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

# MARK SCHEME for the May/June 2009 question paper

# for the guidance of teachers

## 9700 BIOLOGY

**9700/32** Paper 32 (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.

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UNIVERSITY of CAMBRIDGE
International Examinations

| Question | Expected Answers | Additional Guidance | Mark |
|---|---|---|---|
| **1 (a) (i) Decide which other salt concentrations to make and complete the table.** | | | |
| MMO decisions 3 | 0 and 5% salt plus at least three evenly/serial spaced ignoring 0;<br>e.g.<br>5/3.75/2.5/1.25 or serial 10/5/2.5/1.2 or 5/2.5/1.25/0.625 or 1/3/5/7<br>check any others. | Ignore % in body of table. | [1] |
| | correct volumes used to dilute up to 10 $cm^3$ AND correct % salt<br>AND correct % of yeast and salt half % salt;<br>Credit rounding up or down and from 0.5 either way. | | [1] |
| | (tubes listed) either most dilute/lowest % to most concentrated % or most concentrated to most dilute; Ignore 0. | | [1] |
| **(ii) Prepare space and record results.** | | | |
| PDO recording 2 | single table AND all cells drawn AND %/percent(age); | heading \| heading \| heading<br>heading<br>heading<br><br>Do not credit if % in body of table. | [1] |
| | (number/no. of) drops/AW; (heading to the left or above the data) | Do not credit bubbles or if drops repeated in table. | [1] |
| MMO collection 2 | suitable time with units e.g.<br>per minute/min/$min^{-1}$/<br>secs/seconds/s<br>maximum time 5 minutes, minimum time 30 sec; | Ignore mean/time in table<br>Credit anywhere even outside the table | [1] |
| | any two different concentrations/tubes show different numbers of drops; | | [1] |

| | | | |
|---|---|---|---|
| **(iii) Identify two of most significant errors** | | | |
| ACE interpretation 1 | different times before measuring/timing not the same;<br><br>drops have air bubbles/different sizes/different masses/too fast;<br><br>not airtight/air lock/froth/bubbles in nozzle; | Do not credit not enough time. | [max 2] |
| **(iv) State degree of uncertainty (of ruler used).** | | | |
| ACE interpretation 1 | +/– AND<br>either half smallest division OR whole smallest division<br>AND units/cm/mm; | Ruler has error at each end of measurement of half smallest division = +/– half a division × 2 = +/– whole division with units mm.<br>Credit half division as ruler may have started at zero.<br>Do not credit % error unless candidate shows formula including the measured length of the pipette<br>i.e. 3.5 cm /35 mm. e.g. 0.1/3.5 × 100 = +/– 2.8%<br>or 1/35 × 100 = +/– 2.8%<br>0.05/3.5 × 100 = +/– 1.4 cm etc.% | [1] |

| (v) Suggest how to make sure results are as accurate as possible and as reliable as possible | | | |
|---|---|---|---|
| ACE improvements 3 | C (identification or control of any relevant variables)<br>use buffer/same pH<br>same type of yeast<br>keep time same/set up separate expts/stagger time;<br>Ignore use water bath/same temp. | Credit in either accuracy or reliability. | [1] |
| | Accuracy: collect volume using measuring cylinder/video/time lapse photography/alternative method/<br>credit idea of making sure all drops are counted e.g. removal of all air locks in context /AW; | Accuracy: (change/improvement to method of measuring to obtain results as close as possible to the true value) | [1] |
| | Reliability 1: increase number/range of concentrations/2 named examples; | Reliable: (method to control variables so more repeatable) | [1] |
| | Reliability 2: repeats more/several times/twice/obtain three readings (at each concentration)/collect class data (for same expt.); | Do not credit repeat experiment unqualified. | [1] |
| | Reliability 3: calculate mean/average; | Do not credit three reliability marks. | [1]<br>[max 2] |

| | | | | |
|---|---|---|---|---|
| **(b) (i) Plot a graph of the data shown in Table 1.3.** | | | | |
| PDO layout 4 | O | x-axis mass of (dried) yeast (/)g 100 $cm^{-3}$ glucose solution<br>y-axis % or percentage, absorbance; | | [1] |
| | S | y axis 20 to 2 cm and x axis 0.5 to 2 cm;<br>Credit origin 0.50/1.00 if labelled. | Do not credit S if awkward scale.<br>Must use more than half the grid in either direction. | [1] |
| | P | plotting correct points using crosses/dots in circles only;<br>Do not credit if any extra points plotted in same way as other points e.g. at 60% or 25%.<br>No 2 crosses larger than x or blobs bigger than o. Plots at 1.00, 1.50, 2.00 and 2.25 must be within the horizontal lines for the correct box plot<br>3.00 must be on horizontal line and correct vertical. | Do not credit P plotting if awkward scale or if only blobs/dots/blobs in circles. | [1] |
| | L | curve through at least 4 points/points joined with straight line;<br>Quality – line no thicker than 1 mm thick<br>Complete line should be smooth/not feathery. | Ignore extrapolation to zero. Do not credit any extrapolation beyond the last horizontal/vertical lines or extrapolation which does not reach zero. | [1] |
| **(ii) Complete the Table 1.4 (readings at 60% and 25% absorbance using graph).** | | | | |
| ACE interpretation 1 | | correct readings from candidate's graph at 60 and 25% absorbance to two decimal places; | 2.40 and 1.70 most likely.<br>Must be to two decimal places as in table. | [1] |
| **(iii) Show clearly on the graph how you obtained the mass.** | | | | |
| ACE interpretation 1 | | for both vertical and horizontal lines; | Credit even if reading from wrong value. | [1] |

| (d) State whether you think the hypothesis is supported by the student's results. Explain your answer. | | | |
|---|---|---|---|
| ACE conclusion 2 | not true/no;<br>decreases between day 1 **and** day 3 or quote of data or not enough data/ described; | Credit ecf from their results | [1+1] |
| | true/yes;<br>mass on day 1/quoted and day three/quoted are higher than day 0/quoted<br>OR<br>0/quoted 5 absorbance between days 1 and 3 showing it would be higher or add mass for day 1 and day 3 and divide by 2 = 2.00; | Credit statement – even if the supporting argument is weak. | [1+1] |
| | no and then yes<br>or yes then say no<br>or partly or might be true;<br>not enough data/described; | | [1+1] |
| | | | **[Total: 21]** |

<table>
<tr><th>Question</th><th>Expected Answers</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td colspan="4">2 (a) (i) Draw large low power plan section given. Annotation.</td></tr>
<tr><td>PDO layout 1</td><td>clear, sharp, unbroken lines AND no shading AND cannot fit totally within the acetate grid;</td><td></td><td>[1]</td></tr>
<tr><td>MMO collection 3</td><td>no cells AND epidermal layer drawn as two lines;</td><td></td><td>[1]</td></tr>
<tr><td></td><td>1 or 2 vascular bundles AND a closed tapering end;</td><td></td><td>[1]</td></tr>
<tr><td></td><td>shows a region at the closed tapered end (for collenchyma);</td><td></td><td>[1]</td></tr>
<tr><td>MMO decision 2</td><td>Any TWO from:
<table>
<tr><td>(epidermal cells)</td><td>clear/large/ thin cell walls/one cell thick;</td></tr>
<tr><td>(collenchyma cells)</td><td>thick cell walls/densely stained/small;</td></tr>
<tr><td>(mesophyll cells)</td><td>red cells/irregular/rectangular shapes/loosely-packed/ spaces;</td></tr>
<tr><td>(xylem)</td><td>large <u>cells or vessels</u>/lignified/red/brown/thick walls/ clear;</td></tr>
<tr><td>(phloem)</td><td>small cells;</td></tr>
</table>
Credit tissue red etc. reject large tissue idea.<br>Ignore lumen/hollow/empty/air/labels look for the line and apply description</td><td>Credit any correct description.<br><br>Do not credit functions.</td><td>[max 2]</td></tr>
</table>

**(ii) Make a large labelled drawing of 2 epidermal cells and the cells which form the layer inside touching these two cells.**

<table>
<tr><td>PDO layout 1</td><td>clear, sharp, unbroken lines AND<br><br>For any cells drawn.</td><td>no shading AND</td><td>cannot fit totally within the acetate grid 6 cm × 6 cm;<br>For the complete drawing.</td><td></td><td>[1]</td></tr>
<tr><td>MMO collection 1</td><td colspan="2"><u>only 2 complete epidermal cells</u> drawn AND</td><td>at least 2 complete cells underneath touching;</td><td></td><td>[1]</td></tr>
<tr><td>PDO recording 1</td><td colspan="3">valid observation; Do Not credit if textbook or too much detail
<table>
<tr><td>epidermal cells</td><td>oil droplet Do not credit if nucleus present</td></tr>
<tr><td></td><td>projection on outer wall</td></tr>
<tr><td></td><td>granules inside</td></tr>
<tr><td></td><td>1 cell shape has vertical sides and a bowed upper and lower surfaces</td></tr>
</table></td><td></td><td>[1]</td></tr>
<tr><td>MMO decisions 2</td><td colspan="3">Any two correct<br>epidermal/mesophyll/other layer of cell(s)<br>cell wall<br>nucleus (on mesophyll cell) Ignore on epidermis<br>cytoplasm<br>air space (between cells)<br>chloroplast (in mesophyll cell)<br>vacuole<br>oil droplet/highly stained part of cell/darkened area/AW (in epidermal cell)<br>Ignore starch grain/cell membrane</td><td></td><td>[max 2]</td></tr>
</table>

| (b) Calculate the area of view. Count and record no. of stomata in field of view. Calculate no. of stomata per $mm^2$. | | | |
|---|---|---|---|
| PDO display 1 | calculation of field of view shown;<br>$3.14 \times 0.15^2$ or $3.14 \times (1.5 \times 10^{-1})^2$<br><br>$(3.14 \times 150^2)(/1000\ 000$ or $10^6)$;<br>Credit $(3.14 \times 300^2/4)$ $(/1000\ 000/10^6$ or $\times 10^{-6})$ | | [1] |
| MMO collection 1 | ref to 0.15 mm/150 µm; | | [1] |
| MMO decision 1 | (uses stage micrometer to obtain) diameter 300 µm/0.3 mm or radius/0.15 mm/ 150 µm; | | [1] |
| MMO collection 1 | marks stomata on fig. AND between 20 and 36; | | [1] |
| PDO display 1 | shows number of stomata divided by their calculated area/correct answer whole number only; | | [1] |

**(c) Show the differences between the cells in Fig. 2.2 and Fig. 2.4.**

| | | | | | |
|---|---|---|---|---|---|
| PDO recording 1 | organise as a table/ Venn diagram/ ruled connected boxes | headed | comparative statements opposite each other; First two statements. | | |
| ACE interpretation 1<br><br>ACE conclusion 1 | | | | | [max 2] |

| feature | Fig. 2.4 | Fig. 2.5 |
|---|---|---|
| number of stomata/ cells | more/calculated no. per $mm^2$ | fewer/calculated no. per $mm^2$; |
| size of stomata/cells | smaller | larger/longer; |
| shape of stomata/cells | oval/rounded/irregular/ puzzle-shaped/ | rectangular/triangular/ regular; |
| orientation of stomata/ cells | random/scattered/ irregular | lined up/parallel; /regular; |
| (epidermal) cell walls | thinner/smoother | thicker/rougher/ folded; |
| | (folded/irregular) all round | folded along sides/no folds at ends; |

Ignore stomata open and closed/sunken.
Ignore drawings credit annotations if comparative

**[Total: 19]**