UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

9700 BIOLOGY

9700/32 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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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore
BOD	Benefit of Doubt given
ACE	Analysis, Conclusions and Evaluation (skills)
PDO	Presentation of Data and Observations (skills)
MMO	Manipulations, Measurement and Observation (skills)

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1 (a) (i) **Complete Fig. 1.1 to show how you will make a *serial* dilution to reduce the concentration by *half* between each concentration.** **[3]**		
MMO decisions 1	[1]	(labels under correct sequence of beakers) 1(.0) AND 0.5 AND 0.2(5);
		Additional guidance **Must have** • % once
MMO decisions 2	[1]	(uses serial dilution) (adds previous concentration of G to **each** of three beakers and same volume) volume of 2(%) or shown by arrow with volume **AND** the same volume transferred from first beaker to second and from second beaker to third beaker);
		Additional guidance **Must have** • cm^3 once
	[1]	(adds of (distilled) water/W to **each** of three beakers) 10 cm^3;
		Additional guidance **Must have** • cm^3 once

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(ii) Complete Table 1.1 to show the volumes of solutions you intend to use in your investigation. [2]

MMO decisions 2

[1]

[1]

solution	volume / cm^3
G and S1 and S2	all same volume;
	Additional guidance **Must have** • volume 2 cm^3 or more **AND** 15 cm^3 or less • whole number **Do not give mark for** • drops
Benedict's	(whole number) same as G and S1 and S2 OR more than G and S1 and S2 OR same or more than the largest volume from G / S1 / S2;
	Additional guidance **Do not give mark if** • for a combined volume of solution plus Benedict's of 21 or more cm^3 • if any value missing for G / S1 / S2

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(b) (i)	**State one variable, other than volume, which needs to be kept the same in this investigation. Describe *how you* will keep this variable the same.** **[1]**			
ACE improvement 1	[1]	**Do not give credit if answer gives a choice.**		
		temperature	**AND** (idea of how kept the water-bath the same) heat or described Or add hot or cold water	**AND** boil Or to temperature 80(°C) to 100 Or checking or monitoring with thermometer BOD temperature probe/gauge;
		Additional guidance	**Do not give mark if** • ref to thermostatically controlled or electronic etc. **how will you** • heating with thermometer • temperatures below 80	

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	(ii) Prepare the space below and record your results. Allow G as 4%.		**[4]**
PDO recording 2	[1]	table with all cells drawn	**AND** heading (top or left) percent(age) conc(entration);
		Additional guidance	**Can have** • no outer boundary • % **Do not give mark if** • test-tube or beaker • other units e.g. mol dm^{-3}
	[1]	(heading for any column/row including mean) time with s or sec(onds);	
		Additional guidance	**Do not give mark if** • units in cells of this column/row • min(utes) • additional columns/rows for method e.g. volumes of glucose or water or temp • t or T
MMO collection 2	[1]	records whole seconds (numbers) less than 301 for ANY 5 concentrations **and** S1 **and** S2 (7);	
		Additional guidance	**Must have** • whole seconds only • no value over 300
	[1]	highest concentration recorded is shorter time than next concentration;	
		Additional guidance	**Can have** • minimum two recorded times

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(c) (i) Estimate the concentration of glucose in solutions S1 and S2.			**[1]**
ACE conclusion 1	[1]	correct estimate with their results for both S1 and S2	**AND** percentage or % once;
		Additional guidance	**Do not give mark if** • calculate value between concentrations **Can have** • 'lower than' or quote lower value • 'higher than' or quote higher value • 'between … and ….' Or e.g. 2–4%
(ii) State which solution, S1 or S2 is most likely to be from an untreated diabetic.			**[1]**
ACE conclusion 1	[1]	(from **(c)(i)** – **MUST** have values for both S1 and S2) correct with their estimate from **(c)(i)** i.e. the highest concentration estimate;	
		Additional guidance	**ECF** if estimates the same value then can have 'S1 and S2' Or 'S1 or S2' Or 'both' **Must have** • estimate in **(c)(i)** for both S1 and S2
			[Total: 12]

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2 (a) Plot a graph of the data shown in Table 2.1. [4]

PDO layout 4

[1]

x-axis
distance (along tube (/) cm

AND *y*-axis
diameter (of tube) (/) mm;

Additional guidance

Must have
- units on *x*-axis and *y*-axis

[1]

scale as *x*-axis
5.0 to 2 cm
Must label each 2 cm

AND *y*-axis
1.0 to 2 cm;
Must label each 2 cm

Additional guidance

Do not give mark if
- awkward scale
- scale not written on each 2 cm

[1]

correct plotting of each point;

Additional guidance

0.5	1.8
4.5	2.4
12.5	3.8
20.0	5.1
24.0	5.8

Can have
- small cross or dot in circle or cross in circle
- ECF if *x*-axis not 0 if scale 20 to 2 cm.

Do not give mark if
- awkward *y*-axis scale
- blobs or dots alone
- cross too large with any part of line touching 4 mm by 4 mm square –

[1]

lines point to point or line of best fit

AND
- ruled, clear sharp –
- quality – ruled lines thinner than half square;

Additional guidance

Can have
- extrapolation to edges of grid if line of best fit

Do not give mark if
- less than 5 plots
- any feathery line
- irregular thickness
- extrapolated when point to point line (not line of best fit)

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(b) (i)	**Calculate the actual diameter of the tube shown by line x in fig. 2.1**	**[4]**
MMO collection 1	[1]	measures line X correctly in mm; *95 or 95.5 or 96 or 96.5 or 97 mm*
		Additional guidance **Must have** • units
PDO display 2	[1]	shows measurement divided by 22;
		Additional guidance **Can show** • alternative division signs • incorrect measurement
	[1]	rounds any answer of division by 22 to two or three significant figures;
		Additional guidance **Do not give if** • in metres
ACE interpretation 1	[1]	correct answer one of following only in mm; 4.32 or 4.34 or 4.36 or 4.39 or 4.41 or 4.3 or 4.4 mm.
		Additional guidance **Do not give mark if** 0.43/0.44 cm or micrometres
(ii)	**Use the actual diameter of the tube calculated in (b)(i) and your graph in (a)(i) to estimate the distance along length of the tube.**	**[1]**
ACE interpretation 1	[1]	correct answer using their answer from **(b)(i)** and graph and cm;

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(iii) Describe how you would find the mean diameter of the tube shown in Fig. 2.1. **[2]**

ACE improvements 2

[1]

assume in context of the tube –
Do not give mark if
- Idea of different tubes
- Just 'take readings'

Idea of more or e.g. 2 or higher take/find measure make readings/measurements of OR Uses/adds	diameters (from graph) measurements 5 actual figures from data or 5 points from graph – Or all diameters or values-or readings

[1]

add/sigma/sum of (measurements can be from graph)
and divide by the number of measurements (ecf)
OR alternative description;

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(iv) Prepare the space below so that it is suitable for you to record the observable differences between the specimens in Fig. 2.1 and in Fig. 2.2. [5]

PDO recording 2

[1] organise as a table/Venn diagram/ruled boxes **AND** headed Fig. 2.1 and Fig. 2.2 **AND** first difference opposite each other;

Additional guidance Fig. 2.1 | Fig. 2.2 OR Fig. 2.2 | Fig. 2.1

[1] observable differences only; can be incorrect
Do not give mark if any similarities or function differences or features in overlapping part of Venn diagram

ACE interpretation max 3

max 3

	feature	Fig. 2.1	Fig. 2.2
1.	lumen shape or epithelial	less / few / four folds / thick cross(-shape) or drawn	more / five / six folds / thin star or drawn
2.	lumen size	large(r)	small(er);
3.	epithelial tissue	thick(er)	thin(er);
4.	connective tissue	goes less into folds thick(er) or thin(ner)	goes more into folds thin(ner) or thick(er);
5.	muscle tissue	more / thick or less / thin striated / skeletal / voluntary	less / thin or more / thick smooth / involuntary;
6.	cells or nuclei	visible / present / seen	not visible / absent / not seen;
7.	(Overall) shape Extra layer between connective tissue and muscle	squashed / no extra layer absent	round / extra 'arm' present / has / described

[Total: 16]

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3 (a) (i) Draw a large plan diagram of the whole of the transverse section. Label the epidermis and xylem. [5]				
PDO layout 1	[1]	clear, sharp, unbroken lines	**AND** no shading	**AND** larger than 60 mm across widest point top to bottom;
		Additional guidance 'tail' or overlap or gap has to be more than 1 mm	**Must have** • three or more enclosed areas **Do not give mark if** • drawn over the print of question • any line thicker – 1 mm or more • any feathery line or broken in enclosed area	
MMO collection 2	[1]	no cells drawn	**AND** complete section drawn;	
	[1]	draws outline with at least four larger bulges;		
		Additional guidance	**Can have** • different bulge attached or additional structure outside main outline	
MMO decisions 2	[1]	inner region below bulges has at least three lines (two layers);		
		Additional guidance	**Do not give mark if** • vascular bundle(s) drawn	
	[1]	correct label with label lines to epidermis (outer two lines or touches outermost line not into area past a single line) **and** xylem (any inner region outside centre and under bulges); blob tick		
		Additional guidance	**Do not give mark if** • any label which is biologically incorrect e.g. from incorrect organ or animal • any label within drawn area except if showing ratio • upper or lower **Can have** • labels to additional bulges	

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(ii) Calculate the ratio of the total diameter of the stem to the diameter of the pith. [1]

ACE interpretation 1

[1] last answer as larger **whole** number to / : smaller **whole** number;

Additional guidance

Must have
- to smallest denominator

Can have
- as a fraction to smallest denominator

Do not give mark if
- any units/epg in answer
- if give more than one answer

(b) (i) State one observable feature of the epidermis that supports the conclusion that this is a stem from a plant growing in a dry habitat. Explain how this feature reduces water loss. [1]
Read whole answer for feature.

ACE conclusions 1

[1]

cuticle stomata with no or BOD few or sunken epidermis with folded grooved fleshy	**AND** reduces or prevents storage of water	evaporation or water escaping or diffusing or transpiration;

Additional guidance

Do not give mark if
- features not linked to epidermis
- ref. to leaf

Ignore
- ref. to surface area

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(ii) Make a large drawing of three adjacent cells from the central pith. Label the cell wall.				**[5]**
PDO layout 1	[1]	clear, sharp, unbroken lines	**AND** no shading	**AND** longer than 30 mm across widest point of largest cell;
		Additional guidance	**Must have** • at least three enclosed areas **Do not give mark if** • drawn over the print of question • any thicker line – than 1 mm • any feathery line	
MMO collection 3	[1]	only three cells drawn	**AND** as a group or as line;	
	[1]	no gaps between two pairs of touching cell walls;		
		Additional guidance	**Must have** • be in contact for whole length where adjacent	
	[1]	cell walls drawn as double lines with middle lamella between adjacent walls of any two cells;		
MMO decision 1	[1]	correct label with label line to cell wall;		
		Additional guidance	**Do not give mark if** • any label is biologically incorrect e.g. from incorrect organ or animal or EM organelles or chloroplasts • label within drawn area	
				[Total: 12]

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