**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

**BIOLOGY** **0610/51**

Paper 5 Practical Test **May/June 2019**

MARK SCHEME

Maximum Mark: 40

**Published**

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.

Cambridge International will not enter into discussions about these mark schemes.

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## Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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| GENERIC MARKING PRINCIPLE 5:<br><br>Marks should be awarded using the full range of marks defined in the mark scheme for the question (however**;** the use of the full mark range may be limited according to the quality of the candidate responses seen). |
| GENERIC MARKING PRINCIPLE 6:<br><br>Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind. |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(a)(i) | (agar closest to the well is) pink / red / orange / yellow **;** | **1** | |
| 1(a)(ii) | from (edge of) hole to (edge of) the (red or yellow) circle / zone **;**<br>diameter / radius of (red or yellow) circle **;** | **1** | |
| 1(a)(iii) | table drawn with header line **and** at least two columns **;**<br>headings: concentration of citric acid **and** distance / diameter **;**<br>units in headers only; percentage / % **and** mm / cm **;**<br>three distances recorded in correct column / row **;** | **4** | |
| 1(a)(iv) | the higher the concentration (of solution) the further (the acid) moves / AW**;** | **1** | |
| 1(a)(v) | 6.5 **;;** | **2** | |
| 1(b)(i) | number of drops / three drops (of citric acid / solution in the holes) **;**<br>agar , concentration / depth / volume / type **;**<br>holes/wells, depth/size/width **;**<br>indicator, concentration / volume / type **;**<br>time / 30 minutes **;**<br>same temperature **;**<br>AVP **;** e.g. same type of acid/volume of stock solution | **2** | |

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1(b)(ii)</td><td>
<table>
<tr><th>error</th><th>effect on results</th></tr>
<tr><td>drop sizes vary ;</td><td>larger volume produces greater diffusion distance ; ora</td></tr>
<tr><td>no repeats ;</td><td>unable identify anomalous results ;</td></tr>
<tr><td>one dropping pipette used for all (three) solutions / contamination ;</td><td>a weaker solution would produce a smaller diffusion distance ;</td></tr>
<tr><td>longer diffusion time / citric acid added at different times / circles measured at different times ; ora</td><td>greater / lesser distance travelled ;</td></tr>
<tr><td>difficult to judge edge of colour change / subjective ;</td><td>results overestimated or underestimated ;</td></tr>
<tr><td>uneven shape / not circular ;</td><td>distance moved may be more/less than measured ;</td></tr>
<tr><td>difficult to cut holes ;</td><td>greater / less, surface area or volume contained may have less effect on distance ;</td></tr>
<tr><td>spillage ;</td><td>area may be larger ;</td></tr>
<tr><td>AVP ; e.g. solutions not mixed</td><td>AVP ; more / less concentrated so diffuse more/less</td></tr>
</table>
</td><td>2</td><td>AW throughout<br>mark as a pair, effect must match the source of error</td></tr>
</table>

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(c) | *any two from given method* **;;**<br>agar plates used<br>indicator (in agar)<br>holes made in agar<br>(citric) acid added<br>left for fixed (stated) time<br>measure distance moved/diameter/radius<br><br>*any three from novel method* **;;;**<br>using range of at least 2 temperatures<br>temperatures specified and **all** less than 70 (°C)<br>idea of keeping temperature constant<br>ref to temperature equilibration time prior to adding citric acid<br>measure time taken to reach specified diameter<br><br>*any additional points:*<br>same concentration of citric acid **;**<br>wear gloves / goggles **;**<br>repeating the investigation at least twice / three holes in each plate / use three dishes at each temperature **;**<br>AVP **;** | **6** | |
| 2(a)(i) | *line*: clear single continuous lines without shading **;**<br>*size*: occupies at least half the space available **;**<br>*detail*: layers in correct proportions **;** | **3** | |
| 2(a)(ii) | length of line **AB** = 40 mm **;**<br>actual length =0.4 mm **;;** | **3** | **A** ±1 mm<br>**A** ±0.01 mm |
| 2(a)(iii) | **X** written on the spongy mesophyll of drawing **;** | **1** | |
| 2(b)(i) | to obtain a representative leaf size **;**<br>to identify anomalous results **;** | **1** | |

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| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(b)(ii) | to avoid bias / gain a representative sample / AW **;**<br>so that a comparison can be made (between the different light intensities) **;** | **1** | **A** leaves at different heights may be different sizes |
| 2(b)(iii) | draw round the outline of the leaf on a grid / place leaf under a (transparent) grid **;**<br>count the squares **;**<br>include any squares more than half covered / other valid method described **;** | **2** | |
| 2(b)(iv) | light intensity **;** | **1** | |
| 2(c)(i) | 67(%) **;;** | **2** | |
| 2(c)(ii) | *axes labelled with units:*<br>light intensity / arbitrary units or au<br>**and** average leaf area / $mm^2$<br>**and** species A and B labelled / key given **;**<br><br>*scale and size:*<br>even scale for leaf area<br>sequential for *x*-axis<br>bars/plotting area to occupy at least half the grid in both directions **;**<br><br>*plots:*<br>6 values plotted accurately ± ½ small square ;<br><br>4 bars:<br>bars the same width (at least 1 small square wide)<br>gaps present between bars /pairs of bars **;** | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(c)(iii) | *species **A**:*<br>as the light intensity decreases the (average) leaf area increases / **; ora**<br><br>*species **B**:*<br>(average) leaf area increases with increasing light intensity (to maximum at 50 au) and then decreases **; ora** | **2** | |
| 2(c)(iv) | measure leaf growth at a narrower range of light intensities around 50 (au) **;** | **1** | |

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