



# Mark Scheme (Results)

October 2024

Pearson Edexcel International Advanced Level  
In Biology (WBI16)  
Paper 01 Practical Skills in Biology II

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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              | <p>An answer that includes the following:</p> <ul style="list-style-type: none"> <li>convert starch to maltose (1)</li> </ul> | <p>Allow convert amylose / amylopectin</p> <p>Allow breakdown / digest / hydrolyse</p> <p>Allow convert to glucose</p> | 1    |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Additional Guidance                                                                                                                                                          | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1b              | <p>A description that includes six of the following points:</p> <ul style="list-style-type: none"> <li>use of aseptic technique (1)</li> <li>{cut seed in half / to separate endosperm from embryo} (1)</li> <li>soak <b>both halves</b> in gibberellin (1)</li> <li>use of control (from grains) not soaked in gibberellin (1)</li> <li>place (grain halves cut side down) on <b>starch</b> agar plate (1)</li> <li>incubate for a stated time (range 24-48 hours) / at a {stated / fixed} temperature (1)</li> <li>add iodine (to plate after incubation) (1)</li> <li>description of how results can be compared (1)</li> </ul> | <p>Allow wash with sterile water / sodium hypochlorite also in preparing plate</p> <p>Allow soak in water</p> <p>Do not allow waterbath</p> <p>Ignore zone of inhibition</p> | 6    |

| Question Number | Answer                                                                                                                                                                                                                                                                              | Additional Guidance                                                                                               | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------|
| 1c              | <p>A description that includes three of the following points:</p> <ul style="list-style-type: none"> <li>gibberellin is a transcription factor (1)</li> <li><b>increasing</b> the transcription (of amylase mRNA) (1)</li> <li>(resulting in) translation of amylase (1)</li> </ul> | <p>Ignore genes / cAMP</p> <p>Allow starts / stimulates / enables transcription</p> <p>Allow enzyme / protein</p> | 3    |

(Total for question 1 = 10 marks)

| Question Number | Answer                                                                                                                                            | Additional Guidance                                                                                                                                                                                                                                                                                       | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2a              | <ul style="list-style-type: none"> <li>suitable risk clearly identified (1)</li> <li>reduction of risk identified to the scientist (1)</li> </ul> | <p>Candidates will express this in a number of different ways</p> <p>e.g. breaking fibre damages eye so use goggles / safety screen; allergies to plant / fibre so wear gloves; hydrogen peroxide is irritant so wear gloves; falling masses may cause injury so place a cushion beneath / stand back</p> | 2    |

| Question Number | Answer                                                                                                                                                                 | Additional Guidance                                                                                                              | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------|
| 2b              | <ul style="list-style-type: none"> <li>• correct mean calculated (1)</li> <li>• correct percentage increase (1)</li> <li>• correct answer to 3 sig figs (1)</li> </ul> | <p>ECF for using incorrect means for MP2 and 3</p> <p>834</p> <p>10.432</p> <p>10.4</p> <p>Correct answer only gains 3 marks</p> | 3    |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Additional Guidance                                                                                                                                    | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2ci             | <p>An answer that includes two of the following points:</p> <p><b>Abiotic</b></p> <ul style="list-style-type: none"> <li>• pH (of soil) (1)</li> <li>• water content (of soil) (1)</li> <li>• organic matter (of soil) (1)</li> <li>• concentration of hydrogen peroxide (1)</li> </ul> <p><b>Biotic</b></p> <ul style="list-style-type: none"> <li>• age of { plant / fibre} (1)</li> <li>• species (1)</li> <li>• {diameter / length} of fibre (1)</li> </ul> | <p>Allow humidity (in room)</p> <p>Allow mineral content (of soil), ignore nutrients</p> <p>Allow variety / cultivar / type</p> <p>Allow thickness</p> | 2    |

| Question Number | Answer                                                                                                  | Additional Guidance                                                                                                          | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------|
| 2cii            | <ul style="list-style-type: none"> <li>• description of an appropriate method of control (1)</li> </ul> | <p>Allow control of temperature or other unsuitable variable</p> <p>If water / pH selected it must be controlled in soil</p> | 1    |

| Question Number | Answer                                                                                                                                                                                                                                                                                 | Additional Guidance | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| 2d              | <p>A description that includes two of the following:</p> <ul style="list-style-type: none"> <li>• (long) cells with {secondary thickening / lignin} (1)</li> <li>• end wall present (1)</li> <li>• {dead cells / no cell contents / hollow} (1)</li> <li>• pits present (1)</li> </ul> |                     | 2    |

**Total for question 2 = 10 marks)**

| Question Number | Answer                                                                                                                                                                 | Additional Guidance                            | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------|
| 3a              | <ul style="list-style-type: none"> <li>there is no (significant) difference between the mitotic index at different oxygen concentrations (after 2 days) (1)</li> </ul> | Candidates will express this in different ways | 1    |

| Question Number | Answer                                                                                                                                                                                                                                           | Additional Guidance                                                                                   | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------|
| 3b              | <p>An answer that includes the following:</p> <ul style="list-style-type: none"> <li>suitable table format with correct column headings and units (1)</li> <li>all data correctly entered (1)</li> <li>means correctly calculated (1)</li> </ul> | <p>Allow mitotic index % or au</p> <p>not if units in table</p> <p>5.7 and 4.0<br/>Do not allow 4</p> | 3    |

| Question Number | Answer                                                                                                                                                                                                                                                               | Additional Guidance                                                                                                                                                                                | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3c              | <p>An answer that includes the following:</p> <ul style="list-style-type: none"> <li>bar graph with linear scale starting at <b>zero</b> and axes labelled, with units (1)</li> <li>means plotted correctly (1)</li> <li>range bars plotted correctly (1)</li> </ul> | <p><b>mean</b> mitotic index<br/>allow % as unit for mitotic index<br/>oxygen %</p> <p>ECF using the means from 3b<br/>Allow tolerance of half a small square</p> <p>3.6 to 4.4<br/>5.1 to 6.2</p> | 3    |



| Question Number | Answer                                                                                                                                                      | Additional Guidance                                                                                               | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------|
| 3di             | <ul style="list-style-type: none"> <li>correct substitution of given <math>(SA)^2</math> and <math>(SB)^2</math> (1)</li> <li>correct answer (1)</li> </ul> | <p>Allow ECF if incorrect means used<br/>(denominator is 0.1499923)</p> <p>11.33 / 11.3<br/>Ignore minus sign</p> | 2    |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Additional Guidance                                                                                                                                                              | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3dii            | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>(pea seeds grown) under 20% oxygen have a larger mitotic index than those grown under 5% oxygen (1)</li> <li>the calculated value of <math>t</math> (11.33) is more than the critical value 2.12 (1)</li> <li>(therefore) reject the null hypothesis, the difference in the mitotic index at 5% oxygen compared to 20% oxygen is significant (1)</li> </ul> | <p>Allow any quoted <math>t</math> value and a following correct statement for MP2 and MP3<br/>Allow 2.92 at 1% significance</p> <p>Allow different concentrations of oxygen</p> | 3    |

| Question Number | Answer                                                                                                                                                                                                                                                                          | Additional Guidance                                                                                                       | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------|
| 3e              | <p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• use different temperatures (1)</li> <li>• use different oxygen concentrations (1)</li> <li>• use different times (1)</li> <li>• use different plant species (1)</li> </ul> | <p>Ignore repeat the expt</p> <p>Allow within the 5-20% range or a wider range</p> <p>Allow variety / cultivar / type</p> | 2    |

(Total for question 3 = 14 marks)

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Additional Guidance                                                                                                                    | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------|
| 4a              | <p>A description that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• find a suitable {mass / length} of pondweed (1)</li> <li>• find a suitable temperature/pH (for photosynthesis) (1)</li> <li>• find suitable method to measure the {oxygen / gas} production (1)</li> <li>• find suitable depth(s) of water or light intensity (1)</li> <li>• find a suitable <b>method to change</b> depth of water or light intensity (1)</li> </ul> | <p>A method to provide quantitative results</p> <p>Allow time to measure gas production</p> <p>Allow to change wavelength of light</p> | 2    |

|    | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Additional Guidance                                                                                                                                                                                                                                                                                                                                                                                                                   | Mark |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4b | <p>An answer that includes nine of the following points:</p> <ul style="list-style-type: none"> <li>• clear statement of the dependent variable e.g. the volume of {gas / O<sub>2</sub>} released per <b>unit time</b> (1)</li> <li>• description of method of measuring volume of gas (1)</li> <li>• method of standardising plants (1)</li> <li>• method of producing two (or more) different depths of water or different light intensities (1)</li> <li>• use of (sodium) <b>hydrogencarbonate</b> (1)</li> <li>• allow plant time to acclimatise (1)</li> <li>• {standardised / stated} time for gas collection (1)</li> <li>• one variable that need to be controlled and its method of control (1)</li> <li>• method of calculating rate (1)</li> <li>• {repeats / repeat the whole experiment} and calculate {means / SD's} (1)</li> </ul> | <p>Ignore amount / bubble /rate<br/>Allow distance moved per unit time</p> <p>Allow<br/>photosynthometer / labelled diagram</p> <p>Allow mass /length<br/>Ignore age</p> <p>Allow equilibrate</p> <p>Allow 10 mins to 24hrs (if given)</p> <p>e.g. temp / pH / wavelength / light intensity (if depth is changed) / depth (if light intensity is changed)</p> <p>e.g. distance ÷ time<br/>vol ÷ time<br/>number of bubbles ÷ time</p> | 9    |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Additional Guidance                                                                                                                                                                                                                                       | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4c              | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>table for <b>raw</b> data with headings and units, with means calculated from repeats (1)</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>bar graph format with labelled axes (1)</li> <li>use of a t test for difference (with a bar graph showing only two different light intensities) (1)</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>{line / scatter} graph format with labelled axes (1)</li> <li>use of a correlation test (with a line graph showing more than two different light intensities) (1)</li> </ul> | <p>Reject rate in heading<br/>Allow description of mean calculated in text or mean on one graph label</p> <p>Graph must be clearly sketched or stated</p> <p>Allow named test</p> <p>Graph must be clearly sketched or stated</p> <p>Allow named test</p> | 3    |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                          | Additional Guidance                                                                                                                                       | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4d              | <p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• difficult to measure {distances along capillary tube / volume} with precision (1)</li> <li>• difficult to control surface area of {leaves / plant} (1)</li> <li>• a described difficulty with the apparatus (1)</li> </ul> | <p>Ignore bubbles</p> <p>e.g. oxygen dissolves in water / oxygen used in respiration / temperature change due to lamp / hard to exclude ambient light</p> | 2    |

**Total for question 4 = 16**

