



National Unit Specification: general information

UNIT Laboratory Science: Working in a Laboratory (SCQF level 5)

CODE F86L 11

SUMMARY

This Unit has been designed as a mandatory Unit of the SCQF level 5 Skills for Work Laboratory Science Course and has been designed to be taken as part of that Course. It can also be taken as a free-standing Unit. It is suited to candidates who have an interest in, and may be considering a career in laboratory science, as well as those whose interest is more general.

This Unit provides an opportunity to gain practical experience in measuring and weighing quantities, basic laboratory skills such as handling chemicals and preparing solutions and in calculating and presenting results of practical work. Safety and security procedures are addressed to enable candidates to maintain health and safety while working in a laboratory environment and a risk assessment is carried out. Opportunities arise for the development of numeracy and communication skills when recording and reporting practical work.

OUTCOMES

- 1 Carry out a risk assessment for a specified procedure in a scientific laboratory.
- 2 Perform chemical handling procedures in a scientific laboratory.
- 3 Use scientific instruments to measure, record and calculate in specified tasks.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, it would be helpful if candidates have attained or are studying one of the following, or equivalent:

- ◆ Standard Grade General or Credit in Biology, Chemistry, Physics or Science
 - ◆ SCQF level 4 Units in Biology, Chemistry or Physics
 - ◆ SCQF level 5 Units in Biology, Chemistry or Physics
- together with**
- ◆ Standard Grade General or Credit, or SCQF level 4 or SCQF level 5 Units in Mathematics

Administrative Information

Superclass: RA

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CREDIT VALUE

1 credit at SCQF level 5 (6 SCQF credit points at SCQF level 5*).

**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 Access 1 to Doctorates.*

CORE SKILLS

Achievement of this Unit gives automatic certification of the following:

Complete Core Skills	None
Core Skill components	Using Number at SCQF level 4 Critical Thinking at SCQF level 4

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

National Unit Specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Carry out a risk assessment for a specified procedure in a scientific laboratory.

Performance Criteria

- (a) Identify the main hazards present.
- (b) Identify the associated significant risks to health and safety.
- (c) Suggest appropriate ways to minimise risks.

OUTCOME 2

Perform chemical handling procedures in a scientific laboratory.

Performance Criteria

- (a) Identify the requirements for specific forms of chemical storage.
- (b) Carry out appropriate steps to prepare a chemical solution.
- (c) Demonstrate safe working practices in preparing a chemical solution.
- (d) Select and use appropriate personal protective equipment and materials required when dealing with a chemical spill.
- (e) Comply with relevant current health and safety requirements throughout practical activities.

OUTCOME 3

Use scientific instruments to measure, record and calculate in specified tasks.

Performance Criteria

- (a) Select and set up an appropriate measuring instrument for a specified task.
- (b) Use the instrument correctly to take accurate measurements.
- (c) Record measurements from the instrument using correct notation.
- (d) Perform calculations correctly for a specified task.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Performance evidence and written and/or oral evidence which covers all the Outcomes and Performance Criteria is required for this Unit.

Outcome 1: Written and/or oral evidence

Evidence for Outcome 1 will be gathered in open-book conditions at an appropriate point in the Unit.

Candidates will be provided with a case study specifying a procedure in a given area of a scientific laboratory for which the risk assessment will be carried out.

Candidates are required to:

- ◆ identify the main hazards present in the specified procedure. The main hazards **must** include:
 - use of electrical equipment
 - use of flammable materials
 - use of chemicals
- ◆ identify **one** significant risk associated with **each** identified hazard.
- ◆ identify **one** way to minimise **each** identified risk.

The evidence for Outcome 1 will be presented in the form of a completed risk assessment. The risk assessment will be carried out in a real or simulated setting under supervision at an appropriate point in the Unit. Candidates must organise and present their findings in an appropriate format. A template for the risk assessment will be provided.

It is the centre's responsibility to ensure that the evidence collected is the candidate's own work.

Outcome 2 — Written and/or oral and performance evidence

Written and/or oral evidence is required for Outcome 2 Performance Criteria (a) and will be gathered under supervised open-book conditions.

Candidates are required to:

- ◆ identify **five** categories of chemicals from their hazard symbols.
- ◆ state where and how a chemical from each identified category should be stored. This must include the appropriate location, type of container/label/position.

Performance evidence is required for Performance Criteria (b), (c), (d), and (e).

Candidates will be required to undertake **two** practical activities. One practical activity must relate to the chemical preparation. The other practical activity must relate to the simulated chemical spill.

For the chemical preparation activity, candidates will be required to demonstrate that they are able to:

- ◆ prepare a chemical solution according to a standard protocol.
- ◆ demonstrate safe working practices in preparing a chemical solution.

National Unit Specification: statement of standards (cont)

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For the simulated chemical spill activity, candidates will be required to demonstrate that they are able to:

- ◆ select appropriate personal protective equipment and materials required to deal with a chemical spill.
- ◆ participate in a practical activity which involves a simulated chemical spill.

Throughout each practical activity candidates must comply with relevant current health and safety requirements. This must include safe disposal of chemicals as appropriate.

Further guidance on appropriate practical activities can be found in the support notes.

Assessor observation checklists must be used to provide evidence of candidate performance.

Outcome 3 Written and/or oral evidence and performance evidence

Performance evidence is required for Outcome 3 Performance Criteria (a) and (b).

Candidates are required to demonstrate by **two** practical activities that they are able to:

- ◆ select, set up and accurately use an appropriate instrument to measure volume
- ◆ select, set up and accurately use an appropriate instrument to measure mass

An assessor observation checklist must be used to support the performance evidence for Performance Criteria (a) and (b) for each practical activity.

Further guidance on appropriate practical activities can be found in the support notes.

Written and/or oral evidence is required for Outcome 3 Performance Criteria (c) and (d) and will be gathered during the practical activities under supervised open book conditions

Candidates are required to:

- ◆ record measurements taken during the practical activities in an appropriate format.
- ◆ use correct notation for recorded measurements: appropriate SI units of volume and mass and multiples/fractions thereof
- ◆ perform **one** correct calculation of **each** of the following four types:
 - Percentages (eg percentage solution)
 - Ratios (eg serial dilutions)
 - Averages (eg from replicate measurements)
 - Rearranging formula to solve for any variable (eg Concentration = Moles/Volume)

The National Assessment Bank (NAB) pack for this Unit illustrates the standard that should be applied. It provides an exemplar case study and a risk assessment template for the assessment of Outcome 1. An assessor observation checklist and a specified tasks exemplar is provided for Outcomes 2 and 3. Centres wishing to develop their own assessments must refer to the NAB to ensure that they are of a comparable standard.

National Unit Specification: support notes

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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 has been designed as a mandatory Unit of the SCQF level 5 Skills for Work Laboratory Science Course and has been designed to be taken as part of that Course. It can also be taken as a free-standing Unit. It is suited to candidates who have an interest in, and may be considering a career in laboratory science, as well as those whose interest is more general.

This Unit provides an opportunity to gain practical experience in measuring and weighing quantities, basic laboratory skills such as handling chemicals and preparing solutions and in calculating and presenting results of practical work. Safety and security procedures are addressed to enable candidates to maintain health and safety while working in a laboratory environment and a risk assessment is carried out. Opportunities arise for the development of numeracy and communication skills when recording and reporting practical work.

During this Unit, candidates should be encouraged to develop a positive approach to the employability skills and attitudes identified by employers. These should be taught as an integral part of the Unit. In addition to the specific vocational skills developed and assessed, candidates will have the opportunity to develop the following employability skills:

- ◆ ability to follow instructions
- ◆ awareness of health & safety in the laboratory*
- ◆ appropriate use of resources
- ◆ positive attitude to learning
- ◆ flexible approach to problem solving
- ◆ confidence to set goals, reflect and learn from experience
- ◆ time management skills
- ◆ communication skills*
- ◆ presentation skills
- ◆ numeracy skills*
- ◆ practical skills in weighing*, measuring*, preparing solutions*
- ◆ working co-operatively with others
- ◆ confidence to seek feedback
- ◆ review and self evaluation skills
- ◆ working independently

Development of these employability skills (those marked with an asterisk*) will be clearly identified as a result of the evidence generated through the assessment activities for this Unit. There are opportunities in the Unit to develop the remaining skills.

National Unit Specification: statement of standards (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The requirements of this Unit should be discussed with candidates as part of the induction to the Unit. It is suggested that the content for Outcome 1 is taught at the start of the delivery of this Unit to enable candidates to be made fully aware of the hazards and risks present in a science laboratory. The main approach to teaching and learning should be experiential, practical and candidate-centred. Candidates should have the opportunity to learn and develop practical skills in a laboratory environment where they will experience workplace conditions and will learn how to work co-operatively with others. Each part of the teaching/learning should incorporate both theory and practice, and it is recommended that to facilitate learning the Unit is delivered in conjunction with *Laboratory Science: Practical Skills* (SCQF level 5). This would also optimise the number of practical activities required to generate sufficient evidence.

Outcome 1

In this Outcome candidates will learn how to carry out a basic risk assessment for a specified procedure in a laboratory setting. Candidates will be provided with a case study specifying a procedure in a given area of a scientific laboratory for which the risk assessment will be carried out. The risk assessment could be in relation to the practical activities undertaken in Outcomes 2 and 3. Candidates will be taught about risk assessments and why and how these are carried out. Candidates should be made aware of the difference between a hazard and a risk. The nature of the work carried out in a scientific laboratory, often involves hazardous chemicals, pathogens, sharps etc, which leaves employees exposed to potential harm, therefore there is a need for candidates to be able to demonstrate in practise their ability to work safely in a laboratory.

Candidates should be encouraged to explore and develop an understanding of the relevant health and safety requirements in a science laboratory. An example of this includes the basic requirements of the Health and Safety at Work Act in relation to the candidates' role in a laboratory, and why HASAW, COSHH etc are important.

Outcome 2

In this Outcome candidates will be required to demonstrate competence in their ability to handle chemicals. This will include chemical storage, chemical disposal, working with chemicals and dealing with chemical spills. Candidates will be required to identify where chemicals should be stored (eg a chemical store) and how chemicals should be stored in terms of type of container/label/position. A candidate-centred practical approach to teaching and learning should be employed. Candidates should have the opportunity to learn, develop and implement chemical handling skills in a laboratory environment where they will experience workplace conditions and will learn how to work with others in a team.

Examples of relevant practical activities for preparing a chemical solution could include:

- ◆ preparing a chemical solution of 0.1 mol l^{-1}
- ◆ preparing 5% w/v sodium chloride

Examples of relevant practical activities for a simulated chemical spill could include:

- ◆ using vinegar solution in place of concentrated sulphuric acid
- ◆ using sea salt in place of solid sodium hydroxide

National Unit Specification: statement of standards (cont)

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Outcome 3

In this Outcome candidates are required to select and operate appropriate measuring instruments for two specified tasks: one to measure volume and one to measure mass. Candidates must also record results from the scientific instruments accurately and using appropriate scientific notation thus developing skills of oral and/or written communication.

Candidates are required to perform one calculation correctly for percentages, ratios, averages and also to rearrange formulae to solve for any variable. Outcome 3 should be delivered in a manner which enables candidates to learn and practise a range of calculations (in a scientific context). Centres are strongly advised to allow candidates opportunities to become competent in carrying out such calculations before they undertake specific tasks. The learning and teaching should arise naturally throughout the selected practical activities.

In any scientific laboratory it is a requirement that employees keep a record of activity and results in a lab diary/log book. Such good working practice should be encouraged in this practical Unit.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

In this Unit candidates will carry out a range of practical activities which involve following instructions, recording data and seeking advice. These are good opportunities for developing aspects of the Core Skill of *Communication*. In recording results candidates will be handling and interpreting data as well as performing calculations based on this data; this offers scope to develop aspects of additional components of the Core Skill of *Numeracy*. If the candidate uses a computer while undertaking any part of this Unit (eg in researching relevant health and safety legislation) they will have the opportunity to develop aspects of the Core Skill of *Information and Communication Technology*. In Outcome 2 candidates are required to select appropriate materials and equipment to deal with a simulated chemical spillage. This provides an opportunity to develop aspects of additional components of the Core Skill of *Problem Solving*, and there may be opportunities for candidates to work with others, which would enable them to develop effective interpersonal skills.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The Evidence Requirements are fully expressed in the mandatory section of this Unit Specification.

When delivering this Unit a holistic approach to generating evidence is recommended. By selecting appropriate practical activities it should be possible to provide candidates with an opportunity to perform risk assessments, carry out calculations and demonstrate awareness of relevant health and safety procedures, as well as demonstrate competence in the practical task itself. Evidence for all Outcomes should be gathered over a realistic timeframe, which gives candidates the opportunity to practise and develop their practical skills. It is therefore recommended that multiple opportunities for formative assessment exist throughout the Unit before candidates are assessed as competent in the relevant practical skills.

National Unit Specification: statement of standards (cont)

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Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

DISABLED CANDIDATES AND/OR THOSE WITH ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements