

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
GCE Advanced Subsidiary Level and GCE Advanced Level

**MARK SCHEME for the May/June 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	Marks
1 (a) (i)	Complete the sentences: If the plant tissue ..... water then the sucrose solution will become more dilute. This will change the solution so that it becomes ..... dense.		
ACE conclusion 1	loses and less;		[1]
(ii)	Show clearly on the diagrams below how you would expect to see the drop move.		
ACE conclusion 2	(same concentration/middle tube) drop stays at same height/no movement;		[1]
	(more concentrated/left tube) shows drops/sinks/falls	(less concentrated/right tube) <b>AND</b> rises;	[1]
(iii)	Decide on the concentrations of sucrose solution. Prepare the space below to show concentrations of sucrose solution; volumes of 1.0 mol dm <sup>-3</sup> sucrose solution; volumes of distilled water.		
MMO decisions 3	three concentrations;		[1]
	even range;		[1]
	correct volumes to make 50 cm <sup>3</sup>	<b>AND</b> correct molarity;	[1]

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<b>(iv) Prepare the space below to record your observations.</b>			
PDO recording 3	table with cells drawn no outer boundary	(heading to top/left) <b>AND</b> conc(entratn)/mol dm <sup>3</sup> ;	[1]
	(headings) (syringe) <b>A</b>	<b>AND</b> (syringe) <b>B</b> ;	[1]
	(records) description or key to show movement;		[1]
MMO collection 2	<b>A</b> (0.7 mol dm <sup>3</sup> ) moves up and down;		[1]
	<b>B</b> (0.25 mol dm <sup>3</sup> ) moves up in molarities more than 3 and down in others;		[1]
MMO decision 1	records more than one drop for each concentration;		[1]
<b>(v) Use your results to estimate the sucrose concentration.</b>			
ACE interpretation	<b>(A)</b> correct with their results;		[1]
	<b>(B)</b> correct with results;		[1]

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PDO layout 4 (b) (i) Plot a graph of the data shown in Table 1.1.	<b>O</b> x-axis [sucrose] or conc mol dm <sup>-3</sup> /M/molar	y-axis <b>AND</b> water potential/ $\Psi$ kPa x10 <sup>2</sup> ;	Must have units	[1]
	<b>S</b> scale as 0.2 to 2 cm (allow no 0) ECF if no labels or incorrect on axes for O	<b>AND</b> negative 0 at top –10 to 2 cm;	<b>Reject</b> if awkward scale	[1]
	<b>P</b> correct plotting using crosses or dot in circle;	Intersection of cross must be clear to show plot	<b>Reject</b> plotting if scale is awkward or if only blobs/dots/blobs in circles	[1]
	<b>L</b> ruled/straight line through points;	Quality – not thick, 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>Straight line through</u> <u>most plots</u></li> <li>• <u>Straight line</u> <u>extrapolated to 0</u></li> </ul> Extrapolation not beyond x- or y-axis	<b>Reject</b> if not five plots	[1]
	<b>0.15</b> <b>-5.0</b>			
	<b>0.35</b> <b>-12.0</b>			
<b>0.55</b> <b>-19.0</b>				
<b>0.75</b> <b>-26.0</b>				
<b>1.00</b> <b>-35.0</b>				

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<b>(ii) Using your results and your graph estimate the water potential of sample A (0.70).</b>			
MMO collection 1	(using their result for A) shows clearly on graph how one water potential obtained;	<b>Allow</b> any indication but must be estimate of A	[1]
ACE interpretation 1	any correct reading of water potential(s) <b>AND</b> <u>kPa x10<sup>2</sup></u> ;	If A between ... and .... reads off two water potentials allow any correct <b>Allow</b> if correct with result and reading from graph	[1]
<b>(iii) Describe how you would improve the investigation to obtain a more accurate estimate of the water potential of sample A.</b>			
ACE improvement 3	more (sucrose) solutions of known water potential; two further examples of concentration of sucrose or describes more around where drop drops and rises; more sucrose solutions or concentrations to estimate A; standardise the volume of the methylene blue dye OR suggests method for controlling volume of drop; method to introduce drop OR measure time to rise or sink;		[max 3]
<b>Total</b>			<b>[23]</b>

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2 (a) (i) Draw a large plan diagram of half of the trachea showing the ends of the cartilage ring. Label the diagram. Reject all marks except label if only 1 line.	<table border="1"> <tr> <td>clear, sharp, unbroken lines</td> <td><b>AND</b> no shading</td> <td><b>AND</b> large; Minimum of three lines</td> </tr> </table>	clear, sharp, unbroken lines	<b>AND</b> no shading	<b>AND</b> large; Minimum of three lines	<b>Reject</b> if overlaps text in question	[1]
	clear, sharp, unbroken lines	<b>AND</b> no shading	<b>AND</b> large; Minimum of three lines			
	no cells	<b>AND</b> drawn <u>only</u> half; Minimum of two lines.	[1]			
(in half section) has at least two ends of cartilage ring;		[1]				
MMO decision 2	at least 6 lines for layers;	<b>Reject</b> if any writing on drawing	[1]			
	<b>Reject</b> if any label is biologically incorrect e.g. cell wall <b>Reject</b> if any labels from other tissues e.g. arteries, veins, plant tissues and named cells unless described as a layer <b>Accept</b> any one label with label line correct cartilage epithelium (smooth) muscle layer of Goblet/mucus cells lumen;		[1]			

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(ii) Prepare the space below so that it is suitable for you to compare and contrast the specimens on slide L1 and in Fig. 2.1.					
PDO recording 1	<p>organised as AND table/venn diagram/ruled connected boxes</p> <p>correctly headed AND</p> <p>comparative statements opposite each other;</p>	<p>L1   Fig 2.2</p>	[1]		
MMO collection 1	lumen clearly identified as present in both;		[1]		
ACE interpretation 3	<p><b>feature:</b></p> <p>then three of:</p> <p>1. lumen shape or lining</p> <p>2. cilia or brush border microvilli</p> <p>3. cartilage</p> <p>4. surrounding cells/air sacs/spaces</p> <p>5. epithelium</p> <p>6. goblet or mucus cells</p> <p>7. size</p> <p>8. whole shape similarities: smooth muscle</p>	<p><b>L1 (trachea):</b></p> <p>regular/circular not folded/no villi</p> <p>present</p> <p>cilia/brush border</p> <p>present</p> <p>absent or no(ne)</p> <p>thinner/narrower</p> <p>present or visible</p> <p>wider/larger</p> <p>oval/triangular (whole shape)</p> <p>round/circular</p>	<p><b>Fig. 2.1:</b> (bronchiole)</p> <p>irregular/hot circular folded/villi;</p> <p>absent or not visible microvilli;</p> <p>absent;</p> <p>present or have;</p> <p>thicker/wider;</p> <p>absent or not visible;</p> <p>narrower/smaller;</p> <p>round/circular;</p>	<p>Ticks and crosses requires a key</p> <p><b>Reject</b> 3D, disc or spherical or arbitrary or random</p> <p><b>Reject</b> negatives e.g. not circular</p> <p><b>Reject</b> opposites e.g. regular</p>	[max 3]

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(iii) Calculate the actual distance across the lumen of the structure shown by line X in Fig. 2.1.			
MMO collection 1	measures line X correctly in mm or cm <b>Reject</b> m	mm/cm 28/2.8 28.5/2.85 29/2.9 29.5/2.95 30/3	[1]
PDO display 2	shows their measurement divided by or / or ÷ 70 <b>AND</b> x 1000 or 10 <sup>3</sup> (mm) or 10000 or 10 <sup>4</sup> (cm) or x 10 x 1000; figure to no more than three sig. figs.;	<b>Reject</b> use or conversion to metres <b>Reject</b> if no units	[1]



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<b>(b) Make a large drawing of three of these structures, which must be complete, to show the differences between them. Draw a circle on Fig. 2.2 around each of the structures Z which you have drawn.</b>					
MMO collection 1	circles 3 complete Z structures on Fig 2.2	<b>AND</b> draws three;		Reject if overlaps text of question	[1]
	clear, sharp, unbroken lines	<b>AND</b> no shading	large;		
PDO layout 1					[1]
MMO decisions 2	two of six structures match those drawn for shape;				[1]
	one enclosure matches any one structure shape	<b>AND</b>	position;	<b>Reject if more detail</b>	[1]
<b>Total</b>					<b>[17]</b>