Course Support Notes

National 4 Biology Course Support Notes

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

April 2012, version 1.0

Contents

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 4 Biology Course. They are intended for teachers and lecturers who are delivering the Course and its Units. They should be read in conjunction with the *Course Specification*, the *Added Value Unit Specification*, and the *Unit Specification*s for the Units in the Course.

General guidance on the Course

Aims

As stated in the *Course Specification,* the aims of the Course are to enable learners to:

- develop and apply knowledge and understanding of biology
- develop an understanding of biology's role in scientific issues and relevant applications of biology in society and the environment
- develop scientific inquiry and investigative skills
- develop scientific analytical thinking skills in a biology context
- develop the use of technology, equipment and materials, safely, in practical scientific activities
- develop problem solving skills in a biology context
- use and understand scientific literacy, in everyday contexts, to communicate ideas and issues
- develop the knowledge and skills for more advanced learning in biology

Progression into this Course

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

- National 3 Biology Course

There may also be progression from National 3 Chemistry, National 3 Environmental Science, National 3 Physics or National 3 Science Courses.

Experiences and Outcomes
National Courses have been designed to draw on and build on the curriculum experiences and outcomes as appropriate. Qualifications developed for the senior phase of secondary education are benchmarked against SCQF levels. SCQF level 4 and the curriculum level 4 are broadly equivalent in terms of level of demand although qualifications at SCQF level 4 will be more specific to allow for more specialist study of subjects.

Learners who have completed Curriculum for Excellence experiences and outcomes will find these an appropriate basis for doing the Course. In this Course, learners would benefit from having experience of the following:

Organisers	**Lines of development**	
Planet Earth	Biodiversity and Interdependence	SCN 01, 02, 03
Biological Systems	Body Systems	SCN 12, 13
	Inheritance	SCN 14

More detail is contained in the Biology Progression Framework. The Biology Progression framework shows the development of the key areas throughout the suite of Courses.

Skills, knowledge and understanding covered in the Course

Note: teachers and lecturers should refer to the *Added Value Unit Specification* for mandatory information about the skills, knowledge and understanding to be covered in this Course.

Progression from this Course

This Course or its components may provide progression for the learner to:

- National 5 Biology Course
- National 4 or 5 Course in another science subject
- Skills for Work Courses (SCQF levels 4 or 5)
- National Certificate Group Awards
- National Progression Awards (SCQF levels 4 or 5)
- Employment and/or training

Hierarchies

Hierarchy is the term used to describe Courses and Units which form a structured sequence involving two or more SCQF levels.

It is important that any content in a Course and/or Unit at one particular SCQF level is not repeated if a learner progresses to the next level of the hierarchy. The skills and knowledge should be able to be applied to new content and contexts to enrich the learning experience. This is for centres to manage.

- Biology Courses from National 3 to Advanced Higher are hierarchical.
- Courses from National 3 to National 5 have Units with the same structure and titles.

National 5 gives equal progression to both Higher Biology and Higher Human Biology. Higher Biology and Higher Human Biology give equal progression to Advanced Higher Biology.

Approaches to learning and teaching

The purpose of this section is to provide you with advice and guidance on learning and teaching. It is essential that you are familiar with the mandatory information within the Biology Added Value Unit.

Teaching should involve an appropriate range of approaches to develop knowledge and understanding and skills for learning, life and work. This can be integrated into a related sequence of activities, centred on an idea, theme or application of biology, based on appropriate contexts, and need not be restricted to the Unit structure. Learning should be experiential, active, challenging and enjoyable, and include appropriate practical experiments/activities and could be learner-led. The use of a variety of active learning approaches is encouraged, including peer teaching and assessment, individual and group presentations, role-playing and game-based learning, with learner-generated questions.

When developing your Biology Course there should be opportunities for learners to take responsibility for their learning. Learning and teaching should build on learners' prior knowledge, skills and experiences. The Units and the key areas identified within them may be approached in any appropriate sequence, at the centre's discretion. The distribution of time between the various Units is a matter for professional judgement and is entirely at the discretion the centre. Each Unit is likely to require an approximately equal time allocation, although this may depend on the learners' prior learning in the different key areas.

Learning and teaching, within a class, can be organised, in a flexible way, to allow a range of learners' needs to be met, including learners achieving at different levels. The hierarchical nature of the new Biology qualifications provides improved continuity between the levels. Centres can, therefore, organise learning and teaching strategies in ways appropriate for their learners.

Within a class, there may be learners capable of achieving at a higher level in some aspects of the Course. Where possible, they should be given the opportunity to do so. There may also be learners who are struggling to achieve in all aspects of the Course, and may only achieve at the lower level in some areas.

Teachers/lecturers need to consider the Course and Unit Specifications to identify the differences between Course levels. It may also be useful to refer to the Biology Progression Framework.

When delivering this Course to a group of learners, with some working towards different levels, it may be useful for teachers to identify activities covering common concepts and skills for all learners, and additional activities required for some learners. In some aspects of the Course, the difference between levels is defined in terms of a higher level of skill.

An investigatory approach is encouraged in Biology, with learners actively involved in developing their skills, knowledge and understanding by investigating a range of relevant Biology applications and issues. A holistic approach should be adopted to encourage simultaneous development of learners' conceptual understanding and skills.

Where appropriate, investigative work/experiments, in Biology, should allow learners the opportunity to select activities and/or carry out extended study. Investigative/ experimental work is part of the scientific method of working and can fulfil a number of educational purposes.

All learning and teaching should offer opportunities for learners to work collaboratively. Practical activities and investigative work can offer opportunities for group work, which should be encouraged.

Group work approaches can be used within Units and across Courses, where it is helpful to simulate real-life situations, share tasks and promote team working skills. However, there must be clear evidence for each learner to show that the learner has met the required assessment standards for the Unit or Course.

Laboratory work should include the use of technology and equipment that reflects current scientific use in Biology. Fieldwork provides an opportunity for practical work, using first-hand experience of an ecosystem to develop knowledge, understanding and problem solving. Appropriate risk assessment must be undertaken.

Learners would be expected to contribute their own time in addition to programmed learning time.

Effective partnership working can enhance the science experience. Where possible, locally relevant contexts should be studied, with visits where this is possible. Guest speakers from, for example, industry, further and higher education could be used to bring the world of biology into the classroom.

Information and Communications Technology (ICT) can make a significant contribution to practical work in Biology, in addition to the use of computers as a learning tool. Computer interfacing equipment can detect and record small changes in variables allowing experimental results to be recorded over short periods of time, completing experiments in class time. Results can also be displayed in real time helping to improve understanding. Data logging equipment and video cameras can be set up to record data and make observations over periods of time longer than a class lesson which can then be subsequently downloaded and viewed for analysis.

Learning about Scotland and Scottish culture will enrich the learners' learning experience and help them to develop the skills for learning, life and work they will need to prepare them for taking their place in a diverse, inclusive and participative Scotland and beyond. Where there are opportunities to contextualise approaches to learning and teaching to Scottish contexts, teachers and lecturers should consider this.

Assessment should be integral to and improve learning and teaching. The approach should involve learners and provide supportive feedback. Self- and peer-assessment techniques should be encouraged, wherever appropriate. Assessment information should be used to set learning targets and next steps.

Suggestions for possible contexts and learning activities to support and enrich learning and teaching are detailed in the table below.

The **key areas** are from the Added Value Unit. Activities in the **Suggested learning activities** are not mandatory. This offers examples of suggested activities, from which you could select a range of suitable activities. It is not expected that all will be covered. The contexts for key areas are open to personalisation and choice, so centres are likely to devise their own learning activities. **Exemplification of key areas** is not mandatory. It provides an outline of the level of demand and detail of the key areas.

Cell Biology		
Key areas	**Suggested learning activities**	**Exemplification of key areas**
1 Cell division and its role in growth and repair.	♦ Grow colonies of microorganisms on agar. ♦ Investigate the use of cells in the context of tissue culture for therapeutic use. ♦ Investigate regeneration of damaged tissues in organisms such as salamanders and starfish.	Cell division is essential to allow organisms to grow and repair damaged parts, eg cuts, broken bones. During cell division, the parent cell divides to produce two identical cells, which contain the same number of chromosomes in their nuclei as the parent cell. Cancer as uncontrolled cell division.
2 DNA, genes and chromosomes.	♦ Decoding activities to produce coloured 'paper-chain' proteins. ♦ Case studies of inherited diseases.	Genes are located on chromosomes in the nucleus. Genes are made of DNA which carries the instructions to make proteins. Each individual's DNA is unique. Genes are passed on from parents to offspring.
3 Therapeutic use of cells.	♦ Investigate uses of genetic engineering. ♦ Investigate eg insulin/factorVIII/human growth hormone. ♦ Research projects or visit research labs to see uses which are relevant.	Insulin or other protein production via genetic engineering. Other examples may include products of genetic engineering, stem cell technology or using cells to grow artificial organs.

4	Properties of enzymes and use in industries.	♦ Carry out experiments with eg phosphorylase, amylase, catalase to demonstrate specificity and to test for substrates and products using iodine, Benedict's and Clinistix. ♦ Make paper/plasticine models or animations of enzyme action. ♦ Investigate the cleaning effect or energy efficiency of biological and non-biological detergents. ♦ Carry out experiments with rennet. Make cheese/visit cheese factory. Investigate the history and ethics of rennet production.	Enzymes are found in living cells. They are specific, speed up reactions in cells and remain unchanged by the reaction. Enzymes build-up and break-down molecules. Enzymes can be used in a range of biotechnology industries.
5	Properties of microorganisms and use in industries.	♦ Make eg bread, beer, yoghurt. ♦ Visit a local industry. ♦ Investigate production and use of biofuels. ♦ Investigate the effect of temperature on rising dough. ♦ Investigate breakdown of sewage. ♦ Use eg nigrosin stain to visualise bacteria in yoghurt. ♦ Investigate use of microorganisms in bioremediation	Properties of microorganisms include rapid growth, diverse use of food source and wide range of products. Examples of how some cells work and are used in industrial processes. Yeast in baking and brewing. Bacteria for yoghurt and biofuels production. Production of cheese.
6	Photosynthesis — limiting factors.	♦ Carry out starch tests in various conditions. ♦ Elodea/Cabomba investigations to find out about limiting factors. ♦ Investigate immobilised algae and hydrogen carbonate indicator to show the effect of light on the production of carbon dioxide. Use IT simulations and data logging.	If any of the requirements (light, water, carbon dioxide or a suitable temperature) are low or missing, the photosynthesis rate is limited. By overcoming these limitations, faster growth rates can be achieved.

7	Factors affecting respiration.	♦ Carry out germinating peas experiments. ♦ Investigate the effect of mass of sugar/temperature on the rate of respiration in yeast. Use IT simulations and data logging.	Respiration is used to release energy for use in cells. Oxygen may or may not be used in both yeast and animal cells. With oxygen, both yeast, plant and animal cells use glucose to produce carbon dioxide and water. Without oxygen, yeast and plant cells use glucose to produce alcohol and carbon dioxide. Without oxygen, animal cells use glucose to produce lactic acid More energy is released per molecule of glucose when oxygen is present. The process is enzyme controlled in all cases and so is affected by temperature.
8	Controversial biological procedures.	♦ Investigate/debate any relevant interesting topic eg gene therapy, pharming, transgenic animals and plants.	

Multicellular Organisms		
Key areas	**Suggested learning activities**	**Exemplification of key areas**
1 Sexual and asexual reproduction and their importance for survival of species.	♦ Investigate reproduction in various organisms. ♦ Compare different methods, success rates and how these relate to species survival. ♦ Brine shrimp practicals. ♦ Investigate asexual reproduction in plants and animals using models, reference materials and videos.	
2 Propagating and growing plants.	♦ Carry out various propagation techniques with suitable plants.	Different methods to propagate plants eg seeds, cuttings, bulbs.
3 Commercial use of plants.	♦ Investigate increased yields of crops/fuel/medicines via pharming.	

4	Genetic information.	♦ Investigate how genetics determines our features, ensures variation. ♦ Use *Reebops* or similar activities to model inheritance from two parents. Examine photographs of families to consider which features a child inherited from which parent.	
5	Growth and development of different organisms.	♦ Select a range of different organisms and compare their growth and development. ♦ Seed germination experiments to compare necessary/optimum conditions for growth. ♦ Investigate how chemicals or radiation can affect growth and development. ♦ Investigate commercial plant growing/visit a commercial plant nursery. ♦ Research/investigate the importance of suitable conditions eg diet and temperature to maintain growth and development. Debate the links between diet and growth and development disorders.	A balanced diet, suitable conditions, water, minerals and vitamins are required for healthy growth and development.
6	Biological actions in response to internal and external changes to maintain stable body conditions.	♦ Research/investigate the nervous system eg how nerves allow appropriate responses to be made for a rapid response to environmental changes. ♦ Investigate the density of touch receptors in the skin. ♦ Investigate the effect of changing external temperature on core body temperature. ♦ Research causes of diabetes.	The basic principles of homeostasis through maintaining body temperature and regulating blood glucose.

	♦ Explore behavioural adaptations to ensure the body conditions are maintained eg woodlice experiment/ brine shrimp practical.	

Life on Earth		
Key areas	**Suggested learning activities**	**Exemplification of key areas**
1 Animal and plants species depend on each other.	♦ Investigate a variety of ecosystems/biomes eg rainforest, tundra, desert, arctic, temperate, local ecosystems. ♦ Investigate various biotic factors eg food availability, predators, disease and competition. Use sampling techniques eg transect and quadrat analysis. ♦ Investigate/research how the addition/removal of a species will impact upon other species in an ecosystem.	
2 Impact of population growth and natural hazards on biodiversity.	♦ Investigate examples of human population growth and how these affect biodiversity. Investigate/research ecological footprints that measure human demands on earth's resources. ♦ Investigate human influenced environmental disruptions on biodiversity eg habitat destruction, deforestation, over-fishing, intensive agriculture, genetic pollution, over population, climate change, acid rain, oil and chemical spills, sewage and litter. ♦ Investigate impact of natural hazards on biodiversity eg forest fires, earthquakes, volcanic activity, tsunamis, wind. ♦ Debate issues around conservation of endangered species to maintain biodiversity nationally and globally.	

3 Nitrogen cycle.	♦ Investigate/research the nitrogen cycle including the role of microorganisms. ♦ Use card sorting to identify stages and processes of the cycle. ♦ Use compost columns/heaps/bins to investigate decay. ♦ Carry out water culture experiments with eg lemna ♦ Investigate seedling development with/without nitrogen using sand or perlite.	Nitrogen is essential for organisms to make proteins.
4 Fertiliser design and environmental impact of fertilisers.	♦ Explore the use of natural and artificial fertilisers and the advantages/disadvantages of each eg cost, specificity, purity, NPK composition. ♦ Visit a farm. ♦ Investigate the effects of fertilisers eg algal blooms. ♦ Investigate Blue Flag beaches nationally and internationally.	Nitrogen can be added to the soil in the form of nitrate fertilisers, manure or compost. When crops are harvested, nitrogen is taken out of the cycle so needs to be replaced. Nitrogen in fresh water increases algal growth, blocking out the light. This causes death of organisms, decrease of oxygen and means less life can be supported.
5 Adaptations for survival.	♦ Research examples of structural and physiological adaptations which lead to species survival eg cactus, camel, polar bear, fish.	Adaptations can be structural, physiological or behavioural and help organisms survive and reproduce in their environment.
6. Learned behaviour in response to stimuli linked to species survival.	♦ Research examples of innate and learned behavioural adaptations which lead to species survival such as swarming, huddling, imprinting, migration, communication eg waggle dance in bees.	

	♦ Practical investigation using eg choice chambers, mazes, mirror drawing, touch typing. ♦ Practical investigation on habituation eg in snails. ♦ Research group/cultural/social/territorial behaviour eg robins, Japanese macaques. Use data to produce a graph/chart of daily activities. ♦ Research how insects (eg bees) learn to associate flower scent and colour with nectar.	

Developing skills for learning, skills for life and skills for work

Learners are expected to develop broad generic skills as an integral part of their learning experience. The *Course Specification* lists the skills for learning, skills for life and skills for work that learners should develop through this Course. These are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and must be built into the Course where there are appropriate opportunities. The level of these skills will be appropriate to the level of the Course.

For this Course, it is expected that the following skills for learning, skills for life and skills for work will be significantly developed:

Numeracy
This is the ability to use numbers in order to solve problems by counting, doing calculations, measuring, and understanding graphs and charts. This is also the ability to understand the results. Learners will have opportunities to extract, process and interpret information presented in numerous formats including tabular and graphical. Practical work will provide opportunities to develop time and measurement skills.

2.1 Number processes
Number processes means solving problems arising in everyday life through carrying out calculations, when dealing with data and results from experiments/investigations and everyday class work, making informed decisions based on the results of these calculations and understanding these results

2.2 Money, time and measurement
This means using and understanding time and measurement to solve problems and handle data in a variety of biology contexts, including practical and investigative

2.3 Information handling
Information handling means being able to interpret biological data in tables, charts and other graphical displays to draw sensible conclusions throughout the Course. It involves interpreting the data and considering its reliability in making reasoned deductions and informed decisions. It also involves an awareness and understanding of the chance of events happening.

Thinking skills
This is the ability to develop the cognitive skills of remembering and identifying, understanding and applying. The Course will allow learners to develop skills of applying, analysing and evaluating. Learners can analyse and evaluate practical work and data by reviewing the process, identifying issues and forming valid conclusions. They can demonstrate understanding and application of concepts and explain and interpret information and data.

5.3 Applying
Applying is the ability to use existing information to solve biological problems in different contexts, and to plan, organise and complete a task such as an investigation.

5.4 Analysing and evaluating
This covers the ability to identify and weigh-up the features of a situation or issue in biology and use judgement of them in coming to a conclusion. It includes reviewing and considering any potential solutions.

In addition, learners will also have opportunities to develop literacy skills, working with others, creating and citizenship.

Literacy
Learners develop the literacy skills to effectively communicate key biology concepts and describe, clearly, biology issues in various media forms. Learners will have opportunities to communicate knowledge and understanding, with an emphasis on applications and environmental, ethical and/or social impacts. Learners will have opportunities to develop listening and reading skills when gathering and processing information.

Working with Others
Learning activities provide many opportunities, in all areas of the Course, for learners to work with others. Practical activities and investigations, in particular, offer opportunities for group work, which is an important aspect of biology and should be encouraged.

Creating
Through learning in biology, learners can demonstrate their creativity. In particular, when planning and designing experiments/investigations, learners have the opportunity to be innovative in their approach. Learners also have the opportunities to make, write, say or do something new.

Citizenship
Learners will develop citizenship skills, when considering the applications of biology on our lives, as well as environmental and ethical implications.

Approaches to assessment

Assessment should cover the mandatory skills, knowledge and understanding of the Course. Assessment should be integral to and improve learning and teaching. The approach should involve learners and provide supportive feedback. Self and peer assessment techniques should be used, where appropriate.

See the *Unit Support Notes* for guidance on approaches to assessment of the Units of the Course.

Added Value

Courses from National 4 to Advanced Higher include assessment of added value. At National 4 the added value will be assessed in the Added Value Unit.

Information given in the *Course Specification* and the *Added Value Unit* about the assessment of added value is mandatory.

The Biology Added Value Unit is assessed by an Assignment. Prior to doing this Unit, learners would benefit from having covered the key areas from at least one of:

- Cell Biology (National 4)
- Biology: Multicellular Organisms (National 4)
- Biology: Life On Earth (National 4)

It is intended that the majority of the time for the Added Value Unit should be spent in learning and teaching activities, which further develop the skills necessary to conduct investigative/practical work in Biology. In addition to ensuring that learners are suitably prepared to conduct simple background research using the internet, learners should also have the opportunity to become familiar with practical techniques.

If the Added Value Unit is delivered as part of a Course, centres can deliver this Unit at any point during the Course. The Assignment need not be seen as an end-of-Course activity. However, teachers/lecturers may wish to delay the Assignment until the latter stages of the Course, in consideration of the points above.

The Assignment should be carried out under supervised, open-book conditions.

Learners will use the skills, knowledge and understanding necessary to undertake an investigation into a topical issue in biology. The teacher/lecturer may provide guidance to learners on topics for study, taking into account the needs of their learners and the relevance to everyday issues. While the learner should choose the topic to be investigated, it would be reasonable for the choice the learner makes to be one where the teacher/lecturer has some expertise and has resources available to enable the learner to successfully meet the Assessment Standards.

The Assignment offers opportunities for learners to work in partnership and in teams, though it must be clear, at each stage, that the learner has produced evidence of their contribution to any group work carried out.

Combining assessment across Units

If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units. If this approach is used, then it is necessary to be able to track evidence for individual Outcomes and Assessment Standards.

Transfer of evidence: Outcome 1 in a Unit may be used as evidence of the achievement of Outcome 1 in other Units of this Course.

Equality and inclusion

The following should be taken into consideration:

Situation	Reasonable Adjustment
Carrying out practical activities	Use could be made of practical helpers for learners with: ♦ physical disabilities, especially manual dexterity, when carrying out practical activities ♦ visual impairment who have difficulty distinguishing colour changes or other visual information
Reading, writing and presenting text, symbolic representation, tables, graphs and diagrams	Use could be made of ICT, enlarged text, alternative paper and/or print colour and/or practical helpers for learners with visual impairment, specific learning difficulties and physical disabilities
Process information using calculations	Use could be made of practical helpers for learners with specific cognitive difficulties (eg dyscalculia)
Draw a valid conclusion, giving explanations and making generalisation/predictions	Use could be made of practical helpers for learners with specific cognitive difficulties or autism

As far as possible, reasonable adjustments should be made for the Assignment, where necessary. This includes the use of 'practical helpers', readers, scribes, adapted equipment or assistive technologies.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Course Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Course.

It is important that centres are aware of and understand SQA's assessment arrangements for disabled learners, and those with additional support needs, when making requests for adjustments to published assessment arrangements. Centres will find more guidance on this in the series of publications on Assessment Arrangements on SQA's website: www.sqa.org.uk/sqa//14977.html.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications are available on SQA's website at: www.sqa.org.uk/sqa//14977.html.
- *Building the Curriculum 3: A framework for Learning and Teaching*
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- *Course Specifications*
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- Principles and practice papers for Sciences curriculum area
- Science: A Portrait of current practice in Scottish schools (Nov 2008)
- *SCQF Handbook: User Guide* (published 2009) and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*

Administrative information

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Superclass: to be advised

History of changes to Course Support Notes

Course details	Version	Description of change	Authorised by	Date

Unit Support Notes

Unit Support Notes — Cell Biology (National 4)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Cell Biology (National 4) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- *Added Value Unit Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with knowledge and understanding of cell biology.

Learners will apply these skills when considering the applications of cell biology on our lives, as well as the implications on society/the environment. This can be done by using a variety of approaches, including investigation and problem solving. The Unit covers the key areas of:

- Cell division and its role in growth and repair
- DNA, genes and chromosomes
- Therapeutic use of cells
- Properties of enzymes and use in industries
- Properties of microorganisms and use in industries
- Photosynthesis — limiting factors
- Factors affecting respiration
- Controversial biological procedures

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

Progression into this Unit

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 the following or equivalent qualifications and/or experience:

- National 3 Biology Course

There may also be progression from National 3 Chemistry, National 3 Environmental Science, National 3 Physics or National 3 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 4 Biology *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers should cover the mandatory skills and key areas in ways which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- Other qualifications in Biology
- Further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are covered in the *Course Support Notes*.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit, is given in the relevant *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and, where possible, enable personalisation and choice for learners in assessment methods and processes. Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching. The table below gives guidance and advice on possible approaches to assessment and gathering evidence:

Strategies for gathering evidence
There may be opportunities in the day-to-day delivery of the Units in a Course to observe learners providing evidence, which satisfies completely, or partially, a Unit or Units. This is naturally occurring evidence and can be recorded as evidence for an Outcome or parts of an Outcome. In some cases, additional evidence may also be required to supplement and confirm the naturally occurring evidence. Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner by bringing together different Outcomes and/or Assessment Standards.

If a holistic approach is used, then it is necessary to be able to track individual Assessment Standard evidence.

Strategies for gathering evidence and ensuring that the learners' work is their own could include:

- personal interviews during which the teacher or lecturer can ask additional questions about completed work
- an oral presentation on their work
- writing reports in supervised conditions
- checklists to record the authenticity
- supplementary sources of evidence, such as witness testimony, film or audio clips

Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods, which could include a test of knowledge, understanding and skills.

Equality and inclusion

The *Course Support Notes* provide full information on equality and inclusion for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these Unit Support Notes is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and where the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 3: A framework for Learning and Teaching*
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- *Course Specifications*
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- Science: A Portrait of current practice in Scottish schools (Nov 2008)
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

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History of changes to Unit Support Notes

Unit details	Version	Description of change	Authorised by	Date

Unit Support Notes

Unit Support Notes — Biology: Multicellular Organisms (National 4)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Biology: Multicellular Organisms (National 4) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- *Added Value Unit Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with knowledge and understanding of multicellular organisms.

Learners will apply these skills when considering the applications of multicellular organisms on our lives, as well as the implications on society/the environment. This can be done by using a variety of approaches, including investigation and problem solving. The Unit covers the key areas of:

- Sexual and asexual reproduction and their importance for survival of species
- Propagating and growing plants
- Commercial use of plants
- Genetic information
- Growth and development of different organisms
- Biological actions in response to internal and external changes to maintain stable body conditions

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

Progression into this Unit

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 the following or equivalent qualifications and/or experience:

- National 3 Biology Course

There may also be progression from National 3 Chemistry, National 3 Environmental Science, National 3 Physics or National 3 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 4 Biology *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers should cover the mandatory skills and key areas in ways which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- Other qualifications in Biology
- Further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are covered in the *Course Support N*otes.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit, is given in the relevant *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and, where possible, enable personalisation and choice for learners in assessment methods and processes. Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching. The table below gives guidance and advice on possible approaches to assessment and gathering evidence:

Strategies for gathering evidence
There may be opportunities in the day-to-day delivery of the Units in a Course to observe learners providing evidence, which satisfies completely, or partially, a Unit or Units. This is naturally occurring evidence and can be recorded as evidence for an Outcome or parts of an Outcome. In some cases, additional evidence may also be required to supplement and confirm the naturally occurring evidence. Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner by bringing together different Outcomes and/or Assessment Standards. If a holistic approach is used, then it is necessary to be able to track individual

Assessment Standard evidence.
Strategies for gathering evidence and ensuring that the learners' work is their own could include:

- personal interviews during which the teacher or lecturer can ask additional questions about completed work
- an oral presentation on their work
- writing reports in supervised conditions
- checklists to record the authenticity
- supplementary sources of evidence, such as witness testimony, film or audio clips

Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods, which could include a test of knowledge, understanding and skills.

Equality and inclusion

The *Course Support Notes* provide full information on equality and Inclusion for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these Unit Support Notes is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and where the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled learners and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 3: A framework for Learning and Teaching*
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- *Course Specifications*
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- Science: A Portrait of current practice in Scottish schools (Nov 2008)
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: April 2012 (version 1.0)

Superclass: to be advised

History of changes to Unit Support Notes

Unit details	Version	Description of change	Authorised by	Date

Unit Support Notes

Unit Support Notes — Biology: Life on Earth (National 4)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Biology: Life on Earth (National 4) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- *Added Value Unit Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

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

- Animal and plants species depend on each other
- Impact of population growth and natural hazards on biodiversity
- Nitrogen cycle
- Fertiliser design and environmental impact of fertilisers
- Adaptations for survival
- Learned behaviour in response to stimuli linked to species survival

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

Progression into this Unit

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 the following or equivalent qualifications and/or experience:

- National 3 Biology Course

There may also be progression from National 3 Chemistry, National 3 Environmental Science, National 3 Physics or National 3 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 4 Biology *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers should cover the mandatory skills and key areas in ways which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- Other qualifications in Biology
- Further study, employment and/or training

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Approaches to learning and teaching and suggested learning activities are covered in the *Course Support Notes*.

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