

**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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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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% <b>AND</b> any two other concentrations	<b>AND</b> <u>all</u> in ascending or descending order;
	[1] for two other concentrations correct volumes to make 20 cm <sup>3</sup>	<b>AND</b> 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	<b>AND</b> heading (top or left) percentage conc(entration);
	<b>Reject</b> • 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 <sup>3</sup> ;	
[1]	volumes recorded to 2 decimal places;	
MMO collection 3	[1] volume or drops decrease from highest concentration to next highest;	
	[1] <b>Reject</b> if records less than 3 concentrations result for Y (water/0%) records <u>lowest</u> volume;	
	[1] replicate recorded;	

<b>(iii) Plot a graph of the results.</b>				<b>[4]</b>
PDO layout 4	O [1]	x-axis percentage conc(entration)	<b>Reject v</b> <b>AND</b> y-axis vol(ume) cm <sup>3</sup> ;	Must have units
	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.	
		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>• <u>ruled lines plot to plot</u></li> <li>• <u>line of best fit two plots plus even plots (+1) either side</u> <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.</b>				<b>[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]	%;		

(v) Identify <i>two</i> significant sources of error when finding the concentration of ascorbic acid in sample X. [2]			
ACE interpretation max 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 too many at once/end-point missed
	[1]	volume for <b>Y</b> colour change or same colour	too small judging determining seeing when;;
	[1]	(standardised variables) drop size/different pressure on syringe/syringe sticking/	not same/vary/different;
	[1]	mixing	
	[1]	iodine evaporating/exposed to light	
	[1]	(independent variable) (ascorbic acid) evaporates or mixes with air	changes concentration/reacts;
	[1]	concentrations	more/wider/narrower/different needed;
			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;	max 3
	[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>			

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> <p><b>AND</b> uses most of the space provided;</p>
	[1] clear, sharp, unbroken lines		
MMO collection 2	[1] no cells drawn	<b>AND</b> 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;		
	<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;		

Question	Expected Answers	Additional guidance		
<b>(ii) Using high-power, draw a large plan diagram to show one large vascular bundle in detail. Label the phloem. [5]</b>				
PDO layout 1	[1] <b>Reject</b> • if drawn over the print of question			
	<b>Reject</b> • thick lines • feathery lines • 4 'tails' or overlaps or gaps		<b>AND</b> no shading	<b>AND</b> 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] <b>Reject</b> • 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>(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]</b>		
MMO collection 1	[1] <b>Reject</b> <ul style="list-style-type: none"> <li>• if no units</li> <li>• metres.</li> </ul>	
	[1] two measurements of A one between 17 to 19 mm <u>and</u> one between 12 to 14 mm or one combined measurement between 28 and 33 mm	
PDO display 2	[1] shows larger figure to smaller figure;	<b>Reject</b> if converts to other units (than mm or cm) or standard form
	[1] (needs working) answer rounded to correct ratio e.g. 39 : 29;	<b>Reject</b> if put units



Question	Expected Answers	Additional guidance																														
<p>(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. <span style="float: right;">[3]</span></p>																																
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</td> <td>semicircles /AW</td> <td>not semicircles or one end only;</td> </tr> <tr> <td>cap</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 <b>Reject</b> 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> </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	semicircles /AW	not semicircles or one end only;	cap	yes/present	no/none/absent;	stomata numbers	none/not visible or few(er)	yes/more;	position	top/bottom/one side	all round/sides;	sunken	no/none/absent	yes/present;	leaf shape	tapered/pointed/elongated	semicircle/rounded;	surface <b>Reject</b> regular	irregular/rough	smooth;	extra ring/inner layer/allow endodermis	no/none/absent	yes/present;	max 2
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Question	Expected Answers	Additional guidance
<b>(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]</b>		
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
<b>[Total: 19]</b>		