

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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

Question	Expected Answers	Marks	Additional Guidance
1 (a) (i)	Prepare the space below and record your results. [6]		
PDO recording 2	1. table with all cells drawn	[1]	
	2. Reject <ul style="list-style-type: none"> • 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]	

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

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

ACE Interpretation MAX 2

(iii) Suggest how you would make <i>three</i> improvements to this investigation.		[3]
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]																																										
all three figures circled;																																												
<table border="1" style="margin-left: auto; margin-right: auto;"> <caption>time to displace 10 cm³ of water / s</caption> <thead> <tr> <th>pH</th> <th>trial 1</th> <th>trial 2</th> <th>trial 3</th> <th>trial 4</th> <th>trial 5</th> <th>mean</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>17</td> <td>14</td> <td>16</td> <td>14</td> <td>15</td> <td>15</td> </tr> <tr> <td>6</td> <td>8</td> <td>5</td> <td>15</td> <td>6</td> <td>5</td> <td>6</td> </tr> <tr> <td>7</td> <td>2</td> <td>10</td> <td>3</td> <td>3</td> <td>4</td> <td>3</td> </tr> <tr> <td>8</td> <td>8</td> <td>6</td> <td>6</td> <td>17</td> <td>7</td> <td>7</td> </tr> <tr> <td>9</td> <td>20</td> <td>16</td> <td>17</td> <td>16</td> <td>16</td> <td>17</td> </tr> </tbody> </table>		pH	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]
pH	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																																						

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

	(ii) Complete table 1.1. by calculating the missing value.			[1]	[1]
ACE 1 Interpretation	7; Allow 9.			[1]	
	(iii) Plot a graph of the data shown in Table 1.1.			[4]	[4]
PDO layout 4	O	x-axis	pH	Reject t	Must have units
				AND y-axis time/s or seconds;	[1]
	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 correct plotting using crosses/dots in circle only;		intersection of cross must be clear to show plot. NO cross must touch the line for the next square.	[1]
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 – <ul style="list-style-type: none"> ruled lines plot to plot curve through all plots extrapolation <ul style="list-style-type: none"> not beyond x- or y-axis 	[1]	Reject if any extrapolation

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

(iv) Explain the relationship between pH and the enzyme catalase shown in the data. [3]	
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
	(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]	

Page 7	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

2	Make a large, high-power drawing to show the details of five of the structures specialised for gas exchange (alveoli). The walls of one alveolus must be touching the walls of at least two other alveoli. Label where gas exchange takes place. [5]	1.	Reject if drawn over the print of question	Reject <ul style="list-style-type: none"> thick lines feathery lines 2 'tails' or overlaps or gaps AND no shading	AND use most of the space provided; [1]					
							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]	
							4.	(walls with) at least 2 cells drawn	AND at least one nucleus drawn; [1]	
							5.	Reject <ul style="list-style-type: none"> 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]		
MMO decisions 2										

Page 8	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

(b) (i) Draw a large plan diagram of the bronchiole shown in Fig. 2.1. Label the lumen.				[5]
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	AND use most of space provided; [1]
			clear, sharp, unbroken lines	
			no cells drawn	
			13 to 15 folds in lumen;	
			shows indentation;	
MMO collection 2	2.		AND width of base of fold greater than width of tip of fold; [1]	
	3.		[1]	
MMO decisions 2	4.		[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]	

Page 9	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

(ii) Calculate the ratio of the mean thickness of the outer layer of the bronchiole compared to the mean thickness of the wall of the blood vessel shown in Fig. 2.1. [4]			
MMO collection 2	<p>Reject If lines not shown on both bronchiole and blood vessel</p> <p>shows one measurement on each of bronchiole and blood vessel;</p>	[1]	
	<p>Reject If no units If not both same units If metres or converted to metres or micrometres or standard form</p> <p>(one bronchiole measured) to nearest 0.5 mm</p> <p>AND mm;</p>	[1]	
	<p>shows mean adds measurements</p> <p>AND shows division by number of measurements;</p>	[1]	
MMO decisions 2	<p>Reject</p> <ul style="list-style-type: none"> • If given as decimal :1 • If smaller to larger number • If include units <p>answer is larger whole number to smaller whole number or leaves as fraction;</p>	[1]	Either must be to lowest common denominator

Page 10	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE A LEVEL – October/November 2010	9700	31

<p>(iii) Prepare the space below so that it is suitable for you to compare the observable features of the bronchiole and blood vessel in the photomicrograph Fig. 2.1.</p>				
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;	
	heading for similarities/similarity/compare (with contrast)/same;			
MMO 1 decision	attempted one similarity ;			
ACE interpretation 3	Do not accept <ul style="list-style-type: none"> • tick and cross without a key • diagrams • 3-D description • incorrect biological terms e.g. endodermis 		[1]	
		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 D6	outer/muscle layer/wall overall shape	thick(er)/wic(er) circular/round	thinn(er)/narrow(er); oval/squashed circle;
[Total: 20]				