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

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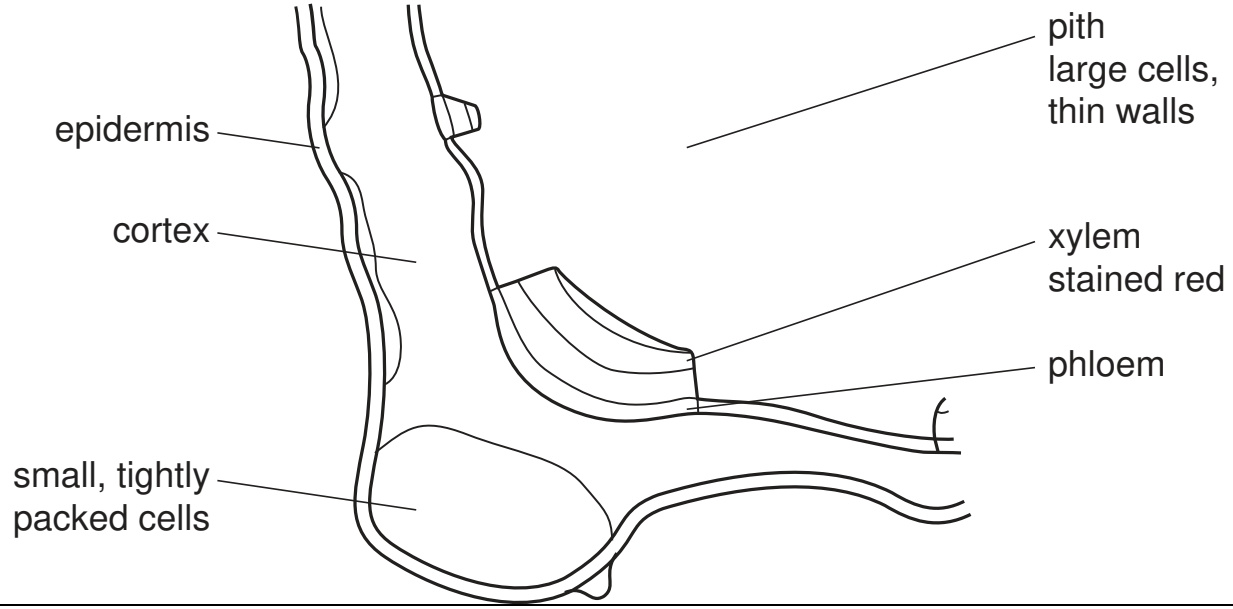
UNIVERSITY of CAMBRIDGE
International Examinations

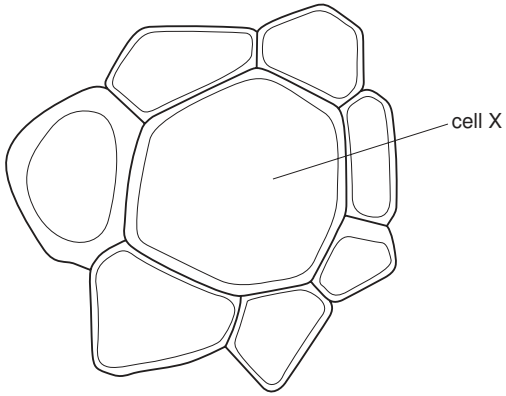
Question		Expected Answers		Marks	Additional Guidance
1 (a) (i) Prepare the space below to record all your results.					
PDO	recording 2	all cells drawn AND	(heading top or to left) **W**, **X**, **Y**, AND **Z**; **Ignore** P	[1]	If **W**, **X**, **Y**, **Z** NOT given. **Allow** concentration.
		(heading 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]**	