Mark Scheme (Results)

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Pearson Edexcel International Advanced Level In Biology Pearson Edexcel (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 an alternative response.

Question Number	Answer	Additional guidance	Mark
1(a)	1. method of touching worm qualified ;	1. e.g. use a glass rod, use a cotton bud, touch with the same force **IGNORE** touch with finger unqualified	
	2. description of how to obtain quantitative results ;	2. e.g. record time taken for the worm to extend, number of stimuli / time before there is no response	
	3. need for earthworms to { recover / acclimatise } ;		
	4. standardised method to adjust light intensity ;	4. e.g. closing the blinds, use different wattage lightbulbs, alter the distance from light source	
	5. use { several / other / more } earthworms at each light intensity ;	5. e.g. minimum of 3 worms	
	6. repeat and calculate mean values ;	6. **ACCEPT** average	
			(5)

Question Number	Answer	Additional guidance	Mark
1(b)(i)	1. { age / size / species / mass / length / eq } of earthworm ; 2. temperature ; 3. humidity / eq ;	 3. **ACCEPT** moisture	 **(2)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	1. method of control of variable ; 2. effect if variable not controlled ;	1. **ACCEPT** methods of control variables not given credit in 1(b)(i) e.g. noise	 **(2)**

Question Number	Answer	Additional guidance	Mark
1(c)	1. each response uses { energy / ATP } ;	1. **ACCEPT** wastes energy **OR** energy is not wasted / saved or is conserved (if worm is habituated)	
	2. (this) energy could be used for a named purpose ;	2. e.g. growth / reproduction / movement / digestion / feeding / avoiding predators IGNORE respiration / metabolism unqualified	
	3. idea that response to a repeated stimulus does not increase chance of survival ;	3. **ACCEPT** not responding to a repeated stimulus increases chance of survival	
	4. the earthworm is showing a form of { learning / habituation } ;		
		'There will be more energy for feeding' gains MP1 and 2	**(3)**

Question Number	Answer	Additional guidance	Mark
2(a)	1. there is no **significant difference** ; 2. between the variety of wheat and the number of infected shoots / eq ;	**ACCEPT** for MP1 and MP2 'the difference between the number of infected shoots of each variety is not significant'	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)	1. two means correctly calculated to the same number of decimal places ; 2. table drawn with headings ; 3. all raw data and means entered in table ;	1. Giza 11, 11.3 or 11.25 and Sakha 9, 8.8, 8.75 Example table: {table below}	**(3)**

Example table:

Wheat Variety	Number of shoots with larvae												Mean
Giza	10	12	15	17	12	6	13	10	12	13	7	8	11.3
Sakha	4	6	5	13	7	6	13	9	14	11	10	7	8.8

Question Number	Answer	Additional guidance	Mark
2(c)	A axes with linear scales and suitable labels ; P means plotted accurately as bar graph ; B range bars plotted ;	**DO NOT ACCEPT** a.u. P: ALLOW ECF from means in 2(b) Giza range 6 – 17 Sakha range 4 – 14	**(3)**
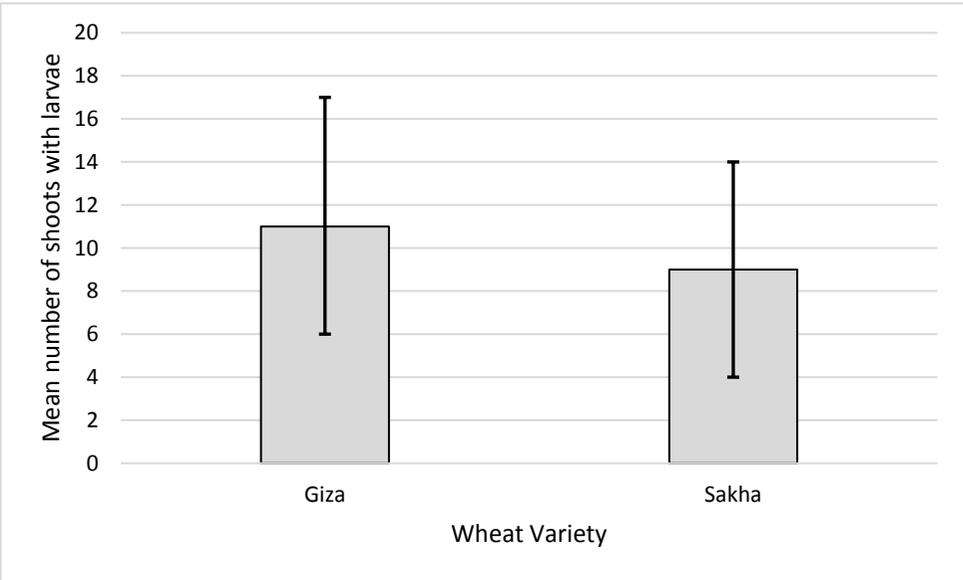
Question Number	Answer	Additional guidance	Mark
2(d)	1. 37 identified (as critical value at p=0.05) ; 2. the { calculated value / eq } is greater than the { critical value / eq } ; 3. the null hypothesis can be accepted ; 4. there is **no significant difference** between variety of wheat and the number of infected shoots / eq ; 5. comment on variability of data ;	2. 44 is greater than 37 = MPs 1 & 2	**(4)**

Question Number	Answer		Mark
2(e)		**IGNORE** genetic differences	
	1. idea that a **named** environmental factor may not have been taken into consideration ;	1. e.g. soil type, mineral content, humidity, temperature, planting density, light intensity, wind speed, pesticides, water	
	2. small sample size / only 12 samples of each wheat variety / eq ;	2. **IGNORE** only 12 plants	
	3. only one set of data ;	3. **ACCEPT** different times of year / places	
	4. wide variability in results / comment on { large / overlapping } range bars ;		
	5. difficulty of identifying { larvae / infected shoots } / eq ;	5. **IGNORE** counting errors unqualified	
			(3)

Question Number	Answer	Additional guidance	Mark
3(a)	1. allows population to grow rapidly / eq ;	1. **IGNORE** increase unqualified	
	2. idea of exploiting favourable conditions ;	2. e.g. food source availability	
	3. idea of less chance of eggs being eaten ;	3. **ACCEPT** reduced chance of predation of an individual **IGNORE** damage to eggs	
	4. idea that large population increases the { gene pool / genetic variability } ;		**(2)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	1. practise method to see if it will work / eq ;		
	2. check { most suitable number / mass / viability / eq } of eggs to use / eq ;		
	3. select suitable copper ion concentrations / eq ;		
	4. find the time for the eggs to hatch / find method for counting the larvae / eq ;	4. **ACCEPT** hatched eggs	
	5. identify an environmental condition to control { temperature / salinity / pH / oxygen concentration / light intensity } ;		**(4)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)		**Max. 8 marks** from this section. Two marks are reserved for QWC.	
	1. clear statement of dependent variable ;	1. e.g. number of eggs hatched / time for eggs to hatch / hatching rate	
	2. identification of the independent variable ;	2. e.g. a range of copper concentrations / stated range (minimum 5) / presence and absence of copper ions	
	3. identification of one variable, other than copper ions, that could affect egg hatching ; -	For MP3 and MP5. e.g. concentration of other ions / light intensity / temperature / pH / salt concentration / oxygen concentration / source of eggs / age of eggs / species of eggs	
	4. description of how this variable can be { controlled / minimised } ;	**IGNORE** a stated temperature unqualified	
	5. identification of second variable, other than copper, that could affect egg hatching ;		
	6. description of how this second variable can be { controlled / minimised } ;		**(8)** **Expert** **+ 2** **QWC** **(see** **below)**

	7. suitable time interval(s) for counting egg hatching ;	7. e.g. stated intervals in hours or days and a minimum of 2 counts ACCEPT one stated time to count eggs hatched	
	8. clear reference to need to repeat the whole experiment ;	8. **DO NOT ACCEPT** replicate at each concentration	
	9. method of calculating rate of hatching ;	9. **ACCEPT** calculate percentage hatched or number of eggs hatched per unit time	
	10. reference to a control (with no copper) ;		

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(b)(iii)	1. clear table with headings and appropriate units ;	1. **DO NOT ACCEPT** a.u. IGNORE temperatures entered in the table	
	2. means calculated from repeated data / eq ;	2. **ACCEPT** a space headed 'mean' if appropriate	
	3. graph format appropriate to data, with correctly labelled axes ;	3. e.g. scatter / line **ACCEPT** bar graph for presence / absence only	
	4. statistical test appropriate to data ;	4. e.g. use of correlation test (Spearman's rank / eq) / suitable test to compare numbers (t- test / Mann-Whitney U test / eq) for presence / absence	**(4)**

Question Number	Answer	Additional guidance	Mark
3(b)(iv)	1. difficult to control all other factors affecting brine shrimp hatching / eq ;		
	2. a named environmental factor may fluctuate / eq ;	2. e.g. temperature, pH, light intensity, oxygen concentration, mineral concentration **IGNORE** nutrients	
	3. suitable reference to difficulty of counting / eq ;		
	4. an example of a possible limitation ;	4. e.g. viability of eggs / species of brine shrimp / genetic differences / damage to eggs	**(3)**