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

9700/34 Paper 3 (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
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]**

MMO decisions 3

[1] two correct dimensions;

Additional guidance **R** any above 1 cm and any below 0.20

[1] one correct surface area with one correct volume;
If more than two then mark only first two.

Additional guidance **Must have** dimensions between 1 and 0.20 cm

[1] one correct surface area : volume ratio according to dimensions of agar blocks;
If more than two then mark only first two.

Additional guidance **Must have** dimensions between 1 and 0.20 cm

	SA	VOL	SA:VOL
1 × 1 × 1	6.0	1/0	6:1
1 × 1 × 0.5	4.0	0.5	8:1
1 × 0.5 × 0.5	2.5	0.25	10:1
1 × 1 × 0.25	3.0	0.25	12:1
0.5 × 0.5 × 0.5	1.5	0.125	12:1
1 × 0.5 × 0.25	1.75	0.125	14:1
0.5 × 0.5 × 0.25	1	0.0625	16:1
1 × 0.25 × 0.25	1.125	0.0625	18:1
1 × 1 × 0.4	3.6	0.4	8:1
1 × 1 × 0.2	2.8	0.2	14:1

SA = ((length × width) + (length × height) + (height × width)) × 2

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	(ii)		**[5]**
PDO recording 2	[1]	table with cells drawn **AND** heading (top or left) surface area to volume (ratio);	
		Additional guidance	**A** no outer boundary **A** SA:Vol(ume) **A** mean to left **R** V or v **R** if any units are included with surface area:volume ratio
	[1]	(heading) time / min(utes);	
		Additional guidance	**R** units in cells of column / row **R** secs / s or m **R** additional columns: surface area or volume with surface area:volume ratio **A** dimensions
MMO collection 2	[1]	records in whole minutes **AND** times for three blocks of each size **AND** either in order of increasing size OR shortest time to reach end-point to longest time to reach end-point;	
		Additional guidance	**R** whole seconds
	[1]	correct pattern of results – 6:1 (1 × 1 × 1 (6)) is the longer time than 8:1 (1 × 1 × 0.5 (4);	

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MMO decision 1	[1]	includes mean or average;	
		Additional guidance	**R** if no data **Must have** at least two sets of data

(iii)			**[2]**
Mark first **three ideas** for two correct.			
ACE interpretation **max 2**	**max 2**	Cause of error	WITH idea of error
	mp1	(independent variable – surface area:volume ratio) cutting / measuring blocks to size	difficult to be accurate or not straight / uneven or vary / not same / different;
	mp2	(dependent variable) number of blocks or three blocks	hard to record or difficult to judge time varies / different or variable;
	mp3	end-point	not easy to distinguish / sometimes not equal distance to see through or difficult to judge;
	mp4	(standardised) blocks	float to side / stick to bottom / blocks close together (diffusion hindered);
	mp5	blocks	different quantities of dye / different colours or too dark or unevenly distributed;

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(b) (i) **[3]**

Mark first four ideas for three correct. Note that dependent variable should not be controlled so ignore ref. to video camera or count for seconds and multiply.

ACE improvements **max 3**	**max 3**		
	mp1	(independent variable) (temperature of) fish	leave fish before counting allow to acclimatise to water in beaker before starting to count;
	mp2	(standardised variables) fish used **R** species or same fish	 keep the same / similar size / mass / weight / sex / age; same conditions before using
	mp3	fish moving about varies ref. to plastic bag **R** same beaker.	so restrict movement in small container, AW same bag or same type;
	mp4	oxygen content (of water) or temperature	so bubble oxygen through water or use running water;
	mp5	water / same volume	use same source / measuring cylinder graduated (beaker / pipette) / syringe;
	mp6	temperature of water **R** thermostatically controlled water-bath.	insulate beaker or fridge or water-bath with hot and cold / ice;

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	(ii)		**[4]**
PDO layout 4	O	*x*-axis temp(erature) °C **AND** *y*-axis rate of breathing number min^{-1};**A** bar chart	
		Additional guidance	**Must have** units for both axes **R** t or T
	S	scale as *x*-axis 5 to 2 cm **AND** *y*-axis 10 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*-axis and *y*-axis **A** no 0 label at origin **R** awkward scale
	P	correct plotting of each point to half a square i.e. 1 mm from intersection; **A** bar chart	
		Additional guidance	**A** small cross or dot in circle or cross in circle **R if** • awkward *y*-axis scale • blobs or dots alone • cross too large
	L	lines point to point or line of best fit **AND** ruled, clear sharp ruled lines thinner than half square; **A** extrapolation from line of best fit to vertical or horizontal lines of plotted point only	
		Additional guidance	**A ecf** from incorrect *P* **R if** • any feathery line • irregular thickness • extrapolation to zero

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	(iii)		**[3]**
ACE interpretation 1	[1]	**mp1** as temperature increases the rate of breathing increases;	
		Additional guidance **ora** (directly) proportional / use of data if relationship clear e.g. from 10 to 25 rate of breathing increases	
ACE conclusions **MAX 2**	[1]	(fish breathes quicker) **ora** **mp2** idea of more oxygen needed / used / required or less at lower temperatures OR **mp2** less oxygen in water;	
	[1]	(as temperature increases <u>reason why it needs more oxygen</u> or at low temperatures why less oxygen needed) Ref to any increase of process in the fish **ora** **mp3** e.g. temperature of fish increases / rises or blood flows quicker or muscles work OR **mp3** fish moves more OR **mp3** enzymes or respiration work faster, (fish breathes faster) **mp4** (less oxygen) breathes faster to get required oxygen;	
			[Total: 20]

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2 (a) (i)			[5]
PDO layout 1	[1]	no shading **AND** larger than 60 mm in any direction **AND** (clear, sharp, unbroken lines); **Must have** three or more enclosed areas **R if** • drawn over the print of question • any line 1 mm or thicker • any feathery or dashed line • 2 'tails' or overlaps or gaps • any ruled lines or compass drawn	
MMO collection 2	[1]	no cells drawn **AND** whole section **AND** (lumen) 'D'-shaped (not circular);	
	[1]	cartilage discontinuous;	
PDO recording 1	[1]	at least 6 lines across one wall **AND** irregular / rough innermost line;	
		Additional guidance **Ignore** additional enclosed areas outside main trachea	
MMO decision 1	[1]	correct label with label line to space between two lines to cartilage;	
		Additional guidance **R** any label which is biologically incorrect e.g. from incorrect organ or animal / plant **R** any label within drawn area **R** label line to a line **R** to innermost or outermost layer if no context (e.g. only two layers)	

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	(ii)		**[5]**
		Ignore cilia or small inclusions.	
PDO layout 1	mp1	no shading **AND** length of smallest cell larger than 60mm in any direction excluding cilia **AND** (clear, sharp, unbroken lines); **Must have** three or more enclosed areas **R if** • drawn over the print of question • any line 1mm or more • any feathery line • 1 'tails' or overlaps or gaps • any ruled lines	
MMO collection 2	mp2	only two epithelial cells drawn and touching each other;	
		Additional guidance **Must be** touching along whole length of cells **R** two lines drawn for cell membrane	
	mp3	one nucleus per cell **AND** length of <u>both</u> nuclei greater than 25% of total length of cell, excluding cilia;	
MMO decision 2	mp4	EITHER at closest point between two nuclei within 7 mm;	*OR* if drawn top nucleus displaced towards middle of cell and shape tapers;
	mp5	correct label with label line to one epithelial cell **AND** one nucleus in correct context;	
		Additional guidance **R if** • drawn cell organelles e.g. mitochondria or Golgi • any label is biologically incorrect e.g. from incorrect organ or animal or plant e.g. epidermis • label within drawn area **Ignore** microvilli or goblet cells	

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	(iii)	[1]
ACE conclusion 1	[1]	(micro)cilia used to move / waft / sweep / swipe / carry / transport / remove / AW, mucus / dust / particles / substances / impurities / AW; NOT microvilli
		Additional guidance **Ignore** ref. to goblet cells / bacteria / lumens

(b)	(i)	[5]
PDO recording 1	[1]	organise as a table / Venn diagram / ruled boxes **AND** headed Fig. 2.1 and Fig. 2.2 **AND** first difference opposite each other;
MMO decision 1	[1]	only one similarity and only two observable differences recorded;

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ACE interpretation **max 3**

max 3

	feature	Fig. 2.1	Fig. 2.2
mp1	both have	cilia / nuclei / nucleoli / lumen / cells longer than wide / same length;	
mp2	length of cilia hairs length of cell (no cilia)	long(er) short(er) smaller	short(er) long(er) larger (more) elongated;
mp3	cilia hairs	continuous / complete not closely packed / not close	discontinuous / not complete closely packed or close;
mp4	number or size of nuclei	fewer nuclei / 4 or 1 per cell bigger	more nuclei / 5,6,7 smaller;
mp5	shape of nucleus	oval / irregular or elongated	some round or circular;
mp6	nucleolus	no(ne) or absent or has no or one or not seen / visible	yes or present or has or idea of more or seen or visible;
mp7	packing / layers of cells	less packed / fewer layers few cells	more packed / more layers more cells;
mp8	shape of cells	(cilia end) membrane bulges / curves up thicker or wider	flat or curve down / AW narrower or thinner

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	(ii)		**[4]**
MMO collection 2	[1]	takes at least 3 measurements of the epithelial layer and cilia layer; **I** units	
	[1]	must have mm or cm (for both) once for each **AND** (epithelial) 50 to 80 mm (5 to 8 cm) (cilia) 8 to 18 ... (0.8 to 1.8 cm) or both to 0.5 mm or 0.05 cm	
		Additional guidance **Must be** raw data not mean	
PDO display 2	[1]	show addition / sum of measurements for both divided by the number of measurements;	
		Additional guidance **A** any number of measurements 2 or more	
	[1]	Shows larger number to smaller number **AND** rounds to appropriate number and ratio expressed correctly;	
		Additional guidance **A** any ratio in whole numbers larger to smaller **A** expression as fraction **R** any units	
			[Total: 20]

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