



## Higher National Graded Unit specification

### General information for centres

This Graded Unit has been validated as part of the HNC Chemical Engineering. Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

**Graded Unit title:** Chemical Engineering: Graded Unit 1

**Graded Unit code:** F4CG 34

**Type of Graded Unit:** Project

**Assessment Instrument:** Investigation

**Credit points and level:** 1 HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7\*)

*\*SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

**Purpose:** This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the HNC Chemical Engineering:

- ◆ developing candidates' knowledge and skills such as planning, developing and evaluating
- ◆ developing employment skills and enhancing candidates' employment prospects
- ◆ enabling progression within the SCQF
- ◆ developing transferable skills including Core Skills
- ◆ preparing for employment in a chemical engineering/process related post at operator/technician or professional levels

**Recommended prior knowledge and skills:** It is recommended that the candidate should have completed or be in the process of completing the following Units relating to the above specific aims prior to undertaking this Graded Unit:

F3X8 34	<i>Chemical Engineering Principles</i>
F3XC 34	<i>Heat Transfer: Theory and Practice</i>
F3XF 34	<i>Process Operations: Distillation</i>
F3XB 34	<i>Fluid Mechanics: Theory and Practice</i>
DN8D 33	<i>Maths for Science 1</i>
F3XG 35	<i>Process Operations: Heat Exchange, Drying and Evaporation</i>

## General information for centres (cont)

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

**Assessment:** This Graded Unit will be assessed by the use of an investigation. The developed investigation brief should provide the candidate with the opportunity to produce evidence that demonstrates she/he has met the aims of the Group Award that this Graded Unit covers.

## Administrative Information

**Graded Unit code:** F4CG 34  
**Graded Unit title:** Chemical Engineering: Graded Unit 1  
**Original date of publication:** August 2008  
**Version:** 03 (August 2018)

### History of changes:

Version	Description of change	Date
02	Correcting typographical errors.	03/02/09
03	Update of Conditions of Assessment.	03/08/18

**Source:** SQA

© Scottish Qualifications Authority 2008, 2009, 2018

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

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Graded Unit specification if sourced by the Scottish Qualifications Authority can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0345 279 1000.

## **Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates**

**Graded Unit title:** Chemical Engineering: Graded Unit 1

### **Conditions of assessment**

The candidate should be given a date for completion of the project. However, the instructions for the assessment task should be distributed to allow the candidate sufficient time to assimilate the details and carry out the assessment task. During the time between the distribution of the assessment task instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance to candidates.

Reasonable assistance is the term used by SQA to describe the difference between providing candidates with some direction to generate the required evidence for assessment and providing too much support which would compromise the integrity of the assessment. Reasonable assistance is part of all learning and teaching processes.

In relation to the assessment of Higher National Project-based Graded Units, assessors may provide advice, clarification, and guidance during the time between the distribution of the project instructions and the completion date, ie at each stage of the project.

Remediation allows an assessor to clarify candidate responses, either by requiring a written amendment or by oral questioning, where there is a minor shortfall or omission in evidence requirements. In either case, such instances must be formally noted by the assessor, either in writing or recording, and be made available to the internal and external verifier.

In relation to Higher National Project-based Graded Units, candidates must be given the opportunity for remediation at each stage of the project.

The evidence for a Higher National Project-based Graded Unit is generated over time and involves three distinct stages, each of which has to be achieved before the next is undertaken. This means that any re-assessment of stages must be undertaken before proceeding to the next stage. The overall grade is derived from the total number of marks *across all* sections, and should reflect the ability of the candidate to work autonomously and the amount of support required. In relation to Higher National Project-based Graded Units, candidates who have failed any stage of the project and have been unable to provide the necessary evidence through remediation must be given the opportunity for re-assessment of that stage.

Any candidate who has failed their graded unit or wishes to upgrade their award must be given a re-assessment opportunity, or in exceptional circumstances, two re-assessment opportunities. In the case of project-based graded units, this must be done using a substantially different project.

The final grading given must reflect the quality of the candidate's evidence at the time of the completion of the graded unit. Candidates must be awarded the highest grade achieved — whether through first submission or through any re-assessment, remediation, and/or reasonable assistance provided.

## **Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)**

**Graded Unit title:** Chemical Engineering: Graded Unit 1

### **Instructions for designing the assessment task**

The assessment task is a project. This will take the form of an investigation on a topic relevant to the subject areas covered by Units forming the HNC Chemical Engineering. The project undertaken by the candidate must be a complex task which involves:

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

The assessment task must require the candidate 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

The purpose of the investigation is to provide candidates with an opportunity to apply and integrate knowledge and skills within the field of Chemical Engineering.

Candidates should choose a topic for investigation in agreement with the assessor/supervisor in the delivering centre. The range of investigation topics in Chemical Engineering is potentially extensive. However, it is more than likely that candidates will be required to investigate an existing problem or a new project. Both approaches require the exploration of alternative solutions and both will require a solution or solutions that fall(s) from the data collected and analysed. The brief presented to candidates should clearly indicate the three stages required Planning, Development and Evaluation.

## Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)

Candidates should have completed and have been assessed on the planning stage before proceeding to the development stage even though there may be a need to revisit the planning process throughout the duration of the investigation.

Work based projects will, at the level of the majority of candidates, most likely be part of a team based project. However, the candidate could undertake a sub project that is part of the wider team project that would meet the requirements of the Graded Unit. If this is the case then centres must ensure the authenticity of the candidate's work within a team setting.

### Guidance on grading candidates

Candidates who meet the minimum Evidence Requirements will have their achievement graded as C — competent, or A — highly competent or B somewhere between A and C. The grade related criteria to be used to judge candidate performance for this Graded Unit is specified in the following table.

Grade A	Grade C
<p>Is a seamless, coherent piece of work which:</p> <ul style="list-style-type: none"> <li>◆ has sufficient evidence of the three essential phases of the project that is produced to a high standard, and is clearly related</li> <li>◆ demonstrates an accurate and insightful interpretation of the project brief</li> <li>◆ is highly focussed and relevant to tasks associated with the project brief</li> <li>◆ provides the initial project timetable containing a comprehensive list of project activities and timings</li> <li>◆ is clear and well structured throughout with language of a high standard in terms of level, accuracy and technical content used</li> <li>◆ effectively consolidates and integrates required knowledge and skills</li> <li>◆ identifies clear and full details of the new knowledge and skills developed as a result of doing the project (such as deadlines, researching sources)</li> <li>◆ demonstrates the candidate's ability to work autonomously</li> <li>◆ demonstrates a high level of self motivation throughout</li> <li>◆ incorporates additional research beyond that demanded by the project</li> </ul>	<p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> <li>◆ has sufficient evidence of the three essential phases of the project, that is produced to an adequate standard</li> <li>◆ demonstrates an acceptable interpretation of the project brief</li> <li>◆ is focussed and relevant to tasks associated with the project brief</li> <li>◆ provides the initial project timetable containing all the essential project activities and timings</li> <li>◆ is satisfactorily structured with adequate language in terms of level, accuracy and technical content</li> <li>◆ consolidates and integrates knowledge and skills but this may lack some continuity and consistency</li> <li>◆ provides at least three examples of new knowledge and skills developed as a result of doing the project</li> <li>◆ demonstrates independent learning with minimum support and revision during project</li> <li>◆ demonstrates an acceptable level of motivation</li> </ul>

## Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)

The project will be marked out of 200. Assessors will mark each stage of the project, taking into account the criteria outlined. The marks will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the candidate for this Graded Unit based on the following grade boundaries.

A	=	70%	—	100%
B	=	60%	—	69%
C	=	50%	—	59%

**Note:** the candidate must achieve all of the minimum evidence specified below for each stage of the project in order to achieve the Graded Unit.

### Evidence Requirements

The project consists of three stages: planning; developing; and evaluating. The following table specifies the minimum evidence required to pass each stage.

**Note:** The candidate must achieve **all of the minimum evidence** specified below for each stage of the project in order to pass the Graded Unit.

Project stage	Minimum Evidence Requirements
Stage 1 — Planning  20%	An action plan which includes:  <ol style="list-style-type: none"><li>1 the aims and objectives of the project</li><li>2 timescales for achieving these aims and objectives</li><li>3 evidence of a clear structured plan</li><li>4 identification of the main area of the project</li><li>5 identification of the methods for carrying out the project and sources to be used</li></ol> <i>The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i>
Stage 2 — Developing  60%	<b>An investigation report</b> including evidence of  <ol style="list-style-type: none"><li>1 collection of data</li><li>2 interpretation/analysis of data</li><li>3 summary of findings and conclusions drawn</li></ol> The report should include a contents page. A list of acknowledgments of sources and references.  <i>The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage.</i>

## Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)

Project stage	Minimum Evidence Requirements
Stage 3 — Evaluating  20%	<p><b>An evaluation report</b> which should:</p> <ol style="list-style-type: none"> <li>1 briefly outline the investigation</li> <li>2 evaluate the extent to which the aims and objectives of the action plan have been achieved</li> <li>3 assess the strengths and weaknesses of the output of the investigation</li> <li>4 summarise any unforeseen events and how they were handled</li> <li>5 identify knowledge and skills which have been gained and/or developed</li> </ol> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i></p>

To pass the Graded Unit candidates must achieve 50% of the total marks and **all** the minimum Evidence Requirements for each of the three sections.

### Support notes

### Grading Checklist

Centres may provide additional comments to support their grading decisions. A candidate may be awarded less than the mark allocation for a grade C in appropriate circumstances.

#### Stage 1: Planning stage — The Action Plan

Evidence Requirements	Maximum Mark	Mark Grade C	Mark Awarded
1 The aims and objectives of the project:			
a. Research	4	2	
b. Development	4	2	
c. Evaluation	4	2	
2 Timescales for achieving these aims and objectives	4	2	
3 The evidence is a concise, structured plan	4	2	
4 Identification of main issues	10	5	
5 Identification and description of the methods of research and sources to use	10	5	
	40	20	

## Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)

### Stage 2: Developing stage — The investigation/Project Report

Evidence Requirements	Maximum Mark	Mark Grade C	Mark Awarded
1 Collection of data			
a. Uses different resources types	3		
b. Contains accurate details of investigation/project	5		
c. Applies knowledge and skills from any four course Units	8	20	
d. Gathers appropriate evidence	12		
e. Develops a coherent line of thought	12		
2 Interpretation/analysis of information/data	25		
f. interpretation/analysis of relevant pieces of information/data	25	25	
g. applies problem solving techniques			
3 Summary of conclusions drawn from investigation	10	5	
4 A contents page	1	1	
5 A list of acknowledgments of sources and references including any references within the report	4	2	
6 Clear well structured report with suitable levels of language in terms of level, accuracy and technical content	8	4	
7 Knowledge and skills effectively integrated and consolidated	4	2	
8 Works well with little supervision and high motivation level	2	1	
9 Additional research well above that required by the project	1		
	120	60	

## Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)

### Stage 3: Evaluation stage — The evaluation report

Evidence Requirements	Maximum Mark	Mark Grade C	Mark Awarded
1 Brief summary of the investigation/project (remit, research methods and resources used)	6	3	
2 The extent to which the investigation covers the topic and is evaluated and justified	6	3	
3 Evaluation and justification of the extent to which the aims and objectives of the action plan have been covered	6	3	
4 Assessment of effectiveness of the research methods	8	4	
5 Assessment of strengths and weaknesses of the investigation report	4	2	
6 Summary of any difficulties encountered and how they were overcome	2	1	
7 Identification of knowledge and skills which have been gained and /or developed	8	4	
	40	20	

Centres are advised to give candidates adequate time to choose their topic and carry out the planning stage. Careful planning will enable candidates to complete the subsequent tasks of developing and evaluating more effectively.

The task briefing given to candidates should have clear instructions on how the investigation will be assessed so that candidates can provide all the required evidence for the Unit.

It is preferable that candidates have completed and been assessed on the planning stage before proceeding to the developing stage. If required, however, candidates may return to and alter the plans if the developing stage does not progress as expected.

The potential range of investigation topics for the Graded Unit is extensive, however the investigation may consist of:

- ◆ a chemical engineering design project
- ◆ a work based project
- ◆ a current area of development in chemical engineering
- ◆ oil refining
- ◆ an environmental related topic eg biofuels
- ◆ producing process drawings for a new facility

Work based projects will at the level of the candidate most likely be part of a team project, however the candidate could have a sub project that is part of the team project to meet the requirements of the Graded Unit.

## **Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)**

### **Equality and inclusion**

This graded unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Equality and inclusion*, which is available on SQA's website: [www.sqa.org.uk](http://www.sqa.org.uk).

## **General information for candidates**

The Graded Unit is a project based Unit and will be assessed by an investigation that you will carry out. You will use a variety of sources and research methods to complete your investigation. You will have advice on a suitable topic from your tutor but the final selection of the topic will be yours.

This Graded Unit gives you the opportunity to pursue an area of interest from the programme and develop your skills and knowledge further in that area. The area of choice may be related to your workplace or an area of interest to you personally. However, any project requires skills out with the technical knowledge to complete the task. These skills include planning the project, identifying the project aims and objectives, working to a deadline (time management), evaluating the project as you carry out the work and after you have completed the task, communicating effectively with your project supervisor, being innovative and motivated.

The project will be marked out of 200 which will then be converted into a percentage. To pass the Graded Unit you must achieve 50% of the total as well as achieving the minimum Evidence Requirements for each of the three sections.

A percentage of 50–59% will be awarded a C  
A percentage of 60–69% will be awarded a B  
A percentage of 70–100% will be awarded an A

The project will be broken down into three stages: planning, development and evaluation. These stages will be explained to you by your project supervisor. You will be required to keep a logbook or diary, a project brief, and complete a project report.