UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9700 BIOLOGY

9700/31 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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International Examinations

Question	Expected Answers	Additional Guidance	Marks
1 (a) (i) Decide how often you will take samples. You should not sample for longer than 20 minutes.			
MMO decisions 2	4 or more numbers; Ignore units.		[1]
	even range of times;	Range: longest time must be 10 or more minutes	[1]
(ii) Prepare the space below to record: time you remove sample, time at which end-point is reached and time taken to reach the end-point.			
PDO recording 2	1 table with all cells drawn no outer boundary needed. (**heading** top or left) **AND** sampling or sample time or time removed;	**Reject** units in body of table	[1]
	2 (**heading** for **one** other column or row) time with units;		[1]
MMO collection 2	3 (ignore headings on results columns) sample time plus result column = other result column;	Must be clear units **Reject** 1.24	[1]
	4 (trend correct) figure for last sample less than figure for first sample;		[1]
MMO decision 1	5 (end-point result column) whole seconds or whole minutes for at least three results;		[1]
(b) (i) Describe a suitable control for this investigation.			
ACE interpretation 1	1 boil and cooled enzyme OR 2 no enzyme and replace with water;		[1]

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Question	Expected Answers		Additional Guidance	Marks
(c) (i) Identify two significant sources of error in this investigation				
ACE interpretation 2	1 timing with reason why causes an error e.g. removal of samples AND adding to potassium permanganate OR timing end-point OR two lots of timing;			[max 2]
	2 judging or detecting end-point or colour change;			
	3 idea of volume of reaction mixture or AW decreasing with each sample;		**Reject** temperature **Reject** pH **Reject** evaporation	
(ii) State one variable which was not controlled in this investigation and how it could be controlled.				
ACE improvement 1	temperature	**AND** use thermostatically-controlled water-bath or water-bath at constant temperature;	**Reject** if more than one variable	[max 1]
	pH	**AND** use buffer;		

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Question	Expected Answers			Additional Guidance	Marks
(d) (i) Plot a graph to show the results in Table 1.1.					
PDO layout 4 60 0.32 120 0.64 180 0.95 300 1.55 400 2.05	O	*x*-axis time (/) s or sec(ond)s	*y*-axis **AND** mass of (reducing) sugars (/) mg;	Must have units	[1]
	S	scale as 100 s to 2 cm ECF if no labels for O. Allow at origin 50 as long as scale 100 s to 2 cm	AND 0.5 mg to 2 cm; Allow 0.25 at origin but must label origin.	**Reject** if awkward scale	[1]
	P	correct plotting using crosses/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	straight line through points;	Quality – not thick, not feathery for the complete line. Joining plots – • Ruled lines plot to plot • Straight line through most plots • Straight line extrapolated to 0 Extrapolation • Not beyond *x*- or *y*-axis	**Reject** if not five plots	[1]

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Question	Expected Answers		Additional Guidance	Marks
(ii) Use the graph to find the rate of hydrolysis of the sucrose by finding the gradient of the line. Show on your graph where you took your readings.				
MMO collection 1	shows on graph at least one time and mass;			[1]
MMO decision 1	two masses and two times;			[1]
PDO display 2	shows mass up 2.05 mg	**AND** divided by time up to 400 s;		[1]
	any answer rounded to maximum of three significant figures OR five decimal places OR standard form;			[1]
(iii) Explain why the mass of reducing sugars increased and then remained the same.				
ACE conclusion 2	enzyme;		**Reject** use of enzyme in incorrect biological context	[1]
	(context of increase or up to 400 s) idea that non-reducing sugar or sucrose being converted (context of remaining the same or after 400 s) AND idea that all substrate hydrolysed or broken down or used up;		**Reject** enzyme active sites full or enzyme used up	[1]
				[Total: 21]

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Question	Expected Answers	Additional Guidance	Marks
2 TS oesophagus **(a) (i) Draw a large plan diagram of a quarter of the tube as shown in Fig. 2.1**			
PDO layout 1	1 clear, sharp, unbroken lines **AND** no shading **AND** **Allow** only for 3 or more lines;	**Reject** if overlaps text of question	[1]
MMO collection 1	2 no cells **AND** Drawn detail for only correct quarter; Minimum of one layer needed.	**Reject** if drawn incorrect quarter	[1]
MMO decision 2	3 innermost layer is thinner (+ or – 1 mm) than outermost thick layer;		[1]
	4 first two lines folded;		[1]

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Question	Expected Answers	Additional Guidance	Marks
(b) (i) Calculate the actual length, shown by line X, of one of the structures.			
MMO collection 2	measures line **X** correctly in mm or cm; **Reject** m	<table><tr><th>mm</th><th>cm</th></tr><tr><td>54.(0)</td><td>5.4</td></tr><tr><td>54.5</td><td>5.45</td></tr><tr><td>55.(0)</td><td>5.5</td></tr><tr><td>55.5</td><td>5.55</td></tr><tr><td>56.(0)</td><td>5.6</td></tr><tr><td>56.5</td><td>5.65</td></tr><tr><td>57.(0)</td><td>5.7</td></tr></table>	[1]
	shows their measurement divided by or / or ÷ 50 **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]
(ii) Explain how you would find the mean length of the structures shown in Fig. 2.2			
ACE improvements 2	measure all OR any number five or more;	**Reject** calculate	[1]
	add together and divide by the number measured;		[1]

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<table>
<tr><th>Question</th><th colspan="4">Expected Answers</th><th>Additional Guidance</th><th>Marks</th></tr>
<tr><td colspan="7">(iii) Prepare the space below so that it is suitable for you to compare and contrast the cells in J1 and Fig. 2.2.</td></tr>
<tr><td rowspan="2">PDO
recording 2</td><td colspan="2">(organise)
table/
venn diagram/
ruled connected boxes</td><td>(heading for differences)
any appropriate heading e.g
J1 and Fig. 2.2</td><td>all differences statements opposite each other;</td><td><u>J1</u> <u>Fig. 2.2</u></td><td>[1]</td></tr>
<tr><td colspan="4">heading , similarities;</td><td></td><td>[1]</td></tr>
<tr><td rowspan="11">ACE
interpretation 3</td><td>feature:</td><td>J1:</td><td colspan="2">Fig. 2.2:</td><td rowspan="11">Must have at least 1 similarity

Allow D5 or S1 not both

Ticks and crosses require a key</td><td rowspan="11">[max 3]</td></tr>
<tr><td>D1. folds no.
OR
packing or gaps or spaces

OR
surface area (to volume ratio)</td><td>fewer

loosely packed/widely spaced or large gaps

small(er)</td><td colspan="2">more

densely packed/closely packed or small gaps

larg(er);</td></tr>
<tr><td>D2. fold shape
Ignore length or height</td><td>wider or thicker/flat at top or round(ed)</td><td colspan="2">thinner or pointed end;</td></tr>
<tr><td>D3. number of layers</td><td>more or larg(er)</td><td colspan="2">few(er);</td></tr>
<tr><td>D4. group of folds</td><td>different shapes</td><td colspan="2">similar shapes;</td></tr>
<tr><td>D5. lumen/ hollow/ space</td><td>present</td><td colspan="2">absent;</td></tr>
<tr><td colspan="4">Similarities/compare clear as 'both are'</td></tr>
<tr><td>S1. lumen/hollow/ space</td><td>present;</td><td colspan="2"></td></tr>
<tr><td>S2. folds</td><td>present;</td><td colspan="2"></td></tr>
<tr><td>S3. layers</td><td>present or many/multi-;</td><td colspan="2"></td></tr>
</table>

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Question	Expected Answers	Additional Guidance	Marks
(iv) Suggest how the structures in Fig. 2.2 are adapted for absorption.			
ACE conclusion	large surface area or microvilli or brush border or good or extensive blood supply or capillary network or lacteals or lymph vessels or selectively permeable;		[1]
(c) Make a large, labelled drawing of the complete cells shown in the sector on Fig. 2.3.			
PDO layout 1	**1** clear, sharp, unbroken lines **AND** no shading **AND** large;	**Reject** if overlaps text of question	[1]
MMO collection 2	**2** cells drawn as a group **AND** narrower at base than top;		[1]
	3 nucleus to right hand side goblet cell touching the membrane **AND** nucleus tapers;		[1]
MMO decision **2**	**4** triangular shape (goblet cell);		[1]
	5 **Reject** if any label is biologically incorrect e.g. cell wall one correct label with label line from nucleus nuclear membrane nucleolus cytoplasm cell membrane microvilli brush border goblet cell columnar epithelium cilia;	**Reject** if any writing on drawing **Reject** if drawn organelles other than nucleus or nucleolus	[1]
			[Total: 19]

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GCE Advanced Subsidiary Level and GCE Advanced Level

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for the guidance of teachers

9700 BIOLOGY

9700/32 Paper 32 (Advanced Practical Skills 2), maximum raw mark 40

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Question	Expected Answers		Additional Guidance	Marks
1 (a) (i) Calculate the surface area of each bead and the mean surface area of beads.				
MMO decision 1	1. 5 or more (bead radii/diameters);			[1]
MMO collection 1	2. measures diameter or records radius	**AND** units mm;	**Reject** any measurements not whole number of mm **Reject** 6 mm or more for diameter or 3 mm or more for radius	[1]
ACE interpretation 1	3. one correct calculation for one bead surface area;			[1]
PDO display 2	4. shows addition of bead measurements divided by number measured or each surface area added together and divided by number;			[1]
	5. answer no more than 3 sig. figs.;			[1]

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Question	Expected Answers		Additional Guidance	Marks
(ii) Prepare the space below to record your observations.				
PDO recording 2	1. table with all cells drawn	(heading top/left) **AND** surface area (/)mm^2 or no. of beads;	**Reject** if units in body of table	[1]
	(heading) 2. colour/observation;			[1]
MMO collection 2	3. only records at 2, 4 and 6 (minutes);			[1]
	(highest no. of beads) 4. yellow/green;			[1]
MMO decisions 3	5. surface area recorded;			[1]
	6. use 20 beads in one tube and at least 3 different numbers of beads;			[1]
	7. even range;			[1]
(iii) The student realised that there were two independent variables in this procedure. State the two independent variables.				
ACE interpretation 1	surface area or number of beads	**AND** enzyme or yeast concentration/quantity;	**Reject** more than two variables	[1]

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Question	Expected Answers	Additional Guidance	Marks
(iv) Suggest how you would make three improvements to the student's procedure.			
ACE improvements 3	idea of cubes with equal volume of yeast;	**Reject** amount	[1]
	idea of equal shaking;		
	repeat measurements AND mean or average;		[max 2]
	colorimeter/white card or pH paper or meter;		
	separate beads using Petri dish/larger container;		
	use thermostatically-controlled water-bath;		
	idea keep time the same e.g. stagger start or have separate experiments;		
	use more beads or more surface areas;		

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Question	Expected Answers	Additional Guidance	Marks
(b) Describe and explain the results shown in Table 1.2.			
ACE conclusions 3	1. (in context of data) stops increasing or levels off or stops or stays constant or no more carbon dioxide or reaction stops;		[1]
	(in any correct context use of) 2. enzyme or catalase or active sites or ESCs;		[max 2]
	3. glucose or substrate fits into active sites or forms ESCs or (slowing or stops) lack of glucose or substrate or glucose not high enough or build up of product or ethanol lack of oxygen build up of carbon dioxide change in pH carbon dioxide dissolves into glucose or substrate or solution or water;		
	Total		**[19]**

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Question	Expected Answers			Additional Guidance	Marks
2 (a) (i) Draw a large plan diagram of a half of the specimen as shown in Fig. 2.1. Label xylem and the cortex.					
PDO layout 1	clear, sharp, (not thicker than grid line for whole line) unbroken lines	**AND** no shading	**AND** large 5 cm or more from centre of stele to epidermis;	**Reject** if overlaps the text of question	[1]
MMO collection 2	no cells	**AND** drawn only half with detail (shown by epidermis line);			[1]
	endodermis shown by two lines	**AND** length between epidermis and endodermis is at least twice the diameter of stele;			[1]
MMO decision 2	draws region of xylem central;				[1]
	Reject if any label is biologically incorrect. one correct label with label line from xylem or cortex;			**Reject** if any writing on drawing	[1]

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Question	Expected Answers			Additional Guidance	Marks
(ii) Make a high-power drawing of a group of three complete touching xylem vessels and a group of three complete touching cortex cells. Reject all marks if only two cells drawn except label mark?					
PDO layout 1	**1.** clear, sharp, (not thicker than grid line for whole line) unbroken lines	**AND** no shading	**AND** smallest group of complete touching cells will not fit inside 6 × 6 cm grid;		[1]
MMO collection 2	only 6 complete cells drawn	**AND** two groups of 3 touching cells;			[1]
	cell wall in at least one cell drawn angular in one group of three	**AND** other group of cells rounded;			[1]
MMO decision 2	(xylem) thicker cell wall than (cortex) cell walls; Measure thickest on both.			**Allow** only if cell walls drawn as double lines for both groups of cells	[1]
	correct labels with label lines to lumen in xylem **AND** any cell wall;			**Reject** if any writing on drawing	[1]

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Question	Expected Answers			Additional Guidance	Marks
(b) (i) Calculate the magnification of the specimen shown in Fig. 2.2. Actual length of line X = 1900 µm.					
MMO collection 1	measures line **X** correctly with mm or cm;				[1]
ACE interpretation 2	show in last calculation before answer 52 or 52.5 or 53 or 53.5 or 54 with 1.9 OR 5.2 or 5.25 or 5.3 or 5.35 or 5.4 with 0.19 OR 52000 or 52500 or 53000 or 53500 or 54000 with 1900;				[1]
	correct calculation of any figure divided by 1900 or 1.9 or 0.19;				[1]
(ii) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on slide M1 and in Fig. 2.2.					
PDO recording 2	organise as a table/venn diagram/ruled connected boxes	**AND** headed M1 and Fig 2.2	**AND** all comparative statements opposite each other;		[1]
	only differences recorded;				[1]

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ACE interpretation 2	feature	M1	Fig. 2.2	**Reject** all ticks with crosses unless have key	[max 2]
	1. xylem shape	star-shape;			
	2. xylem position	centre;			
	3. phloem	clearer or can see or present	not clear or cannot see or absent;		
	4. pith	absent	present;		
	5. thickened cells under epidermis	absent	thick ring/present;		
	6. epidermis layers	one or thin(ner)	two or thick(er);		
	7. size cortex stele/xylem	larger/wider/thicker or more smaller/narrower/ thinner or less	smaller/narrower/ thinner or less larger/wider/thicker or more;		

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Question	Expected Answers			Additional Guidance	Marks
(c) Plot a graph of the data shown in Table 2.1.					
PDO layout 4	**O**	*x*-axis time /hr(s) or hour(s)	*y*-axis **AND** vol(ume) /cm^3 hr^{-1};	Must have units	[1]
	S	scale as 1hr to 2 cm (allow no 0) Allow 1 at origin as long as 1hr to 2 cm must label origin.	**AND** 0.5 cm^3 to 2 cm; Allow 0. 5 at origin must label origin if not 0	**Reject** S if awkward scale	[1]
	P	correct plotting with crosses or dot in circle;	Intersection of cross must be clear to show plot	**Reject** P plotting if awkward scale **Reject** if only blobs or dots or blobs in circles	[1]
	L	straight line between all points or smooth curve through all points;	Quality – no thicker than on grid, not feathery for the complete line Joining plots • Ruled lines plot to plot • Curve through all plots Extrapolation • Not beyond *x*- or *y*-axis • 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 not five plots	[1]
	Total				**[21]**

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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 i**f sample not recorded in results	**AND** percentage/%;	• 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^{o}C to 100^{o}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 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]
	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 – • <u>Ruled lines plot to plot</u> • <u>Curve through all plots</u> Extrapolation • Not beyond *x*- or *y*-axis	**Reject** if no 0,0 plot	[1]

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Question	Expected Answers	Additional Guidance	Marks
(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) between or at 10 and 20 minutes;		[1]
PDO display 1	2. shows **distance divided by time** (has to be clear) any number between 4 and 20 divided by or / or ÷ whole number (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 gradient, getting less OR Idea of (high at beginning) concentration or diffusion gradient high OR Idea of (at end) evenly coloured;		[1]

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Question	Expected Answers	Additional Guidance	Marks
(f) State the uncertainty of the measurements using this ruler.			
ACE interpretation 1	+/- 0.5 mm OR +/- 0.05 cm;		[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** complete red blood cell	on Fig. 2.2 **AND** any one complete 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** no 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;	Fig 2.1 | Fig. 2.2	[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
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		present
	(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		

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]

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<table>
<tr><th>Question</th><th colspan="3">Expected Answers</th><th>Additional Guidance</th><th>Marks</th></tr>
<tr><td colspan="6">(iii) Calculate the actual diameter of the cell shown by the line X in Fig. 2.2.</td></tr>
<tr><td rowspan="2">MMO
collection 2</td><td colspan="3">measures line X correctly in mm or cm;

Reject m</td><td><table><tr><th>mm</th><th>cm</th></tr><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></table></td><td>[1]</td></tr>
<tr><td colspan="3">shows
(their measurement divided by or / or ÷ 700)

AND × 1000 or 10^3 (mm)
or 10000 or 10^4 (cm) or × 10 × 1000;</td><td>Reject use or conversion to metres
Reject if no units</td><td>[1]</td></tr>
<tr><td colspan="6">(iv) Suggest how you would obtain a mean diameter for cells of this type.</td></tr>
<tr><td>ACE
improvement 1</td><td>idea of make more measurements
Reject calculate</td><td>AND add together</td><td>AND divide by the number of measurements;</td><td></td><td>[1]</td></tr>
</table>

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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. different vessels; (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 smooth muscle OR tunica media OR elastic fibres/elastin OR collagen OR tunica externa;	**Reject** if more than one given	[1]
	Total		**[18]**

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 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.

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UNIVERSITY of CAMBRIDGE
International Examinations

Question	Expected Answers		Additional Guidance	Marks
1 (a) (i) Prepare the space below to show concentrations of hydrogen peroxide; volumes of hydrogen peroxide; volumes of distilled water.				
MMO decisions 4	three or more concentrations;			[1]
	includes 10 % as highest;			[1]
	volumes to make up to 10 cm^3 or 20 or 30	**AND** correct;		[1]
	even range or serial dilution;			[1]
(ii) Prepare the space below to record your results.				
PDO recording 2	table with all cells drawn	(heading to left or top) **AND** concentration;		[1]
	(heading for one other column or row) time with units;		**Reject** if units in body of table	[1]
MMO collection 2	collects times in whole seconds or whole minutes;			[1]
	figures for time faster at highest concentration compared with lowest concentration recorded;			[1]
MMO decision 1	repeats/more than one bead recorded for a concentration or six concentrations;			[1]

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Question	Expected Answers	Additional Guidance	Marks
(iii) Identify three significant errors in your investigation. Mark for any correct.			
ACE interpretation 3	(beads) not all same or damaged;		[max 3]
	(test-tube) not vertical (measuring bead to surface);		
	(conditions for enzyme action) temperature not constant;		
	(measuring) beads stuck to sides of tube/stuck together with those already dropped/float up under each other;		
	test-tubes not all the same size;		
	hydrogen peroxide concentration changes or too high or too low;		

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Question	Expected Answers	Additional Guidance	Marks
(iv) Suggest how you would make three improvements to this investigation.			
ACE improvements 3	(ref. to beads) describes selection of bead or passes through sieve with same size holes or mechanism to release or allow to drip from syringe or use spoon or method to prevent damage;		[max 3]
	(ref. to method) (hydrogen peroxide/H) wider range or more concentrations or adjust the concentration or use fresh hydrogen peroxide/H each time or cover hydrogen peroxide or wash and dry beads or use same size of test-tube or use a large test-tube/measuring cylinder;		
	(ref to conditions) thermostatically-controlled waterbath or describes keeping water bath at constant temp;		
	(ref. to measuring) put test-tube in retort stand and make vertical or view at correct angle or use video/camera/light gate to record drop or stain beads or mark line at top;		
	repeats and mean/average;		

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Question	Expected Answers			Additional Guidance	Marks
(b) (i) Plot a graph of the data shown in Table 1.1.					
PDO layout 4	**O**	*x*-axis time/min	*y*-axis **AND** vol(ume/) cm^3;	Must have units	[1]
	S	scale as 1 min to 2 cm	0.5 cm^3 to 2 cm;	**Reject S** if awkward scale	[1]
	P	correct plotting with crosses or dot in circle;	Intersection of cross must be clear to show plot	**Reject** P plotting if awkward scale **Reject** if only blobs or dots or blobs in circles	[1]
	L	ruled/straight line to all points or smooth curve;	Quality – no thicker than on grid, not feathery for the complete line Joining plots – • Ruled lines plot to plot • Curve through all plots Extrapolation • Not beyond *x*- or *y*-axis If not correct in context of data then no extrapolation at either end of data		[1]

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Question	Expected Answers	Additional Guidance	Marks
(ii) Describe and explain the results of the student's investigation.			
ACE conclusion 3	in first minute or from 2.9 drops to 0.8 or fastest or largest increase or biggest volume;		[1]
	hydrogen peroxide/H or substrate fits into or binds to enzyme or active sites or forms ESCs;		[1]
	lack of hydrogen peroxide/H or substrate or hydrogen peroxide not high enough;		[1]
	Total		**[22]**

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Question	Expected Answers	Additional Guidance	Marks
2 (a) (i) Draw a large plan diagram of a sector to include three vascular bundles. Draw a circle around one of the vascular bundles on your plan diagram. Label the xylem.			
PDO layout 1	clear, sharp, (not thicker than grid line for whole line) unbroken lines **AND** no shading **AND** larger than 6 cm across widest point on sector drawn;	**Reject** if overlaps the text of question	[1]
MMO collection 3	no cells **AND** only three vascular bundles **AND** circle round one vascular bundle;		[1]
	any one vascular bundle divided into at least three regions with at least one curved line **AND** middle region of vascular bundle thicker than the epidermis;		[1]
	one vascular bundle from three drawn or circled wider at outer edge than inner edge (apex);	**Reject** if any writing on drawing	[1]
MMO decision 1	**Reject** if any label is biologically incorrect. correct label with label line to inner half of vascular bundle xylem;		[1]

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Question	Expected Answers			Additional Guidance	Marks
(ii) Draw three complete cells from the epidermis which are touching. Draw three complete touching cells between the inner edge of vascular bundle and centre of the specimen. This drawing should show any difference in size observed between these cells and the 'two' epidermal cells.					
PDO layout 1	clear, sharp,	**AND** no shading	**AND** size of bottom group of cells;		[1]
MMO collection 3	two groups of only three cells drawn	**AND** each group of 3 cells touching;			[1]
	(epidermis) all cell walls must have two lines	**AND** straight line between any two cells	**AND** one of these cells, cell wall obviously curved or domed;		[1]
	(inner cells) all cells rounded	**AND** at least one cell larger than smallest epidermal cell;			[1]
(b) (i) Calculate the actual length, in μm, of the structure shown by line X.					
PDO display 2	shows 27.5 or 28 or 28.5 or 29 or 29.5 or 2.75 or 2.8 or 2.85 or 2.9 or 2.95	**AND** multiplied by $\times 1000/10^3$ or multiplied by or $\times 10000/10^4$	divided by 110;		[1]
	any answer correctly rounded to no more than three sig. figs.;				[1]

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Question	Expected Answers		Additional Guidance	Marks
(ii) Using Fig. 2.1 find the mean actual length of these structures. Prepare the space below and record your results.				
PDO recording 2	5 or more recorded;			[1]
	0.0/0.5 mm or 0.00/0.05 cm	OR calculated data to same precision, same number of sig. figs.;		[1]
MMO decision 1	shows addition and division by number of measurements;			[1]
(iii) Draw a large plan diagram of the specimen as shown in Fig. 2.1.				
PDO layout 1	no cells	**AND** five areas of thickening touching epidermis;		[1]

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Question	Expected Answers	Additional Guidance	Marks
(c) Annotate your plan diagram to show three differences between your diagram and the specimen on slide N1.			
ACE interpretation 3	**Any three annotated labels on plan** features labelled: under epidermis patches thickening or present;		[max 3]
	vascular bundles scattered or not in ring or in centre;		
	vascular bundle thickening or collenchyma on top and bottom/more;		
	vascular bundle shape longer/thinner;		
	pith or centre cells not completely stained cells OR cells relatively much smaller compared to vascular bundle OR no intercellular or air spaces between cells;		
	air space present or large;		
	whole shape or outer square or not wavy or has straight sides;		
	Total		**[18]**

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9700 BIOLOGY

9700/35 Paper 31 (Advanced Practical Skills 1), maximum raw mark 40

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International Examinations

Question	Expected Answers		Additional Guidance	Marks
1 (a) (i) Complete the sentences: If the plant tissue ….. water then the sucrose solution will become more dilute. This will change the solution so that it becomes ……dense.				
ACE conclusion 1	loses and less;			[1]
(ii) Show clearly on the diagrams below how you would expect to see the drop move.				
ACE conclusion 2	(same concentration/middle tube) drop stays at same height/no movement;			[1]
	(more concentrated/left tube) shows drops/sinks/falls	(less concentrated/right tube) **AND** rises;		[1]
(iii) Decide on the concentrations of sucrose solution. Prepare the space below to show concentrations of sucrose solution; volumes of 1.0 mol dm^{-3} sucrose solution; volumes of distilled water.				
MMO decisions 3	three concentrations;			[1]
	even range;			[1]
	correct volumes to make 50 cm^3	**AND** correct molarity;		[1]

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Question	Expected Answers		Additional Guidance	Marks
(iv) Prepare the space below to record your observations.				
PDO recording 3	table with cells drawn no outer boundary	(heading to top/left) **AND** conc(entration)/mol dm^{-3};		[1]
	(headings) (syringe) **A**	**AND** (syringe) **B**;		[1]
	(records) description or key to show movement;			[1]
MMO collection 2	**A** (0.7 mol dm^{-3}) moves up and down;			[1]
	B (0.25 mol dm^{-3}) moves up in molarities more than 3 and down in others;			[1]
MMO decision 1	records more than one drop for each concentration;			[1]
(v) Use your results to estimate the sucrose concentration.				
ACE interpretation	**(A)** correct with their results;			[1]
	(B) correct with results;			[1]

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Question	Expected Answers			Additional Guidance	Marks
(b) (i) Plot a graph of the data shown in Table 1.1.					
PDO layout 4 **0.15 –5.0** **0.35 –12.0** **0.55 –19.0** **0.75 –26.0** **1.00 –35.0**	**O**	*x*-axis [sucrose] or conc mol dm^{-3}/M/molar	*y*-axis **AND** water potential/Ψ kPa x10^2;	Must have units	[1]
	S	scale as 0.2 to 2 cm (allow no 0) ECF if no labels or incorrect on axes for O	**AND** negative 0 at top –10 to 2 cm;	**Reject** if awkward scale	[1]
	P	correct plotting using crosses or dot in circle;	Intersection of cross must be clear to show plot	**Reject** plotting if scale is awkward or if only blobs/dots/blobs in circles	[1]
	L	ruled/straight line through points;	Quality – not thick, not feathery for the complete line Joining plots – • Ruled lines plot to plot • Straight line through most plots • Straight line extrapolated to 0 Extrapolation not beyond *x*- or *y*-axis	**Reject** if not five plots	[1]

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Question	Expected Answers		Additional Guidance	Marks
(ii) Using your results and your graph estimate the water potential of sample A (0.70).				
MMO collection 1	(using their result for **A**) shows clearly on graph how one water potential obtained;		**Allow** any indication but must be estimate of **A**	[1]
ACE interpretation 1	any correct reading of water potential(s)	**AND** kPa x10^2;	If **A** between … and …. reads off two water potentials allow any correct **Allow** if correct with result and reading from graph	[1]
(iii) Describe how you would improve the investigation to obtain a more accurate estimate of the water potential of sample A.				
ACE improvement 3	more (sucrose) solutions of known water potential;			[max 3]
	two further examples of concentration of sucrose or describes more around where drop drops and rises;			
	more sucrose solutions or concentrations to estimate **A**;			
	standardise the volume of the methylene blue dye OR suggests method for controlling volume of drop;			
	method to introduce drop OR measure time to rise or sink;			
	Total			**[23]**

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Question	Expected Answers			Additional Guidance	Marks
2 (a) (i) Draw a large plan diagram of half of the trachea showing the ends of the cartilage ring. Label the diagram. Reject all marks except label if only 1 line.					
PDO layout 1	clear, sharp, unbroken lines	**AND** no shading	**AND** large; Minimum of three lines	**Reject** if overlaps text in question	[1]
MMO collection 2	no cells	**AND** drawn only half; Minimum of two lines.			[1]
	(in half section) has at least two ends of cartilage ring;				[1]
MMO decision 2	at least 6 lines for layers;				[1]
	Reject if any label is biologically incorrect e.g. cell wall **Reject** if any labels from other tissues e.g. arteries, veins, plant tissues and named cells unless described as a layer **Accept** any one label with label line correct cartilage epithelium (smooth) muscle layer of Goblet/mucus cells lumen;			**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 specimens on slide L1 and in Fig. 2.1.					
PDO recording 1	organised as AND table/venn diagram/ruled connected boxes	correctly headed AND	comparative statements opposite each other;	L1 | Fig 2.2	[1]
MMO collection 1	lumen clearly identified as present in both;				[1]
ACE interpretation 3	**feature:**	**L1 (trachea):**	**Fig. 2.1:** (bronchiole)	Ticks and crosses requires a key **Reject** 3D, disc or spherical or arbitrary or random **Reject** negatives e.g. not circular **Reject** opposites e.g. regular	[max 3]
	then three of:				
	1.lumen shape or lining	regular/circular not folded/no villi	irregular/not circular folded/villi;		
	2. cilia or brush border microvilli	present cilia/brush border	absent or not visible microvilli;		
	3. cartilage	present	absent;		
	4. surrounding cells/air sacs/spaces	absent or no(ne)	present or have;		
	5. epithelium	thinner/narrower	thicker/wider;		
	6. goblet or mucus cells	present or visible	absent or not visible;		
	7. size	wider/larger	narrower/smaller;		
	8. whole shape similarities: smooth muscle	oval/triangular (whole shape) round/circular	round/circular;		

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Question	Expected Answers	Additional Guidance	Marks
(iii) Calculate the actual distance across the lumen of the structure shown by line X in Fig. 2.1.			
MMO collection 1	measures line **X** correctly in mm or cm **Reject** m	mm/cm 28/2.8 28.5/2.85 29/2.9 29.5/2.95 30/3 **Reject** use or conversion to metres **Reject** if no units	[1]
PDO display 2	shows their measurement divided by or / or ÷ 70 **AND** × 1000 or 10^3 (mm) or 10000 or 10^4 (cm) or × 10 × 1000;		[1]
	figure to no more than three sig. figs.;		[1]

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(b) Make a large drawing of three of these structures, which must be complete, to show the differences between them. Draw a circle on Fig. 2.2 around each of the structures Z which you have drawn.					
MMO collection 1	circles 3 complete **Z** structures on Fig 2.2		**AND** draws three;	**Reject** if overlaps text of question	[1]
PDO layout 1	clear, sharp, unbroken lines	**AND** no shading	large;		[1]
MMO decisions 2	two of six structures match those drawn for shape;				[1]
	one enclosure matches any one structure shape	**AND**	position;	**Reject** if more detail	[1]
	Total				**[17]**

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