Unit 6 - Mark scheme

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 1(a) | A description that includes five of the following points:<br><br>• dependent variable identified (1)<br><br>• range of at least five suitable temperatures (1)<br><br>• description of how to obtain quantitative results (1)<br><br>• time measurement to obtain rate (1)<br><br>• carbon dioxide needs to be absorbed (1)<br><br>• control of temperature with a thermostatic water bath (1)<br><br>• {same / stated} time for exposure to each temperature to equilibrate (1)<br><br>• repeats (at each temperature) and calculate a {mean / standard deviation} (1) | For example, oxygen consumption<br><br>Accept temperatures within the range of 0 to 40 °C, e.g. measurement of coloured liquid movement / use of a respirometer / use of hydrogen carbonate indicator<br><br>Accept reference to use of KOH<br><br>Accept description of how temperature is controlled, e.g. Bunsen burner and thermometer | (5) |

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|---|---|---|
| 1(b) | An answer that includes any two of the following:<br><br>• age of seeds (1)<br><br>• {species / variety} of seeds (1)<br><br>• {mass / number} of seeds (1)<br><br>• water available to seeds (1) | (2) |

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| 1(c)(i) | • variable with suitable control method described | For example, (age of seeds) choose seeds from the same plant / pod / packet | (1) |

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| 1(c)(ii) | • results are not valid / description of expected effect on the dependent variable | For example, older seeds may respire more slowly | (1) |

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| 1(d) | An explanation that includes the following points:<br><br>• reduced growth because {increase in anaerobic / decrease in aerobic} respiration (1)<br><br>• therefore less ATP produced (1)<br><br>• therefore less energy available for growth (1) | <br><br><br><br>Accept ethanol produced<br><br>Accept (ethanol) inhibits growth | (3) |

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| 2(a) | • total calculated and divided by 5<br><br>Example of calculation:<br><br>1405 ÷ 5 = 281 | (1) |

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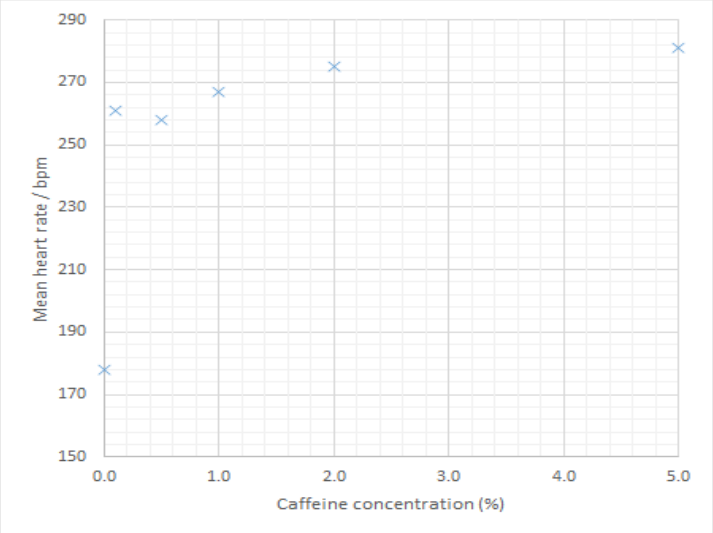
| 2(b) | Graph plotted to show the following:<br>• labelled axes with correct orientation and linear scale (1)<br>• data plotted as {scatter graph / line graph} (1)<br>• all points plotted correctly (1)<br>Allow ecf from 2a<br>Example graph:<br>  <br> | (3) |

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| 2(c) | An answer that includes the following points:<br>• there will be no (significant) correlation (1)<br>• between the caffeine concentration and the (*Daphnia*) heart rate (1) | (2) |

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| 2(d) | An explanation that includes the following points:<br>• simple nervous system (1)<br>• so less likely to suffer {pain / stress} (1)<br>or<br>• abundant in nature (1)<br>• so not affecting food chain (1) | Accept invertebrate nervous system | (2) |

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| 2(e)(i) | • calculate the value of $d^2$ (1)<br>• calculate the value of $6\Sigma d^2$ (1)<br>• calculate the value of $r_s$ (1)<br>Example of calculation:<br>$\Sigma d^2 = 2$<br>$6\Sigma d^2 = 12$<br>$r_s = 0.943$ | Allow ecf from first or second marking point<br>Correct answer with no working shown gains full marks | (3) |

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| 2(e)(ii) | An explanation that includes any five of the following points:<br>• as caffeine concentration increases, heart rate increases (1)<br>• critical value is 0.886 (1)<br>• calculated value (0.943) is higher than critical value (1)<br>• therefore reject the null hypothesis (1)<br>• there is a significant positive correlation between concentration of caffeine and heart rate (1)<br>• low concentrations have a large effect, higher concentrations give a smaller increase (1) | (5) |

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|---|---|---|
| 3(a) | An answer that includes any two of the following points:<br>• risk of growing {bacteria / fungi} (1)<br>• {growth regulators / plant tissue} may cause allergic reaction (1)<br>• sharp instruments / other sensible risk (1) | (2) |

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| 3(b) | A description that includes any three of the following points:<br>• find suitable range of concentration of growth regulator (1)<br>• find suitable method for measuring amylase activity (1)<br>• find the time taken for amylase production (1)<br>• identify {other / named} variable that needs to be taken into account (1) | (3) |

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| 3(c) | An answer that includes ten of the following points:<br>• appropriate measurement of dependent variable (1)<br>• measure the dependent variable several times and calculate a mean (1)<br>• at least five concentrations of growth regulator (1)<br>• description of how growth regulator is applied (1)<br>• description of using the endosperm (1)<br>• reference to aseptic conditions (1)<br>• stated time period for incubation (1)<br>• description of using starch as a substrate (1)<br>• description of using iodine solution (1)<br>• repeats at each concentration and mean calculated (1)<br>• control of one variable relating to the cereal grains (1)<br>• control of one other standardised variable (1) | For example, measuring diameter of clear zone<br>Accept description of aseptic methods | (10) |

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| 3(d) | A description that includes the following points:<br>• table with headings (1)<br>• means calculated from repeats (1)<br>• {scatter / line} graph format with labelled axes (1)<br>• use of an appropriate statistical test (1) | For example, (Pearson's) correlation coefficient or Spearman's rank | (4) |

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| 3(e) | An answer that includes any three of the following points:<br>• difficult to control {all variables / or a named variable} (1)<br>• another factor may be limiting effect of growth regulator (1)<br>• possible contamination with {bacteria / fungi} (1)<br>• more than one growth regulator may be involved (1) | (3) |