**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

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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 | <u>0 and 5% salt</u> 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 | 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 <u>numbers</u> of drops; | | [1] |

| | | | |
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| **(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;<br><br>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;<br><br>no and then yes<br>or yes then say no<br>or partly or might be true;<br>not enough data/described; | Credit ecf from their results<br><br>Credit statement – even if the supporting argument is weak. | [1+1]<br><br>[1+1]<br><br>[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 cells or vessels/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 colspan="3">clear, sharp, unbroken lines AND no shading AND cannot fit totally within the acetate grid 6 cm × 6 cm;<br>For any cells drawn. 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 colspan="2">at least 2 complete cells underneath touching;</td><td>[1]</td></tr>
<tr><td>PDO recording 1</td><td colspan="4">valid observation; Do Not credit if textbook or too much detail<br><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>[1]</td></tr>
<tr><td>MMO decisions 2</td><td colspan="4">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>[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]**