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

9700/34 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	**AND** description of what is measured; e.g. from halfway mark to top of sediment or bottom of tube to top of sediment/or from Fig. 1.1/AW;	
(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.**		**[1]**
		State the volume of Y and the volume of each buffer solution to use.		**[1]**
MMO decisions 2	[1]	describes all following steps • takes into account to (half-way) line • takes into account 1 cm^3 calcium chloride/C • divides by half;		**Allow** • to 0.1 cm^3
	[1]	volume of Y <u>equal</u> to volume of buffer AND cm^3 / ml on both;		

Question		Expected Answers		Additional guidance
(iv)		**Prepare the space below and record your observations.**		
PDO recording 2	[1]	table with all cells drawn	**AND** heading (top or left) pH;	
	[1]	**Reject** • 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;		
	[1]	recorded to 1 mm or 0.1 cm only;		**Reject** if no units/if mixed units **Allow as error carried forward** whole or 0.5 units on graph paper
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) more / higher rate of • at some pH • or correct example of pH with results;		**Reject** activity

Question		Expected Answers		Additional guidance
(vi)		**Identify *one* significant source of error in this experiment.**		
ACE interpretation max 1	[1] or [1]	cause of error (dependent variable) boundary/ top of layers or bubbles on surface or graph paper and test-tube	error idea of finding measuring seeing determining judging; lining up;	
	[1]	(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

Question		Expected Answers	Additional guidance
(vii)	**Suggest how you could make this investigation as accurate as possible … as reliable as possible**		
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;	**Allow** for either accuracy or reliable
	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 ;	max 3

Question		Expected Answers		Additional guidance
(b) (i)		**Plot a graph of the data shown in Table 1.1.**		
PDO layout 4	O [1]	*x*-axis calcium chloride/$CaCl_{(2)}$ conc(entration)(/) m mol	**Reject** t/T **AND** *y*-axis time (/) min;	Must have units
	S [1]	**Reject** if awkward scale 0.25 to 2 cm scale as 0.2 to 2 cm	**AND** 20 to 2 cm;	error carried forward if incorrect O then must use more than half provided grid in *x* and *y*
	P [1]	**Reject** • plotting if scale is awkward unless 0.25 • if only blobs/dots/blobs in circles. correct plotting using crosses/dots in circle only;	intersection of cross must be clear to show plot.	
	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 – • ruled lines plot to plot extrapolation • 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 • 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** • 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 trichome. Label the trichome.					[
PDO layout 1	[1]	**Reject** if drawn over print of question			
		Reject • thick lines – than on grid • feathery lines • 5 'tails' or overlaps or gaps if double cell walls	**AND** no shading	**AND** uses most of the space provided;	
		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** • 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;			

Question		Expected Answers	Additional guidance
(b) (i) Calculate the ratio of the diameter of the vascular tissue labelled X to the total diameter of the plant organ labelled Y.			
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

Question		Expected Answers			Additional guidance
(ii)		**Prepare the space below so that it suitable for you to describe the observable differences between M1 and Fig. 2.1.**			
PDO recording 1	[1]	organise as a table or Venn diagram or ruled connected boxes	headed M1 and Fig. 2.1	differences opposite each other;	M1 | Fig. 2.1
ACE interpretation 4		**Reject** tick and cross without a key –			if no organisation then mark points only if in same sentence or following sentences. **Allow** differences even if not opposite each other. **Allow** difference on one side if e.g. use more or –er.
		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;	max 4
				[Total: 18]	