



# Mark Scheme (Results)

Summer 2024

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

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                           | Additional guidance                                                                                  | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------|
| 1(a)            | <p>An explanation that includes two of the following points (in order):</p> <ul style="list-style-type: none"> <li>because the surface area needs to be the same (1)</li> <li>so they have the same {number / amount / substrate} of protein (molecules) (1)</li> <li>to produce valid {(set of) data / results / experiment / test / comparisons} / for validity (1)</li> </ul> | <p>ACCEPT substrate / protein concentration</p> <p>Ignore reliable, accurate, precise, fair test</p> | (2)  |

| Question number | Answer                                                                                                            | Additional guidance                                                                                            | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------|
| 1(b)(i)         | <ul style="list-style-type: none"> <li>water / same solvent (as used to dissolve the enzymes) / buffer</li> </ul> | <p>Accept boiled enzyme</p> <p>Denatured enzyme</p> <p>Ignore any qualification of water, e.g., salt water</p> | (1)  |

| Question number | Answer                                                                                                                                               | Additional guidance                                        | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------|
| 1(b)(ii)        | <ul style="list-style-type: none"> <li>so that any effect can be attributed to the enzymes (and not the solvent) / allows comparisons (1)</li> </ul> | <p>ACCEPT as a baseline</p> <p>ACCEPT reverse argument</p> | (1)  |

| Question number | Answer                                                                                                                | Additional guidance                                               | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------|
| 1(c)            | <ul style="list-style-type: none"> <li>(same) temperature <b>and</b> (same) {time / length / duration} (1)</li> </ul> | DO NOT ACCEPT pH, size of pieces<br>IGNORE volumes, concentration | (1)  |

| Question number | Answer                                                                  | Additional guidance                     | Mark |
|-----------------|-------------------------------------------------------------------------|-----------------------------------------|------|
| 1(d)(i)         | <ul style="list-style-type: none"> <li>12.5 (cm<sup>3</sup>)</li> </ul> | IGNORE other units than cm <sup>3</sup> | (1)  |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Additional guidance                                                                                                                                                        | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(d)(ii)        | A description that includes two of the following points: <ul style="list-style-type: none"> <li>both enzymes decrease the pH (more than in the control) / at higher concentration the decrease in pH is more than at lower concentration / decrease in pH in bromelain more (than in papain) (1)</li> <li>bromelain is more effective at breaking down the protein (than papain) (1)</li> <li>at the higher concentration both enzymes are more effective at breaking down the protein (than at lower concentration) (1)</li> </ul> | ACCEPT lower pH {in bromelain than papain / at high concentration than at low concentration}<br>ACCEPT there is a negative correlation between pH and enzyme concentration | (2)  |



| Question number | Answer                                                                       | Additional guidance | Mark |
|-----------------|------------------------------------------------------------------------------|---------------------|------|
| 2(a)            | <ul style="list-style-type: none"> <li>0.989 / 0.99 / 1.0 / 1 (m)</li> </ul> | ACCEPT 0.994        | (1)  |

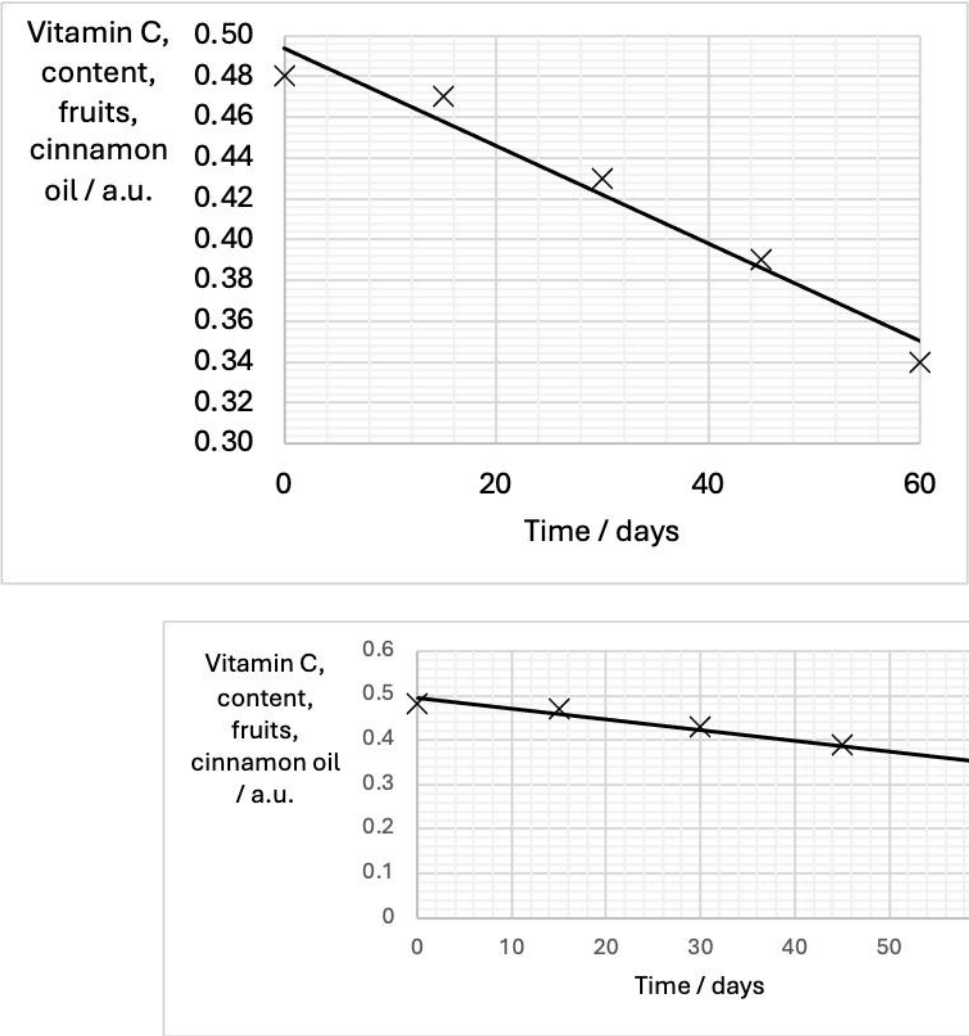
| Question number                                             | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Additional guidance | Mark                   |                                                             |                                                                                     |    |  |                                      |                      |                                                            |                                                                                                                              |                                         |     |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------|----|--|--------------------------------------|----------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----|
| 2(b)                                                        | <table><tr><th>Hazard</th><th>How to reduce the risk</th></tr><tr><td>(using / cutting oneself with) {knife / scissors / scalpel}</td><td>cut {away from fingers / hands / oneself / on a board or tile / wearing gloves} (1)</td></tr><tr><td>OR</td><td></td></tr><tr><td>(contact with / allergy to) fish (1)</td><td>wear {gloves / mask}</td></tr><tr><td>(use of / inhalation of / spilling of) <b>formalin</b> (1)</td><td>use in a well-ventilated room / use in a fume cupboard / wear gloves / wash hands / wear protective eye wear / wear mask (1)</td></tr></table> | Hazard              | How to reduce the risk | (using / cutting oneself with) {knife / scissors / scalpel} | cut {away from fingers / hands / oneself / on a board or tile / wearing gloves} (1) | OR |  | (contact with / allergy to) fish (1) | wear {gloves / mask} | (use of / inhalation of / spilling of) <b>formalin</b> (1) | use in a well-ventilated room / use in a fume cupboard / wear gloves / wash hands / wear protective eye wear / wear mask (1) | ACCEPT preservative liquid for formalin | (4) |
| Hazard                                                      | How to reduce the risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |                        |                                                             |                                                                                     |    |  |                                      |                      |                                                            |                                                                                                                              |                                         |     |
| (using / cutting oneself with) {knife / scissors / scalpel} | cut {away from fingers / hands / oneself / on a board or tile / wearing gloves} (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                        |                                                             |                                                                                     |    |  |                                      |                      |                                                            |                                                                                                                              |                                         |     |
| OR                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                        |                                                             |                                                                                     |    |  |                                      |                      |                                                            |                                                                                                                              |                                         |     |
| (contact with / allergy to) fish (1)                        | wear {gloves / mask}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |                        |                                                             |                                                                                     |    |  |                                      |                      |                                                            |                                                                                                                              |                                         |     |
| (use of / inhalation of / spilling of) <b>formalin</b> (1)  | use in a well-ventilated room / use in a fume cupboard / wear gloves / wash hands / wear protective eye wear / wear mask (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                        |                                                             |                                                                                     |    |  |                                      |                      |                                                            |                                                                                                                              |                                         |     |



| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Additional guidance                                                                                                                                                                                                                                                                                                                                                                                                         | Mark |
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| 2(d)            | <p>An answer that includes 6 of the following points:</p> <ul style="list-style-type: none"> <li>• use minimum of five fish (1)</li> <li>• (of) different sizes (1)</li> <li>• measure the {length / mass / volume} of each fish (1)</li> <li>• measure the {length / mass/ volume} of each heart (1)</li> <li>• detail of fish standardisation of measurement (1)</li> <li>• detail of standardisation of heart {measurement / dissection} (1)</li> <li>• plot a graph of fish size vs heart size / calculate ratios (1)</li> <li>• carry out a (correctly named) correlation test / compare ratios (1)</li> </ul> | <p>ACCEPT more than one quoted size, minimum a big one and a small one</p> <p>ACCEPT diameter</p> <p>ACCEPT diameter</p> <p>e.g., between same points on each fish, preparation of fish prior to measurement (e.g., remove parasites)</p> <p>e.g., length from end of sinus venosus to start of bulbus arteriosus each time, preparation of heart prior to measurement (e.g. empty of blood, remove extraneous tissues)</p> | (6)  |

| Question number | Answer                                                                                                                                                                                                      | Additional guidance                                                                                                                                                                                                                                                                                                              | Mark |
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| 3(a)(i)         | <ul style="list-style-type: none"> <li>percentage decrease of fruit coated with chitosan calculated (1)</li> <li>difference calculated correctly and given to given to 2 significant figures (1)</li> </ul> | <p>34.69387755, or any correct rounding (34.6938776, 34.693878, 34.69388, 34.6939, 34.694, 34.69, 34.7) for the calculation</p> <p>ACCEPT 35 for one mark only</p> <p>e.g. <math>43.75 - 34.69 = 9.06</math><br/> <math>= 9.1</math> to 2 sig figs</p> <p>Incorrect rounding at any intermediate stage can only have 1 mark.</p> | (2)  |



| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                     | Additional guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Mark |
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| 3(a)(ii)        | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>• A-axes correct (x- time, y - Vit Conc,) (1)</li> <li>• L-both axes labelled with suitable title and units (x, Time / days, y, Vitamin C content of fruits coated with cinnamon oil / a.u. (1)</li> <li>• points plotted correctly on linear scale (1)</li> <li>• appropriate line of best fit (1)</li> </ul> |  <p>The top graph shows Vitamin C content (y-axis, 0.30 to 0.50) versus Time / days (x-axis, 0 to 60). The data points are approximately (0, 0.48), (15, 0.47), (30, 0.43), (45, 0.39), and (60, 0.34). A line of best fit is drawn through these points.</p> <p>The bottom graph shows Vitamin C content (y-axis, 0 to 0.6) versus Time / days (x-axis, 0 to 60). The data points are approximately (0, 0.48), (15, 0.46), (30, 0.43), (45, 0.39), and (60, 0.34). A line of best fit is drawn through these points.</p> | (4)  |

| Question number | Answer                                                                                                                                                                                                                                                                                              | Additional guidance                                                                                                                          | Mark |
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| 3(a)(iii)       | <p>A description that includes the following points:</p> <ul style="list-style-type: none"> <li>• repeat {for all 3 groups / experiment} (1)</li> <li>• (calculate) mean <b>and</b> standard deviation (1)</li> <li>• plot (mean and) {standard deviation / error bars} (on a graph) (1)</li> </ul> | <p>IGNORE formula<br/>ACCEPT SD<br/>ACCEPT find</p> <p>ACCEPT range bars<br/>ACCEPT present in a table described<br/>e.g. with SD column</p> | (3)  |

| Question number | Answer                                                                                                                                                                                                                                                                                                                  | Additional guidance                                                                                                                                                                                                                                                                                     | Mark |
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| 3(a)(iv)        | <p>A description that includes three of the following points:</p> <ul style="list-style-type: none"> <li>• describe method to standardise coating method (1)</li> <li>• repeat the investigation under the same conditions as before (1)</li> <li>• use of DCPIP (1)</li> <li>• description of titration (1)</li> </ul> | <p>e.g. dip in it for standard time / do as done in original investigation / same concentrations as in original investigation</p> <p>ACCEPT e.g. temperature, length of time, 60 days, size of fruit, type of fruit</p> <p>IGNORE colour change<br/>e.g. titrate dropwise / using burette / pipette</p> | (3)  |

| Question number | Answer                                                                                                                                                                                                                           | Additional guidance                                                                     | Mark |
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| 3(b)(i)         | <p>A description that includes the following points:</p> <ul style="list-style-type: none"> <li>take readings at the (bottom of the) meniscus (1)</li> <li>hold the pipette at eye level when taking the readings (1)</li> </ul> | <p>ACCEPT reverse argument<br/>ACCEPT avoid parallax error<br/>ACCEPT perpendicular</p> | (2)  |

| Question number | Answer                                                                                                      | Additional guidance                                                     | Mark |
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| 3(b)(ii)        | <ul style="list-style-type: none"> <li><math>1 \times 10^5</math> / <math>1.0 \times 10^5</math></li> </ul> | <p>ACCEPT <math>1 \cdot 10^5</math><br/><math>1.0 \cdot 10^5</math></p> | (1)  |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Additional guidance                                                                                                                                                                                    | Mark |
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| 3(b)(iii)       | <p>An explanation that includes two of the following points:</p> <ul style="list-style-type: none"> <li>{aseptic technique / description of aseptic technique} to avoid contamination of {cultures with other bacteria / ourselves with bacteria (which could be pathogenic)} (1)</li> <li>{leave the lid loose / only partially seal lid} (of Petri dish onto base) so that {conditions are aerobic / anaerobic bacteria (which could be pathogenic) do not grow} (1)</li> <li>growing bacteria at temperatures {slightly below <math>37^\circ\text{C}</math> / no higher than <math>35^\circ\text{C}</math> / body temperature} to decrease growth of pathogenic bacteria (1)</li> </ul> | <p>ACCEPT harmful, disease causing for pathogenic<br/>IGNORE irritant, allergy</p> <p>IGNORE to kill microbes<br/>ACCEPT infection</p> <p>ACCEPT taped vertically</p> <p>ACCEPT forming pathogenic</p> | (2)  |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Additional guidance                                                                                                                                                                                        | Mark |
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| 3(b)(iv)        | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>• different types of agar used as bacteria and fungi have different nutritional requirements (1)</li> <li>• higher temperature for bacteria because the {enzymes / metabolism} of bacteria have a higher optimum (temperature than the enzymes of fungi) (1)</li> <li>• fungi cultured for longer as they have a slower {growth / reproductive} rate (than bacteria) (1)</li> </ul> | <p>ACCEPT food</p> <p>ACCEPT reverse argument<br/>ACCEPT enzyme / metabolism optima different</p> <p>ACCEPT reverse argument<br/>ACCEPT growth rates different<br/>ACCEPT fungi take more time to grow</p> | (3)  |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Additional guidance                                                                                      | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------|
| 3(b)(v)         | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>• uses {a range / more than one species} (of microorganism) / bacteria and fungi} so conclusion is (more) representative</li> <li>• uses only four microbes so conclusion is not representative (1)</li> <li>• no {data given for uncoated fruit / control} so do not know if either coating has an (antimicrobial) effect (1)</li> <li>• no {error bars / SDs / repeats} so cannot judge if the {differences are statistically significant / there is no measure of variability (1)</li> <li>• measures diameter, direct area measure would be better <i>because</i> zone not always circular (1)</li> <li>• no indication of concentration of coating substance so may not be {representative / optimal} (1)</li> </ul> | <p>ACCEPT the differences are small so cannot judge if the differences are statistically significant</p> | (4)  |