**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Subsidiary Level and GCE Advanced Level**

# MARK SCHEME for the October/November 2012 series

## 9700 BIOLOGY

**9700/36** 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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] | cuts two blocks which are different from 10 × 10 × 5 mm (400 $mm^2$) | **AND** dimensions OR surface area of blocks 2 and 3 are **smaller** than block 1; |
| | [2] | each surface area column correctly completed;; | |
| **(ii)** | | | [5] |
| PDO recording 2 | mp 1 | table with all cells drawn | **AND** heading<br>(top row or column to left of recorded data)<br>surface area (/) $mm^2$; |
| | | **Can have**<br>• no outer boundary<br>**Ignore**<br>• block/additional columns (results for **U**)<br>• notes outside the area | **Do not give mark if**<br>• units $mm^2$ in cells of headed column<br>• other units e.g. $cm^2$<br>• no heading for surface area or $cm^2$<br>• SA<br>• two rows in one cell |
| | mp 2 | (heading for any column/row including mean)<br>only time (with) s or sec(onds); e.g. time and observation in same heading | |
| | | **Ignore**<br>• if have columns/rows for blocks or observations e.g. colour<br>• any notes outside area<br>• headings for blocks<br>• t or T | **Do not give mark if**<br>• volume<br>• units in cells of this column/row/other notation e.g. 35**'**<br>• min(utes)<br>• ref. to width/length/depth or method information or in cells e.g. width, length, depth and surface area in the one cell<br>• ref. to **U**<br>• ref. to temperature |
| MMO collection 2 | mp 3 | (mark **first** column/row of recorded time) records whole numbers only for ANY three (surface areas/blocks) that is any whole number less than 360 or records > or 'more than 360'; | |
| | | **Must have**<br>• whole numbers between 3 and 360/'more than 360' | **Do not give mark if**<br>• 'less than 360'<br>• time recorded as 0**:**51 |
| | mp 4 | replicates for all three surface areas (six times); | |

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| | | |
|---|---|---|
| MMO decision 1 | mp 5 | calculates mean OR rate for all surface areas; |

**(iii)** [2]

| | | | |
|---|---|---|---|
| ACE interpretation max 2 | | **cause of error** | **WITH idea of error** |
| | mp 1 | loss of colour/or describe | judge<br>observe<br>see<br>identify<br>determine<br>subjective<br>different/varies/not same; |
| | mp 2 | handling<br>e.g. using the mounted needle | gave 'hole' describes damage/<br>increases or changes surface area; |
| | mp 3 | temperature | different/varies/not same<br>drops/decreases/changes; |
| | mp 4 | blue colour/staining of blocks or orientation in test-tube/ block touches the sides of the test tube | not dark enough/uneven or blotchy/<br>decreases/changes the surface area; |
| | mp 5 | cutting the blocks | difficult to get correct size/accurate; |

**(iv)** [3]

| | | |
|---|---|---|
| ACE improvements max 3 | mp 1 | idea of using more or different or wider/narrower range of surface areas/sizes or examples<br><br>OR<br><br>repeats/replicates//more readings; |
| | mp 2 | (method to keep surface area constant)<br>use 'cutter'/use a machine<br>use sharper (scalpel)<br>use Vernier calliper<br>use moulds; |

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| | | | |
|---|---|---|---|
| | mp 3 | *(*standardised variables)<br>(how water temperature is maintained)<br>temperature maintained in thermostatically(-controlled) water-bath<br>or<br>described using heating<br>or<br>different/'fresh' water at desired temperature; | |
| | | **Can have**<br>thermostatic/electr(on)ic/incubator | |
| | mp 4 | staining for longer/shorter/use darker/lighter stain; | |
| | mp 5 | use a flat/shallow container/beaker and make sure blocks same way up; | |
| | mp 6 | use spoon/forceps to prevent damage to block; | |
| **(b) (i)** If draw chart then max 1 for O. [4] | | | |
| PDO layout 4 | O | *x*-axis<br>time (/) s(econds)<br><br>**AND** *y*-axis<br><br>speed of (the) bubble (/) cm $s^{-1}$ or cm/s or cm per second; | (**R** cm/$s^{-1}$) |
| | S | scale on *x*-axis<br><br>5 to 2cm labelled each 2 cm except origin and 30<br><br>**AND** *y*-axis<br><br>2 to 2 cm labelled each 2 cm except origin and 8; | **ecf** if no labels for O or if reverse O then scale must use more than half grid for both *x* and *y*<br><br>Allow speed of bubble 1 to 2 cm (3 at origin) AND time 10 to 2 cm ONLY<br><br>**Ignore** symbol for break in *y*-axis<br><br>**Must have**<br>• label of value of origin if zero not at origin<br><br>**Do not give mark if**<br>• awkward scale |
| | P | correct plotting of<br>• **5** points<br>• as small cross (lines less than 4 mm each) **o**r dot (in circle) **or** cross in circle to within half a square<br><br>**Can have**<br>• **ecf** if *x*-axis not 0 if scale 5 to 2cm even | **Do not give mark if**<br>• the plot for the reading-off point is the same as for the five plotting points<br>• awkward scale.<br>• **ANY** blobs or dots alone<br>• **ANY** cross too large |

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| | | | |
|---|---|---|---|
| | L | **five** plots with<br>ruled lines exactly point to point<br><br>**AND** (quality)<br><br>smooth line less than 1 mm thick;<br><br>**Can have**<br>• **ecf** from incorrect **P** | **Do not give mark if**<br>• any feathery line<br>• any irregular thickness<br>• any extrapolation either end |
| | **(ii)** | | [2] |
| MMO collection 1 | mp 1 | shows on graph where reading taken off at 10 seconds; | |
| | | **Can have mark if**<br>• same as other plotted points<br>• one or two lines<br>• on graph with *x* and *y* axes incorrectly orientated | **Do not give mark if**<br>• shown two lines on graph (given choice of two lines anywhere on graph) |
| ACE interpretation1 | mp 2 | correct reading from graph accurate to value of half square | **AND**<br>(cm $s^{-1}$ or cm/s or cm per second);<br>(**Do not give** $cm/s^{-1}$) |
| | | **Can have mark if**<br>• line crosses at halfway between horizontal lines then **MUST** read half square value e.g. 0.1<br>• line crosses nearer right horizontal then can have only either half square value or value of right horizontal<br>• line crosses nearer left horizontal then can have only either value of left horizontal or half way value<br>• apply same idea if drawn on incorrect scale<br>• units incorrect on graph then allow **ecf** for units here | |

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| | | |
|---|---|---|
| **(iii)** | | [3] |
| ACE conclusions 3 | mp 1 | (between 12 and 17 seconds)<br><br>starch is being hydrolysed/broken down by the enzyme; |
| | mp 2 | (between 25 and 30 seconds)<br><br>hydrolysis (almost) ended/almost finished/no more starch or starch all hydrolysed/broken down<br>or limiting (factor) or nearly zero/hardly any left; |
| | mp 3 | (either 12-17 seconds or 25-30 seconds)<br><br>correct ref. to active sites used or ESCs (substrate binding);<br><br>**Do not give mark for**<br>• colliding<br>• effective collision |
| | | **[Total: 22]** |



| | | |
|---|---|---|
| **2 (a) (i)** | | [5] |
| PDO layout 1 | mp 1 | quality of plan diagram with clear, sharp, unbroken lines;<br><br>**Do not give mark if**<br><br>• drawn over the print of question<br>• <u>any</u> shading anywhere<br>• <u>any</u> ruled lines<br><br>• smaller than 60 mm across widest point (from outermost line to innermost line)<br><br>• if less than **three** hand drawn lines AND at least **one** enclosed area (best vascular bundle)<br>if any of the **three** outermost lines and any **one** outer line of enclosed area has<br>• <u>any</u> line 1mm or thicker<br>• <u>any</u> feathery line or broken/dashed line or gaps<br>• <u>any</u> 'tails' or overlaps |

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| | | | |
|---|---|---|---|
| MMO collection 2 | mp 2 | no cells drawn<br>**AND**<br>sector plus at least one vascular bundle drawn; | |
| | | **Ignore**<br>• outline being curved | |
| | mp 3 | the outermost line **AND** at least three inner lines comprising the 'epidermal layers'; | |
| MMO decision 2 | mp 4 | (vascular bundle) drawn with at least three enclosed areas **AND** tapering (inner phloem narrower than outer phloem, **NOT** symmetrically oval); | |
| | mp 5 | labels <u>phloem</u> with ruled line touching line around enclosed area or ending inside enclosed area in vascular bundle with at least **three** regions where middle region is the widest (either outer or inner region); | |
| | | **Ignore**<br>• any labels identifying tissues associated with plant | **Do not give mark if**<br>• any label which is biologically incorrect e.g. from animal<br>• any label within drawn area |
| | **(ii)** | | [4] |
| PDO layout 1 | mp 1 | quality of drawing with clear, sharp, unbroken lines;<br><br>**Do not give mark if**<br><br>• drawn over the print of question<br>• enclosed in an outline (VB)<br>• <u>any</u> shading anywhere<br>• <u>any</u> ruled lines<br><br>• if smaller than 50mm across widest cell<br><br>• if less than 3 cell outlines<br>either of the outermost lines of the **two** largest enclosed areas have<br>• <u>any</u> line 1mm or thicker (use grid)<br>• <u>any</u> feathery line or broken/dashed or gaps<br>• <u>any</u> 'tails' or overlaps | |
| MMO collection 2 | mp 2 | only two largest enclosed areas drawn **AND** at least two smaller vessels; | for the two largest enclosed areas **do not give mark if**<br>• any enclosed areas/cell structures<br>• regions of vascular bundles are drawn (see exemplar E in standardisation) |
| | mp 3 | for both largest enclosed areas the cell walls must have double lines; | |
| MMO decision 1 | mp 4 | labels <u>lumen</u> with ruled line inside enclosed area within xylem cell;<br><br>**Do not give mark if**<br>• any label (apart from xylem vessels and xylem cells) other than lumen<br>• any label within drawn lines | |

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| | | | |
|---|---|---|---|
| **(b) (i)** | | | [4] |
| MMO decision 1 | mp 1 | shows at least three large values<br><br>OR<br>shows at least three large values | **AND** the same number of smaller values all less than the large values<br>**AND**<br>draws and measures a line across at least five cells; |
| MMO collection 1 | mp 2 | for width and length shows at least once on raw data<br><br>OR<br>where added up units <u>mm</u> or <u>cm</u> | **AND**<br>either whole number mm or to 0.5 mm<br>OR<br>whole cm or to 0.05 cm; |
| PDO display 2 | mp 3 | shows either<br>for width AND length shows addition and division by number of measurements<br>OR<br>for width one measurement divided by the number of cells AND for length addition and division by number of measurements; | |
| | | **Do not give mark if**<br>• use different units for width and length<br>• conversion to metres<br>• conversion to μm | |
| | mp 4 | any number shown to <u>lowest common denominator</u><br>either as larger whole number: or <u>to</u> smaller whole number<br><br>OR<br><br>as a fraction, larger number over smaller number; | |
| | | **Do not give mark if**<br>• only give ratio with no working shown | |

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**(ii)** [5]

**PDO recording 2**

mp 1

organise as a table with only **three** columns or rows separated by lines (no cells needed)
**Ignore** number column

**AND** headings in any order only
cortex and xylem

**AND**
third column contains features;

features | cortex | xylem either way round and other column to left, right or in middle

mp 2

only observable differences (at least two) recorded;

**Do not give mark if**
- any similarities or function recorded
- living versus dead
- ref. to cell membrane
- ref. to end walls/pits/pores

**ACE interpretation max 3**

[max 3]

| mp | feature | cortex | xylem |
|---|---|---|---|
| 1 | nuclei | visible/present (**ignore** more nuclei) | not visible/absent; (**ignore** fewer nuclei) |
| 2 | ratio of length to width/ length width | low(er) shorter wider | high(er) longer narrower; |
| 3 | cell wall | thin | thick; |
| 4 | bands (of lignin)/ staining/colour | absent/brown/ different | present/red/different; |
| 5 | cell contents/ cytoplasm/ vacuole/lumen/hollow | present any difference | absent any difference; |
| 6 | number of cells/packing | more/closely packed | few(er)/loosely packed; |

**[Total: 18]**

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