Higher National Unit specification

General information for centres

Unit title: Microbiology of Foods: Food Quality and Safety

Unit code: F8L9 35

Unit purpose: This Unit is designed to enable candidates to assess the quality and safety of food and food ingredients, as well as the hygiene standards in food premises. It enables them to undertake the practical microbiological work which is an essential aspect of food manufacturing and equips them with the knowledge and understanding of relevant principles of microbiology.

On completion of the Unit the candidate should be able to:

1 Explain the formulation of sampling plans for the microbiological analysis of foods.
2 Assess the quality and safety of food.
3 Evaluate methods to assess standards of hygiene in food premises.

Credit points and level: 1 HN credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the centre. However, it would be beneficial if candidates had experience in microbiology either via industry or achievement of relevant Units at SCQF level 7 such as F6VL 34 Microbiology of Foods 1 and F6VM 34 Microbiology of Foods 2.

Core Skills: There are opportunities to develop the following Core Skills components in this Unit: *Written Communication* (Writing) at SCQF level 6; *Numeracy* (Using Number); *Problem Solving* (Critical Thinking) at SCQF level 6; *Problem Solving* (Reviewing and Evaluating) at SCQF level 6. There is no automatic certification of these Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: The assessment for this Unit consists of observation of laboratory work on micro-organisms supplemented by reports and/or presentations which could be based on responses to questions given to candidates. This work will enable candidates to demonstrate that they have the necessary practical skills and that they have acquired the underpinning knowledge and understanding needed to undertake the microbiological analysis necessary to maintain suitable standards of safety, quality and hygiene in food handling and manufacture. An observation checklist can be used to record the achievement of practical skills such as safe laboratory practice.

Higher National Unit specification: statement of standards

Unit title: Microbiology of Foods: Food Quality and Safety

Unit code: F8L9 35

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Please refer to *Knowledge and/or Skills for the Unit* and *Evidence Requirements for the Unit* after the Outcomes.

Outcome 1

Explain the formulation of sampling plans for the microbiological analysis of foods

Knowledge and/or Skills

- Microbiological quality, stability and safety
- Microbiological criteria
- Classes of sampling plans
- Hazard groups

Outcome 2

Assess the quality and safety of food

Knowledge and/or Skills

- Pure cultures
- Sample preparation of foods
- Sampling methods
- Isolation and identification methods
- Indicator and spoilage organisms
- Pathogens
- Correct use of laboratory equipment
- Safe performance of laboratory techniques

Outcome 3

Evaluate methods to assess standards of hygiene in food premises

Knowledge and/or Skills

- Methods of assessing hygiene of plant and ancillary equipment
- Standards of hygiene
- Spoilage, indicator and pathogenic organisms
- Correct use of laboratory equipment
- Safe performance of laboratory techniques
- Data analysis and presentation of results

Higher National Unit specification: statement of standards (cont)

Unit title: Microbiology of Foods: Food Quality and Safety

Evidence Requirements for the Unit

Candidates will need to provide written/oral and practical evidence to meet all the Knowledge and/or Skills items by showing that they can:

- give accurate examples to illustrate the distinctions between microbiological safety, quality and stability of food
- give accurate examples to illustrate 3 different purposes of microbiological criteria, including food mandatory and advisory microbiological criteria
- formulate a correct sampling plan to identify hazards to consumers of spoilage organisms and/or pathogens for a specified situation
- justify the way in which the sampling plan has been formulated by giving reasons to show that they have taken into account different classes of sampling plans, relevant factors influencing the formulation of sampling plans and the stringency of sampling plans

Candidates should also perform microbiological techniques to assess the safety and quality of food and the assess standards of hygiene in food premises. They must:

- use selective and differential media to obtain one pure culture from a mixed culture
- use each of morphological, physiological and biochemical characteristics to identify one bacterium or yeast culture
- use a suitable microbiological method to sample aseptically food or a food ingredient
- carry out appropriate microbiological tests on two different foods to detect and identify spoilage organisms, indicators and pathogens
- use appropriate sampling methods to assess the standards of hygiene in food premises. This must cover production plant, ancillary equipment and personnel.
- carry out microbiological analysis to assess the standards of hygiene of production plant, ancillary equipment and personnel: the analysis must include the search for spoilage organisms, one indicator organism and one pathogen

Candidates should prepare and set up equipment in an appropriate manner for each piece of laboratory work. They should deploy suitable practical techniques in accordance with relevant safety requirements in the laboratory and ensure that their work produces accurate results. To ensure that candidates meet these requirements, they should be observed on all occasions. A record should be kept of each observation. Candidates should also keep records of the results of each practical exercise.

Candidates should also provide **two** reports on laboratory work associated with assessing the safety and quality of food covered in Outcome 2. The reports should be presented in a suitable format and include suitable data and evaluation. The evaluation should be based directly on the data obtained by candidates who should draw reasoned conclusions from the data they have collected.

Higher National Unit specification: statement of standards (cont)

Unit title: Microbiology of Foods: Food Quality and Safety

Assessment Guidelines for the Unit

Candidates could present evidence in a number of ways to show that they can explain the formulation of sampling plans. They could be asked to formulate a sampling plan for a specific situation and asked to provide reasons to justify their choice. These reasons could be presented in the form of a short report or through a poster presentation or by using presentation software. Candidates could be given questions and could present their work as responses to these questions.

An observation checklist can be used to record the observation of practical work and it can cover items such as practical skills deployed and safe laboratory practice. Candidates could provide information of the results of each laboratory exercise by keeping a laboratory logbook. Candidates could be asked questions about the work they have done to supplement the observation checklist.

The format for the laboratory reports could include:

- Title and date
- Introduction including relevant theory
- Materials and method
- Results, including tables, calculations and graphs where relevant
- Evaluation
- Conclusions
- References

Administrative Information

Unit code: F8L9 35

Unit title: Microbiology of Foods: Food Quality and Safety

Superclass category: NH

Original date of publication: August 2009

Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Microbiology of Foods: Food Quality and Safety

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

The main emphasis of this Unit is to enable candidates to further develop their practical laboratory skills in microbiology in the context of food quality and safety. However, it also gives candidates the underpinning knowledge needed to assess food quality and safety and the standards of hygiene on food premises. It also builds on the SCQF level 7 Units: F6VL 34 Microbiology of Foods 1 and F6VM 34 Microbiology of Foods 2 as it enables candidates to develop and extend the microbiology theory and practical skills which they acquired through these Units. The Unit will help prepare candidates for employment in biological science related posts in the food industry, particularly ones associated with quality assurance. It is recommended that candidates should have the relevant microbiology experience from industry or have achieved Units F6VL 34 Microbiology of Foods 1 and F6VM 34 Microbiology of Foods 2 (or equivalent) before embarking on this Unit.

This is an applied Unit. Candidates are therefore expected throughout this Unit to apply their knowledge and understanding of microbiology and associated laboratory techniques to food safety, quality and hygiene in the food industry. It is important that candidates appreciate the reason why the study and practice of microbiology is vitally important in food manufacturing.

The Unit will help candidates to develop their skills and awareness of the critical importance of microbiological techniques to safety, quality and hygiene in the food industry. It will also reinforce for candidates the importance of following proper laboratory procedures as well as extending the range of laboratory skills and techniques which they can perform. Throughout, candidates should be reminded of the importance of safe working practices and the precautions that should be taken to ensure that these are achieved. They should remember, and put into practice, the need to conduct experiments carefully and according to the relevant procedure. They will be expected also to keep a record of their observations and results including the assessment and evaluation of the results. At the completion of the Unit, candidates should feel that they have developed additional skills in practical microbiology which will be of value to them as prospective employees in the food industry.

The following give some further details on the 3 Outcomes.

Outcome 1:

- Microbiological criteria: principles underlying the formulation of microbiological criteria; information needed to establish a criterion for foods; standards, specifications and guidelines; microbial load — number of spoilage and pathogenic organisms.
- Sampling: types of sample — simple, stratified, quota, cluster; sample size; sampling plans — 2-class and 3-class sampling plans for foods; stringency of the sampling plan.
- Hazard groupings: different pathogens, spoilage organisms.

Higher National Unit specification: support notes (cont)

Unit title: Microbiology of Foods: Food Quality and Safety

Outcome 2: [NB — this is the key Outcome in this Unit and the one to which most emphasis should be given].

- Aseptic technique for the isolation and maintenance of pure cultures
- Isolation and detection techniques for moulds, yeasts and bacteria: wet and heat-fixed preparations, selective and differential staining and microscopy to observe morphological characteristics; cultural and physiological characteristics including selective and differential media, oxygen requirement, pH, OP, temperature preference; biochemical tests including IMViC, Eijkman, Coagulase/Staphylase, API/Enterotube tests; bacteriophage typing; serological typing.
- Sample preparation of food or food ingredients: solid, particulate solid, liquid foods; diluents, stomacher vs. homogeniser.
- Sampling methods: pipette, swab, surface slice, deep sample or rinse in preparation for microbiological analysis.
- Tests to identify spoilage and indicator organisms: colony counts, enzyme activity, dye reduction. Pathogens: Staphylococcus aureus, Salmonella, E.coli.
- Quality and safety tests: dye reduction tests, enzyme tests, antibiotic detection tests.

Outcome 3:

- Methods: impression techniques, rinses, swabbing, settle plates, sweep plates, air sampling and ATP/bioluminescence measurements.
- A range of equipment could be investigated and the importance of correct choice of technique can be stressed.
- Efficacy of sanitisation; isolation and confirmatory tests for Staphylococcus aureus.

In both Outcomes 2 and 3, candidates will be engaged in laboratory based practical exercises. Candidates should therefore develop the laboratory skills that they gained in Unit such as Microbiology of Foods 1 and Microbiology of Foods 2.

Candidates should be made thoroughly aware of the critical importance of health and safety in a laboratory and be able to take all appropriate precautions to ensure that an appropriate environment is maintained.

Guidance on the delivery and assessment of this Unit

Delivery Guidance:

Delivery should aim to help candidates apply the material in the Unit to the food industry. Learning activities should be able to take advantage of the experience that candidates have gained from their previous work in microbiology associated with the food industry. The practical laboratory work for this Unit, for example, can build on the laboratory skills that candidates have developed in the earlier Microbiology of Foods Units. Delivery for this Unit, therefore, could seek to enhance the capabilities which candidates have already gained. By this stage candidates should be confident of what they can do and be able to recognise the ways in which they could apply the skills they are developing in their future employment in the food industry.

Higher National Unit specification: support notes (cont)

Unit title: Microbiology of Foods: Food Quality and Safety

Candidates should be encouraged to take responsibility for their own learning and may be able to research and work out for themselves some of the ways in which the microbiology work they are doing applies in the food industry. This Unit emphasises safety, hygiene and quality all of which are critical to the food industry and the success of companies engaged in food processing and manufacturing. If this Unit is being delivered as part of the HND in Food Science and Technology, it can contribute towards the integration of the whole award. Candidates who take this Unit and have completed Units in Food Processing and should be in a strong position to appreciate, and find examples of, the impact that micro-organisms can have on safety, quality and hygiene in the food industry.

Tutors may find the following references useful:

- Scottish Schools Education Research Council (SSERC): Code of practice for the use of micro-organisms in schools and colleges
- HSE: Categorisation of dangerous pathogens
- IFST guidelines
- FSA guidelines

Tutors are reminded that Outcome 2 is the key Outcome in this Unit and the one to which most emphasis should be given.

Assessment Guidance

Assessment for this Unit involves both practical work and explanation. Explanation predominantly arises in Outcome 1 and can be provided in a number of ways. Tutors could choose to vary the methods to suit different groups of candidates. Candidates could provide a report for example which they could prepare in their own time. This report could be based on a series of questions which may help candidates to structure their responses. Another option is to ask candidates to give a presentation. Again candidates could be given some questions to help them structure their work. Candidates could make use of presentation software or they could develop a poster based presentation. Assessment judgments should be based on the explanation of micro-biological terms, and not the facility that the candidate used to outline the explanation.

Candidates should be observed during some of their practical work and the observation should be recorded on a checklist. This will provide evidence that candidates have followed proper laboratory procedures and carried out the work safely and accurately. If necessary, the observation checklists may be supplemented by additional questions. Candidates must provide information on the results of practical work which could be done through a laboratory log book. They must also provide a laboratory report in a suitable format on a laboratory exercise using a count technique. The format should allow candidates to present and evaluate their results but any accepted format would be suitable.

Candidates could gather all their evidence in a portfolio which they can build as they progress through the Unit. Oral evidence should be recorded (eg by video) and retained.

Higher National Unit specification: support notes (cont)

Unit title: Microbiology of Foods: Food Quality and Safety

Opportunities for developing Core Skills

Communication: Written Communication (Writing) at SCQF level 6
As part of their assessment work for this Unit, candidates are expected to maintain details of practical work. This can be done in a log book or diary and candidates will be expected to present and analyse essential information in a logical and effective order. They will have to do this by using a structure which links the various points together and organises the content in a manner which distinguishes between the results of their practical work, the analysis of the results and the conclusions drawn from the analysis. They will be expected to follow the conventions of scientific report writing and ensure that their report is comprehensible to an industrial readership.

Numeracy (Using Number) at SCQF level 6
This Unit involves candidates in working with samples. To be able to do this, they will have to be able to deal confidently with statistical methods associated with sampling. They will need to know how to carry out the steps involved in sampling and the order in which they are to be done. They will need to know the limitations of sampling data and how this impinges on the calculations that can be made and the interpretation of results.

Problem Solving: Critical Thinking at SCQF level 6
Outcomes 2 and 3 of this Unit require candidates to assess and evaluate food safety, quality and hygiene. In evaluating hygiene factors in food premises, for example, they will be expected to identify the microbiological factors involved. These relate to the machinery equipment, the materials used and the personnel involved and are, therefore, complex. Candidates will be expected to identify the various relationships between these factors and decide which microbiological tests will constitute an appropriate approach to assessing standards of safety, quality and hygiene in a particular situation. They will be expected to justify this approach by showing that it will provide the evidence that is needed to make a valid judgement of safety, quality and hygiene in food processing.

Problem Solving: Reviewing and Evaluating at SCQF level 6
Candidates are expected in this Unit, especially in Outcomes 2 and 3, to identify and gather evidence on food safety and quality as well as on the hygiene in food premises. They will do this through practical work involving the use of microbiological techniques and methods. From the results of this work, they will be expected to draw conclusions based on the results. On the basis of these conclusions, they will be expected, in a particular situation, to make judgements on food safety and quality and on hygiene in food premises.

Open learning

This Unit could be delivered by Open Learning. However, candidates must be able to undertake practical laboratory work under supervised conditions, something which may be time-consuming and difficult to organise. If suitable arrangements can be made, they would have to cover assessment and quality assurance.

Higher National Unit specification: support notes (cont)

Unit title: Microbiology of Foods: Food Quality and Safety

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**

General information for candidates

Unit title: Microbiology of Foods: Food Quality and Safety

You will already be aware from your experience in microbiology or study of Units such as Microbiology of Foods 1 and 2 that micro-organisms are critical to all aspects of the food industry and can impact on consumers and manufacturing. This Unit is therefore designed to enable you to further develop your microbiology knowledge, understanding and practical laboratory skills.

This Unit emphasises safety, quality and hygiene and the impact that micro-organisms can have on these key aspects of the food industry. This makes it a particularly important Unit because the success of the food industry depends on consumers being confident that the food they eat is safe. This, in turn, means that it has been manufactured in safe and hygienic conditions to suitable quality standards. As well as enabling you to recognise and take action on aspects of food safety, quality and hygiene, this Unit is important also because it adds to the vocabulary that you will need when you take up employment in the food industry. This will enable you to discuss food safety, quality and hygiene in a professional manner as well as appreciating the importance of these factors for consumers and food manufacturers.

This Unit enables you to further develop your laboratory skills and you will learn a number of new techniques. By giving you a wider range of skills, it will enhance your capabilities in food science. After completing the Unit you will have built up a good appreciation of the importance of food safety, hygiene and quality to the food industry. You will also be in a position to evaluate and assess safety, quality and hygiene in food establishments.

The assessment for the Unit will require you to show that you can accurately explain the formulation of sampling plans for the microbiological analysis of foods. You will also have to successfully complete practical laboratory work which will enable you to assess the safety and quality of food and food ingredients and evaluate standards of hygiene in food premises. You will be observed while you are doing your laboratory work and you will have to keep records of work that you have done. For this Unit, you will also have to complete 2 reports on your laboratory work on assessing the quality and safety of food. Your tutor will be able to advise you on the format of your reports. You will have succeeded in meeting all the requirements of this Unit if you pass the assessments.