



Higher National Unit specification

General information for centres

Unit title: Process Quality: Sampling, Testing and Evaluation

Unit code: F816 35

Unit purpose: The purpose of this Unit is to provide the candidates with the knowledge and understanding necessary to enable them to design, perform, analyse and report on investigations to monitor the value of key quality indicators to ensure compliance with standards and specifications within the petrochemical process industries. The Unit may be taken as a stand alone Unit or be used as part of a group award relevant to the petrochemical process industry.

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

- 1 Explain the key parameters and techniques used to monitor product quality of a petrochemical process.
- 2 Design a practical investigation to collect data samples of key parameters representative of the quality of a petrochemical process.
- 3 Conduct a practical investigation to establish a product quality representative of a petrochemical process.
- 4 Analyse, evaluate and report the findings of a practical investigation in respect of petrochemical process quality compliance

Credit points and level: 1HN 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 is at the discretion of the centre.

Core Skills: There are opportunities to develop the Core Skills of *Communication*, *Numeracy*, *Problem Solving* and *Working with Others* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

General information for centres (cont)

Context for delivery: This Unit was developed as a stand alone Unit as part of the restricted core options within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. If this Unit is delivered as part of another 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 of individual outcomes of this Unit may be conducted separately. Outcome 1 may be assessed by a suitable balance of short answer, restricted response and structured questions. Outcomes 2, 3 and 4 should be a combined assignment assessed by an investigation report supported with recorded responses to assessor questions.

Candidates must achieve all of the minimum evidence specified for each outcome in order to pass the Unit.

Higher National Unit specification: statement of standards

Unit title: Process Quality: Sampling, Testing and Evaluation

Unit code: F816 35

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

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

Explain the key parameters and techniques used to monitor product quality of a petrochemical process

Knowledge and/or Skills

- ◆ Product integrity
- ◆ Sampling techniques
- ◆ Testing techniques
- ◆ Health, safety and environment (HSE) implications

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can explain the key parameters and techniques used to monitor product quality of a petrochemical process

Evidence for the Knowledge and/or Skills items in Outcome 1 will be assessed through sampling. Candidates will be assessed on three of the four items in the Knowledge and Skills list. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate can:

- ◆ Explain product integrity in respect of the types of process products (solid, liquid or gas), quality specification, quality standards, key quality parameters and factors affecting product quality.
- ◆ Explain the types, principles and applications of sampling techniques used to assess process quality together with the requirements of sampling plans and the control of sampling conditions.
- ◆ Explain the types, principles and applications of testing techniques used to assess process quality together with the requirements of testing plans and the control of testing conditions.
- ◆ Explain the HSE implications of process quality sampling and testing with reference to regulations, safe working practices, risk assessments and disposal of waste.

Assessment Guidelines

The assessment for Outcome 1 can be a separate assessment of approximate planned duration of one hour.

Evidence of candidate knowledge and understanding may take the form of short answer, restricted response or structured essay type questions.

Higher National Unit specification: statement of standards (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Outcome 2

Design a practical investigation to collect data samples of key parameters representative of the quality of a petrochemical process

Knowledge and/or Skills

- ◆ Standard operating procedure (SOP)
- ◆ Sampling Plan
- ◆ Testing Plan
- ◆ Documentation requirements

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can devise a practical investigation to collect data samples of key parameters representative of the quality of a petrochemical process.

Evidence for the Knowledge and/or Skills items in Outcome 2 will be assessed through sampling. Candidates will be assessed on three of the four items in the knowledge and skills list. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Design the standard operating procedure (SOP) for the investigation to include the aim and objectives, specification of quality, standards, validation criteria, accuracy and precision, cost, time, HSE implications, sampling plan requirements, and testing plan requirements.
- ◆ Design the investigation sampling plan to include properties to sample, representative sample, sampling conditions, sampling frequency and duration, sampling method and procedure, and HSE requirements.
- ◆ Design the investigation testing plan to include resources required, testing method and procedure, test conditions, calibration and accuracy of test instrumentation, data recording, contingencies, and HSE requirements.
- ◆ Explain documentation requirements for the investigation to include technical manuals, test procedures and equipment operating instructions, risk assessments, and permits.

Higher National Unit specification: statement of standards (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Assessment Guidelines

Assessment for Outcome 2 should take the form of an assignment to design a practical investigation to collect and test product samples representative of a particular process operation or system.

Candidates' assignment work should be presented in a 1,000 word report. A suggested format of the report is:

- ◆ Introduction
- ◆ Description of the process operation or system including SOP for the investigation
- ◆ Sampling requirements and plan
- ◆ Testing requirements and plan
- ◆ Documentation
- ◆ Concluding remarks

Outcome 3

Conduct a practical investigation to establish a product quality representative of a petrochemical process

Knowledge and/or Skills

- ◆ Investigation — SOP; aim and objectives
- ◆ Sampling plan — sources of relevant information; implementation; representative samples; integrity of the samples; conduct sampling; record data; relevant HSE
- ◆ Testing plan — sources of relevant information; implementation; preparation of sample for test; conduct test; record data; relevant HSE

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can conduct a practical investigation to establish a product quality representative of a petrochemical process

Evidence for the knowledge and/or skills items in Outcome 3 will be assessed through sampling. Candidates will be assessed on two of the three items in the Knowledge and Skills list. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Implement the investigation in accordance with the Standard Operating Procedure
- ◆ Implement the investigation sampling plan in a safe and effective manner
- ◆ Implement the investigation testing plan in a safe and effective manner

Higher National Unit specification: statement of standards (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Assessment Guidelines

Assessment for Outcome 3 should take the form of an assignment to conduct a practical investigation to collect and test product samples representative of a particular process operation or system.

Candidates' assignment work should be presented in a 1,000 word report. A suggested format of the report is:

- ◆ Introduction, including SOP
- ◆ Implementation of sampling plan
- ◆ Implementation of testing plan
- ◆ Concluding remarks

Outcome 4

Analyse, evaluate and report the findings of a practical investigation in respect of petrochemical process quality compliance

Knowledge and/or Skills

- ◆ Collation and validation of data against requirements
- ◆ Presentation of results — data analysis/processing, evaluation of trends, valid conclusions
- ◆ Investigation documentation — written report

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can analyse, evaluate and report the findings of a practical investigation in respect of petrochemical process quality compliance

Evidence for the Knowledge and/or Skills items in Outcome 4 will be assessed through sampling. Candidates will be assessed on all three items in the knowledge and skills list for this Outcome. Assessment must be carried out under supervised conditions.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ Collate and validate investigation data against requirements
- ◆ Analyse investigation, evaluate results and draw valid conclusions
- ◆ Produce an investigation report to include SOP, sampling and testing plan, record of data, analysis of data, results, evaluative comments, conclusions, and recommendations

Higher National Unit specification: statement of standards (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Assessment Guidelines

Assessment for Outcome 4 should take the form of an assignment to analyse and evaluate the results of a practical investigation conducted to collect and test product samples representative of a particular process operation or system.

Candidates' assignment work should be presented in a 1,000 word report. A suggested format of the report is:

- ◆ Introduction
- ◆ Data collation
- ◆ Data analysis and presentation of result
- ◆ Evaluation of results
- ◆ Conclusions

Assessment of Outcomes 2, 3 and 4 may be combined into a unified assignment which provides combined assessment evidence through a single investigation report of around 3,000 words in length.

Administrative Information

Unit code: F816 35

Unit title: Process Quality: Sampling, Testing and Evaluation

Superclass category: VD

Original date of publication: August 2009

Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

© Scottish Qualifications Authority 2009

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

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: Process Quality: Sampling, Testing and Evaluation

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 was developed as part of the restricted core options within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. It may be used as a stand-alone Unit.

This Unit has been designed to contribute to the broad capacity building context of process operations within the petrochemical industries. It has specially been designed to provide knowledge, understanding and skills to support operations within the upstream and downstream sectors of the industry in relation to sampling, testing and evaluating the quality of petrochemical process quality against specified requirements.

The Unit is at SCQF level 8 and has been developed as part of the HNC/HND awards in Petroleum Process Technology, Operations and Control. In this context, the Unit has been designed to link to appropriate National Occupational Standards that form part of the suite of Scottish/National Vocational Qualifications (S/NVQs) in Process Operation: Hydrocarbons and Laboratory Science at Technician level. However this does not preclude the use of this Unit in other awards where it is appropriate and contributes relevance and added value. The Unit may also be delivered as a stand-alone Unit.

Access to this Unit fully inclusive and at the discretion of the SQA approved delivery centre. However, candidates may find it beneficial to have a prior knowledge of this area as provided by the SQA HN Unit *F811 34: Petroleum Industry: Organisation, Products and Processes*.

This Unit has been written in order to allow candidates to develop knowledge, understanding and skills to allow candidates to achieve the following Outcomes:

- 1 Explain the key parameters and techniques used to monitor product quality of a petrochemical process.
- 2 Design a practical investigation to collect data samples of key parameters representative of the quality of a petrochemical process.
- 3 Conduct a practical investigation to establish a product quality representative of a petrochemical process.
- 4 Analyse, evaluate and report the findings of a practical investigation in respect of petrochemical process quality compliance

A list of topics for each Outcome is given below:

Higher National Unit specification: support notes (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Outcome 1

- ◆ Explain:
 - types of process products as solid, liquid or gas
 - product quality definition and specification, standards
 - key process product quality parameters and factors affecting quality
 - types, principles and applications of sampling techniques
 - control of sampling techniques
 - requirements and content of sampling plans
 - types, principles and applications of testing techniques
 - control of testing conditions
 - requirements and content of testing plans
 - HSE regulations, safe working practices, risk assessment and waste disposal related to process quality sampling and testing operations

Outcome 2

- ◆ Design:
 - standard operating procedure (SOP) for a practical sampling and/or testing operation to include the aim and objectives, specification of quality, standards; validation criteria; accuracy and precision, cost, time, HSE implications, sampling plan requirements and/or testing plan requirements
 - investigation sampling plan to include properties to sample, representative sample, sampling conditions, sampling frequency and duration, sampling method and procedure, and HSE requirements
 - investigation testing plan to include resources required, testing method and procedure, test conditions, calibration and accuracy of test instrumentation, data recording, and HSE requirements
- ◆ Explain:
 - documentation requirements for the investigation
 - access to regulatory and technical information, test procedures and equipment operating — instructions, risk assessments, permits

Outcome 3

- ◆ Implement:
 - investigation in accordance with the standard operating procedure
 - investigation sampling plan and/or testing plan in a safe and effective manner

Outcome 4

- ◆ Produce an investigation report to include:
 - SOP
 - sampling and/or testing plan
 - record of collated and validated data
 - analysis of data,
 - analysis of results
 - evaluative of results
 - conclusions and recommendations

Higher National Unit specification: support notes (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Guidance on the delivery and assessment of this Unit

This Unit was developed as a stand alone Unit as part of the restricted core options within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. It may also be used as a stand-alone Unit.

The content of the Outcomes of this Unit follows a logical delivery sequence.

This Unit may be delivered on a full-time, block release, open or blending learning, part-time day or part-time evening basis at the discretion of the SQA approved delivery centre. Learning and teaching methods may include a combination of lectures, tutorials, group work, practical/laboratory assignments, computer-based simulations, case studies and industrial visits.

The use of flexible learning through on-line materials and methodologies is encouraged wherever possible to supplement and support the learning that takes place in the delivery centre. It is also recommended that candidates are directed to undertake internet research where a rich amount of material can be found that is relevant to the content of this Unit to support their learning. Wherever appropriate, it is recommended that relevant practical learning activities are used to support the development of the knowledge and understanding requirements of this Unit. At every appropriate opportunity, it is recommended that the delivery of this Unit reflects on the health, safety and environment implications relevant to the content and context of this Unit.

Formal assessment of this Unit may take a number of different forms such as written and numerical tests, laboratory work, simulation exercises, practical exercises and case studies. Assignments may be conducted as group endeavours to allow candidates to develop teamwork skills. In such cases, assessment work should be that of the individual candidates.

The assessment of individual outcomes of this Unit may be conducted separately. Outcome 1 may be assessed by a suitable balance of short answer, restricted response and structured questions and should be an assessment of no more than one hour duration. Outcomes 2, 3 and 4 could be a combined assignment assessed by an investigation report supported with recorded responses to assessor questions. This combined assessment should be allocated three hours to produce the investigation report. Any assessment should be conducted under controlled, supervised conditions.

Where evidence requirements call for a practical investigation, such as in Outcome 3 of this Unit, it may better suit the learning needs of candidates for centres to use a case study in conjunction with a relevant industry partner to provide a realistic working environment with industrial realism. Such a case study may be conducted as a group endeavour to allow candidates to develop teamwork skills. In such cases, assessment work should clearly identify the contribution of individual candidates, and the case study/investigation report must entirely the work of the individual candidate.

The combined assessment should be completed toward the end of the delivery of the Unit. Individual assessments should be carried out at the end of the delivery of each Outcome.

It should be noted that the candidates must achieve all the minimum evidence specified for each Outcome in order to pass the Unit. Where sampling of knowledge and skills items is used for assessment, the sampling should be selected to meet the specific needs of the candidate cohort within the context of their current employment or progression goals.

Higher National Unit specification: support notes (cont)

Unit title: Process Quality: Sampling, Testing and Evaluation

Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines under each Outcome in the Higher National Unit specification: Statement of Standards section. It is recommended that these sections be read carefully before proceeding with assessment of candidates.

Opportunities for developing Core Skills

There may be opportunities to gather evidence toward the following Core Skills within this Unit, although there is no automatic certification of Core Skills or Core Skills components in this Unit:

<i>Communication</i>	SCQF level 6
<i>Numeracy</i>	SCQF level 6
<i>Problem Solving</i>	SCQF level 6
<i>Working with Others</i>	SCQF level 6

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. With regard to assessment, planning would be required of the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangements would be required to be put in place to ensure that assessments were conducted under controlled, supervised conditions. Agreement would have to be made to ensure that a single assessment for the end test is delivered in a supervised environment under controlled conditions.

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: Process Quality: Sampling, Testing and Evaluation

This Unit has been designed to allow you to develop the knowledge, understanding and skills involved in collecting samples, testing samples and analysing data representative of the quality of a petrochemical process. As such, this Unit will contribute to your development as an operations or laboratory technician within the petrochemical industry. The vocational focus of this Unit combines the necessary blend of key petrochemical process sampling and testing related technological principles with knowledge of their industrial process applications in a safety and environmentally critical context.

The Unit comprises the following broad outcomes:

- 1 Explain the key parameters and techniques used to monitor product quality of a petrochemical process.
- 2 Design a practical investigation to collect data samples of key parameters representative of the quality of a petrochemical process.
- 3 Conduct a practical investigation to establish a product quality representative of a petrochemical process.
- 4 Analyse, evaluate and report the findings of a practical investigation in respect of petrochemical process quality compliance

These outcomes are linked to National Occupational Standard that form part of the suite of Scottish/National Vocational Qualifications (S/NVQs) in Process Operation: Hydrocarbons and Laboratory Science at Technician level.

Within this Unit, you will also have opportunities to develop the transferable Core Skills of *Communication, Numeracy, Problem Solving* and *Working with Others*, although these are not separately certificated.

Access to this Unit is fully inclusive and at the discretion of your SQA approved delivery centre. However, you may find it beneficial to have a prior knowledge of this area as provided by the SQA HN Unit *F811 34: Petroleum Industry: Organisation, Products and Processes*.

This Unit can be delivered on a full-time, block release, open or blending learning, part-time day or part-time evening basis at the discretion of your SQA approved delivery centre. Learning and teaching methods may include lectures, tutorials, group work, practical/laboratory assignments, computer-based simulations and case studies. The use of flexible learning through on-line materials and methodologies may be used to supplement and support the learning that takes place in the delivery centre.

Formal assessment of this Unit may take a number of different forms such as written and numerical tests, laboratory work, simulation exercises, practical exercises and case studies. Assessments will normally be conducted at the end of the delivery of each Outcome. Where assessments are combined, these may be conducted toward the end of the Unit.