

# Mark Scheme (Results)

June 2011

GCE Biology (6BI08) Paper 01  
Practical Biology and Research  
(WA)

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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.

## GENERAL INFORMATION

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point
Eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{ } curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[CE] or [TE]	Consecutive error / transferred error

### Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

### Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous  
e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not  
e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not  
e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not  
e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not
- candidates must make their meaning clear to the examiner to gain the mark.
- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark - irrelevant material should be ignored

Question Number	Answer	Mark
1(a)	<ol style="list-style-type: none"> <li>1. suitable dependent variable identified e.g. number germinated, number hatched, growth ;</li> <li>2. suitable method for measuring dependent variable e.g. reference to identification of germination, shrimps moving in water, growth measurement described ;</li> <li>3. time stated for length of time allowed for development / eq ;</li> <li>4. method stated for how to keep the temperature constant during the experiment ;</li> <li>5. suitable range of temperatures selected ;</li> <li>6. reference to repeats ;</li> <li>7. indication of some rationale behind selection of organisms {seeds /seedlings / eggs} e.g. undamaged seeds, age of seeds, seedlings or eggs ;</li> </ol>	(5)

Question Number	Answer	Mark
1(b)(i)	<p>Any two variables appropriate to the organisms used e.g.</p> <ol style="list-style-type: none"> <li>1. age / storage / eq ;</li> <li>2. genetic type / source / eq ;</li> <li>3. light {intensity/ wavelength / eq} ;</li> <li>4. photoperiod / eq ;</li> <li>5. density of planting / number of eggs {added / used} (in a stated volume) / eq ;</li> <li>6. soil {type/ mass/ volume} / eq ;</li> <li>7. wind {speed / exposure / eq} ;</li> <li>8. humidity / eq ;</li> <li>9. pH ;</li> <li>10. water {frequency / volume / eq} ;</li> <li>11. minerals / nutrients / salt {concentration / type / eq} ;</li> <li>12. {oxygen / carbon dioxide} concentration ;</li> </ol>	(2)

Question Number	Answer	Mark
1(b)(ii)	<ol style="list-style-type: none"> <li>1. suitable control method described for the chosen variable ;</li> <li>2. description of likely effect on the dependent variable provided ;</li> </ol>	(2)

Question Number	Answer	Mark
1(c)	<ol style="list-style-type: none"> <li>1. GPP = photosynthesis only / eq ;</li> <li>2. NPP = photosynthesis - respiration ;</li> <li>3. (lower yield due to) less {material / eq} stored / eq ;</li> <li>4. temperature increases { respiration / photosynthesis /metabolism} / reference to kinetic effect / eq ;</li> <li>5. reference to enzyme ;</li> <li>6. respiration uses up products of photosynthesis / eq ;</li> <li>7. temperature has greater effect on respiration / respiration going up faster than photosynthesis / eq ;</li> <li>8. photosynthesis limited by another factor (other than temperature) / eq ;</li> </ol>	(4)

Question Number	Answer	Mark
2(a)	there will be no <u>significant</u> difference in the body mass of the students who eat breakfast and those who don't eat breakfast / eq ;	(1)

Question Number	Answer	Mark																																	
2(b)	<ol style="list-style-type: none"> <li>1. 61.2 / 61 (kg) ;</li> <li>2. 69.8 / 70 (kg) ;</li> <li>3. raw data in suitable table format of rows and columns ;</li> <li>4. accurate headings ;</li> </ol> e.g. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Diet / eq</th> <th>Student</th> <th>Mass / Kg</th> </tr> </thead> <tbody> <tr> <td rowspan="7">Breakfast</td> <td>A</td> <td>66</td> </tr> <tr> <td>B</td> <td>55</td> </tr> <tr> <td>D</td> <td>68</td> </tr> <tr> <td>H</td> <td>58</td> </tr> <tr> <td>J</td> <td>61</td> </tr> <tr> <td>L</td> <td>59</td> </tr> <tr> <td>(mean</td> <td>61.2 / 61)</td> </tr> <tr> <td rowspan="7">No Breakfast</td> <td>C</td> <td>63</td> </tr> <tr> <td>E</td> <td>72</td> </tr> <tr> <td>F</td> <td>65</td> </tr> <tr> <td>G</td> <td>71</td> </tr> <tr> <td>I</td> <td>75</td> </tr> <tr> <td>K)</td> <td>73</td> </tr> <tr> <td>(mean</td> <td>69.8 / 70)</td> </tr> </tbody> </table>	Diet / eq	Student	Mass / Kg	Breakfast	A	66	B	55	D	68	H	58	J	61	L	59	(mean	61.2 / 61)	No Breakfast	C	63	E	72	F	65	G	71	I	75	K)	73	(mean	69.8 / 70)	(4)
Diet / eq	Student	Mass / Kg																																	
Breakfast	A	66																																	
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Question Number	Answer	Mark
2(c)	<p><b>A</b> axes correct orientation and scale with units and labels ;</p> <p><b>P</b> data plotted as bar chart with bars plotted correctly ;</p> <p><b>B</b> range bar included ;</p>	(3)



Question Number	Answer	Mark
2(d)	<ol style="list-style-type: none"> <li>1. the value of t is greater than the critical value / figures quoted <math>3.09 &gt; 2.23</math> ;</li> <li>2. at the 95% confidence level / eq ;</li> <li>3. therefore there is a <b>significantly</b> higher body mass for those students who do not eat breakfast in comparison to those who do eat breakfast / eq ;</li> </ol>	(3)

Question Number	Answer	Mark
2(e)	<ol style="list-style-type: none"> <li>1. other variables not controlled / eq ;</li> <li>2. suitable named variable given e.g. gender ;</li> <li>3. sample size very small / eq ;</li> <li>4. should measure change in mass over time / BMI / eq ;</li> </ol>	(3)

Question Number	Answer	Mark
3(a)	<ol style="list-style-type: none"> <li>1. need to avoid potential source of bacterial infection / eq ;</li> <li>2. risk due to {body fluids / blood / saliva} ;</li> <li>3. risk due to use of (strong) {acids / alkalis} / eq ;</li> <li>4. risk due to sterilisation technique / eq ;</li> <li>5. reference to consent from donors / no consent needed because it is waste material / eq ;</li> <li>6. any other appropriate risk / ethical issue ;</li> </ol>	(3)

Question Number	Answer	Mark
3(b)	<ol style="list-style-type: none"> <li>1. practise proposed method / see if proposed method will work / see if the decrease in mass would be measureable / eq ;</li> <li>2. check most suitable conditions for decay of teeth / eq ;</li> <li>3. select suitable timescale for measuring {decay/reaction} rates / eq ;</li> <li>4. consider what other variables need to be taken into account e.g. check if the {type / age} of tooth has an effect ;</li> <li>5. to determine appropriate dependent variable / eq ;</li> <li>6. check pH of orange juice / pH of different juices / eq ;</li> </ol>	(3)

Question Number	Answer	Mark
3(c)	<ol style="list-style-type: none"> <li>1. clear statement of dependent variable i.e. exactly what is to be measured stated e.g. (percentage) change in mass of tooth / time for tooth to decay / eq ;</li> <li>2. clear statement of independent variable pH ;</li> <li>3. range of suitable pHs suggested (at least 5) ;</li> <li>4. idea of (the proposed range) includes the pH of the orange juice ;</li> <li>5. suitable details about how to measure pH ;</li> <li>6. suitable apparatus for measuring mass of tooth suggested ;</li> <li>7. some clear consideration of time period over which the decay will be measured / eq ;</li> <li>8. and 9. identification of up to 2 other variables that could affect decay ;;</li> <li>9. and 11. description of how those 2 identified</li> <li>10. variables can be controlled ;;</li> <li>11. reference to why one of the identified variables needs to be controlled ;</li> <li>13. clear reference to need for repeats ;</li> </ol>	(8) + (2) QWC

QWC 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.

Question Number	Answer	Mark
3(d)	<ol style="list-style-type: none"> <li>1. clear table which matches method described with headings and units ;</li> <li>2. percentage change in mass calculated / eq ;</li> <li>3. means calculated from repeat data ;</li> <li>4. {scatter/ line} graph format with correctly labelled axes/bar chart of calculated means /eq ;</li> <li>5. reference to a suitable statistical test e.g. use of correlation test {Spearman's Rank / eq} / compare rates of decay at two pHs {<i>t</i>-test / Mann-Whitney U test / eq} ;</li> <li>6. statistical test justified /eq ;</li> </ol>	(4)

Question Number	Answer	Mark
3(e)	<ol style="list-style-type: none"> <li>1. difficult to control all variables affecting {decay / results / eq} / eq ;</li> <li>2. example of uncontrolled variable e.g. exposure to bacteria, damage to tooth, genetic makeup, age ;</li> <li>3. measuring loss of mass does not necessarily correspond to decay rate / eq ;</li> <li>4. {controlled / experimental / eq} conditions do not represent natural decay conditions in the mouth / eq ;</li> <li>5. suitable reference to difficulty of proposed technique ;</li> </ol>	(3)

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