

SQA Advanced Graded Unit Specification

General information for centres

This graded unit has been validated as part of the SQA Advanced Certificate and SQA Advanced Diploma in Manufacturing 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: Manufacturing Engineering: Graded Unit 1

Graded Unit Code: HV4E 47

Type of Graded Unit: Examination

Assessment Instrument: Examination

Credit points and level: 1 SQA 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 SQA Advanced Certificate in Manufacturing Engineering:

- ◆ develop knowledge, understanding and skills in a range of core principles and technologies by undertaking units in engineering drawing, quality systems, engineering principles, materials selection, economics of manufacture, process and equipment selection and engineering measurement
- ◆ develop candidates' ability to apply analysis and synthesis skills to the solution of manufacturing engineering problems
- ◆ develop learning and transferable skills (including core skills)

SQA Advanced Graded Unit Specification

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 these specific aims prior to undertaking this graded unit:

- ◆ Engineering Drawing
- ◆ Quality Management: An Introduction
- ◆ Engineering Principles
- ◆ Materials Selection
- ◆ Economics of Manufacture
- ◆ Process and Equipment Selection
- ◆ Mathematics for Engineering 1: Mechanical and Manufacturing

Core skills: There are no core skills embedded in this graded unit specification.

Assessment: This examination-based graded unit is Manufacturing Engineering: Graded Unit 1. It will consist of a written examination of three hours duration.

An exemplar instrument of assessment and marking guidelines have been produced to indicate the national standard of achievement required at SCQF level 7.

SQA Advanced Graded Unit Specification

Administrative information

Graded Unit Code: HV4E 47

Graded Unit Title: Manufacturing Engineering: Graded Unit 1

Original date of publication: November 2017

Version: 01

History of Changes:

Version	Description of change	Date

Source: SQA

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

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SQA Advanced Graded Unit Specification: instructions for designing the assessment task and assessing candidates

Graded Unit Title: Manufacturing Engineering: Graded Unit 1

Conditions of assessment

The assessment is based on an examination paper consisting of a Section A covering topics in the units: Mathematics for Engineering 1: Mechanical and Manufacturing, Quality Management: An Introduction, Engineering Principles and Materials Selection. Candidates should answer all questions in this Section and be able to score a maximum of 40%. The paper should also have a Section B which should cover topics in the units: Economics of Manufacture, Process and Equipment Selection and Engineering Drawing. Section B should comprise five questions worth 20% each and candidates should be able to select any three from five questions allowing them to score a maximum of 60%.

The examination should be conducted under closed-book, supervised conditions but with candidates being allowed access to standard formulae and appropriate data sheets where required.

The grade given will reflect the candidate's achievement on the first assessment event. A candidate may wish to retake the graded unit but this should be based on a significantly different examination.

The examination paper should be unseen prior to the assessment event which should be conducted under controlled and invigilated conditions.

Instructions for designing the assessment task:

The examination should be designed to assess the candidate's critical knowledge and understanding of the topics relating to the specific aims which this graded unit is designed to cover. The questions and corresponding marks should be designed in accordance with the ranges indicated in the table that follows. However, the overall total mark for the examination is 100.

Topic	Level of knowledge/ understanding	Approximate Weighting/Mark Allocation
Apply mathematical techniques in the context of mechanical and manufacturing engineering	Apply algebraic and vector techniques to solve problems commonly found in engineering.	6%
Identify key principles behind quality control and quality assurance	Explain the fundamental principles of quality assurance and quality control	6%
Apply quality improvement techniques	Analyse and select appropriate methods of control for a given process	

SQA Advanced Graded Unit Specification

Topic	Level of knowledge/ understanding	Approximate Weighting/Mark Allocation
Demonstrate a fundamental understanding of statics and strength of materials, dynamics and thermofluids	Demonstrate a knowledge and understanding of the following: <ul style="list-style-type: none"> ◆ statics and strength of materials ◆ dynamics ◆ thermofluids 	18%
Demonstrate a knowledge of the basic properties of materials Select suitable materials for a range of products	Identify basic properties for a range of materials Select suitable materials for a range of products	10%
Demonstrate an ability to identify categories of cost in a manufacturing organisation. Solve problems involving the calculation of these costs Apply the principles of breakeven analysis	Identify categories of costs within a manufacturing organisation. Calculate costs from given data Apply principles of breakeven analysis	18%
Demonstrate an ability to categorise manufacturing/process equipment Plan a sequence of manufacturing operations and include estimates of times Prepare a justification for a new or different item of equipment or process	Review and categorise manufacturing/process equipment Plan the sequence of manufacturing operation and estimate times Prepare a justification for new or different equipment or process	34%
Interpret mechanical engineering drawing symbols	Interpret engineering drawings and modifications	8%

SQA Advanced Graded Unit Specification

Questions in Section A of the examination paper should normally comprise a number of short answer, restricted response and calculation based questions.

In Section B the structure of each question should normally conform to the following marking structure:

Knowledge and understanding	4 marks
Applications	8 marks
Analysis and evaluation	8 marks

The examination will be marked out of 100. Assessors will aggregate the marks achieved by the candidate to arrive at an overall mark for the examination. Assessors will then assign a grade to the candidate for this graded unit based on the following grade boundaries:

- ◆ A = 70% – 100%
- ◆ B = 60% – 69%
- ◆ C = 50% – 59%

Equality and inclusion

This unit specification 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 our website www.sqa.org.uk/assessmentarrangements.

SQA Advanced Graded Unit Specification

Guidance to centres

Centres are encouraged to study this Manufacturing Engineering: Graded Unit 1 specification and the associated Assessment Exemplar paper carefully before embarking on the writing of any SQA Advanced Certificate in Manufacturing Engineering examination paper.

The main purpose of the Manufacturing Engineering: Graded Unit 1 specification is to assess the candidate's ability to solve problems based on the Manufacturing Engineering units specified under the recommended prior knowledge and skills in this graded unit specification. Centres should make every attempt to ensure that questions are set within a realistic industrial context. Centres should also make every reasonable effort to integrate the knowledge and understanding learnt in one subject area to other areas so that candidates' ability to transfer knowledge and understanding from one subject area to another can also be assessed. Experience shows that candidates often have great difficulty in transferring knowledge, understanding and skills from one subject area to solve problems in another area of study. Candidates tend to compartmentalise knowledge, understanding and skills into subject areas with considerable reluctance to transfer across subject boundaries. It is important however in Engineering that candidates can apply knowledge, understanding and skills from different subject areas to the solution of complex problems.

As well as having a three hour examination, the unit includes a notional study time of 37 hours to allow candidates to practise solving problems which should include the transfer of knowledge, understanding and skills across the subject boundaries. Centres should use a range of formative assessments to support such skills developments.

Centres are also strongly recommended not to limit opportunities for the transferability of knowledge, understanding and skills within Manufacturing Engineering to the Manufacturing Engineering: Graded Unit 1 only but to seek opportunities for the consolidation of these critical skills throughout the whole SQA Advanced Certificate and SQA Advanced Diploma in Manufacturing Engineering.