**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

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

# MARK SCHEME for the May/June 2011 question paper

# for the guidance of teachers

## 9700 BIOLOGY

**9700/35** 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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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) |
| **PDO** | Presentation of Data and Observations (skills) |
| **MMO** | Manipulations, Measurement and Observation (skills) |

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**1 (a) (i) Complete Fig. 1.1 to show how you will make three further concentrations of ethanol, E solution. [3]**

MMO decisions 3

[1]

(labels under correct sequence of beakers)
2.5 AND 1.25 AND 0.6(25);

Additional guidance

**Must have**
- % once
- Concentrations at least 1 decimal place

MMO decision 2

[1]

(uses serial dilution to complete three unlabelled beakers)
(adds previous concentration of E to each of three beakers)

5 (%) with volume
Or shown by arrow from 5(%) with volume

**AND** the same volume transferred from first beaker to second and from second beaker to third;

Additional guidance

**Must have**
- $cm^3$ once

**ecf**
- if mp 1 incorrect

[1]

(adds (distilled) water/W to **each** of three beakers)
10 $cm^3$ (W/water);

Additional guidance

**Must have**
- $cm^3$ once

**ecf**
- if mp1 incorrect
- if mp2 incorrect BUT **MUST** add previous concentration to second and third beakers

**(ii) Describe how you will set up this control using the apparatus provided. [1]**

ACE improvement 1

[1]

(test-tube)
replace E/ethanol with equal or same or 10 $cm^3$ volume of water
OR
(beaker)
20 $cm^3$ or only water;

Additional guidance

**Do not give mark if**
- 10% ethanol/E

**Ignore**
- 0% must have what this is i.e. water

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| | | | | |
|---|---|---|---|---|
| **(iii) Prepare the space below and record your observations.** | | | | **[4]** |
| PDO recording 2 | [1] | table with all cells drawn | **AND** heading (top or left)<br>percent(age) conc(entration) ; | |
| | | Additional guidance | **Can have**<br>• %<br>**Do not give mark if**<br>• % in cells of the headed column / row<br>• other units e.g. mol $dm^{-3}$ | |
| | [1] | (heading)<br>colour or observations or description or result(s) AW; | | |
| | | Additional guidance | **Do not give mark if**<br>• additional columns/rows for method/volumes of E / lengths | |
| MMO collection 2 | [1] | records colour / no change for 5 concentrations **AND** control / 0 (6); | | |
| | [1] | records highest concentration with deeper blue than next concentration; | | |
| | | Additional guidance | **Can have**<br>• minimum two recorded colours | |
| **(iv) State the volume of the smallest division on syringe. State degree of uncertainty.** | | | | **[1]** |
| ACE interpretation 1 | [1] | +/– | **AND** half smallest division | **AND** $cm^3$ / ml; |
| | | Additional guidance | **Can have**<br>• rounding up or down<br>• percentage error if shows calculation as half division / 10 or any volume X 100<br><br>**Must have** percentage or % | |

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| | | |
|---|---|---|
| | **(v) Explain the effect of the ethanol on the plant tissue.** | **[3]** |
| ACE conclusion max 3 | max 3 | **1.** (ethanol)<br>Idea of breaks down / destroys/damages cell or cell surface / plasma membrane; |
| | | **2.** Idea of<br>decreases <u>selective</u> permeability or increases permeability; |
| | | **3.** <u>Idea of</u><br>effect on protein (in cell membrane) <u>denatures</u> or opens channels; |
| | | **4.** Idea of<br>effect on phospholipid(s); |
| | **(vi) If the ends had not been cut off how would the results have been affected?** | **[1]** |
| ACE interpretation max 1 | max 1 | **1.** lengths not same; |
| | | **2.** more colour from ends; |
| | | **3.** colour not same; |

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**(b) (i) Plot a graph of the data shown in Table 1.1. [4]**

PDO layout 4

[1] *x*-axis pH of buffer solutions **AND** *y*-axis absorbance / %;

Additional guidance
**Must have**
- units

**Do not give mark if**
- any units for pH e.g. arbitrary units

[1] (scale on *x*-axis) 4.0 at 0 AND one pH to 2 cm **must** label each 2 cm **AND** (scale on *y*-axis ) 20 to 2 cm **must** label each 2 cm;

Additional guidance
ecf if no labels for O
If reverse O scale must have still have 20 to 2 cm

**Do not give mark if**
- awkward scale e.g. 25 to 2 cm, 40 to 2 cm

[1] correct plotting of each point;

Additional guidance

| | |
|---|---|
| 4.0 | 83 |
| 6.0 | 39 |
| 7.3 | 10 |
| 7.8 | 38 |
| 8.5 | 78 |

**Can have**
- small cross or dot in circle

**Do not give mark if**
- awkward *y*-axis scale
- blobs or dots alone
- cross too large with any part of line touching 4 mm by 4 mm square –

[1] lines point to point **AND**
- ruled, clear sharp and
- quality ruled lines, thinner than half square;

Additional guidance
**Do not give mark if**
- any feathery line
- irregular thickness
- extrapolation at either end

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| | | | |
|---|---|---|---|
| **(ii) ... the absorbance was 46%. Use your graph to estimate the pH of the buffer solution at this absorbance.** **[2]** | | | |
| ACE interpretation 1 | [1] | one correct reading from graph; | |
| MMO decision 1 | [1] | readings of any TWO values from graph; | |
| **(iii) State two variables that need to be kept the same in this investigation. Describe how to keep each of these variables the same.** **[3]** | | | |
| MMO decision 1 | [1] | (selects **TWO** variables for **one** mark)<br>**1.** Idea of size of plant material<br>**2.** type or part of plant or condition | (Suitable method to keep the same )<br><br>using ruler / use cork borer / Vernier callipers;<br>use <u>same</u> type or <u>same</u> part or fresh; |
| ACE improvements max 2 | max 2 | **1.** volume of buffer | use syringe / measuring cylinder / graduated pipette burette; |
| | | **2.** temperature; | use thermostatically-controlled water-bath; |
| | | **3.** time | staggered start or separate experiments; |
| **[Total: 22]** | | | |

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| | | | | |
|---|---|---|---|---|
| **2 (a) Draw a large plan diagram of the quarter shown in Fig. 2.1. Label the xylem.** | | | | **[5]** |
| PDO layout 1 | [1] | clear, sharp, unbroken lines | **AND** no shading | **AND** larger than *60 mm* by *60 mm*; |
| | | Additional guidance | **Must have**<br>• four or more lines<br>**Do not give mark if**<br>• drawn over the print of question<br>• any line thicker – than 1mm<br>• any feathery line<br>• 1 'tail' or overlap or gap | |
| MMO collection 3 | [1] | no cells drawn | | **AND** correct quarter drawn; |
| | [1] | *(outer layer(s)outside stele)*<br>drawn as two / three lines wider than 5mm for most of layer; | | |
| | [1] | *(central vascular tissue)*<br>drawn with two lines for endodermis **AND** triangular regions / extra layer adjacent; | | |
| MMO decision 1 | [1] | correct label with label line to xylem; | | |
| | | Additional guidance | **Do not give mark if**<br>• any label which is biologically incorrect e.g. from incorrect organ or animal<br>• label within drawn area | |

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**(b) (i) Prepare the space below so that it is suitable for you to record the observable differences between the specimens on Fig. 2.1 and that in Fig. 2.2. [4]**

PDO recording 1 — [1]

| | | |
|---|---|---|
| organise as a table/ruled boxes | **AND** headed<br>Fig. 2.1 and Fig. 2.2 | **AND**<br>first difference opposite each other; |
| Additional guidance | Fig. 2.1 \| Fig. 2.2 OR Fig. 2.2 \| Fig. 2.1 | |

ACE interpretation max 3 — [max 3]

| | feature | Fig. 2.1 | Fig. 2.2 |
|---|---|---|---|
| 1 | vascular tissue / xylem | small(er) / only one; | large(r) or seven or more; |
| 2 | | round / circular or middle / in centre | star-shape / (seven) different area / not circular or more spread; |
| 3 | endodermis | present / around stele | absent / none; |
| 4 | cortex or parenchyma cells | large(r) / wid-er circular / round / more even sizes | small(er) / narrow(er) irregular / different sizes; |
| 5 | thickened / layer under or epidermis | thick(er) / wide(r) / large(r) | curled / bent; |
| 6 | epidermis or hairs / trichomes | present / has hairs / trichomes / many | absent / no / few hairs / trichomes or rough; |
| 7 | radius / size | 1.25mm / smaller | 1.7 mm / larger; |
| 8 | AVP; | | |

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| | | | |
|---|---|---|---|
| | **(ii) Use the scale bar to calculate the magnification of Fig. 2.2.** | | **[4]** |
| MMO collection 1 | [1] | measures scale bar in mm;<br>14 or 14.5 or 15 or 15.5 or 16 mm | |
| | | Additional guidance **Do not give mark if**<br>• metres | |
| MMO decision 1 | [1] | (converts to same units)<br>(mm to μm)<br>X 1000<br>14 000 or 14 500<br>or 15 000 or 15 500<br>or 16 000<br>ecf if mp1 incorrect | |
| | | OR (converts μm to mm)<br>620/1000 | |
| PDO display 2 | [1] | shows division of converted scale bar measurement by 620;<br>OR<br>scale bar measurement in mm / 0.620; | |
| | | Additional guidance ecf if no units or incorrect measurement or no or incorrect conversion | |
| | [1] | whole number only;<br>22 or 23 or 24 or 25 or 26 | |

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**(c) ... find three cells with different shapes. Make a large drawing of these cells. Label the cell wall and any observable internal structures of these cells. [5]**

| | | | | |
|---|---|---|---|---|
| PDO layout 1 | [1] | clear, sharp, unbroken lines | **AND** no shading | **AND** largest cell 50 mm at widest point; |
| | | Additional guidance | **Must have**<br>• three or more enclosed areas<br><br>**Do not give mark if**<br>• drawn over the print of question<br>• any line thicker – than 1 mm<br>• any feathery line<br>• 0 'tails' or overlaps or gaps if one line for cell walls check cell walls only. | |
| MMO collection 2 | [1] | only three cells drawn **AND** all different shapes; | | |
| | [1] | three cells with cell walls drawn as double lines; | | |
| PDO recording 1 | [1] | at least one cell contains three or more substantial inclusions drawn; | | |
| MMO decision 1 | [1] | correct label with label lines to cell wall **AND** starch (grain) or nucleus; | | |
| | | Additional guidance | **Do not give mark if**<br>• any label which is biologically incorrect e.g. from incorrect organ or animal<br>• label within drawn area | |

**[Total: 18]**

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