

# Mark Scheme (Results)

January 2013

GCE Biology (6BI08) 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  | Mark       |
|-----------------|---|------------|
| <b>1(a)</b>     | <ol style="list-style-type: none"> <li>1. ref. to at least two specific different storage temperatures ;</li> <li>2. ref to juice being tested ;</li> <li>3. ref to DCPIP ;</li> <li>4. description of colour change of DCPIP from blue to {colourless / pink} ;</li> <li>5. idea of titration ;</li> <li>6. idea of comparison of results e.g. volumes of DCPIP added or use of calibration curve or calculation of vitamin C concentration against known vitamin C solution ;</li> <li>7. ref to repeats ;</li> </ol> | <b>(5)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>1(b)(i)</b>  | <ol style="list-style-type: none"> <li>1. { mass / eq} of fruit / eq ;</li> <li>2. { age / source / eq} of fruit / eq ;</li> <li>3. time for storage / eq ;</li> <li>4. method of juice extraction / eq ;</li> <li>5. { volume / concentration / eq} of juice / DCPIP/ eq ;</li> <li>6. any other credible alternative variable / 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 method described ;</li> <li>2. Description of likely effect on the dependent variable provided ;</li> </ol> | <b>(2)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>1(c)</b>     | <p>1. (low temperature) {reduces / prevents / eq} growth of {microorganisms / eq} ;</p> <p>2. (low temperature) reduces activity of enzymes / eq ;</p> <p>3. due to less kinetic energy / fewer collisions / fewer cell divisions / eq ;</p> | <b>(3)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>2(a)</b>     | Idea that there will be no significant difference (between the number of numbers recalled) when listening to music or not / eq ; | <b>(1)</b> |

| Question Number | Answer   | Mark       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
|-----------------|--|------------|-----------------------------------|--|---------|---------------|------------|---|------|-----|---|-----|------|---|------|------|---|------|------|---|------|-----|---|------|------|---|------|-----|---|------|------|---|------|------|---|------|-----|---|------|------|---|------|------|---|------|-----|---|------|------|---|------|-----|--------------|------|------|------------|
| <b>2(b)</b>     | <p>1. 10.9 / 10.91 ;</p> <p>2. 10.1 / 10.11 ;</p> <p>3. raw data in suitable table format of rows and columns ;</p> <p>4. accurate headings ;</p> <p>e.g.</p> <table border="1"> <thead> <tr> <th></th> <th colspan="2">(mean) number of numbers recalled</th> </tr> <tr> <th>Student</th> <th>without music</th> <th>with music</th> </tr> </thead> <tbody> <tr><td>A</td><td>10.3</td><td>9.0</td></tr> <tr><td>B</td><td>9.7</td><td>10.3</td></tr> <tr><td>C</td><td>10.0</td><td>10.7</td></tr> <tr><td>D</td><td>11.7</td><td>10.3</td></tr> <tr><td>E</td><td>11.7</td><td>9.7</td></tr> <tr><td>F</td><td>11.3</td><td>11.0</td></tr> <tr><td>G</td><td>10.7</td><td>9.3</td></tr> <tr><td>H</td><td>10.3</td><td>10.7</td></tr> <tr><td>I</td><td>12.3</td><td>10.3</td></tr> <tr><td>J</td><td>11.3</td><td>9.7</td></tr> <tr><td>K</td><td>10.7</td><td>10.0</td></tr> <tr><td>L</td><td>10.3</td><td>10.3</td></tr> <tr><td>M</td><td>11.3</td><td>9.7</td></tr> <tr><td>N</td><td>11.0</td><td>11.0</td></tr> <tr><td>O</td><td>11.0</td><td>9.7</td></tr> <tr><td>overall mean</td><td>10.9</td><td>10.1</td></tr> </tbody> </table> |            | (mean) number of numbers recalled |  | Student | without music | with music | A | 10.3 | 9.0 | B | 9.7 | 10.3 | C | 10.0 | 10.7 | D | 11.7 | 10.3 | E | 11.7 | 9.7 | F | 11.3 | 11.0 | G | 10.7 | 9.3 | H | 10.3 | 10.7 | I | 12.3 | 10.3 | J | 11.3 | 9.7 | K | 10.7 | 10.0 | L | 10.3 | 10.3 | M | 11.3 | 9.7 | N | 11.0 | 11.0 | O | 11.0 | 9.7 | overall mean | 10.9 | 10.1 | <b>(4)</b> |
|                 | (mean) number of numbers recalled  |            |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| Student         | without music  | with music |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| A               | 10.3   | 9.0        |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| B               | 9.7  | 10.3       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| C               | 10.0   | 10.7       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| D               | 11.7   | 10.3       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| E               | 11.7   | 9.7        |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| F               | 11.3   | 11.0       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| G               | 10.7   | 9.3        |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| H               | 10.3   | 10.7       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| I               | 12.3   | 10.3       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| J               | 11.3   | 9.7        |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| K               | 10.7   | 10.0       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| L               | 10.3   | 10.3       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| M               | 11.3   | 9.7        |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| N               | 11.0   | 11.0       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| O               | 11.0   | 9.7        |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |
| overall mean    | 10.9   | 10.1       |                                   |  |         |               |            |   |      |     |   |     |      |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |      |   |      |     |   |      |      |   |      |     |              |      |      |            |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>2(c)</b>     | <p><b>A</b> axes : scale with suitable labels ;</p> <p><b>P</b> data plotted as bar chart with bars plotted correctly ;</p> <p><b>B</b> accurate range bars included ;</p> | <b>(3)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>2(d)</b>     | <ol style="list-style-type: none"> <li>1. the ( t ) value is greater than the critical value at the { 95% confidence / 5% significance } level / eq ;</li> <li>2. reject null hypothesis / eq ;</li> <li>3. reference to 28 degrees of freedom ;</li> <li>4. reference to use of 30 degrees of freedom on table as closest to 28 / eq ;</li> <li>5. therefore there is a <b>significant difference</b> (between the number of numbers recalled) with and without music / eq ;</li> <li>6. conclusion states that there is a higher overall mean for numbers recalled without music than with music / eq ;</li> <li>7. explanation provided e.g. music is a distraction and reduces the amount of other information that can be stored in short term memory, music and learning involve the same part of the brain ;</li> </ol> | <b>(5)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>2(e)</b>     | <p>1. recognition that other factors may not have been taken into consideration ;</p> <p>2. specific factor named e.g. type of music, time of day, length of time to recall numbers, eq ;</p> <p>3. Investigation only uses {one sample of students / recall of numbers on grid / eq} ;</p> <p>4. small sample size / only 15 students / eq ;</p> | <b>(3)</b> |



| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>3(a)</b>     | <p>1. suitable ethical argument e.g. there are no significant ethical issues / consideration of possible environmental impact of releasing enzymes into the environment ;</p> <p>2. and 3. up to two suitable safety points made e.g. enzymes may cause {allergic reactions / skin damage / eq}, {bacteria / hygiene issues/ eq} from source of protein stain ; ;</p> | <b>(2)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>3(b)</b>     | <p>1. see if proposed method will work / will provide measurable results / eq ;</p> <p>2. to check for suitable conditions for digestion e.g. temperature, pH ;</p> <p>3. select timescale (for measuring stain digestion) / eq ;</p> <p>4. idea of selecting a range of protease concentrations ;</p> <p>5. check if the type of {protein / stain} is affected / eq ;</p> <p>6. select suitable dependent variable for measuring {digestion / removal / eq} of the {stain / protein / eq} ;</p> | <b>(3)</b> |

| Question Number | Answer  | Mark                                   |
|-----------------|---|--|
| <b>3(c)</b>     | <ol style="list-style-type: none"> <li>1. clear reference to what is the dependent variable e.g. the presence of stain ;</li> <li>2. clear description of method of measuring dependent variable e.g. record time for stain to disappear, area of protein digested, colour change compared to a colour standard ;</li> <li>3. clear reference to independent variable e.g. concentration of {enzyme / protease / eq} ;</li> <li>4. range of suitable concentrations suggested (at least 5) ;</li> <li>5. and 6. identification of up to 2 other variables that could affect enzyme action e.g. protein type, volume of solution, stirring, pH, temperature, surface area, protein concentration ; ;</li> <li>7. and 8. description of how those 2 identified variables can be controlled ; ;</li> <li>9. clear reference to need for repeats at each concentration ;</li> <li>10. control of source of {stain / protein / eq } e.g. use of same egg mixture ;</li> <li>11. use of graph to identify other values of concentration to test to identify optimum concentration / eq ;</li> </ol> | <b>(8)<br/>+ 2 SPG<br/>(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 ;</li> <li>2. means calculated from repeat data ;</li> <li>3. {scatter / line} graph format with correctly labelled axes / eq ;</li> <li>4. use of graph to estimate range for optimum / point at which another factor becomes limiting / eq ;</li> <li>5. use of graph to identify other values of concentration to test to identify optimum concentration ;</li> <li>6. recognition that concentrations above those first reaching maximum rate of digestion would be wasteful /eq ;</li> </ol> | <b>(4)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>3(e)</b>     | <ol style="list-style-type: none"> <li>1. idea that it is difficult to control all the variables (affecting protein digestion) ;</li> <li>2. example of uncontrolled variable e.g. surface area of stain, protein concentration ;</li> <li>3. idea that another variable may be limiting the digestion ;</li> <li>4. reference to experimental conditions may not match the conditions that would normally be used for washing clothes etc ;</li> </ol> | <b>(3)</b> |

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