

**Controlled Assessment – Science A ISA BU 1.x**  
**Microorganisms (Specimen)**

**For moderation in May 20xx or January 20xx**

**Teachers' Notes**

**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  $0.5\text{cm}^3$  and  $5\text{cm}^3$

5 sterile nutrient agar plates

Incubator at  $25^\circ\text{C}$

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  $10\text{cm}^3$  of the disinfectant into test tube ‘1’.
3. Remove  $5\text{cm}^3$  from test tube ‘1’ into test tube ‘2’.
4. Add a further  $5\text{cm}^3$  of water to test tube ‘2’.
5. Remove  $5\text{cm}^3$  from test tube ‘2’ into test tube ‘3’.
6. Add a further  $5\text{cm}^3$  of water to test tube ‘3’.
7. Repeat this process to make test tubes ‘4’ and ‘5’.
8. Remove  $5\text{cm}^3$  of solution from test tube 5 and discard it.
9. Add  $0.5\text{cm}^3$  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  $25^\circ\text{C}$  for 2 – 3 days.
12. After 2 – 3 days count and record the number of colonies of bacteria on each agar plate.

**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*

**Hypothesis**

**Research sources**

**Method(s)**

**Equipment**

**Risk assessment issues**

**Relating the investigation to the context**

Centre Number						Candidate Number					For Teacher's Use	
Surname						Other Names						
<b>Notice to Candidate.</b> 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.											Section	Mark
<b>Candidate Declaration.</b> 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.											Section 1 (/20)	
Candidate Signature						Date					Section 2 (/30)	
											TOTAL (max 50)	



General Certificate of Secondary Education

## Science A (Specimen)

### Controlled Assessment ISA BU1.x Microorganisms Section 1

For moderation in May 20xx or January 20xx

Time allowed up to 45 minutes

<p><b>You will need</b></p> <ul style="list-style-type: none"> <li>Your Candidate Research notes</li> <li>A pencil and a ruler</li> </ul> <p style="text-align: center;">You may use a calculator.</p>
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#### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in **Section 1** 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 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.

<p><b>Details of additional assistance (if any).</b> 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.</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>
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<p><b>Teacher Declaration:</b> 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.</p> <p>Signature of teacher ..... Date .....</p>
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**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.

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

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(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.

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(3 marks)





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.

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(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**

20
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Centre Number						Candidate Number					
Surname						Other Names					
<b>Notice to Candidate.</b> 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.											
<b>Candidate Declaration.</b> 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					

For Teacher's Use	
Section	Mark
Section 1 (/20)	
Section 2 (/30)	
<b>TOTAL</b> (max 50)	



## 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 .....

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**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.

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*(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.

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*(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.

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(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.

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(3 marks)

Turn over ►

**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.

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*(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.

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(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.

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(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**

## Secondary Data Sheet – Controlled Assessment Science A

### BU1.x Microorganisms (Specimen)

#### 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.

Concentration of disinfectant in cm <sup>3</sup> per dm <sup>3</sup> of water	Number of colonies of bacteria that grew
0	88
10	84
20	34
30	8
40	0
50	0

#### 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.

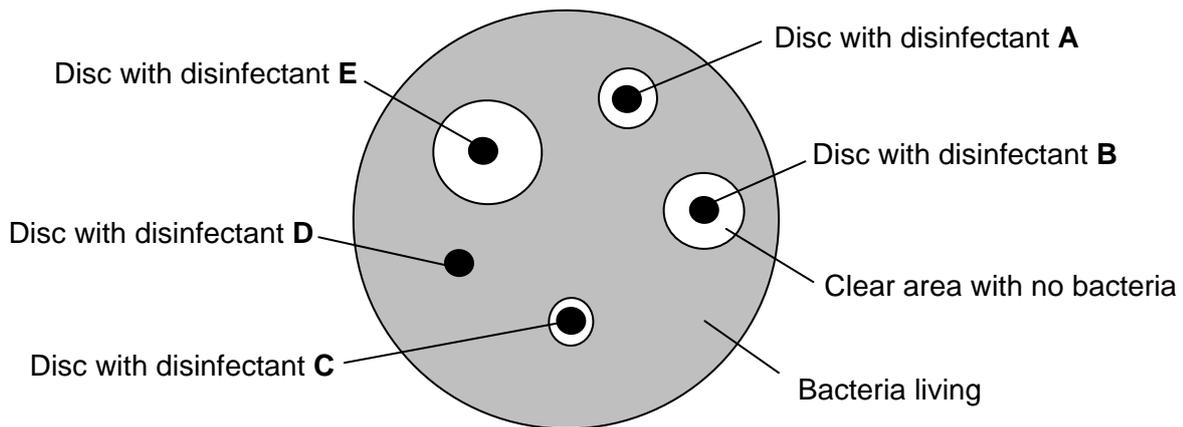
Percentage concentration of hand-wash	Number of bacterial colonies that grew			
	Test 1	Test 2	Test 3	Mean
0	147	151	146	148
25	62	88	63	71
50	36	32	33	34
75	14	18	15	16
100	0	0	0	0

### 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.

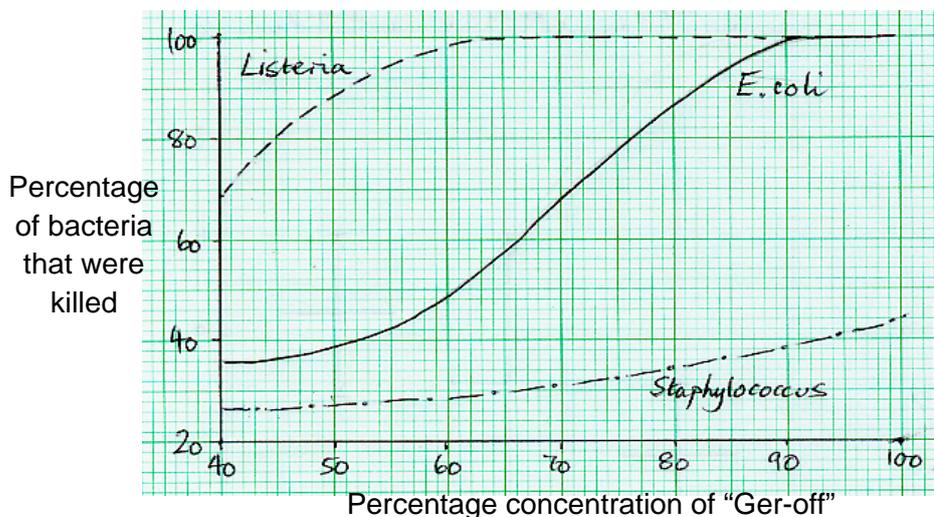


### Case study 4

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.



**BU1.x Microorganisms (Specimen) ISA - Marking Guidelines**

**GCSE Science – Controlled Assessment ISA – Marking Guidelines**

**Science ISA – BU1.x Microorganisms (Specimen)**

**For moderation in May 20xx or January 20xx**

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**

	<b>0 marks</b>	<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>
<b>Q. No. 1</b>	No creditworthy response	Two relevant sources are clearly identified	Two relevant sources are clearly identified  The usefulness of the sources is commented on	Two relevant sources are clearly identified  The usefulness the sources is explained and a detailed comparison made
<b>Additional Guidance</b>	<p><i>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.</i></p> <p><i>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.</i></p> <p><i>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.</i></p>			

**BU1.x Microorganisms (Specimen) ISA - Marking Guidelines**

<b>SECTION 1</b>				
	<b>0 marks</b>	<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>
<b>Q. No. 2</b>	<p>No creditworthy response</p>	<p>There is a clear identification of a suitable control variable</p> <p>A method for determining the value of the variable is attempted but is incomplete</p> <p>Only one value to be investigated in the preliminary experiment is suggested</p> <p>Little or no mention is made of measurement of the dependent variable</p>	<p>There is a clear identification of a suitable control variable</p> <p>A method for determining the value of the variable is attempted but is incomplete</p> <p>Values to be investigated in the preliminary experiment are suggested but may not all be appropriate</p> <p>The dependent variable is stated, but details concerning its measurement are incomplete</p> <p>A statement concerning how the results could be used has been made, but is unclear</p>	<p>There is a clear identification of a suitable control variable</p> <p>A suitable method for determining the value of the variable is stated</p> <p>Appropriate values to be investigated in the preliminary experiment are suggested</p> <p>Measurement of the dependent variable is correctly described</p> <p>A clear statement concerning how the results could be used to determine the best value for the variable has been made</p>
<b>Additional Guidance</b>	<p><i>A suitable method may involve measuring the extent of growth of colonies of bacteria after different time intervals, and then comparing the results.</i></p> <p><i>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.</i></p> <p><i>Do <b>not</b> give full credit to a candidate who describes how to do the entire investigation at this stage.</i></p>			

## BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

SECTION 1									
<p>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.</p> <p>Candidates will be required to use good English, organise information clearly and use specialist vocabulary where appropriate.</p> <p>In order to attain a mark within a certain level, <b>both</b> the science <b>and</b> the QWC must be of a standard appropriate to that level.</p>									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 25%;">0 marks</th> <th style="width: 25%;">1, 2 or 3 marks</th> <th style="width: 25%;">4, 5 or 6 marks</th> <th style="width: 10%;">7, 8 or 9 marks</th> </tr> </thead> </table>						0 marks	1, 2 or 3 marks	4, 5 or 6 marks	7, 8 or 9 marks
	0 marks	1, 2 or 3 marks	4, 5 or 6 marks	7, 8 or 9 marks					
<p><b>Q. No.</b> <b>3</b></p>	<p>No creditworthy response</p>	<p>Most of the necessary equipment is listed</p> <p>The method described is weak but shows some understanding of the sequence of an investigation</p> <p>The measurements to be made are stated</p> <p>An appropriate hazard is identified, but the corresponding risk assessment and control measure is weak or absent</p> <p>The answer is poorly organised, with almost no specialist terms and little or no detail given</p> <p>The spelling, punctuation and grammar is very weak</p>	<p>All of the necessary equipment is listed</p> <p>The method described will enable valid results to be collected</p> <p>The measurements to be made are stated</p> <p>At least one control variable is given</p> <p>Any significant hazards are identified, together with a corresponding control measure but the risk assessment is weak or absent</p> <p>The answer has some structure and organisation, use of specialist terms has been attempted but not always correctly, and some detail is given</p> <p>The spelling, punctuation and grammar is reasonable although there may still be some errors</p>	<p>All of the necessary equipment is listed</p> <p>The method described will enable valid results to be collected</p> <p>The measurements to be made are stated</p> <p>Control variables are clearly identified, with details of how they will be monitored or controlled</p> <p>Any significant hazards are identified, together with an assessment of the associated risks and corresponding control measures</p> <p>The answer is coherent and written in an organised, logical sequence, containing a range of relevant specialist terms used correctly</p> <p>The answer shows almost faultless spelling, punctuation and grammar</p>					
<p><b>Additional Guidance</b></p>	<p><i>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.</i></p> <p><i>It may be possible to credit a clearly labelled diagram for some of the marks.</i></p>								

## BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

SECTION 1				
	<b>0 marks</b>	<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>
<b>Q. No. 4</b>	No creditworthy response	An alternative method is outlined briefly although some of the necessary steps may not be clear  <b>OR</b>  A suggestion is given as to why this alternative method would not have been as good as the one chosen	An alternative method is outlined briefly although some of the necessary steps may not be clear    A suggestion is given as to why this alternative method would not have been as good as the one chosen	An alternative method is outlined in sufficient detail so that the necessary steps are clear    A sensible explanation is given as to why this alternative method would not have been as good as the chosen one
<b>Additional Guidance</b>	<p><i>Full detailed plans are not required for the alternative method</i></p> <p><i>Suggestions regarding lack of specific, named equipment are sufficient as a sensible explanation</i></p>			
Table for the results				
	<b>0 marks</b>	<b>1 mark</b>	<b>2 marks</b>	
<b>Q. No. 5</b>	No table or a table with incomplete headings or units for the measured variables. Fewer than half of the required elements are present	A table with incomplete headings or units for the measured variables. At least half of the required elements should be present	Correct headings and units present for all measured variables	
<b>Additional Guidance</b>	<p><i>The table should be able to accommodate all the variables that the candidate is going to measure or record during the investigation.</i></p> <p><i>There is no need for the candidate to include columns for repeats, means or derived values.</i></p>			

## BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

SECTION 2				
Q. No. 1 (a)	0 marks	1 mark	2 marks	3 marks
	No creditworthy response	Any <b>one</b> variable correctly identified	Any <b>two</b> variables correctly identified	All <b>three</b> variables correctly identified
<b>Additional Guidance</b>	<p><i>The independent is the concentration of disinfectant used</i></p> <p><i>Examples of dependent variables are: the number of colonies of bacteria that grow, or the cloudiness of nutrient broth</i></p> <p><i>Examples of control variables are: the volume of disinfectant used, the temperature of incubation, or the time of incubation</i></p>			
SECTION 2				
Q. No. 1 (b)	0 marks	1 mark	2 marks	3 marks
	No creditworthy response	<p>There is a correct statement regarding whether or not any measurements were repeated</p> <p>There is mention of the presence or absence of anomalous results</p>	<p>There is a correct statement regarding whether or not any measurements were repeated</p> <p>There is reference to either anomalous results or to systematic or random uncertainties</p>	<p>There is a correct statement regarding whether or not any measurements were repeated and a clear indication of which results were repeated</p> <p>There is reference to either anomalous results or to systematic or random uncertainties, and the effects that these would cause</p>
<b>Additional Guidance</b>	<p><i>In order to gain maximum marks, the candidate should quote some examples from their results.</i></p> <p><i>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.</i></p>			

## BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

SECTION 2				
	0 marks	1 mark	2 marks	3 marks
<b>Q. No. 1 (c)</b>	No creditworthy response	At least one end of the range is correctly stated  Another value of the independent variable is suggested, although it may not be appropriate	The range is correctly stated, according to the candidate's own results  Another appropriate value of the independent variable is suggested  The reason for the additional value is unclear or inappropriate	The range is correctly stated, according to the candidate's own results  Another appropriate value of the independent variable is suggested  The reason for the additional value is clear and appropriate
<b>Additional Guidance</b>	<p><i>An appropriate extra reading will usually be one of the following:</i></p> <ul style="list-style-type: none"> <li>• <i>an intermediate reading to fill in a gap, perhaps where the trend line becomes unclear</i></li> <li>• <i>a reading outside the range already investigated, perhaps to see if the trend continues</i></li> </ul>			
SECTION 2				
	0 marks	1 mark	2 marks	3 marks
<b>Q. No. 1 (d)</b>	No creditworthy response	A simple statement is made as to whether or not the results support the hypothesis	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	A simple statement is made as to whether or not the results support the hypothesis  and a detailed explanation is provided using either <b>two</b> examples from the candidate's results or a correctly identified patterns in the results
<b>Additional Guidance</b>	<p><i>Note that the answer should refer to the candidate's own results, and not simply to the expected result.</i></p>			

## BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

SECTION 2				
	0 marks	1 mark	2 marks	3 marks
<b>Q. No. 1 (e)</b>	No creditworthy response	A simple statement is made as to whether or not the results support the hypothesis	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	A simple statement is made as to whether or not the results support the hypothesis  and a detailed explanation is provided using either <b>two</b> examples from the other results or correctly identified patterns in the results
<b>Additional Guidance</b>	<i>Note that the answer should refer to the class or teacher's results, and not simply to the expected result.</i>			
	0 marks	1 mark	2 marks	
<b>Q. No. 2 (a)</b>	No creditworthy response	<b>Either:</b> both axes labelled with the variables (units not essential)  <b>Or</b> a suitable line drawn	Both axes labelled with the variables (units not essential)  <b>and</b> a suitable line drawn	
<b>Additional Guidance</b>	<i>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.</i>			

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SECTION 2				
<b>Q. No. 2 (b)</b>	<b>0 marks</b>	<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>
	No creditworthy response	A clear statement is made that Case study 1 supports the hypothesis  A simple correct statement is made about one of the other Case studies	A clear statement is made that Case study 1 supports the hypothesis  Correct statements are made about both Case studies 2 and 3 supported by a more detailed explanation of one of them	A clear statement is made that Case study 1 supports the hypothesis  A clear statement is made that Case study 2 supports the hypothesis accompanied by comments on the anomalous result (25%, Test 2) and the need to recalculate the mean for that concentration  A clear explanation is given of why Case study 3 is irrelevant
<b>Additional Guidance</b>	<p><i>An example of a clear statement for Case study 1 is “the greater the concentration, the fewer colonies/bacteria grow”.</i></p> <p><i>Further explanation for Case study 2 could include reference to the variation in results between the two tests</i></p> <p><i>Further explanation for Case study 3 will be that that results are based on type of disinfectant rather than concentration</i></p>			
<b>Q. No. 2 (c)</b>	<b>0 marks</b>	<b>1 mark</b>	<b>2 marks</b>	<b>3 marks</b>
	No creditworthy response	A comment is made as to whether the advice is supported or not  There is a simple statement that uses information from the graph to support the comment	A comment is made as to whether the advice is supported or not  There is a statement that uses information from the graph to support the comment  A clear advantage of using “Ger-off” <b>or</b> a clear disadvantage of using “Ger-off” is stated	A comment is made as to whether the advice is supported or not  There is a statement that uses information from the graph to support the comment  A clear advantage of using “Ger-off” <b>and</b> a clear disadvantage of using “Ger-off” is stated
<b>Additional Guidance</b>	<p><i>Examples of advantages include: “all Listeria will be killed (at 90% concentration)” or “All E.coli (probably) killed (at 90% concentration)”</i></p> <p><i>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”</i></p>			

## BU1.x Microorganisms (Specimen) ISA - Marking Guidelines

SECTION 2				
	0 marks	1 mark	2 marks	3 marks
<b>Q. No. 3</b>	No creditworthy response	An idea from the research has been related to the context	An idea from the research has been related to the context  There is a simple explanation of how this idea can be applied and used in the given context	An idea from the research has been related to the context  There is a detailed explanation of how this idea can be applied in the given context
<b>Additional Guidance</b>	<i>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.</i>			
Graph or chart				
	Answer	Additional Guidance		Mark
<b>Q. No. 4</b>	X axis: suitable scales chosen and labelled with quantity and units.	Scale should be such that the plots occupy at least one third of each axis.		<b>1</b>
	Y axis: suitable scales chosen and labelled with quantity and units.	Accept axes reversed. It may not always be necessary to show the origin.		<b>1</b>
	Points or bars plotted correctly to within $\pm 1$ mm.	Allow one plotting error out of each 5 points/bars plotted.		<b>1</b>
	Suitable line drawn on graph or bars correctly labelled on bar chart.	Allow error carried forward from incorrect points.   f wrong type of graph / chart, maximum <b>3</b> marks. If the independent variable is: <ul style="list-style-type: none"> <li>• continuous, a best fit line should be drawn</li> </ul> <b>NB</b> If no line is possible because there is no correlation, candidates should state this on the graph to gain the mark <ul style="list-style-type: none"> <li>• categoric, a bar chart should be drawn</li> </ul>		<b>1</b>