

# Mark Scheme (Results)

Summer 2014

IAL Biology (WBI03)  
Paper 01

Unit 3: Practical Biology and Research  
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.

## Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

## Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

| Question Number | Answer                    | Additional Guidance                                                                                             | Mark |
|-----------------|---------------------------|-----------------------------------------------------------------------------------------------------------------|------|
| 1(a)(i)         | (type of ) solvent / eq ; | IGNORE extract<br>NOT or amount, concentration of solvent<br>ALLOW the solvents used, different solvent(s) used | (1)  |

| Question Number | Answer                                                                                                                                                                          | Additional Guidance                                                                                  | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------|
| 1(a)(ii)        | 1. (DV is) diameter of {zone of inhibition / clear zone} ;<br><br>2. use of {callipers / ruler} to obtain {nearest millimetre / Vernier / multiple measurements } of diameter ; | NOT area but ALLOW Mp 2 if method of obtaining area is described e.g. use a mm grid or use $\pi r^2$ | (2)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Additional Guidance                                                                                                                                                                                                                                                                                        | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(a)(iii)       | <p>1. temperature (of incubation) ;</p> <p>2. incubator {set at specific temperature (25 to 40°C) / thermostatically controlled} / eq ;</p> <p>OR</p> <p>3. pH of {agar / eq};</p> <p>4. by using a buffer / stated pH ;</p> <p>OR</p> <p>5. same {mass / source} of leaves used ;</p> <p>6. balance with detail e.g. accuracy, no. of places, zeroing, stated mass OR from {same plant / eq} ;</p> <p>OR</p> <p>7. volume of {solvent / extract} ;</p> <p>8. pipette with detail of use / graduated measuring cylinder / stated volume ;</p> <p>OR</p> <p>9. same {size / thickness / material / eq} filter paper disc ;</p> <p>10. ref. hole punch / choice of material to use / stated appropriate diameter ;</p> <p>OR</p> <p>11. standard extraction method e.g. same time ;</p> <p>12. explanation of how this achieved e.g. grind for 2 mins ;</p> | <p>1. ACCEPT for growth of bacteria</p> <p>2. ACCEPT oven / room if qualified with idea of set temperature, NOT water bath of any sort</p> <p>4. ACCEPT pH 6to 8</p> <p>5. NOT amount<br/>IGNORE concentration of extract</p> <p>7. IGNORE concentration of extract<br/>NOT amount</p> <p>10. max 10mm</p> | (2)  |

| Question Number | Answer                                                                                                                                                                                                                                        | Additional Guidance                                                                                                                                                                                                 | Mark       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>1(b)(i)</b>  | <p>A bar chart ;</p> <p>L axes correctly labeled as<br/>x-axis has bars identified as water and solvent A,B,C<br/>y-axis mean diameter of {zone of inhibition / ZI}<br/>(with) mm ;</p> <p>P correct plotting ;</p> <p>S suitable scale ;</p> | <p>A. IGNORE plots of the 'control'</p> <p>L. NOT if bars labelled A, B and C unqualified</p> <p>P. IGNORE plots of SD</p> <p>S. ACCEPT if y-axis has a discontinuity line<br/>ACCEPT origin starting at 1 or 2</p> | <b>(4)</b> |

| Question Number | Answer                                                         | Additional Guidance                          | Mark       |
|-----------------|----------------------------------------------------------------|----------------------------------------------|------------|
| <b>1(b)(ii)</b> | <p>1. data is reliable / eq ;</p> <p>2. SDs {small / eq} ;</p> | <p>IGNORE comments comparing size of SDs</p> | <b>(2)</b> |

| Question Number  | Answer                                                                                                                                                                                             | Additional Guidance                                                                                                                                 | Mark       |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>1(b)(iii)</b> | 1. solvent A because it has the largest {zone of inhibition / diameter / eq} ;<br>2. idea thus the bacteria are killed or inhibited ;<br>3. comparative manipulation of the data to support this ; | $11.9/2.1=5.67 \text{ x or } 5.7\text{x}$<br>$11.9/5.8 = 2.05\text{x or } 2.1\text{x}$<br>$11.9-2.1 = 9.8 \text{ mm}$<br>$11.9-5.8 =6.1 \text{ mm}$ | <b>(3)</b> |

| Question Number | Answer                                                                                                                                              | Additional Guidance                                                                                                                                                               | Mark       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>1(c)</b>     | 1. idea that best solvent is still Solvent A ;<br>2. worst is {water / water and Solvent B}<br>OR still little difference between the other three ; | NB care when refers to 3 bacteria unless compares to previous investigation or <i>S. typhii</i><br>2. ACCEPT water and solvent C have same mean diameter for <i>S. aeruginosa</i> | <b>(2)</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Additional Guidance                                                                                               | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------|
| 1 (d)           | <p><b>Advantages</b></p> <ol style="list-style-type: none"> <li>1. <i>Senna</i> is cheap / eq ;</li> <li>2. Idea that bacteria have not developed resistance to <i>Senna</i> / eq ;</li> <li>3. idea of good availability of <i>Senna</i> ;</li> </ol> <p><b>Disadvantages</b></p> <ol style="list-style-type: none"> <li>4. <i>Senna</i> is {less effective / smaller diameter / eq} than Ofloxacin / eq ;</li> <li>5. <i>Senna</i> not been through clinical trials / eq ;</li> <li>6. there may be side effects / eq ;</li> </ol> | <p>ACCEPT converse</p> <p>3. ACCEPT easier to obtain</p> <p>4. ACCEPT Ofloxacin has better results than senna</p> | (4)  |

| Question Number | Answer                                                   | Additional Guidance | Mark |
|-----------------|----------------------------------------------------------|---------------------|------|
| 2(a)            | 1. idea of decline in numbers of bees because of mites ; |                     | (1)  |

| Question Number | Answer                                                                                                                                                                                                          | Additional Guidance                                                                                                                                                                                                                                        | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(b)(i)         | <p>1. sensible {bar graph / table} ;</p> <p>2. suitable {labelled axes /table headings / } ;</p> <p>3. Title - Idea of {varroacide / treatments} , compared, percentage kill of {Varroa destructor / mite};</p> | <p>1. 3 or 4 bars correctly identified, roughly right proportions correct number of columns and rows</p> <p>2. e.g. Percentage effectiveness, percentage of mites killed</p> <p>3. e.g. Effectiveness of {chemical treatments for mites / varroacides}</p> | (3)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                              | Additional Guidance                                                                                                                                                                           | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(b)(ii)        | <p>1. (mite) population needs to be kept below 1000 (to avoid serious damage to hive) ;</p> <p>2. {90% effective varroacide / B} would give protection for about 110 days / {80% effective varroacide / A} would give protection for about 80 ;</p> <p>3. Idea that this means {3 to 5 / eq} treatments are needed ;</p> <p>4. Idea that any or all of the ones in paragraph 9 are greater than 90% effective ;</p> | <p>2. ACCEPT for 90% 100 to 112<br/>for 80% 65 to 80</p> <p>e.g oxalic acid is 90% effective and protects for 110 days so would only need to be applied max of 3x per year = Mp 4,2 and 3</p> | (3)  |

| Question Number | Answer          | Additional Guidance | Mark |
|-----------------|-----------------|---------------------|------|
| 2(b)(iii)       | (Paragraph) 6 ; |                     | (1)  |

| Question Number | Answer                                                                                                                                                                        | Additional Guidance                                                                                                                                                                                              | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(c)            | 1. ONLY author, date, title, publisher, (town) present in any order ;<br><br>2. correct order of any 3 of the following 4 elements (author, date, title, publisher, (town)) ; | 1. author as surname and initial<br><br>2. Ignore any additions<br><br>Schaker, M. 2008 A spring without bees – How colony collapse disorder has endangered our food supply, The Globe Pequot Press. = Mp1 and 2 | (2)  |

| Question Number | Answer                                                                                                                                      | Additional Guidance | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| 2(d)(i)         | 1. cost of {varroacide/ treatment} / cost of rotating varroacides / eq ;<br><br>2. oxalic acid (is poisonous and) can get into honey / eq ; |                     | (2)  |

| Question Number | Answer                                                                                                                                                                                                                         | Additional Guidance               | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------|
| 2(d)(ii)        | 1. idea of (mites) development of resistance (to varroacide) ;<br><br>2. (so) they become ineffective / eq ;<br><br>3. idea of alternative does not {affect taste / cause illness} ;<br><br>4. consequence of this on profit ; | 3. ACCEPT converse for varroacide | (3)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                             | Additional Guidance                                         | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------|
| 2(d)(iii)       | 1. idea of treating the bees with sugar e.g. dusting ;<br>2. stops mites gripping bees / eq ;<br>3. idea that mites cannot feed on the bees OR it is safe for bees ;<br><b>OR</b><br>4. use of fungus ;<br>5. kill mites in hive / eq ;<br>6. idea that it is safe for {bees / environment / eq} ; | 4. IGNORE biological control but Mps 5 and 6 can be awarded | (3)  |

| Question Number | Answer                                                                                                                                                                                                                 | Additional Guidance | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| 2(e)            | 1. producer site could be biased / government site (less / un / not) likely to be biased / eq ;<br>2. idea that government site agrees with producer site ;<br>3. (therefore) both references are likely to be valid ; |                     | (2)  |

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