

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 Petroleum 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: Petroleum Engineering: Graded Unit 1

Graded Unit Code: HV4G 47

Type of Graded Unit: Project

Assessment Instrument: Case Study

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 Petroleum Engineering:

General aims:

- ◆ to develop skills of study, research and analysis
- ◆ to develop ability to define and solve problems
- ◆ to develop transferable skills
- ◆ to develop ability to be flexible and work co-operatively with others
- ◆ to develop responsibility for learning
- ◆ to develop planning, organisational and review/evaluation skills
- ◆ to develop technical skills — broadening and deepening
- ◆ to develop spoken, written and pictorial communication skills
- ◆ to develop numerical and ICT skills
- ◆ to develop resource management skills
- ◆ to develop knowledge, skills and motivation as a basis for progression to higher level studies

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Specific aims:

- ◆ prepare candidates for employment in the petroleum engineering industry
- ◆ provide candidates with a range of contemporary vocational skills embracing the prime discipline of petroleum engineering such as geosciences, oilfield drilling, reservoir engineering, oil well engineering and petroleum production processes
- ◆ provide a choice of optional units that will allow candidates to develop in other areas relevant to employment, and career enhancement or progression via an SQA Advanced Diploma within the petroleum engineering industry
- ◆ enable candidates to achieve appropriate professional body recognition as an engineering technician

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:

- ◆ HV4J 47 *Science Industry: Key Issues*
- ◆ HV4P 47 *Petroleum Engineering: Physics, Mathematics and Chemistry*
- ◆ HV4R 47 *Petroleum Geology and Geophysics: An Introduction*
- ◆ HV4T 47 *Petroleum Reservoir Engineering: An Introduction*
- ◆ HV4N 47 *Oilfield Drilling Techniques and Operations: An Introduction*

Core skills: The achievement of this unit gives automatic certification of the following:

- ◆ Critical Thinking at SCQF level 5
- ◆ Planning and Organising at SCQF level 5

There are also opportunities to develop aspects of the core skills in *Communication* and *Numeracy* at SCQF level 6 in this unit and these are highlighted in the support notes of this unit specification.

Assessment: This graded unit will be assessed by the use of a case study. The developed case study should provide the candidate with the opportunity to produce evidence that demonstrates she/he has met the aims of the graded unit that it covers.

Administrative information

Graded Unit code: HV4G 47

Graded Unit title: Petroleum Engineering: Graded Unit 1

Original date of publication: November 2017

Version: 01

History of changes:

| Version | Description of change | Date |
|---------|------------------------------------|----------|
| 02 | Update of Conditions of Assessment | 07/08/18 |
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| | | |
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Source: SQA

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

Graded Unit title: Petroleum Engineering: Graded Unit 1

Conditions of assessment

The candidate should be given a date for completion of the case study. 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.

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 Advanced Certificate/Diploma 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 by recording, and be made available to the internal and external verifier. In relation to Advanced Certificate/Diploma project-based Graded Units, candidates must be given the opportunity for remediation at each stage of the project.

The evidence for an Advanced Certificate/Diploma 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 Advanced Certificate/Diploma 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.

Instructions for designing the assessment task

The assessment task is a project. 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 assessment task should be a case study based project within the context of a petroleum engineering discipline, or a combination of up to four such disciplines embraced by the core units of the SQA Advanced Certificate framework. The range of tasks within the case study to be undertaken should be defined in relation to the context of a particular petroleum engineering development, and to what it is reasonable to expect of candidates in the time scales available. The case study issues selected should focus on the main aims of the SQA Advanced Certificate in Petroleum Engineering course, particularly in the discipline fields of geosciences, oil-well drilling, reservoir engineering, production techniques and processes, and the need to demonstrate an ability to integrate knowledge and skills across the mandatory units within the award framework.

The case study should allow the candidate to demonstrate valid responses to the current and future issues and development needs of the petroleum engineering industry including, where appropriate, health, safety and environmental issues. Where relevant, the assessment task should consider safe working practices in accordance with current regulations and codes of practice. Environmental considerations should include reference to criteria affecting, and the impact of not implementing, a sustainability approach.

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 table below.

| Grade-related criteria | |
|---|--|
| Grade A | Grade C |
| <p>Is a seamless, coherent piece of work which:</p> <ul style="list-style-type: none"> ◆ provides considerably more than the minimum Evidence Requirements for each of the three stages ◆ evidence is of a high standard ◆ includes a particular insightful interpretation of the case study brief ◆ has continuously accessed available guidance in arriving at the Outcomes submitted ◆ embodies non-traditional and innovative methodology and solutions ◆ has accessed a wide range of relevant resources, information, documentation and data ◆ outcomes are of a high standard in terms of scope, accuracy and technical content ◆ consolidates and integrates required knowledge and skills showing continuity and consistency ◆ considers possible conflict in integrating solutions in relation to constraints imposed ◆ includes clear rationale and justification for solutions proposed ◆ clearly and comprehensively addresses a fit-for-purpose objective in arriving at proposed solution ◆ clearly identifies key areas for improvement when undertaking the work to the defined time line action plan ◆ clearly identifies key areas for improvement when reflecting on the technical solutions chosen compared with the initial objectives | <p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> ◆ provides the minimum Evidence Requirements for each of the three stages ◆ evidence is produced to an acceptable standard ◆ includes an interpretation of the case study brief ◆ has made satisfactorily use of available guidance in arriving at the Outcomes submitted ◆ embodies only routine and traditional methodology and solutions ◆ has accessed a satisfactory range of resources, information, documentation and data ◆ Outcomes are of a satisfactory standard in terms of scope, level and technical content ◆ consolidates and integrates knowledge and skills but lacks some continuity and consistency ◆ considers proposed solution in isolation from constraints imposed ◆ includes a satisfactory rationale with just sufficient justification ◆ satisfactorily addresses a fit-for-purpose objective in arriving at proposed solution ◆ achieves Outcomes with minimum evaluation against the time line plan ◆ assumes the technical solutions chosen as ‘most appropriate’ with minimal retrospective comparison with initial objectives |

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The project will be marked out of 100. 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 case study 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%) | <p>Develop an action plan for Stage 2 and 3 that includes:</p> <ul style="list-style-type: none"> ◆ interpretation of case study brief into a suitable time line plan ◆ identification of resources required and their likely sources <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i></p> |
| Stage 2 — Developing (60%) | <p>Use appropriate methods in undertaking the specific tasks in Stage 2 which should include:</p> <ul style="list-style-type: none"> ◆ use appropriate methods in undertaking specific tasks <ul style="list-style-type: none"> — select criteria and reasoning/justification — conduct a preliminary evaluation of agreed elements of this stage — establish and use required resources such as hardware and software — establish and use required guidance, information, documentation and data ◆ produce evidence in a suitable form to support the development of the case study solution <ul style="list-style-type: none"> — adequate reports, specifications, drawings/diagrams, schedules, calculations and test results to justify understanding and completion of required tasks — rationale and justification for proposal submitted ◆ create a case study portfolio <ul style="list-style-type: none"> — portfolio including executive summary and evidence of development and conclusions — presentation as an introduction to viva voce interview to include objectives and progress against chosen solutions ◆ issues of compliance with Health, Safety and Environmental requirements <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage.</i></p> |

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| Project stage | Minimum Evidence Requirements |
|----------------------------------|---|
| Stage 3 — Evaluating (20%) | <p>Reflective report on Outcomes from Stage 1 and 2, which should include:</p> <ul style="list-style-type: none">◆ critical evaluation of Outcomes achieved compared with the time line action plan◆ critical comparison of submitted evidence against initial objectives◆ identification of feedback to inform future similar tasks◆ issues of compliance with Health, Safety and Environmental requirements <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i></p> |

Marking tariff

Assessors should adhere to the following appropriate marks distribution between the three stages of the case study:

| Project Stage | Appropriate Percentage of Marks |
|---------------|---------------------------------|
| Planning | 20 |
| Developing | 60 |
| Evaluating | 20 |

SQA Advanced Graded Unit Specification: support notes

The project-based case study should present a candidate with an unfamiliar and complex problem for solution. They may be college-derived in conjunction with industrial requirements or workplace related for candidates employed within the petroleum engineering industry.

Candidates will be supplied with a clear brief of the aim of the assessment task for their case study which must supply sufficient information to allow candidates to:

- ◆ interpret the needs of the case study brief
- ◆ identify information sources to clarify the brief
- ◆ formulate a realistic solution approach
- ◆ implement the chosen solution approach within set resources
- ◆ critically evaluate the solution outcome(s)

The developed case study specification should allow candidates to produce evidence that is clearly identifiable as individual work. However, this does not preclude individual projects being part of a larger group project. Candidates' contribution to a larger group project would present opportunities to develop the core skill of *Working with Others*.

Projects may consist of one of the following:

- ◆ appraisal of an existing petroleum engineering technology application
- ◆ appraisal of an existing petroleum engineering system
- ◆ feasibility study of a technical issue or proposal
- ◆ laboratory investigation

OR

A combination of any of the above to provide a multi-disciplinary project within the field of petroleum engineering.

The project or assignment task should be designed to allow the student to:

- ◆ produce a case study specification from the customer requirements brief
- ◆ define milestone objectives for the case study work
- ◆ draw-up an initial case study activity schedule which should be used to inform on-going development
- ◆ justify chosen case study direction in relation to one or more alternatives
- ◆ feedback to a case study supervisor on a regular basis
- ◆ access appropriate hardware, software, documentation and reference materials to support the project development
- ◆ generate or gather, as appropriate, test results, investigation data or information
- ◆ analyse test results, investigation data or information collated during the case study
- ◆ maintain an activity log book/diary throughout the duration of the case study
- ◆ complete a case study report which conforms to appropriate report standards, includes an evaluation of the case study outcomes
- ◆ present details of the case study including a reflective account of the project outcomes
- ◆ comply with all relevant health, safety and environmental requirements

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.

General information for candidates

This graded unit forms a mandatory unit for the SQA Advanced Certificate and the SQA Advanced Diploma in Petroleum Engineering. It will normally be delivered to you during the second half of your SQA Advanced Certificate-level studies

The unit requires that you undertake a project-based case study in a complex and unfamiliar topic within the field of petroleum engineering.

Engineering technicians and incorporated engineers frequently undertake case studies of an investigative nature where a customer is defined as the end-user of the case study outcomes. Such case study work starts with understanding the customer brief and translating this into a specification and objectives. This leads into scheduling activities to ensure that all objectives will be met in the allocated timescale of the case study. It then proceeds to implementation of the case study and applying appropriate authentication techniques to ensure that the case study outcomes are thoroughly tested as being fit-for-purpose. The final phase of a case study is a reflective evaluation of the overall approach and outcomes.

At the start of this graded unit, just as in a real-life industrial situation, you will be presented a customer requirement brief from which you will develop the case study specification and a list of tasks to enable completion of the case study objectives. You will make plans to undertake the case study; you will develop the case study tasks; you will evaluate the work you have done during the case study and you will evaluate what you have learned and what you would do differently next time.

During this case study you will develop knowledge and skills directly relevant to petroleum engineering disciplines. You will also develop knowledge and skills in the none-technical aspects associated with case study assignments such as managing aspects of planning and organisation, communication, evaluative skills, time management and many others.

The SQA Advanced Certificate course units will lay the foundations for this graded unit which will prepare you to undertake the tasks necessary to complete your case study. Tutors will provide guidance during the graded unit and you will have to submit evidence for each stage of the assignment. This evidence will include the maintenance of a case study activity log book or diary, submission of a comprehensive written report and the delivery of a short presentation.

On successful completion of the graded unit you will be graded A, B or C. Further details of this grading will be given to you by the project tutor at the delivery centre.