Unit 6 - Mark scheme

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

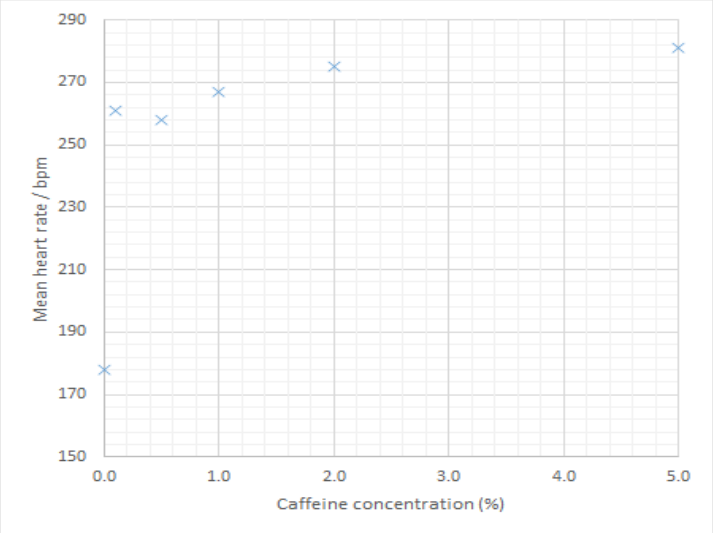
Question number	Answer	Mark
1(b)	An answer that includes any two of the following: • age of seeds (1) • {species / variety} of seeds (1) • {mass / number} of seeds (1) • water available to seeds (1)	(2)

Question number	Answer	Additional guidance	Mark
1(c)(i)	• variable with suitable control method described	For example, (age of seeds) choose seeds from the same plant / pod / packet	(1)

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

Question number	Answer	Additional guidance	Mark
1(d)	An explanation that includes the following points: • reduced growth because {increase in anaerobic / decrease in aerobic} respiration (1) • therefore less ATP produced (1) • therefore less energy available for growth (1)	 Accept ethanol produced Accept (ethanol) inhibits growth	(3)

Question number	Answer	Mark
2(a)	• total calculated and divided by 5 Example of calculation: 1405 ÷ 5 = 281	(1)

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

Question number	Answer	Mark
2(c)	An answer that includes the following points: • there will be no (significant) correlation (1) • between the caffeine concentration and the (*Daphnia*) heart rate (1)	(2)

Question number	Answer	Additional guidance	Mark
2(d)	An explanation that includes the following points: • simple nervous system (1) • so less likely to suffer {pain / stress} (1) or • abundant in nature (1) • so not affecting food chain (1)	Accept invertebrate nervous system	**(2)**

Question number	Answer	Additional guidance	Mark
2(e)(i)	• calculate the value of d^2 (1) • calculate the value of $6\Sigma d^2$ (1) • calculate the value of r_s (1) Example of calculation: $\Sigma d^2 = 2$ $6\Sigma d^2 = 12$ $r_s = 0.943$	Allow ecf from first or second marking point Correct answer with no working shown gains full marks	**(3)**

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

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

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

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

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

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