UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 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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Question		Expected Answers		Marks	Additional Guidance
1 (a) (i) Prepare the space below and record your results.					
PDO recording 2	1.	table with all cells drawn	**AND** heading (top or left) surface area/cm^2 or length/mm;	[1]	
	2.	**Reject** • if units in body of table • t or T • additional columns details of method			
		(heading) time with units;		[1]	
MMO collection 2	3.	collects data as times for all four pieces of potato;		[1]	
	4.	(A) recorded time different from other pieces;		[1]	
MMO decisions 2	5.	**Reject** units must be clear so 1.2 or 1:2 must have min and s or secs			
		records all times correctly as whole seconds or minutes with seconds; UNITS must be clear somewhere		[1]	
	6.	replicate recorded;		[1]	

(ii) Identify *two* significant sources of error in your investigation.

ACE interpretation MAX 2

	Reject temperature			
	Cause of error	Error		
	(dependent)			
1.	timing /dropping/distance long pieces of potato	not accurate/delayed/different;		
2.	ora shorter pieces	different height to top there is shorter distance to surface longer distance to surface;		
3.	(pieces of) potato	stick to sides/bottom of tube don't sink to bottom;	[max 1]	
	(standardised variables)			
4.	potato or position in potato or age or storage	not same different/variety old;		
5.	water left on potato	not same/different;		
6.	(test)-tubes	not same size/height;		
7.	hydrogen peroxide	concentration changes/decreases evaporates/degenerates/breaksdown;	[max 1]	
	(independent variable)			
8.	lengths/size/surface areas/volumes	not same different vary;	[max 1]	max 2 overall

(iii) Suggest how you would make *three* improvements to this investigation.

ACE improvements Max 3

1.	same potato or position in same age or storage or fresh use micrometer/cork borer/vernier callipers;	[1]	
2.	use same volume/mass/volume ratio more surface areas/sizes;	[1]	
3.	use a wider container or smaller potato use deeper container use tubes of same size clamp tubes in vertical position;	[1]	
4.	method to dry the potato lid to cover hydrogen peroxide;	[1]	
5.	(collect oxygen) use a gas syringe or water displacement/oxygen sensor;	[1]	
6.	replicate/repeat;	[1]	max 3

(b) (i) Three of the values in table 1.1 are anomalous. Draw a circle around each of these values. [1]

MMO decision 1

all three figures circled;

pH	time to displace 10 cm^3 of water/s					
	trial 1	trial 2	trial 3	trial 4	trial 5	mean
5	17	14	16	14	15	15
6	8	5	15	6	5	6
7	2	10	3	3	4	3
8	8	6	6	17	7	7
9	20	16	17	16	16	17

[1]

(ii) Complete table 1.1. by calculating the missing value.					
ACE interpretation 1	7; **Allow** 9.			[1]	
(iii) Plot a graph of the data shown in Table 1.1.					**[4]**
PDO layout 4	O	*x*-axis pH	**Reject** t	[1]	Must have units
			AND *y*-axis time/s or seconds;		
	S	**Reject** awkward scale			Must use more than half grid in *x* and *y*.
		scale as each pH to 2 cm	AND 5 seconds to 2 cm;	[1]	
	P	**Reject** plotting if scale is awkward if only dots/blobs or blobs in circles **Allow** cross in circle	intersection of cross must be clear to show plot. NO cross must touch the line for the next square.	[1]	
		correct plotting using crosses/dots in circle only;			
	L	straight line through points; error carried forward if scale or plotting incorrect	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 • <u>not beyond *x*- or *y*-axis</u>	[1]	**Reject** if any extrapolation

(iv) Explain the relationship between pH and the enzyme catalase shown in the data.

ACE conclusion 3

(in correct context of pH and activity (below 7/acid or above 7/ alkali) effect on) structure of protein/enzyme/active site or bonds	 changed/altered/destroyed/no longer complementary broken;	 [1]
(below 7 or above 7) **do not accept** collision(s)/react fewer ECSs (enzyme substrate complexes) or less/no substrate can bind/combine/attach fit into enzyme/active site;		 [1]
(below 7/above 7) (enzymes) denatured;		 [1]

[Total: 20]

2 Make a large, high-power drawing to show the details of five of the structures specialised for gas exchange (alveoli). The wa… alveolus must be touching the walls of at least two other alveoli. Label where gas exchange takes place.

PDO layout 1	1.	**Reject** if drawn over the print of question			[1]	
		Reject • thick lines • feathery lines • 2 'tails' or overlaps or gaps	**AND** no shading	**AND** use most of the space provided;		
		clear, sharp, unbroken continuous lines				
MMO collection 2	2.	five structures drawn	**AND** at least 3 structures touching;		[1]	
	3.	at least three alveoli different shapes/sizes	**AND** thickness of one wall irregular;		[1]	
MMO decisions 2	4.	(walls with) at least 2 cells drawn	**AND** at least one nucleus drawn;		[1]	
	5.	**Reject** • if any label is biologically incorrect e.g. cell wall. • label within drawn area • into centre of alveolus correct label with label line to wall of alveolus;			[1]	

(b) (i) Draw a large plan diagram of the bronchiole shown in Fig. 2.1. Label the lumen.

PDO layout 1	1.	**Reject** if drawn over the print of question				
		Reject • thick lines – than grid • feathery lines • 3 'tails' or overlaps or gaps clear, sharp, unbroken lines	**AND** no shading	**AND** use most of space provided;	[1]	
MMO collection 2	2.	no cells drawn	**AND** width of base of fold greater than width of tip of fold;		[1]	
	3.	13 to 15 folds in lumen;			[1]	
MMO decisions 2	4.	shows indentation;			[1]	
	5.	**Reject** • if any label is biologically incorrect e.g. cell wall. • label within drawn area correct label with label line to lumen;			[1]	

	(ii) Calculate the ratio of the mean thickness of the outer layer of the bronchiole compared to the mean thickness of the w… blood vessel shown in Fig. 2.1.			
MMO collection 2	**Reject** If lines not shown on both bronchiole and blood vessel			
	shows one measurement on each of bronchiole and blood vessel;		[1]	
	Reject If no units If not both same units If metres or converted to metres or micrometres or standard form			
	(one bronchiole measured) to nearest 0.5 mm	**AND** mm;	[1]	
MMO decisions 2	shows mean adds measurements	**AND** shows division by number of measurements;	[1]	
	Reject • If given as decimal :1 • If smaller to larger number • If include units answer is larger whole number to smaller whole number or leaves as fraction;		[1]	**Either** must be to lowest common denominator

(iii) Prepare the space below so that it is suitable for you to compare the observable features of the bronchiole and blood the photomicrograph Fig. 2.1.

PDO recording 2

organise as a table/ Venn diagram/ ruled boxes	**AND** headed <u>bronchiole</u> and <u>blood vessel</u>	**AND** differences opposite each other;	[1]	<u>bronchiole</u> | <u>blood vessel</u>
heading for similarities/similarity/compare (with contrast)/same;			[1]	

MMO decision 1

attempted one similarity ;		[1]	

ACE interpretation 3

Do not accept
- tick and cross without a key
- diagrams
- 3-D description
- incorrect biological terms e.g. endodermis

		bronchiole	blood vessel
	similarity		
S max 1	lumen	smooth muscle	epithelium
	feature		
D1	lumen shape	irregular/lobed/folded	smooth/oval/not folded;
D2	lumen size	small(er)	larg(er);
D3	folds	many/present	none/absent;
D4	no. of layers	more/2	less/1;
D5	outer/muscle layer/wall	thick(er)/wid(er)	thinn(er)/narrow(er);
D6	overall shape	circular/round	oval/squashed circle;

[max 3]

If no organisation if in same sentence or following sentences.

[Total: 20]