National 5 Course Specification

National 5 Environmental Science

Course code:	C826 75
Course assessment code:	X826 75
SCQF:	level 5 (24 SCQF credit points)
Valid from:	session 2017–18

The course specification provides detailed information about the course and course assessment to ensure consistent and transparent assessment year on year. It describes the structure of the course and the course assessment in terms of the skills, knowledge and understanding that are assessed.

This document is for teachers and lecturers and contains all the mandatory information you need to deliver the course.

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Contents

Course overview

The course consists of 24 SCQF credit points which includes time for preparation for course assessment. The notional length of time for a candidate to complete the course is 160 hours.

The course assessment has two components.

Component	Marks	Scaled mark	Duration
Component 1: question paper	100	n/a	2 hours and 30 minutes
Component 2: assignment	20	25	8 hours of which a maximum of 1 hour and 30 minutes is allocated to the reporting stage — see course assessment section

Recommended entry	Progression
Entry to this course is at the discretion of the centre. Candidates should have achieved the fourth curriculum level or the National 4 Environmental Science course or equivalent qualifications and/or experience prior to starting this course. Candidates may also progress from relevant biology, chemistry, physics, science or geography courses.	♦ other qualifications in environmental science or related areas ♦ further study, employment or training

Conditions of award

The grade awarded is based on the total marks achieved across all course assessment components.

Course rationale

National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

Every course provides opportunities for candidates to develop breadth, challenge and application. The focus and balance of assessment is tailored to each subject area.

Environmental science is an interdisciplinary subject which draws from the sciences and social sciences. Environmental scientists are involved in tackling issues such as global climate change, pollution, use of land and water resources, and changes in wildlife habitats.

Environmental science courses encourage the development of skills and resourcefulness which lead to becoming a confident individual. Successful candidates in environmental science think creatively, analyse and solve problems. Studying relevant areas of environmental science such as the living environment, the Earth's resources and sustainability produces responsible citizens.

The National 5 Environmental Science course is practical and experiential and develops scientific awareness of environmental issues. It involves an understanding of scientific principles, economic influences and political action.

The course allows candidates to understand and investigate the world in an engaging and enjoyable way. It develops candidates' abilities to think analytically, creatively and independently, and to make reasoned evaluations. The course provides opportunities for candidates to acquire and apply knowledge, to evaluate environmental and scientific issues, to consider risk, and to make informed decisions. This can lead to candidates developing an informed and ethical view of topical issues. Candidates develop skills in communication, collaborative working and leadership, and apply critical thinking in new and unfamiliar contexts to solve problems.

Purpose and aims

The purpose of the course is to develop candidates' curiosity, interest and enthusiasm for environmental science in a range of contexts. The skills of scientific inquiry are integrated and developed throughout the course, as well as investigative and experimental skills.

The course develops a scientific understanding of environmental issues. It provides a broad and up-to-date selection of ideas relevant to the role of environmental science in society. This develops an understanding of environmental issues and possible solutions to preventing or reversing environmental degradation, and of sustainable practices.

The course provides a range of opportunities for candidates to investigate key areas of the living environment such as biodiversity and interdependence. Through the Earth's systems, candidates investigate access to and use of resources associated with the atmosphere, hydrosphere, geosphere and biosphere. Sustainability and sustainable development are explored through food, water and energy security, as well as investigating issues relating to waste generation and its management.

The course has a strong interdisciplinary nature and aims to develop skills, knowledge and understanding in relevant areas of science and social science. It provides opportunities for candidates to develop scientific literacy skills. In addition, candidates recognise the impact environmental science makes on their lives, on the lives of others, on the environment, and on society.

Due to its interdisciplinary nature, candidates gain additional benefit from studying environmental science along with other science subjects and/or geography, as this enhances the candidates' skills, knowledge and understanding. The course allows flexibility and personalisation by allowing choice of topic for the assignment.

The aims of the course are for candidates to:

- develop and apply knowledge and understanding of environmental science
- develop an understanding of environmental science's role in scientific issues and relevant applications of environmental science, including the impact these could make in society and the environment
- develop scientific inquiry and investigative skills
- develop scientific analytical thinking skills in an environmental science context
- develop the skills to use technology, equipment and materials, safely, in practical scientific activities
- develop planning skills
- develop problem-solving skills in an environmental science context
- develop practical fieldwork skills in an environmental science context
- use and understand scientific literacy, in everyday contexts, to communicate ideas and issues and to make scientifically informed choices
- develop the knowledge and skills for more advanced learning in environmental science
- develop skills of independent working

This course enables candidates to make their own decisions on issues within a modern society where the body of scientific knowledge and its applications and implications are ever developing.

Who is this course for?

The course is suitable for learners who have experienced learning across the sciences experiences and outcomes. It may be suitable for those wishing to study environmental science for the first time.

This course has a skills-based approach to learning. It takes account of the needs of all learners and provides sufficient flexibility to enable learners to achieve in different ways.

Course content

Candidates gain an understanding of environmental science through a variety of approaches, including practical activities. They research topics, apply scientific skills and communicate information related to their findings, which develops skills of scientific literacy.

The course content includes the following areas of environmental science:

Living environment
The key areas covered are: investigating ecosystems and biodiversity; interdependence; human influences on biodiversity.

Earth's resources
The key areas covered are: an overview of Earth systems and their interactions; the geosphere; the hydrosphere; the biosphere; the atmosphere.

Sustainability
The key areas covered are: an introduction to sustainability; food; water; energy; waste management.

Skills, knowledge and understanding

Skills, knowledge and understanding for the course

The following provides a broad overview of the subject skills, knowledge and understanding developed in the course:

- demonstrating knowledge and understanding of environmental science by making statements, describing information, providing explanations and integrating knowledge
- applying knowledge of environmental science to new situations, interpreting information and solving problems
- planning, designing, and safely carrying out experimental/fieldwork investigations to test given hypotheses or to illustrate particular effects
- selecting information from a variety of sources
- presenting information appropriately in a variety of forms
- processing information (using calculations and units, where appropriate)
- making predictions and generalisations based on evidence/information
- drawing valid conclusions and giving explanations supported by evidence/justification
- suggesting improvements to practical experimental/fieldwork investigations
- communicating findings/information

Skills, knowledge and understanding for the course assessment

The following provides details of skills, knowledge and understanding sampled in the course 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 which 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
- traps (pitfall, camera, mammal)
- capture–mark–recapture

d Techniques to measure abiotic factors:

- aquatic — water flow rate, oxygen concentration, water pH, and water temperature
- terrestrial — temperature, light intensity, soil moisture, soil pH, wind velocity, wind direction, and 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 accurate the results will be
- counts of individuals rely on accurate identification

Living environment

- 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, eg 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 a species 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 material.

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

Living environment

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 which 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 Environmental Protection Agency (SEPA) as an environmental regulator
- the role of Scottish Natural Heritage (SNH) as an environmental educator and advisor
- designation and purpose of Sites of Special Scientific Interest (SSSI) in Scotland

Earth's resources

1 Overview of Earth systems and their interactions

a Identification of the main Earth systems: geosphere, hydrosphere, atmosphere, and biosphere.

b Classification of resources into physical, biological, renewable and non-renewable.

2 Geosphere

a Definitions:

- weathering — the exposure and breaking down of rocks in situ at the Earth's surface over geological time due to interaction with the atmosphere
- transportation — the movement of rock fragments by water, wind, ice or gravity from the place where they were originally weathered
- erosion — the breaking down of rock fragments into smaller pieces and sediments due to collision with other rock fragments during transportation
- deposition — the settling out of rock fragments and sediments after transportation by water, wind, ice or gravity
- igneous — rock that forms through the cooling of molten rock (magma) to a solid form in the upper crust or on the surface of the Earth
- sedimentary — rock that is formed from weathered rock fragments and sediments which have been eroded, transported, deposited, compacted and cemented
- metamorphic — rock that has been subjected to heat and/or pressure, permanently altering the minerals or internal structure
- rock — a solid mass made of one or more minerals
- mineral — an element or chemical compound formed as a result of rock cycle processes
- ore — a naturally occurring solid material from which a metal or valuable mineral can be extracted profitably
- porosity — a measure of a rock's ability to hold fluid
- permeability — a measure of the amount of water allowed to pass through a rock

b Structure of the Earth
Core (inner and outer), mantle, and crust (oceanic and continental).

c Rock cycle processes:

- erosion
- weathering (physical, chemical, biological, link with soil formation)
- transportation
- deposition
- melting
- effects of heat and pressure
- formation of igneous (granite, basalt), sedimentary (sandstone, shale), and metamorphic (marble, slate) rocks

Earth's resources

d Relationship between rocks, minerals, and ores:

- rock — granite is mostly composed of quartz, biotite and feldspar minerals
- minerals — quartz (silica and oxygen), calcium carbonate (calcium, carbon and oxygen)
- ore — metallic iron can be economically extracted from iron ores

e Properties of rocks: porosity and permeability.

f Limestone:

- formation (formed in shallow tropical sea water as a result of calcium carbonate precipitating out)
- extraction (quarrying)
- processing (cutting, crushing)
- uses
- environmental impacts of extraction and/or processing

Uses of limestone: cement manufacture, construction, agriculture, iron and steel manufacture.

g Geological carbon cycle; the role of limestone and coal as carbon sinks; and chemical weathering (carbonic acid).

h Iron ore:

- formation (formed in sea water as a result of oxygen release by photosynthesising organisms; the oxygen combines with dissolved iron in the ocean to form iron oxide)
- extraction (opencast mining)
- processing (blast furnace)
- uses
- environmental impacts of extraction and/or processing

Processing: ore smelting in a blast furnace; inputs (iron ore, limestone, oxygen, coke) and outputs (pig iron, slag, carbon dioxide).

Uses of iron: steel manufactured products, reinforced concrete, cast iron and wrought iron products.

i Crude oil:

- formation (formed from the remains of small animals and plants that died and fell to the seafloor millions of years ago; compression and heating of these remains within the Earth's crust forms oil)
- extraction (drilling)
- processing (fractional distillation)

Earth's resources

- uses
- environmental impacts of extraction, processing and uses

Processing: fractional distillation (including role of temperature in formation of outputs), graduation in molecule size.

Uses: domestic and industrial fuels, electricity generation, petrol, diesel, fuel oil, plastics, tar, bitumen, lubricants, roofing felt, medicines, and cosmetics.

Environmental impacts of crude oil products.

3 Hydrosphere

a Definitions:

- evaporation — the process of turning from liquid into vapour or gas
- condensation — the process of a vapour or gas turning into a liquid
- precipitation — moisture that falls from the air to the ground (rain, snow, sleet, hail, drizzle, fog, mist)
- transpiration — the evaporation of water from a plant's leaves, stem or flowers
- run-off — the precipitation that flows across the surface of the ground
- infiltration — the physical movement of water through soil (relative to the soil's porosity and permeability)
- percolation — the movement of water through soil by gravity and capillary forces
- throughflow — the horizontal flow of water within soil
- groundwater — water that occupies pore spaces in soil and bedrock
- groundwater flow — the movement of groundwater horizontally

b Water cycle: evaporation, condensation, precipitation, transpiration, run-off, infiltration, percolation, throughflow, groundwater flow, storage.

c Main stores of water: atmosphere, oceans, ice, freshwater (rivers, streams, springs), groundwater (soil moisture, rock pores and crevices), and aquifers.

d Uses of water: industrial, domestic, and agricultural.

e Issues arising from availability of water resources in Scotland and the rest of the British Isles: drought and flooding.

Role of SEPA in flood warning and water quality.

f Energy from water: hydro-electric, tidal, wave, energy changes involved (kinetic to electrical).

Earth's resources

g Requirements and considerations for siting hydro-electric and tidal power stations:

- ♦ hydro-electric power (HEP): steep gradient, high precipitation, narrow deep valley, impermeable geology, population density, proximity to National Grid, current land use
- ♦ tidal: narrow channel, large water volume, large tidal stream, population density, proximity to National Grid, current water use

4 Biosphere

a Definitions:

- ♦ biomass — the mass of living or recently living plants or animals
- ♦ biofuels — combustible biomass or fuels derived from biomass

b Oceanic and freshwater resources: economically important species of plants and animals.

c Terrestrial resources: economically important species of domesticated and hunted animals, agricultural crops, forestry (native and plantation).

d Energy from biological resources: biomass (wood, peat).

Process of fermentation in formation of biofuels: conditions required for formation of peat (acidic and anaerobic), and methane as the primary biogas.

5 Atmosphere

a Definition:

- ♦ natural greenhouse effect — the process by which radiation reflected from the Earth's surface is absorbed by gases in the atmosphere and prevented from escaping into space, thus keeping the Earth warmer than it would otherwise be

b Composition of the atmosphere (nitrogen, oxygen and carbon dioxide), and the importance of the 'natural' greenhouse effect.

c Energy from wind, including energy changes involved (kinetic to electrical).

d Requirements and considerations for siting wind farms: strong/steady wind flow, exposed site, population density, proximity to National Grid, current land/water use.

Sustainability

1 Introduction to sustainability

a Definitions:

- sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs
- sustainability is the relationship or balance between social, economic and environmental issues
- global citizenship is an awareness of the world as a global community and recognition of the rights and responsibilities of citizens within it

b Global citizenship: role of the United Nations sustainable development goals, education and personal responsibility.

2 Food

a Definitions:

- food miles — the distance food travels from the time of its production until it reaches the consumer
- carbon footprint — the mass of carbon dioxide emitted by any specific activity
- carbon neutral — no net release of carbon dioxide into the atmosphere
- carbon offsetting — compensating for emissions of carbon dioxide into the atmosphere with an equivalent reduction in carbon dioxide emissions elsewhere

b Impacts (social, economic, environmental) of an increasing global population on food supplies.

c Strategies in farming for a secure food supply: intensive farming, genetically modified (GM) crops, and agrochemicals (fertilisers and pesticides).

d Organic farming, including advantages and disadvantages.

e Strategies in freshwater and marine-based systems for a secure food supply: intensive fishing (trawling, dredging) and promotion of alternative species.

f Fish conservation approaches: marine conservation areas, zoning, and sustainable fishing methods (mesh size, net shape, days at sea, line fishing, hand diving).

g Environmental impact of food distribution: food miles, carbon footprint, carbon neutral, carbon offsetting.

Strategies to reduce carbon footprint.

Sustainability

3 Water

a Definition:

- wastewater — water that has been used in the home, in a business, or as part of an industrial process

b Impacts (social, economic, environmental) of an increasing global population on water supplies.

Clean water supplies in developing and developed countries.

c Issues arising from water use:

- industry — water pollution, effluents
- agriculture — water pollution and change in water levels as a consequence of water abstraction and irrigation
- domestic — gardening, washing, cooking, heating, sanitary, may lead to water shortages in times of drought and to water-use restrictions
- impacts on public health, contamination and pollution of water supplies, conservation, and tourism and recreation
- impact of wastewater, including untreated sewage, on aquatic ecosystems

d Sustainable approaches to water use: methods of water conservation in domestic, agricultural and industrial contexts.

e Role of SEPA in monitoring and enforcement.

4 Energy

a Definitions:

- enhanced greenhouse effect — the enhancement of the natural greenhouse effect through man-made emissions of greenhouse gases, trapping increasing quantities of heat
- climate change — a large-scale, long-term shift in Earth's weather patterns or average temperatures

b Impacts (social, economic, environmental) of an increasing global population on energy supplies.

c The 'enhanced' greenhouse effect.
Carbon dioxide, nitrous oxide and methane, and their sources.

d Renewable and non-renewable energy sources and issues arising from their use.

Sustainability

e Sustainable approaches to reduce greenhouse gas emissions in transport, industry, domestic and agricultural contexts.

f Impacts (social, economic and environmental) of climate change: habitat loss, reduction in biodiversity, changes in species distribution, rising sea levels leading to flooding, loss of agricultural land, and loss of business.

5 Waste management

a Definitions:

- reduce — to decrease the amount of waste produced
- reuse — to refill or find another use for a product without processing it other than cleaning
- recycle — to reprocess materials into new and useful products

b Increase in waste production as a result of an increasing global population and societal demands.

c Sustainable approaches to managing waste: reduce, reuse and recycle, and local initiatives to encourage these.

d Role of SEPA in waste management.

Apparatus and techniques

In addition to the key areas, candidates must have knowledge of the following pieces of apparatus and techniques. Where it is not possible to carry out a practical technique, candidates 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

Apparatus and techniques

- nets: sweep, dip
- traps: pitfall, mammal, camera
- thermometer
- meters: light intensity, soil moisture, soil pH, water flow rate, oxygen concentration
- anemometer
- rain gauge
- floats
- test kits: soil pH, soil nitrate/nitrite
- ID cards/keys: plants, mammals, rocks

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 — ability to read and provide grid references is not required

The course support notes provide a list of suggested learning activities. Choosing from the activities suggested in the course support notes, or carrying out any other appropriate activities, allows candidates to become familiar with the apparatus and techniques listed above. Where it is not possible to carry out a particular technique, other resources could be utilised.

Reporting experimental work/fieldwork

Candidates 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 or other graphical form appropriate to environmental science, with appropriate scales, labels, keys and units
- including a line of best fit (straight or curved) if appropriate, to represent the trend observed in experimental/fieldwork data
- comparing data sets
- drawing conclusions from the data, and relating them to the aim
- evaluating an experimental/fieldwork procedure and suggesting and justifying improvements

Calculations

Candidates should be familiar with the following methods of calculation:

- average: mean

Apparatus and techniques
♦ ratio ♦ percentage ♦ percentage increase/decrease ♦ calculations involving number substitution in formulae

Skills, knowledge and understanding included in the course are appropriate to the SCQF level of the course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.scqf.org.uk).

Skills for learning, skills for life and skills for work

This course helps candidates to develop broad, generic skills. These skills are based on SQA's Skills Framework: Skills for Learning, Skills for Life and Skills for Work and draw from the following main skills areas:

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

These skills must be built into the course where there are appropriate opportunities and the level should be appropriate to the level of the course.

Further information on building in skills for learning, skills for life and skills for work is given in the course support notes.

Course assessment

Course assessment is based on the information provided in this document.

The course assessment meets the key purposes and aims of the course by addressing:

- breadth — drawing on knowledge and skills from across the course
- challenge — requiring greater depth or extension of knowledge and/or skills
- application — requiring application of knowledge and/or skills in experimental/fieldwork or theoretical contexts as appropriate

This enables candidates to:

- apply breadth and depth of skills, knowledge and understanding from across the course to answer questions in environmental science
- apply skills of scientific inquiry, using related knowledge, to carry out a meaningful and appropriately challenging task in environmental science and communicate findings

The course assessment has two components. The relationship between these two components is complementary, to ensure full coverage of the knowledge and skills of the course.

Course assessment structure: question paper

Question paper 100 marks

The purpose of the question paper is to assess breadth, challenge and application of skills, knowledge and understanding from across the course.

The question paper samples knowledge, understanding and skills from across the course. It also assesses the application or extension of knowledge and/or skills in unfamiliar situations, practical and theoretical contexts.

The question paper gives candidates an opportunity to demonstrate the following skills, knowledge and understanding:

- demonstrating knowledge and understanding of environmental science by making statements, describing information, providing explanations and integrating knowledge
- applying knowledge of environmental science to new situations, interpreting information and solving problems
- planning and/or designing experimental/fieldwork investigations to test given hypotheses or to illustrate particular effects
- selecting information from a variety of sources
- presenting information appropriately in a variety of forms
- processing information (using calculations and units, where appropriate)
- making predictions and generalisations based on evidence/information

- drawing valid conclusions and giving explanations supported by evidence/justification
- suggesting improvements to experimental/fieldwork investigations

The skills may be assessed in the context of any of the key areas of the course and in any section of the question paper. Overall, marks are evenly distributed across each of the three areas:

- living environment
- Earth's resources
- sustainability

The question paper has a total of 100 marks and is worth 80% of the overall marks for the course assessment.

The question paper has three sections:

Section 1
Section 1 consists of restricted response questions totalling 66 marks. This section samples knowledge and understanding and a selection of skills by presenting candidates with appropriately challenging context-based questions, broken down into sub-parts. There may be integration of key areas and skills from different areas of the course.

Section 2
Section 2 contains a case study, with 20 marks allocated for restricted response questions on related applications of environmental science. This section samples knowledge and understanding plus a selection of skills, and there may be integration of key areas and skills from different areas of the course.

All data and information relevant to the case study is provided in a separate supplementary booklet.

Section 3
Section 3 has a total of 14 marks. It has:

- one pair of structured extended-response questions with candidates selecting and answering one of these
- one pair of unstructured extended-response questions with candidates selecting and answering one of these

Each extended-response question has a mark allocation of 7 marks.

The majority (approximately 70%) of the marks are awarded for demonstrating and applying knowledge and understanding. The other marks (approximately 30%) are awarded for applying scientific inquiry, analytical thinking, problem-solving skills and the impacts of applications of environmental science on society and the environment.

Setting, conducting and marking the question paper

The question paper is set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. The question paper is 2 hours and 30 minutes in duration.

Specimen question papers for National 5 courses are published on SQA's website. These illustrate the standard, structure and requirements of the question papers candidates sit. The specimen papers also include marking instructions.

Course assessment structure: assignment

Assignment 20 marks

The purpose of the assignment is to assess the application of skills of scientific inquiry and related environmental science knowledge and understanding.

This assignment allows assessment of skills which cannot be assessed through the question paper, for example, the handling and processing of data gathered as a result of experimental/fieldwork and research skills.

Candidates apply skills, knowledge and understanding by carrying out an experiment or fieldwork procedure and investigating a topic relevant to environmental science. The topic should draw on one or more of the key areas of the course, and should be chosen with guidance from the teacher/lecturer. It should be sufficiently open and flexible to allow for personalisation and choice.

Assignment overview

The assignment gives candidates an opportunity to demonstrate skills, knowledge and understanding by:

- applying knowledge of environmental science to new situations, interpreting information and solving problems
- planning, designing and safely carrying out experimental/fieldwork investigations to test given hypotheses or to illustrate particular effects
- selecting information from a variety of sources
- presenting information appropriately in a variety of forms
- processing the information (using calculations and units, where appropriate)
- making predictions and generalisations based on evidence/information
- drawing valid conclusions and giving explanations supported by evidence/justification
- suggesting improvements to experimental/fieldwork investigations
- communicating findings/information

The assignment offers challenge by requiring skills, knowledge and understanding to be applied in a context that is one or more of the following:

- unfamiliar
- familiar but investigated in greater depth
- integrates a number of familiar contexts

Candidates will research and report on a topic that allows them to apply skills and knowledge in environmental science at a level appropriate to National 5.

The topic should be chosen with guidance from the teacher/lecturer and must involve experimental/fieldwork.

The assignment has two stages:

- research
- report

The research stage must involve an experiment or fieldwork which allows measurements to be made. Candidates must also gather data from the internet, books or journals to compare against their experimental/fieldwork results.

Candidates must produce a report on their research.

Setting, conducting and marking the assignment

Setting

The assignment is:

- set by centres within SQA guidelines
- set at a time appropriate to the candidate's needs
- set within teaching and learning and includes experimental/fieldwork at a level appropriate to National 5

Conducting

The assignment is:

- an individually produced piece of work from each candidate
- started at an appropriate point in the course
- conducted under controlled conditions

Marking

The assignment has a total of 20 marks which are allocated to the following sections:

Section of assignment		Marks
1	Aim	1
2	Underlying environmental science	3
3	Data collection and handling	6
4	Graphical presentation	4
5	Analysis	1
6	Conclusion	1
7	Evaluation	2
8	Structure	2
	Total marks	**20**

The report is submitted to SQA for external marking.

All marking is quality assured by SQA.

Assessment conditions

Controlled assessment is designed to:

- ensure that all candidates spend approximately the same amount of time on their assignments
- prevent third parties from providing inappropriate levels of guidance and input
- mitigate concerns about plagiarism and improve the reliability and validity of SQA awards
- allow centres a reasonable degree of freedom and control
- allow candidates to produce an original piece of work

Time

It is recommended that no more than 8 hours is spent on the whole assignment. This includes a maximum of 1 hour and 30 minutes which is allocated to the reporting stage.

Supervision, control and authentication

There are two levels of control.

Under a high degree of supervision and control	Under some supervision and control
♦ the use of resources is tightly prescribed ♦ all candidates are within direct sight of the supervisor throughout the session(s) ♦ display materials which might provide assistance are removed or covered ♦ there is no access to e-mail, the internet or mobile phones ♦ candidates complete their work independently ♦ interaction with other candidates does not occur ♦ no assistance of any description is provided	♦ candidates do not need to be directly supervised at all times ♦ the use of resources, including the internet, is not tightly prescribed ♦ the work an individual candidate submits for assessment is their own ♦ teachers/lecturers can provide reasonable assistance

The assignment has two stages.

Stage	Level of control
♦ research	conducted under some supervision and control
♦ report	conducted under a high degree of supervision and control

Detailed conditions for assessment are given in the assignment assessment task.

Resources

The only materials which **can** be used in the report stage are:

- the instructions for candidates
- the candidate's raw experimental/fieldwork data
- the internet or literature data/information (including a record of the source of the data)
- information on the underlying environmental science
- the experimental/fieldwork method, if appropriate

Candidates **must not** have access to a previously prepared:

- draft of a report
- draft of a description of the underlying environmental science
- specimen calculation or set of calculations for mean or derived values
- graph
- comparison of data
- conclusion
- evaluation of an experimental/fieldwork procedure

Reasonable assistance

Candidates must undertake the assessment independently. However, reasonable assistance may be provided prior to the formal assessment process taking place. The term 'reasonable assistance' is used to try to balance the need for support with the need to avoid giving too much assistance. If any candidates require more than what is deemed to be 'reasonable assistance', they may not be ready for assessment or it may be that they have been entered for the wrong level of qualification.

The assignment assessment task provides guidance on reasonable assistance.

Evidence to be gathered

The following candidate evidence is required for this assessment:

- a report

The same report cannot be submitted for more than one subject.

Volume

There is no word count.

Grading

A candidate's overall grade is determined by their performance across the course assessment. The course assessment is graded A–D on the basis of the total mark for all course assessment components.

Grade description for C

For the award of grade C, candidates will typically have demonstrated successful performance in relation to the skills, knowledge and understanding for the course.

Grade description for A

For the award of grade A, candidates will typically have demonstrated a consistently high level of performance in relation to the skills, knowledge and understanding for the course.

Equality and inclusion

This course is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

For guidance on assessment arrangements for disabled candidates and/or those with additional support needs, please follow the link to the assessment arrangements web page: www.sqa.org.uk/assessmentarrangements.

Further information

The following reference documents provide useful information and background.

- National 5 Environmental Science subject page
- Assessment arrangements web page
- Building the Curriculum 3–5
- Design Principles for National Courses
- Guide to Assessment
- SCQF Framework and SCQF level descriptors
- SCQF Handbook
- SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work
- Coursework Authenticity: A Guide for Teachers and Lecturers
- Educational Research Reports
- SQA Guidelines on e-assessment for Schools
- SQA e-assessment web page

Administrative information

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History of changes to course specification

Version	Description of change	Authorised by	Date

Note: You are advised to check SQA's website to ensure you are using the most up-to-date version of the course specification.