Higher National Unit specification

General information for centres

Unit title: Environmental Science: An Introduction

Unit code: F5T5 35

Unit purpose: This Unit is designed to provide candidates with the ability to identify, characterise and evaluate polluting chemicals in the environment, as well as an understanding of how science is applied in environmental studies. The Unit looks at the ways in which science contributes to understanding the environment, assessing human impacts and managing the environment, by focusing on important environmental issues. Key chemical compounds of environmental importance are studied, including the chemical nature of such compounds, their movement through the environment and their eventual fate. Main concepts include the chemical structure of selected compounds and the importance of functional groups on their chemical activity, stability and persistence, and the importance of microbial processes in modifying the environment and chemically transforming organic compounds.

On completion of the Unit the candidate should be able to:

1 Explain how science proceeds, and how it plays a key role in understanding and managing the environment
2 Identify and characterise important polluting chemical compounds in the environment.
3 Explain the transport and dispersal of important chemicals through the environment, and how such chemicals are detected and measured.
4 Critically evaluate the role of microbial processes in environmentally important chemical transformations.

Credit points and level: 1 HN credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**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.*

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre. There are no specific prior knowledge requirements for this Unit. However a basic grounding in science and an awareness of environmental issues would be advantageous. This might be evidenced by the possession of the Units *Chemistry and Physics for the Life Sciences*, *Pollution and Waste Management*, and *Environmental Awareness*.

Core Skills: There are opportunities to develop the Core Skills of *Communication, Numeracy* and *Problem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

General information for centres (cont)

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: The assessments for Outcomes 1 and 2 could be individual open-book short-answer tests. Alternatively, both Outcomes could be assessed together by means of a single test divided into two sections corresponding to the Outcomes. Outcome 3 could be assessed by means of either three questions submitted as a single report, or an extended-answer, open-book test. Outcome 4 could be assessed by either a single report covering a laboratory exercise, or by extended-answer questions.

Higher National Unit specification: statement of standards

Unit title: Environmental Science: An Introduction

Unit code: F5T5 35

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain how science proceeds, and how it plays a key role in understanding and managing the environment

Knowledge and/or Skills

- Scientific enquiry
- Role of science in environmental studies

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- explain how scientific enquiry proceeds, through experimentation and the hypothetico-deductive method
- describe and evaluate the role of science in progressing our understanding and management of at least two key environmental issues

Assessment Guidelines

This Outcome may be assessed by means of an open-book short answer question test. However, it is recommended that this assessment be combined with the assessment for Outcome 2. See Outcome 2 for details.

Higher National Unit specification: statement of standards (cont)

Unit title: Environmental Science: An Introduction

Outcome 2

Identify and characterise important polluting chemical compounds in the environment

Knowledge and/or Skills

- Classes of chemical compounds
- Nature of chemical compounds
- Functional Groups

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- characterise at least five functional groups present in important polluting chemical compounds
- identify and evaluate the class of chemical compound based on the functional group present
- describe the nature of at least ten selected compounds, covering at least five different functional groups

Assessment Guidelines

This Outcome may be assessed by means of a short-answer open-book test, in which at least five of the ten functional groups are covered. However, it is recommended that Outcomes 1 and 2 be assessed together in an open-book test. This test may be divided into two sections, each covering a single Outcome.

Higher National Unit specification: statement of standards (cont)

Unit title: Environmental Science: An Introduction

Outcome 3

Explain the transport and dispersal of important chemicals through the environment, and how such chemicals are detected and measured.

Knowledge and/or Skills

- Pathways of transport and dispersal of chemicals
- Detection and measurement of chemicals

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- describe and explain the mechanisms of transport, deposition, accumulation, cycling and degradation, within and between soil, water, air and biota, of at least three selected chemicals in the environment
- explain how these selected chemicals are detected in the environment, and how the level of concentration of these chemicals can be measured

Assessment Guidelines

It is recommended that the assessment for this Outcome be three questions, each question of 500 words or equivalent, submitted together as part of a single report. There should be one question covering each of soil, air and water, and together these questions should cover three different chemical compounds. Alternatively, the assessment may consist of an extended-answer, open-book test.

Higher National Unit specification: statement of standards (cont)

Unit title: Environmental Science: An Introduction

Outcome 4

Critically evaluate the role of microbial processes in environmentally important chemical transformations.

Knowledge and/or Skills

- Microbial processes
- Chemical transformations
- Microbial activity and oxygen

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- describe three selected important chemical transformations
- explain microbial involvement in those selected chemical transformations
- evaluate the effects of at least one example of such microbial activity in specified environments, by summarising in an appropriate format the results from an experimental investigation

Assessment Guidelines

This Outcome may be assessed by means of a report based on a laboratory exercise carried out by all students. The report could be around 1500 words or equivalent in total. Alternatively, this Outcome may be assessed by means of extended answer questions, submitted together as part of a single report.

Administrative Information

Unit code: F5T5 35

Unit title: Environmental Science: An Introduction

Superclass category: QA

Original date of publication: August 2008

Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Environmental Science: An Introduction

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

Outcome 1 could give candidates an overview of the role of science in understanding and managing the environment. The 'standard' method of science (hypothetico-deductive), including the roles of hypothesis and experimentation, could be described. The link between science and society could be briefly explored. These concepts could all be illustrated through reference to key environmental issues, where science plays a key role (such as addressing pollution issues, climate change).

Outcome 2 could be taught with reference to the chemistry of environmentally important compounds. These might include hydrocarbons, chlorofluorocarbons and other organic pollutants. Biocides and growth regulators could include antibiotics, insecticides, herbicides, molluscicides and fungicides; plant growth regulators and synthetic oestrogens. Important inorganic compounds could include nitrate, gaseous nitrogen oxides and phosphate. Heavy metal ions and compounds may also be covered.

Outcome 3 could consider the dispersal of selected compounds in the environment. Emphasis could be placed on the routes taken and the environmental impact of selected compounds on ecosystems. Measurement and detection methodologies could be taught with reference to statutory requirements and the bodies responsible for monitoring environmentally significant compounds.

Outcome 4 is intended to integrate knowledge of chemical properties with information about the importance of microbial activity in the natural environment. Themes covered may include decomposition, biotransformation, detoxification and mobilisation of compounds and elements through microbial action.

Guidance on the delivery and assessment of this Unit

Ideally this Unit could be delivered using a variety of methods and media, which could include formal lectures, discussions, tutorials, work exercises and lab sessions. It may be possible to include relevant site visits to illustrate environmental issues or observe sampling/monitoring in action. Outcomes 1 and 2 may be primarily delivered through formal lectures and tutorials, but Outcome 3 may benefit from an appropriate site visit to reinforce lecture materials. Outcome 4 could be based primarily on lecture and laboratory materials, but again a site visit may be useful for students to observe the sampling of the media used in the laboratory, if applicable.

The assessments for Outcomes 1 and 2 could be individual open-book short-answer tests. Alternatively, both Outcomes could be assessed together by means of a single test divided into two sections corresponding to the Outcomes. Outcome 3 could be assessed by means of either three questions submitted as a single report, or an extended-answer, open-book test. Outcome 4 could be assessed by either a single report covering a laboratory exercise, or by extended-answer questions.

Higher National Unit specification: support notes (cont)

Unit title: Environmental Science: An Introduction

Opportunities for developing Core Skills

There are opportunities to develop the Core Skills of *Communication, Numeracy* and *Problem Solving* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components. In preparing for and completing written work for the Outcomes, candidates may develop the Core Skill of *Communication*. The *Numeracy* Core Skill may be developed in handling and summarising data resulting from any laboratory study (Outcome 3), whilst the *Problem Solving* Core Skill may be developed in addressing all Outcomes.

Open learning

This Unit would be suitable for delivery on an open (distance) learning basis, although the practical aspects of laboratory analysis would, however, require specialist support, and it is recommended that candidates would require organised laboratory sessions to complete the necessary work.

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**

General information for candidates

Unit title: Environmental Science: An Introduction

This Unit is designed to provide you with an understanding of how science is applied in environmental studies, and is primarily intended for candidates who wish to pursue a career within the environmental sector. The Unit looks at the ways in which science contributes to understanding the environment, assessing human impacts and managing the environment, through case studies of important environmental issues. Key chemical compounds of environmental importance are studied, including the chemical nature of such compounds, their movement through the environment and their eventual fate. Main concepts include the chemical structure of selected compounds and the importance of functional groups on their chemical activity, stability and persistence, and the importance of microbial processes in modifying the environment.

On completion of the Unit you should be able to:

- explain how science proceeds, and how it plays a key role in understanding and managing the environment
- identify and characterise important polluting chemical compounds in the environment
- explain the transport and dispersal of important chemicals through the environment, and how such chemicals are detected and measured
- critically evaluate the role of microbial processes in environmentally important chemical transformations

The assessments for this Unit could be through a class test and through short reports. You may also have the opportunity to develop the Core Skills of *Numeracy, Communication* and *Problem Solving* through this Unit, but these will not be formally assessed.