



# Mark Scheme (Results)

Summer 2012

GCE Biology (6BI08) Paper 6B  
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	Mark
<b>1(a)</b>	<ol style="list-style-type: none"> <li>1. suitable dependent variable identified e.g. percentage cover of weeds ;</li> <li>2. reference to method for measuring dependent variable e.g. use of a quadrat grid to estimate percentage cover ;</li> <li>3. description of method for distribution of random {quadrats / samples} eq ;</li> <li>4. description of calculation needed to obtain dependent variable e.g. number of squares out of 100 containing weeds ;</li> <li>5. reference to weedkiller is independent variable</li> <li>6. description of method of application of weedkiller to {field / plot / quadrats / eq} ;</li> <li>7. reference to control with {no / old / eq} weedkiller ;</li> <li>8. reference to measuring cereals as well as weeds ;</li> <li>9. idea of measuring {cereals / weeds} in field before treatment / eq ;</li> </ol>	<b>(6)</b>

Question Number	Answer	Mark
<b>1(b)(i)</b>	<p>Any <b>two</b> from:</p> <ol style="list-style-type: none"> <li>1. soil {type / pH /organic content / minerals / eq} ;</li> <li>2. water content of soil {humidity / eq} ;</li> <li>3. temperature ;</li> <li>4. wind speed / eq ;</li> <li>5. light intensity / eq ;</li> <li>6. topography / eq ;</li> </ol>	<b>(2)</b>

Question Number	Answer	Mark
<b>1 (b) (ii)</b>	<ol style="list-style-type: none"><li>1. appropriate variable chosen, with suitable {control / monitoring} method described ;</li><li>2. description of likely effect on the dependent variable e.g. (increase / decrease / eq) in {growth / percentage cover / eq };</li></ol>	<b>(2)</b>

Question Number	Answer	Mark
<b>1 (c)</b>	Any <b>two</b> from: <ol style="list-style-type: none"><li>1. reference to cell elongation / eq ;</li><li>2. stimulates excessive growth of the (broad-leaved) plant(s) / eq ;</li><li>3. interferes with { plant metabolism / photosynthesis / respiration / mineral uptake / cell cycle / eq} ;</li><li>4. acts as an inhibitor of {enzyme / channel protein / eq} / eq ;</li><li>5. toxic / eq ;</li></ol>	<b>(2)</b>

Question Number	Answer	Mark
<b>2(a)</b>	there will be no significant { difference / correlation} in the time it takes for the snail to { re-emerge / start moving / eq} and the { number of taps received / eq} / eq ;	<b>(1)</b>

Question Number	Answer	Mark																																												
<b>2(b)</b>	<p>1. suitable table format e.g. tap time or tap number in 1st column ;</p> <p>2. correct column headings with units ;</p> <p>3. means correctly calculated ;</p> <p>4. all raw data and means included ;</p> <p>e.g.</p> <table border="1" data-bbox="438 985 1209 1393"> <thead> <tr> <th rowspan="2">Tap time / min</th> <th colspan="4">Time taken to re-emerge (and start moving) / seconds</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>mean</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>90</td> <td>108</td> <td>80</td> <td>93</td> </tr> <tr> <td>2</td> <td>40</td> <td>60</td> <td>48</td> <td>49</td> </tr> <tr> <td>4</td> <td>30</td> <td>40</td> <td>80</td> <td>50</td> </tr> <tr> <td>6</td> <td>10</td> <td>15</td> <td>20</td> <td>15</td> </tr> <tr> <td>8</td> <td>0</td> <td>5</td> <td>0</td> <td>2</td> </tr> <tr> <td>10</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>12</td> <td>2</td> <td>0</td> <td>0</td> <td>1</td> </tr> </tbody> </table>	Tap time / min	Time taken to re-emerge (and start moving) / seconds				A	B	C	mean	0	90	108	80	93	2	40	60	48	49	4	30	40	80	50	6	10	15	20	15	8	0	5	0	2	10	0	0	0	0	12	2	0	0	1	<b>(4)</b>
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4	30	40	80	50																																										
6	10	15	20	15																																										
8	0	5	0	2																																										
10	0	0	0	0																																										
12	2	0	0	1																																										

Question Number	Answer	Mark
<b>2(c)</b>	<p><b>A</b> axes correct orientation and continuous linear scale with units and labels ;</p> <p><b>F</b> data plotted as x y scatter graph ;</p> <p><b>P</b> points plotted correctly ;</p>	<b>(3)</b>

Question Number	Answer	Mark
<b>2(d)</b>	<p>1. identified anomalous result: snail C at {4 min / 3<sup>rd</sup> tap / 80} / OR snail A at {12 min / 7th tap / 2} / OR (mean result at) {4 min / 12 min / 3<sup>rd</sup> tap / 7th tap / 50 / 0.7} eq ;</p> <p>2. time to respond increased from 2nd to third tap / eq OR would expect all at 12 min to be zero / eq OR appropriate reference to width of the range bar;</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>2(e)</b>	<p>1. reference to critical value is 0.79 ;</p> <p>2. the calculated value is greater than the {critical value / 0.79} at the 95% confidence level / eq ;</p> <p>3. therefore there is a (significant negative) correlation between the number of taps received by the snail and the time it takes the snail to start moving again / eq ;</p> <p>4. repeated stimulation results in loss of response / eq ;</p> <p>5. lack of {reinforcement / reward / punishment / eq} ;</p> <p>6. idea that Ca<sup>2+</sup> ion channels become less responsive / eq ;</p> <p>7. fewer {action potentials / waves of depolarisation / impulses / eq} / eq ;</p>	<b>(5)</b>

Question Number	Answer	Mark
<b>3(a)</b>	<ol style="list-style-type: none"><li>1. alcohol is flammable / irritant / eq ;</li><li>2. keep alcohol away from naked flames / wear gloves / eq ;</li><li>3. need to prevent {growth of harmful bacteria / exposure to bacteria} / eq ;</li><li>4. (prevention of growth or exposure by) use of any <b>one</b> of the following:  aseptic conditions needed / eq use of a strain of bacteria that is not harmful / do not incubate at 37°C /eq secure lids on plate but not air tight to prevent anaerobic conditions / eq use of antiseptic need safe disposal of plates / eq ;</li><li>5. other acceptable risk;</li></ol>	<b>(3)</b>



Question Number	Answer	Mark
<b>3(b)</b>	<ol style="list-style-type: none"><li>1. practise proposed method / see if proposed method will work / eq ;</li><li>2. check most suitable conditions for growth of the bacteria / eq ;</li><li>3. select suitable timescale for measuring growth of bacteria / eq ;</li><li>4. check method of measuring effect on growth of bacteria / eq ;</li><li>5. consider what other variables need to be taken into account / eq ;</li><li>6. check the method of adding alcohol to plates / eq ;</li><li>7. determine a suitable concentration range for alcohol / eq ;</li><li>8. check which {type / strain / eq} bacteria to use ;</li></ol>	<b>(3)</b>

Question Number	Answer	Mark
<b>3(c)</b>	<ol style="list-style-type: none"> <li>1. clear statement of dependent variable e.g. (zone of inhibition of bacteria / absorbance of bacterial culture / eq) ;</li> <li>2. clear statement of independent variable as concentration of alcohol ;</li> <li>3. range of concentrations suggested (at least 5) ;</li> <li>4. clear description of how the alcohol will be added to the bacterial culture / eq ;</li> <li>5. clear reference to need for nutrient gel / nutrient broth /eq ;</li> <li>6. some clear consideration of time period over which the growth will be measured / eq ;</li> <li>7. consideration of which type of bacteria to use / named example / eq ;</li> <li>8. and 9. Identification of up to two other variables that could affect growth of bacteria ;</li> <li>10. and 11. description of how these two identified variables can be controlled ;</li> <li>12. clear reference to need for repeats (at each concentration) ;</li> <li>13. clear description of how the bacterial culture/plate will be set up e.g. lawn, inoculation of broth ;</li> </ol>	<b>(8) + 2 SPG (see below)</b>

### SPG award up to 2 marks

level	Mark	Descriptor
<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.

Question Number	Answer	Mark
<b>3(d)</b>	<ol style="list-style-type: none"> <li>1. clear table which matches method described with headings and units ;</li> <li>2. change in bacterial growth calculated e.g. by measuring area of zone of inhibition / absorbance of culture ;</li> <li>3. means calculated from repeat data ;</li> <li>4. graph type selected that matches the data to be collected ;</li> <li>5. reference to an appropriate statistical test e.g. use of correlation test (Spearman's Rank / eq) / suitable test to compare bacteria growth with and without alcohol (t- test / Mann-Whitney U test / Chi – squared / eq) ;</li> </ol>	<b>(4)</b>

Question Number	Answer	Mark
<b>3(e)</b>	<ol style="list-style-type: none"> <li>1. difficult to control all variables (affecting bacterial growth) / eq ;</li> <li>2. uneven spread of bacteria at start / eq ;</li> <li>3. another variable may be acting as a limiting factor for bacterial growth / eq ;</li> <li>4. idea of need to test effect on more than one type of bacteria / eq ;</li> <li>5. idea that experimental conditions do not match use of hand wash ;</li> <li>6. reference to effects of diffusion / eq ;</li> <li>7. reference to effects of ethanol evaporation ;</li> </ol>	<b>(3)</b>

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