

## **Unit title:** Laboratory Science: Working in a Laboratory (National 5)

**Unit code:** HN9W 75

**Superclass:** RA

**Publication date:** November 2019

**Version:** 3.0

This document is for teachers and lecturers and contains all the mandatory information required to deliver the unit.

### **Unit purpose**

This is a mandatory unit of the National 5 Skills for Work Laboratory Science Course. It should be taken as part of this course. It can also be taken as a freestanding unit. It is suitable for learners who may be considering a career in laboratory science, as well as those whose interest is more general.

Learners measure and weigh quantities, learn basic laboratory skills such as handling chemicals and preparing solutions, and calculate and present results of their practical work. To maintain health and safety while working in a laboratory environment, learners follow safety and security procedures, and carry out a risk assessment. There are opportunities for learners to develop numeracy and communication skills when they record and report on their practical work.

## Outcomes

Learners who successfully complete the unit will be able to:

- 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.

## Credit points and level

1 National unit credit at SCQF level 5: (6 SCQF credit points at SCQF level 5)

## Recommended entry to the unit

Entry to this unit is at the centre's discretion.

It would be helpful if learners have achieved or are studying one of the following, or equivalent:

- ◆ National 4 Science Course
- ◆ National 4 or National 5 Biology, Chemistry or Physics Course
- ◆ SCQF level 4 units in Biology, Chemistry or Physics
- ◆ SCQF level 5 units in Biology, Chemistry or Physics

and

- ◆ National 4 or National 5 Mathematics Course, or SCQF level 4 or SCQF level 5 units in Mathematics

## Core Skills

Learners who achieve this unit get automatic certification for:

Complete Core Skills                  None

Core Skill component                  Using Number at SCQF level 4

The unit support notes highlights opportunities for learners to develop aspects of Core Skills.

## Context for delivery

If you deliver this unit as part of a course, you should teach and assess it within the subject area of the course that it contributes to.

The assessment support pack (ASP) for this unit provides assessment and marking guidelines that meet the national standard. You can develop your own unit assessments using the ASP as a guide to ensure your assessment meets the national standard. A list of existing ASPs is available on SQA's website (<http://www.sqa.org.uk/sqa/46233.2769.html>).

## Equality and inclusion

This unit is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

Guidance on assessment arrangements for disabled candidates and/or those with additional support needs is available on the assessment arrangements web page: [www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements).

# National unit specification: statement of standards

To achieve this unit, learners must meet the standards set out in this part of the unit specification.

## 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 when preparing a chemical solution.
- (d) Select and use appropriate personal protective equipment and materials 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 scientific measuring instrument for a specified task.
- (b) Use the scientific instrument correctly to take accurate measurements.
- (c) Record measurements in an appropriate format from the scientific instrument using correct SI notation.
- (d) Perform calculations correctly for a specified task.

## Evidence requirements for this unit

To demonstrate that learners have achieved all outcomes and performance criteria, the following evidence is required.

The ASP 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.

### Outcome 1 — written evidence

You must give learners a case study that specifies a procedure in a given area of a scientific laboratory, and provide them with a template for the risk assessment. Learners must carry out a risk assessment for the procedure.

Learners must:

- ◆ 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

Evidence is a completed risk assessment, carried out in open-book conditions. Learners carry out the risk assessment in a real or simulated setting under supervision. Learners must organise and present their findings in an appropriate format.

You must ensure the evidence collected is the learner's own work.

### Outcome 2 — written and performance evidence

Performance criterion (a) requires written evidence, which learners carry out under supervised open-book conditions.

Performance criteria (b), (c), (d), and (e) require performance evidence, and you must use the provided assessor observation checklist.

Learners must:

- ◆ identify **five** categories of chemicals from classification, labelling and packaging (CLP) hazard pictograms. Learners should only identify chemicals that are labelled according to CLP
- ◆ state where and how a chemical from each identified category should be stored. This **must** include the appropriate location, type of container, label and position

Learners must carry out **two** practical activities. One must relate to a chemical preparation. The other must relate to a simulated chemical spill.

For the chemical preparation activity, learners must:

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

For the simulated chemical spill activity, learners must:

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

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

Further guidance on appropriate practical activities is available in the unit support notes.

### **Outcome 3 — written and performance evidence**

Learners must 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

Performance criteria (a) and (b) require performance evidence for each practical activity. You must use the provided assessor observation checklist.

Further guidance on appropriate practical activities is available in the unit support notes.

Performance criteria (c) and (d) require written evidence, using an appropriate format. Learners produce evidence during the practical activities under supervised open-book conditions.

Learners must:

- ◆ take and record measurements during the practical activities in an appropriate format
- ◆ use correct notation for recorded measurements: appropriate SI units of volume and mass, and multiples or fractions thereof
- ◆ perform **one** correct calculation of **each** of the following four types:
  - percentages (for example percentage solutions)
  - ratios (for example serial dilutions)
  - averages (for example from replicate measurements)

- re-arranging formulae to solve for any variable  
(for example  $\text{concentration} = \frac{\text{moles}}{\text{volume}}$  )

These calculations can be evidenced in any unit of the course.

# Developing Skills for Learning, Skills for Life and Skills for Work

Developing employability skills, the skills and attitudes needed to gain and maintain employment, is an important part of all Skills for Work units. Learners are also expected to develop broad, generic skills in this unit as listed below.

## **2 Numeracy**

2.1 Number processes

2.2 Money, time and measurement

## **5 Thinking skills**

5.3 Applying

5.4 Analysing and evaluating

SQA's [Skills Framework: Skills for Learning, Skills for Life and Skills for Work](#) contains more information.

You must build these skills into the unit where there are suitable opportunities. The unit support notes provides suggestions on how to do this.

# National unit support notes

## Unit title: Laboratory Science: Working in a Laboratory (National 5)

Unit support notes are for guidance and are not mandatory. Please read these support notes in conjunction with the unit specification and the ASP.

The exact time allocated to this unit is at the discretion of the centre. The notional length of time for learners to complete the unit is 40 hours.

### Guidance on the content and context for this unit

Employability skills are an integral part of the unit. You should encourage learners to develop a positive approach to the employability skills and attitudes that have been identified by employers.

The assessment activities for this unit clearly develop the following employability skills:

- ◆ ability to follow instructions
- ◆ awareness of health and safety in the laboratory
- ◆ appropriate use of resources
- ◆ flexible approach to problem solving
- ◆ communication skills
- ◆ numeracy skills
- ◆ practical skills in weighing, measuring and preparing solutions
- ◆ working independently

The unit also gives learners opportunities to develop the following employability skills:

- ◆ positive attitude to learning
- ◆ confidence to set goals, reflect and learn from experience
- ◆ time-management skills
- ◆ presentation skills
- ◆ working co-operatively with others
- ◆ confidence to seek feedback
- ◆ review and self-evaluation skills

### Guidance on approaches to delivery of this unit

You should discuss the unit's requirements with learners, as part of the learner's induction. Outcome 1 should be taught first, so that learners are fully aware of the hazards and risks present in a science laboratory.

Learning and teaching should mainly be experiential, practical and learner-centred. Learners learn and develop practical skills in a laboratory environment, where they experience workplace conditions and learn how to work co-operatively with others. Each part of the learning and teaching should incorporate theory and practice. To facilitate learning, this unit should be delivered in conjunction with the *Laboratory Science: Practical Skills (National 5)* unit. This optimises the number of practical activities required to generate sufficient evidence.

## Outcome 1

Learners are given a case study specifying a procedure to carry out, and complete a basic risk assessment for this procedure in a laboratory setting. The risk assessment could be in relation to the practical activities undertaken in outcomes 2 and 3, or could be customised to suit partner organisations.

An example of a practical activity that could cover all of outcome 1 is preparation of esters.

The work carried out in a scientific laboratory often involves hazards, such as chemicals, pathogens, and sharps, which leave employees exposed to potential harm. Learners need to be able to demonstrate their ability to work safely in a laboratory. They learn about risk assessments and why and how these are carried out, and the difference between a hazard and a risk.

You should encourage learners to explore and develop an understanding of the relevant health and safety requirements in a scientific laboratory. An example of this includes the basic requirements of the *Health and Safety at Work etc Act 1974* (HSWA) in relation to a learner's role in a laboratory. They learn why a range of regulations, such as HSWA, COSHH, European Regulation (EC) on classification, labelling and packaging of substances and mixtures (CLP) are important.

Learners should understand [Safety in Microbiology: A Code of Practice for Scottish Schools and Colleges](#) (SSERC, 2018), which is a set of preventive and protective measures produced as a result of model risk assessments.

## Outcome 2

Learners demonstrate competence in their ability to handle chemicals. This includes chemical storage, chemical disposal, working with chemicals and dealing with chemical spills. Learners identify where chemicals should be stored (for example a chemical store), and how chemicals should be stored in terms of type of container, label and position.

You should use a learner-centred practical approach to learning and teaching. Learners should learn, develop and implement chemical handling skills in a laboratory environment, where they experience workplace conditions and 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  $0.1 \text{ mol l}^{-1}$
- ◆ 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

### Outcome 3

Learners select and operate appropriate measuring instruments for two specified tasks: one to measure volume and one to measure mass. Learners must record results from the scientific instruments accurately and use appropriate scientific notation, which helps their written communication skills.

Learners perform one of each type of calculation correctly for percentages, ratios, averages and to re-arrange formulae to solve any variable. They learn and practise a range of calculations (in a scientific context). You must make sure that learners are competent in carrying out these types of calculations before they undertake specific tasks. The learning and teaching should arise naturally throughout the selected practical activities. Calculations can be evidenced in any unit of the course.

In any scientific laboratory, employees must keep a record of activity and results in a daybook or logbook. You should encourage this good working practice.

### Guidance on approaches to assessment of this unit

The approaches to assessment outlined in this section are suggestions only. Other methods may be more suitable for some learners. Experiencing a range of assessment methods helps learners to develop different transferable skills.

If you create your own assessment, or adapt an SQA assessment, you should have it prior verified by SQA before you use it with your learners to ensure it meets the national standards.

Experiencing a range of assessment methods, can help learners to develop different skills that should be transferable to work or further and higher education.

You should use a holistic approach to generating evidence. By selecting appropriate practical activities, learners have the opportunity to perform risk assessments, carry out calculations and demonstrate awareness of relevant health and safety procedures, as well as demonstrate their competence in the practical task. Evidence for all outcomes should be gathered over a realistic timeframe, which gives learners the opportunity to practise and develop their practical skills. Learners should have multiple formative assessments throughout the unit before their practical skills are assessed.

## Opportunities for e-assessment

E-assessment is assessment supported by information and communications technology (ICT), such as e-testing, e-portfolios or social software. If you use e-assessment, you must ensure that the national standard is applied to all candidate evidence and that the conditions of assessment specified in the evidence requirements are met. The most up-to-date guidance on using e-assessment to support SQA's qualifications is available at [www.sqa.org.uk/e-assessment](http://www.sqa.org.uk/e-assessment).

## Opportunities to develop Core Skills

This unit has the Using Number component of Numeracy embedded in it. This means that when learners achieve the unit, their Core Skills profile is updated to show they have achieved Using Number at SCQF level 4.

Learners carry out a range of practical activities that involve following instructions, recording data and seeking advice. These are good opportunities for developing aspects of the Core Skill of Communication.

If the learner uses a computer during this unit (for example to research relevant health and safety legislation) they may develop aspects of the Core Skill of Information and Communication Technology (ICT).

In outcome 2, learners select appropriate materials and equipment to deal with a simulated chemical spillage. This provides an opportunity to develop aspects of the Core Skill of Problem Solving, and learners may work with others, which would enable them to develop effective interpersonal skills.

# General information for learners

## Unit title: Laboratory Science: Working in a Laboratory (National 5)

This section explains:

- ♦ what the unit is about
- ♦ what you need to do during the unit

You learn about health and safety and how to handle and store chemicals safely. You measure liquids and weigh solids to prepare various solutions safely. You learn how to write risk assessments for the procedures you carry out. You develop numeracy and communication skills as you record and report on your practical work.

You carry out a range of practical activities, follow instructions, record data and seek advice. These are good opportunities for developing aspects of the Core Skill of Communication.

This unit has the Using Number component of Numeracy embedded in it. This means that when you achieve the unit, your Core Skills profile is updated to show you have achieved Using Number at SCQF level 4.

If you use a computer during this unit (for example to research relevant health and safety legislation) you may develop aspects of the Core Skill of Information and Communication Technology (ICT).

You select appropriate materials and equipment to deal with a simulated chemical spillage. You may develop aspects of the Core Skill of Problem Solving, and there may be opportunities for you to work with others, enabling you to develop effective interpersonal skills.

# Administrative information

---

**Published:** November 2019 (version 3.0)

**Superclass:** RA

---

## History of changes

| Version | Description of change                                                            | Date           |
|---------|----------------------------------------------------------------------------------|----------------|
| 2.0     | Core Skills Component Using Number at SCQF level 4 embedded.                     | September 2017 |
| 3.0     | Relevant legislation updated.<br><br>Unit specification moved to a new template. | November 2019  |
|         |                                                                                  |                |
|         |                                                                                  |                |

The information in this document may be reproduced in support of SQA qualifications only on a non-commercial basis. If it is reproduced, SQA must be clearly acknowledged as the source. If it is to be reproduced for any other purpose, written permission must be obtained from [permissions@sqa.org.uk](mailto:permissions@sqa.org.uk).

Note: please check SQA's website to ensure you are using the most up-to-date version of this unit specification.

© Scottish Qualifications Authority 2017, 2019