



Higher National Unit specification

General information for centres

Unit title: Petrochemical Process Specification and Equipment Selection

Unit code: F810 35

Unit purpose: This Unit is designed to enable candidates to enhance their knowledge and skills as process planners by relating system functions to process equipment requirements for petrochemical applications. 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 Review the types, functions and operating principles of petrochemical processes.
- 2 Interpret the performance specification of a petrochemical process system.
- 3 Evaluate the sequence of process operations for optimum performance of a petrochemical process system.
- 4 Evaluate the equipment requirements to meet the performance specification of a petrochemical process system.

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 is at the discretion of the centre although candidates should have some knowledge and understanding of petrochemical process operations and system functions as may be evidenced by the achievement of the HN Unit *F811 34: Petroleum Industry: Organisation, Products and Processes*.

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

Context for delivery: 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. 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 of individual Outcomes of this Unit may be conducted separately or the assessment for Outcomes 2, 3 and 4 may be combined into a single assessment. The assessment for Outcome 1 should be composed of a suitable balance of short answer, restricted response or structured questions and be conducted under controlled, closed-book, supervised conditions. Outcomes 2, 3 and 4 should be assessed by the use of case study reports which should be clearly identifiable as individual candidate work.

Higher National Unit specification: statement of standards

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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

Review the types, functions and operating principles of petrochemical processes

Knowledge and/or Skills

- ◆ Extraction processes
- ◆ Separation processes
- ◆ Natural gas processes
- ◆ Distillation processes
- ◆ Cracking processes

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can review:

- ◆ two types of processes from those five listed in the Knowledge and/or Skills for this Outcome
- ◆ the functions of the two selected processes
- ◆ the principles of operation of those two processes

Assessment Guidelines

The assessment of Outcome 1 should be conducted separately from the other Outcomes comprising this Unit. It should be composed of a suitable balance of short answer, restricted response and/or structured questions with a planned duration of no more than one hour. The assessment should be conducted under controlled, closed-book, supervised conditions.

Higher National Unit specification: statement of standards (cont)

Unit title: Petrochemical Process Specification and Equipment Selection

Outcome 2

Interpret the performance specification of a petrochemical process system

Knowledge and/or Skills

- ◆ Scope of specification
- ◆ Performance parameters
- ◆ Input conditions
- ◆ Output conditions
- ◆ Processing requirements
- ◆ Economic considerations
- ◆ HSE considerations

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can interpret:

- ◆ The full list of items in the knowledge and/or skills for this Outcome for one of the processes selected from those five listed in the Knowledge and/or Skills for Outcome 1

Assessment Guidelines

The assessment of Outcome 2 may be conducted separately or combined with the assessment of Outcome 3 and/or Outcome 4. Outcome 2 should be assessed by the use of a case study report which should be clearly identifiable as individual candidate work. The report should be of approximately 1,000 words in length and include appropriate labelled diagrams. If the assessment of Outcome 2 is combined with that of Outcome 3 and Outcome 4, then the combined case study report should be of approximately 3,000 words in length.

Higher National Unit specification: statement of standards (cont)

Unit title: Petrochemical Process Specification and Equipment Selection

Outcome 3

Evaluate the sequence of process operations for optimum performance of a petrochemical process system

Knowledge and/or Skills

- ◆ System function
- ◆ System operation
- ◆ System components and connectivity
- ◆ System measurement and control
- ◆ Process system diagram

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can evaluate:

- ◆ The full list of items in the knowledge and/or skills for this Outcome for one of the processes selected from those five listed in the knowledge and/or skills for Outcome 1

Assessment Guidelines

The assessment of Outcome 3 may be conducted separately or combined with the assessment of Outcome 2 and Outcome 4. Outcome 3 should be assessed by the use of a case study report which should be clearly identifiable as individual candidate work. The report should be of approximately 1,000 words in length and include appropriate labelled diagrams. If the assessment of Outcome 3 is combined with that of Outcome 1 and Outcome 4, then the combine case study report should of approximately 3,000 words in length.

Higher National Unit specification: statement of standards (cont)

Unit title: Petrochemical Process Specification and Equipment Selection

Outcome 4

Evaluate the equipment requirements to meet the performance specification of a petrochemical process system.

Knowledge and/or Skills

- ◆ Process equipment requirements
- ◆ Utility equipment requirements
- ◆ Measurement equipment requirements
- ◆ Control equipment requirement
- ◆ Requirements for HSE related devices

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can evaluate:

- ◆ The full list of items in the knowledge and/or skills for this Outcome for one of the processes selected from those five listed in the knowledge and/or skills for Outcome 1

Assessment Guidelines

The assessment of Outcome 4 may be conducted separately or combined with the assessment of Outcome 2 and Outcome 3. Outcome 4 should be assessed by the use of a case study report which should be clearly identifiable as individual candidate work. The report should be of approximately 1,000 words in length and include appropriate labelled diagrams. If the assessment of Outcome 4 is combined with that of Outcome 2 and Outcome 3, then the combine case study report should of approximately 3,000 words in length.

Administrative Information

Unit code: F810 35

Unit title: Petrochemical Process Specification and Equipment Selection

Superclass category: YC

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History of changes:

Version	Description of change	Date

Source: SQA

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Higher National Unit specification: support notes

Unit title: Petrochemical Process Specification and Equipment Selection

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 to be 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 delivered 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 especially been designed to provide the knowledge, understanding and skills involved in process planning by relating system functions to process planning and equipment requirements for petrochemical applications. As such, this Unit will contribute to your development as a technician within the petrochemical industry. The vocational focus of this Unit combines the necessary blend of key petrochemical process related technological principles with knowledge of their industrial applications in a safety and environmentally critical context.

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 Chemical, Pharmaceutical and Petrochemical Process operations Process Operations 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.

The intended content of each Outcome is outlined below:

Outcome 1

This Outcome is designed to familiarise candidates with the prime types of processes employed within the upstream and downstream sectors of the petrochemical industry. The Outcome identifies the functions and the technological principles of operation of those processes. The engineering applications employed.

Outcome 2

This Outcome is designed to familiarise candidates with the scope and format of a process system specification. The purpose of the Outcome is to allow candidates to interpret the specification of a typical petrochemical process in relation to the required system performance. Performance parameters are identified in terms of output requirements and economic considerations such as costs and efficiency. These are related to the input conditions through the processing requirements. HSE considerations are included in the context of safe system operations together with control of emissions and waste from an environmental perspective.

Higher National Unit specification: support notes (cont)

Unit title: Petrochemical Process Specification and Equipment Selection

Outcome 3

This Outcome is designed to familiarise candidates with the sequencing of operations within a petrochemical process system to achieve optimum performance in safety and environmentally critical applications. Having identified the system function; the purpose of the Outcome is to identify all the system processing operations, instrumentation and control requirements, and to sequence these in a manner to achieve the desired system performance.

Outcome 4

This Outcome is designed to familiarise candidates with the requirements of equipment selection to meet the performance specification of a petrochemical process system. The Outcome identifies the types of equipment necessary for optimum performance of a process system and evaluates that equipment to meet a particular system specification. The equipment list should include all necessary devices related to HSE requirements on the basis of a risk assessment of the system operation.

Guidance on the delivery and assessment of this Unit

This Unit was developed to be 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.

Candidates should be given the opportunity to access information and data sources relevant to the Outcomes of this Unit. In particular, it would be beneficial for candidates to be able to access typical petrochemical process system information such as system specifications, system process diagrams and details of system equipment.

Formal assessment of this Unit may take a number of different forms such as written test and case studies. Tests should be conducted under controlled, closed-book supervised conditions. Measures should be taken to ensure that case study assessment work is that of the individual candidates.

Higher National Unit specification: support notes (cont)

Unit title: Petrochemical Process Specification and Equipment Selection

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 may be combined into a single case study assignment assessed by an investigation report. In this way, the case study may be devised to focus on one particular petrochemical process selected from those listed in the knowledge skills for Outcome. Such a case study can thus be tailored to the needs of the individual candidate and/or their employer. This combined assessment should be allocated three hours to produce the case study report.

Assessment evidence should include appropriate diagrams suitably annotated for clarity. Such diagrams may include features of equipment comprising process systems, process flow diagrams and P and IDs.

In the case of Outcomes 2 and 4, 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 actual process system requirements 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.

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

- ◆ Written Communication at SCQF level 6
- ◆ Critical Thinking at SCQF level 6
- ◆ Planning and Organisation at SCQF level 6
- ◆ Review and Evaluation at SCQF level 6

Higher National Unit specification: support notes (cont)

Unit title: Petrochemical Process Specification and Equipment Selection

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 the conditions specified in the Evidence Requirements and Assessment guidelines under each Outcome in the Higher National Unit specification: Statement of Standards section.

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

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This Unit has been designed to allow you to develop the knowledge, understanding and skills involved in process planning by relating system functions to process planning and equipment requirements for petrochemical applications. As such, this Unit will contribute to your development as a technician within the petrochemical industry. The vocational focus of this Unit combines the necessary blend of key petrochemical process related technological principles with knowledge of their industrial applications in a safety and environmentally critical context.

The Unit comprises the following broad outcomes:

- 1 Review the types, functions and operating principles of petrochemical processes.
- 2 Interpret the performance specification of a petrochemical process system.
- 3 Evaluate the sequence of process operations for optimum performance of a petrochemical process system.
- 4 Evaluate the equipment requirements to meet the performance requirements of a petrochemical process system.

Within this Unit, you will also have opportunities to develop components of the transferable Core Skills of *Communication* and *Problem Solving*, 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 following SQA HN Units

- ◆ Petroleum Industry: Organisation, Products and Processes
- ◆ Engineering Science Principles
- ◆ Chemical Engineering Principles

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, 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 tests 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.