

# Mark Scheme (Results)

Summer 2014

IAL Biology (WBI06)

Paper 01

Unit 6: Practical Biology and Research  
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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
  - i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  - ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  - iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

## 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
- 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)	<ol style="list-style-type: none"> <li>1. allow snail to adjust to environment before starting / eq ;</li> <li>2. stimulus described e.g. tapping the snail / eq ;</li> <li>3. idea of maintaining strength of stimulus e.g. same force ;</li> <li>4. description of what will be recorded as a response / eq ;</li> <li>5. idea of repeating the stimulus (after response) ;</li> <li>6. idea of repetition of experiment after time delay OR with different snail ;</li> </ol>	<ol style="list-style-type: none"> <li>2. ACCEPT tapping table, use of any tool to tap with</li> <li>3. IGNORE firmly, gently unless repeated</li> <li>4. IGNORE timing retraction of snail ACCEPT time for { snail / eyestalks / eq } to reemerge</li> </ol>	<b>(5)</b>

Question Number	Answer	Additional guidance	Mark
1(b)(i)	<ol style="list-style-type: none"> <li>1. temperature ;</li> <li>2. another named environmental factor e.g. background noise, humidity, light intensity ;</li> <li>3. idea of variable related to snail e.g. species, age, gender ;</li> <li>4. previous handling of the snail / time to recover during experiment / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>1. IGNORE variables related to stimulus, same snail</li> <li>2. ACCEPT use same surface or container for snail</li> </ol>	(2)

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	<ol style="list-style-type: none"> <li>1. variable with suitable control method described ;</li> <li>2. description of likely effect on the dependent variable provided ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT any variable including related to stimulus, use of temperature controlled room IGNORE measurement of variable e.g. use of thermometer</li> <li>2. ACCEPT any reasonable effect on the results described</li> </ol>	(2)

Question Number	Answer	Additional guidance	Mark
1(c)	<ol style="list-style-type: none"> <li>1. (repeated stimulation) affects calcium channels / eq ;</li> <li>2. fewer calcium <u>ions</u> enter the pre-synaptic knob / eq ;</li> <li>3. less neurotransmitter is released / eq ;</li> <li>4. less depolarisation of the post-synaptic membrane / fewer sodium channels open in post-synaptic membrane / eq ;</li> <li>5. {no / fewer / eq }action potential generated / no impulse (in post-synaptic cell) / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>2. ACCEPT pre-synaptic membrane</li> <li>3. IGNORE runs out of neurotransmitter</li> <li>5. IGNORE messages, signals</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional guidance	Mark
2(a)	<ol style="list-style-type: none"> <li>1. Null hypothesis that has a reference to { no / eq} <u>significant correlation</u> ;</li> <li>2. between forced expiratory volume and the height of a person / eq ;</li> </ol>		(2)

Question Number	Answer	Additional guidance	Mark																		
2(b)	<ol style="list-style-type: none"> <li>1. correctly calculated means ;</li> <li>2. height and means in suitable table format of rows and columns ;</li> <li>3. headings to include units ;</li> </ol>	<p>ACCEPT raw data in table, units in headings only e.g.</p> <table border="1"> <thead> <tr> <th>Height / cm</th> <th>Mean FEV<sub>1</sub> / dm<sup>3</sup></th> </tr> </thead> <tbody> <tr><td>178</td><td>3.10</td></tr> <tr><td>174</td><td>4.27</td></tr> <tr><td>177</td><td>4.19</td></tr> <tr><td>181</td><td>4.28</td></tr> <tr><td>183</td><td>4.70</td></tr> <tr><td>170</td><td>3.24</td></tr> <tr><td>171</td><td>3.38</td></tr> <tr><td>176</td><td>3.59</td></tr> </tbody> </table> <p>3. NOT if units repeated in rows</p>	Height / cm	Mean FEV <sub>1</sub> / dm <sup>3</sup>	178	3.10	174	4.27	177	4.19	181	4.28	183	4.70	170	3.24	171	3.38	176	3.59	(3)
Height / cm	Mean FEV <sub>1</sub> / dm <sup>3</sup>																				
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181	4.28																				
183	4.70																				
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171	3.38																				
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Question Number	Answer	Additional guidance	Mark
2(c)	<p>A axes : scale with suitable labels ;</p> <p>P data plotted as scatter graph with means plotted accurately ;</p> <p>B range bars included at each point ;</p>	<p>A. ACCEPT linear scale with discontinuity indicator if starts at zero, axes labelled as mean FEV / dm<sup>3</sup> and height / cm</p> <p>P. IGNORE joined points, line of best fit</p>	(3)

Question Number	Answer	Additional guidance	Mark
2(d)	<p>1. idea that graph shows that there may be a relationship</p> <p>OR</p> <p>Idea that there is a lot of variability data ;</p> <p>2. 0.71 identified ;</p> <p>3. the {calculated value / eq} is less than the value at [{5% / 0.05} significance level / {95% / 0.95} confidence level] / eq ;</p> <p>4. the null hypothesis is accepted ;</p> <p>5. there is no significant correlation between height and forced expiratory volume / eq ;</p>	<p>1. ACCEPT overlap in the range bars</p> <p>2. ACCEPT circled in table</p> <p>0.65 is lower than 0.71 = Mps 2 and 3</p> <p>5. ACCEPT no significant relationship between these variables</p>	(4)

Question Number	Answer	Additional guidance	Mark
2(e)	<ol style="list-style-type: none"> <li>1. idea that a named factor has not been taken into consideration e.g. health, age, gender, mass ;</li> <li>2. small sample size / only eight individuals / eq ;</li> <li>3. idea that study only carried out on one occasion / eq ;</li> <li>4. idea that study does not represent the whole population e.g. narrow height range ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT weight, smoking</li>   <li>3. ACCEPT it would need to be repeated</li> </ol>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
3(a)	<ol style="list-style-type: none"> <li>1. suitable ethical argument concerning care of spiders ;</li> <li>2. idea of impact on ecosystem of using spiders e.g. change in food chain, food web ;</li> <li>3. Suitable safety point e.g. possible irritant, allergenic material, working in field, wearing gloves qualified, protection against sunburn ;</li> </ol>		(2)

Question Number	Answer	Additional guidance	Mark
3(b)	<ol style="list-style-type: none"> <li>1. practice the method to check it works / eq ;</li> <li>2. identify suitable site with leafhoppers / eq ;</li> <li>3. identify suitable time of year / eq ;</li> <li>4. idea of number of spiders already present OR that need to be added to rice ;</li> <li>5. find a sampling method to determine number of leafhoppers / eq ;</li> <li>6. determine a time scale for detecting an effect of introducing the spiders / eq ;</li> <li>7. consider impact of farming practices used e.g. pesticides ;</li> </ol>	<p>IGNORE references to research in texts etc</p> <p>6. ACCEPT time for damage to the rice plants to be seen</p>	(3)

Question Number	Answer	Additional guidance	Mark
3(c)	<p><b>NB Maximum of 8 marks from the following + 2 SPG marks</b></p> <ol style="list-style-type: none"><li>1. clear reference to independent variable e.g. number of wolf spiders released, presence of wolf spiders ;</li><li>2. appropriate design e.g. 5 different numbers of spiders (correlation) / eq ;</li></ol> <p>OR</p> <p>spiders released in some fields and not in others / eq ;</p> <ol style="list-style-type: none"><li>3. clear reference to the dependent variable e.g. number of leafhopper nymph / eq ;</li><li>4. idea of need to know initial number of leafhoppers ;</li><li>5. clear description of method for measuring dependent variable e.g. count leafhopper nymphs in randomly placed quadrats , sweep net / eq ;</li><li>6. and 7. identification of two variables ;</li><li>8. and 9. Description of how the two identified variables can be {monitored / controlled / eliminated / eq} ;</li><li>10. clear reference to need for repeats / eq ;</li></ol>	<p>IGNORE comments about damage to rice</p> <p>6/7 IGNORE size of quadrat, species of spider ACCEPT immi/emigration, predation</p>	(10)

**SPG award up to 2 marks**

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
<b>Level 1</b>	<b>0</b>	The account is very disorganised and is very difficult to follow. Scientific vocabulary is very limited with many spelling and grammatical errors.
<b>Level 2</b>	<b>1</b>	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.
<b>Level 3</b>	<b>2</b>	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.

<b>Question Number</b>	<b>Answer</b>	<b>Additional guidance</b>	<b>Mark</b>
<b>3(d)</b>	<ol style="list-style-type: none"> <li>1. clear table for raw with headings ;</li> <li>2. means calculated from repeat data ;</li> <li>3. {scatter / line / bar} graph with correctly labelled axes ;</li> <li>4. reference to an appropriate statistical test e.g. use of correlation test / Spearman's Rank / t-test ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT table includes damage to rice plants</li> <li>3. ACCEPT horizontal bars if each bar is number of spiders</li> <li>4. relate this to the content of the table of data e.g. with and without spiders = t-test / Mann-Whitney U range of spiders = correlation test / Spearman's rank / Pearson's</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional guidance	Mark
3(e)	<p>1. idea that it is difficult to control (all) the variables ;</p> <p>2. and 3 two uncontrolled variables e.g. temperature in field over a period of time, presence of another predator, health of organisms eq ;</p> <p>4. limitations related to{ sampling / counting leafhoppers / distribution of leafhoppers};</p> <p>5. idea that laboratory conditions may not relate to what happens in rice fields ;</p>	<p>2. ACCEPT weather, migration, light intensity IGNORE genetic variability</p> <p>5. ACCEPT reference to laboratory bred spiders</p>	(3)

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