General Certificate of Secondary Education
Specimen Controlled Assessment

GCSE Additional Applied Science

Unit 2 How Scientists use Practical Techniques

Specimen Controlled Assessment V1.0

Assignment 1, Option 3: The work of microbiologists in the food industry

Notes for Teachers

GCSE Additional Applied Science Controlled Assessment

Assignment 1, Option 3: The work of microbiologists in the food industry

Notes for Teachers

This task relates to Unit 1 Section 3.3.5 – The use of science in food production.

Introduction

In this option for Assignment 1, candidates should research and write a report on the work of a microbiologist who is working within the food production industry. They should then carry out a practical task using some of the techniques that a microbiologist working in food production might carry out in the process of their work and write a report on their findings.

Candidates should be allowed to demonstrate their research skills by collecting information from a range of sources and referencing them. Internet research is permissible, but candidates should be reminded to record all sources used. When using sources of information they should be reminded of the rules concerning plagiarism and that plagiarised work will receive no credit.

It is hoped that candidates may be able to collect first-hand information by visiting scientific organisations where microbiologists work, or that visits by a practitioner may be made to the centre.

Candidates should also be given the opportunity to practice the techniques they will use before undertaking the practical task. They must be made aware of the importance of following standard procedures.

During the practical task, candidates may work singly or in groups to obtain their data. However, each candidate must record and process the data individually, and must identify the data collected under their own direction.

Area of Investigation

This work should be carried out during the teaching of Unit 1, section 3.3.5 – The use of science in food production.

Approach to the investigation

Candidates need to do research to find an organisation involved in food production in which a microbiologist works, and then write a report on the work that person undertakes and the qualifications and practical skills he or she needs to carry out their work. They should be encouraged to decide for themselves on the organisation to study. A good introduction to the

research task might be to hold an initial classroom discussion into the role of microbiologists in the food industry.

The second part of the assignment is a practical task, which should be researched and set by the teacher. A task should be set that uses practical techniques that a microbiologist would use – such as use of aseptic technique, preparing serial dilutions, preparing plates and counting colonies of bacteria. The task should be put into a context relating clearly to the work of microbiologists in the food industry, and **must** include at least one technique that allows candidates to obtain and use quantitative as well as qualitative data.

Teachers should prepare a procedure for candidates to follow in order to carry out the practical task. One copy of the procedure supplied to candidates should be included in the work sent for moderation. Candidates should study the procedure they will be carrying out and use it to devise a hypothesis that the procedure will test.

An example scenario is given below. Teachers are free to use this, adapt it to suit their candidates' needs or to create their own scenario.

A microbiologist in the bacteriology laboratory of a food factory carries out routine tests to ensure that the working surfaces on the production line do not become contaminated with harmful bacteria, making the food being produced unsafe to eat. She carries out a spot test on a measured area of one of the work surfaces, to identify and count the number of bacteria present. She must make sure that she uses aseptic techniques throughout her testing to ensure that contamination by other bacteria does not occur.

The teacher would need to prepare the following standard procedures for candidates to follow:

- *preparing serial dilutions from a previously prepared culture*
- *plating up*
- *counting bacterial colonies.*

In addition to this, candidates must understand the importance of working aseptically. Candidates should be provided with all the equipment and chemicals they would need in order to carry out the task.

Once given the scenario and task, candidates should make a hypothesis that the procedures are going to test, and clearly state this hypothesis in their write-up.

Once candidates have carried out the task, they should prepare a report, analysing their data and drawing conclusions from the results such as the scientist in the scenario would have to do.

Working safely in the laboratory

It is the responsibility of the centre to be aware of any health and safety implications of the investigation and ensure that a risk assessment for the practical is carried out. Teachers should remind candidates about safe working when carrying out laboratory procedures.

Stage 1 – Planning

The teacher should lead a discussion with the candidates to introduce the assignment, during which the research methods and practical techniques to be used should be discussed. The discussion should include how to develop a hypothesis and the role of experimentation and gathering evidence in testing hypotheses.

Candidates should be given the opportunity to have hands-on experience of the techniques to be used during the delivery of Unit 1.

Stage 2 – Completing the assignment

For the research part of the assignment candidates may work individually or in groups under limited supervision.

When undertaking the practical element of the assignment candidates may work individually or in groups under normal laboratory supervision.

Each candidate must contribute to the collection of data.

Stage 3 – Data processing, analysis and final report writing

This part of the investigation may be carried out under informal supervision during normal class time. Candidates must work on their own to write up their research findings, analyse their data and present their conclusions and final report. The report may be handwritten or data processed.

We expect that this stage of the assignment will take a number of normal lessons. Candidates' work (including that done on removable media such as memory sticks or floppy disks) must be collected by the teacher at the end of each lesson and returned at the beginning of the next. Candidates should **not** be allowed to work on the report between lessons.

In their final report candidates should:

- give information about the organisation in which the microbiologist works
- give an account of the work that their chosen microbiologist carries out in this organisation, including the qualifications and practical skills they need to carry out their job
- list the range of sources they have used to find this information
- make a hypothesis for the investigation
- demonstrate that they have followed the standard operating procedures correctly
- present their observations and numerical data appropriately
- identify patterns within their data and carry out calculations
- make conclusions based on their analysis of the data / evidence that a microbiologist might be expected to make

GCSE Additional Applied Science: Marking criteria for Assignment 1

Skill area	0 marks	Level 1	Level 2	Level 3	Assessment Objective
1. Research 1A. Information on the organisation	No relevant content	There is a statement of the purpose of the type of organisation in which the scientist works and of the investigation to be completed. Information is poorly organised and lacks a coherent structure, although it may contain some valid points. (1–2 marks)	There is a description of the purpose of the type of organisation in which the scientist works and of the investigation to be completed. Information shows some organisation and structure and contains some valid evidence. (3–4 marks)	There is an explanation of the type of organisation in which the scientist works and of the investigation to be completed in terms of the benefits to society. Information is logically organised and structured coherently, and is supported by a range of valid evidence. (5–6 marks)	3 AO1 3 AO2
1B. Information on work of scientist	No relevant content	There is a brief account of the work of a scientist and at least one link to scientific knowledge from the specification. (1–2 marks)	There is a description of the work of a scientist and some relevant links to scientific knowledge from the specification are identified. (3–4 marks)	There is a detailed account of the work of a scientist, with clear links to scientific knowledge from the specification. (5–6 marks)	6 AO1
1C. Qualification skills used by the scientist	No relevant content	The qualifications required by the scientist are stated and at least one practical skill that is required to carry out the investigation is mentioned. (1–2 marks)	There is a description of the qualifications required by the scientist and how practical skills are used to carry out the investigation. (3–4 marks)	There is a description of the qualifications required by the scientist and an explanation of how practical skills and scientific knowledge are used to carry out the investigation. (5–6 marks)	3 AO1 3 AO2
1D. Sources of information	No relevant content	A limited range of sources of information is given, some of which may have been provided to the candidate. (1 mark)	There is a record of using a range of identified sources of information, showing some degree of selection. The limitations of the data and conclusions that the scientist may recognise are given. (2–3 marks)	There is a bibliography containing a wide range of sources of information and the relevant information has been selected from this. Alternative strategies that the scientist may use to improve the data collected from the investigation are given. (4–5 marks)	5 AO2

2. Making a hypothesis	No relevant hypothesis presented	A vague hypothesis has been stated for the investigation, but it has little scientific foundation. (1 mark)	A hypothesis has been stated, which is relevant to the investigation. (2 marks)	A reasoned hypothesis has been given for the investigation, with scientific justification. (3 marks)	3AO2
3. Following standard procedures and collecting data	No data collected or results presented	The investigation has been carried out, but only vaguely following the standard operating procedure. Simple observations and measurements have been made and there is some attempt to record the results appropriately. (1–2 marks)	The investigation has been carried out, following the standard operating procedure with some guidance. Careful and accurate measurements and observations have been made and have been recorded in appropriate tables and graphs, with little guidance. Observations that it would be appropriate to repeat have been recognised. (3–5 marks)	The investigation has been carried out, independently following the standard operating procedure. Accurate and precise measurements and observations have been made throughout and have been independently recorded accurately in appropriate tables and graphs. Reasons for repeating any measurements or observations have been given. (6–8 marks)	8AO2
4. Analysing data / evidence and drawing conclusions	No attempt made to identify patterns or manipulate the data; no conclusions given	There is some attempt to identify patterns and carry out calculations. A vague explanation that the scientist may make in a report of the investigation is given. The conclusions show little logical structure or organisation. (1–2 marks)	Patterns within the data / observations have been identified and calculations carried out. Conclusions that the scientist may make, based on the evidence collected, in a report of the investigation are given, which are consistent with the evidence. The conclusions show some organisation and structure and relate directly to the evidence obtained. (3–4 marks)	Patterns within the data / observations are identified and explained and some expertise in manipulating the data to carry out calculations is demonstrated. Conclusions that the scientist may make, based on the evidence collected, in a report of the investigation are given. The conclusions are clear and logical and relate directly to the evidence obtained, demonstrating a comprehensive scientific understanding. (5–6 marks)	3AO2 3AO3
Total					**40**