

National Unit Specification: general information



UNIT Forensic Science: Practical Techniques (SCQF level 6)

CODE F824 12

SUMMARY

This Unit develops practical skills and an awareness of the role of science in society by allowing the opportunity for candidates to undertake forensic techniques in all three sciences. The Unit also enables candidates to develop analytical and scientific reporting skills.

The Unit also allows the opportunity for the candidate to undertake investigations in all three sciences. Candidates who complete this Unit will be able to describe and perform a variety of forensic techniques as well as process and report the results.

This Unit is an optional Unit in the National Certificate in Applied Sciences at SCQF level 6 but it can also be taken as a free-standing Unit.

It is suitable for candidates with some knowledge and practical experience in science who wish to extend their experience into all three areas of science (biology, chemistry and physics) and prepare for entry to Further or Higher Education.

OUTCOMES

- 1 Explain and analyse forensic science techniques.
- 2 Perform forensic science techniques.
- 3 Investigate a simulated crime scene.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ Forensic Science: Applications (SCQF level 5)
- ◆ Intermediate 2 Biology, Chemistry or Physics
- ◆ Standard Grade Biology, Chemistry, Physics or Science at Credit level

Administrative Information

Superclass: QH

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CREDIT VALUE

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

**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 Core Skill components:

- ◆ Critical Thinking at SCQF level 6

There are also opportunities for candidates 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

Explain and analyse forensic science techniques.

Performance Criteria

- (a) Explain forensic science techniques.
- (b) Analyse the results of forensic science techniques.

OUTCOME 2

Perform forensic science techniques.

Performance Criteria

- (a) Set up equipment correctly for each technique.
- (b) Carry out each technique correctly and safely.
- (c) Record relevant measurements and observations in an appropriate format.
- (d) Draw valid conclusions from the information recorded.

OUTCOME 3

Investigate a simulated crime scene.

Performance Criteria

- (a) Collect evidence at the simulated crime scene.
- (b) Interpret given results from the analysis of forensic evidence.
- (c) Collate findings and draw conclusions.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Written and/or recorded oral evidence and performance evidence which covers all Outcomes and Performance Criteria is required for this Unit.

Outcome 1 — Written and/or Oral Evidence

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

Candidates are required to:

- ◆ Explain two biological techniques, two chemical techniques and two physical techniques in relation to their use in forensic science
- ◆ Analyse the results of two biological techniques, two chemical techniques and two physical techniques in relation to their use in forensic science

Outcome 2 — Performance Evidence and Written and/or Oral Evidence

Performance evidence is required for Outcome 2 Performance Criteria (a) and (b). An assessor observation checklist must be used to record the performance evidence for **six** techniques covering **two** each from biology, chemistry and physics.

This should cover preparation, performance of experiment and health and safety.

Further guidance on appropriate techniques can be found in the Support Notes.

Written and/ or oral evidence is required for Outcome 2 Performance Criteria (c) and (d) for each technique. In a workbook candidates must record the results and draw valid conclusions for the six techniques.

Outcome 3 — Performance Evidence and Written and/or Oral Evidence

The candidate must collect at least 60% of the available forensic evidence from a simulated crime scene.

A checklist must be used to ensure that Performance Criterion (a) is covered by each candidate.

The candidate must be provided with the results from the analysis of the forensic evidence at the crime scene for interpretation.

Evidence for Performance Criteria (b) and (c) must be presented in written or oral format.

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 is an optional Unit in the National Certificate in Applied Sciences at SCQF level 6 but it can also be taken as a free-standing Unit.

This Unit is suitable for candidates who have some knowledge and practical experience in science. It gives candidates an opportunity to extend their practical abilities in the forensic context and to prepare for entry to Further and Higher Education. The Unit also allows the opportunity for the candidate to undertake investigations in all three sciences. Candidates who complete this Unit will be able to describe and perform a variety of forensic techniques as well as process and report the results.

Whilst the Unit enables candidates to develop knowledge and understanding of biology, chemistry and physics it is intended that the Unit is delivered entirely in the context of forensic science, using only methods which are relevant to this particular application of science.

The practical techniques to be carried out in this Unit must be related to all three areas of science: Biology, Chemistry; Physics.

Teachers/lecturers should select techniques appropriate to the available resources for Outcomes 1 and 2, which may be integrated.

A list of possible techniques is given below:

Some of the listed techniques may have limited opportunity for the analysis of results required for Outcome 1 but could still be suitable to be performed for Outcome 2.

[* possible Outcome 1]

Biology

- 1 DNA isolation [from cheek cells, kiwi fruit or onion]
- 2 DNA fingerprinting [electrophoresis using a kit with DNA knowns and unknowns]*
- 3 Identification by Blood group Analysis [ABO and Rhesus]*
- 4 Fingerprint Identification [Using points of comparison eg deltas, cores, bifurcations, islands]*
- 5 Microscopy – Identification of hair/fibre samples*
- 6 Estimation of height from bone length [femur]*
- 7 Urinalysis [presence of substances in the urine eg blood, drugs (asprin)]*
- 8 Soil analysis [pH testing, microscopy for particle composition]*

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Chemistry

Various techniques to identify substances found at crime scenes such as drugs or paint samples. Spectra could be provided* for techniques not possible in the centre.

- 1 Chromatography (paper(eg inks); TLC; GLC;HPLC)*
- 2 Mass spectrometry*
- 3 Infrared spectrometry*
- 4 UV spectrometry*
- 5 Magnetic Resonance Spectroscopy*
- 6 Colorimetry*
- 7 Identification techniques (eg Flame tests; chemical tests; melting points)*
- 8 Chemical synthesis (aspirin)
- 9 Chemical analysis (using aspirin; Vitamin C)*

Physics

- 1 Audiometry (Sound recording and analysis)
- 2 Photography (CCTV; Mobile phone; Youtube; recording of crime scene)
- 3 Ballistics (Firearms identification; cartridge identification; analysis of point of discharge) *
- 4 Electronics (imaging; enhancement techniques; cameras; alarms; door locks; telephone; PC)
- 5 Density and refractive properties of glass (to match glass from crime scene and suspect) *
- 6 Blood spatter analysis (to identify events at a crime scene) *
- 7 Impressions (electrostatic lifting of footprints for identification) *
- 8 Document examination (ESDA and VSC) *
- 9 Momentum and kinetic energy of collisions (motor vehicles) *
- 10 UV visualisation of forensic evidence. *

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Practical work is one of the essential features of this Unit. A series of exercises should be planned to give the candidates experience of the basic techniques before they are assessed. A possible strategy is to integrate Outcomes 1 and 2.

Techniques must be approved by the teacher/lecturer and due consideration should be given to health and safety at all times.

Important aspects of this Unit are communication in different contexts, team working and interpretation of results.

The candidate must be able to select appropriate forms to communicate information. The candidate could demonstrate team working by working with others to investigate the simulated crime scene and collate results from investigations of the collected evidence. However, assessment evidence must be carried out individually.

The candidate must also be able to interpret and report results of investigations. Techniques must be chosen so that these skills are assessed.

The list of experiments is given for guidance only, other experiments can be used.

The simulated crime scene (kidnap, drugs factory, assault or breaking and entry) could be set up in a corner of a classroom or in a small room. Candidates could sketch/photograph the scene, identifying the evidence to be collected. The evidence could then be collected and candidates could then request what type of forensic testing is required for each item. Simulated results of these tests could be provided to the candidate for interpretation. The candidate could then collate the findings as a group and come to a conclusion which they present to the 'court'/class.

Several small practice crime scenes could be set up at various stages in the Unit. For example:

- ◆ a bench with several different unknown tablets to be analysed for aspirin content
- ◆ a chair with fibres for microscopic analysis (to be lifted using tape)
- ◆ blood drops on the floor to be analysed for directionality and height of drop

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Communication

A candidate must be able to select appropriate forms to communicate information. These might include a written lab report suitable for an audience with a science background (eg as a forensic scientist to the police); an oral report of findings to a colleague or a presentation to an audience with variable science knowledge (ie as an expert witness to a jury).

National Unit Specification: support notes (cont)

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ICT

A candidate may be able to report findings to other members of the group or tutor by email. Digital images of the techniques or crime scene could be incorporated into reports and/or presentations. Use of PowerPoint, a word-processing package and a spreadsheet package could be used to produce reports and presentations.

Problem Solving

Candidates have to select and present information about the techniques and the crime scene. Information has to be accurately processed. Valid conclusions must be drawn and supported by evidence.

These opportunities, if taken, could also improve employability skills and citizenship with a fuller awareness of the use of science in society

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

It is recommended that:

Outcome 1 is assessed by an end of Unit closed book test with questions covering all the Performance Criteria.

Outcome 2 is assessed by undertaking six practical techniques (2 from each science) for Performance Criteria (a) and (b) and completing a workbook to cover Performance Criteria (c) and (d) for each.

Outcome 3 is assessed by undertaking the collection of evidence from a simulated crime scene. An appropriate number is between 6 and 10 pieces of forensic evidence. Prepared results (eg fingerprints, DNA gels) must be provided to candidates for interpretation. The collected evidence should be interpreted, collated and then used to report the evidence as an 'expert witness'. Evidence for Performance Criteria (b) and (c) could be a Powerpoint presentation or poster.

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)*.

National Unit Specification: support notes (cont)

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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.