

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 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 | Additional Guidance | Marks |
|--|---|--|---|
| 1 (a) (i) Decide how often you will take samples. You should not sample for longer than 20 minutes. | | | |
| MMO decisions 2 | 4 or more numbers; Ignore units. | Range: longest time must be 10 or more minutes | [1] |
| | even range of times; | | [1] |
| (ii) Prepare the space below to record: time you remove sample, time at which end-point is reached and time taken to reach the end-point. | | | |
| PDO recording 2 | 1 table with all cells drawn no outer boundary needed. | (heading top or left) AND <u>sampling</u> or <u>sample</u> time or time <u>removed</u> ; | [1] |
| | 2 (heading for one other column or row) <u>time</u> with units; | | Reject units in body of table [1] |
| MMO collection 2 | 3 (ignore headings on results columns) sample time plus result column = other result column; | Must be clear units Reject 1.24 | [1] |
| | 4 (trend correct) figure for last sample less than figure for first sample; | | [1] |
| MMO decision 1 | 5 (end-point result column) whole seconds or whole minutes for at least three results; | | [1] |
| (b) (i) Describe a suitable control for this investigation. | | | |
| ACE interpretation 1 | 1 boil and cooled enzyme OR 2 no enzyme and replace with water; | | [1] |

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|---|---|--|---|---------|
| (c) (i) Identify two significant sources of error in this investigation | | | | |
| ACE interpretation 2 | 1 timing with reason why causes an error e.g. removal of samples AND adding to potassium permanganate OR timing end-point OR two lots of timing; | | [max 2] | |
| | 2 judging or detecting end-point or colour change; | | | |
| | 3 idea of volume of reaction mixture or AW decreasing with each sample; | Reject temperature Reject pH Reject evaporation | | |
| (ii) State one variable which was not controlled in this investigation and how it could be controlled. | | | | |
| ACE improvement 1 | temperature | AND use thermostatically-controlled water-bath or water-bath at constant temperature; | Reject if more than one variable | [max 1] |
| | pH | AND use buffer; | | |

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|---|--|--|---|------|-----|------|-----|------|-----|------|---|-----------------------------------|--|-----------------|-----|
| (d) (i) Plot a graph to show the results in Table 1.1. | | | | | | | | | | | | | | | |
| PDO layout 4 <table border="1" style="margin-left: 20px;"> <tr><td>60</td><td>0.32</td></tr> <tr><td>120</td><td>0.64</td></tr> <tr><td>180</td><td>0.95</td></tr> <tr><td>300</td><td>1.55</td></tr> <tr><td>400</td><td>2.05</td></tr> </table> | 60 | 0.32 | 120 | 0.64 | 180 | 0.95 | 300 | 1.55 | 400 | 2.05 | O | x-axis time (/) s or sec(ond)s | y-axis AND mass of (reducing) sugars (/) mg; | Must have units | [1] |
| | 60 | 0.32 | | | | | | | | | | | | | |
| | 120 | 0.64 | | | | | | | | | | | | | |
| | 180 | 0.95 | | | | | | | | | | | | | |
| 300 | 1.55 | | | | | | | | | | | | | | |
| 400 | 2.05 | | | | | | | | | | | | | | |
| S | scale as 100 s to 2 cm ECF if no labels for O. Allow at origin 50 as long as scale 100 s to 2 cm | AND 0.5 mg to 2 cm; Allow 0.25 at origin but must label origin. | Reject if awkward scale | [1] | | | | | | | | | | | |
| P | correct plotting using crosses/dots in circle only; | Intersection of cross must be clear to show plot. | Reject plotting if scale is awkward Reject if only blobs/dots/blobs in circles | [1] | | | | | | | | | | | |
| L | straight line through points; | Quality – not thick, not feathery for the complete line. Joining plots – <ul style="list-style-type: none"> • <u>Ruled lines plot to plot</u> • <u>Straight line through most plots</u> • <u>Straight line extrapolated to 0</u> Extrapolation <ul style="list-style-type: none"> • Not beyond x- or y-axis | Reject if not five plots | [1] | | | | | | | | | | | |

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| Question | Expected Answers | Additional Guidance | Marks |
|---|--|---|--------------------|
| (ii) Use the graph to find the rate of hydrolysis of the sucrose by finding the gradient of the line. Show on your graph where you took your readings. | | | |
| MMO collection 1 | shows on graph at least one time and mass; | | [1] |
| MMO decision 1 | two masses and two times; | | [1] |
| PDO display 2 | shows mass up 2.05 mg | AND divided by time up to 400 s; | [1] |
| | any answer rounded to <u>maximum</u> of three significant figures OR five decimal places OR standard form; | | [1] |
| (iii) Explain why the mass of reducing sugars increased and then remained the same. | | | |
| ACE conclusion 2 | <u>enzyme</u> ; | Reject use of enzyme in incorrect biological context | [1] |
| | (context of increase or up to 400 s) idea that non-reducing sugar or sucrose being converted (context of remaining the same or after 400 s) AND idea that all substrate hydrolysed or broken down or used up; | Reject enzyme active sites full or enzyme used up | [1] |
| | | | [Total: 21] |

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| Question | Expected Answers | | | Additional Guidance | Marks |
|--|--|---|---|--|-------|
| 2 TS oesophagus | | | | | |
| (a) (i) Draw a large plan diagram of a quarter of the tube as shown in Fig. 2.1 | | | | | |
| PDO layout 1 | 1 clear, sharp, unbroken lines | AND no shading | AND Allow only for 3 or more lines; | Reject if overlaps text of question | [1] |
| MMO collection 1 | 2 no cells | AND Drawn detail for only correct quarter; Minimum of one layer needed. | | Reject if drawn incorrect quarter | [1] |
| MMO decision 2 | 3 innermost layer is thinner (+ or – 1 mm) than outermost thick layer; | | | | [1] |
| | 4 first two lines folded; | | | | [1] |

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| Question | Expected Answers | Additional Guidance | Marks | | | | | | | | | | | | | | | | |
|--|--|---|-------|----|--------|-----|------|------|--------|-----|------|------|--------|-----|------|------|--------|-----|-----|
| (b) (i) Calculate the actual length, shown by line X, of one of the structures. | | | | | | | | | | | | | | | | | | | |
| MMO collection 2 | measures line X correctly in mm or cm; Reject m | <table border="1"> <thead> <tr> <th>mm</th> <th>cm</th> </tr> </thead> <tbody> <tr> <td>54.(0)</td> <td>5.4</td> </tr> <tr> <td>54.5</td> <td>5.45</td> </tr> <tr> <td>55.(0)</td> <td>5.5</td> </tr> <tr> <td>55.5</td> <td>5.55</td> </tr> <tr> <td>56.(0)</td> <td>5.6</td> </tr> <tr> <td>56.5</td> <td>5.65</td> </tr> <tr> <td>57.(0)</td> <td>5.7</td> </tr> </tbody> </table> | mm | cm | 54.(0) | 5.4 | 54.5 | 5.45 | 55.(0) | 5.5 | 55.5 | 5.55 | 56.(0) | 5.6 | 56.5 | 5.65 | 57.(0) | 5.7 | [1] |
| | mm | cm | | | | | | | | | | | | | | | | | |
| 54.(0) | 5.4 | | | | | | | | | | | | | | | | | | |
| 54.5 | 5.45 | | | | | | | | | | | | | | | | | | |
| 55.(0) | 5.5 | | | | | | | | | | | | | | | | | | |
| 55.5 | 5.55 | | | | | | | | | | | | | | | | | | |
| 56.(0) | 5.6 | | | | | | | | | | | | | | | | | | |
| 56.5 | 5.65 | | | | | | | | | | | | | | | | | | |
| 57.(0) | 5.7 | | | | | | | | | | | | | | | | | | |
| | shows their measurement divided by or / or ÷ 50 AND × 1000 or 10^3 (mm) or 10000 or 10^4 (cm) or × 10 × 1000; | Reject use or conversion to metres Reject if no units | [1] | | | | | | | | | | | | | | | | |
| (ii) Explain how you would find the mean length of the structures shown in Fig. 2.2 | | | | | | | | | | | | | | | | | | | |
| ACE improvements 2 | <u>measure</u> all OR any number five or more; | Reject calculate | [1] | | | | | | | | | | | | | | | | |
| | add together and divide by the number measured; | | [1] | | | | | | | | | | | | | | | | |

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| Question | Expected Answers | | | Additional Guidance | Marks |
|---|--|--|--|--|---------|
| (iii) Prepare the space below so that it is suitable for you to compare and contrast the cells in J1 and Fig. 2.2. | | | | | |
| PDO recording 2 | (organise) table/ venn diagram/ ruled connected boxes | (heading for differences) any appropriate heading e.g J1 and Fig. 2.2 | all differences statements opposite each other; | J1 <u>Fig. 2.2</u> | [1] |
| | heading , similarities; | | | | [1] |
| ACE interpretation 3 | feature: | J1: | Fig. 2.2: | Must have at least 1 similarity Allow D5 or S1 not both Ticks and crosses require a key | [max 3] |
| | D1. folds no. OR packing or gaps or spaces | fewer | more | | |
| | OR surface area (to volume ratio) | loosely packed/widely spaced or large gaps | densely packed/closely packed or small gaps | | |
| | D2. fold shape Ignore length or height | small(er) | larg(er); | | |
| | D3. number of layers | wider or thicker/flat at top or round(ed) | thinner or pointed end; | | |
| | D4. group of folds | more or larg(er) | few(er); | | |
| | D5. lumen/ hollow/ space | different shapes | similar shapes; | | |
| | Similarities/compare clear as 'both are' | | | | |
| | S1. lumen/hollow/ space | present; | | | |
| | S2. folds | present; | | | |
| S3. layers | present or many/multi-; | | | | |

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|--|---|---------------------------------------|-------------------|--|--------------------|
| (iv) Suggest how the structures in Fig. 2.2 are adapted for absorption. | | | | | |
| ACE conclusion | large surface area or microvilli or brush border or <u>good</u> or extensive blood supply or capillary network or lacteals or lymph vessels or selectively permeable; | | [1] | | |
| (c) Make a large, labelled drawing of the complete cells shown in the sector on Fig. 2.3. | | | | | |
| PDO layout 1 | 1 clear, sharp, unbroken lines | AND no shading | AND large; | Reject if overlaps text of question | [1] |
| MMO collection 2 | 2 cells drawn as a group | AND narrower at base than top; | | | [1] |
| | 3 nucleus to right hand side goblet cell touching the membrane | AND nucleus tapers; | | | [1] |
| MMO decision 2 | 4 triangular shape (goblet cell); | | | | [1] |
| | 5 Reject if any label is biologically incorrect e.g. cell wall one correct label with label line from nucleus nuclear membrane nucleolus cytoplasm cell membrane microvilli brush border goblet cell columnar epithelium cilia; | | | Reject if any writing on drawing Reject if drawn organelles other than nucleus or nucleolus | [1] |
| | | | | | [Total: 19] |