# Mark Scheme (Results)

## October 2024

Pearson Edexcel International Advanced Subsidiary Level in Biology (WBI13)
Paper 01 Practical Skills in Biology I

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**General Marking Guidance**

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1a | An answer that includes the following points.<br>• {α / alpha} glucose molecules (1)<br>• (which are) joined by glycosidic bonds (1)<br>• 1,4 bonds (1)<br>• amylose AND amylopectin (1)<br>• {amylose, coiled / amylopectin, branched or have 1,6 bonds} (1) | accept anywhere EXCEPT in context of branched<br>accept mixture of | 3 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1bi | An explanation that includes two of the following points.<br>• more starch is synthesised above 20 / 25°C and below 30°C (than at any other temperatures) (1)<br>• (because the manufacture of starch) will involve enzymes (1)<br>• explanation of the effect of temperature change on enzyme activity (1) | accept most made between 20 / 25 and 30<br>accept if implied<br>e.g. effect of temperature on number of {successful collisions of E and S / number of ES complexes<br>effect of temperatures over {30 / | 2 |

| | | | |
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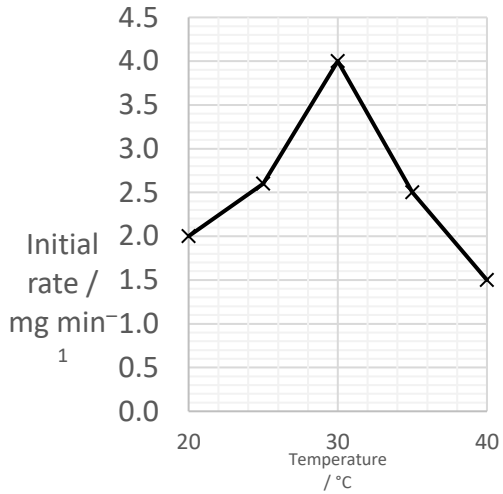
| | | optimum} on enzyme shape / ref denaturation} | |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1bii | A table with the following features:<br><br>• suitable table drawn (1)<br><br>• headings with units (1)<br><br>• only means entered correctly (1) | <table><tr><th>Temperature / °C</th><th>Mean rate of starch synthesis / mg day$^{-1}$</th></tr><tr><td>20</td><td>6.1</td></tr><tr><td>25</td><td>7.3</td></tr><tr><td>30</td><td>7.6</td></tr><tr><td>35</td><td>6.4</td></tr></table>Mp 2 lost if units in cells<br>Mp3 lost if SDs included | 3 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1biii | An answer that includes:<br><br>• value of SD: 0.35 (mg day$^{-1}$) (1)<br><br>plus<br><br>Explanation, one of :<br><br>• when applied to the mean it {overlaps with value at 25 (°C) / does not overlap with value at 35 (°C)} (1)<br><br>• (a measure of) the {variation / dispersion / spread / deviation / fluctuation / variability } (of data) around the mean (1) | Ignore any sign<br><br>a region that includes 68 % of all the data points<br><br>there is a 32 % chance of the value being higher or lower by 0.35<br><br>do not accept range, margin of error | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1biv | An answer that includes the following points:<br><br>• difference between 20 (°C) and 25 (°C) is significant because SDs do not overlap (1)<br><br>• difference between 25 (°C) and 30 (°C) is not significant because SDs do overlap (1) | accept error bars for SDs for all mps<br>do not accept range bars | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1ci | 4.0 (mg $min^{-1}$) (1) | accept 4 | 1 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1cii | A graph with the following features<br><br>• A axes correct (x – temperature, y- initial rate) (1)<br><br>• L all labels correct (x- temperature / ºC, y / initial rate mg $min^{-1}$ / mg/min) (1)<br><br>• P plots correct on a linear scale on both axes (1)<br><br>• S points joined with straight lines (1) |  <br>Ignore plot at 30 °C<br>lose mp P If extend to 0 or 10 C<br>lose mp S extrapolate beyond 40<br>does not have to start at zero on either axis but must what it does start at<br>bar charts lose mp S | 4 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1ciii | An answer that includes any two of the following points:<br><br>• (the initial rate) would not be influenced by a {change / reduction} in substrate concentration (1)<br><br>• (the initial rate) would not be influenced by a {change / build-up} of products (1) | accept substrate concentration would not be a limiting factor<br>accept substrate used up | 2 |

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| | • allows (valid) comparisons of rates (between temperatures) (1) | | |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2ai | An answer that includes four of the following points:<br><br>• use of {water culture / soilless compost} (1)<br><br>• with and without VCL (1)<br><br>• control of appropriate biotic variable (1)<br><br>• control of appropriate abiotic variable (1)<br><br>• remove roots (1)<br><br>• dry to constant mass (1) | accept vermiculite / perlite<br><br>e.g. same {variety / type / cultivar} of tomato plant<br>starting condition {same size / age of seedling / plant}<br>seed source<br>ignore species<br><br>e.g. temperature / pH / light intensity / suitable time for growth (if a time is quoted must be at least a day) / concentration of Hoagland<br>ignore soil<br>accept known in any case<br>accept amount for time only<br><br>accept a description | 4 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2aii | A calculation that includes the following steps.<br><br>• {correct bars identified / difference found} (1)<br><br>• correct division performed correctly and answer multiplied by 100% | e.g. {115 AND 95 / 115 - 95 / 20}<br><br>20 ÷ 95 = 0.21, 0.21 x 100 = 21%<br>accept 21.05 and 21.1<br><br>accept 21.0 for 1 mark | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2bi | An answer that includes the following points:<br><br>Length<br><br>• hard to judge where {top / bottom} of shoot is / shoot {width may vary / may be branched / may be bent} (1)<br><br>Fresh shoot<br><br>• (fresh mass will include) water content which will lead to variability of mass of tissue (1) | accept reverse argument | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2bii | A calculation showing the following steps.<br><br>• correct measurement of {XY / length of shoot} from photograph (1)<br><br>• correct conversion of measurement from mp1 to actual length (1) | inspect photograph for any sign of measurement<br><br>e.g., 38 (mm)<br>accept any value between 37 and 38 (mm)<br>accept if given in cm if correct<br><br>38 x (50 ÷ 5) = 380 (mm0<br>Accept value between 370 and 380<br><br>correct answer with no working gets 2 marks | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2biii | An answer that includes five of the following point:<br><br>• VCL enhances {growth / dry mass / shoot length} when both K and P absent<br><br>• VCL has very small effect on {growth / dry mass / shoot length} when N is absent (1)<br><br>• VCL shows biggest (percentage) increase when no P (1)<br><br>• VCL improves root growth (in all treatments) (1)<br><br>• comment on lack of any data to allow comment on significance of any differences (1)<br><br>• reference to {cost / sustainable / renewable} (1) | accept VCL enhances {growth / dry mass / shoot length}<br>accept comparative words , long**er**, heavi**er** etc.<br><br>accept no effect<br>accept VCL contains K and P but not N for mps 2 and 3<br><br>do not accept reliability<br><br>do not accept climate change | 5 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3ai | An explanation that includes the following points:<br>• (48 hours) allows time for {bacteria to become visible / extract to work} (1)<br>• 30°C {will not allow growth of (human) pathogens / is high enough for adequate growth (in 48 hours)} (1) | accept extract to diffuse into agar | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3aii | An explanation that includes three of the following points.<br>• flame {loop / spreader / neck of culture bottle} **to** {kill the bacteria / sterilise it / disinfect it} (1)<br>• have a Bunsen lit **to** move microorganisms in the air away (1)<br>• lift (receiving) {Petri dish / culture bottle} lid partially **to** minimise entry of bacteria (1)<br>• use disinfectant on workplace **to** kill bacteria (1) | do not accept, goggles,<br>do not accept unqualified {gloves, contamination}<br>accept use sterilised equipment, e.g. pipette, gloves, wash hands before start **so** no bacteria present<br>accept stop bacteria falling in dish | 3 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3bi | An explanation that includes the following points:<br><br>• use of squared paper (1)<br><br>• detail of what to do with paper to get area (1)<br><br>OR<br><br>• measure {diameter / radius} {using callipers / in more than one direction} (1)<br><br>• detail of calculation of area from this (1) | e.g. treatment of part squares<br>do not accept unqualified count squares<br><br>accept micrometer and/or graticule<br>accept different angles<br><br>e.g. $\pi r^2$ | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3bii | type or species of {extract / plant (oil) / bacteria} (1) | Do not accept concentration of extract<br><br>do not accept if DV or controlled variable given in addition to correct IV | 1 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3biii | An answer that includes the following point:<br><br>• a calculation to compare two relevant results between different {oils / bacteria} (1)<br><br>and any three of the following :<br><br>• oil A is a more effective (inhibitor of bacterial growth) than oil B (on both bacteria) (1)<br><br>• both oils are more effective (inhibitors of bacterial growth) on *B. subtilis* (than on *E. coli*) (1)<br>• oil B (inhibits only *B. subtilis* / does not inhibit *E.coli*) / oil A inhibits both bacteria (1)<br><br>• biggest (anti-bacterial) effect is A on *B. subtilis* / smallest (anti-bacterial) effect is B on *E. coli* (1) | penalize the idea that the effect is a stimulus to growth once only.<br><br>e.g. *B. subtilis* 20.66 ÷ 11.33 = 1.82 x more inhibited by A than B<br><br>oil A has 9.33 greater zone of inhibition than oil B on B. subtilis<br><br>oil A affects B. s. 2.4 times more than it affects E. c. or reverse calculation<br><br>many other calculations are possible for the mark<br><br>accept Z.o.I. bigger for more effective<br><br>accept reverse argument<br>do not piece together, must be clearly stated | 4 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3ci | An answer that includes any two from the following points:<br>• size (of antimicrobial molecule) (1)<br>• {solubility (of antimicrobial molecule) / properties of agar} (1)<br>• concentration (of antimicrobial molecules) (1)<br>• (incubation) temperature (1) | accept molecules in extract for antimicrobial molecule<br>accept concentration of extract in well, concentration gradient<br>ignore pH | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3cii | An answer that includes the following points.<br>• calculation of 10% of highest population (1)<br>• reading of concentration of extract that gives 20 alive (1) | e.g. 200 x 0.1=20<br>e.g. 4.3 mg $dm^{-3}$<br>accept 4.4 for **two** marks<br>accept any value between 4.3 and 4.4 for 2<br>accept 4.2 for **one** mark | 2 |

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