</td></tr></table></td><td>max 2</td></tr>
</table>

Question		Expected Answers		Additional guidance
(d) Describe how the observable features of Fig.2.2 support the conclusion that this is a leaf from a plant growing in a dry habitat. [3]				
ACE conclusion MAX 3	[1]	sunken stomata or rolled/rounded	to reduce the <u>diffusion</u> of water/decreases diffusion gradient;	
	[1]	thick cuticle or thickened epidermis	to prevent or reduce <u>evaporation</u> of water;	
	[1]	no spongy mesophyll layer or no air spaces	to prevent <u>evaporation</u> from cell walls;	
	[1]	rounder shape or rolled or fewer stomata smaller surface area to volume ratio	to increase humidity/decreases diffusion gradient;	
	[1]	(in context of any of above) reduces <u>transpiration</u> (rate);		max 3
			[Total: 19]	