UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

9700 BIOLOGY

9700/31 Paper 3 (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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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
ACE	Analysis, Conclusions and Evaluation (skills)
MMO	Manipulations, Measurement and Observation (skills)
PDO	Presentation of Data and Observations (skills)

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1 (a)			[3]
MMO decisions 3	mp1	(labels under correct sequence of beakers) 0.025 **AND** 0.0125 **AND** 0.00625;	
		Additional guidance	**Must have** % once and concentrations to 3 or more decimal places **A** mixture of precision e.g. 0.025 with 0.012 or 0.013 with 0.006 or 0.0062 or 0.0063
	mp2	**EITHER** (uses serial dilution)	
		10 cm^3 of 0.05(%) or shown by arrow with 10 cm^3 **AND** 10 cm^3 transferred from third beaker to fourth and from fourth beaker to fifth beaker;	
		Additional guidance	**Must have** cm^3 once in either and or % once when labelling or **ecf** if mp1 not given
	mp3	(adds (distilled) water / **W** to **each** of three beakers BUT **MUST** add previous concentration to fourth and fifth beakers) 10 cm^3 (into each beaker $3^{rd}/4^{th}/5^{th}$) of (d) W or water;	
		Additional guidance	**Must have** cm^3 once **ecf** if mp1 not given and / or if mp2 not given

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max 1

OR (simple dilution for mp1 and mp3)

0.1% (**S**)	2.5 AND	**AND**	1.25 AND	**AND**	0.625 AND
W	7.5		8.75		9.375

OR

0.1% (**S**) **W**	5.0 AND 15.0	**AND**	2.5 AND 17.5	**AND**	1.25 AND 18.75

Additional guidance

Must have cm^3 once and 10 (%) for each beaker with % once or arrow from first beaker to each one
ecf if mp1 not given
R if

- round volumes up or down
- just **S**

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	(ii)		**[5]**
PDO recording 2	[1]	table with all cells drawn **AND** heading (top or left) percent(age) conc(entration) ;	
		Additional guidance	**A** no outer boundary **A** % **R if** % in body of table **Ignore** test-tube / additional columns
	[1]	(heading below or to right) time sec(onds)/s; **R** T or t	
		Additional guidance	**R if** units in body of table
MMO collection 2	[1]	records times for at least four concentrations;	
		Additional guidance	**A** any times as long as with clear units. **Must have** cm^3 once **ecf** if mp1 not given for slip and / or if mp2 not given
	[1]	any times as whole seconds (numbers) 'less than 601' ;	
		Additional guidance	**A** minimum of four recorded times including 'more than 600'.
MMO decision 1	[1]	records correct pattern: highest concentration recorded is shorter time than next concentration;	
		Additional guidance	**A** any values, e.g. seconds with tenths or min:sec **A** minimum two recorded times including 'more than 600' once

	(iii)		**[1]**
	Mark first variable.		
ACE improvement 1	[1]	temperature **AND** thermostatically controlled water-bath / AW;	
		Additional guidance	**R** pH **A** digital or electronic **A** description of use of heating and cooling with Bunsen or hot and cold water

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	(iv)		**[max 2]**
	Mark the first three ideas for two correct.		
ACE improvement 2 **max 2**	**max 2**		
	mp1	(independent variable) more / different / vary / wider range concentrations / solutions;	
	mp2	two examples of different concentrations;	
		Additional guidance	**A** mp1 and 2 if list at least two more concentrations between correct values or examples of smaller intervals or implies all differences e.g. 0.5% **R** 'serial dilution'
	mp3	use a colorimeter or use a pH meter or indicator paper or use a colour standard;	
	mp4	(dependent variable) (repeat / replicate) more than once / many / more times / twice / thrice;	
		Additional guidance	**A** doing repeats / replicates / repetitions

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(b) (i)			[4]
PDO layout 4	O	*x*-axis concentration of inhibitor / μg cm^{-3} **AND** *y*-axis inhibition area / mm^2	
		Additional guidance	**Must have** units on *x*-axis AND *y*-axis
	S	scale as *x*-axis 20 to 2 cm **AND** *y*-axis 20 to 2 cm ;	
		Additional guidance	**ecf** if no labels for O if reverse O then scale must use more than half grid for both x and y and do not have an awkward scale **A** no 0 label at origin and no end label
	P	correct plotting of each point to within half a square;	
		Additional guidance	**A** small cross or dot in circle or cross in circle **A ecf** if *x*-axis not 0 if scale 20 to 2 cm even **R if** • plot 100 with same cross or dot in circle • awkward *y*-axis scale • blobs or dots alone • cross too large
	L	ruled lines point to point or curve through all points **AND** quality clear sharp; **R if** • less than 5 plots • line 1mm or thicker • any feathery line • irregular thickness • any extrapolation	
		Additional guidance	**A ecf** from incorrect P

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	(ii)		**[1]**
ACE interpretation 1	[1]	reading is shown at <u>100</u> **AND** correct concentration of inhibitor;	

	(iii)		**[2]**
ACE interpretation 2	[1]	as <u>concentration</u> increases the <u>inhibition</u> (area) increases;	
		Additional guidance **Ignore** (inversely / directly) proportional	
	[1]	inhibition slows down;	
		Additional guidance **A** levelling off or plateau or decreasing rate **R** stops going up / increasing	

	(iv)		**[2]**
ACE conclusion 2	[1]	*(rate of)* hydrolysis *or breakdown or digestion would slow down*;	
		Additional guidance **A** (enzyme) bonds broken or denatures	
	[1]	*Idea of (at higher concentrations)* more active sites inhibited / describe *or* shape of active site / enzyme changed or fewer ES complexes (formed);	
			[Total: 20]

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2 (a) (i)		**[5]**
PDO layout 1	[1]	no shading **AND** *longer than 60 mm in any direction* **AND** (clear, sharp, unbroken lines) **Must have** four or more hand drawn lines and / or enclosed areas **R if** • drawn over the print of question • any line 1mm or thicker • any feathery line • three 'tails' or overlaps or gaps • **any** ruled or dashed line
MMO collection 2	[1]	no cells drawn **AND** whole quarter drawn **AND** at least one enclosed area;
	[1]	(epidermis) drawn with two lines closer than 4 mm at widest point **AND** four and nine complete air spaces;
PDO recording 1	[1]	shows two / three distinct regions from centre;
MMO decision 1	[1]	correct label with one label line to epidermis;
		Additional guidance **R if** • any label which is biologically incorrect e.g. from incorrect organ e.g. spongy mesophyll or animal e.g. epithelium or cell structures • any label within drawn area

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	(ii)	[5]
PDO layout 1	[1]	no shading **AND** largest dimension of one cell larger more than 40 mm in any direction **AND** (clear, sharp, unbroken lines for outer cell line only); **Must have** three or more hand drawn enclosed areas **R if** • drawn over the print of question • any line thicker 1 mm or thicker • any feathery or broken/dashed line • any 'tails' or overlaps or gaps if two lines for cell walls • any ruled lines
MMO collection 3	[1]	drawn three cells touching and forming a single chain;
		Additional guidance **R if** any ruled lines
	[1]	one cell tapers to join one adjacent cell **AND** this cell is the largest;
		Additional guidance **R if** any extra line (basal line) **R if** incorrect cell organelles such as golgi, mitochondria etc.
	[1]	cells walls as double lines with middle lamella between each pair of adjacent walls;
MMO decision 1	[1]	correct label with one label line to a cell wall;
		Additional guidance **R if** any label other than cell wall **R** any label within drawn area

	(iii)	[1]
	Mark first feature.	
ACE conclusion 1	[1]	(air) spaces for floating / buoyancy / support / flexibility **OR** chains of cells for support / gas exchange / AW;

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(b) (i)			[4]
MMO collection 1	[1]	five *(measurements)* all between 10 and 40	
		Additional guidance **A** 1 to 4 **A** to 0.5 mm only and to 0.05 cm only	
MMO decision 1	[1]	*(10 to 40) mm OR (1 to 4) cm*;	
PDO display 2	[1]	shows addition step **AND** shows division by no. of measurements shown;	
	[1]	shows multiplication by *1000 / 10^3 for mm or 10000 / 10^4 for cm* ***AND*** *shows division by 30*;	
		Additional guidance **ecf** for incorrect measurements **R** any ref. to metres	

(ii)			[5]
PDO recording 1	[1]	organise as a table / Venn diagram / ruled boxes **AND** headed **J1** and **Fig 2.2** **AND** first difference opposite each other;	
MMO decision 1	[1]	only **one** observable similarity recorded AND only **two** differences;	

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ACE interpretation **max 3**

max 3

	feature	J1	Fig. 2.2
mp1	**Similarities**	spaces or vascular bundle(s) or chains of cells;	
mp2	*central stele* *vascular bundle*	*present* *centre*	*absent;* *scattered or periphery;*
mp3	*air space shape* *arrangement*	*triangular* *regular or symmetrical*	*circular/oval;* *irregular/random or not symmetrical;*
mp4	*air space number* *area*	*more* *less of small(er)*	*few;* *more or large(r);*
mp5	*projections into air space*	*none*	*spiky projections;*
mp6	*each air space sizes*	*similar/same*	*different or vary or large and small;*
mp7	*epidermis*	*thin*	*thick;*
mp8	*cells* *cell shape*	*large(r) or more* *packed or more* *vary or different*	*smaller or loosely packed or few(er)* *same or less different;*

Additional guidance **Ignore**

- tick and cross without a key
- diagrams
- refs. to size
- 3-D descriptions such as spherical
- colours / staining

[Total: 20]

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