UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

9700 BIOLOGY

9700/31 Paper 31 (Advanced Practical 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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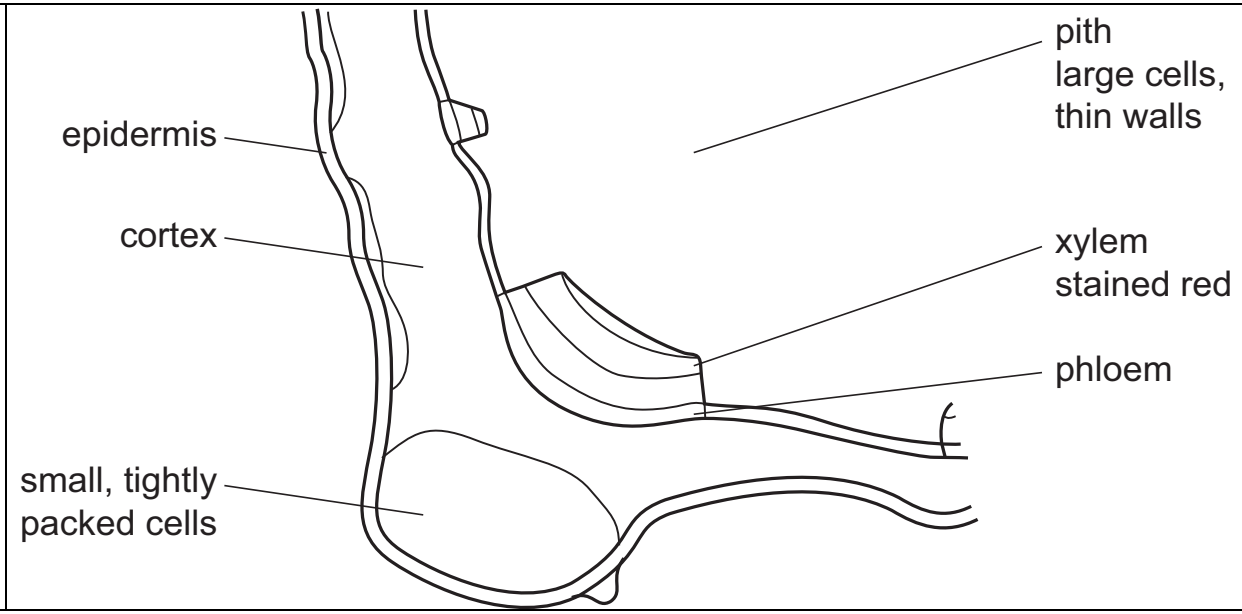
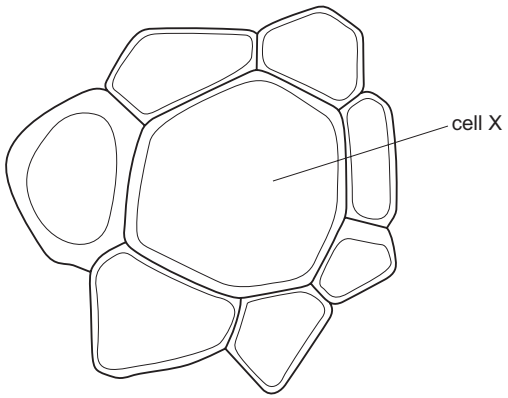
Question		Expected Answers		Marks	Additional Guidance
1 (a) (i) Prepare the space below to record all your results.					
PDO	**recording 2**	all cells drawn AND	(heading top or to left) **W**, **X**, **Y**, AND **Z**; **Ignore** P	[1]	If **W**, **X**, **Y**, **Z** NOT given. **Allow** concentration.
		(heading top or to right) time;		[1]	**Ignore** units. **Reject** units in table.
MMO	**collection 3**	times recorded for samples **W**, **X**, **Y** and **Z**;		[1]	**Ignore** wrong recording 1:20 etc. **Ignore P**.
		time at **W**/5.00 quicker/less than time for **Z**/0.25;		[1]	**Reject** if 1.24 etc. unless have made it clear this is minutes and seconds 1 minute 24 seconds.
		time for **P** between 0.25/**Z** and 1.00/**Y**; **Allow** same as **Z** or **Y**.		[1]	**Allow 1.24 etc.** as long as figures between **Z** and **Y**.
MMO	**decisions 1**	whole number of seconds recorded (units must be clear somewhere);		[1]	
(ii) Use your results to estimate the concentration of sugar in P.					
MMO	**decisions 2**	is **W** or **X** or **Y** or **Z** OR is between **W** and **X** or **X** and **Y** or **Y** and **Z** correct from results **Allow candidate P result** equal to or more than **W** or equal to or less than **Z** OR units g 100 cm^{-3} or g/100 cm^3;		[1]	**If no reading for P** then can only award correct units. **Reject** g/100 cm^{-3} **Ignore** incorrect units.
		is 5.00 or 2.50 or 1.00 or 0.25; OR (P) is between 5.00 and 2.50 or 2.50 and 1.00 or 1.00 and 0.25;		[1]	**Do not allow any estimate between two values.**

Question		Expected Answers			Marks	Additional Guidance
(b) State degree of uncertainty in using the small syringe to measure the volumes.						
ACE	interpretation 1	+/– AND	half volume given AND	units/cm^3/ml/cc;	[1]	
(c) (i) Identify a significant source of error in estimating the sugar concentration of P.						
ACE	interpretation 1	determination of colour change; **Ignore** timing.			[max 1]	**Reject** temperature of water-bath. **Reject** correcting an error e.g. use a colorimeter.
		P between two concentrations/not enough concentrations;				**Allow P** not tested for other sugars.
(ii) Suggest how you would improve the investigation.						
ACE	improvements 3	more/different/wider range concentrations;			[1]	
		three examples of concentrations/serial dilution;;			[2]	**Ignore** units.
		white card to show colour change;			[1]	**Reject** colorimeter/colour chart.
		(repeat/replicate) more than once/many/more times/twice/thrice;			[1]	**Reject** repeat/repeat again/repeat(s) experiment.
		mean/average;			[1]	
		test **P** before hydrolysing;			[1]	
		have equal or excess volume of Benedict's;			[max 3]	

Question		Expected Answers	Marks	Additional Guidance
(d) Suggest one reason why the concentration of sugar in the phloem is not always the same.				
ACE	conclusion 1	different part of plant/near source or sink/position in phloem;		
		different plant;		
		different time day/year or different season;		
		higher temperature;		
		different student so different timing to colour change;		**Reject any other errors** e.g. ref. to volumes.
		AVP; aphids feeding ref to osmosis/water relations needs link to sugars ref to damage to plant	[max 1]	
		Total	**[14]**	

Question Fig 2.1		Expected Answers							Marks	Additional Guidance
2 (a) Draw a large, labelled plan diagram of the part of the stem shown in fig. 2.1. Add TWO annotations to describe the visible appearance of two tissues.										
PDO	layout 1	clear, sharp, unbroken lines AND	no shading AND	longer than 6 cm from centre of drawn corner in both directions;					[1]	
MMO	collection 2	no cells AND	only correct quarter drawn;						[1]	
		epidermis as two lines maximum 3 mm at the corner OR corner region of collenchyma drawn; Must be a discrete area.							[1]	
PDO	recording 1	corner vascular bundle outer and inner edges both curved towards corner	AND smaller V.B. OR half on right side;						[1]	
MMO	decision 2	any one correct label/epidermis/trichome/cortex/vascular bundle/xylem/phloem/ pith;							[1]	
		Annotations based on	xylem	phloem	cortex	pith	epidermis	collenchyma	[max 1]	Must be two different tissues. Allow for any correct description of visible feature. **Ignore** functions.
		colour walls	red/pink	green						
		colour/lumen	white/ hollow							
		size cells Allow tightly packed			large	large	small/ thin	small		
							2 layers	compact		
		shape of tissue/cells			angular/pentagon/ AW		square			
		walls	thick		thin	thin		thick		



Question Fig. 2.2		Expected Answers			Marks	Additional Guidance
(b) Make a large drawing of cell X and all the cells that are touching it. Label cell X on your drawing.						
PDO	layout 1	clear, sharp, AND unbroken lines **Ignore** additional cells beyond cell **X** plus surrounding cells	no shading AND	cell **X** largest internal dimension is more than 3cm;	[1]	
MMO	collection 2	labelled **correct** cell **X**;			[1]	**Ignore** any additional cells and organelles or textbook drawings. 
		drawn all cells (complete) surrounding (cell **X**); **Ignore** incorrect labelling of **X**/no label and number of cells, must have cells all round cell **X** but ignore additional cells/textbook additions.			[1]	
PDO	recording 1	(cell **X**) three adjoining straight walls; **Ignore** incorrect labelling of cell **X**.			[1]	
MMO	decision 2	(must have at least minimum 4 adjacent cells) all cells drawn must have side walls touching; **Reject** if cell wall boundaries are not clear.			[1]	
		cell between 6 o'clock and 9 o'clock has longer side attached to cell **X** than opposite wall; OR anomaly on right separated as line from adjacent cells;			[1]	
		Total			**[12]**	

Question		Expected Answers	Marks	Additional Guidance
3 (a) (i) Prepare the space below and record your observations.				
MMO	**collection 1**	records observations of cells/yeast/AW grains/bubbles/spots for **A1** and **A2** and **A3**; **Allow** stained/blue unstained white/colourless/clear **Ignore** solution/liquid **Reject** molecules	[1]	**Allow** drawings under headings. **Ignore** other colours than blue or /white/colourless.
MMO	**decision 1**	(boiled yeast/**A1**) (mostly) blue/stained/no white (white) AND (yeast in glucose/**A3**) (mostly) white/unstained (blue) AND (yeast in salt/**A2**) white/unstained//white and blue/blue;	[1]	**A1** boiled **A2** high concentration salt **A3** in glucose/living
(ii) Explain the appearance of the yeast cells in A1 (boiled) and A3 (living)				
ACE	**interpretation 1**	(boiled yeast/**A1** blue/stained cells) cells dead/no activity/denatured enzymes/AW AND (yeast in glucose/**A3** white/unstained) living cells/example e.g. budding/respiration/enzymes active; ECF from results.	[1] AND	**Reject** yeast denatured.
(b) (i) Complete Table 3.1 by calculating the missing value for the mean activity of yeast. Show all the steps in your calculation.				
PDO	**display 2**	shows 177+180+168 and divided by 3; 177/3 180/3 168/3 then adding up;	[1]	
		then by 3 again; ECF from point 1, allow answer from point 1 divided by 3 or 9.	[1]	177+180+168 divides by 9;; 177+180+168 = 525/9 = 175/3 = (58);;

Question		Expected Answers			Marks	Additional Guidance
(ii) Plot a graph of these data shown in Table 3.1.						
PDO	layout 4	**O**	x-axis concentration/conc/ %/percentage **AND**	y-axis <u>bubbles</u> min^{-1} or /min;	[1]	
		S	scale as 1.0 to 2 cm (allow no 0) and 20 to 2 cm; ECF from wrong O – must use more than half grid for both *x* and *y* axis with sensible scale 20 to 2cm and y 2 to 2 cm.		[1]	Allow 10 on origin on y but must be labelled.
		P	plotting crosses or dot in circle ONLY **AND** plots correct;		[1]	**Do not credit blobs in or out of circles.** **Credit x s in circles.**
		L	ruled/straight line to all points; Smooth curve through all points.		[1]	**Do not credit if any extrapolation beyond 0 or 5.0**

Question		Expected Answers		Marks	Additional Guidance
(iii) Describe the results shown in your graph.					
ACE	interpretations 2	increases/most bubbles to 1.5%;		[1]	
		decreases/AW;		[1]	
(iv) From your graph estimate the mean activity of yeast in a 2.0% sodium chloride solution.					
ACE	interpretaton 1	correct reading from graph at 2.0%	AND bubbles per minute/min^{-1};	[1]	Whole number of bubbles only.
(v) Explain the difference in the activity between					
ACE	conclusion 2	**(0.0% to 1.5%) sodium chloride solution**	(Salt) increase enzyme activity /AW	[1]	**Allow** ref. increase in process e.g. active transport.
		(3.0 to 5.0%) sodium chloride solution	(Salt) inhibits/denatures enzymes OR causes water to move out of cells/ osmosis/dehydration/dessication of cells/plasmolysed;	[1]	**Reject** yeast denatured/killed/dies. Enzyme killed. Enzyme doesn't work.
		Total		**[14]**	