



Higher National Unit Specification

General information for centres

Unit title: Industrial Chemicals: Processes and Products

Unit code: F3XD 34

Unit purpose: This Unit is designed to provide candidates with knowledge of the chemistry and chemical process technology of chemical engineering. This may apply to the petrochemical industry and other appropriate large scale chemical industries.

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

- 1 Explain oil refinery processes.
- 2 Describe the synthesis of a range of industrial products.
- 3 Describe the processes involved in the synthesis of a selected industrial fine chemical.

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: Access to this Unit will be at the discretion of the centre, however it is recommended that candidates have prior skills in at chemistry at SCQF level 6, or equivalent.

Core Skills: There are opportunities to develop the Core Skills of *Numeracy* and *Problem Solving* and the component *Written Communication*, all at SCQF level 6 in this Unit, 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 within the subject area of the Group Award to which it contributes.

Assessment: Outcomes 1 and 2 could be assessed as a single assessment for each or by a combined assessment covering both. Assessment could be composed of an appropriate balance of short answer, restricted response and structured questions. Assessment should be carried out under supervised conditions. Outcome 3 could be assessed by a report detailing the industrial process involved in the synthesis of the selected industrial chemical. The report could be around 1,500 words or equivalent in length.

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

Explain oil refinery processes

Knowledge and/or Skills

- ◆ Crude oil stabilisation/distillation
- ◆ Catalytic cracking,
- ◆ Hydrocracking,
- ◆ Catalytic reforming,
- ◆ Catalytic alkylation
- ◆ Products from refinery processes
- ◆ Pollution on receiving environment

Evidence Requirements

Evidence for this Outcome will be provided on a sample basis with candidates being required to provide evidence for four of the seven Knowledge and/or Skills items. Assessment must be carried out under supervised conditions.

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

- ◆ the processes of crude oil stabilisation including preheating, dehydration, degassing
- ◆ the process of vacuum distillation including the major fractions obtained and their uses
- ◆ refinery processes. The explanation must include:
 - catalytic cracking (catalyst, reactions, plant description, uses of products)
 - hydrocracking (typical reactions, feedstocks, catalysts, plant description, uses of products)
 - catalytic reforming (typical reactions, catalyst, plant description, uses of products)
 - catalytic alkylation (typical reactions, catalyst, plant description, uses of products)
- ◆ the environmental considerations of the refining processes and products

Assessment Guidelines

Outcomes 1 and 2 could be assessed as a single assessment for each or by a combined assessment covering both. Assessment could be composed of an appropriate balance of short answer, restricted response and structured questions.

Higher National Unit specification: statement of standards (cont)

Unit title: Industrial Chemicals: Processes and Products

Outcome 2

Describe the synthesis of a selection of petrochemical products

Knowledge and/or Skills

- ◆ Synthetic routes of selected petrochemical products
- ◆ Commercial manufacture of petrochemical products
- ◆ Environmental impact

Evidence Requirements

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

- ◆ describe the synthesis of at least two petrochemical products. The petrochemical products be selected from ethene, polyethene, ethanol and butadiene.
- ◆ explain the conditions for the synthesis of the two petrochemical products described. The explanation must include operating conditions, feedstocks and product yields.
- ◆ explain the effects of pollution on the receiving environment for selected petrochemical products.

Assessment Guidelines

Outcomes 1 and 2 could be assessed as a single assessment for each or by a combined assessment covering both. Assessment could be composed of an appropriate balance of short answer, restricted response and structured questions.

Higher National Unit specification: statement of standards (cont)

Unit title: Industrial Chemicals: Processes and Products

Outcome 3

Describe the processes involved in the synthesis of a selected industrial fine chemical

Knowledge and/or Skills

- ◆ The synthetic process to manufacture
- ◆ Environmental considerations and hazards
- ◆ Health and safety implications of the process
- ◆ The commercial value of the synthetic route

Evidence Requirements

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

- ◆ synthetic process to manufacture of industrial fine chemicals is described. The fine chemical should be chosen from a pharmaceutical compound, a speciality chemical (eg inks, biocides, dyestuff, pigments) or an agrochemical.
- ◆ environmental aspects of the synthetic process chosen in the previous Evidence Requirement.
- ◆ health and safety implications of the chosen synthetic process.
- ◆ commercial value of the manufacture of the selected chemical.

Assessment Guidelines

Outcome 3 could be assessed by a report detailing the industrial process involved in the synthesis of the selected industrial chemical. The report could be around 1,500 words or equivalent in length.

Administrative Information

Unit code: F3XD 34
Unit title: Industrial Chemicals: Processes and Products
Superclass category: WE
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Version	Description of change	Date

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Higher National Unit specification: Support Notes

Unit title: Industrial Chemicals: Processes and Products

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 intended to explain aspects of an industrial chemical process or processes. The details given in the outline of knowledge and skills are directed at the petrochemical industry. It is intended that these could be substituted by relevant points pertaining to the manufacture of other large scale products such as the manufacture of pharmaceuticals, dyes and pigments, alcohol products, plastics etc. the substitution of appropriate Outcome content is at the discretion of the assessing centre.

Outcomes 1 and 2

These Outcomes are intended to give a broad overview of a large scale industrial process. The petrochemical industry is used as an example, with the various stages in refining detailed. This could be equally well used to describe the broad conversion of ethane to finished goods such as polyethene, going into detail on the synthesis, use of copolymers and additives and extrusion, moulding and finishing techniques. Another example could be the manufacture of pigments/dyes from the raw materials through the various processing stages and material testing to finished products.

Outcome 3

It is recommended the candidates choose their own topic for this Outcome—an area of particular interest or relevance for them. The work should show a good understanding of the chemistry involved in the manufacture of their chosen material, as well as details of the commercial manufacture of the product. The environmental and health and safety implications must be addressed in some detail, demonstrating an understanding of the wider implications of the chemical processes involved. Finally the candidate should have a clear view of their chosen chemical manufacturing route, ideally within a relevant marketplace either locally or globally.

Guidance on the delivery and assessment of this Unit

This Unit is intended to explain the main concepts of industrial processes and products. The Unit is designed to be taught using relevant examples of industrial processes, with end of Outcome assessment recommended for Outcomes 1 and 2 and a report recommended for Outcome 3.

Higher National Unit specification: Support Notes (cont)

Unit title: Industrial Chemicals: Processes and Products

Opportunities for developing Core Skills

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

The submission of a report for Outcome 3 may provide the opportunity to develop both *Critical Thinking* and *Written Communication* skills.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning resources may be required for candidate support, assessment and quality assurance.

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (www.sqa.org.uk).

General information for candidates

Unit title: Industrial Chemicals: Processes and Products

This Unit is intended to provide you with an understanding of the key aspects of an industrial chemical process or processes. Before undertaking this Unit it is recommended that you have studied chemistry at SCQF level 6 or equivalent. Ideally, you will be working in the industrial chemical process industry, particularly the petrochemical area, or looking to develop a career in that industry.

The petrochemical industry may be used as an example, with the various stages in refining detailed. However, this Unit may be equally relevant to the manufacture of other large scale products such as pharmaceuticals, dyes and pigments, alcohol products, plastics etc.

On completion of the Unit you should be able to:

- 1 Explain oil refinery processes.
- 2 Describe the synthesis of a range of industrial products.
- 3 Describe the processes involved in the synthesis of a selected industrial fine chemical.

The Unit could be assessed either through two separate assessments or by using a combined assessment for Outcome 1 and 2. Outcome 3 is likely to be assessed by the production of a report based on a selected industrial chemical, preferably one that is of interest to you.

There are opportunities to develop the Core Skills of Numeracy and Problem Solving and the component 'Written Communication,' all at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.