Mark Scheme (Results)

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Pearson Edexcel International Advanced Level Biology (WBI06) Paper 01 Practical Biology and Investigative Skills

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

- Crossed out work should be marked UNLESS the candidate has replaced it with and alternative response.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer. ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication
Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
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- select and use a form and style of writing appropriate to purpose and to complex subject matter

- organise information clearly and coherently, using specialist vocabulary when appropriate.

  Full marks will be awarded if the candidate has demonstrated the above abilities.
  Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Additional Guidance	Mark
1(a)	1. **dependent variable** identified as heart rate ;	**MP1** ACCEPT 'beats per minute' for heart rate, the DV must be a clear statement	
	2. both pesticides used ;	**MP2** ACCEPT both named pesticides	
	3. allow *Daphnia* to {acclimatise / equilibrate / eq} (in the pesticide) ;	**MP3** ACCEPT reference to chemicals	
	4. description of how to obtain quantitative results ;	**MP4** e.g. pencil and dots for set time period, count heart beats for stated time	
	5. credit one detail of methodology ;	**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*	
	6. take several readings **and** calculate a mean ;		**(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 ;	**MP1** ACCEPT dissolve in water	
	2. so enter by {diffusion / facilitated diffusion} ;	**MP2** ACCEPT a description of diffusion, e.g. down a concentration gradient	
	3. absorbed by heart (muscle) cells / alters nerve function / alters (muscle) contraction / eq ;	**MP3** ACCEPT reference to nerve ganglion / SAN Ignore effect on hormones/protein synthesis	
	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 ;	**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 | 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	 **MP2** do not accept if units are repeated in the column	**(3)**

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 *Graph: Mean absorbance / a.u. (y-axis, 0–50) vs Concentration of bile salts (%) (x-axis, 0–1.2). Plotted points with range bars: (0.2, 13), (0.4, 26), (0.6, 29), (0.8, 37), (1, 45).* 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 ;	**MP1** e.g. insect bites	
	2. risk that plants may cause allergic reaction / injury / eq ;	**MP2** ACCEPT plants are prickly, have thorns	
	3. identify one other sensible risk such as danger from falling ice / remote location / eq ;	**MP3** ACCEPT tripping on rocks, slip on ice	
	4. risk of hypothermia / eq ;	**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 ;	**MP1** e.g. use of quadrat (of defined size) / transect	
	2. stated distances from the glacier for the samples ;	**MP2** e.g. 'every 3 metres'	
	3. dependent variable identified as the abundance of plant species ;	**MP3** ACCEPT a suitable statement about what they are going to measure	
	4. {count / record} number of { plants / species } / find percentage cover (of each species) ;	**MP4** Accept % frequency	
	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 ;	**MP9** e.g. use a transect parallel to the first / several quadrats at each distance	
	10. means calculated from repeat data ;		**(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)**