



# Mark Scheme (Results)

Summer 2015

Pearson Edexcel International  
Advanced Level  
in Biology (WBI06) Paper 01  
Practical Biology and  
Investigative Skills

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Summer 2015

Publications Code IA040943\*

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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	Additional Guidance	Mark
1(a)	<ol style="list-style-type: none"> <li>1. prepare sterile (nutrient) agar plates / use aseptic techniques to prepare { agar plates / (nutrient) broth } ;</li> <li>2. prepare seeded agar / spread bacteria / inoculate broth / eq ;</li> <li>3. using a named bacterium ;</li> <li>4. description of appropriate method of applying antibiotics ;</li> <li>5. incubate for stated period of time ;</li> <li>6. incubate at stated temperature ;</li> <li>7. description of how to obtain quantitative results ;</li> </ol>	<ol style="list-style-type: none"> <li>5. from 12 to 72 hours</li> <li>6. from 20 °C to 30 °C</li> <li>7. e.g. radius, diameter, area, turbidity, cell count</li> </ol>	(5)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	<ol style="list-style-type: none"> <li>1. temperature ;</li> <li>2. antibiotic concentration ;</li> <li>3. incubation time ;</li> <li>4. O<sub>2</sub> concentration / gas atmosphere of incubator / eq ;</li> <li>5. { type / pH / composition } of { agar / medium } / eq ;</li> <li>6. { batch / strain / volume } of bacteria / eq ;</li> <li>7. method of applying antibiotics (soaking same sized paper discs in antibiotic / same volume of antibiotic in wells of same size) / eq ;</li> </ol>	<p>IGNORE light intensity or humidity</p> <p>6. IGNORE species, type</p>	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	<ol style="list-style-type: none"> <li>appropriate variable chosen, with suitable control method described ;</li> <li>description of likely effect on the dependent variable provided ;</li> </ol>	<ol style="list-style-type: none"> <li>ACCEPT any variable. For temperature do NOT accept room temperature or air conditioning etc.</li> <li>reference to measurable results and direction of effect e.g. an increase / decrease in diameter of the clear zone</li> </ol>	(2)

Question Number	Answer	Additional Guidance	Mark
1(c)	<b>reason</b> for appropriate safety precaution ;	e.g. aseptic technique to prevent { infection / eq } of the investigator / autoclaving to destroy microorganisms at the end of the investigation to { prevent release of pathogens into the environment / eq }	(1)

Question Number	Answer	Additional Guidance	Mark
1(d)	<ol style="list-style-type: none"> <li>1. idea of { preventing / inhibiting } synthesis of { proteins / enzymes } / stops translation / eq ;</li> <li>2. prevents ribosome binding to RNA ;</li> <li>3. lack of enzymes for bacterial { life processes / eq } ;</li> </ol>	<p>If suggested mechanism is inhibition of transcription do NOT award MP1 or MP2</p> <ol style="list-style-type: none"> <li>1. IGNORE bacteriostatic / bactericidal</li> <li>2. ACCEPT mRNA or tRNA IGNORE antibiotic binding to ribosome</li> <li>3. ACCEPT named life process</li> </ol>	<p><b>(2)</b></p>

Question Number	Answer	Additional Guidance	Mark
2(a)	1. there will be {no / eq} significant difference ;  2. between the number of {parasites / larvae} found in male and female fish / eq ;	1. ACCEPT there will be { no / eq } significant association <b>NOT</b> correlation	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark									
2(b) (i)	1. suitable table format of rows and columns with accurate headings ;  2. raw data correctly tabulated ;          3. both means correctly calculated ;	<p><b>NOT</b> arbitrary units / au</p> <p>Example of a table</p> <table border="1"> <thead> <tr> <th>Gender of fish / Sex of fish</th> <th>Number of larvae</th> <th>Mean number of larvae</th> </tr> </thead> <tbody> <tr> <td>Male / ♂</td> <td>4, 7, 8, 1, 2, 11, 6, 2</td> <td>5 / 5.1 / 5.13</td> </tr> <tr> <td>Female / ♀</td> <td>12, 9, 0, 5, 0, 18, 2, 25</td> <td>9 / 8.9 / 8.88</td> </tr> </tbody> </table> <p>3. <b>NOT</b> more decimal places</p>	Gender of fish / Sex of fish	Number of larvae	Mean number of larvae	Male / ♂	4, 7, 8, 1, 2, 11, 6, 2	5 / 5.1 / 5.13	Female / ♀	12, 9, 0, 5, 0, 18, 2, 25	9 / 8.9 / 8.88	<b>(3)</b>
Gender of fish / Sex of fish	Number of larvae	Mean number of larvae										
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Question Number	Answer	Additional Guidance	Mark
2(b) (ii)	<p><b>A</b> axes : linear scale with suitable labels ;</p> <p><b>P</b> mean data correctly plotted as bar chart ;</p> <p><b>B</b> accurate range bars included ;</p>	<p><b>NOT</b> au but allow ECF from table in 2b(i).  <b>X</b>-axis must be labelled in addition to bars</p> <p><b>P and B</b> accuracy within one small square or 1 mm.</p> <p>Scale must be long enough to accommodate range bars.</p>	(3)

Question Number	Answer	Additional Guidance	Mark
2(c)	<ol style="list-style-type: none"> <li>1. the calculated value (8.03) is greater than the critical value at { 0.01 / 0.05 / 1% / 5% /95% / 99% } / eq ;</li> <li>2. therefore reject the null hypothesis ;</li> <li>3. there is a <b>significant difference</b> between the number of parasites found in male and female fish / eq ;</li> <li>4. there is a higher mean number of larvae in the livers of female fish / eq ;</li> <li>5. idea that there is more variability for the females ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT 8.03 is greater than { 3.84 / 6.64 }</li> <li>3. ACCEPT there is a <b>significant association</b> between number of parasites and gender of fish</li> <li>4. ACCEPT converse statement</li> </ol>	(4)

Question Number	Answer	Additional Guidance	Mark
2(d)	<ol style="list-style-type: none"><li>1. recognition that another <b>named</b> { factor / variable } may not have been taken into consideration ;</li><li>2. idea of { different / limited } skill levels of students in identifying larvae ;</li><li>3. small sample size / only 16 fish / eq ;</li><li>4. idea of wide variability in results ;</li></ol>	<ol style="list-style-type: none"><li>1. e.g. age of fish, size of fish, type of fish, when or where the fish was caught, only one type of fish tested</li>          <li>4. ACCEPT idea that { range / error } bars { are large / overlap }</li></ol>	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)	<ol style="list-style-type: none"> <li>1. there are no ethical issues ;</li> <li>2. suitable safety point made ;</li> </ol>	<ol style="list-style-type: none"> <li>2. e.g. burns when handling hot vegetables, use of sharp knife, DCPIP may be an irritant IGNORE stains to clothing</li> </ol>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
3(b)	<ol style="list-style-type: none"> <li>1. practise proposed method to see if it will work / eq ;</li> <li>2. selection of a suitable food / eq ;</li> <li>3. identify suitable { preparation / cooking conditions } for food / eq ;</li> <li>4. identify a suitable { timescale / temperature } for { measuring loss of vitamin C / keeping food warm } / eq ;</li> <li>5. identify suitable method for extracting vitamin C from vegetable / eq ;</li> <li>6. determine some aspect of measuring vitamin C content / eq ;</li> </ol>	<ol style="list-style-type: none"> <li>5. e.g. blending vs pestle and mortar</li> <li>6. e.g. find appropriate volumes or concentrations of DCPIP or vegetable solution</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
3 (c)	<ol style="list-style-type: none"> <li>1. correct experimental sequence involving cooking vegetables, keeping them warm then blending or crushing ;</li> <li>2. clear statement of independent variable as length of time food is stored (after cooking) ;</li> <li>3. at least 5 times stated ;</li> <li>4. clear statement of dependent variable as vitamin C concentration ;</li> <li>5. clear description of method of measuring dependent variable as titration using redox indicator including correct colour change ;</li> <li>6. idea of recording volume of { DCPIP / vegetable extract } needed (to reach the end point) ;</li> <li>7. identification of <b>two</b> variables that could affect the result obtained ;</li> <li>8. and 9. description of methods by which each of the variables can be controlled ;;</li> <li>10. clear reference to need for repeats ;</li> <li>11. idea of calibration of vitamin C assay using solution of known vitamin C concentration ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT extracting juice</li> <li>2. ACCEPT time left after cooking</li> <li>4. IGNORE <b>amount</b> of vitamin C</li> <li>5. NOT use of cooking water alone</li> <li>6. ACCEPT number of drops</li> <li>7. IGNORE room temperature e.g. DCPIP concentration, { cooking / storage } conditions, { source / preparation } of vegetable</li> <li>8. and 9. <b>two different</b> methods required for two marks</li> </ol>	(8)

level	Mark	Descriptor
<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>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 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.

Question Number	Answer	Additional Guidance	Mark
3(d)	<ol style="list-style-type: none"> <li>1. clear table with headings and units ;</li> <li>2. means calculated from repeat data ;</li> <li>3. { scatter / line } graph format with correctly labelled axes ;</li> <li>4. use of a statistical test of correlation ;</li> </ol>	<p>ACCEPT MP1, 2 and 3 from diagram or description.</p> <ol style="list-style-type: none"> <li>1. time vegetables kept warm is required, then raw data appropriate to the candidate's method. IGNORE vitamin C concentration as it is not raw data</li> <li>3. time vegetables kept warm on x-axis, units and 'mean' <b>not</b> required, allow ECF from table</li> <li>4. e.g. correlation test / Spearman's rank / Pearson's / product-moment correlation coefficient</li> </ol>	<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
3(e)	<ol style="list-style-type: none"> <li>1. difficult to control all variables <b>affecting vitamin C</b> (concentration) ;</li> <li>2. difficulty of judging endpoint of titration / eq ;</li> <li>3. idea that assay for vitamin C may { lack specificity / measure other factors } ;</li> <li>4. idea that experimental conditions may not match the conditions normally used for keeping food warm ;</li> <li>5. idea that different foods may show different responses ;</li> </ol>	<ol style="list-style-type: none"> <li>1. ACCEPT a named example of an uncontrolled variable</li> <li>4. ACCEPT idea that pulping / blending may cause loss of vitamin C</li> <li>5. ACCEPT only one type of vegetable used</li> </ol>	<b>(3)</b>

