SCQF level 5
Unit Specification

Environmental Science: Living Environment

SCQF: level 5 (6 SCQF credit points)

Unit code: J25Y 75

Unit outline

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with knowledge and understanding of the living environment. Learners will apply these skills when considering the applications of the living environment on our lives, as well as the implications on society and the environment. This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of investigating ecosystems and biodiversity; interdependence; human influences on biodiversity.

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Learners who complete this Unit will be able to:

1. Apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation

2. Draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

This Unit is available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes*, which provide advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in *Unit Assessment Support*.

Recommended entry

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- National 4 Environmental Science Course or relevant component Units
- National 4 Geography Course or relevant component Units
- National 4 Biology Course or relevant component Units

There may also be progression from National 4 Chemistry or National 4 Physics.

In terms of prior learner, relevant experiences and outcomes may also provide an appropriate basis for doing this Unit.

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. For further information, please refer to the *Unit Support Notes.*

Standards

Outcomes and Assessment Standards

Outcome 1

The learner will:

1 Apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation by:

1.1 Planning an experiment/practical investigation
1.2 Following procedures safely
1.3 Making and recording observations/measurements correctly
1.4 Presenting results in an appropriate format
1.5 Drawing valid conclusions
1.6 Evaluating experimental procedures

Outcome 2

The learner will:

2 Draw on knowledge and understanding of the key areas of this Unit and apply scientific skills by:

2.1 Making accurate statements
2.2 Solving problems

Evidence Requirements for the Unit

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners, to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

The key areas covered in this Unit are:

- investigating ecosystems and biodiversity
- interdependence
- human influences on biodiversity

The *Unit Support Notes* (Appendix) provide details of skills, knowledge and understanding sampled in the Unit assessment.

The following table describes the evidence for the Assessment Standards.

Assessment Standard	Evidence required
Planning an experiment or practical investigation	A plan that must include: ♦ a clear statement of the aim ♦ a dependent and independent variable ♦ variables to be kept constant ♦ observations and/or measurements to be made ♦ necessary equipment and/or materials ♦ a clear and detailed description of how the experiment or practical investigation should be carried out, including safety considerations
Following procedures safely	Record showing that the learner was observed following procedures safely.
Making and recording observations/measurements correctly	Raw data recorded in a relevant format, for example a table. Repeated measurements, where appropriate. Where measurements are repeated, averages must be calculated.
Presenting results in an appropriate format	One format from: line graph, bar graph, scatter graph or other appropriate format.
Drawing a valid conclusion	A conclusion that includes reference to the aim, and is supported by the data.
Evaluating experimental procedures	An evaluative statement, with justification, about the procedures used.
Making accurate statements and solving problems	Achievement of at least 50% of the total marks available in a holistic assessment. The assessment must **not** be split into smaller sections, such as individual key areas.

Exemplification of assessment is provided in *Unit Assessment Support*.

Assessment Standards thresholds

Outcome 1
Learners are not required to show full mastery of the Assessment Standards to achieve Outcome 1. Instead, five out of the six Assessment Standards for Outcome 1 must be met to achieve a pass. Learners must be given the opportunity to meet all Assessment Standards.

Outcome 2
Learners are assessed using a holistic test that covers Assessment Standards 2.1 and 2.2. To gain a pass for Outcome 2, learners must achieve 50% or more of the total marks available in the assessment.

Transfer of evidence

Evidence for the achievement of Outcome 1 for this Unit can be used as evidence of Outcome 1 in the SCQF level 5 Units: *Environmental Science: Earth's Resources* (J263 75) and *Environmental Science: Sustainability* (J265 75).

Evidence for the achievement of Outcome 2 for this Unit is not transferable between the SCQF level 5 Units: *Environmental Science: Earth's Resources* (J263 75) and *Environmental Science: Sustainability* (J265 75).

Re-assessment

SQA's guidance on re-assessment is that there should be only one or, in exceptional circumstances, two re-assessment opportunities. Re-assessment must be carried out under the same conditions as the original assessment and must be of equal demand.

Outcome 1
Learners can either re-draft their original Outcome 1 report or carry out a new experiment or practical investigation.

Outcome 2
Learners must have a full re-assessment opportunity that consists of a holistic assessment. For Outcome 2, learners must achieve 50% of the total marks available in the re-assessment.

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. The skills that learners will be expected to improve on and develop through the Unit are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and 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
2.3 Information handling

4 Employability, enterprise and citizenship

4.6 Citizenship

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 of 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 *Unit Support Notes.*

Appendix: Unit Support Notes

Introduction

These support notes provide advice and guidance on developing skills, knowledge and understanding for the Unit assessment. They should be read in conjunction with:

- *Unit Assessment Support*

Developing skills, knowledge and understanding

Teachers and lecturers are free to select the skills, knowledge and understanding, and contexts that are most appropriate for delivery in their centres.

Skills, knowledge and understanding for the Unit assessment

The following information provides details of skills, knowledge and understanding sampled in the Unit assessment.

Living Environment

1 Investigating ecosystems and biodiversity

a. Definitions

- habitat — the place where an organism lives
- community — all the organisms that live together in an ecosystem
- population — a number of organisms of one species in an ecosystem
- ecosystem — a natural biological unit made up of living and non-living parts, ie the community and the habitat
- biodiversity — the variety that exists among living things
- species — a group of organisms that can interbreed to produce fertile offspring
- biotic — a living feature of an ecosystem, such as food supply, disease, predation
- abiotic — a non-living feature of an ecosystem, such as light intensity, precipitation, temperature, wind speed, wind direction
- adaptation — any feature that makes an organism well suited to living in its environment
- competition — a negative interaction that occurs between organisms whenever there is demand for a limited resource

b. Biodiversity in the context of one aquatic and one terrestrial ecosystem

c. Quantitative techniques for sampling plants and animals

- quadrat
- transect (line)
- nets (sweep, dip)
- traps (pitfall, camera, mammal)
- capture-mark-recapture

d. Techniques to measure abiotic factors

- aquatic — water flow rate, oxygen concentration, water pH, water temperature
- terrestrial — temperature, light intensity, soil moisture, soil pH, wind velocity, wind direction, precipitation

e. Limitations of quantitative techniques and potential sources of error

- quantitative techniques provide information about frequency and distribution
- the larger the sample the more reliable the results will be
- counts of individuals rely on accurate identification
- all measurements have a potential to introduce error: equipment should be calibrated and used appropriately

The importance of random sampling and reliability of results:

- random sampling — every individual in a population has an equal chance of being selected
- reliability of results — the extent to which an experiment, test or other measuring procedure yields the same results on repeated trials

f. The effect of abiotic factors on the distribution of organisms

g. Identification of organisms through construction and use of paired-statement keys

2 Interdependence

a. Definitions

- carnivore — an animal that only eats other animal material
- herbivore — an animal that only eats plant material
- omnivore — an animal that eats both plant and animal material
- detritivore — an animal that feeds on dead organic matter, for example wood louse, earthworm, maggot
- decomposer — bacteria and fungi that feed on dead organic matter at microscopic level
- producer — an organism that can produce its own food; usually a green plant that produces its own food via photosynthesis
- primary consumer — a herbivore that eats the producer in a food chain
- secondary consumer — an animal that eats the primary consumer in a food chain
- tertiary consumer — an animal that eats the secondary consumer in a food chain
- niche — the role played by an organism within a community: where it lives, what it eats, and what eats it

b. Food webs, in the context of one aquatic and one terrestrial ecosystem

c. Interdependence between plants and animals
Simple word equations for photosynthesis and respiration

d. Energy flow through food webs

e. Energy loss through movement, heat, and undigested waste

f. Factors affecting food webs
Predation, disease, competition, natural and human impacts

g. Carbon cycle

- The role of the carbon cycle in recycling nutrients
- Processes in the biological carbon cycle: photosynthesis, respiration, feeding, decomposition, formation and combustion of fossil fuels
- Organisms involved in the carbon cycle: the role of detritivores and decomposers

h. Nitrogen cycle

- The role of the nitrogen cycle in recycling nutrients
- Processes: fixation (by soil bacteria, lightning), death/decay (decomposition by fungi and bacteria), nitrification and denitrification, nitrate absorption by plants, feeding by animals
- Organisms involved in the nitrogen cycle: the roles of bacteria in fixation (free-living bacteria and bacteria in root nodules on legumes), decomposition, nitrifying, and denitrifying

3 Human influences on biodiversity

a. Definitions

- non-native species — a species introduced through human action (accidental or deliberate) outside its native distribution
- invasive non-native species (INNS) — any non-native animal or plant that has the ability to spread and cause damage to the environment, the economy, our health or the way we live
- indicator species — the presence, absence or abundance of certain living organisms that show an environment is affected by a particular set of environmental conditions

b. Human activities that have a positive and/or negative effect on ecosystems, with a focus on species reduction or increase, extinction, and loss of biodiversity

c. The role of a named indicator species in environmental monitoring

d. The impact of a named INNS on ecosystems

e. Conflicts between land and/or water-based activities
At least two stakeholders using a single resource, with potential solution/compromise for shared use

f. Relevant current national organisations

- the role of Scottish Environment Protection Agency (SEPA) as an environmental regulator
- the role of NatureScot (NS) as an environmental educator and advisor
- designation and purpose of Sites of Special Scientific Interest (SSSI) in Scotland

Apparatus and techniques

In addition to the skills, knowledge and understanding listed above, learners must have knowledge of the following pieces of apparatus and techniques. Where it is not possible to carry out a fieldwork technique, learners should be made aware of the purpose and methodology of the technique through teaching.

Apparatus

- beaker
- balance
- measuring cylinder
- dropper/pipette
- test tube
- stopwatch
- funnel
- crucible
- oven
- microscope
- choice chamber
- quadrat
- transect: tape measure or rope marked off in intervals
- metre stick
- nets: sweep, dip
- traps: pitfall, camera, mammal
- thermometer
- meters: light intensity, soil moisture, soil pH, water flow rate, oxygen concentration
- anemometer
- rain gauge
- floats
- test kits: soil pH, soil nitrate and/or nitrite
- ID cards/keys: plants and animals

Techniques

- sampling plants and animals
- identification of species using paired-statement keys
- measuring abiotic factors
- assessing the distribution of a species by collecting discrete data via observation
- interpreting case study documentary evidence, including Ordnance Survey map content, sketch maps, photographic evidence, tabular data, and/or short passages of text. The ability to read and provide grid references is not required.

Reporting experimental and/or fieldwork

Learners should be familiar with the following:

- setting an aim and/or hypothesis
- describing experimental/fieldwork procedures
- drawing labelled diagrams of experimental/fieldwork apparatus
- presenting data in tabular form, with appropriate headings and units of measurement
- presenting data in graphical form: bar graph, line graph, scatter graph or other graphical form appropriate to environmental science, with appropriate scales, labels, keys and units, and including a line of best fit (straight or curved) on a scatter graph, if appropriate, to represent the trend observed in experimental/field work data
- processing data (using calculations and units, where appropriate)
- comparing and/or analysing data sets
- drawing valid conclusions from the data, and relating them to the aim
- evaluating an experimental/field work procedure and suggesting and justifying improvements
- citing and referencing sources of data/information

Calculations

Learners should be familiar with the following methods of calculation:

- measures of average: mean
- ratio
- percentage
- percentage increase and decrease
- calculations involving number substitution in formulae

Administrative information

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Superclass: QA

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
2.0	Added table detailing content to be covered. Transfer of evidence updated.	Qualifications Manager	April 2018
2.1	Assessment standard threshold added.	Qualifications Manager	September 2018
3.0	Unit code updated	Qualifications Manager	July 2019
4.0	Refined guidance on Evidence Requirements; removed option for assessment-standard-specific evidence for Outcome 2. Added 'Assessment Standards thresholds' heading to existing information. Refined guidance on re-assessment. Some changes made to the format throughout the document to improve accessibility. **What you need to do differently** ♦ If you are already assessing outcome 2 holistically at the end of the unit, by using the assessment as a single test with marks and a cut-off score, you don't need to do anything differently. ♦ If you have been assessing outcome 2 atomistically, by assessing each key area and each problem-solving skill separately, you must change to using the holistic approach for outcome 2. You must do this by administering the test in a single sitting, at the end of the unit, and applying the marks and cut-off score in the unit assessment support pack.	Qualifications Manager	August 2025