Higher National Project-based Graded Unit Specification

General Information

This Graded Unit has been validated as part of the HNC Chemical Process Technology. Centres are required to develop a project-based assessment in accordance with this validated specification.

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Graded Unit code: HF0K 34

Type of Project: Investigation

Publication date: June 2016

Source: Scottish Qualifications Authority

Version: 02

Graded Unit purpose

This Graded Unit is designed to provide evidence that the learner has achieved the following principal aims of the HNC Chemical Process Technology:

- Develop learners' knowledge and skills such as planning, developing and evaluating.
- Develop employment skills and enhancing learners' employment prospects.
- Enable progression within the Scottish Credit and Qualifications Framework (SCQF).
- Develop transferable skills including Core Skills.
- Prepare for employment in a chemical process technology or related post at technician or professional level.
- Develop a range of vocational skills appropriate to employment at technician or professional level in the chemical science sector.

Credit points and level

1 Higher National Unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

Higher National Project-based Graded Unit Specification: General Information (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Recommended entry to the Graded Unit

It is recommended that the learner should have completed or be in the process of completing the following HN Units relating to the above principal aims prior to undertaking this Graded Unit:

H92X 34 *Fundamental Chemistry: Theory and Laboratory Skills*
H933 34 *Organic Chemistry: Theory and Laboratory Skills*
H936 34 *Physical Chemistry: Theory and Laboratory Skills*
H97N 34 *Chemical Engineering: Principles*

And

Two of the Units below:

HE3F 34 *Process Safety Engineering*
H97T 34 *Heat Transfer Theory and Practical Skills*
HE3E 34 *Fluid Mechanics: Theory and Laboratory Skills*

And

One of the Units below:

H7K0 33 *Engineering Mathematics 1*
H7K1 34 *Engineering Mathematics 2*

Core Skills

Achievement of this Unit gives automatic certification of the following:

Complete Core Skill *Problem Solving* at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

Assessment Support Pack

The Assessment Support Pack for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable instrument of assessment. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard. Assessment Support Packs are available on SQA's secure website.

Higher National Project-based Graded Unit Specification: General Information (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Equality and inclusion

This Graded Unit has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on SQA's website:
www.sqa.org.uk/assessmentarrangements

Higher National Project-based Graded Unit Specification: Designing the project and assessing learners

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Assessment

This Graded Unit will be assessed by the use of a project-based investigation developed by centres. The project should provide the learner with the opportunity to produce evidence that demonstrates they have met the aims of this Graded Unit.

The project undertaken by the learner must be a complex task which involves:

- variables which are complex or unfamiliar
- relationships which need to be clarified
- a context which may be unfamiliar to the learner

The project must require the learner to:

- analyse the task and decide on a course of action for undertaking the project
- plan and organise work and carry it through to completion
- reflect on what has been done and draw conclusions for the future
- produce evidence of meeting the aims which this Graded Unit has been designed to cover

Learners must carry out the investigation individually, and learners should not produce joint evidence. Assessors must be satisfied that the work has been completed by the individual learner.

Conditions of assessment

The learner should be given a date for completion of the project. However, the instructions for the project should be distributed to allow the learner sufficient time to assimilate the details and carry out the project. During the time between the distribution of the project instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance. The project should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the learner's evidence at the time of the completion date.

The evidence for the project is generated over time and involves three distinct stages, where each stage has to be achieved before the next is undertaken. Thus any re-assessment of stages must be undertaken before proceeding to the next stage.

If a learner fails the project overall or wishes to upgrade, then this must be done using a *substantially different* project, ie all stages are undertaken using a new project. In this case, a learner's grade will be based on the achievement in the re-assessment, if this results in a higher grade.

Higher National Project-based Graded Unit Specification: Designing the project and assessing learners (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

At SCQF level 7 learners should work independently. It is the responsibility of the centre to take reasonable steps to ensure that the project is the work of the learner. For example, centres may wish to informally question learners at various stages on their knowledge and understanding of the project on which they have embarked. Centres should ensure, where research, etc is carried out in other establishments or under the supervision of others, that the learner does not receive undue assistance.

Higher National Project-based Graded Unit Specification: Designing the project and assessing learners (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Evidence Requirements for this Graded Unit

The project undertaken by learners will consist of three stages: Planning; Developing; and Evaluating. The following table specifies the minimum evidence required to pass each stage.

Project stage	Minimum Evidence Requirements	% Mark Allocation
Stage 1 — Planning	♦ Identification of the processes involved in carrying out the investigation. (1.1) ♦ Identification of the topic for research. (1.2) ♦ Identification of the main issues for research. (1.3) ♦ Identification and introduction of the methods of research and sources to be used. (1.4)	20%
	*The learner **must** achieve all of the minimum evidence specified above in order to pass the Planning stage.*	
Stage 2 — Developing	♦ Collection and collation of information/data. (2.1) ♦ Interpretation/analysis of information/data. (2.2) ♦ Findings and conclusions drawn. (2.3)	60%
	*The learner **must** achieve all of the minimum evidence specified above in order to pass the Developing stage.*	
Stage 3 — Evaluating	♦ Briefly outline the investigation. (3.1) ♦ Evaluation of the output of the investigation. (3.2) ♦ Evaluation of the processes involved in carrying out the investigation. (3.3)	20%
	*The learner **must** achieve all of the minimum evidence specified above in order to pass the Evaluating stage.*	

Higher National Project-based Graded Unit Specification: Designing the project and assessing learners (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Important Note: Centres **must** complete the Grading Checklist on pages 12−16 for each Chemical Process Technology project. Completed checklists will be used as part of the external verification process to ensure the accuracy and consistency of grading between learners in the centre and across the centres.

Assessing and grading learners

The overall project will be marked out of **100**. Only whole marks should be used.

The percentage of marks allocated to each stage of the project is outlined in the **Evidence Requirements**.

It is a requirement that learners must meet the minimum Evidence Requirements for the Planning stage before progressing to the Developing stage before progressing to the Evaluating stage. Assessors should use the Grade Related Criteria outlined below to judge learner performance.

Learners are required to work independently to meet the Evidence Requirements of the Graded Unit. At the same time, learners need appropriate support. SQA uses the term reasonable assistance to describe the balance between supporting learners in their project and not providing too much assistance.

At the end of each stage there should be opportunities for remediation and re-assessment of learners for that particular stage. This includes the final Evaluation stage. Any re-assessment should be carried out in line with the centre's own assessment policy.

To pass the Graded Unit learners must achieve:

Planning stage:

- A minimum of 50% of the total marks (10 marks) **and** all of the minimum Evidence Requirements.

Developing stage:

- A minimum of 50% of the total marks (30 marks) **and** all of the minimum Evidence Requirements.

Evaluating stage:

- A minimum of 50% of the total marks (10 marks) **and** all of the minimum Evidence Requirements.

Higher National Project-based Graded Unit Specification: Designing the project and assessing learners (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

The Grade Related Criteria to be used to judge learner performance for this Graded Unit is specified in the following table.

Grade Related Criteria	
Grade A	**Grade C**
Is a seamless, coherent piece of work which:	Is a co-ordinated piece of work which:
♦ has sufficient evidence of the three essential phases of the project that is produced to a high standard, and is clearly inter-related.	♦ has sufficient evidence of the three essential phases of the project that is produced to an adequate standard.
♦ demonstrates an accurate and insightful interpretation of the project brief.	♦ demonstrates an acceptable interpretation of the project brief.
♦ is highly focused and relevant to the tasks associated with the project brief.	♦ is focused and relevant to the tasks associated with the project brief.
♦ provides the initial project timetable containing a comprehensive list of project activities and timings.	♦ provides the initial project timetable containing all essential project activities and timings.
♦ is clear and well-structured throughout with language of a high standard in terms of level, accuracy and technical content used.	♦ is satisfactorily structured with adequate language in terms of level, accuracy and technical content used.
♦ effectively consolidates and integrates required knowledge and skills.	♦ consolidates and integrates knowledge and skills but this may lack some continuity and consistency.
♦ identifies clear and full details of the new knowledge and skills the learner has developed as a result of doing the project such as keeping deadlines and researching expert sources.	♦ provides at least three examples of new knowledge and skills the learner has developed as a result of doing the project.
♦ the learner undertakes the project with the minimum of supervision.	♦ the learner undertakes the project with necessary interventions from the project supervisor to ensure the project remains on track.
♦ the learner demonstrates a high level of self-motivation throughout the project.	♦ the learner demonstrates an acceptable level of motivation.

Higher National Project-based Graded Unit Specification: Designing the project and assessing learners (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Grade Related Criteria	
Grade A	**Grade C**
♦ the learner undertakes additional research well beyond that demanded by the project.	♦ does not contain additional research well beyond that demanded by the project.

The marks allocated to each stage will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the learner for this Graded Unit based on the following grade boundaries.

A = 70%−100%
B = 60%−69%
C = 50%−59%

These grade boundaries are fixed and should **not** be amended.

If a learner does not achieve a pass or wishes to upgrade, then this must be done using a substantially different project, ie all stages are undertaken using a new project. In these circumstances, the highest grade achieved should be awarded.

More information on reasonable assistance, remediation and re-assessment may be found in the SQA publication *Guidance for the Implementation of Graded Units in Higher National Certificates and Diplomas* (SQA, 2008, Publication code: CA4405).

Higher National Project-based Graded Unit Support Notes

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Guidance on approaches to delivery and assessment of this Graded Unit

In order to pass the Graded Unit a learner must pass each one of the three stages (Planning, Developing, Evaluating) ie they must achieve a minimum of 50% of the total marks for each stage, and achieve all of the minimum Evidence Requirements on at least one occasion for each stage. Centres should note that the grading checklist should be applied holistically and it is not a requirement that learners address all of the bullet points in the checklist (although they must achieve all of the minimum Evidence Requirements on at least one occasion for each stage).

Scenario 1

Where a learner achieves a minimum of 50% of the total marks for a stage but does not achieve all of the minimum Evidence Requirements on at least one occasion, then they may receive guidance and remediation and re-submit that stage. Only the parts of the project that have failed to achieve the minimum Evidence Requirements should be returned for guidance and remediation.

In the case of such re-submission, the evidence supplied by the learner following remediation will be marked to 50% of the original marks available, and against the same standard as that set out in the original marking scheme. That is to say, that if a previously non-addressed minimum Evidence Requirement was worth 10 marks, then a learner may on remediation receive a maximum of 5 marks, and these would be awarded for 5 items of qualifying evidence. If a learner supplies further items of evidence then additional marks will not be awarded, as 50% is now the maximum mark which may be awarded for this Evidence Requirement. Parts of the project that achieve the minimum Evidence Requirements on the first submission should not be altered or remarked.

The final grading given should reflect the quality of the learner's evidence at the time of the Unit completion date and must take into account the grade levels indicated in each of the three stages by reference to the Grade Related Criteria table above. For example where a learner has demonstrated a high level of performance in each stage but has been allowed remediation in one of the stages to address a missing minimum Evidence Requirement this would not necessarily preclude a Grade 'A'.

Scenario 2

Where a learner achieves all of the minimum Evidence Requirements on at least one occasion for a stage but does not achieve a minimum of 50% of the total marks, then they may receive guidance and remediation and re-submit that stage.

In the case of such re-submission, the learner may address aspects of the stage to bring the overall stage up to 50% of the total marks available. The maximum mark that may now be awarded for the stage is 50% of the total marks available.

The final grading given should reflect the quality of the learner's evidence at the time of the Unit completion date and must take into account the grade levels indicated in each of the three stages by reference to the Grade Related Criteria table above. For example where a learner has been allowed remediation for an entire stage, then this would indicate a Grade 'C' for that stage, so overall a final Grade 'A' could not be awarded. (Refer to Grade 'A' Criteria 1 above — no high level of performance demonstrated in each stage.) However if some re-assessment opportunities were provided only for one entire stage, this would not necessarily preclude a Grade 'B'.

Scenario 3

Where a learner does not achieve a minimum of 50% of the total marks for a stage and does not achieve all of the minimum Evidence Requirements on at least one occasion, then they may receive guidance and remediation and re-submit that stage.

In the case of such re-submission, the evidence supplied by the learner following remediation for the minimum Evidence Requirements will be marked to 50% of the original marks available, and against the same standard as that set out in the original marking scheme. The learner may also, if required, address other aspects of the stage to bring the overall mark for the stage to 50% of the total marks available. The maximum mark that may now be awarded for the stage is 50% of the total marks available.

The final grading given should reflect the quality of the learner's evidence at the time of the Unit completion date and must take into account the grade levels indicated in each of the three stages by reference to the Grade Related Criteria table above. For example where a learner has been allowed remediation for an entire stage, then this would indicate a Grade 'C' for that stage, so overall a final Grade 'A' could not be awarded. (Refer to Grade 'A' Criteria 1 above — no high level of performance demonstrated in each stage.) However if some re-assessment opportunities were provided only for one entire stage, this would not necessarily preclude a Grade 'B'.

Guidance on grading

When allocating the final grade on completion, a levelling process should be adopted taking the Grade Related Criteria and overall marks into account, eg a learner may achieve 10/20 for Planning *following remediation for that stage*, 47/60 for Developing, 15/20 for Evaluation — this would indicate an 'A' grade (72 out of 100) but due to inadequate planning performance would not meet the Grade 'A' criteria and therefore may be levelled at a Grade 'B'.

Grading Checklist

A grading checklist is presented below to facilitate the allocation of marks.

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Chemical Process Technology: Graded Unit 1

Grading Unit Checklist

Centre Name: ……

Centre Number: ……

Learner Name: ……..

Learner Number: ……..

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Stage 1: Planning Stage — The Action Plan

Grading Criteria		Maximum Mark	Mark Awarded (1st Submission)	Mark Awarded (after remediation)
1.1 (a)	The aims and objectives of the project.	2		
1.1 (b)	Timescales for achieving these aims and objectives.	2		
1.2	An introduction to the topic to be investigated.	4		
1.3	Identification of the main issues for research.	4		
1.4	Identification of methods of research and sources of information.	4		
1.5	The evidence is a concise, structured plan (1,000 words +/- 10%).	2		
1.6	Works with little supervision and high level of motivation to produce a plan of a high standard.	2		
Total		**20**		

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Stage 2: Developing Stage — The Investigation Report

Grading Criteria		Maximum Mark	Mark Awarded (1st Submission)	Mark Awarded (after remediation)
2.1 (a)	Uses a variety of different resource types.	3		
2.1 (b)	Uses different resources (one mark per two resources).	4		
2.1 (c)	Introduction section contains accurate details of the topic and summary of what is covered by investigation.	3		
2.1 (d)	Gathers appropriate evidence — text contains ten relevant pieces of substantive chemical science and/or chemical engineering information that are commensurate with SCQF level 7.	10		
2.1 (e)	Develops a coherent line of thought such that sections of the report link appropriately to each other and to overall topic.	3		
2.2 (a)	Correctly interprets and analyses the assimilated information.	10		
2.2 (b)	Use of appropriate statistical methods of data analysis to facilitate interpretation or presentation.	4		
2.3	Substantial conclusions and findings drawn from the report, commensurate with SCQF level 7.	10		
2.4	A contents page.	1		
2.5	Appropriate referencing of sources and references including full and appropriate referencing within the report through use of an established system (eg Vancouver or Harvard).	4		
2.6	Clear, well structured, and concise report, using technically accurate language commensurate with SCQF level 7.	4		

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Grading Criteria		Maximum Mark	Mark Awarded (1st Submission)	Mark Awarded (after remediation)
2.7	Works with little supervision and high level of motivation to produce a report of high standard.	2		
2.8	Produces additional research well above the minimum required for the project. This might be illustrated, for example, by using a diverse range of sources (eg non published sources such as expert testimony, laboratory and field measurements, surveys, etc) by collating evidence and drawing conclusions across diverse aspects of chemical science and/or chemical engineering, or by displaying detailed consideration of the impacts of chemical science and/or chemical engineering on society.	2		
Total		**60**		

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Stage 3: Evaluation Stage — The Evaluation Report

Grading Criteria		Maximum Mark	Mark Awarded (1st Submission)	Mark Awarded (after remediation)
3.1	Brief outline of the investigation (investigation remit, research methods used, resources used).	2		
3.2 (a)	The extent to which the investigation covers the topic and action plan is evaluated and justified.	4		
3.2 (b)	Assessment of the strengths and weaknesses of the output of the investigation report (two strengths/two weaknesses).	4		
3.3 (a)	Assessment of the effectiveness of the research methods.	4		
3.3 (b)	Summary of any difficulties encountered and how they were handled.	2		
3.3 (c)	Identification and justification of specific knowledge and skills which have been gained and/or developed.	4		
Total		**20**		

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

Centres are strongly advised to give learners adequate time to chose their topic and carry out the planning stage. Careful planning enables the learner to complete the following tasks of developing and of evaluating more effectively.

The briefing task sheet for the learners should include clear indications of how the Unit is being assessed so that the learner can provide all the evidence required to complete the Unit. It is strongly advised that learners are provided with a detailed description of the requirements of the planning stage to enable them to carry out the task prior to proceeding to the development stage. It is advisable that the planning stage should be assessed prior to the learner progressing to the developing stage.

However if the development stage does not progress as anticipated the learners may return to their plans and modify them. If changes to plans are needed during the developing stage this can be reflected on during the evaluation.

The evaluation stage develops the reflective skills of the learners.

Opportunities for developing Core and other essential skills

This Unit has the Core Skill of *Problem Solving* embedded in it. This means that when learners achieve the Unit, their Core Skills profile will also be updated to show they have achieved *Problem Solving* at SCQF level 5.

The delivery and assessment of this Unit may also provide learners with the opportunity to develop the Core Skills of *Communication, Numeracy* and *Information and Communication Technology (ICT).*

The precise nature and level of these will vary depending on the nature of the project topic, however some indicative examples are given below.

***Communication* — Writing at SCQF level 6**

Learners will produce a written communication which presents, analyses, and evaluates a substantial body of information, and develop interpretations and conclusions in relation to an issue which is explored in depth.

***Communication* — Writing at SCQF level 6**

Learners will be required to extract, summarise, and provide a full explanation of the relationships between substantive information drawn from a range of different sources.

Higher National Project-based Graded Unit Support Notes (cont)

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

***Numeracy* — Using Graphical Information at SCQF level 6**

Learners may use an appropriate form of complex table, chart, diagram, or qualitative form, to communicate complex information.

***Information and Communication Technology (ICT)* — Providing Information at SCQF level 5**

Learners will select appropriate websites/data sources to research an issue and present findings in an appropriate format including referencing.

This Unit has the Core Skill of Problem Solving embedded in it, so when learners achieve this Unit their Core Skills profile will be updated to show that they have achieved Problem Solving at SCQF level 5.

History of changes to Graded Unit

Version	Description of change	Date
02	Core Skill Problem Solving at SCQF level 5 embedded.	19/08/2016

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General information for learners

Graded Unit title: Chemical Process Technology: Graded Unit 1 (SCQF level 7)

This is a 1 credit Unit at SCQF level 7. This Unit is project-based and is assessed by an investigation and the report of that investigation. You will carry out the investigation using a variety of research methods and tools. The topic of research will be left to your choice with advice from your lecturer. This enables you to find out more about an area of chemical science or chemical engineering that interests you particularly and may reflect some developing fields of chemical science or chemical engineering or an interest at your employment.

The investigation will be marked out of 100. To pass the Graded Unit you must achieve 50% of the total marks and all of the minimum Evidence Requirements for each of the three sections. The three sections are:

The Planning Stage: Where you will produce a plan outlining the nature of the investigation and the requirements to proceed.

The Developing Stage: Where you will undertake the investigation, and produce a comprehensive written report.

The Evaluating Stage: Where you will summarise the output of the developing stage (ie the report), and evaluate the report and the processes evolved in undertaking the project.

Core Skills

This Unit has the Core Skill of *Problem Solving* at SCQF level 5 embedded in it. You may also have opportunities to develop the Core Skills of *Communication, Numeracy* and *Information and Communication Technology (ICT)*.

This Unit has the Core Skill of Problem Solving embedded in it, so when you achieve this Unit your Core Skills profile will be updated to show that you have achieved Problem Solving at SCQF level 5.