

# Unit Specification



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

**Unit code:** HN9W 75

**Superclass:** RA

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## Unit purpose

This unit is a mandatory unit of the National 5 Laboratory Science Skills for Work 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 learners 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 learners 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

On successful completion of the unit the learner 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)

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### **Recommended entry to the unit**

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

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

#### **together with**

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

### **Core Skills**

Opportunities to develop aspects of Core Skills are highlighted in the support notes for this unit specification.

There is no automatic certification of Core Skills or Core Skill components in this unit.

### **Context for delivery**

If this unit is delivered as part of a course, it is recommended that it should be taught and assessed within the subject area of the course to which it contributes.

The Assessment Support Pack (ASP) for this unit provides assessment and marking guidelines that exemplify the national standard for achievement. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website (<http://www.sqa.org.uk/sqa/46233.2769.html>).

### **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](http://www.sqa.org.uk/assessmentarrangements).

# 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

Evidence is required to demonstrate that learners have achieved all outcomes and performance criteria.

### 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.

Learners 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.

Learners 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. Learners 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 learner's own work.

# National unit specification: Statement of standards (cont)

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## 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.

Learners are required to:

- ◆ identify **five** categories of chemicals from their CLP (Classification, Labelling and Packaging) hazard pictograms. Learners should only use 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/position.

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

Learners 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, learners 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.

For the simulated chemical spill activity, learners 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 learners 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 learner performance.

## National unit specification: statement of standards (cont)

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### Outcome 3 — Written and/or oral evidence and performance evidence

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

Learners 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

Learners 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 Assessment Support Pack (ASP) 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 ASP to ensure that they are of a comparable standard.

# Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this unit. Employability is a key aspect of Skills for Work and is present throughout the unit. In addition, there are a number of other skills that learners will be expected to improve on and develop as they undertake this unit, these can be drawn from the main skills areas listed below. These must be built into the unit where there are appropriate opportunities.

## **2 Numeracy**

- 2.1 Number processes
- 2.2 Money, time and measurement

## **5 Thinking skills**

- 5.3 Applying
- 5.4 Analysing and evaluating

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills should be at the same SCQF level as the unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the national unit support notes.

# National unit support notes

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Unit support notes are offered as guidance and 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 National 5 Laboratory Science Skills for Work 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 learners 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 learners 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, learners 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, learners will have the opportunity to develop the following employability skills:

- ◆ ability to follow instructions
- ◆ awareness of health and 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



## National unit support notes (cont)

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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.

### Guidance on approaches to delivery of this unit

The requirements of this unit should be discussed with learners 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 learners 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 learner-centred. Learners 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 the unit *Laboratory Science: Practical Skills* (National 5). This would also optimise the number of practical activities required to generate sufficient evidence.

### Outcome 1

In this outcome learners will learn how to carry out a basic risk assessment for a specified procedure in a laboratory setting. Learners 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 or could be customised to suit partner organisations. Learners will be taught about risk assessments and why and how these are carried out. Learners 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 learners to be able to demonstrate in practise their ability to work safely in a laboratory.

Learners 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 learners' role in a laboratory, and why HASAW, COSHH, European Regulation (EC) on classification, labelling and packaging of substances and mixtures (CLP), etc are important.

## National unit support notes (cont)

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### Outcome 2

In this outcome learners 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. Learners 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 learner-centred practical approach to teaching and learning should be employed. Learners 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  $0.1 \text{ mol l}^{-1}$
- ◆ 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

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

Learners 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 learners to learn and practise a range of calculations (in a scientific context). Centres are strongly advised to allow learners 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.

## National unit support notes (cont)

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### Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

The evidence requirements are fully expressed in the mandatory section of this unit specification. For assessment of Outcome 2, performance criteria (a) learners should only use chemicals that are labelled according to CLP.

When delivering this unit a holistic approach to generating evidence is recommended. By selecting appropriate practical activities it should be possible to provide learners 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 learners the opportunity to practise and develop their practical skills. It is therefore recommended that multiple opportunities for formative assessment exist throughout the unit before learners are assessed as competent in the relevant practical skills.

### Opportunities for 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 Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software.

Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at [www.sqa.org.uk/e-assessment](http://www.sqa.org.uk/e-assessment).

## National unit support notes (cont)

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### Opportunities for developing Core Skills

In this unit learners 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 learners 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 learner 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 (ICT). In Outcome 2 learners 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 learners to 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 will help you decide whether this is the unit for you by explaining what the unit is about, what you should know or be able to do before you start, what you will need to do during the unit and opportunities for further learning and employment.

In this unit you will learn about health and safety and how to handle and store chemicals safely. You will gain expertise in measuring liquids and weighing solids to prepare various solutions safely. You will learn how to write risk assessments and will be required to write these for the procedures you carry out. Numeracy and communication skills are developed as you record and report on your practical work.

You 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 you 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 you use a computer while undertaking any part of this unit (eg in researching relevant health and safety legislation) you will have the opportunity to develop aspects of the Core Skill of Information and Communication Technology (ICT).

You will be 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 you to work with others, which would enable you to develop effective interpersonal skills.

## Administrative information

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### History of changes to National Unit Specification

Version	Description of change	Date

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Note: readers are advised to check SQA's website: [www.sqa.org.uk](http://www.sqa.org.uk) to ensure they are using the most up-to-date version of the unit specification.

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