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

9700/33 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) (i)			[3]
		Do not give marks mp2 and mp3 for simple dilution	
MMO decisions 1	[1] mp1	labels under correct sequence of beakers <u>0.5</u>(%) **AND** <u>0.05(</u>%) **AND** <u>0.005(</u>%);	
		Additional guidance **Must have** % once	
MMO decisions 2	[1] mp2	**Must be** serial dilution (**R** if simple dilution) and adds previous concentration of milk (**M**) to **each** of three beakers and 1 cm^3 (adds previous concentration of **M** to **each** of three beakers and 1 cm^3) **EITHER** 1 cm^3 on an arrow from each previous beaker to next **OR** <u>1</u> cm^3 of <u>5</u>(%) (to 3rd beaker) **AND** <u>1</u> cm^3 of <u>0.5</u> (%) (3rd to 4th beaker) **AND** <u>1</u> cm^3 of <u>0.05</u> (%) (4th to 5th beaker);	
		Additional guidance **Must have** cm^3 once in either and or % once when labelling or **ecf** if mp1 not given	
	[1] mp3	(adds (distilled) water / W to **each** of three additional beakers but **MUST** add previous concentration to fourth and fifth beakers) <u>9</u> cm^3 (into each beaker 3rd / 4th / 5th) of (d) <u>W or water</u>;	
		Additional guidance **Must have** cm^3 once **ecf** if mp2 not given	

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	(ii)		**[5]**
PDO recording 2	[1]	table with cells drawn **AND** heading (top left) percent(age) conc(entration) ;	
		Additional guidance **A** no outer boundary **A** % **R** % in body of table **R** other units e.g. mol dm^{-3}	
	[1]	(headings) colour OR observation(s) **AND** number or no or # or scale;	
		Additional guidance **R** headings for standardised variables e.g. volumes **Ignore** heading for test-tubes or additional observations	
MMO collection 3	[1]	records results for **any 5 different** concentrations **and U** (ignore position) **and W / 0**;	
		Additional guidance **A** colours or numbers or only whole numbers	
	[1]	records their highest concentration as highest <u>number</u> **AND** records next lower concentration next highest <u>number</u>;	
		Additional guidance **Must have** at least two readings other than **U** **A** any values 10 or below **A** scale numbers in incorrectly headed column/row	
	[1]	records collection of **EITHER** (for W) <u>blue or no purple</u> **AND** <u>0</u> **OR** records replicate; **A** scale numbers in incorrectly headed column / row	

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(iii) **[2]**

MMO decisions 2

[1] *(from their results)* puts **U** in correct position on scale;

Additional guidance

50	5	(0).5	(0).05	(0).005
18	1.8	0.18	0.018	0.0018

10 → lower
darkest purple → blue

A ecf from different concentrations
R if shows values in wrong order from their results
R no value for **U** in results

[1] (from their result for **U**) correct quantity to complete the statement 'between ... and ... ' as

Additional guidance **A ecf** from different concentrations

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	(iv)		**[max 3]**
ACE interpretation 2	mp1	(independent variable) Idea of use or (repeat with) more concentrations between <u>two examples</u> of concentrations used -50% and 0;	
		Additional guidance	**Ignore** just wider / higher / lower **ecf** from answer to **(a)(ii)** or **(a)(iii)** if **U** more than 50%
	mp2	Gives **two** examples / figures relevant **EITHER** to their estimate **OR** between 50% and 0 OR description of use of e.g. colorimeter readings to draw a calibration graph and read off estimate;	
		Additional guidance	**ecf** if recorded **U** is above 50% then allow two examples more than 50% for mp1 and mp2 **R** if examples not in correct range e.g. more than 50% when **U** not recorded more than 50%
ACE interpretation **max 1**	mp3	(dependent variable) use colorimeter or colour standard card for colours **and** numbers; **R** cAlorimeter **R** white card or tile (since this is given)	
	mp4	replicate or repeat **U**;	
		Additional guidance	**A** more times / trials / readings or repeats or repeat **Ignore** mean **Ignore** repeat with different concentrations
	mp5	(standardised variables) use graduated pipette or syringe with smaller divisions or burette or measuring cylinder (as milk is too thick for syringe)	

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(b) (i)		[4]
PDO layout 4	O	*x*-axis <u>time</u> (/) <u>s or sec</u>(onds) **R** T or t **AND** *y*-axis <u>conc</u>(entration) <u>of protein</u> (/) <u>mg dm^{-3}</u> ; **R** mg/dm^{-3} **A** mg/dm^{3}
		Additional guidance **Must have** units on *x*-axis and *y*-axis
	S	scale as *x*-axis <u>10 to 2 cm</u> **AND** *y*-axis <u>20 to 2 cm</u> ;
		Additional guidance **ecf** if no labels for axes If reverse then scale must use more than half grid for both *x* and *y* and **not** have an awkward scale. If move origin from 0 **must label value** at origin. **A** no 0 label at origin and no end label **R** awkward scale
	P	correct plotting of each point to <u>within</u> half a square i.e. less than 1 mm from intersection;
		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** • awkward *y*-axis scale • blobs or dots alone • cross too large
	L	<u>ruled</u> lines point to point or <u>ruled</u> line of best fit (two plots on line and then 2 and 1 either side of line) **AND** quality clear sharp; **A** extrapolation from line of best fit to vertical or horizontal lines of plotted point only **R if** • less than 5 plots • line 1mm or thicker • any feathery line • irregular thickness • extrapolated when point to point line
		Additional guidance **A ecf** from incorrect P

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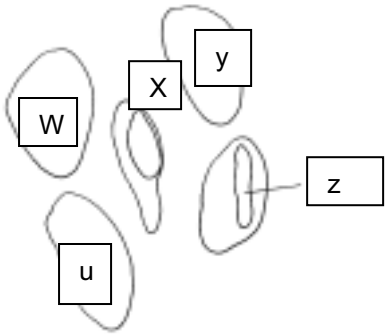
	(ii)		**[3]**
ACE interpretation 1	mp1	longer time (to collect) less protein present as time increases the concentration decreases **OR** shorter time more protein present as time decreases the protein concentration increases;	
		Additional guidance **Ignore** (inversely/directly) proportional	
ACE conclusions 2	mp2	Idea of (longer time in contact or to collect) <u>protease or enzyme</u> hydrolyses or digests or breaks down protein;	
		Additional guidance **R if** in context of change in concentration **Ignore** beads	
	mp3	(longer time) idea of ref. ES complexes or described OR (more likely) ref active sites used; (shorter time) idea of ref ES complexes or described OR (less likely) ref active sites used;	
		Additional guidance **R if** protein used again **R** enzyme all used up	

	(iii)		**[2]**
ACE interpretation 2	[1]	0.5 divided by / 15 multiplied by × 100;	
	[1]	correct answer; **ecf** for 1 /15 × 100	
			[Total: 22]

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2 (a)		**[5]**
PDO layout 1	[1]	no shading anywhere **AND** width across lines forming outer layers (convex surface) or largest enclosed area longer than *20 mm* **AND** (clear, sharp, unbroken lines); **Ignore** spaces drawn in innermost layer or enclosed areas outside lines **Must have** three or more hand drawn lines either with at least one folded **or** wavy line or may include at least one enclosed area to be assessed. **R if** • drawn over the print of question • any line 1mm or thicker or ruled • any feathery or broken / dashed • 2 'tails' or overlaps in line • 3 'tails' or overlaps with a enclosed area any ruled lines
MMO collection 2	[1]	no cells drawn **AND** only one field of view **AND** with at least one line folded or wavy or if no folds / wave but at least one enclosed area;
		Additional guidance **Ignore** (folds) enclosed areas within layers
	[1]	drawn at least five ridges / peaks / furrows / folds / waves in one line;
PDO recording	[1]	at least three folded or wavy lines **OR** drawn (spaces in innermost layer) as irregular (enclosed) areas **OR** one large enclosed area drawn with at least two lines;
MMO decision 1	[1]	correct label **D** with label line to **EITHER** between two folded or wavy lines or touching one of folded or wavy lines **OR** if enclosed area with two lines then inside this layer or to outer line;
		Additional guidance **R** any other label **R** any label within drawn lines

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(b) (i)		[4]
PDO layout 1	[1]	no shading **AND** largest nucleus more than 30 mm at longest point **AND** (clear, sharp, unbroken lines on outer membranes **only**) **Must have** three or more hand drawn enclosed areas **R if** • drawn over the print of question • any line 1mm or thicker or ruled • any feathery or broken/dashed line • any 'tails' or overlaps or gaps if **three** or fewer enclosed areas • 2 'tails' or overlaps or gaps if **four or five** enclosed areas
MMO collection 2	[1]	five whole nuclei drawn as in Fig. 2.1;
		Additional guidance **R** double line for outer boundary / nuclear membrane **R** additional diagrammatic organelles or chromosomes
	[1]	two nuclei are drawn with nucleolus (in nuclei shown by *x*, *y*, or *z* in guidance diagram below)
		ignore *contents of u, w, and y*
		guidance diagram: 
MMO decision 1	[1]	correct label with label line to one nucleolus in *x*, *y* or *z* only;
		Additional guidance **R if** • if label more than one • any label is biologically incorrect e.g. from incorrect organ or cell organelles such as Golgi or mitochondria • any label within or overlapping drawn nucleus

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	(ii)		**[3]**
MMO collection 1	[1]	measures line **L** correctly in mm; 14 or 14.5 or 15 or 15.5 or 16 or 16.5 mm;	
		Additional guidance	**A** 1.4 or 1.45 or 1.5 or 1.55 or 1.6 or 1.65 cm **Must have** units somewhere **Ignore** use of metres
PDO display 2	[1]	shows conversion mm to μm by multiplication ×1000 or 10^3 **OR** cm to μm by multiplication × 10 000 or 10^4;	
		Additional guidance	**A** conversion after division / incorrect measurement as long as units correct with correct conversion **R if** metres anywhere **R if** no units
	[1]	shows division of a number;	
		Additional guidance	**ecf** if measurement or conversion incorrect

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(c) (i) **[5]**

Mark first **three** in first column.

PDO recording 1 [1] organise as a table / Venn diagram / ruled boxes **AND** headed Fig.2.2 and Fig 2.3 **AND** first difference opposite each other;

MMO decision 1 [1] only **three** observable differences recorded;
R if any similarities

ACE interpretation max 3 **max 3**

	feature	Fig. 2.2	Fig. 2.3
mp1	(E layer) surface	rough or wavy or perforated	smooth or plain;
mp2	*(taste buds or cells or nuclei)*	visible or present/has/yes	not seen or absent/no(ne);
mp3	*overall shape/E/* ***R if** 3-D e.g. spherical* ***R** villi* ***A** calculated sizes*	(outer shape) folds or fingers or flat or elongated (projections or lumen) deep(er) or long(er) or large(r) or higher	 rounded or circular or curved; (projections or lumen) shallow(er) or short(er) or small(er) or lower;
mp4	*(E or L layer)* *(inner shape)*	folded or like fingers inside fold or goes deep	no folds inside; on surface;
mp5	*(L layer)*	thin(ner) or less or narrow(er)	thick(er) or more or wide(r);
mp6	*overall size or **E (and L)** layer* ***A** calculated sizes*	large(r) or thick(er or wide(r))	small(er) or thin(ner) or narrow(er);
mp7	*different layer at base of fold*	*absent or no(ne)*	*present or yes;*

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

	(ii)		**[1]**
ACE conclusion 1	[1]	folds or ridges or projections or villus / villi or elongated or long and thin or long spaces taste bud(s) **AND** idea of large surface area *idea of* moves slower or traps liquid shape or many or both sides or all round;	
		Additional guidance **Must have** feature and 'how'	
			[Total: 18]

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