Question Number	Answer	Additional Guidance	Mark
1(a)	1. **dependent variable** identified as heart rate ; 2. both pesticides used ; 3. allow *Daphnia* to {acclimatise / equilibrate / eq} (in the pesticide) ; 4. description of how to obtain quantitative results ; 5. credit one detail of methodology ; 6. take several readings **and** calculate a mean ;	**MP1** ACCEPT 'beats per minute' for heart rate, the DV must be a clear statement **MP2** ACCEPT both named pesticides **MP3** ACCEPT reference to chemicals **MP4** e.g. pencil and dots for set time period, count heart beats for stated time **MP5** e.g. controlling temperature, obtaining *Daphnia* from pesticide free water, use of a cavity slide, immobilising *Daphnia* with cotton wool, same concentration of pesticides, same size *Daphnia*	**(5)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	**Abiotic variables** Any **one** of 1. concentration of pesticide ; 2. pH ; 3. {oxygen / carbon dioxide} concentration ; 4. temperature ; 5. solvent / eq ; **Biotic variables** Any **one** of 1. species of *Daphnia* ; 2. sex of *Daphnia* ; 3. {mass / size / age} of *Daphnia* ; 4. {genotype / eq} of *Daphnia* ;	If the candidate gives both an abiotic factor and a biotic factor (for each), mark = 0	**(2)**

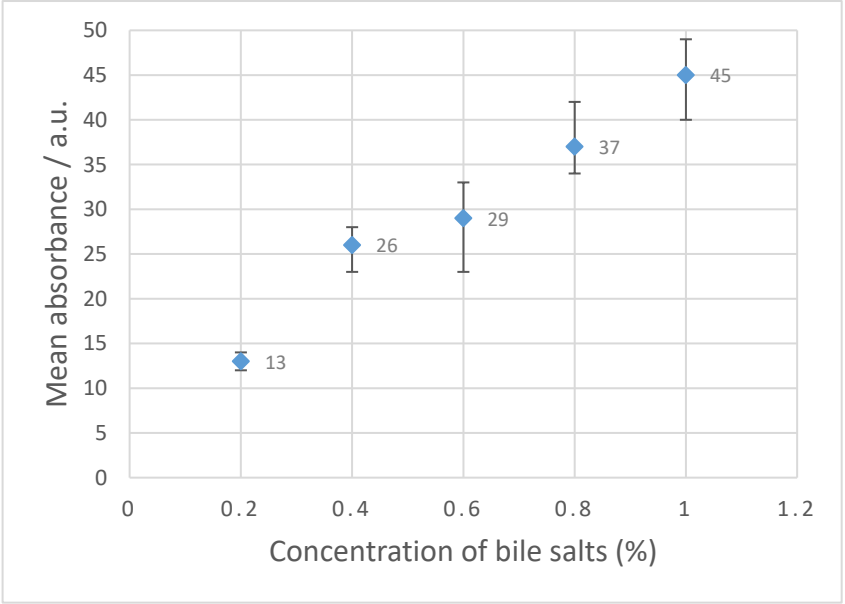
Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	1. variable with suitable control method described ; 2. results are not valid / description of expected effect on the dependent variable ;	**MP1** eg use a thermostatically controlled water bath, temperature controlled room **MP2** the effect must be qualified, i.e. a decrease or an increase in heart rate	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)	1. pesticides may be water soluble ; 2. so enter by {diffusion / facilitated diffusion} ; 3. absorbed by heart (muscle) cells / alters nerve function / alters (muscle) contraction / eq ; OR 1. pesticides may be lipid soluble ; 2. so dissolve in lipids in membranes ; 3. absorbed by heart (muscle) cells / alters nerve function / alters muscle contraction / eq ;	**MP1** ACCEPT dissolve in water **MP2** ACCEPT a description of diffusion, e.g. down a concentration gradient **MP3** ACCEPT reference to nerve ganglion / SAN Ignore effect on hormones/protein synthesis **MP3** ACCEPT reference to nerve ganglion / SAN Ignore effect on hormones/protein synthesis	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. there will be no significant correlation ; 2. between the **concentration of bile salts** and the {absorbance / release of pigments / eq} ;	**MP1** ACCEPT no significant relationship	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. suitable table format ; 2. correct column headings with units ; 3. all raw data and means correct ;	Example table **MP2** do not accept if units are repeated in the column	**(3)**

Concentration of bile salts (%)	**Absorbance / a.u.**			**Mean**
0.2	13	14	12	13
0.4	28	27	23	26
0.6	31	23	33	29
0.8	35	42	34	37
1.0	49	46	40	45

Question Number	Answer	Additional Guidance	Mark
2(c)	1. axes correct orientation, labelled and linear scale ; 2. data plotted correctly ; 3. range bars plotted correctly ;	ALLOW ECF from 2b  IGNORE line of best fit or line joining points	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(d)	1. there is a significant (positive) {correlation / relationship} between the concentration of bile salts and the absorbance ; 2. the critical value identified as 0.48 ; 3. calculated value (0.95) is greater than the critical value / eq ; 4. therefore reject the null hypothesis ;	**MP2** ACCEPT the critical value indicated on the table of values **Note**: 0.95 > 0.48 gains **MP2** and **MP3**	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(e)	1. a named beetroot factor may not have been { controlled / measured } ; 2. no information on the source of bile / eq ; 3. volume of solutions not stated ; 4. credit a factor relating to the colorimeter ; 5. idea that there is only limited data / range of concentrations used / mean based on only {three readings / three replicates} ; 6. comment on variability of raw data / no S.D. calculated / (some) range bars overlap / large S.D. / low variability at 0.2% large variability at 0.6% ;	**MP1** e.g. beetroot pre-treatment, size of cylinders, age of beetroot, part of beetroot **MP4** e.g. wavelength, filter, calibration, use matched cuvettes **MP5** IGNORE 'small sample size' unless qualified	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(a)	1. risk of contact with harmful organisms / eq ; 2. risk that plants may cause allergic reaction / injury / eq ; 3. identify one other sensible risk such as danger from falling ice / remote location / eq ; 4. risk of hypothermia / eq ;	**MP1** e.g. insect bites **MP2** ACCEPT plants are prickly, have thorns **MP3** ACCEPT tripping on rocks, slip on ice **MP4** ACCEPT low temperatures, frostbite, exposure to sunlight	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. practise the method to see if it works ; 2. find suitable size of quadrat / eq ; 3. find suitable length for transect to show changes / eq ; 4. identify different plant species / find suitable key ; 5. find a suitable method of measuring abundance ; 6. identify one named factor that needs to be taken into account ;	**MP3** ACCEPT determine distance between quadrats, or find a suitable range of distances **MP5** ALLOW percentage cover	**(3)**

Question Number	Answer	Additional Guidance	Mark
*3(c)	**QWC -Spelling of technical terms must be correct and answer must be organised in a logical sequence** 1. description of method used to collect data ; 2. stated distances from the glacier for the samples ; 3. dependent variable identified as the abundance of plant species ; 4. {count / record} number of { plants / species } / find percentage cover (of each species) ; 5 and 6. two other variables that could affect abundance ;; 7 and 8. description of how these variables are measured ;; 9. description of how to collect repeat data ; 10. means calculated from repeat data ;	**MP1** e.g. use of quadrat (of defined size) / transect **MP2** e.g. 'every 3 metres' **MP3** ACCEPT a suitable statement about what they are going to measure **MP4** Accept % frequency **MP9** e.g. use a transect parallel to the first / several quadrats at each distance	**(10)** 8+2 QWC

Level	Mark	Descriptor
Level 1	0	The account is very disorganised and is very difficult to follow. Scientific vocabulary is very limited with many spelling and grammatical errors.
Level 2	1	There is some disorganisation in the account which is not always in the correct sequence. Some relevant scientific vocabulary is used. The account is not always in continuous prose and there are grammatical errors and some important spelling mistakes.
Level 3	2	The account is well organised with no undue repetition and a correct sequence. There is good use of scientific vocabulary in the context of the investigation described. The account is written in continuous prose which is grammatically sound with no major spelling errors.

Question Number	Answer	Additional Guidance	Mark
3(d)	1. table with headings and units ; 2. means calculated from repeats ; 3. appropriate graph format with both axes labelled ; 4. use of an appropriate statistical test ;	**MP4** ACCEPT e.g. correlation (coefficient) OR test for difference (e.g. Mann-Whitney, *t*-test), consistent with data	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(e)	1. {other variables / or a named variable} might affect species present ; 2. idea of seasonal variations affecting the actual species present ; 3. idea of weather conditions preventing plants from being seen ; 4. idea of difficulty of {identifying / counting} plant species ;	**MP1** ACCEPT not all variables affecting species present were considered / eq **MP4** ACCEPT idea that determining the percentage cover is subjective, it is difficult to measure the area covered by plants	**(3)**

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