

**MARK SCHEME for the May/June 2010 question paper
for the guidance of teachers**

9700 BIOLOGY

9700/33

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) Draw on Fig. 1.1 a line to show the level of water in the large test-tube.			
MMO decision 1	line drawn above or at the same level as the line showing the contents in the Visking tubing;		[1]
(b) State the volume of Benedict's solution and the volume of the solutions and the sample.			
MMO decision 1	(volume of Benedict's) equal to or greater than (volume of each solution and sample)	AND (volume of each solution and sample) equal;	Reject any other values e.g. 2.5 cm ³ [1]
(c) State ONE variable, other than volume, which needs to be kept constant when you do the TESTS and describe how you will keep this variable constant.			
MMO decisions 2	<u>temperature:</u>		Reject if in context of Visking tubing set up or experiment e.g. keep at room temperature Reject if more than one variable given [1]
	use of water-bath	AND between 80°C and 100°C or boiling;	[1]

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Question	Expected Answers	Additional Guidance	Marks	
(d) (i) Prepare the space below and record your results.				
PDO recording 2	1. table with all cells drawn No outer boundary needed	(heading to left/ top) AND a <u>heading</u> to describe (sample, or solution or test-tube or glucose);	[1]	
	2. (heading) <u>time</u> (/) s or sec(onds) or min(utes);	Reject if units in table	[1]	
MMO collection 2	3. time for 0.3%/S3 quicker than 0.2%/S2;	Must be clear units Reject 1.24	[1]	
	4. figures for 0.2%/S2 quicker than 0.1%/S1;		[1]	
(ii) Estimate the concentration of glucose in the sample.				
ACE interpretation 1	correct estimate from their results Reject if sample not recorded in results	AND percentage/%;	<ul style="list-style-type: none"> • is 0.1% or 0.2% or 0.3% • between 0.1% and 0.2% • 0.15% • between 0.2% and 0.3% • 0.25% • greater/more than 0.3% • less than 0.1% Reject any other values Ignore use of S1, S2, S3	[1]

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Question	Expected Answers	Additional Guidance	Marks
(iii) Suggest how you might modify this investigation to find the effect of temperature on the rate of diffusion of glucose through Visking tubing.			
ACE improvements 2	states 5 or more temperatures OR gives examples of 5 or more 1°C to 100°C;		[1]
	(in context of readings) repeats or more than once or replicates AND mean or average OR take samples at same time interval or example of time with units OR same volumes or example of volume with units of samples removed OR rate calculated from time taken to change colour OR same concentration or volume of glucose or example of concentration or volume + units;	Reject if change another variable e.g. concentration of glucose Reject amount	[1]

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Question	Expected Answers	Additional Guidance	Marks													
(e) (i) Plot a graph to show the results in Table 1.1.																
PDO layout 4 <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>0</td><td>0</td></tr> <tr><td>15</td><td>14</td></tr> <tr><td>30</td><td>22</td></tr> <tr><td>45</td><td>26</td></tr> <tr><td>60</td><td>28</td></tr> <tr><td>75</td><td>29</td></tr> </table>	0	0	15	14	30	22	45	26	60	28	75	29	O	x-axis time (/) min(ute)s	y-axis AND distance (diffused from well by coloured solution /) <u>mm</u> ;	[1]
	0	0														
	15	14														
	30	22														
45	26															
60	28															
75	29															
S	scale as 20 min to 2 cm ECF if no labels on axes for O Allow 5/10 at origin but must label origin	AND 5 mm to 2 cm; Allow 5/10 as long as scale 5 mm to 2 cm but must label origin	Reject if awkward scale	[1]												
P	correct plotting using crosses or dots in circle only;	Intersection of cross must be clear to show plot	Reject plotting if scale is awkward Reject if only blobs/dots/blobs in circles	[1]												
L	line joined point to point or smooth curve;	Quality – no thicker than on grid, not feathery for the complete line Joining plots – <ul style="list-style-type: none"> • <u>Ruled lines plot to plot</u> • <u>Curve through all plots</u> Extrapolation <ul style="list-style-type: none"> • Not beyond x- or y-axis 	Reject if no 0,0 plot	[1]												

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(ii) Use the graph to calculate the rate of diffusion of the solution between 10 mins and 20 mins. Show on your graph.			
MMO collection 1	1. shows on graph at least one reading(s) <u>between or at 10 and 20 minutes</u> ;		[1]
PDO display 1	2. shows distance divided by time (has to be clear) any number between 4 and 20 divided by or / or ÷ <u>whole number</u> (between 4 and 20) or shows subtraction of numbers;	Reject if not clear distance divided by time	[1]
ACE interpretation 1	3. correct answer	AND mm min ⁻¹ or mm per min or mm/min;	[1]
PDO display 1	4. any figure rounded to maximum of four significant figures;		[1]
(iii) Describe and explain the trend in the rate of diffusion shown in the graph you have drawn in (e) (i).			
ACE conclusion 2	(description) rate or distance decreases or slows or levels off;		[1]
	(in correct context of diffusion ref. to) Idea of concentration or diffusion <u>gradient</u> , getting less OR Idea of (high at beginning) concentration or diffusion <u>gradient</u> high OR Idea of (at end) evenly coloured;		[1]

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(f) State the uncertainty of the measurements using this ruler.			
ACE interpretation 1	<u>+/- 0.5 mm</u> OR <u>+/- 0.05 cm;</u>		[1]
	Total		[22]

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Question	Expected Answers	Additional Guidance	Marks		
2 (a) (i)	Make a large, labelled drawings of two different types of cell from Fig. 2.1 and one cell from Fig. 2.2. Indicate on the photomicrographs the cells that you have drawn.				
MMO collection 1	1. (only cells marked on Figs. and drawn)		Reject if shown more cells Reject if drawing overlaps text of question	[1]	
	on Fig. 2.1 white blood cell	AND any one <u>complete</u> red blood cell			on Fig. 2.2 AND any one <u>complete</u> red blood cell;
PDO layout 1	2. clear, sharp, (not thicker than grid line for whole line) unbroken lines Allow 1 error in three cells 0 error for two or one cell	AND <u>no</u> shading	AND smallest cell drawn larger than 2 cm (+/- 1mm) at widest point;	Must draw at least TWO cells	[1]
MMO decision 2	3. (wbc from Fig. 2.1) (nucleus position) nearer to one side	(nucleus size) AND (+ or – 1 mm) nucleus fills between 50 and 75 % of whole cell;		Reject if any additional organelles drawn in any cell	[1]
	4. Reject if any label is biologically incorrect e.g. cell wall any ref. to plants e.g. cell wall or named plant cell or named animal cell other than blood cells. Ignore nucleolus and named blood cells One correct label with label line from nucleus nucleoplasm cytoplasm cell membrane/AW;			Reject if any writing on drawing	[1]

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Question	Expected Answers			Additional Guidance	Marks
(ii) Prepare the space below so that it is suitable for you to compare and contrast the cells in Fig. 2.1 and Fig. 2.2.					
PDO recording 2	(organise) table/ venn diagram/ ruled connected boxes	(heading for differences) Fig. 2.1 and Fig. 2.2, labelled cells from (a) (i) , named cells linked to figs.	all differences statements opposite each other;	<u>Fig 2.1</u> <u>Fig. 2.2</u>	[1]
	heading similarities;				[1]
ACE interpretation 3	Mark with identification from (i) drawings even if incorrectly named cells Mark for any similarities or differences max 3 Must be clear which cells are being compared or contrasted Ticks and crosses requires a key (continued on next page)				

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Question	Expected Answers			Additional Guidance	Marks
feature	Fig. 2.1		Fig. 2.2	Beware Fig 2.1 cells magnified 3+ more than Fig 2.2 so cells in Fig 2.1 smaller Reject nucleus Reject if just cells have nucleus present or absent Reject 3D , rugby or disc or spherical or biconcave or arbitrary or random Reject negatives e.g. not circular Reject opposites e.g. regular	[max 3]
Only credit each number once.	rbc or label from (i)	wbc or label from (i)	rbc or label		
1. size	(rbc) small(er)	(wbc) larg(er)			
cells;	small(er)		larg(er)		
2. types of cells;	rbc or label	and wbc or label	and only rbc/label		
		wbc present	no wbc		
	two		one		
3. number	many or more cells/rbcs		few(er) cells/rbcs		
	many or more rbcs	one or a Reject few/small no.			
OR degree of packing;	dens(er)/more overlapping rbcs		less dense;		
4. nucleus	absent Allow cannot be seen	present			
	absent Allow cannot be seen (no key)	present	present		
OR nucleus shape;		lobed or irregular	not lobed or oval or round or regular or smooth		
5. cell shape;	circular or round	irregular			
	circular or round		oval		
		irregular	oval Allow few or some round Reject round		
6. cytoplasm;	not granular	granular			
		granular	not granular or normal		
7. cytoplasm OR cell membrane;	(no key) present				

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(iii) Calculate the actual diameter of the cell shown by the line X in Fig. 2.2.															
MMO collection 2	measures line X correctly in mm or cm; Reject m	<table border="1"> <thead> <tr> <th>mm</th> <th>cm</th> </tr> </thead> <tbody> <tr> <td>26(.0)</td> <td>2.6</td> </tr> <tr> <td>26.5</td> <td>2.65</td> </tr> <tr> <td>27(.0)</td> <td>2.7</td> </tr> <tr> <td>27.5</td> <td>2.75</td> </tr> <tr> <td>28(.0)</td> <td>2.8</td> </tr> </tbody> </table>	mm	cm	26(.0)	2.6	26.5	2.65	27(.0)	2.7	27.5	2.75	28(.0)	2.8	[1]
	mm	cm													
26(.0)	2.6														
26.5	2.65														
27(.0)	2.7														
27.5	2.75														
28(.0)	2.8														
	shows (their measurement divided by or / or ÷ 700) AND × 1000 or 10 ³ (mm) or 10000 or 10 ⁴ (cm) or × 10 × 1000;	Reject use or conversion to metres Reject if no units	[1]												
(iv) Suggest how you would obtain a mean diameter for cells of this type.															
ACE improvement 1	idea of make more measurements Reject calculate	AND add together AND divide by the number of measurements;	[1]												

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Question	Expected Answers	Additional Guidance	Marks
(b) (i) Draw a large plan diagram of two different blood vessels shown in K1. Reject if one line for each vessel.			
PDO layout 1	1. clear, sharp, (unbroken lines) complete vessels only	AND no shading	AND large;
		Reject if overlaps text of question	[1]
MMO collection 2	2. no cells	AND only two complete vessels drawn; Minimum of three lines between two vessels	[1]
	3. <u>different vessels</u> ; (more than one) at least two complete vessels OR total size or shape; Minimum of three lines between two vessels		[1]
MMO decision 2	4. at least one complete vessel drawn with two or more layers; Minimum three lines		[1]
	5. one with wall thicker than other vessel wall;	Reject if more than two vessels	[1]

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Question	Expected Answers	Additional Guidance	Marks
(ii) Suggest one way in which these blood vessels are adapted for transport.			
ACE conclusion 1	lumen/hollow OR <u>smooth</u> muscle OR tunica media OR elastic fibres/elastin OR collagen OR tunica externa;	Reject if more than one given	[1]
	Total		[18]