

SQA Advanced Unit Specification

General information for centres

Unit title: Petroleum Reservoir Engineering: An Introduction

Unit code: HV4T 47

Unit purpose: This unit will provide candidates with the knowledge and understanding of the fundamental principles of hydrocarbon reservoir engineering.

On completion of the unit the candidate should be able to:

- 1 explain the fundamental characteristics of hydrocarbon reservoirs
- 2 perform calculations to provide preliminary analysis on hydrocarbon reservoirs

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.*

Recommended prior knowledge and skills: Access to this unit will be at the discretion of the centre. Candidates should have some fundamental knowledge of engineering physics, engineering chemistry and oilfield geosciences which could be evidenced by the achievement of the following units:

- ◆ HV4P 47 *Petroleum Engineering: Physics, Mathematics and Chemistry*
- ◆ HV4R 47 *Petroleum Geology and Geophysics: An Introduction*

Core skills: There are opportunities to develop the core skill in *Numeracy* at SCQF level 5 and the Critical Thinking component of the core skill in *Problem Solving* at SCQF level 5 in this unit, although there is no automatic certification of core skills or core skills components.

Context for delivery: This unit is included in the framework for SQA Advanced Certificate and SQA Advanced Diploma in Petroleum Engineering. If this unit is delivered as part of another group award, it is recommended that it should be taught and assessed within the context of the subject area of the group award to which it contributes.

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Assessment: Outcome 1 and Outcome 2 for this unit could be assessed separately or could be combined into a single holistic assessment for the unit.

Assessment could be composed of an appropriate balance of short-answer, restricted-response and structured questions.

Assessment should be carried out under supervised conditions.

SQA Advanced Unit Specification: statement of standards

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The sections of the unit stating the outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the fundamental characteristics of hydrocarbon reservoirs

Knowledge and/or skills

- ◆ Rock characteristics
- ◆ Reservoir fluids
- ◆ Reservoir parameters
- ◆ Reservoir volume
- ◆ Flow behaviour
- ◆ Reservoir performance forecasting

Evidence requirements

Candidates will need to provide evidence for each item of this outcome to demonstrate their knowledge and skills by showing that they can explain:

- ◆ porosity, permeability and capillary behaviour of reservoir structure
- ◆ four reservoir fluids one of which must be mixtures
- ◆ two categories and three prime parameters of hydrocarbon reservoirs
- ◆ the meaning of the terms, volume reserves, production volumes, depletion practices of hydrocarbon reservoirs
- ◆ the meaning of the flow behaviour terms, homogeneous, single phase, two-phase, laminar, turbulent
- ◆ the requirements and techniques of reservoir performance forecasting

Assessment guidelines

Assessment for this outcome could be composed of an appropriate balance of short-answer, restricted-response and structured questions. The assessment of this outcome could be combined with the assessment for Outcome 2.

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Outcome 2

Perform calculations to provide preliminary analysis on hydrocarbon reservoirs

Knowledge and/or skills

- ◆ Reservoir volume calculations
- ◆ Material balance calculations
- ◆ Reservoir flow calculations
- ◆ Preliminary reservoir performance prediction

Evidence requirements

Candidates will need to provide evidence for each item of this outcome to demonstrate their knowledge and skills by showing that they can:

- ◆ calculate the volume reserve and production volume of one hydrocarbon reservoir under typical conditions applying the appropriate data and the relevant equation
- ◆ calculate the material balance for one typical hydrocarbon reservoir condition applying the appropriate data and the relevant equation
- ◆ calculate reservoir flow type under two different conditions applying the appropriate data and relevant equation
- ◆ predict preliminary reservoir performance using analysis results for one typical hydrocarbon reservoir condition

Assessment guidelines

Assessment could be composed of an appropriate balance of short-answer, restricted-response and structured questions. The assessment for this outcome could be combined with the assessment of Outcome 1.

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Administrative information

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Unit title:	Petroleum Reservoir Engineering: An Introduction
Superclass category:	YB
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Version	Description of change	Date

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SQA Advanced Unit Specification: support notes

Unit title: Petroleum Reservoir Engineering: An Introduction

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this unit

This unit is designed to provide candidates with an understanding of the physical parameters characterising hydrocarbon reservoirs and apply basic reservoir engineering calculations to make provisional estimates of reservoir capacity and performance.

Outcome 1

This outcome is designed to introduce candidates to the prime features of hydrocarbon reservoir engineering and to identify this discipline's relevance within the exploration and production sector of the oil and gas industry. The outcome identifies relationship between reservoir engineering and other specialist areas of petroleum engineering, particularly in regard to geosciences data and well performance. Topics and data sources of fundamental importance to the formulation of analytical techniques used in reservoir performance calculations are explored in this outcome.

Outcome 2

This outcome is designed to introduce candidates to the basic principles and application of formulae for hydrocarbon reservoir calculations. Candidates should be given the opportunity to access relevant data sources in order to apply these formulae to make preliminary estimates of reservoir performance in the core areas of volume, material balance and simple fluid flow. Candidates shall be able to interpret these preliminary performance estimates.

Guidance on the delivery and assessment of this unit

This unit will probably be delivered as part of a group award designed to provide candidates with technical knowledge and skills for employment in the petroleum engineering industries.

While the use of case study material is particularly recommended for both learning and teaching components of this unit, other suggested teaching and learning methods for this unit could include: the use of visual aids, information communication technology (ICT), group lectures and discussion, practical demonstrations and laboratory work, simulation software, question and answer sessions, directed study, industrial/site visits.

Access to actual hydrocarbon reservoir data sources for performance estimates would greatly enhance the relevance of the learning experience.

Formative work for this unit could include group discussion and role play emphasising workplace health and safety issues and events specific to petroleum engineering. Such an approach could be beneficial to those candidates without industrial experience.

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Assessment strategies for this unit will include:

Outcome 1

Assessment could be composed of an appropriate balance of short-answer, restricted-response and structured questions which require descriptive or explanatory responses.

Outcome 2

Assessment could be composed of an appropriate balance of short-answer, restricted-response and structured questions which require responses of a mainly calculative and evaluative in nature.

Where calculations are performed, the candidate should:

- ◆ apply the formulae correctly
- ◆ apply the principles of calculation correctly
- ◆ show all working through a calculation
- ◆ provide reasonable answers

The evidence requirements for this outcome state that candidates must ‘provide reasonable answers’ to calculations. This allows for the acknowledgement of correct working and application of formulae and interpretation of results even where candidates’ final responses may not be accurate.

The centre should decide on the typical conditions of a hydrocarbon reservoir to be provided to the candidate as the basis of calculation required for this outcome.

Opportunities for developing core skills

This unit provides opportunities for developing the core skill in *Numeracy* at SCQF level 5 and the component of Critical Thinking in the core skill of *Problem Solving* at SCQF level 5, although there is no automatic certification

Throughout this unit, candidates are required to perform calculations, manage formula and equations and interpret data sources and performance predictions which provide the opportunities to develop the core skill in *Numeracy* at SCQF level 5.

In Outcome 2, candidates are required to provide solutions to problems and evaluate their significance which provides the opportunities to develop the Critical Thinking component of the core skill in *Problem Solving* at SCQF level 5.

Open learning

If this unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance. A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

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

Unit title: Petroleum Reservoir Engineering: An Introduction

This unit is intended to provide you with an understanding of the physical parameters characterising hydrocarbon reservoirs and apply basic reservoir engineering analysis techniques to make provisional estimates of reservoir capacity and performance.

It is a single-credit unit that is intended for students studying for the SQA Advanced Certificate and SQA Advanced Diploma in Petroleum Engineering but the unit can be studied as a stand-alone basis.

Before undertaking this unit it is expected that you already have some fundamental knowledge of engineering physics, engineering chemistry and oilfield geosciences which could be evidenced by the achievement of the following SQA Advanced units:

- ◆ HV4P 47 *Petroleum Engineering: Physics, Mathematics and Chemistry*
- ◆ HV4R 47 *Petroleum Geology and Geophysics: An Introduction*

On completion of the unit, you will have gained knowledge and understanding to enable you to:

- 1 explain the fundamental characteristics of hydrocarbon reservoirs
- 2 apply analysis techniques to provide preliminary solutions to fundamental hydrocarbon reservoir problems

Throughout this unit, you will learn about the prime features of hydrocarbon reservoir engineering and to identify this discipline's relevance within the exploration and production sector of the oil and gas industry. You will identify relationships between reservoir engineering and other specialist areas of petroleum engineering, particularly in regard to geosciences data and well performance. Topics and data sources of fundamental importance to the formulation of analytical techniques used in reservoir performance calculations will also be explored in this unit.

Furthermore, you will be introduced to the basic principles and application of formulae for hydrocarbon reservoir calculations. You will also learn how to apply these formulae to make preliminary estimates of reservoir performance in the core areas of volume, material balance and fluid flow; and you will learn how to evaluate these preliminary reservoir performance estimates and interpret their significance to the efficiency of well production.

Assessments for this unit are likely to take the form of two separate assessment assignments, although some delivery centres may choose to combine these into a single holistic assessment for the unit.