



Arrangements for:

HNC Chemical Process Technology

Group Award Code: G920 15

HND Chemical Process Technology

Group Award Code: G921 16

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1 Introduction

This is the Arrangement Document for the revised HNC Chemical Process Technology (G920 15) and HND Chemical Process Technology (G921 16) which were validated in April 2008. This document includes background information on the development of the Group Awards, their aims, guidance on access, details of the Group Award structures, and guidance on delivery.

The revised HNC Chemical Process Technology (G920 15) replaces the predecessor HNC Chemical Process Technology (G5KE 15).

The revised HND Chemical Process Technology (G921 16) replaces the predecessor HND Chemical Process Technology (G5KE 16).

The revised Group Awards have been designed to prepare candidates for work in the chemicals industry, eg as an analytical or industrial laboratory technician, or a process or chemical engineer, and also to facilitate progression to further study in either chemical engineering or chemistry.

2 Rationale for the revision of the award

2.1 Background to the revision

The predecessor Chemical Process Technology HNC and HND had been in existence since 2000. The review provided an opportunity for updating course content to meet current requirements from stakeholders. The Group Awards have been revised to meet the needs of both the Scottish market and the expanding international market.

2.2 The current development

As the revised Group Awards have been developed in collaboration, the needs of both Scottish and international learners have been taken into account in the revised structure. The revisions of the Group Awards followed current SQA design principles and alongside new Units in chemical engineering include other modernised HN Units from the science catalogue. The revised HNC/HND are designed to equip candidates with the skills, underpinning knowledge and application of technologies that will lead to employment in the chemical or related industry or further academic progression. The revised Group Awards may enable candidates to gain entry to a variety of degree programmes in chemical engineering or chemistry. The revised HNC/HND take into account the content of predecessor provision, but also cater for the needs of modern chemical industries in their revised content. Thus, the content of the revised HNC/HND is more relevant to the needs of the chemicals industry than the predecessor provision.

2.3 Consultation process

The initial phase reviewed the content of predecessor provision, and identified stakeholders to be consulted on the revised HNC/HND. The consultation involved:

- ◆ Colleges
- ◆ Employers
- ◆ Candidates
- ◆ Universities

The stakeholders were consulted and their feedback was collated and reviewed. The majority of consultation was carried out either by face-to-face meetings or phone conversations.

2.4 Summary of consultations

The main findings of the consultation process are noted below:

- ◆ Integration of theory and practical Units was required, to form subject-specific Units covering the theory and practical elements together
- ◆ Specialist Units were required, to meet employers' needs
- ◆ Units meeting the needs of learners progressing from HNC to HND or from HND to degree studies were required

The resultant frameworks were influenced by the requirements of learners, employees, employers, college staff and HE establishments. These needs are not always identical and the split of mandatory and optional Units reflects this by providing flexibility. This flexibility gives learners progressing to further study the best possible HNC/HND for their purposes while allowing those in the workplace to have a vocational element within the programme. The integration of the theory with practical elements in Units has enabled the HNC/HND to align with the modernised science HNs. This gives a consistency of approach across the suite of awards offered in the colleges.

Regular meetings took place during the revision to ensure the Units covered the required areas avoiding any overlap, that no required content was omitted and that assessment would be consistent across the Group Awards.

3 Aims of the Group Awards

3.1 Aims of HNC Chemical Process Technology

The HNC is intended to provide a progressive, integrated and coherent education which will be responsive to the needs of candidates and employers.

3.1.1 General aims

Furthermore, the general aims of the HNC Chemical Process Technology are to:

- 1 develop candidates' knowledge and skills.
- 2 develop employment skills.
- 3 enable progression within the SCQF.
- 4 develop study and research skills.
- 5 develop transferable skills.
- 6 develop candidates' IT skills.
- 7 provide a flexible route to a qualification.

3.1.2 Specific aims

The specific aims of the HNC Chemical Process Technology are to:

- 8 prepare candidates for an appropriate level of employment in the chemicals industry.
- 9 develop a range of vocational skills relating to the use, support and development of systems appropriate to employment at operator or technician level.
- 10 allow candidates to learn and develop the practical skills and techniques needed within the chemicals industry.
- 11 provide options to permit an element of vocational specialisation in a variety of areas such as analytical chemistry, process and refinery operations.

3.2 Aims of HND Chemical Process Technology

The HND is intended to build on the knowledge and skills already gained from the HNC programme and provide a progressive, integrated and coherent education which will be responsive to the needs of candidates and employers.

3.2.1 General aims

Furthermore, the general aims of the HND Chemical Process Technology are to:

- 1 develop skills of independent study and communication.
- 2 enable progression within the SCQF.
- 3 enhance transferable skills.
- 4 further develop and enhance candidates' employment prospects.
- 5 provide a flexible route to a qualification.

3.2.2 Specific aims

The specific aims of the HND in Chemical Process Technology are to:

- 6 provide candidates with a deeper underpinning knowledge by supplying a wide range of theoretical and practical knowledge in chemistry and chemical engineering.
- 7 prepare candidates for an appropriate level of employment in the chemicals industry.
- 8 develop a range of vocational skills relating to the use, support and development of systems appropriate to employment at technician level.
- 9 allow candidates to learn and develop the practical skills and techniques needed within the chemicals industry.

- 10 provide options to permit an element of vocational specialisation in a variety of areas such as: distillation, fermentation, water and steam services, refinery operations, CAD and environmental sampling.

3.3 Target groups

The HNC/HND Chemical Process Technology principally serve the following three main groups of learners:

- ◆ **Full-time candidates.** The Group Awards meet the learning and development needs of full-time candidates. The awards give the candidates the relevant theoretical and practical knowledge to develop in the areas of chemical engineering and chemistry.
- ◆ **Training apprentices.** The Group Awards meet the learning and development needs of apprentices who are embarking on a career as process engineers. In conjunction with level 3 SVQs, the HNC/HND provide the relevant vocational skills supported by the appropriate theory and technical knowledge, and are an integral part of a multinational chemicals company's fast track apprentice scheme.
- ◆ **International learners.** In recent years delivering colleges have seen an increase in the number of international learners studying for the Chemical Process Technology HNC/HND. These are experienced process operators attending college for a fixed period to study for the HNC or HND. These learners have experience on 'plant' but limited knowledge of the supporting theory to progress further in the workplace.

3.4 Employment opportunities

Employment opportunities for holders of the HNC/HND Chemical Process Technology are substantial, as the chemicals and life sciences sector have experienced a skills shortage at technician and operator level.

In the coming years, this skills gap will require competent people who have both the practical and theoretical knowledge, as obtained with these HN qualifications. Several companies, both in the UK and abroad, use the Chemical Process Technology HN provision as means of training and progressing employees.

These programmes have been developed through consultation with industry to ensure an appropriate curriculum, meeting the needs of the sector. Candidates will develop the competences to work as process operators, process control operators, laboratory technicians on completion of the HNC or process technicians, laboratory scientists or control room technicians on completion of the HND. The Group Awards are structured in such a way that they offer flexible routes into employment for candidates, upon completion.

4 Access to the Group Awards

4.1 Formal qualifications

There are no unnecessary barriers to entry. It is intended that admission to these awards should be as broadly based as possible, but that this should be consistent with the selection of candidates who have a reasonable chance of successfully completing either Group Award. Access is at the discretion of the delivering centre, and the following entry requirements are given as guidelines only:

- ◆ One Science Higher, ideally either Chemistry or Physics, and not fewer than three Standard Grade Credit/Intermediate 2 passes, from: Chemistry, Physics, English and Mathematics.
- ◆ A National Qualification in an appropriate Science and Maths programme, such as SWAP Access to Science. Candidates should preferably possess at least four NQ Units at SCQF level 6 in mathematics and chemistry.
- ◆ Equivalent qualification to the above, gained through other awarding bodies, such as GCSE, AS levels, City and Guilds.

Work experience

At the discretion of the presenting centre, applications may be considered from those with a different experiential background, who would benefit from undertaking the HNC/HND, or Units within the framework (eg adult returners, overseas candidates with relevant qualifications).

4.2 Recommended Core Skills entry level

The recommended Core Skills entry levels for the HNC and HND in Chemical Process Technology are as follows:

Core Skill	HNC recommended entry level	HND recommended entry level
Communication	SCQF level 5	SCQF level 6
Numeracy	SCQF level 5	SCQF level 6
ICT	SCQF level 5	SCQF level 6
Problem Solving	SCQF level 5	SCQF level 6
Working with Others	SCQF level 4	SCQF level 5

5 Group Award structures

The 96 SCQF credit points (12 SQA credits) of the HNC Chemical Process Technology Group Award would normally be studied on a full-time basis, over one year. Those learners intending on progressing to the HND would normally complete a further 24 SCQF credit points (3 SQA credits) in this year. To complete the 240 SCQF credit points (30 SQA credits) HND learners would normally complete the remaining 120 SCQF credit points (15 SQA credits) in a second year of full-time study.

5.1 Framework

Higher National Certificate in Chemical Process Technology (G920 15)

For a candidate to achieve the HNC in Chemical Process Technology, they must attain **all** of the mandatory Units (64 SCQF credit points/8 SQA credits), including one Graded Unit at SCQF level 7 (8 SCQF credit points/1 SQA credit). Candidates must **also** attain a minimum of 16 SCQF credit points (2 SQA credits) and a maximum of 24 SCQF credit points (3 SQA credits) from the restricted optional Units list (Group 1), and a minimum of 1 SCQF credit point (8 SQA credits) and a maximum of 16 SCQF credit points (2 SQA credits) from the optional Units list (Group 2 and 3).

Mandatory Units

Candidates must achieve **all** of the following mandatory Units (64 SCQF credit points/8 SQA credits):

Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Chemical Process Technology: Graded Unit 1	F4CH 34	1	7	8
Fundamental Chemistry: Theory and Practice	DH2K 34	2	7	16
Information Technology: Applications Software 1	D75X 34	1	7	8
Fundamental Concepts of Organic Chemistry	DP2P 34	1	7	8
Fundamental Concepts of Physical Chemistry	DP2R 34	1	7	8
Mathematics for Science 1	H8XP 33**	1	6	8
Chemical Engineering Principles	F3X8 34	1	7	8

Restricted optional Units

Candidates must achieve a minimum of 16 SCQF credit points (2 SQA credits) and a maximum of 24 SCQF credit points (3 SQA credits) from Group 1:

Group 1: Restricted optional Units				
Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Process Safety Engineering	F43J 34	1	7	8
Heat Transfer: Theory and Practice	F3XC 34	1	7	8
Fluid Mechanics: Theory and Practice	F3XB 34	1	7	8

Optional Units

Candidates must achieve a minimum of 0 SCQF credit points (0 SQA credit) and a maximum of 16 SCQF credit points (2 SQA credits) from Group 2:

Group 2: Optional Units				
Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Industrial Chemicals: Processes and Products	F3XD 34	1	7	8
Physics Principles: Mechanics	F3XE 34	1	7	8
Physics Principles: Heat and Thermodynamics	F43H 34	1	7	8
Thermodynamics and Kinetics	DP4N 35	1	8	8
Quality Health and Safety Systems in Science Industries	DF82 34	1	7	8
Fundamental Chemistry: An Introduction	DX29 33	1	6	8
Instrumental Techniques: Theory and Practice 1	DH54 35	1	7	8
Mathematics for Science 2	H8XR 34**	1	7	8
Fundamental Concepts of Inorganic Chemistry	DP2N 34	1	7	8
Hydrocarbon Extraction and Process	F43V 34	1	7	8

Optional Units (continued)

Candidates must achieve a minimum of 0 SCQF credit points (0 SQA credit) and a maximum of 16 SCQF credit points (2 SQA credits) from Group 3:

Group 3: Optional Units:				
Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Workplace Communication in English	H8T2 33**	1	6	8
ESOL for Work: Advanced Operational	F1HW 34	1	7	8
Personal Development Planning	DE3R 34	1	7	8

**Refer to the History of Changes table

The Units listed in Group 3 are offered to provide broadening in communications and personal development skills thus providing candidates with the opportunity to develop 'softer' skills as part of their qualification. Support for candidates for whom English may not be their first language is provided through this structure.

Higher National Diploma in Chemical Process Technology (G921 16)

For a candidate to achieve the HND in Chemical Process Technology, they must attain **all** of the mandatory Units (184 SCQF credit points/23 SQA credits), including one Graded Unit at SCQF level 7, and one Graded Unit at SCQF level 8. Candidates must **also** attain 56 SCQF credit points/7 SQA credits from the list of optional Units.

Mandatory Units

Candidates must achieve **all** of the following mandatory Units (184 SCQF credit points/23 SQA credits):

Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Fundamental Chemistry: Theory and Practice	DH2K 34	2	7	16
Information Technology: Applications Software 1	D75X 34	1	7	8
Fundamental Concepts of Organic Chemistry	DP2P 34	1	7	8
Fundamental Concepts of Physical Chemistry	DP2R 34	1	7	8
Mathematics for Science 1	H8XP 33**	1	6	8
Chemical Process Technology: Graded Unit 1	F4CH 34	1	7	8
Chemical Engineering Principles	F3X8 34	1	7	8
Aromatic Chemistry	DP54 35	1	8	8
Chemical Process Technology: Graded Unit 2	F4CJ 35	2	8	16
Process Operations: Heat Exchange, Drying and Evaporation	F3XG 35	1	8	8
Fluid Mechanics: Theory and Practice	F3XB 34	1	7	8
Instrumental Techniques: Theory and Practice 1	DH54 35	1	8	8
Industrial Chemicals: Processes and Products	F3XD 34	1	7	8
Process Safety Engineering	F43J 34	1	7	8
Process Operations: Distillation	F3XF 35	1	8	8
Thermodynamics and Kinetics	DP4N 35	1	8	8
Heat Transfer: Theory and Practice	F3XC 34	1	7	8
Phase Equilibrium and Surface Chemistry	DP5X 35	1	8	8

Mandatory Units (continued)

Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	DP5W 35	1	8	8
Fundamental Concepts of Inorganic Chemistry	DP2N 34	1	7	8
Mathematics for Science 2	H8XR 34**	1	7	8

Optional Units

Candidates must achieve a minimum of 24 SCQF credit points (3 SQA credits) and a maximum of 56 SCQF credit points (7 SQA credits) from Group 1:

Group 1: Optional Units				
Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Instrumental Techniques: Theory and Practice 2	DH2N 35	1	8	8
Main Group Inorganic Chemistry	DV9F 35	1	8	8
Electrochemistry	DP5V 35	1	8	8
Organic Stereochemistry	DX2H 35	1	8	8
Physics Principles: Heat and Thermodynamics	F43H 34	1	7	8
Fermentation Engineering	F3XA 34	1	7	8
Process Water and Steam Services	F3XH 34	1	7	8
Chemical Engineering: Applied Physical Chemistry	F3X9 34	1	7	8
CAD: 2D I	DW1E 34	1	7	8
Physics Principles: Mechanics	F3XE 34	1	7	8
Quality and Health & Safety Systems in Science Industries	DF82 34	1	7	8
Fundamental Chemistry: An Introduction	DX29 33	1	6	8
Transition Metal Chemistry	DR0E 35	1	8	8
Environmental Sampling and Analysis	DT4X 35	1	8	8
Hydrocarbon Extraction and Process	F43V 34	1	7	8

Optional Units (continued)

Candidates must achieve a minimum of 0 SCQF credit points (0 SQA credits) and a maximum of 32 SCQF credit points (4 SQA credits) from Group 2:

Group 2: Optional Units				
Unit title	Code	SQA credit value	SCQF level	SCQF credit points
Workplace Communication in English	H8T2 33**	1	6	8
ESOL for Work: Advanced Operational	F1HW 34	3	7	8
Personal Development Planning	DE3R 34	1	7	8
Work Role Effectiveness	DG6E 34	3	7	24
Work Role Effectiveness	DG6G 35	3	8	24

**Refer to the History of Changes table

The Units in Group 2 are offered to provide broadening in Communications and personal development skills thus providing candidates with the opportunity to develop 'softer' skills as part of their qualification. Support for candidates for whom English may not be their first language is provided through this structure.

Graded Units

The purpose of the Graded Units is to assess the candidate's ability to integrate and apply the Knowledge and/or Skills gained in individual Units, demonstrating that they have achieved the specific aims as detailed in Sections 3.1.2 and 3.2.2, and also to grade candidate achievement.

Candidates will take a 1 credit (8 SCQF credit points) Graded Unit at SCQF level 7 in the HNC Chemical Process Technology. Candidates will take an additional 2 credit (16 SCQF credit points) Graded Unit at SCQF level 8 in year 2 of the Chemical Process Technology HND.

Chemical Process Technology Graded Unit 1: Investigation

This Unit will be project based and will take the form of an investigation which, it is recommended, should take place during the last block of study. It will cover a range of skills achieved through studying the mandatory Units of the HNC.

Candidates will select an appropriate topic to research and produce a report covering the planning, developing and evaluation stages of the investigation. An investigation report allows candidates to integrate knowledge and skills gained in the mandatory Units. It allows them to use research skills, set timescales, and identify main issues, methods and sources of research. It also allows them to use written scientific reporting skills in setting out the aims, data, analysis, summary, evaluation and references relevant to their investigation.

Chemical Process Technology Graded Unit 2: Practical Assignment

This Unit will be project based and will take the form of a practical assignment which, it is recommended, should take place during the last block of the second year of study. It will cover a range of skills achieved through studying the mandatory Units and one of the restricted optional Units of the Group Award.

Candidates will carry out a practical assignment. They will produce a report covering the planning, developing and evaluation stages of the project. This will allow candidates to integrate knowledge and skills gained in the mandatory Units. It allows them to use practical and/or theory based skills, risk assessments and other Health and Safety considerations as well as extending investigative skills to a practical situation. They will be expected to apply the knowledge gained in the theoretical Units when they are planning and discussing the project. It also allows them to use reporting skills by producing a logbook/diary of their activities as well as the final project report.

5.2 Mapping information

5.2.1 Core Skills

There are opportunities to develop all five Core Skills across Group Award frameworks. In addition, Core Skills may feature in the entry qualifications that candidates have already achieved, eg *Problem Solving* at SCQF level 5 is embedded in all science Highers. It should be noted that although there are no mandatory entry and exit levels, the following are recommended:

HNC Chemical Process Technology

Core Skills	Recommended entry level	Recommended exit level
Communication	SCQF level 5	SCQF level 6
Numeracy	SCQF level 5	SCQF level 6
Information Technology	SCQF level 5	SCQF level 6
Problem Solving	SCQF level 5	SCQF level 6
Working with Others	SCQF level 4	SCQF level 5

HND Chemical Process Technology

Core Skills	Recommended entry level	Recommended exit level
Communication	SCQF level 6	SCQF level 6
Numeracy	SCQF level 6	SCQF level 6
Information Technology	SCQF level 6	SCQF level 6
Problem Solving	SCQF level 6	SCQF level 6
Working with Others	SCQF level 5	SCQF level 6

The Unit *Information Technology: Applications Software 1* (D75X 34) provides candidates with automatic certification of the Core Skill of *Information Technology*, at SCQF level 6.

Appendix 1 gives detailed information on Core Skills mapping of the HNC and HND Chemical Process Technology.

5.2.2 Relation of aims to structure

The aims are listed in Section 3, and the mapping of aims to Units is detailed in Appendix 2.

5.3 Articulation, professional recognition and credit transfer

5.3.1 Articulation

The Group Awards provide qualifications which demonstrate relevant knowledge and skills, allowing successful candidates to progress to employment. Additionally, candidates can articulate to degree courses. The optional Units have been included to allow candidates to articulate to a range of degree programmes at different higher education institutions.

Candidates may expect to progress, on completion of the HNC award, to 1st or 2nd year of a degree programme. On completion of the HND a candidate may expect to progress to 2nd or 3rd year of a degree programme. Third year entry is likely to require a higher grade in the Graded Unit of the Group Award.

5.3.2 Credit transfer

Candidates may be given credit transfer between HN Units (developed using 1988 design principles) and the revised HN Units (developed using 2003 design principles). There is no transition framework for the HND Chemical Process Technology but candidates can be given credit transfer for individual Units.

Credit transfer can be given where there is broad equivalence between the subject related content of the Unit or combination of Units. Candidates who are given credit transfer between predecessor Units and revised HN Units must still satisfy all other conditions of the revised HNC Chemical Process Technology and HND Chemical Process Technology, including the Mandatory Units, Graded Units and the correct number of credits at the correct SCQF level.

Appendix 4 details where full or partial credit transfer can be given between predecessor Units and revised Units. These have been agreed by the External Verifier.

6 Approaches to delivery and assessment

6.1 Content and context

The Chemical Process Technology HNC/HND enable candidates to acquire knowledge and technical skills in organic chemistry, physical chemistry, chemical engineering principles and physics. The HNC introduces the basic building blocks required in order to pursue further study, with the options available allowing candidates to choose areas of specialism. These may be related to current or future employment or study and include analytical chemistry, water and steam services and process operations.

The Chemical Process Technology HND develops ideas taught initially within the HNC and enables candidates to acquire knowledge and technical skills in industrial chemistry, organic chemistry, physical chemistry, heat transfer, fluid mechanics, process operations and analytical chemistry. The options allow candidates to choose areas of specialism that may be related to current or future employment including analytical chemistry, water and steam services and environmental sampling.

6.2 Sequencing of Units

Although centres can choose the order in which to teach the Units within the Group Award, guidelines have been produced on timetabling the mandatory Units (see Appendix 3). These timetables reflect the building block nature of the Units and the client groups expected to study on the programme.

It is envisaged that a mixture of delivery methods will be utilised in the delivery of the programme. These will include course booklets, presentations, practical work, group work and the VLE.

The assessment strategy of the design principles to encourage a more holistic approach to assessment has been adopted in the revised Group Awards. The HN Unit specification places the emphasis on reducing the assessment load for candidates and centres. This can be done by devising assessments which sample knowledge and skills. Unit specifications detail exactly the minimum Evidence Requirements and suggested assessment procedures for each assessment event. Should centres wish to use a different mode of assessment from that recommended, they should seek prior moderation from SQA.

6.3 Practical laboratory hours

HNC Chemical Process Technology

Mandatory Units

Unit title	Code	SQA credit value	SCQF level	Laboratory hours
Chemical Process Technology: Graded Unit 1	F4CH 34	1	7	0
Fundamental Chemistry: Theory and Practice	DH2K 34	2	7	30
Information Technology: Applications Software 1	D75X 34	1	7	0
Fundamental Concepts of Organic Chemistry	DP2P 34	1	7	10
Fundamental Concepts of Physical Chemistry	DP2R 34	1	7	10
Mathematics for Science 1	H8XP 33**	1	6	0
Chemical Engineering Principles	F3X8 34	1	7	10

Group 1: Restricted optional Units				
Unit title	Code	SQA credit value	SCQF level	Laboratory hours
Process Safety Engineering	F43J 34	1	7	0
Heat Transfer: Theory and Practice	F3XC 34	1	7	15
Fluid Mechanics: Theory and Practice	F3XB 34	1	7	5

HNC Chemical Process Technology (continued)

Group 2: Optional Units				
Unit title	Code	SQA credit value	SCQF level	Laboratory hours
Industrial Chemicals: Processes and Products	F3XD 34	1	7	0
Physics Principles: Mechanics	F3XE 34	1	7	10
Physics Principles: Heat and Thermodynamics	F43H 34	1	7	10
Thermodynamics and Kinetics	DP4N 35	1	8	10
Quality Health and Safety Systems in Science Industries	DF82 34	1	7	0
Fundamental Chemistry: An Introduction	DX29 33	1	6	10
Instrumental Techniques: Theory and Practice 1	DH54 35	1	7	30
Mathematics for Science 2	H8XR 34**	1	7	0
Fundamental Concepts of Inorganic Chemistry	DP2N 34	1	7	10
Hydrocarbon Extraction and Process	F43V 34	1	7	0

Group 2: Optional Units				
Unit title	Code	SQA credit value	SCQF level	Laboratory hours
Workplace Communication in English	H8T2 33**	1	6	0
ESOL for Work: Advanced Operational	F1HW 34	3	7	0
Personal Development Planning	DE3R 34	1	7	0
Work Role Effectiveness	DG6E 34	3	7	0
Work Role Effectiveness	DG6G 35	3	8	0

HND Chemical Process technology

Mandatory Units

Unit title	Code	SCQF credit points	SCQF level	Laboratory hours
Fundamental Chemistry Theory and Practice	DH2K 34	16	7	30
Information Technology: Applications Software 1	D75X 34	8	7	0
Fundamental Concepts of Organic Chemistry	DP2P 34	8	7	10
Fundamental Concepts of Physical Chemistry	DP2R 34	8	7	10
Mathematics for Science 1	H8XP 33**	8	6	0
Chemical Process Technology: Graded Unit 1	F4CH 34	8	7	0
Chemical Engineering Principles	F3X8 34	8	7	10
Aromatic Chemistry	DP54 35	8	8	10
Chemical Process Technology: Graded Unit 2	F4CJ 35	16	8	60*
Process Operations: Heat Exchange, Drying and Evaporation	F3XG 35	8	8	0
Fluid Mechanics Theory and Practice	F3XB 34	8	7	5
Instrumental Techniques Theory and Practice 1	DH54 35	8	8	30
Industrial Chemicals: Processes and Products	F3XD 34	8	7	0
Process Safety Engineering	F43J 34	8	7	0
Process Operations: Distillation	F3XF 35	8	8	15
Thermodynamics and Kinetics	DP4N 35	8	8	10
Heat Transfer: Theory and Practice	F3XC 34	8	7	15
Phase Equilibrium and Surface Chemistry	DP5X 35	8	8	10
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	DP5W 35	8	8	10
Fundamental Concepts of Inorganic Chemistry	DP2N 34	8	7	10
Mathematics for Science 2	H8XR 34**	8	7	0

*60 hours practical may be on design, in industrial setting or laboratory

HND Chemical Process technology (continued)

Group 1 Optional Units

Unit title	Code	SCQF credit points	SCQF level	Laboratory hours
Instrumental Techniques 2	DH2N 35	8	8	30
Main Group Inorganic Chemistry	DV9F 35	8	8	10
Electrochemistry	DP5V 35	8	8	10
Organic Stereochemistry	DX2H 35	8	8	5
Physics Principles: Heat and Thermodynamics	F43H 34	8	7	10
Fermentation Engineering	F3XA 34	8	7	0
Process Water and Steam Services	F3XH 34	8	7	0
Chemical Engineering: Applied Physical Chemistry	F3X8 34	8	7	0
CAD 2 DI	DW1E 34	8	7	0
Physics Principles: Mechanics	F3XE 34	8	7	10
Quality Health and Safety Systems in Science Industries	DF82 34	8	7	0
Fundamental Chemistry: An Introduction	DX29 33	8	6	10
Transition Metal Chemistry	DROE 35	8	8	10
Environmental Sampling and Analysis	DT4X 35	8	8	30
Hydrocarbon Extraction and Process	F43V 34	8	7	0

Group 2 Optional Units

Unit title	Code	SCQF credit Points	SCQF levels	Laboratory hours
Workplace Communication in English	H8T2 33**	8	6	0
ESOL for Work: Advanced Operational	F1HW 34	8	7	0
Personal Development Planning	DE3R 34	8	7	0
Work Role Effectiveness	DG6E 34	24	7	0
Work Role Effectiveness	DG6G 35	24	8	0

6.4 Guidance on open learning

Chemical Process Technology HNC/HND could be delivered by open learning, however some Units require specialist practical facilities which preclude this. Candidates would need to attend the presenting centre or other agreed institution to complete the practical assessments in these cases.

Full details on the suitability of individual Units for open learning are contained in each individual Unit specification.

7 General information for centres

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).

Internal and external verification

All instruments of assessment used within this/these Group Award(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in SQA's *Guide to Assessment and Quality Assurance for Colleges of Further Education* (www.sqa.org.uk).

8 General information for candidates

HNC Chemical Process Technology (G920 15)

The HNC Chemical Process Technology is designed to prepare you for a variety of positions in the chemicals industry, for example a process operator or laboratory technician, within the wide variety of areas that are encompassed by the chemical and life science industries.

The Group Award is also designed for progression to further study either by continuing to an HND or progression to university. Entry to university would be either 1st or 2nd year depending on the university course chosen and/or grade obtained during HNC study.

Along with developing your knowledge of chemical engineering and chemistry you will develop general skills, these include:

- ◆ Study and research skills
- ◆ Employment skills
- ◆ Planning, developing and evaluating skills
- ◆ The Core Skills of *Numeracy, IT, Problem Solving, Communication and Working with Others*

You will also gain knowledge in the subject areas related to chemistry and chemical process technology. These subjects will provide the basic building blocks for a career in Chemical Process Technology and will include:

- ◆ Organic Chemistry
- ◆ Physical Chemistry
- ◆ Chemical Engineering principles
- ◆ Physics

Alongside developing subject knowledge and theory you will have the opportunity to develop practical skills in a laboratory environment, across a range of topics. In addition you will have the opportunity to undertake Units reflecting specialisms within the chemical process industry.

To progress from HNC to HND you will complete a total of 12 credits/96 SCQF credit points. If you are a full-time candidate seeking to achieve the HND you may be required to have completed an additional 3 credits/24 SCQF credit points during your first year of study. This allows for 15 credits/120 SCQF credit points of study in year 1 and 15 credits/120 SCQF credit points in year 2, with an even split over two years of the 30 credits/240 SCQF credit points necessary for an HND.

Progression to HND is at the discretion of the centre. If you choose to progress to university after the HNC, achievement of 15 credits/120 SCQF credit points may be a prerequisite for year 2 entry.

HND Chemical Process Technology (G921 16)

The HND Chemical Process Technology is a progression from the HNC Chemical Process Technology. The HND Chemical Process Technology is designed to prepare you for a variety of positions in the chemical industry. The HND is also designed for progression to further study at university. Entry to University could be either 2nd or 3rd year depending on the university course you have chosen and/or the grade obtained during HND study.

Alongside development of chemistry and chemical engineering knowledge, you will develop general skills. These include:

- ◆ Study and research skills
- ◆ Employment skills
- ◆ Planning, developing and evaluating skills
- ◆ The Core Skills of *Numeracy, IT, Problem Solving, Communication and Working with Others*

You will also gain knowledge in the subjects areas related to chemistry and chemical engineering. These include:

- ◆ Organic Chemistry
- ◆ Physical chemistry
- ◆ Heat Transfer
- ◆ Fluid Mechanics
- ◆ Process Operations
- ◆ Analytical Chemistry

Alongside developing subject knowledge and theory you will have the opportunity to develop practical skills in a laboratory environment, across a range of topics.

Assessment of HNC and HND

For both the HNC and HND, in order to pass each individual Unit you will need to show that you have the required level of knowledge of the topic studied. For Units with a practical element you will have to complete practical experiments to a required standard as well as producing a laboratory report or pro forma.

In addition to Unit assessments, you are required to complete a Graded Unit in the HNC year and a second Graded Unit in the HND year. The Graded Unit in year 1 will be in the form of an investigation. The investigation will be on a topic of interest to you that is related to the course. If you are in employment while studying for the HNC you may choose a related topic from your workplace. The Graded Unit in the HND year will be project-based and take the form of a practical assignment. You will choose the subject for your project with guidance from your lecturer, and if you are in employment you may choose a related topic from your workplace.

The overall purpose of the Graded Units is to allow you to show you can integrate the knowledge and skills developed throughout the Group Awards, in a piece of work. On completion of each Graded Unit you will be awarded either an A, B, C grade, or no award.

9 Glossary of terms

SCQF: This stands for the Scottish Credit and Qualification Framework, which is a new way of speaking about qualifications and how they inter-relate. We use SCQF terminology throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at www.scqf.org.uk

SCQF credit points: One HN credit is equivalent to 8 SCQF credit points. This applies to all HN Units, irrespective of their level.

SCQF levels: The SCQF covers 12 levels of learning. HN Units will normally be at levels 6–9. Graded Units will be at level 7 and 8.

Subject Unit: Subject Units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Graded Unit: Graded Units assess candidates' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage candidates to retain and adapt their skills and knowledge.

Dedicated Unit to cover Core Skills: This is a non-subject Unit that is written to cover one or more particular Core Skills.

Embedded Core Skills: This is where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level.

Signposted Core Skills: This refers to the opportunities to develop a particular Core Skill at a specified level that lie outwith automatic certification.

Qualification Design Team: The QDT works in conjunction with a Qualification Manager/Development Manager to steer the development of the HNC/HND from its inception/revision through to validation. The group is made up of key stakeholders representing the interests of centres, employers, universities and other relevant organisations.

Consortium-devised HNCs and HNDs are those developments or revisions undertaken by a group of centres in partnership with SQA.

Specialist single centre and specialist collaborative devised HNCs and HNDs are those developments or revisions led by a single centre or small group of centres who provide knowledge and skills in a specialist area. Like consortium-devised HNCs and HNDs, these developments or revisions will also be supported by SQA.

10 Appendices

Appendix 1: Core Skills mapping of HNC and HND Chemical Process Technology

Appendix 2: Mapping of aims to Units

Appendix 3: Suggested delivery schedule

Appendix 4: Unit credit transfer arrangements

Appendix 1: Core Skills mapping of HNC and HND Chemical Process Technology

Unless otherwise indicated Core Skills are developed within the Units.

Unit	Core Skill				
	Numeracy	Communication	IT	Problem Solving	Working with Others
Fundamental chemistry Theory and Practice (2 credits)	SCQF 6	SCQF 6		SCQF 6	
IT apps 1			Embedded SCQF 6		
Fundamental Concepts of Organic Chemistry		SCQF 6		SCQF 6	
Fundamental Concepts of Physical Chemistry	SCQF 6	SCQF 6		SCQF 6	
Physics principles Heat & Thermodynamics	SCQF 6	SCQF 6		SCQF 6	
Mathematics for Science 1	SCQF 6			SCQF 6	
Graded Unit 1	SCQF 6	SCQF 6	SCQF 6	SCQF 6	
Chemical Engineering Principles	SCQF 6	SCQF 6		SCQF 6	
Aromatic Chemistry		SCQF 6		SCQF 6	
Main Group Inorganic		SCQF 6		SCQF 6	
Graded Unit (2 credit)	SCQF 6	SCQF 6	SCQF 6	SCQF 6	
Process Operations: Heat, Evaporation and Drying	SCQF 6	SCQF 6	SCQF 6	SCQF 6	
Fluid Mechanics Theory and Practice	SCQF 6	SCQF 6	SCQF 6	SCQF 6	
Instrumental Techniques Theory and Practice 1	SCQF 6	SCQF 6		SCQF 6	
Thermodynamics and Kinetics	SCQF 6	SCQF 6		SCQF 6	
Instrumental Techniques 2	SCQF 6	SCQF 6		SCQF 6	
Heat Transfer Theory & Practice	SCQF 6	SCQF 6	SCQF 6	SCQF 6	
Phase Equilibrium and Surface Chemistry		SCQF 6		SCQF 6	
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis		SCQF 6			
Fundamental Concepts of Inorganic Chemistry	SCQF 6	SCQF 6		SCQF 6	

Unit	Core Skill				
	Numeracy	Communication	IT	Problem Solving	Working with Others
Industrial Chemicals Processes and Products		SCQF 6	SCQF 6		
ESOL for work: Advanced Operational		SCQF 6			
Process Safety Engineering	SCQF 6	SCQF 6	SCQF 6	SCQF 6	
Electrochemistry		SCQF 6		SCQF 6	
Organic Stereochemistry		SCQF 6		SCQF 6	SCQF 5
Chemical Engineering Applied Physical Chemistry	SCQF 6			SCQF 6	
Process Operations: Distillation	SCQF 6	SCQF 6		SCQF 6	
Fermentation Engineering	SCQF 6			SCQF 6	
Process water and Steam services	SCQF 6	SCQF 6		SCQF 6	
CAD 2 D1	SCQF 6		SCQF 6		
Maths for Science 2	SCQF 6				
Physics: Mechanics	SCQF 6	SCQF 6		SCQF 6	
Quality Health & Safety in Science Industries		SCQF 6		SCQF 6	
Fundamental Chemistry: An Introduction				SCQF 6	
Transition Metal Chemistry		SCQF 6		SCQF 6	SCQF 5
Environmental Sampling and Analysis				SCQF 6	SCQF 5
Workplace Communication in English		SCQF 5			

Communication — SCQF level 6

Skill component: Written Communication

Written Communication (Reading)

Read and understand complex Written Communication

- a Identify and summarise all significant information, ideas and supporting details in a complex written environment.
- b Evaluate fully the effectiveness of a communication in meeting its purpose and needs of its intended readership.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b
Industrial Chemical, Processes and Products	Outcome 3	Developed	✓	✓
Fundamental Chemistry: Theory and Practice	Outcome 2	Developed	✓	✓
Process Safety Engineering	Outcome 4	Developed	✓	✓
Process operations: Distillation	Outcome 2	Developed	✓	✓
Fluid mechanics Theory & Practice	Outcome 2	Developed	✓	✓
Heat Transfer Theory & Practice	Outcome 2	Developed	✓	✓
Quality and Health & Safety Systems in Science Industries	Outcome 2	Developed	✓	✓
Fundamental Concepts of Inorganic Chemistry	Outcome 2	Developed	✓	✓
Fundamental Concepts of Organic Chemistry	Outcome 2	Developed	✓	✓
Fundamental Concepts of Physical Chemistry	Outcome 2	Developed	✓	✓
Instrumental Techniques: Theory and Practice 1	Outcome 2	Developed	✓	✓
Instrumental Techniques: Theory and Practice 2	Outcome 2	Developed	✓	✓
Organic Stereochemistry	Outcome 3	Developed	✓	✓
Base-Catalysed Reactions and Organometallic Reagents in Organic synthesis	Outcome 2	Developed	✓	✓

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b
Aromatic Chemistry	Outcome 2	Developed	✓	✓
Transition Metal Chemistry	Outcome 2	Developed	✓	✓
Main Group Chemistry	Outcome 2	Developed	✓	✓
Electrochemistry	Outcome 2	Developed	✓	✓
Phase Equilibrium and Surface Chemistry	Outcome 2	Developed	✓	✓
Kinetics and Thermodynamics	Outcome 2	Developed	✓	✓
Physics Heat & Thermodynamics	Outcome 2	Developed	✓	✓
Physics Mechanics	Outcome 2	Developed	✓	✓
ESOL for Work: Advanced Operational	Outcome 3	Developed	✓	✓
Process Water and Steam services	Outcome 3	Developed	✓	✓
Graded Unit 1		Developed	✓	✓
Graded Unit 2		Developed	✓	✓

Written Communication (Writing)

Produce well-structured Written Communication on complex topics

- a Present all essential ideas/information and supporting detail in a logical and effective order.
- b Use a structure which takes account of purpose and audience and links major and minor points in ways which assist the clarity and impact of the writing.
- c Use conventions which are effective in achieving the purpose and adapted as necessary for the target audience.
- d Use spelling, punctuation and sentence structures which are consistently accurate.
- e Vary sentence structure, paragraphing and vocabulary to suit the purpose and target audience.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c	d	e
Industrial Chemical, Processes and Products	Outcome 3	Developed	✓	✓	✓	✓	✓
Fundamental Chemistry: Theory and Practice	Outcome 2	Developed	✓	✓	✓	✓	✓
Process Safety Engineering	Outcome 4	Developed	✓	✓	✓	✓	✓
Process operations: Distillation	Outcome 2	Developed	✓	✓	✓	✓	✓
Fluid mechanics Theory & Practice	Outcome 2	Developed	✓	✓	✓	✓	✓
Heat Transfer Theory & Practice	Outcome 2	Developed	✓	✓	✓	✓	✓
Quality and Health & Safety Systems in Science Industries	Outcome 2	Developed	✓	✓	✓	✓	✓
Fundamental Concepts of Inorganic Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Fundamental Concepts of Organic Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Fundamental Concepts of Physical Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Instrumental Techniques: Theory and Practice 1	Outcome 2	Developed	✓	✓	✓	✓	✓
Instrumental Techniques: Theory and Practice 2	Outcome 2	Developed	✓	✓	✓	✓	✓
Organic Stereochemistry	Outcome 3	Developed	✓	✓	✓	✓	✓
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	Outcome 2	Developed	✓	✓	✓	✓	✓
Aromatic Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c	d	e
Transition Metal Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Main Group Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Electrochemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Phase Equilibrium and Surface Chemistry	Outcome 2	Developed	✓	✓	✓	✓	✓
Kinetics and Thermodynamics	Outcome 2	Developed	✓	✓	✓	✓	✓
Physics Heat & Thermodynamics	Outcome 2	Developed	✓	✓	✓	✓	✓
Physics Mechanics	Outcome 2	Developed	✓	✓	✓	✓	✓
ESOL for Work: Advanced Operational	Outcome 3 and 4	Developed	✓	✓	✓	✓	✓
Process Water and Steam services	Outcome 3	Developed	✓	✓	✓	✓	✓
Graded Unit 1		Developed	✓	✓	✓	✓	✓
Graded Unit 2		Developed	✓	✓	✓	✓	✓

Communication — SCQF level 6

Skill component: Oral Communication

Produce and respond to Oral Communication on a complex topic

- a Use vocabulary and a range of spoken language structures consistently and effectively at an appropriate level of formality.
- b Convey all essential information, opinions or ideas with supporting detail accurately and coherently and with varied emphasis as appropriate.
- c Structure communication to take full account of purpose and audience.
- d Take account of situation and audience during delivery.
- e Respond to others, taking account of their contributions.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c	d	e
Process Operations Heat, Evaporation & Drying	Outcome 2	Assessed	✓	✓	✓	✓	✓

Information Technology — SCQF level 6

Skill component: Using Information Technology

Use an IT system independently to process a range of information

- a Use a range of IT equipment paying attention to security and other users.
- b Resolve one simple hardware or software problem.
- c Use software in an unfamiliar context requiring some analysis and design, integration of data decision on output format.
- d Carry out two searches to extract and present information from electronic data sources.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c	d
Information Technology: Applications Software 1	Embedded in Unit	Assessed	✓	✓	✓	✓
CAD 2 D1	Outcomes 1,2,3 and 4	Developed	✓		✓	
Process Operations Heat, Evaporation & Drying	Outcome 2	Developed	✓		✓	✓
Process Safety Engineering	Outcome 4	Developed	✓		✓	
Heat Transfer Theory & Practice	Outcome 2	Developed	✓		✓	
Fluid Mechanics	Outcome 2	Developed	✓		✓	
Industrial Chemicals Processes and Products	Outcome 3	Developed	✓		✓	✓
Graded Unit 1		Developed	✓		✓	✓
Graded Unit 2		Developed	✓		✓	✓

Numeracy — SCQF level 6

Skill component: Using Number

Apply a wide range of numerical skills

- a Work confidently with a numerical or statistical concept.
- b Decide on the steps and operations to be carried out.
- c Carry out a number of sustained, complex calculations.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Process Operations: Distillation	Outcomes 1 and 2	Developed	✓	✓	✓
Chemical Engineering Principles	Outcomes 1 and 2	Developed	✓	✓	✓
Mathematics for Science 1	Outcomes 1 and 2	Developed	✓	✓	✓
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	✓	✓	✓
Process operations: Heat, Evaporation and Drying	Outcomes 1,2 and 3	Developed	✓	✓	✓
Fluid Mechanics Theory & Practice	Outcomes 1 and 2	Developed	✓	✓	✓
Heat Transfer Theory & Practice	Outcomes 1 and 2	Developed	✓	✓	✓
Chemical Engineering Applied Physical Chemistry	Outcomes 1 and 2	Developed	✓	✓	✓
Mathematics for Science 2	Outcomes 1 and 2	Developed	✓	✓	✓
Process Water and Steam Services	Outcome 3	Developed	✓	✓	✓
Fundamental Concepts Inorganic Chemistry	Outcome 2	Developed	✓	✓	✓
Fundamental Concepts of Physical Chemistry	Outcome 1 and 2	Developed	✓	✓	✓
Physics Principles Heat & Thermodynamics	Outcome 1,2,3, and 4	Developed	✓	✓	✓
Physics Principles Mechanics	Outcome 1,2,3, and 4	Developed	✓	✓	✓
Fermentation Engineering	Outcome 2	Developed	✓	✓	✓
CAD 2 D1	Outcomes 3 and 4	Developed	✓	✓	✓
Maths for Science 2		Developed	✓	✓	✓
Graded Unit 1		Developed	✓	✓	✓
Graded Unit 2		Developed	✓	✓	✓

Numeracy — SCQF level 6

Skill component: Using graphical information

Interpret and communicate graphical information in everyday and generalised contexts

- a Analyse and interpret complex graphical information.
- b Select an appropriate form of table, graph, chart, diagram or qualitative form and communicate information in that form.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b
Process Operations: Distillation	Outcomes 1 and 2	Developed	✓	✓
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	✓	✓
Process Operations: Heat, Evaporation and Drying	Outcomes 3	Developed	✓	✓
Chemical Engineering Principles	Outcomes 2	Developed	✓	✓
CAD 2 D1	Outcomes 3 and 4	Developed	✓	✓

Problem Solving — SCQF level 6

Skill component: Critical Thinking

Analyse a complex situation or issue

- a Identify the factors involved in the situation or issue.
- b Assess the relevance of these factors to the situation or issue.
- c Develop and justify an approach to deal with the situation or issue.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	✓	✓	✓
Process Operations: Distillation	Outcomes 1 and 2	Developed	✓	✓	✓
Fluid Mechanics Theory & Practice	Outcomes 1 and 2	Developed	✓	✓	✓
Heat Transfer Theory & Practice	Outcomes 1 and 2	Developed	✓	✓	✓
Chemical Engineering Applied Physical Chemistry	Outcomes 1, 2 and 3	Developed	✓	✓	✓
Process Safety Engineering	Outcomes 1 and 2	Developed	✓	✓	✓
Industrial Chemical, Processes and Products	Outcome 3	Developed	✓	✓	✓
Fundamental Chemistry: An Introduction	Outcome 1 and 2	Developed	✓	✓	✓
Process Safety Engineering	Outcome 1,2,3 and 4	Developed	✓	✓	✓
Fermentation Engineering	Outcomes 1 and 2	Developed	✓	✓	✓
Process Water and Steam Services	Outcomes 1, 2 and 3	Developed	✓	✓	✓
Fundamental Concepts of Inorganic Chemistry	Outcome 1 and 2	Developed	✓	✓	✓
Fundamental Concepts of Physical Chemistry	Outcome 1 and 2	Developed	✓	✓	✓
Instrumental Techniques: Theory and Practice 1	Outcome 2	Developed	✓	✓	✓
Instrumental Techniques: Theory and Practice 2	Outcome 2	Developed	✓	✓	✓
Organic Stereochemistry	Outcome 3	Developed	✓	✓	✓

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	Outcome 2	Developed	✓	✓	✓
Aromatic Chemistry	Outcome 1 and 2	Developed	✓	✓	✓
Transition Metal Chemistry	Outcome 1 and 2	Developed	✓	✓	✓
Electrochemistry	Outcome 1 and 2	Developed	✓	✓	✓
Phase Equilibrium and Surface Chemistry	Outcome 1 and 2	Developed	✓	✓	✓
Kinetics and Thermodynamics	Outcome 2	Developed	✓	✓	✓
Physics Heat & Thermodynamics	Outcome 2	Developed	✓	✓	✓
Physics Mechanics	Outcome 2	Developed	✓	✓	✓
Environmental Sampling and Analysis	Outcome 1	Developed	✓	✓	✓

Problem Solving —SCQF level 6

Skill component: Planning and Organising

Plan, organise and complete a very simple, familiar task

- a Identify some very simple steps in the plan.
- b Select appropriate resources to carry out the plan.
- c Carry out the task.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcomes 2	Developed	✓	✓	✓
Process Operations: Distillation	Outcomes 2	Developed	✓	✓	✓
Fluid Mechanics Theory & Practice	Outcomes 2	Developed	✓	✓	✓
Heat Transfer Theory & Practice	Outcomes 2	Developed	✓	✓	✓
Fundamental Chemistry: An Introduction	Outcome 1 and 2	Developed	✓	✓	✓
Process Water and Steam Services	Outcomes 3	Developed	✓	✓	✓
Fundamental Concepts of Inorganic Chemistry	Outcome 2	Developed	✓	✓	✓
Fundamental Concepts of Physical Chemistry	Outcome 2	Developed	✓	✓	✓
Instrumental Techniques: Theory and Practice 1	Outcome 2	Developed	✓	✓	✓
Instrumental Techniques: Theory and Practice 2	Outcome 2	Developed	✓	✓	✓
Organic Stereochemistry	Outcome 3	Developed	✓	✓	✓
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	Outcome 2	Developed	✓	✓	✓
Aromatic Chemistry	Outcome 2	Developed	✓	✓	✓
Transition Metal Chemistry	Outcome 2	Developed	✓	✓	✓
Electrochemistry	Outcome 2	Developed	✓	✓	✓
Phase Equilibrium and Surface Chemistry	Outcome 2	Developed	✓	✓	✓
Kinetics and Thermodynamics	Outcome 2	Developed	✓	✓	✓

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Physics Heat & Thermodynamics	Outcome 1 and 3	Developed	✓	✓	✓
Physics Mechanics	Outcome 1 and 3	Developed	✓	✓	✓
Environmental Sampling and Analysis	Outcome 1	Developed	✓	✓	✓

Problem Solving —SCQF level 6

Skill component: Reviewing and Evaluating

Review and evaluate a complex problem solving activity

- a Evaluate the effectiveness of the strategy/strategies.
- b Identify and gather appropriate evidence.
- c Draw conclusions and make recommendations.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcomes 2	Developed	✓	✓	✓
Process Operations: Distillation	Outcomes 2	Developed	✓	✓	✓
Fluid Mechanics Theory & Practice	Outcomes 2	Developed	✓	✓	✓
Heat Transfer Theory & Practice	Outcomes 2	Developed	✓	✓	✓
Fundamental Chemistry: An Introduction	Outcome 2	Developed	✓	✓	✓
Process Water and Steam Services	Outcomes 3	Developed	✓	✓	✓
Fundamental Concepts of Inorganic Chemistry	Outcome 2	Developed	✓	✓	✓
Fundamental Concepts of Physical Chemistry	Outcome 2	Developed	✓	✓	✓
Instrumental Techniques: Theory and Practice 1	Outcome 2	Developed	✓	✓	✓
Instrumental Techniques: Theory and Practice 2	Outcome 2	Developed	✓	✓	✓
Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	Outcome 2	Developed	✓	✓	✓
Aromatic Chemistry	Outcome 2	Developed	✓	✓	✓
Transition Metal Chemistry	Outcome 2	Developed	✓	✓	✓
Electrochemistry	Outcome 2	Developed	✓	✓	✓
Phase Equilibrium and Surface Chemistry	Outcome 2	Developed	✓	✓	✓
Kinetics and Thermodynamics	Outcome 2	Developed	✓	✓	✓

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Physics Heat & Thermodynamics	Outcome 1 and 3	Developed	✓	✓	✓
Physics Mechanics	Outcome 1 and 3	Developed	✓	✓	✓
Environmental Sampling and Analysis	Outcome 1	Developed	✓	✓	✓

Working with Others — SCQF level 5

Work with Others in a group to analyse, plan and complete an activity

- a analyse the activity and identify the component tasks and roles which make up the activity.
- b agree allocation of responsibilities taking account of own strengths and weaknesses and those of others.
- c support co-operative working.
- d evaluate and draw a conclusion about own contribution to group activity, and justify this by referring to supporting evidence.

Unit	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c	d
Process Operations: Heat exchange, Evaporation & Drying	Outcome 2	Developed	✓	✓	✓	
Process Operations: Distillation	Outcomes 2	Developed	✓	✓	✓	
Fluid Mechanics Theory & Practice	Outcomes 2	Developed	✓	✓	✓	
Heat Transfer Theory & Practice	Outcomes 2	Developed	✓	✓	✓	
Quality and Health & Safety Systems in Science Industries	Outcome 3	Developed	✓	✓	✓	
Environmental Sampling and Analysis	Outcome 2	Developed	✓	✓	✓	

Appendix 2: Mapping of aims to Units

HNC Chemical Process Technology (G920 15)

Unit code	Unit title	Aim 1	Aim 2	Aim 3	Aim 4	Aim 5	Aim 6	Aim 7	Aim 8	Aim 9	Aim 10	Aim 11
DH2K34	Fundamental Chemistry: Theory and Practice		✓	✓		✓		✓	✓	✓	✓	
D75X34	Information Technology: Applications Software 1			✓		✓	✓	✓	✓	✓		
DP2P34	Fundamental Concepts of Organic Chemistry		✓	✓		✓		✓	✓	✓	✓	
DP2R34	Fundamental Concepts of Physical Chemistry		✓	✓		✓		✓	✓	✓	✓	
F43H34	Physics Principles: Heat and Thermodynamics			✓		✓		✓	✓		✓	
DN8D33	Mathematics for Science 1			✓		✓		✓	✓			
F3X834	Chemical Engineering Principles		✓	✓		✓		✓	✓	✓		
F4CH34	Chemical Process Technology: Graded Unit 1	✓	✓	✓	✓	✓		✓	✓	✓	✓	
	All optional Units											✓

HND Chemical Process Technology (G921 16)

Unit code	Unit title	Aim 1	Aim 2	Aim 3	Aim 4	Aim 5	Aim 6	Aim 7	Aim 8	Aim 9	Aim 10
DH2K 34	Fundamental Chemistry: Theory and Practice		✓	✓	✓	✓					
D75X 34	Information Technology: Applications Software 1		✓	✓	✓	✓					
DP2P 34	Fundamental Concepts of Organic Chemistry		✓	✓	✓	✓					
DP2R 34	Fundamental Concepts of Physical Chemistry		✓	✓	✓	✓					
F43H34	Physics Principles: Heat and Thermodynamics		✓	✓	✓	✓					
DN8D 33	Mathematics for Science 1		✓	✓	✓	✓					
F3X834	Chemical Engineering Principles		✓	✓	✓	✓					
F4CH34	Chemical Process Technology: Graded Unit 1		✓	✓	✓	✓					
DP54 35	Aromatic Chemistry		✓	✓	✓	✓	✓	✓	✓	✓	
DV9F35	Main Group Inorganic		✓	✓	✓	✓		✓	✓	✓	
F4CJ35	Chemical Process Technology: Graded Unit 2	✓	✓	✓	✓	✓	✓				

HND Chemical Process Technology (G921 16) (continued)

Unit code	Unit title	Aim 1	Aim 2	Aim 3	Aim 4	Aim 5	Aim 6	Aim 7	Aim 8	Aim 9	Aim 10
F3XG35	Process Operations: Heat Exchange, Drying and Evaporation		✓	✓	✓	✓	✓	✓	✓	✓	
F3XB34	Fluid Mechanics Theory and Practice		✓	✓	✓	✓	✓	✓	✓	✓	
DH54 35	Instrumental Techniques Theory and Practice 1		✓	✓	✓	✓	✓	✓	✓	✓	
DP4N 35	Thermodynamics and Kinetics		✓	✓	✓	✓	✓	✓	✓	✓	
DH2N35	Instrumental Techniques: Theory and Practice 2		✓	✓	✓	✓	✓	✓	✓	✓	
F3XC34	Heat Transfer: Theory and Practice		✓	✓	✓	✓	✓	✓	✓	✓	
DP5X 35	Phase Equilibrium and Surface Chemistry		✓	✓	✓	✓	✓	✓	✓		
DP5W 35	Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis		✓	✓	✓	✓	✓	✓	✓	✓	
DP2N 34	Fundamental Concepts of Inorganic Chemistry		✓	✓	✓	✓	✓	✓			
DV9V34	Maths for Science2		✓		✓		✓				
	Optional Units										✓

Appendix 3: Suggested delivery schedule

HNC Chemical Process Technology

Mode of Study: Full-time 1 year (examples of suggested options in brackets)

Unit code	Unit title	SCQF level	Mandatory(M) /Optional(O)	SCQF credit points	SQA credit value	Block 1	Block 2
F4CH34	Chemical Process Technology: Graded Unit 1	7	M	8	1		✓
DH2K 34	Fundamental Chemistry Theory and Practice	7	M	16	2	✓	
D75X 34	Information Technology: Applications Software 1	7	M	8	1	✓	
DP2P 34	Fundamental Concepts of Organic Chemistry	7	M	8	1		✓
DP2R 34	Fundamental Concepts of Physical Chemistry	7	M	8	1		✓
DN8D 33	Mathematics for Science 1	6	M	8	1	✓	
F3X834	Chemical Engineering Principles	7	M	8	1	✓	
Option 1	(eg Process Safety Engineering)	7	O	8	1		✓
Option 2	(eg Heat Transfer: Theory and Practice)	7	O	8	1		✓
Option 3	(eg Industrial Chemicals: Processes and Products)	7	O	8	1		
Option 4	(eg Personal Development Planning)	7	O	8	1	✓	✓

HNC Chemical Process Technology

Mode of Study: Part time Day release over 2 years (4 blocks) (*examples of suggested options in brackets*)

Unit code	Unit title	SCQF level	Mandatory(M) /Optional(O)	SCQF credit points	SQA credit value	Block 1	Block 2	Block 3	Block4
F4CH34	Chemical Process Technology: Graded Unit 1	7	M	8	1				✓
DH2K 34	Fundamental Chemistry Theory and Practice	7	M	16	2	✓			
D75X 34	Information Technology: Applications Software 1	7	M	8	1			✓	
DP2P 34	Fundamental Concepts of Organic Chemistry	7	M	8	1		✓		
DP2R 34	Fundamental Concepts of Physical Chemistry	7	M	8	1		✓		
DN8D 33	Mathematics for Science 1	6	M	8	1	✓			
F3X834	Chemical Engineering Principles	7	M	8	1			✓	
Option 1	<i>(eg Process Safety Engineering)</i>	7	O	8	1				✓
Option 2	<i>(eg Heat Transfer: Theory and Practice)</i>	7	O	8	1				✓
Option 3	<i>(eg Industrial Chemicals: Processes and Products)</i>	7	O	8	1		✓		
Option 4	<i>(eg Personal Development Planning)</i>	7	O	8	1	✓	✓		

HND Chemical Process Technology:

Mode of Study: Full time, 2 years (examples of suggested options in brackets)

Unit code	Unit title	SCQF level	Mandatory (M) /Optional (O)	SCQF credit points	SQA credit value	Block I Year 1	Block II Year 1	Block 1 Year 2	Block II Year 2
F4CH34	Chemical Process Technology: Graded Unit 1	7	M	8	1		✓		
DH2K 34	Fundamental Chemistry Theory and Practice	7	M	16	2	✓			
D75X 34	Information Technology: Applications Software 1	7	M	8	1	✓			
DP2P 34	Fundamental Concepts of Organic Chemistry	7	M	8	1		✓		
DP2R 34	Fundamental Concepts of Physical Chemistry	7	M	8	1		✓		
F43H34	Physics Principles: Heat and Thermodynamics	7	M	8	1	✓			
DN8D 33	Mathematics for Science 1	6	M	8	1	✓			
F3X834	Chemical Engineering Principles	7	M	8	1	✓			
DP54 35	Aromatic Chemistry	8	M	8	1			✓	
DV9F 35	Main Group Inorganic	8	M	8	1				✓
F4CJ35	Chemical Process Technology: Graded Unit 2	8	M	16	2				✓
F3XG35	Process Operations: Heat Exchange, Drying and Evaporation	8	M	8	1			✓	
F3XB34	Fluid Mechanics: Theory and Practice	7	M	8	1		✓		
DH54 35	Instrumental Techniques Theory and Practice 1	8	M	8	1		✓		
DP4N 35	Thermodynamics and Kinetics	8	M	8	1			✓	

Unit code	Unit title	SCQF level	Mandatory (M) /Optional (O)	SCQF credit points	SQA credit value	Block I Year 1	Block II Year 1	Block 1 Year 2	Block II Year 2
DH2N 35	Instrumental Techniques 2	8	M	8	1			✓	
F3XC34	Heat Transfer: Theory and Practice	7	M	8	1		✓		
DP5X 35	Phase Equilibrium and Surface Chemistry	8	M	8	1				✓
DP5W 35	Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	8	M	8	1			✓	
DP2N 34	Fundamental Concepts of Inorganic Chemistry	7	M	8	1			✓	
Option 1	<i>(eg Quality Health and Safety Systems in Science Industries)</i>	7	O	8	1	✓			
Option 2	<i>(eg Industrial Chemicals Processes and Products)</i>	7	O	8	1		✓		
Option 3	<i>(eg Process Safety Engineering)</i>	7	O	8	1		✓		
Option 4	<i>(eg Organic Stereochemistry)</i>	8	O	8	1			✓	
Option 5	<i>(eg Process Operations Distillation)</i>	7	O	8	1			✓	
Option 6	<i>(eg Process Water and Steam Services)</i>	7	O	8	1				✓
Option 7	<i>(eg Chemical Engineering Applied Physical Chemistry)</i>	7	O	8	1				✓
Option 8	<i>(eg CAD2 DI)</i>	7	O	8	1				✓

HND Chemical Process Technology:

Mode of Study: Part time day release, over 4 years (8 blocks) (examples of suggested options in brackets)

Unit code	Unit title	SCQF level	Mandatory(M) /Optional (O)	SCQF credit points	SQA credit value	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8
F4CH 34	Chemical Process Technology: Graded Unit 1	7	M	8	1				✓				
DH2K 34	Fundamental Chemistry: Theory and Practice	7	M	16	2	✓							
D75X 34	Information Technology: Applications Software 1	7	M	8	1			✓					
DP2P 34	Fundamental Concepts of Organic Chemistry	7	M	8	1		✓						
DP2R 34	Fundamental Concepts of Physical Chemistry	7	M	8	1		✓						
F43H 34	Physics Principles: Heat and Thermodynamics	7	M	8	1			✓					
DN8D 33	Mathematics for Science 1	6	M	8	1	✓							
F3X834	Chemical Engineering Principles	7	M	8	1			✓					
DP54 35	Aromatic Chemistry	8	M	8	1					✓			
DV9F 35	Main Group Inorganic Chemistry	8	M	8	1							✓	
F4CJ 35	Chemical Process Technology: Graded Unit 2	8	M	16	2								✓

HND Chemical Process Technology (continued)

Unit code	Unit title	SCQF level	Mandatory(M) /Optional (O)	SCQF credit points	SQA credit value	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8
F3XG 35	Process Operations: Heat Exchange, Drying and Evaporation	8	M	8	1						✓		
F3XB 34	Fluid Mechanics: Theory and Practice	7	M	8	1						✓		
DH54 35	Instrumental Techniques: Theory and Practice 1	8	M	8	1			✓					
DP4N 35	Thermodynamics and Kinetics	8	M	8	1					✓			
DH2N 35	Instrumental Techniques 2	8	M	8	1								✓
F3XC 34	Heat Transfer: Theory and Practice	7	M	8	1					✓			
DP5X 35	Phase Equilibrium and Surface Chemistry	8	M	8	1							✓	
DP5W 35	Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	8	M	8	1						✓		
DP2N 34	Fundamental Concepts of Inorganic Chemistry	7	M	8	1					✓			

HND Chemical Process Technology (continued)

Unit code	Unit title	SCQF level	Mandatory(M)/Optional (O)	SCQF credit points	SQA credit value	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8
Option 1	<i>(eg Quality Health and Safety Systems in Science Industries)</i>	7	O	8	1		✓						
Option 2	<i>(eg Industrial Chemicals Processes and Products)</i>	7	O	8	1			✓					
Option 3	<i>(eg Process Safety Engineering)</i>	7	O	8	1					✓			
Option 4	<i>(eg Chemical Engineering Applied Physical Chemistry)</i>	7	O	8	1								✓
Option 5	<i>(eg Process Water and Steam Services)</i>	7	O	8	1							✓	
Option 6	<i>(eg Work Role Effectiveness)</i>	7	O	24	3							✓	

Appendix 4: Unit credit transfer arrangements

Predecessor Unit		Revised Unit		Credit transfer conditions
Unit code	Unit title	Unit code	Unit title	
A70S 04	Industrial Chemicals Processes and Products	F3XD 34	Industrial Chemicals: Processes and Products	Full
A710 04	Diffusional Process	F3XF 35	Process Operations: Distillation	Partial: credit transfer given for Outcome 1 in the revised Unit
A6BG 04	Chemical Engineering Principles	F3X8 34	Chemical Engineering Principles	Full
A70Y 04	Chemical Engineering: Mass and Heat Transfer Processes	F3XG 35	Process Operations: Heat Exchange, Drying and Evaporation	Full
A70R 04	Chemical Engineering: Fluid Mechanics	F3XB 34	Fluid Mechanics Theory and Practice	Partial: credit transfer given for Outcomes 1 and 2
A6BH 04	Chemical Engineering: Heat and Mass Transfer	F3XC 34	Heat Transfer Theory & Practice	Partial: credit transfer given for Outcome 1
A70V 04	Chemical Engineering Applied Physical Chemistry	F3X9 34	Chemical Engineering Applied Physical Chemistry	Full
		DV9V 34	Mathematics for Science 2	
D5NB 04	Safety Engineering	F43J 34	Process Safety Engineering	Partial: credit transfer given for Outcomes 1, 2 and 4
A6BD 04	Physics Principles: Heat & Thermodynamic	F43H 34	Physics Principles: Heat and Thermodynamics	Full
A6BE 04	Physics Principles: Mechanics	F3XE 34	Physics Principles: Mechanics	Full

Predecessor Unit		Revised Unit		Credit transfer conditions
Unit code	Unit title	Unit code	Unit title	
D3G4 04	Chemical Principles Organic	DP2P 34	Fundamental Concepts of Organic Chemistry	Full
D3G6 04	and Principles & Practices of Science Lab operations			
D3G5 04	Chemical Principles Physical	DP2R 34	Fundamental Concepts of Physical Chemistry	Full
D3G6 04	and Principles & Practices of Science Lab operations			
A715 04	Chemical Engineering Laboratory		Fluid Mechanics Theory and Practice	Partial: credit transfer given for Outcome 3
			Heat Transfer Theory & Practice	Partial: credit transfer given for Outcome 2
			Process Operations: Distillation	Partial: credit transfer given for Outcome 2
A6BD 04	Physics Principles: Heat & Thermodynamic	F43H 34	Physics Principles: Heat and Thermodynamics	Full
A6LR 04	Organic Chemistry: Organic Synthesis	DP5W 35	Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis	Partial: credit transfer given for Outcomes 1 and 2

Predecessor Unit		Revised Unit		Credit transfer conditions
Unit code	Unit title	Unit code	Unit title	
A6LS 04	Organic Chemistry: Aromaticity, Aromatic Synthesis and Stereochemistry	DX2H 35	Organic Stereochemistry	Partial: credit transfer given for Outcomes 1 and 2
A6LT 04	Inorganic Chemistry d-metal and co-ordination compounds	DR0E 35	Transition Metal Chemistry	Full
A6IM 04	Inorganic Chemistry main group elements	DV9F 35	Main Group Inorganic Chemistry	Full
A6LW 04	Physical Chemistry: Electrochemistry	DP5V 35	Electrochemistry	Full
A6LV 04	Physical Chemistry: Phase Equilibrium	DP5X 35	Phase Equilibrium and Surface Chemistry	Partial: credit transfer given for Outcome 1
A70V 04	Chem. Eng Applied Physical Chemistry			
A6LN 04	Physical Chemistry Kinetics	DP4N 35	Thermodynamics and Kinetics	Full
A6LP 04	Physical Chemistry Thermodynamics			
A6LS 04	Organic Chemistry: Aromaticity, Aromatic Synthesis and Stereochemistry (Outcomes 2 and 4)	DP54 35	Aromatic Chemistry	Partial: credit transfer given for Outcome 2
D3G4 04	Chemical Principles Organic (Outcome 3)			
	Analytical Chemistry for Biological Sciences	DH54 35	Instrumental Techniques 1	Full
	Mathematics 1 for Chemical Processes	DN8D 33	Mathematics for Science 1	Partial: credit transfer given for Outcomes 1, 2 and 3