

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

9700 BIOLOGY

9700/34

Paper 32 (Advanced Practical Skills 2),
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)	Show clearly on Fig.1.1 what you would expect the contents of the test-tube to look like after 10 minutes. You will gain marks for clear labels.	[2]
ACE conclusions 2	[1] line drawn level with half way mark	AND more yeast drawn towards bottom of tube or another line to show a separate region;
	[1] one label or description;	
	(ii) State the time intervals you will use and what you will use the graph paper scale to measure.	[2]
MMO decisions 2	[1] uses 10 minutes	AND at least three times (including 10) even time intervals between consecutive three; Or one/two/two and a half minutes or two mins 30s intervals; Reject if does not divide into 10 e.g. 3 minutes
	[1] measures or describes measuring e.g. (use graph paper) to find distance/length	
	(iii) ...decide on the volume of Y and the volume of each buffer solution to use. Describe all the steps you used to work out the volume. State the volume of Y and the volume of each buffer solution to use.	[1] [1]
MMO decisions 2	[1] describes all following steps <ul style="list-style-type: none"> • takes into account to (half-way) line • takes into account 1 cm³ calcium chloride/C • divides by half; 	Allow <ul style="list-style-type: none"> • to 0.1 cm³
	[1] volume of Y <u>equal</u> to volume of buffer AND cm ³ / ml on both;	

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(iv) Prepare the space below and record your observations.		[5]
PDO recording 2	[1] table with all cells drawn AND heading (top or left) <u>pH</u> ;	
	[1] Reject <ul style="list-style-type: none"> if units anywhere else except headings t or T 	
	(headings) time min(utes) AND length/depth/height/AW with mm or cm;	
MMO collection 2	[1] different results/observations for different pH minimum 2 pH;	Reject if no units/if mixed units Allow as error carried forward whole or 0.5 units on graph paper
	[1] recorded to 1 mm or 0.1 cm only;	
MMO decision 1	[1] repeats recorded;	
(v) Use your results to state the effect of pH on the yeast suspension.		[1]
ACE conclusion 1	[1] (yeast settles) <u>more / higher rate of</u> <ul style="list-style-type: none"> at some pH or correct example of pH with results; 	Reject activity

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(vi) Identify <i>one</i> significant source of error in this experiment.		[1]
ACE interpretation max 1	cause of error	error
	(dependent variable) boundary/ top of layers or bubbles on surface	idea of finding measuring seeing determining judging;
	or graph paper and test-tube	lining up;
	(standardised variables) test-tubes sizes/ mixing/adding/readings	not constant not same/different/vary cannot be done at same time;
		max 1
(vi) State the degree of uncertainty of using the graph paper scale as a measure.		[1]
ACE interpretation 1	[1] +/- 2 mm;	Reject % error Allow +/- 0.2 cm or +/- whole or 1 graph paper unit

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Question	Expected Answers	Additional guidance
(vii) Suggest how you could make this investigation as accurate as possible ... as reliable as possible		[3]
ACE improvements max 3	C control of any relevant variable; [1] [1]	(for volumes) use measuring cylinder/burette/graduated pipettes or tubes or smaller (divisions)syringes Or hold tube vertical in retort stand/attach graph paper to tubes;
	A1 improving measurements to get a true value [1]	use ruler/graph paper, with smaller divisions/vernier calipers or colorimeter or collect and dry sediment or larger/more volumes so heights larger;
	A2 [1]	set up each pH separately/stagger timing/longer time;
	A3 [1]	more buffer solutions or examples of extra buffer/pH;
	R1 improve method to get repeat data [1]	repeat or replicate;
	R2 [1]	weigh out (initial) mass of yeast ;

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Question	Expected Answers	Additional guidance				
(b) (i) Plot a graph of the data shown in Table 1.1. [4]						
PDO layout 4	O [1]	x-axis calcium chloride/ CaCl_2 conc(entration)(l) <u>m mol</u>	<table border="1"> <tr> <td>Reject t/T</td> <td rowspan="2">Must have units</td> </tr> <tr> <td>AND y-axis time (l) min;</td> </tr> </table>	Reject t/T	Must have units	AND y-axis time (l) min;
	Reject t/T	Must have units				
	AND y-axis time (l) min;					
	S [1]	<table border="1"> <tr> <td>Reject if awkward scale 0.25 to 2 cm</td> <td rowspan="2">AND 20 to 2 cm;</td> </tr> <tr> <td>scale as 0.2 to 2 cm</td> </tr> </table>	Reject if awkward scale 0.25 to 2 cm	AND 20 to 2 cm;	scale as 0.2 to 2 cm	error carried forward if incorrect O then must use more than half provided grid in x and y
Reject if awkward scale 0.25 to 2 cm	AND 20 to 2 cm;					
scale as 0.2 to 2 cm						
P [1]	<table border="1"> <tr> <td> Reject <ul style="list-style-type: none"> plotting if scale is awkward unless 0.25 if only blobs/dots/blobs in circles. </td> <td rowspan="2">intersection of cross must be clear to show plot.</td> </tr> <tr> <td>correct plotting using crosses/dots in circle only;</td> </tr> </table>	Reject <ul style="list-style-type: none"> plotting if scale is awkward unless 0.25 if only blobs/dots/blobs in circles. 	intersection of cross must be clear to show plot.	correct plotting using crosses/dots in circle only;		
Reject <ul style="list-style-type: none"> plotting if scale is awkward unless 0.25 if only blobs/dots/blobs in circles. 	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"> <u>ruled lines plot to plot</u> extrapolation <ul style="list-style-type: none"> not beyond x- or y-axis ignore if in context of data correct to go to 0,0 must be within 2 mm of 0 if not correct in context of data then no extrapolation at either end of data. 	Reject if any extrapolation beyond 0 or 1.0.			
(ii) State the concentration of calcium chloride required for the yeast to sediment out at 40 minutes. [1]						
MMO collection 1	[1]	correct reading of concentration to no more than 2 significant figures;				

Question	Expected Answers	Additional guidance	
[Total: 22]			
2 (a) (i)	Select a large vascular bundle and draw a large plan diagram of the vascular bundle. Label the xylem tissue.	[5]	
PDO layout 1	[1] Reject if drawn over print of question		
	Reject thick lines <ul style="list-style-type: none"> • feathery lines • 4 'tails' or overlaps or gaps AND no shading		AND uses most of the space provided;
	clear, sharp, unbroken lines		
MMO collection 3	[1] no cells drawn	AND draws only one vascular bundle;	
	[1] (vascular bundle) shows an outline which encloses vascular bundle tissues;		
	[1] (in one vascular bundle) wider at one end than the other (tapered) Or at least three regions shown;		
MMO decision 1	[1] Reject <ul style="list-style-type: none"> • if any label is biologically incorrect e.g. regions belonging to other organs or animals. • label within drawn area 		
	correct label with label line xylem to region middle to tapered end;		

Question	Expected Answers	Additional guidance	
(ii) Make a high-power drawing of one trichome, with at least three cells, and one epidermal cell on each side touching the base of the trichome. Label the trichome. [5]			
PDO layout 1	[1] Reject if drawn over print of question	AND uses most of the space provided;	
	Reject <ul style="list-style-type: none"> thick lines – than on grid feathery lines 5 'tails' or overlaps or gaps if double cell walls 		AND no shading
	clear, sharp, unbroken lines in cell outlines		
MMO collection 2	[1] 5, 6 or 7 cells;		
	[1] cells drawn as a touching group		AND cell walls as double lines with middle lamella in 3 adjacent (epidermal) cells;
MMO decisions 2	[1] (cell or tip of trichome or broken) pointed or rounded Or (in trichome) one larger cell or large base cell;		
	[1] Reject <ul style="list-style-type: none"> if any label is biologically incorrect e.g. labels belonging to other organs or animals. label within drawn area 		
	correct label with label line to trichome;		

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(b) (i) Calculate the ratio of the diameter of the vascular tissue labelled X to the total diameter of the plant organ labelled Y. [3]		
PDO recording 1	[1] (measurements to same degree of precision) whole mm or 0.5 mm;	Allow 0.1 cm or 0.15 cm
PDO display 2	[1] shows larger figure to or: smaller figure or larger figure divided by smaller figure;	
	[1] rounds to correct ratio e.g. 125:69 or leaves as fraction e.g. 125/69;	Reject if include units in answer Reject 1.86:1

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(ii)		Prepare the space below so that it suitable for you to describe the observable differences between M1 and Fig. 2.1.			[5]																													
PDO recording	[1]	organise as a table or Venn diagram or ruled connected boxes	headed <u>M1</u> and <u>Fig. 2.1</u>	differences opposite each other;	<u>M1</u> <u>Fig. 2.1</u>																													
	ACE interpretation 4	<p>Reject tick and cross without a key –</p> <table border="1"> <tr> <td>feature</td> <td>M1</td> <td>Fig. 2.1</td> </tr> <tr> <td>[1] shape</td> <td>irregular/wavy/uneven/starshape/swellings</td> <td>oval/circular; Ignore regular</td> </tr> <tr> <td>[1] pith/hollow space/empty/lumen/cavity Ignore vacuole</td> <td>present/yes</td> <td>absent/no;</td> </tr> <tr> <td>[1] vascular tissue/bundle/xylem</td> <td>bundles/around edge/scattered</td> <td>stele/in centre;</td> </tr> <tr> <td>[1] number of vascular bundles/tissue/xylem</td> <td>(vascular bundles) more/(xylem)less</td> <td>(vascular bundles) less/(xylem)lots/more;</td> </tr> <tr> <td>[1] thickened layer/stained layer/collenchyma/AW</td> <td>present</td> <td>absent;</td> </tr> <tr> <td>[1] outer epidermis</td> <td>thick</td> <td>thin;</td> </tr> <tr> <td>[1]</td> <td>continuous/smooth</td> <td>rubbing off/flaky/AW;</td> </tr> <tr> <td>[1] trichomes/hairs</td> <td>present/yes/some/more Allow less</td> <td>absent/no/none/fewer; Allow more</td> </tr> <tr> <td>[1] trichome shape</td> <td>hair-like/pointed</td> <td>irregular;</td> </tr> </table>			feature	M1	Fig. 2.1	[1] shape	irregular/wavy/uneven/starshape/swellings	oval/circular; Ignore regular	[1] pith/hollow space/empty/lumen/cavity Ignore vacuole	present/yes	absent/no;	[1] vascular tissue/bundle/xylem	bundles/around edge/scattered	stele/in centre;	[1] number of vascular bundles/tissue/xylem	(vascular bundles) more/(xylem)less	(vascular bundles) less/(xylem)lots/more;	[1] thickened layer/stained layer/collenchyma/AW	present	absent;	[1] outer epidermis	thick	thin;	[1]	continuous/smooth	rubbing off/flaky/AW;	[1] trichomes/hairs	present/yes/some/more Allow less	absent/no/none/fewer; Allow more	[1] trichome shape	hair-like/pointed	irregular;
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