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Mark Scheme (Results)

January 2012

GCE Biology (6BI08) Paper 6B
Practical Biology and Investigative Skills

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Question Number	Answer	Mark
1(a)	1. suitable dependent variable identified e.g. oxygen consumption ; 2. suitable method for measuring dependent variable e.g. (rate of) movement of ink in (respirometer) tube ; 3. idea of time measurement to obtain rate e.g. time to move a set distance ; 4. at least five suitable temperatures compared ; 5. description of how temperature will be controlled for each measurement e.g. thermostatically controlled water bath, water bath set at a temperature ; 6. recognition of need to absorb the carbon dioxide produced /eq ; 7. specific detail of how to set up {respirometer / seeds / apparatus} provided ; 8. idea of replicates at each temperature ; 9. indication of thought behind selection of seeds e.g. age, same plant ; 10. some consideration of need for equilibration / compensation for pressure changes/ eq ; 11. suitable control described ;	**(5)**

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Question Number	Answer	Mark
1(b)(i)	1. {type /source /eq} of seeds ; 2. {mass / number / eq} of seeds ; 3. age of seeds / eq ; 4. pH ; 5. reference to equilibration e.g. time left before measuring ; 6. moisture / humidity / water / eq ; 7. any other appropriate variable ;	**(2)**

Question Number	Answer	Mark
1(b)(ii)	1. suitable control method for variable described ; 2. description of likely effect on the dependent variable ;	**(2)**

Question Number	Answer	Mark
1(c)	1. {no / less} movement of the {liquid / eq } in the {respirometer /eq} / eq ; 2. {no / less} change in { volume / pressure } of the gas /eq ; 3. idea of effect on {aerobic /anaerobic} respiration ; 4. Idea that anaerobic respiration produces {less / no / eq} carbon dioxide ;	**(3)**

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Question Number	Answer	Mark
2(a)	Idea that there will be no significant {difference / correlation} in the heart rate (of the Daphnia) in different concentrations of caffeine /eq ;	**(1)**

Question Number	Answer	Mark
2(b)	1. simple nervous system / invertebrate / eq ; 2. idea of reduced {awareness of pain/ stress / eq} ; **OR** 3. abundant in nature / eq ; 4. idea of no threat to {its (species) / dependent species / food chain / eq} survival ; **OR** 5. bred for fish food / eq ; 6. will thus die anyway / eq ;	**(2)**

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<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>2(c)</td><td>
<table>
<tr><th>Concentration of caffeine (%)</th><th>Daphnia mean heart rate / bpm</th></tr>
<tr><td>0.00</td><td>178 / 178.4</td></tr>
<tr><td>0.01</td><td>241 / 240.8</td></tr>
<tr><td>0.10</td><td>257 / 256.8</td></tr>
<tr><td>0.50</td><td>261 / 261.2</td></tr>
<tr><td>1.00</td><td>267 / 267.2</td></tr>
<tr><td>2.00</td><td>275 / 275.2</td></tr>
<tr><td>5.00</td><td>281 / 280.8</td></tr>
</table>
1. units correct ;

2. consistent use of decimal places e.g. none or 1 ;

3. all means correct ;
</td><td>(3)</td></tr>
</table>

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Question Number	Answer	Mark
2(d)	ALLOW error carried forward from 2(c) 1. suitable table format e.g. concentration of caffeine in 1st column ; 2. correct column headings with units ; 3. all raw data and means included ; e.g.	**(3)**

Concentration of caffeine (%)	***Daphnia* Heart rate / bpm**					
	A	**B**	**C**	**D**	**E**	**mean**
0.0	176	178	184	172	182	178
0.01	240	238	244	236	246	241
0.1	256	256	260	248	264	257
0.5	260	262	264	254	266	261
1.0	268	270	270	260	268	267
2.0	274	282	278	270	272	275
5.0	282	274	284	278	286	281

Question Number	Answer	Mark
2(e)	ALLOW error carried forward from 2(c) for means and from 2 (d) units **A** axes correct orientation and continuous linear scale with units and labels ; **F** data plotted as{ x y scatter graph / line graph} ; **P** points plotted correctly ;	**(3)**

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Question Number	Answer	Mark
2(f)	1. (critical value) is 0.79 ; 2. the value is greater than the critical value (at the 95% confidence level) ; 3. idea that there is a (positive) correlation between the concentration of caffeine and the heart rate of the *Daphnia* / eq ; 4. idea that low concentrations have a large effect, higher concentrations produce a smaller increase / eq ; 5. explanation provided e.g. caffeine is a stimulant / effect on nervous system ;	**(4)**

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Question Number	Answer	Mark
3(a)	Any **two** from: 1. tissue culture may provide good growing conditions for {bacteria / fungi} / eq ; 2. possibility of an {allergic / irritant / eq} reaction to the {plant growth regulators / plant material} / eq ; 3. release of GMOs into environment / eq ; 4. use of sharp instruments / eq ; 5. other sensible risk ;	**(2)**

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Question Number	Answer	Mark
3(b)	1. practise proposed method / see if proposed method will work / eq ; 2. determine appropriate dependent variable / eq ; 3. check most suitable conditions for growth of plant tissue / eq ; 4. select suitable timescale for measuring growth rates / eq ; 5. consider what {other / named} variable needs to be taken into account / eq ; 6. check if the type of {plant / tissue /eq} used is affected / eq ; 7. check for (suitable) range of concentrations of plant {growth regulator / hormone / eq} to be used ;	**(3)**

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Question Number	Answer	Mark
3 (c)	1. clear statement of dependent variable i.e. exactly what is to be measured stated (e.g. percentage change in mass of plant tissue / eq) ; 2. clear statement of independent variable concentration of plant {growth regulator / hormone / eq} ; 3. reference to at least 5 concentrations ; 4. and 5. specific descriptions of plant tissue culture provided (e.g. need to grow on nutrient gel, aseptic conditions, antibiotics in gel to prevent growth of microorganisms, etc) ;; 6. some clear consideration of time period over which the growth will be measured / eq ; 7.and 8. identification of up to 2 other variables that could affect growth ;; 9. and 10. Description of how those 2 identified variables can be controlled ;; 11. clear reference to need for repeats (at each concentration) ; 12. control of source of plant tissue e.g. use of same plant/leaf ;	**(8)** **+ 2 SPG** **(see below)**

SPG award up to 2 marks

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.

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Question Number	Answer	Mark
3(d)	1. clear table which matches method described with headings and units ; 2. change in growth calculated e.g. by measuring percentage change in mass ; 3. means calculated from repeat data ; 4. {scatter/line} graph format with correctly labelled axes / bar chart of calculated means / eq ; 5. reference to an appropriate statistical test e.g. use of correlation test (Spearman's Rank / eq) / suitable test to compare specific concentrations and rates of growth (t-test/ Mann-Whitney U test/ Chi – squared / eq) ;	**(4)**

Question Number	Answer	Mark
3(e)	1. difficult to control all {variables / factors /eq} affecting tissue growth ; 2. example of uncontrolled variable e.g. exposure to bacteria ; 3. damage to plant tissue during preparation may affect growth / eq ; 4. another variable may be acting as a limiting factor for plant tissue growth / eq ; 5. idea of need for more than one type of {plant growth regulator / hormone / eq} for effective growth (of new plantlets) ; 6. suitable reference to difficulty of proposed technique ;	**(3)**

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