# Mark Scheme (Results)

# June 2022

Pearson Edexcel International Advanced Level In Biology

(WBI16) Paper 01

Practical Skills in Biology II

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1a** | • Zebra fish are {not caused pain/given a painful stimulus / returned to the source to prevent {ecological change / maintain population} ; | Accept no physical damage / stress / humane conditions / not harmed<br><br>Ignore no licence needed / not against the law / they are social fish / has a simple nervous system or does not feel (much) pain unqualified<br>ignore ethical comments | **(1)** |

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| **1bi** | • Correct expected value calculated (1)<br><br>• Correct use of formula (1)<br><br><br>• Correct answer (1) | No ECF<br>36<br><br>$\dfrac{44\text{-}36}{36}$ + $\dfrac{28\text{-}36}{36}$<br><br>Other values can be awarded as long as two sums are being added<br><br>3.56 or 3.556<br><br>Correct answer with no working gains 3 marks<br>32/9 is MP 1 and 2 only | **(3)** |

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| **1bii** | • {prediction was correct / **null** hypothesis was accepted} as the value of chi squared is less than the critical value (1) | As we do not know their calculated value allow converse statements.<br><br>Must state the calculated/chi squared value is more / less than the critical value/3.84<br><br>Accept there is no difference as the value of chi squared is less than the critical value/ore converse<br><br>Ignore hypothesis unqualified | **(1)** |

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| **1ci** | An answer that makes reference to one of the following:<br>*abiotic*<br>• (water) temperature<br><br>• light intensity<br><br>• pH | Accept comment on water quality/oxygen concentration<br><br>Accept wavelength of light | **(1)** |

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| 1cii | • variable with suitable control method described (1)<br><br>• {results are not valid / description of expected effect on the dependent variable} (1) | For temperature allow *thermostatic* water bath / tank heater / air conditioned room / AC / incubator<br>Accept thermometer with a suitable method to adjust temperature<br><br>Accept an increase or decrease but not just affected/changed<br>Accept control and effect of a biotic variable | (2) |

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| 1d | • so fish cannot {learn (from past experience) / become habituated} | Accept {fish could become habituated (if used more than once) (behavioural) stress / eq / might develop a preference / go to the same colour again }<br>Ignore harm unqualified/ethical issues/explanations | (1) |

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| 2a | A description that includes six of the following points: | | |
| | • dependent variable is the volume of juice needed to decolourise (DCPIP) (1) | **Ignore** amount unqualified<br>Accept volume of DCPIP that stays blue if added to a fixed volume of juice | |
| | • (method of) making a juice extract of fruit (1) | Accept crushing / pestle and mortar / eq | |
| | • (control of) {mass / concentration(s) / volume} of DCPIP<br> **OR** {mass of fruit / volume of juice} (1) | Ignore pH / temperature / age of fruit | |
| | • DCPIP colour changes from blue to {colourless / juice colour / pink} (1) | Accept colourless juice stays blue (when DCPIP added) | |
| | • (record the) volume of {juice / DCPIP} needed to {change colour / reach end point} (1) | Accept titrate/ number of drops | |
| | • Description of how to calculate concentration of Vit C (1) | Accept {use of calibration curve / comparison with a standard concentration of vit C} | |
| | • repeats (for each treatment) and calculate a mean / standard deviation (1) | Accept average | **(6)** |

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| 2b | • correct subtraction (1)<br><br>• correct answer (1) | example of calculation:<br><br>223.3 – 92.7   or   <u>130.6</u><br><br><br>141                OR                8.5<br><br>Answer must be to 3 sig figs<br>Correct answer with no working gains full marks | (2) |

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| 2c | A description that includes the following points:<br><br>• (release of) thromboplastin  (1)<br><br>•  prothrombin into thrombin (1)<br><br>• fibrinogen into fibrin (1)<br><br>• fibrin traps {red blood cells / platelets} (1) | MAX 3 marks if one correct statement is in the wrong order of events<br>Ignore plasmin/plasminogen<br><br><br><br><br><br>Accept (fibrin) mesh holds RBC's / eq | (4) |

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| **3a** | • There is no (significant) **difference** between the **diameter** of control stems and experimental stems | Accept no difference between the diameters of the two groups | **(1)** |

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| 3b | <ul><li>suitable table format with data (1)</li><li>correct column headings with units (1)</li><li>means correctly calculated (1)</li></ul> | Example table<br><br>| **Stem** diameter / mm | |<br>| Control stems | Bent stems |<br>| 17.15 | 17.34 |<br>| 17.52 | 18.16 |<br>| 17.57 | 17.61 |<br>| 17.03 | 18.14 |<br>| 17.26 | 17.64 |<br>| 17.31 | 18.14 |<br>| 17.09 | 17.95 |<br>| 17.38 | 17.78 |<br>| 17.41 | 17.69 |<br>| 17.21 | 17.84 |<br>| 17.34 | 17.99 |<br>| 17.16 | 17.95 |<br>| 17.15 | 17.89 |<br>| 17.32 | 18.16 |<br>| 17.60 | 18.22 |<br>| **17.3(0)** | **17.9(0)** |<br><br>Not 17        18   as mean values<br><br>Means can be to two places or one but not mixed / Means do not have to be in the table<br>Ignore errors in table data eg 17.6 instead of 17.60<br>Not MP2 if units in the body of the table | (3) |

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| 3c | • bar graph with labels, units and linear scale (1)<br><br>• means plotted correctly (1)<br><br>• range bars plotted correctly (1) | mean diameter /mm and group / eq<br>BAR GRAPH MUST START AT ZERO AND NO BROKEN SCALE<br><br>Allow ECF from 3bi<br><br>17.34 -18.22<br>17.03 - 17.60<br><br>MP2 and 3 can be awarded for line graph | (3) |

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| 3di | • correct substitution of given $(SA)^2$ and $(SB)^2$ (1)<br><br>• correct answer (1) | Allow wrong means used for2 marks<br><br>ie 0.03 and 0.06<br><br>7.75<br>Accept 7.746 / 7.7459<br><br>MP2 only for 34.6 / 34.64 / 34.641 | (2) |

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| **3d ii** | <ul><li>the calculated value of t (7.75) is **more than** the critical value 2.05 (at p=0.05) (1)</li><li>therefore reject the {**null** hypothesis/H$_0$}, there is a difference between the diameter of control and experimental stems (1)</li></ul> | Allow use of any quoted value as the calculated value (from3di  so reverse statements<br><br>Allow use of p=0.01 and critical value of 2.76<br><br><br>Allow reverse statement if calculated value is stated / shown as less than 2.05 | **(2)** |

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| **3e** | An explanation that includes two of the following:<br><ul><li>the {seeds/plants} may have been {different varieties / genetically different} (1)</li><li>plants may bend for other reasons eg phototropism / light direction (1)</li><li> the range bars **overlap**</li></ul> | Ignore IAA/auxins | **(2)** |

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| **4a** | A description that includes the three of the following:<br><br>• find suitable ages of seedlings (1)<br><br>• find a suitable temperature for respiration/growth (1)<br><br>• find a suitable time for measuring a volume of gas (1)<br><br>• find a suitable {mass / number} of seedlings (to give measurable results)(1)<br><br>• find a suitable {pH / watering regime} for {respiration / growth} (1) | Ignore practice the method…<br><br><br><br><br>Accept find a suitable time to give measurable results | **(3)** |

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| **4b** | An answer that includes eight of the following points:<br><br>• MP1 clear statement of the dependent variable e.g. volume of gas / distance moved by meniscus (1)<br><br>• MP2 appropriate description or diagram of apparatus used (1)<br><br>• MP3 use seedlings of different ages (1)<br><br>• MP4 record time for a measured distance of the meniscus/volume from gas syringe (1)<br><br>• MP5  do with and without soda lime (1)<br><br>• MP6 description of how to find the volume of oxygen used (1)<br><br>• MP7 temperature needs to be controlled (1)<br><br>• MP8 use of a thermostatic device to control temperature (1)<br><br>• MP9 sterilise the (surface of) seeds (1)<br><br>• MP 10 formula for calculating RQ (1) | Accept RQ<br><br><br>Accept test tube with capillary tube / gas syringe the apparatus must be able to work<br><br><br>Accept age in days or weeks only<br><br><br>Accept record distance meniscus moved in a set time<br><br><br><br>Accept distance x area / reading gas syringe / subtract one gas reading from another to give $CO_2$ produced<br><br><br><br><br><br><br>Carbon dioxide released ÷ oxygen consumed | **(8)** |

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| **4c** | • table to record data with headings. appropriate units and means calculated from repeats (1) | table should have space or columns for repeats. means can be stated somewhere else. Accept units as appropriate once, either in the table or graph RQ has no unit | |
| | • line/scatter graph format with labelled axes (1) | Accept bar graph if only two ages tested | |
| | • use of an appropriate (named) statistical test (1) | t test if only two ages otherwise a correlation test or named test Allow a stats test that relates to the data collected in the table | **(3)** |

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| **4d** | An answer that includes two of the following:<br><br>• difficult to measure {distances / volumes of gas} (1)<br><br>• (difficult to prevent) contamination of mung beans (1)<br><br>• difficult to decide if seedings are germinating at the same rate (1)<br><br>• seedlings may change from aerobic to anaerobic respiration (during investigation) (1) | Ignore amount<br><br>Accept changes in {atmospheric pressure / temperature} change volume of gas<br><br>Accept infected<br><br>Accept seedlings may have a different starch / protein content | **(2)** |