**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 | |
|---|---|---|
| 9700/35 | 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) |
| <u>**underline**</u> | 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) |

| 1 | (a) | (i) | | | [1] |
|---|---|---|---|---|---|
| MMO decisions 1 | | [1] | one temperature + 80(.0); | | |
| | | | Additional guidance | **A** any range 80 to 100 e.g. 80 to 85 | |

| | | (ii) | | | [2] |
|---|---|---|---|---|---|
| MMO decisions 2 | | [1] | equal volume or excess of Benedict's solution with respect to volume of sampling solution; | | |
| | | | Additional guidance | **A** not less than 2 $cm^3$<br>**A** 15 $cm^3$ or less<br>**A** total volume 20 (not 21) $cm^3$<br>**R** whole number only | |
| | | [1] | both must have units $cm^3$ or ml(s); | | |

| | | (iii) | | **[4]** |
|---|---|---|---|---|
| PDO recording 2 | mp1 | table with all cells drawn **AND** heading (top or left) with (reaction) time / <u>min(utes)</u>; | | |
| | | Additional guidance | **A** no outer boundary<br>**A** test-tube or S and E or sampling (solution) with mins<br><br>**R** mins in body of table<br>**R** test-tube number or test-tube alone<br>**R** if convert to seconds<br>**Ignore** test-tube / additional columns / rows | |
| | mp2 | (heading on any one time column or row including mean)<br>time / seconds (s) (to first colour change); | | |
| | | Additional guidance | **Ignore** heading for test-tubes<br>**R** headings for standardised variables e.g. volumes or temperature | |
| MMO collection 2 | mp3 | records results for at least four sample times ; | | |
| | | Additional guidance | **A** 0 minutes<br>**A** times or colours(blue to green to yellow to orange to orange/brown to red)<br>**R** 'no change' | |
| | mp4 | records as times in whole seconds (numbers) only 'less than 601' time;<br>(mark first column or row of recorded time taken) | | |
| | | Additional guidance | **A** minimum of four recorded times including 'more than 600' | |

| (iv) | | | | [1] |
|---|---|---|---|---|
| ACE interpretation **max 1** | max 1 | Cause of error | WITH idea of error | |
| | mp1 | (dependent) (change of Benedict's solution) judge or observe or identifying colour | is difficult or varies or not same; | |
| | mp2 | timing as all test-tubes together or observing change in test-tube | is difficult or varies or not same; | |
| | mp3 | (standardised) glucose or sample solution from previous tube or contamination | is transferred on outside of Visking tubing bag to next test-tube; | |

| (v) | | | [1] |
|---|---|---|---|
| ACE improvement 1 | [1] | boil enzyme (and sucrose) **Or** replace enzyme / **E** with water or use water / **W** instead of enzyme / **E** **Or** replace sucrose with water / **W** or use water instead of sucrose **Or** use sucrose and <u>water</u> / **W** **Or** use enzyme and <u>water</u> / **W**; (Ignore equal volume or 2 cm$^3$ of each) **Ignore** denature enzyme (needs how) **R** 0% sucrose or 0% enzyme | |

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| (vi) | | | | [max 2] |
|---|---|---|---|---|
| | | | Mark first **three** ideas for any correct **two [max 2]** | |
| ACE improvements **max 2** | mp1 | (independent variable) sample more often (e.g. every 2 minutes) or narrower (range); | | |
| | | Additional guidance **R** idea of wider range | | |
| | mp2 | (dependent variable) weigh mass of precipitate; | | |
| | | Additional guidance **R** colorimeter | | |
| | mp3 | (Benedict's) thermostatically-controlled water-bath or water-bath at a named temperature (80 to 100 / boiling); | | |
| | | Additional guidance | **A** digital or electronic | |
| | | | **A** description of use of heating and cooling with Bunsen or hot and cold water | |
| | mp4 | (Benedict's) idea of heat or do each test-tube separately | | |
| | mp5 | replicate / repeat; | | |
| | | Additional guidance | **A** more times/trials/readings or repeats or repeat | |
| | | | **Ignore** mean | |
| | mp6 | (standardised variables)<br>use separate Visking tubing bags / one Visking tubing bag for 5 minutes, one for 10 minutes, one for 15 minutes, one for 20 minutes or test the water before putting in Visking tubing; | | |
| | mp7 | use a buffer; | | |
| | mp8 | check temperature of solution has reached temperature of water-bath or equilibrate enzyme or allow longer time for solutions to reach surrounding temperature in boiling tube; | | |

| (b) (i) | | | [1] |
|---|---|---|---|
| ACE interpretation 1 | [1] | missing value 7.82 or 7.8 or 8.0; | |
| | | Additional guidance **R** 8 | |

| | (ii) | | **[4]** |
|---|---|---|---|
| **PDO layout 4** | O | *x*-axis <u>sucrose conc</u>(entration) <u>mol dm$^{-3}$</u> **AND** *y*-axis <u>change in mass/g</u> or <u>percentage (%)</u> <u>change in mass</u>;<br><br>**A** label anywhere on right side of grid | |
| | | Additional guidance | **Must have** units on x-axis **AND** y-axis<br>**R** put both units g and %<br>**R** mol/dm$^{-3}$<br>**A** mol/dm$^3$ |
| | S | scale as *x*-axis <u>0.2 to 2 cm</u> **AND** *y*-axis <u>10 to 2 cm</u> ; | |
| | | Additional guidance | **A** no 0 label at origin and no end labels<br>**R** awkward scale |
| | P | correct plotting of each point to <u>within</u> half a square i.e. less than 1 mm from intersection<br>i.e. plot has to be nearer than halfway from a line – up or down or either side<br>OR<br>if meant to be between two lines then must not be on line above or below or either side; | |
| | | Additional guidance | **A** small cross or dot in circle or cross in circle<br>**A ecf** if *x*-axis not 0 if scale 20 to 2 cm.<br>**R** awkward *y*-axis scale<br>**R** blobs or dots alone<br>**R** cross too large |
| | L | <u>ruled</u> lines point to point or <u>ruled</u> lines of best fit <span style="float:right">**AND** quality clear sharp;</span><br>**R** extrapolated<br>**A** extrapolation from line of best fit to vertical or horizontal lines of plotted point only<br><br>**R if**<br>• less than 5 plots<br>• line 1 mm or thicker<br>• any feathery line<br>• irregular thickness | |
| | | Additional guidance | **A ecf** from incorrect P |

| (iii) | | [1] |
|---|---|---|
| ACE interpretation 1 | [1] | circle around 0.8 plotted point; |

| (iv) | | | | [3] |
|---|---|---|---|---|
| | R if any incorrect ref. to sucrose solution. | | | |
| ACE interpretation 1 | [1] | (Cell A no change in mass)<br><br>take value for cell A | (Cell B losing mass)<br>**AND**<br>any value higher than value for cell A | (Cell C gaining mass)<br>**AND**<br>any value lower than cell A; |
| | | example<br>0.4 | example<br>any value more than 0.4 | example<br>any value less than 0.4 |
| | | Additional guidance   **Must have** mol dm$^{-3}$ once | | |
| PDO display 2 | [1] | (Cell A) no change in <u>mass</u> or 0% change in <u>mass</u>; | | |
| | [1] | (Cell B) losing mass or figures<br>most negative change in mass<br>Or idea of more water out/exosmosis<br>Or less water in/endosmosis | **AND** (Cell C) gaining mass or positive quote<br>most positive change in mass<br>Or less water out/exosmosis<br>Or more water in/endosmosis; | |
| | | Additional guidance   **Ignore** ref. to size | | |

| (v) | | [2] |
|---|---|---|
| ACE conclusion 2 | [1] | (cell A) no net <u>move</u>(ment) or diffusion or equal move(ment) or diffusion (of water) in and out;<br>R 'no osmosis' |
| | [1] | <u>water potential</u> is same inside and outside cell or no difference; |
| | | [Total: 22] |

| 2 | (a) | (i) | | [6] |
|---|-----|-----|---|-----|

| PDO layout 1 | [1] | no shading **AND** length across widest point (top to bottom) is more than 50 mm **AND** (clear, sharp, unbroken lines)<br>**Must have four** or more hand-drawn lines and / or enclosed areas (not cells)<br>**R if**<br>• drawn over the print of question<br>• any line 1 mm or thicker<br>• any feathery or broken / dashed<br>• 3 'tails' or overlaps or gaps (ignoring gaps for stomata)<br>• **any** ruled or dashed lines in drawing |
|---|---|---|

| MMO collection 3 | [1] | no cells drawn **AND** drawn correct part of leaf **AND** one closed end; |
|---|---|---|
| | [1] | region across closed end or at least two stomata gaps; |
| | [1] | (outermost two lines) drawn with two lines closer than 4 mm at widest point **AND** at least three defined enclosed areas (not cells); |

| MMO decision 2 | [1] | at least two of defined enclosed areas divided into two regions<br>OR has three outside layers (four lines) (not including any line for palisade); |
|---|---|---|
| | [1] | correct label with one label line to each of palisade mesophyll layer and epidermis;<br>label line to within a defined layer for the palisade mesophyll layer and label line to epidermis between any two lines outside this palisade layer or the outermost line. |
| | | Additional guidance     **R if**<br>• any label which is biologically incorrect e.g. from incorrect organ or animal or cell structures<br>• any label within drawn area<br>• any label to open space, epidermis must have two lines |

| | (ii) | | [6] |
|---|---|---|---|
| | | **Ignore** any inclusion inside canal. | |
| PDO layout 1 | [1] | no shading **AND** largest dimension of one cell larger than 30 mm in any direction **AND** (clear, sharp, unbroken lines for outer cell lines only) <br> **Must have** five or more enclosed areas <br> **R if** <br> • drawn over the print of question <br> • any line 1 mm or thicker or ruled <br> • any feathery or broken/dashed line <br> • any 'tails' or overlaps or gaps if two lines for cell walls <br> • **any** ruled lines; | |
| MMO collection 3 | [1] | only (any) 6 cells touching AND form a single chain in an arc (semicircle or full circle); | |
| | | Additional guidance   **R** any ruled lines | |
| | [1] | (for innermost cells) cells not uniform size **AND** no extra line (canal lining as a line); | |
| | | Additional guidance   **R** any ruled lines | |
| | [1] | any one cell showing an inclusion; <br> **R** any three cells with small inclusions / chloroplasts | |
| PDO recording 1 | [1] | cell walls as double lines with middle lamella between three adjacent cells; | |
| MMO decision 1 | [1] | <u>one</u> correct label (**F**) (with label line) to any <u>one</u> cell with enclosed area drawn inside; | |
| | | Additional guidance | **R F** not totally inside when no label line <br> **R** label line within cell <br> **R** any label other than **F** |

| | (iii) | | | [max 1] |
|---|---|---|---|---|
| ACE conclusion **max 1** | | max 1 | (thick) presence of cuticle / lignified / resin cells<br>few air spaces / less spongy mesophyll<br>few stomata or pores | prevents / reduces 'loss of water' or transpiration or evaporation or 'diffusion of water' or trap water; |
| | | | sunken stomata | prevents / reduces diffusion<br>or absorb or trap water or moisture or moist air<br>increase humidity; |

| (b) (i) | | | | | [5] |
|---------|-----|-----|-----|-----|-----|

| PDO recording 1 | [1] | organise as a table / Venn diagram / ruled boxes **AND** headed <u>L1</u> and <u>Fig. 2.2</u> **AND** first difference opposite each other; |
|-----------------|-----|---|

| MMO decision 1 | [1] | only **three** observable differences recorded; |
|----------------|-----|---|

ACE interpretation **max 3** — max 3

| mp | feature | L1 | Fig. 2.2 |
|----|---------|----|----|
| 1. | vascular bundle arrangement | in line / along centre / scattered | scattered / within columns random; |
| 2. | vascular bundle number or closeness | few(er) or more or close | more or few(er) or further apart; |
| 3. | air spaces / number of air spaces | none many / more | present few/less |
| | packing / number of cells | compact more cells / mesophyll | loose fewer cell / less mesophyll; |
| 4. | canals or openings | present | none / absent; |
| 5. | number of stomata / guard cells | many / more or few / less | few / less or many / more; |
| 6. | distribution of stomata / guard cells | all round or both sides or upper and / or lower | one side or only upper epidermis or not lower epidermis; |
| 7. | cuticle | present / thick / large | absent / thin / small; |
| 8. | epidermal layers **R** cells | more than one layer / thick large | one layer / thin small; |
| 9. | collenchymas / sclerenchyma | present | absent; |
| 10. | palisade layer or cells | present | absent / not clear; |
| 11. | overall shape | smooth | wavy / irregular; |

| | | | | | [Total: 18] |
|--|--|--|--|--|-------------|