



Higher National Unit specification

General information for centres

Unit title: Food Manufacturing: Processing Practices at Elevated Temperatures

Unit code: F6VH 34

Unit purpose: This Unit is designed to enable candidates to gain practical experience of food processing operations carried out at elevated temperatures within the food industry. The Unit will enable them to determine appropriate processing techniques to ensure that food safety and food quality requirements are met.

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

- 1 Conduct food processing at elevated temperatures.
- 2 Perform evaporation and dehydration techniques.

Credit points and level: 1 HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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: Candidates should have some knowledge and understanding of the food industry and the processing methods it uses. This could be demonstrated by successful completion of the following Units:

- ◆ F6VF 34 *Food Industry Principles: An Introduction*
- ◆ F6VE 34 *Food Industry Practices: An Introduction*

Core Skills: There are opportunities in this Unit to develop the Core Skills components of *Communication*: Written Communication (Writing) at SCQF level 5 and *Numeracy* (Using Number) at SCQF level 5 and the Core Skill of *Working with Others* at SCQF level 5 although there is no automatic certification of Core Skills or 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 in the subject area of the Group Award to which it contributes. This Unit is a mandatory Unit in the HNC Food Science and Technology. It is one of three specialist Units in food processing methods and is complementary to F6VG 34 *Food Manufacturing: Processing Practices at Ambient Temperatures* and F6VJ 34 *Food Manufacturing: Processing Practices at Sub-Ambient Temperatures*.

General information for centres (cont)

Assessment: This Unit can be assessed in a variety of ways. For example, assessment can consist of observation checklists of practical work supplemented by reports explaining the equipment used, the results of the practical work and conclusions from it. It would be possible for candidates to keep a laboratory log book of their practical work and use it to present assessment evidence.

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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.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Conduct food processing at elevated temperatures

Knowledge and/or Skills

- ◆ Methods of processing food at elevated temperatures
- ◆ Equipment used for processing foods at elevated temperatures
- ◆ Factors affecting the selection, conduct and efficiency of methods and equipment

Outcome 2

Perform evaporation and dehydration techniques

Knowledge and/or Skills

- ◆ Evaporation and dehydration techniques
- ◆ Evaporation and dehydration equipment
- ◆ Factors affecting the selection, conduct and efficiency of techniques and equipment

Evidence Requirements for the Unit

Candidates will need to provide evidence to meet all the Knowledge and/or Skills items by showing that they can carry out practical work for four different food processing operations at elevated temperatures, including evaporation and dehydration. Candidates should carry out the practical work using safe hygienic working practices to ensure food safety. This can be demonstrated by an observation checklist to show:

- ◆ effective planning and preparation for the practical task
- ◆ attention to personal hygiene
- ◆ safe use of equipment in accordance with the specific requirements of the items of equipment used
- ◆ cleaning and disinfection of equipment and surfaces

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For each piece of practical work, candidates should provide evidence to show that they can:

- ◆ accurately record and present results using tables and graphs where appropriate and including all necessary calculations
- ◆ draw conclusions from the results including their applicability to industrial contexts

In addition, candidates must provide evidence to show that they can accurately explain:

- ◆ the items of industrial processing equipment used in a particular context and the functions that they fulfil: two items of equipment should be covered in each context
- ◆ factors which affect the selection and conduct of operations and equipment in a particular context: three factors should be given in each case

Assessment Guidelines for the Unit

This Unit can be assessed in a variety of ways. For example, candidates can be asked to provide a number of brief reports based on their practical work. They can present these in any suitable format. They could, for example, be encouraged to keep a laboratory log book or diary for their practical work and use this as the means of presenting evidence for assessment. This evidence can be supplemented by observation checklists to ensure that candidates have followed suitable practice when undertaking practical work.

Administrative Information

Unit code: F6VH 34

Unit title: Food Manufacturing: Processing Practices at Elevated Temperatures

Superclass category: WM

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Higher National Unit specification: support notes

Unit title: Food Manufacturing: Processing Practices at Elevated Temperatures

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

This Unit is a mandatory Unit in the HNC Food Science and Technology. It is a practically based Unit and will allow candidates to appreciate the care taken by industry to ensure the production of foods for consumers which is both safe and of acceptable quality. It is one of three Units covering methods and equipment used in food manufacturing at different temperatures. The others are:

- ◆ F6VG 34 *Food Manufacturing: Processing Practices at Ambient Temperatures*
- ◆ F6VJ 34 *Food Manufacturing: Processing Practices at Sub-Ambient Temperatures*

This Unit is designed to enable candidates to build on the introduction to processing food at elevated temperatures in F6VE 34 *Food Industry Practices: An Introduction*. Nevertheless, the Unit is suitable for those who have not completed this Unit but have obtained the necessary background in other ways.

The Unit covers the main methods of food processing at elevated temperatures — blanching, pasteurisation, sterilisation, baking and frying — as well as evaporation and dehydration techniques and equipment. Candidates are expected to be aware of the factors which influence all these activities. These factors include:

- ◆ Factors affecting the choice of processing methods such as microbial activity, enzymatic activity, water in foods, water activity, moisture content, available water (Aw) relationships
- ◆ Factors affecting the safety and quality of foods at elevated temperatures such as microbial and enzymatic activity, influence of pH, organoleptic properties
- ◆ Nutrition
- ◆ Advantages and disadvantages of the processes
- ◆ Consumer requirements and cost factors
- ◆ Health and safety requirements
- ◆ Hazard Analysis Critical Control Points (HACCP)/Food Safety Management Systems

For Outcome 1, candidates should understand why processing at elevated temperatures is carried out by industry paying particular attention to maintaining the safety and quality of processed foods. This Outcome deals with blanching, pasteurisation, sterilisation, baking and frying.

For blanching, candidates could be introduced to the reasons for blanching such as enzyme activity on storage and pre-processing operation. They can also consider the advantages and disadvantages of blanching such as: destruction of enzymes; displacement of air/gases; cleaning; reduction of micro-organisms; tissue softening; destruction of vitamins; destruction of texture. It may also be helpful to examine the use of a chemical test such as the peroxidase test to determine residual enzyme activity.

Different types of industrial blanchers could include tunnel and rotary.

Higher National Unit specification: support notes (cont)

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For pasteurisation, candidates could consider the aims of pasteurisation with respect to: the effect on food; the effect on micro-organisms; the influence of pH.

Different methods of industrial pasteurisation for packaged or unpackaged foods could include:

- ◆ Steam pans
- ◆ Plate heat exchanger
- ◆ Tubular heat exchangers
- ◆ Tunnel pasteuriser

Candidates could also examine the principles and practices of an enzymatic test to evaluate pasteurisation efficiency relating to phosphatase and alpha amylase.

For sterility, candidates can consider the concept of commercial sterility and the importance of the destruction of pathogenic and spoilage bacteria with reference to the genera *Clostridium* and *Bacillus*.

Sterilisation techniques can include canning, bottling, use of flexible pouches and UHT processing and can be related to the stages of these processes: ingredient preparation; filling; exhausting; processing.

Sterilisation equipment could include the containers used and cover the formation and closures of three piece and two piece steel and aluminium cans with ribbing, expansion rings, laquering, sealing compound.

Sterilisation equipment could also cover:

- ◆ Static and rotary retorts
- ◆ Hydrostatic steriliser
- ◆ Plate heat exchanger
- ◆ Scraped surface heat exchanger

Candidates could also look at final sterilised packaged product defects attributable to either container or processing faults such as:

- ◆ Can defects, seaming, storage, Fo, operator control, cooling water
- ◆ Blown cans, hydrogen swells, overfilling
- ◆ Flipper, springer, soft swell, hard swell

For Outcome 2 candidates could be introduced to the aims of evaporation and dehydration controlling the state of water in foods, water activity, moisture content and Aw relationships. They could also consider advantages and disadvantages such as weight, bulk, transport, shelf life, packaging, control of Aw, preconcentration, production costs, quality.

Higher National Unit specification: support notes (cont)

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Evaporation and dehydration equipment could include:

- ◆ Pan
- ◆ Plate
- ◆ Short and long tube units
- ◆ Fluid bed
- ◆ Spray
- ◆ Conveyor

For freeze drying, the following could be included:

- ◆ Water phase diagram
- ◆ Freezing
- ◆ Sublimation
- ◆ Desorption
- ◆ Thermal contact
- ◆ Food applications

Candidates could also consider water activity and its effects on spoilage mechanisms. In addition, they could look at the effects of time and temperature on the quality of evaporated and dried foods in terms of enzymatic, physical, chemical and microbial problems; shrinkage, case hardening, loss of volatiles, burn on.

Guidance on the delivery and assessment of this Unit

This Unit is a practically based Unit which also covers important underpinning theoretical knowledge and understanding. Delivery methods should take account of this by ensuring that the material is always closely linked to activities in the food industry and the operations of organisations engaged in food processing.

When undertaking practical work, candidates should display good practice in terms of safe working practices, particularly cleanliness and hygiene. The practical work is likely to cover only some of the possible methods and techniques. The methods selected should be ones which will give candidates a good overall experience of the practical application of suitable methods, techniques and equipment. In this way they should be in a position to apply their experience to other techniques — either as part of their subsequent study or in industry. Candidates may work in groups during practical sessions although any summative assessment work should be done individually.

Assessment can take the form of observation checklists (photographic and/or video evidence could be used to supplement the checklist) and evidence that candidates can record and present the results of their practical work using tables and graphs where appropriate and including all necessary calculations. Candidates should also draw some conclusions from the practical work, in particular about its applicability to larger scale industrial contexts.

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Candidates can present their work in a report format which would enable them also to explain the items of industrial processing equipment used in a particular context and factors which affect the selection and conduct of operations and equipment in a particular context. The evidence should include referencing where appropriate.

However, other methods of presentation would be possible. Candidates could, for example, keep a laboratory logbook or diary during their practical work and use this as a basis for presenting all the evidence for assessment. They could use other presentation methods such as presentation software or make use of web 2.0 techniques. Assessment work can be undertaken as candidates work through the Unit, and gathered together in a portfolio.

Opportunities for developing Core Skills

Communication: Written Communication (Writing) at SCQF level 5

As part of their assessment work for this Unit, candidates are expected to maintain details of practical work. This can be done in a laboratory log book or diary and candidates will be expected to organise the content into a logical and effective structure. Candidates will, therefore, use written information to demonstrate their knowledge and understanding of relevant ideas and information. Candidates can also be asked to write up their practical work in a report style which can replicate that used in industry. In these cases, candidates can be expected to make sure that the report meets its intended purpose by a format and layout appropriate to an industrial readership.

Numeracy (Using Number) at SCQF level 5

As part of the practical work for this Unit, candidates are required to carry out practical work. They are expected to undertake calculations using scientific formulae and, using the Outcome of these calculations, draw conclusions about the results of their practical work. This will involve quantitative data over a range and candidates will be required to decide what numerical operations are to be carried out and the order in which to do them.

Working with Others (Working Co-operatively with Others) at SCQF level 5

The opportunities to gather evidence for this Core Skill component depend on the approach used for the practical work required by this Unit. Candidates are expected to carry out food processing operations using pilot plant equipment. They could do this in groups in which case they will have to work with others to identify the requirements of the practical work and to determine what roles and responsibilities each member will take in order for the work to be completed safely and hygienically. They will also need to organise their own contribution, alter it where appropriate and make suggestions to the others for the practical work. They will also have to take actions to encourage co-operative working during the practical activity such as providing support and encouragement for others involved in the task and helping to minimise any disagreements among group members.

Higher National Unit specification: support notes (cont)

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Open learning

This Unit could be delivered by Open Learning although candidates will have to have the opportunity to undertake practical work. Appropriate arrangements would need to be made for assessment and quality assurance.

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: Food Manufacturing: Processing Practices at Elevated Temperatures

This Unit is a mandatory Unit in the HNC Food Science and Technology. It is one of three specialist Units in food manufacturing which you will take as part of your HNC. The others are:

- ◆ *Food Manufacturing: Food Processing at Ambient Temperatures*
- ◆ *Food Manufacturing: Food Processing at Sub-Ambient Temperatures*

It follows on from the introductory Units in *Food Industry Principles: An Introduction* and *Food Industry Practices: An Introduction*, particularly the second of these. The *Food Industry Practices: An Introduction* Unit introduced you to methods of food processing where you learnt that there are three main types depending on the temperature involved.

This Unit covers food processing at elevated temperatures. The processes you will look at will include blanching, pasteurisation, sterilisation, baking and frying. You will also be asked to perform evaporation and dehydration techniques such as freeze drying.

This is a practical Unit and you will be involved in practical work using pilot plant equipment. This will allow you to develop the skills and understanding you have already gained from *Food Industry Practices: An Introduction*. In this way, you will get more practical, hands-on experience of the kind you will need when you take up employment in the food industry. You will find out about the items of equipment used in different methods of processing at elevated temperatures and the factors which affect the selection of equipment.

You will already know about the importance of health and safety and hygiene in food processing. You will be expected to conduct your practical work in a manner which meets all health, safety and hygiene requirements. You will be observed while you are doing it in order to ensure that you do work in accordance with these.

The assessment for the Unit will require you to carry out four different food processing operations at elevated temperatures, including performing evaporation and dehydration techniques. You will also be required to record the results of your practical work and draw conclusions from them, for example about how they may apply in large-scale industrial contexts. You will also be expected to explain the items of equipment used and factors affecting the selection of equipment and the method of processing.

You will have succeeded in meeting all the requirements of this Unit if you pass the assessments.

After you have completed this Unit, you could consider other areas such as Food Hygiene, HACCP and Health and Safety.