

**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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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 <sup>3</sup>	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	<b>Reject</b> • if units for % in the body of table	
	[1] table with all cells drawn	AND heading (top or left) percentage conc(entrations);
	<b>Reject</b> • if units for volume /drops in body of table • if any additional headings for method e.g. volume of ascorbic acid (heading) volume/vol cm <sup>3</sup> ;	
	[1] volumes recorded to 2 decimal places;	
	[1] volume or drops decrease from highest concentration to next highest;	
MMO collection 3	[1] <b>Reject</b> if records less than 3 concentrations result for Y (water/0%) records <u>lowest</u> volume;	
	[1] replicate recorded;	

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(iii) Plot a graph of the results. [4]			
		Reject v	Must have units
O [1]	x-axis percentage conc(entration)	<b>AND</b> y-axis vol(ume) cm <sup>3</sup> ;	
S [1]	<b>Reject</b> if awkward scale scale as 0.02% to 2 cm	<b>AND</b> sensible volume to 2 cm and uses more than half grid;	
P [1]	<b>Reject</b> plotting if scale awkward if only blobs/dots/blobs in circles if extra plot for <b>X</b> value	intersection of cross must be clear to show plot.	
[1]	correct plotting using crosses/dots in circle only;		
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 – <ul style="list-style-type: none"> <li>• ruled lines plot to plot</li> <li>• <u>line of best fit two plots plus even plots (+1) either side</u></li> <li>• <u>or even plots either side</u></li> <li>• <u>curve through all plots</u></li> </ul>	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  <b>Reject</b> if any extrapolation
<b>(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]</b>			
MMO collection 1	[1]	shows clearly on graph result for <b>X</b> e.g. as single line from volume for <b>X</b> or as extra plot;	
ACE interpretation 2	[1]	correct reading of ascorbic acid concentration	<b>AND</b> answer to no more than 4 decimal places or three significant figures if 4 decimal places last figure must be 5 (or 0);
	[1]	%;	

PDO layout 4

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

ACE interpretation max 2

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<b>(vi) Suggest how you would make <i>three</i> improvements to this investigation.</b>		<b>[3]</b>
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);	
<b>[Total: 21]</b>		max 3

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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	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if drawn over the print of question</li> </ul>	
	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>thick lines</li> <li>feathery lines</li> <li>3 'tails' or overlaps or gaps</li> </ul>	<p><b>AND</b> no shading</p>
	clear, sharp, unbroken lines	<p><b>AND</b> uses most of the space provided;</p>
MMO collection 2	[1]	no cells drawn
	[1]	rounded/pointed end;
	[1]	longest vascular bundle is less than half width at widest point of section;
MMO decisions 2	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if any label is biologically incorrect e.g. cell wall or regions belonging to other organs or animals.</li> <li>additional label(s) within drawn area</li> </ul>	
	[1]	correct label C (can be within drawn area) to tissue below upper or lower epidermis;

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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	<table border="1"> <tr> <td>[1]</td> <td> <p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if drawn over the print of question</li> </ul> <p><b>Reject</b></p> <ul style="list-style-type: none"> <li>thick lines</li> <li>feathery lines</li> <li>4 'tails' or overlaps or gaps</li> </ul> <p>clear, sharp, unbroken lines</p> </td> <td> <p><b>AND</b></p> <p>no shading</p> </td> <td> <p><b>AND</b></p> <p>uses most of space provided;</p> </td> </tr> </table>	[1]	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if drawn over the print of question</li> </ul> <p><b>Reject</b></p> <ul style="list-style-type: none"> <li>thick lines</li> <li>feathery lines</li> <li>4 'tails' or overlaps or gaps</li> </ul> <p>clear, sharp, unbroken lines</p>	<p><b>AND</b></p> <p>no shading</p>	<p><b>AND</b></p> <p>uses most of space provided;</p>	
[1]	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if drawn over the print of question</li> </ul> <p><b>Reject</b></p> <ul style="list-style-type: none"> <li>thick lines</li> <li>feathery lines</li> <li>4 'tails' or overlaps or gaps</li> </ul> <p>clear, sharp, unbroken lines</p>	<p><b>AND</b></p> <p>no shading</p>	<p><b>AND</b></p> <p>uses most of space provided;</p>			
PDO 1 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]	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if any label is biologically incorrect e.g. regions belonging to other organs or animals.</li> <li>label within drawn area</li> </ul> <p>correct label with label line to phloem;</p>				

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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	<p><b>Reject</b></p> <ul style="list-style-type: none"> <li>if no units</li> <li>metres.</li> </ul> <p>[1]</p> <p>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</p> <p><b>AND</b> one measurement between 38 to 40 mm;</p>	
PD0 display 2	[1]	<b>Reject</b> if converts to other units (than mm or cm) or standard form
	[1]	<b>Reject</b> if put units



Question	Expected Answers	Additional guidance																														
(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]																															
MMO decision 1	[1] only observable differences;																															
ACE interpretation max 2	<p><b>Ignore</b></p> <ul style="list-style-type: none"> <li>• tick and cross without a key</li> <li>• ref. to non-observable features</li> <li>• 3 D shapes</li> </ul> <table border="1"> <thead> <tr> <th>feature</th> <th>L1</th> <th>Fig. 2.2</th> </tr> </thead> <tbody> <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>stomata numbers</td> <td>yes/present</td> <td>no/none/absent;</td> </tr> <tr> <td>position</td> <td>none/not visible or few(er)</td> <td>yes/more;</td> </tr> <tr> <td>sunken</td> <td>top/bottom/one side</td> <td>all round/sides;</td> </tr> <tr> <td>leaf shape</td> <td>no/none/absent</td> <td>yes/present;</td> </tr> <tr> <td>surface <b>Reject</b> regular</td> <td>tapered/pointed/elongated</td> <td>semicircle/rounded;</td> </tr> <tr> <td>extra ring/inner layer/allow endodermis</td> <td>irregular/rough</td> <td>smooth;</td> </tr> <tr> <td></td> <td>no/none/absent</td> <td>yes/present;</td> </tr> </tbody> </table>	feature	L1	Fig. 2.2	vascular bundles number arrangement relative sizes	lots/more chain different sizes or large and small	few/one/two centre same sizes;	caps shape cap	semicircles /AW	not semicircles or one end only;	stomata numbers	yes/present	no/none/absent;	position	none/not visible or few(er)	yes/more;	sunken	top/bottom/one side	all round/sides;	leaf shape	no/none/absent	yes/present;	surface <b>Reject</b> regular	tapered/pointed/elongated	semicircle/rounded;	extra ring/inner layer/allow endodermis	irregular/rough	smooth;		no/none/absent	yes/present;	max 2
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Question	Expected Answers	Additional guidance
ACF conclusion MAX 3	(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]	
	[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
		<b>[Total: 19]</b>