This ISA relates to Science A Section B1.1.2

**Topic of investigation**
Section B1.1.2c  The body has different ways of protecting itself against pathogens.

**Overview**

Candidates should:
- plan practical ways to answer scientific questions and test hypotheses;
- devise appropriate methods for the collection of numerical and other data;
- assess and manage risks when carrying out practical work;
- collect, process, analyse and interpret primary and secondary data including the use of appropriate technology;
- draw evidence-based conclusions;
- evaluate methods of data collection and the quality of the resulting data

The teacher should describe the context in which the investigation is set and outline the hypothesis that is to be investigated.

Once the candidates have researched and written up their own plan in the first part of the ISA they should carry out their investigation providing that this is valid, safe and manageable in the laboratory.

**Candidates should be given the hypothesis:**

*The survival and growth of microorganisms depends upon the concentration of disinfectant.*

Candidates will need to decide which variables need to be controlled in order to investigate the hypothesis and research a method that could be used, with particular reference to hazards and risk assessment.

Candidates will be required, in Section 1 of the ISA, to provide a full plan of the method that they have chosen to use and an outline of the other method they have researched. They will also be required to say why the chosen method is better than the alternative method.

**Risk Assessment**

It is the responsibility of the centre to ensure that a risk assessment is carried out.
Stage 1 – Planning (Limited control)
Candidates should be given the opportunity to plan an investigation to test the hypothesis. The investigation should be set in a context by the centre. Examples of suitable contexts could include the need for sterile equipment in hospitals or the use of hand cleaning gels. Whichever context is chosen, the teacher must take care to present it in such a way that it does not limit the candidates' choice of method for the investigation.

Candidates should then independently research an appropriate plan to test the hypothesis and decide for themselves factors such as the range, interval and number of repeat readings that they should take, and the variables that need to be controlled. They should use at least two sources for this research.

They will need to undertake independent research to identify two methods that could be used. During this time they may make up to one A4 side of their own Candidate Research Notes for use during Section 1 of the ISA. The Candidate Research Notes sheet is attached as an appendix.

Candidates may use technology such as the internet or CD-ROMs for their research, textbooks or any other appropriate sources of information.

Candidates should also research how the results of the investigation might be useful in the specified context.

There is no set time allocation for this research, but it is anticipated that it should take no longer than 3 hours of work. This research may be done in the laboratory or elsewhere.

The teacher should check and sign these notes before allowing the candidate to use them during the completion of Section 1 of the ISA. The candidate may use these notes while completing Section 1 and Section 2 of the ISA. When the candidate has completed Section 2, the notes should be stapled to the ISA.

Stage 2 - Reporting on the planning research (High control)
For this stage, candidates must work individually under direct supervision
After the Stage 1 planning session, candidates should be given Section 1 of the ISA and should work on their own, under controlled conditions, to answer it. Candidates may take brief notes of up to one A4 side of their own research into the formal assessment period. These must be checked to ensure they do not include plagiarised text, detailed planning grids or a pre-prepared draft.

Section 1 will require them to:

- consider the variables (independent, dependent and control) that they will need to manage during the investigation
- report on their research into how to test the hypothesis they have been given
- write a detailed plan of their chosen method
- identify possible hazards and write down how the risks may be minimised
- draw a blank table suitable for the method they have planned.

Candidates may choose to use technology to draw the table, e.g. a computer spread sheet. This must be done under the direct supervision of the teacher, and may be done at any convenient time between the planning session in Stage 1 and the completion of Section 1 of the ISA.

While answering Section 1 of the ISA, candidates must not be allowed to use notes, textbooks, the Internet or any other source of help apart from their own Candidate Research notes.
Stage 3 – Practical Work (Limited control)

For this part of the investigation candidates may work individually or in groups.
Candidates may work in groups to carry out their plans, but each candidate must contribute to the collection of data.
Candidates may use appropriate technology during the practical work, e.g. data loggers or sensors.
If the teacher deems that the plan produced by the candidate is invalid, unworkable, unsafe, unmanageable or for any other reason unsuitable, then the teacher may provide a method. An example of a suitable method is attached to these notes.
The teacher may also provide a blank table for the results:

• if the table produced by the candidate is inadequate - in which case the candidate would not be able to score full marks for producing a table.
• if the candidate carries out an investigation from a method provided by the teacher - in which case the candidate would be able to score full marks for producing a table.

Stage 4 – Processing primary data (High control)

For this part of the investigation candidates must work individually under direct supervision.
Candidates should be given back their table of results, or a table containing the pooled results of the class, and asked to display these on a bar chart or line graph. Candidates must decide for themselves which format is the more appropriate for any particular investigation. Candidates may use appropriate technology to do this, e.g. a graph-drawing program on a computer.
If a candidate chooses to use a computer, this must be done under the direct supervision of the teacher and must be printed straight away.
Candidates should not be allowed to take their results and chart or graph away: the teacher must collect them at the end of the lesson.

Stage 5 – Analysing results (High control)

For this part of the investigation candidates must work individually under direct supervision.
AQA will provide a Secondary Data Sheet
The candidates should also be given a table of results from other candidates in the class, or the teacher’s results. Candidates should use the results of others to analyse the validity of their own results.
Candidates should be given Section 2 of the ISA and should also be given:

• their own table of results
• a copy of the results of other candidates in the class
• a reminder of the context in which the investigation was set. This may be printed on the class results table.
• their own chart or graph
• the Secondary Data Sheet supplied by AQA
• their Candidate Research Notes

The teacher should have recorded the marks for each candidate’s table and graph/chart before these are given back. This will ensure that a candidate cannot gain an unfair advantage by making any alterations to them at this stage.
Section 2 will require candidates to:

- analyse their own results
- draw a conclusion
- match their achieved results to the original hypothesis that was given to them
- analyse the validity of their own results by using the results of others
- evaluate the method of collection and the quality of the resulting data
- analyse further secondary data drawn from the same topic area as their original investigation
- relate their findings to the context set in the ISA.
Method Sheet for Controlled Assessment BU1.x

Microorganisms (Specimen)

Hypothesis: The survival and growth of microorganisms depends upon the concentration of disinfectant.

You will need to prepare a table for the results.

Equipment:
- Nutrient broth pre-inoculated with safe bacteria (labelled “safe bacteria”)
- 5 test tubes
- Syringes or other means of measuring volumes of 0.5cm³ and 5cm³
- 5 sterile nutrient agar plates
- Incubator at 25°C
- Disinfectant solution, diluted to double normal working strength (refer to label on bottle used)
- Means of labelling tubes and agar plates
- Inoculating loop
- Bunsen burner

Method:
1. Label 5 test tubes ‘1’ to ‘5’.
2. Put 10cm³ of the disinfectant into test tube ‘1’.
3. Remove 5cm³ from test tube ‘1’ into test tube ‘2’.
4. Add a further 5cm³ of water to test tube ‘2’.
5. Remove 5cm³ from test tube ‘2’ into test tube ‘3’.
6. Add a further 5cm³ of water to test tube ‘3’.
7. Repeat this process to make test tubes ‘4’ and ‘5’.
8. Remove 5cm³ of solution from test tube 5 and discard it.
9. Add 0.5cm³ of “safe bacteria” to each of the five test tubes. Shake gently to mix them.
10. Using sterile techniques spread samples from each test tube onto the agar in separate prepared Petri dishes of sterile nutrient agar.
11. Label the dishes, then place them in the incubator at 25°C for 2 – 3 days.
12. After 2 – 3 days count and record the number of colonies of bacteria on each agar plate.
Centre-assessed work
Candidate Research Notes

GCSE Science A (4405/4406) Additional Science (4408/4409)
Biology (4401) Chemistry (4402) Physics (4403)

SCA4P □ AS4P □ BL4P □ CH4P □ PH4P □

Centre Number ________________ Centre Name ____________________________________

Candidate's Name ________________________________ Candidate's Number _____________

Investigation Title
_____________________________________________________________________

ISA number: __________________________

The notes the candidate takes into the Controlled Assessment task are to be recorded in the spaces on this sheet.

This sheet should be given to the teacher for checking before it is used in Section 1 of the ISA.

When Section 1 of the ISA has been completed, this sheet should be retained by the teacher for subsequent use with Section 2.

When Section 2 of the ISA has been completed, this sheet should be stapled to it.

Declaration

I confirm that these are the only preparation notes used in the Controlled Assessment task.

Teacher signature Candidate signature

Date: ______________________________

This form can be downloaded from Secure Key Materials in e-AQA

To see how AQA complies with the Data Protection Act 1988 please see our Privacy Statement at aqa.org.uk
<table>
<thead>
<tr>
<th><strong>Hypothesis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Research sources</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Method(s)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Equipment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Risk assessment issues</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Relating the investigation to the context</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
Notice to Candidate. The work you submit for assessment must be your own. If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified.

Candidate Declaration. I have read and understood the Notice to Candidate and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.

Candidate Signature
Date

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 20.
- The maximum mark for the Controlled Assessment Unit is 50
- You are reminded of the need for good English and clear presentation in your answers.

Details of additional assistance (if any). Has the candidate received any help or information from anyone other than the subject teacher(s) in the production of this work? If the answer is yes give the details below or on a separate page.

Yes ☐ No ☐

Teacher Declaration:
I confirm that the candidate’s work was conducted under the conditions laid out by the specification. I have authenticated the candidate’s work and am satisfied that to the best of my knowledge the work produced is solely that of the candidate.

Signature of teacher ………………………………………………………… Date ………………………………..
SECTION 1

Hypothesis: *The survival and growth of microorganisms depends upon the concentration of disinfectant.*

1 Think about the research that you did to find out how to test this hypothesis.
Name two sources that you used for your research.

............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................

Which of these sources was the more useful, and why?

............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................

(3 marks)

2 In this investigation, you will need to control some variables.
Describe briefly how you would carry out a preliminary investigation to find a suitable value to use for one of these variables.
You should also explain how the results of this preliminary investigation will help you to decide on the best value to use.

............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................
............................................................................................................................................................................

(3 marks)
3 In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe how you plan to do your investigation to test the hypothesis given.

You should include:

- the equipment that you plan to use
- how you will use the equipment
- the measurements that you are going to make
- how you will make it a fair test
- a risk assessment.

............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
4 In your research you will have found other methods you could have used.

Briefly outline one other method you could have used.

Explain why you chose not to do this method.

........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
(3 marks)

5 Make sure that you hand in your Candidate Research Notes and your blank table for the results with this paper.

You will be awarded up to 2 marks for your table.

(2 marks)

END OF SECTION 1
Notice to Candidate. The work you submit for assessment must be your own. If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified.

Candidate Declaration. I have read and understood the Notice to Candidate and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.

Candidate Signature

Date

General Certificate of Secondary Education

Science A (Specimen)

Controlled Assessment ISA BU1.x Microorganisms Section 2

For moderation in May 20xx or January 20xx

Time allowed 50 minutes

For this paper you must have:
• Results tables and charts or graphs from your investigation
• A copy of the pooled class results
• The Secondary Data Sheet
• Your Candidate Research notes
• A pencil and ruler

You may use a calculator

Instructions
• Use black ink or black ball-point pen.
• Fill in the boxes at the top of this page.
• Answer all questions in Section 2 in the spaces provided. You may use extra paper.
• Do all rough work in this book.
• Cross through any work you do not want to be marked.

Information
• The marks for questions are shown in brackets.
• The maximum mark for this paper is 30.
• The maximum mark for the Controlled Assessment Unit is 50
• You are reminded of the need for good English and clear presentation in your answers.

Details of additional assistance (if any). Has the candidate received any help or information from anyone other than the subject teacher(s) in the production of this work? If the answer is yes give the details below or on a separate page.

Yes [ ] No [ ]

Teacher Declaration:
I confirm that the candidate’s work was conducted under the conditions laid out by the specification. I have authenticated the candidate’s work and am satisfied that to the best of my knowledge the work produced is solely that of the candidate.

Signature of teacher ………………………………………………………… Date ……………………………….

As part of AQA’s commitment to assist students, AQA may make your CAU available on a strictly anonymous basis to teachers, examining staff and students in paper form or electronically, through the Internet or other means, for the purpose of indicating a typical mark or for other educational purposes. In the unlikely event that your CAU is made available for the purposes stated above, you may object to this at any time and we will remove the work on reasonable notice. If you have any concerns please contact cfp@aqa.org.uk

To see how AQA complies with the Data Protection Act 1988 please see our Privacy Statement at aqa.org.uk

GCSE Science A Biology 1 Specimen Controlled Assessment Paper Section 2 V1.0
SECTION 2

Hypothesis: The survival and growth of microorganisms depends upon the concentration of disinfectant.

1 (a) What were the variables in the investigation you did?

   - The independent variable was ...........................................................................................................
   - The dependent variable was ...............................................................................................................
   - One control variable was ....................................................................................................................

(3 marks)

1 (b) Look at your results.

Did you repeat any of the results in your investigation?

Explain why you did or did not repeat any of your results.

Your explanation should include examples from your results.

..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................

(3 marks)

1 (c) In your investigation you changed the concentration of disinfectant.

What was the range of this variable? Give the units.

   - The range was from ........................................... to .........................................................

If you had been able to use another value of this variable, either within or outside this range, what value would you have chosen?

Give a reason for your answer.

..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................

(3 marks)
1 (d) The hypothesis that you were given before you started your investigation was:  

*The survival and growth of microorganisms depends upon the concentration of disinfectant.*  

Do your results support this hypothesis?  

Explain your answer.  

..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................

(3 marks)

1 (e) You researched the results obtained by other people in your class or by your teacher.  

Do the results of others support the hypothesis?  

Explain your answer.  

..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................  
..................................................................................................................................................

(3 marks)
2 You have been given a Secondary Data Sheet which provides results from similar investigations.

2 (a) Draw a sketch graph of the results in Case study 1.

The graph should show how the number of colonies of bacteria varies with the concentration of disinfectant.

(2 marks)

2 (b) Explain whether or not the results on the Secondary Data sheet support the hypothesis you were given.

To gain full marks your explanation should include appropriate examples from the results in Case Studies 1, 2, and 3.

(3 marks)
2 (c) Use Case Study 4 to answer this question.

A hospital worker who saw the results advised:

“The hospital can use ‘Ger-off’ at 90% concentration to make sure most bacteria are killed.”

Do you agree with this advice?

Explain your answer.

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

(3 marks)

3 How could the results from your investigation be useful in making sure that food preparation surfaces at home are free of bacteria?

You may use information from your Candidate Research notes to help you to answer this question.

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________________________________________________

(3 marks)

4 Make sure that you hand in your Candidate Research notes, results tables, and chart or graph with this paper.

You will be awarded up to 4 marks for your chart or graph.

(4 marks)

END OF QUESTIONS
Case study 1

A group of students did an investigation to find out if concentration of disinfectant affects the growth of bacteria.

They used the same disinfectant and species of bacteria each time.
They controlled other relevant variables

These are their results.

<table>
<thead>
<tr>
<th>Concentration of disinfectant in cm³ per dm³ of water</th>
<th>Number of colonies of bacteria that grew</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>88</td>
</tr>
<tr>
<td>10</td>
<td>84</td>
</tr>
<tr>
<td>20</td>
<td>34</td>
</tr>
<tr>
<td>30</td>
<td>8</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

Case study 2

A company makes a new hand-wash. The hand-wash can be diluted with water to make different concentrations.
The company asks one of its scientists to test the effect of using different concentrations of the hand-wash on killing bacteria.

The scientist's results are shown in the table.

<table>
<thead>
<tr>
<th>Percentage concentration of hand-wash</th>
<th>Number of bacterial colonies that grew</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test 1</td>
</tr>
<tr>
<td>0</td>
<td>147</td>
</tr>
<tr>
<td>25</td>
<td>62</td>
</tr>
<tr>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>75</td>
<td>14</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>
Case study 3

Students dipped small discs of filter paper into five disinfectants, A, B, C, D and E. All the disinfectants were diluted to the manufacturer’s recommended strength.

Each disc of filter paper was placed onto agar in a Petri dish in which one type of bacteria was growing. The dish was incubated at 25°C for two days.

The diagram shows the results.

Case study 4

Scientists in a hospital laboratory investigated how well different concentrations of a new disinfectant, “Ger-off”, kills bacteria.

They recorded the percentage of bacteria killed at different concentrations of “Ger-off”.

The graph shows the results.
Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen. Subtotals for each part of each question should be written in the right-hand margin.

Enter the marks for Section 1 and Section 2 and the total mark on the front cover of the answer booklet and fasten them together with the results table(s) and the graphical work and the candidate’s research work from Section 1 of the ISA.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must not be returned to the candidates.

These Marking Guidelines are necessarily generic. Additional guidance on how to relate these generic mark schemes to particular investigations are given below the generic section.

Read through the whole of the candidate's answer and use the Marking Guidelines below to arrive at a 'best-fit' mark.

The layout on the ISA has been designed to help the candidate to structure an answer, but it does not matter if the candidate has written part of the answer in what you consider to be the wrong section of a question.

### SECTION 1

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No creditworthy response</td>
<td>Two relevant sources are clearly identified</td>
<td>Two relevant sources are clearly identified</td>
<td>Two relevant sources are clearly identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The usefulness of the sources is commented on</td>
<td>The usefulness the sources is explained and a detailed comparison made</td>
</tr>
</tbody>
</table>

**Additional Guidance**

- A clearly identified source is referred to by title and author or for websites at least the name of the web site should be quoted.
- A clear comment on only one of the sources may be sufficient to gain 2 marks if the answer implies a comment on the other source.
- If candidates have taken part in peer discussion as part of their research, simply stating this is not sufficient to qualify for quoting a source. Similarly reference to candidate’s own notes or exercise book alone is insufficient.
## SECTION 1

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>No creditworthy response</td>
<td>There is a clear identification of a suitable control variable</td>
<td>There is a clear identification of a suitable control variable</td>
<td>There is a clear identification of a suitable control variable</td>
</tr>
<tr>
<td></td>
<td>A method for determining the value of the variable is attempted but is incomplete</td>
<td>A method for determining the value of the variable is attempted but is incomplete</td>
<td>A suitable method for determining the value of the variable is stated</td>
<td>A suitable method for determining the value of the variable is stated</td>
</tr>
<tr>
<td></td>
<td>Only one value to be investigated in the preliminary experiment is suggested</td>
<td>Values to be investigated in the preliminary experiment are suggested but may not all be appropriate</td>
<td>Appropriate values to be investigated in the preliminary experiment are suggested</td>
<td>Appropriate values to be investigated in the preliminary experiment are suggested</td>
</tr>
<tr>
<td></td>
<td>Little or no mention is made of measurement of the dependent variable</td>
<td>The dependent variable is stated, but details concerning its measurement are incomplete</td>
<td>Measurement of the dependent variable is correctly described</td>
<td>Measurement of the dependent variable is correctly described</td>
</tr>
<tr>
<td></td>
<td>A statement concerning how the results could be used has been made, but is unclear</td>
<td>A clear statement concerning how the results could be used to determine the best value for the variable has been made</td>
<td>A clear statement concerning how the results could be used to determine the best value for the variable has been made</td>
<td>A clear statement concerning how the results could be used to determine the best value for the variable has been made</td>
</tr>
</tbody>
</table>

**Additional Guidance**

A suitable method may involve measuring the extent of growth of colonies of bacteria after different time intervals, and then comparing the results.

The way in which the results could be used may refer to deciding whether there is sufficient growth of colonies to allow clear identification of each colony as a separate entity.

*Do not* give full credit to a candidate who describes how to do the entire investigation at this stage.
**BU1.x Microorganisms (Specimen) ISA - Marking Guidelines**

### SECTION 1

**Q. No. 3**

In this question candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to use good English, organise information clearly and use specialist vocabulary where appropriate.

In order to attain a mark within a certain level, **both** the science **and** the QWC must be of a standard appropriate to that level.

<table>
<thead>
<tr>
<th>0 marks</th>
<th>1, 2 or 3 marks</th>
<th>4, 5 or 6 marks</th>
<th>7, 8 or 9 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No creditworthy response</td>
<td>Most of the necessary equipment is listed</td>
<td>All of the necessary equipment is listed</td>
<td>All of the necessary equipment is listed</td>
</tr>
<tr>
<td></td>
<td>The method described is weak but shows some understanding of the sequence of an investigation</td>
<td>The method described will enable valid results to be collected</td>
<td>The method described will enable valid results to be collected</td>
</tr>
<tr>
<td></td>
<td>The measurements to be made are stated</td>
<td>The measurements to be made are stated</td>
<td>The measurements to be made are stated</td>
</tr>
<tr>
<td></td>
<td>An appropriate hazard is identified, but the corresponding risk assessment and control measure is weak or absent</td>
<td>At least one control variable is given</td>
<td>Control variables are clearly identified, with details of how they will be monitored or controlled</td>
</tr>
<tr>
<td></td>
<td>The answer is poorly organised, with almost no specialist terms and little or no detail given</td>
<td>Any significant hazards are identified, together with a corresponding control measure but the risk assessment is weak or absent</td>
<td>Any significant hazards are identified, together with an assessment of the associated risks and corresponding control measures</td>
</tr>
<tr>
<td></td>
<td>The spelling, punctuation and grammar is very weak</td>
<td>The answer has some structure and organisation, use of specialist terms has been attempted but not always correctly, and some detail is given</td>
<td>The answer is coherent and written in an organised, logical sequence, containing a range of relevant specialist terms used correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The spelling, punctuation and grammar is reasonable although there may still be some errors</td>
<td>The answer shows almost faultless spelling, punctuation and grammar</td>
</tr>
</tbody>
</table>

**Additional Guidance**

Typical hazards with associated risk reduction might include: once incubated the plates should not be opened to prevent possible spread of pathogens that may have grown.

*It may be possible to credit a clearly labelled diagram for some of the marks.*
### SECTION 1

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>No creditworthy response</td>
<td>An alternative method is outlined briefly although some of the necessary steps may not be clear OR A suggestion is given as to why this alternative method would not have been as good as the one chosen</td>
<td>An alternative method is outlined briefly although some of the necessary steps may not be clear</td>
<td>An alternative method is outlined in sufficient detail so that the necessary steps are clear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

Full detailed plans are not required for the alternative method

Suggestions regarding lack of specific, named equipment are sufficient as a sensible explanation

---

### Table for the results

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>No table or a table with incomplete headings or units for the measured variables. Fewer than half of the required elements are present</td>
<td>A table with incomplete headings or units for the measured variables. At least half of the required elements should be present</td>
<td>Correct headings and units present for all measured variables</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

The table should be able to accommodate all the variables that the candidate is going to measure or record during the investigation. There is no need for the candidate to include columns for repeats, means or derived values.
<table>
<thead>
<tr>
<th>Q. No. 1 (a)</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No creditworthy response</td>
<td>Any one variable correctly identified</td>
<td>Any two variables correctly identified</td>
<td>All three variables correctly identified</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

The independent is the concentration of disinfectant used.
Examples of dependent variables are: the number of colonies of bacteria that grow, or the cloudiness of nutrient broth.
Examples of control variables are: the volume of disinfectant used, the temperature of incubation, or the time of incubation.

<table>
<thead>
<tr>
<th>Q. No. 1 (b)</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No creditworthy response</td>
<td>There is a correct statement regarding whether or not any measurements were repeated</td>
<td>There is a correct statement regarding whether or not any measurements were repeated</td>
<td>There is a correct statement regarding whether or not any measurements were repeated and a clear indication of which results were repeated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>There is mention of the presence or absence of anomalous results</td>
<td>There is reference to either anomalous results or to systematic or random uncertainties</td>
<td>There is reference to either anomalous results or to systematic or random uncertainties, and the effects that these would cause</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

In order to gain maximum marks, the candidate should quote some examples from their results.
The candidate may refer to a clearly anomalous result that needs repeating, or to the fact that not all the points lie comfortably on a line of best fit (random uncertainties) or to a systematic uncertainty, such as that caused by the background lighting.
### BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

#### SECTION 2

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (c)</td>
<td>No creditworthy response</td>
<td>At least one end of the range is correctly stated</td>
<td>The range is correctly stated, according to the candidate's own results</td>
<td>The range is correctly stated, according to the candidate's own results</td>
</tr>
<tr>
<td></td>
<td>Another value of the independent variable is suggested, although it may not be appropriate</td>
<td>Another appropriate value of the independent variable is suggested</td>
<td>The reason for the additional value is unclear or inappropriate</td>
<td>Another appropriate value of the independent variable is suggested</td>
</tr>
<tr>
<td></td>
<td>The reason for the additional value is clear and appropriate</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

An appropriate extra reading will usually be one of the following:

- an intermediate reading to fill in a gap, perhaps where the trend line becomes unclear
- a reading outside the range already investigated, perhaps to see if the trend continues

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (d)</td>
<td>No creditworthy response</td>
<td>A simple statement is made as to whether or not the results support the hypothesis</td>
<td>A simple statement is made as to whether or not the results support the hypothesis and an explanation is provided using either an example from the candidate's results or a correctly identified pattern</td>
<td>A simple statement is made as to whether or not the results support the hypothesis and a detailed explanation is provided using either two examples from the candidate's results or a correctly identified patterns in the results</td>
</tr>
</tbody>
</table>

**Additional Guidance**

Note that the answer should refer to the candidate's own results, and not simply to the expected result.

---

GCSE Science A Biology 1 Specimen Controlled Assessment Marking Guidelines V1.0
## SECTION 2

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (e)</td>
<td>No creditworthy response</td>
<td>A simple statement is made as to whether or not the results support the hypothesis</td>
<td>A simple statement is made as to whether or not the results support the hypothesis and an explanation is provided using either an example from the other results or a correctly identified pattern</td>
<td>A simple statement is made as to whether or not the results support the hypothesis and a detailed explanation is provided using either two examples from the other results or correctly identified patterns in the results</td>
</tr>
</tbody>
</table>

### Additional Guidance

Note that the answer should refer to the class or teacher's results, and not simply to the expected result.

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (a)</td>
<td>No creditworthy response</td>
<td>Either: both axes labelled with the variables (units not essential) or a suitable line drawn</td>
<td>Both axes labelled with the variables (units not essential) and a suitable line drawn</td>
</tr>
</tbody>
</table>

### Additional Guidance

Accept axes drawn either way round (i.e. it doesn't matter which axis the concentration is on). The line should be a curve approximately matching the pattern shown by the data in Case study 1.
<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (b)</td>
<td>No creditworthy response</td>
<td>A clear statement is made that Case study 1 supports the hypothesis</td>
<td>A clear statement is made that Case study 1 supports the hypothesis</td>
<td>A clear statement is made that Case study 1 supports the hypothesis</td>
</tr>
<tr>
<td></td>
<td>A simple correct statement is made about one of the other Case studies</td>
<td>Correct statements are made about both Case studies 2 and 3 supported by a more detailed explanation of one of them</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

An example of a clear statement for Case study 1 is “the greater the concentration, the fewer colonies/bacteria grow”.

Further explanation for Case study 2 could include reference to the variation in results between the two tests.

Further explanation for Case study 3 will be that that results are based on type of disinfectant rather than concentration.

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (c)</td>
<td>No creditworthy response</td>
<td>A comment is made as to whether the advice is supported or not</td>
<td>A comment is made as to whether the advice is supported or not</td>
<td>A comment is made as to whether the advice is supported or not</td>
</tr>
<tr>
<td></td>
<td>There is a simple statement that uses information from the graph to support the comment</td>
<td>There is a statement that uses information from the graph to support the comment</td>
<td>There is a statement that uses information from the graph to support the comment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A clear advantage of using “Ger-off” or a clear disadvantage of using “Ger-off” is stated</td>
<td>A clear advantage of using “Ger-off” and a clear disadvantage of using “Ger-off” is stated</td>
<td>A clear advantage of using “Ger-off” and a clear disadvantage of using “Ger-off” is stated</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Guidance**

Examples of advantages include: “all Listeria will be killed (at 90% concentration)” or “All E.coli (probably) killed (at 90% concentration)”

Examples of disadvantages include: “Staphylococcus will not all be killed” or “has not been tested on other bacteria” “need to consider cost (effectiveness)” or “need to compare effectiveness with currently used disinfectants” or “use depends on nature of infection being treated”
### SECTION 2

<table>
<thead>
<tr>
<th>Q. No. 3</th>
<th>0 marks</th>
<th>1 mark</th>
<th>2 marks</th>
<th>3 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No creditworthy response</td>
<td>An idea from the research has been related to the context</td>
<td>An idea from the research has been related to the context</td>
<td>An idea from the research has been related to the context</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is a simple explanation of how this idea can be applied and used in the given context</td>
<td>There is a detailed explanation of how this idea can be applied in the given context</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Guidance

The candidate should attempt to explain, e.g. how manufacturers of disinfectants (or homeowners) could work out the optimum concentration of disinfectant to use at home.

### Graph or chart

<table>
<thead>
<tr>
<th>Q. No. 4</th>
<th>Answer</th>
<th>Additional Guidance</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>X axis: suitable scales chosen and labelled with quantity and units.</td>
<td>Scale should be such that the plots occupy at least one third of each axis.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Y axis: suitable scales chosen and labelled with quantity and units.</td>
<td>Accept axes reversed.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Points or bars plotted correctly to within ± 1 mm.</td>
<td>It may not always be necessary to show the origin.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Suitable line drawn on graph or bars correctly labelled on bar chart.</td>
<td>Allow error carried forward from incorrect points.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>f wrong type of graph / chart, maximum 3 marks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the independent variable is:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• continuous, a best fit line should be drawn</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NB If no line is possible because there is no correlation, candidates should state this on the graph to gain the mark</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• categoric, a bar chart should be drawn</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>