



## National Unit Specification: general information

**UNIT** Forensic Science: Applications (SCQF level 5)

**CODE** F823 11

### SUMMARY

This Unit introduces candidates to fundamental techniques of forensic science allowing them to develop skills in biology, chemistry and physics in this contemporary context. The Unit also enables candidates to develop basic research and information handling skills.

This Unit is an optional Unit in the National Certificate in Applied Sciences at SCQF level 5 but it can also be taken as a free-standing Unit.

It is suitable for candidates with an interest in general science and its practical applications as well as for those who are looking to access further studies in forensic related areas.

### OUTCOMES

- 1 Explain and use scientific techniques in relation to their application in forensics.
- 2 Investigate forensic evidence in a documented case(s).
- 3 Describe potential future developments in forensic science technology.

### 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:

- ◆ Standard Grade Biology, Chemistry, Physics or Science at General level
- ◆ Intermediate 1 Units in Biology, Chemistry or Physics

### 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.*

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### Administrative Information

**Superclass:** QH

**Publication date:** December 2009

**Source:** Scottish Qualifications Authority

**Version:** 01

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## **National Unit Specification: general information (cont)**

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### **CORE SKILLS**

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Unit Specification.

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

## **National Unit Specification: statement of standards**

### **UNIT Forensic Science: Applications (SCQF level 5)**

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 use scientific techniques in relation to their application in forensics.

##### **Performance Criteria**

- (a) Explain scientific techniques in relation to their use in forensics.
- (b) Use scientific techniques safely in a forensic context.

#### **OUTCOME 2**

Investigate forensic evidence in a documented case(s).

##### **Performance Criteria**

- (a) Collect relevant information on a documented forensic case(s).
- (b) Identify and explain how the forensic evidence is used in this case(s).
- (c) Identify potential sources of error in this case(s).

#### **OUTCOME 3**

Describe potential future developments in forensic science technology.

##### **Performance Criteria**

- (a) Identify future practical advances in forensic science.
- (b) Describe a future application of forensic science technology.
- (c) Identify factors which may limit future advances and applications of forensic science.

## National Unit Specification: statement of standards (cont)

### UNIT Forensic Science: Applications (SCQF level 5)

#### EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

##### Outcome 1 — Written/and or Oral evidence and Performance Evidence

Written and/or oral evidence is required for Outcome 1 Performance Criterion (a) and will be gathered under supervision in closed-book conditions.

For Performance Criterion (a) candidates are required to:

- ◆ Explain **three** ‘forensic’ techniques. This must include one technique each from biology, chemistry and physics.

Performance evidence is required for Outcome 1 Performance Criterion (b) and will be gathered under supervision in open-book conditions.

For Performance Criterion (b) candidates are required to:

- ◆ Use **three** scientific techniques safely in a forensic context

An assessor observation checklist must be used to support the performance evidence for Performance Criterion (b). This must cover preparation, performance of experiment, recording and interpretation of results, and health and safety.

Further guidance on suitable contexts is provided in the support notes.

##### Outcome 2 — Written and/or Oral evidence

Evidence for Outcome 2 will be gathered in open-book conditions at appropriate points in the Unit. Candidates must produce evidence which covers three types of forensic evidence. If necessary, candidates could analyse more than a single documented case in order to meet the Evidence Requirements. All evidence must however be collated in a single form which demonstrates the candidates ability to identify the case and the type of forensic evidence obtained, explain how the forensic evidence was used, as well as their ability to identify potential sources of error having analysed the case.

##### Outcome 3 — Written and/or Oral evidence

Evidence for Outcome 3 will be gathered in open-book conditions at appropriate points in the Unit.

Candidates are required to produce evidence which covers the following:

- ◆ Identify **one** future practical advance in forensic science
- ◆ Describe **one** future application of existing forensic science technology
- ◆ Identify factors which may limit future advances and applications of forensic science

## National Unit Specification: support notes

### UNIT Forensic Science: Applications (SCQF level 5)

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 introduces candidates to fundamental techniques of forensic science allowing them to develop skills in biology, chemistry and physics in this contemporary context. The Unit also enables candidates to develop basic research skills and information handling skills.

This Unit is an optional Unit in the National Certificate in Applied Science at SCQF level 5 but it can also be taken as a free-standing unit.

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.

A possible list of suitable contexts and activities for Outcome 1 is given below:

#### Biology:

- ◆ Blood typing (antibody/antigen reaction; precipitation)
- ◆ Fingerprinting (comparison of simple prints/whorls, loops and arches)
- ◆ DNA isolation (eg from kiwi fruit or onions)
- ◆ Use of a microscope (focusing and magnification)
- ◆ Preparation of slides (eg cheek cells, hair or fibres)
- ◆ Bite marks (comparison of patterns/main types of teeth)

#### Chemistry:

- ◆ Flame tests (to identify metals)
- ◆ Chromatography (eg of ink or lipstick)
- ◆ Melting points (eg to identify a white powder)
- ◆ Gel electrophoresis (eg of a mix of food dyes)
- ◆ Reactions of metals (to cover corrosion with oxygen and removal of serial numbers by acid)
- ◆ pH measurements (eg of soil, of 'unknown' liquids)

#### Physics:

- ◆ Blood spatter (velocity/directionality from tailing, diameter, pattern on periphery of droplets)
- ◆ Bullet trajectories (investigate horizontal and vertical motion: could include gravity, velocity and resistance)
- ◆ Collisions (eg in mock road traffic accidents with or without seatbelts could include forces such as friction and resistance, inertia, momentum and pressure)
- ◆ Determining properties of glass (compare density to known standards; refractive indices could include light/reflection/refraction/density of different media such as oil and water)

## National Unit Specification: support notes

## **UNIT Forensic Science: Applications (SCQF level 5)**

Use of radiation in analysis (to investigate reactivated replica guns and damage to car tyres; to detect counterfeit bank notes; UV to detect biological fluids or to authenticate paintings/fine art; IR to analyse drugs, alcohol levels, fibre types, paint types, detect forged documents: IR photography used to examine latent evidence including bloodstains, tyre tracks and gunshot residue).

In all cases the level of detail should be appropriate to SCQF level 5.

In this Unit, it is anticipated that candidates will access information from the Internet and in texts to address the Performance Criteria for Outcome 2. It is important that the documented case selected for analysis has appropriate and accessible resources available for the individual candidate. This should include access to various websites on the Internet as well as newspapers for topical cases. The availability of suitable IT packages will considerably enhance the candidate's ability to produce the required evidence.

Forensic cases for study could include:

- ◆ Criminal cases
- ◆ Victim identification
- ◆ Paternity cases

However, it must be emphasised that candidates accessing information on such cases will come across some sensitive and potentially upsetting material. Given the individual nature of the candidate or candidate group it may be necessary to filter information or to assign particular topics rather than allowing candidates a free choice.

In Outcome 3, future applications of forensic technology do not necessarily have to relate to crime and could for example include their use in creating DNA databanks for insurance companies; identifying peoples ethnicity, hair colour, likely cause of death from their DNA. Future practical advances could be in developing methods to isolate trace chemicals more efficiently; to detect trace evidence without interference from other factors such as bleach interfering with Luminol detection of biological fluids, or fertiliser, tobacco and cosmetics interfering with detection of gun shot residue. Other practical advances could be in methods used to preserve evidence. Limiting factors here could include moral and ethical acceptance of application as well as technical limitations.

### **GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT**

This is a candidate-centred Unit in which a range of teaching and learning strategies should be used, such as group discussion of applications of forensic science or discussion/debate which explores people's opinions on applications of forensic technology. Practical experimental work may take place in groups or individually although the evidence for Outcome 1 should be obtained from an experiment carried out by the individual.

It is recommended that in teaching this Unit, reference is made to the wide variety of television shows/films which feature forensic science so that candidates can relate the science to a familiar setting. However, it should be emphasised to candidates that whilst the science in these shows may not be factually wrong it is often over simplified and/or exaggerated. Candidates should be encouraged to critically analyse these programmes.

## **National Unit Specification: support notes (cont)**

### **UNIT Forensic Science: Applications (SCQF level 5)**

#### **OPPORTUNITIES FOR CORE SKILL DEVELOPMENT**

Further opportunities for candidates to develop aspects of Core Skills include:

- ◆ IT skills: skills in relation to Internet website searches and in developing their knowledge of suitable IT packages to assist them in their research. Producing presentations using presentation software for Outcome 2 and/or 3. Word processing materials for use in Outcome 2 and/or 3.
- ◆ Communication skills: opportunities to develop communication skills exist in Outcome 2 if scientific posters are produced, as well as in Outcome 3 where the report requires that candidates show their understanding of forensic science issues.

#### **GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT**

##### **Outcome 1**

A suitable instrument of assessment for this Outcome would be a closed-book supervised test containing restricted response questions. Such questions will allow candidates to describe three 'forensic' techniques, including one technique each from biology, chemistry and physics. Candidates must demonstrate an understanding of the fundamental science involved in each technique. For example, in gel electrophoresis they should understand that separation is based on size and also that material moves towards the oppositely charged electrode. For fingerprinting they should understand the unique patterns of whorls, loops and arches and the factors which contribute to their formation.

An assessor observation checklist will be used to ascertain whether the candidate has achieved Performance Criterion (b). This will cover preparation (including selection of appropriate apparatus and use of PPE), performance of experiment, recording and interpretation of results, and health and safety. A full laboratory report is not required, however candidates should be encouraged to record their results in a workbook. This could be in an electronic format.

##### **Outcome 2**

For Outcome 2 candidates will have the choice of presenting the result of their analysis orally (as a structured presentation) or in written format (as a scientific poster). This will provide evidence for all of the Performance Criteria for this Outcome and cover a minimum of three forensic science techniques/processes. It is not necessary that these techniques represent biology, chemistry and physics. If necessary, candidates could analyse more than one documented case in order to meet the Evidence Requirements. All evidence must however be provided in a single structured report.

## National Unit Specification: support notes (cont)

### UNIT Forensic Science: Applications (SCQF level 5)

For Outcome 3 evidence will be gathered under open-book conditions. This evidence should describe one future practical advance in forensic science, such as a method to preserve forensic evidence. Candidates will describe how this technique might work and/or why this technique would be better than existing methods. The candidate must also describe one future application of existing forensic science technology; for example, the ability to predict likely causes of death from a person's DNA profile. The evidence should also include a section where candidates identify factors which may limit future advances and applications of forensic science (in the example used here candidates might discuss ethical issues associated with this technique).

Evidence could take the form of a structured oral presentation or a written report. Centres must put in place appropriate measures to ensure that this is the candidate's own work.

For Outcomes 2 and 3 it is important that candidates are briefed clearly as to what is required for assessment purposes. Care should be taken to ensure that candidates produce the evidence in their own words.

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