Course Support Notes

National 5 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).

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Contents

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 5 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 *Course Assessment Specification* and the *Unit Specifications* 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, including the impact these could make 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 planning skills
- develop problem solving skills in a biology 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 biology
- develop skills of independent working

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 4 Biology Course

There may also be progression from National 4 Chemistry, National 4 Environmental Science, National 4 Physics and National 4 Science Courses.

Experiences and outcomes

Learners who have completed relevant 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 *Course Assessment 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:

- Higher Biology or Higher Human Biology
- National 5 Course in another science subject
- Skills for Work Courses (SCQF levels 5 or 6)
- National Certificate Group Awards
- National Progression Awards (SCQF levels 5 or 6)
- 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 National 5 Biology Course Assessment Specification.

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, and Course Assessment 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 and 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 eg 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 National 5 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 **Mandatory Course key areas** are from the *Course Assessment Specification*. 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 Mandatory Course key areas are open to personalisation and choice, so centres may also devise their own learning activities.

Suggested **Exemplification of key areas** is not mandatory. It provides an outline of the level of demand and detail of the key areas.

Cell Biology		
Mandatory Course key areas	**Suggested learning activities**	**Exemplification of key areas**
1 Cell structure Cell ultrastructure and functions to include: cell walls, mitochondria, chloroplasts, cell membrane, vacuole, nucleus, ribosomes and plasmids using examples from typical plant, animal, fungi and bacteria cells.	Examine fresh and prepared slides of a range of plant, animal and microbial cells using appropriate stains and a light microscope/ bioviewer eg cheek epithelium, onion epidermis, rhubarb epidermis, Elodea, yeast. Numeracy activities on cell size to investigate cell length and breadth.	Functions of structures exemplified later in this Unit. Fungal structure in terms of similarity to plant and animal cells but with a different cell wall structure. Bacterial structures only to include absence of organelles and a different cell wall structure to plant and fungal cells. Chemical composition of cell walls not required.
2 Transport across cell membranes a. The cell membrane consists of lipids and proteins and is selectively permeable. b. Passive transport is with the concentration gradient and does not require energy. c. The importance of diffusion in cells as the movement of molecules along a concentration gradient. d. Osmosis as the movement of water molecules across a membrane in terms of	Investigate the structure of the fluid mosaic model. Investigate diffusion and osmosis using visking tubing and/or mass/length of plant tissue, bleeding in plant cells, plant cell plasmolysis, mass changes in egg (shell removed by soaking in vinegar) in syrup/water. Research examples of osmosis for eg power generation, desalination.	Different concentrations of substances exist between cells and their environment. Diffusion in terms of concentration gradients and importance to cells could include glucose, carbon dioxide, oxygen or amino acids.

water concentration. e. Animal cells can burst or shrink and plant cells can become turgid or plasmolysed in different solutions. f. Active transport requires energy for membrane proteins to move molecules against the concentration gradient.	Differential uptake of dye in boiled and live yeast cells.	Appropriate examples for active transport could include sodium and potassium in nerve cells, or iodine in seaweeds. These processes can be applied across relevant areas of the Course.
3 Producing new cells a. Maintenance of diploid chromosome complement by mitosis. Sequence of events of mitosis, including equator and spindle fibres. b. Cell production by cell culture requires aseptic techniques, an appropriate medium and the control of other factors.	Carry out numeracy activities based on cell growth graphs/curves. Select and present information using mitosis stage cards. Create model chromosomes. Observe prepared root tip cell slides/bioviewer. Practical activity/investigation/research into aseptic techniques, solid and liquid media in cell culture and use of fermenters.	Diploid cells have two matching sets of chromosomes, which are replicated during mitosis. Names of mitosis phases are not needed. Appropriate growth media include various nutrient broths and agars. Appropriate factors could include oxygen, temperature and pH.
4 DNA and the production of proteins a. Structure of DNA: double-stranded helix held by complementary base pairs. DNA carries the genetic information for making proteins. The four bases A, T, C and G make up the genetic code. The base sequence determines amino acid sequence in protein.	Research the relationship between chromosomes, genes, DNA and protein to illustrate that genes are located on chromosomes. Construction of 2D or 3D DNA models. Paper models of base pairing or DNA sections.	

b. Messenger RNA (mRNA) is a molecule which carries a copy of the code from the DNA, in the nucleus, to a ribosome, where the protein is assembled from amino acids.	Research biologists eg Watson and Crick, Rosalind Franklin, Maurice Wilkins, Chargaff.	Further details of transcription and translation are not required.
5 Proteins and enzymes a. The variety of protein shapes and functions arises from the sequence of amino acids. b. Functions of proteins to include structural, enzymes, hormones, antibodies. c. Enzymes function as biological catalysts and are made by all living cells. They speed up cellular reactions and are unchanged in the process. The shape of the active site of enzyme molecules is complementary to a specific substrate. d. Each enzyme works best in its optimum conditions. Enzymes and other proteins can be affected by temperature and pH, which result in changes in their shape. A change in shape will affect the rate of reaction and may result in denaturation.	Create protein models eg haemoglobin, antibodies, membrane proteins and enzymes. Use of appropriate software eg RasMol, Protein Explorer. Enzyme experiments with eg pepsin, lipase, amylase, catalase to investigate the influence of temperature and pH on activity. Effect of temperature and pH on egg white as a model for effect on other proteins. Model/sequencing activates on stages.	Levels of protein structure such as secondary/tertiary not required.

6 Genetic engineering Genetic information can be transferred from one cell to another naturally or by genetic engineering. Stages of genetic engineering to include: identify section of DNA that contains required gene from source chromosome, extract required gene, insert required gene into vector/bacterial plasmid, insert plasmid into host cell and grow transformed cells to produce a GM organism.	Research current genetic foods/issues such as golden rice, less toxic rape seed oil, bird resistance to bird flu, tomatoes with longer shelf life, blight resistant potatoes, production of medicines for human use eg insulin and growth hormone.	DNA can be transferred naturally between cells either by bacterial plasmids or viruses. Details of these processes not required. Links with Life on Earth Unit.
7 Photosynthesis a. Chemistry of photosynthesis, as a series of enzyme-controlled reactions, in a two-stage process Light reactions: the light energy from the sun is trapped by chlorophyll in the chloroplasts and is converted into chemical energy in the form of ATP. Water is split to produce hydrogen and oxygen. Excess oxygen diffuses from the cell. Carbon fixation: hydrogen and ATP produced by the light reaction is used with carbon dioxide to produce sugar. b. The chemical energy in sugar is available for respiration or can be converted into plant products such as starch and cellulose. c. Limiting factors: carbon dioxide concentration, light intensity and temperature and their impact on photosynthesis and cell growth.	Oxygen production, carbon dioxide uptake or rate of photosynthesis can be investigated through the use of floating leaf discs, Elodea, Cabomba or immobilised algae. These can also be used to investigate limiting factors. Use IT simulations of photosynthesis experiments eg Multimedia Science Factors affecting starch production can be investigated through iodine testing in leaves. Analysis of limiting factors graphs.	Summary word equation for photosynthesis: $\text{Carbon dioxide} + \text{water} \xrightarrow[\text{Chlorophyll}]{\text{Light energy}} \text{sugar} + \text{oxygen}$ Carbohydrates can then be used to produce fats and proteins.

8 Respiration a. The chemical energy stored in glucose must be released by all cells through a series of enzyme-controlled reactions called respiration. b. The energy released from the breakdown of glucose is used to generate ATP from ADP and phosphate. The chemical energy stored in ATP can be released by breaking it down to ADP and phosphate. This energy can be used for cellular activities including muscle cell contraction, cell division, protein synthesis and transmission of nerve impulses. ATP can be regenerated during respiration. The breakdown of each glucose molecule via pyruvate to carbon dioxide and water in the presence of oxygen yields 38 molecules of ATP. The breakdown of each glucose molecule via the fermentation pathway yields 2 molecules of ATP when oxygen is not present. Breakdown of glucose to lactic acid via pyruvate in animal cells. Breakdown of glucose to alcohol/ethanol and carbon dioxide via pyruvate in plant and yeast cells. c. Fermentation occurs in the cytoplasm. Aerobic respiration starts in the cytoplasm and is completed in the mitochondria.	Practical investigations on burning food. Practical investigations of DCPIP/Cabomba and hydrogen carbonate indicator. Use immobilised yeast and hydrogen carbonate indicator, resazurin or gas sensors and data loggers to investigate rate of respiration. Investigate respiration indirectly through breathing rates before and during exercise in humans.	Cells such as muscle, companion, sperm, neurone will have a high number of mitochondria as they require a lot of energy. Summary word equations for respiration: Glucose + oxygen $\rightarrow$ carbon dioxide + water Glucose $\rightarrow$ ethanol/alcohol + carbon dioxide Glucose $\rightarrow$ lactic acid Links with Multicellular Organisms Unit.

Multicellular Organisms		
Mandatory Course key areas	**Suggested learning activities**	**Exemplification of key areas**
1 Cells, tissues and organs Specialisation of cells, in animals and plants, leads to the formation of a variety of tissues and organs.	Examine a variety of cells from different tissues to relate their structure to function.	Multicellular organisms have more than one cell type and are made up of tissues and organs. Organs perform different functions. The cells in organs are specialised for their function. Specialisation can be applied to all named tissues in this Unit.
2 Stem cells and meristems a. Stem cells are the sites of production of specialised cells in animals and have the potential to become different types of cell. Stem cells are involved in growth and repair. b. Meristems are the sites of production of non-specialised cells in plants and are the only sites for cell division in a plant. These cells have the potential to become any type of plant cell and they contribute to plant growth.	Use a variety of media to investigate the potential uses of stem cells and discuss ethical issues associated with their use. Carry out practicals on root tip/shoot tip stain.	

3 Control and Communication a. Nervous control Nervous control in animals, including structure and function of central nervous system (CNS). Brain structure: cerebrum, cerebellum and medulla.	Investigate examples of where communication pathways are used eg pain receptors.	Internal communication is required for survival of a multicellular organism. Cells in multicellular organisms do not work independently.
b. Rapid reflex action and reflex arc: sensory, relay and motor neurons. Receptors detect sensory input/stimuli. Electrical impulses move along neurons. A synapse occurs between neurons, allowing chemicals to transfer from one neuron to another.	Investigate examples of human reflex activities eg knee-jerk.	Sensory neurons pass the information to the central nervous system. The CNS processes the information from our senses which needs a response. Motor neurons enable a response to occur, which can be a rapid action from a muscle or a slower response from a gland.
c. Hormonal control Endocrine glands release hormones into the blood stream. Hormones are chemical messengers. Target tissues have cells with receptors for hormones, so only some tissues are affected by specific hormones.	Research the role of hormones in the body.	
d. Blood glucose regulation to include insulin, glucagon, glycogen, pancreas and liver.	Investigate the causes and treatment of both type 1 and type 2 diabetes with reference to trends in Scottish health statistics.	Diabetes as a communication pathway that has failed due to a fault in release or a failure to respond to insulin and consequences and treatment. Reference can be made to the benefits of controlling blood glucose level in relation to osmosis in cells. Detail of negative feedback is not required.

4 Reproduction a. Body cells are diploid. The structures and sites of gamete production in plants and animals. b. The fertilisation of haploid gametes to produce a diploid zygote.	Compare and contrast male and female animal and plant gametes, gonads and organs from micrographs, models, reference materials, photographs and dissection of flowers.	
5 Variation and Inheritance a. Comparison of discrete and continuous variation. b. Most features of an individual phenotype are polygenic and show continuous variation. c. Identification of phenotype and genotype, dominant and recessive characteristics and homozygous and heterozygous individuals.	Investigate a variety of discrete and continuous characteristics in organisms eg ear lobes, tongue-rolling and height. Research Mendel's work on peas. Research polygenic inheritance. Use punnet squares to explain inheritance. Carry out Gene Jury activity (How my genes work) to build individual.	Combining genes from separate parents contributes to variation within a species. Single gene inheritance of characters showing discrete variation where measurements fall into distinct groups. Family trees can be used to identify the phenotype and genotype of individuals. Carrier individuals of medical traits can receive genetic counselling. Family tress and pedigree charts can be used to identify individuals.
6 The need for transport a. Plant transport systems i. Water is required for transporting materials and for photosynthesis. ii. Structures and processes involved in water movement to include root hairs, guard cells, stomata, epidermis, mesophyll cells and transpiration.	Investigate the germination of seeds to show root hairs. Transpiration experiments to show water loss. Set up stomatal models, use leaf peels and microscopes to view stomata.	Multicellular organisms need transport systems to deal with surface area to volume ratio issue. Transpiration is the loss of water through leaves. Water is lost by evaporation through stomata, whose opening and closing is controlled by guard cells, which are found in the leaf epidermis. Mesophyll cells of the leaf require water for

Water and minerals are transported up through the stem in xylem. Xylem cells are lignified. iii. Sugar is transported up and down the plant in living phloem cells.	Stain xylem vessels using dye/celery. Examine slides showing xylem and phloem structure.	photosynthesis. Xylem cells are lignified to withstand the pressure changes as water moves through the plant.
b. Animal transport and exchange systems i. In mammals, nutrients, oxygen and carbon dioxide are transported in the blood. ii. Pathway of blood through heart, lungs and body. Heart structure to include right and left atria and ventricles. Blood vessels to include: aorta, vena cava, pulmonary arteries and veins, and coronary arteries. iii. Arteries have thick, muscular walls, a narrow central channel and carry blood under high pressure. Veins carry blood under low pressure; have thinner walls and a wide channel. Veins contain valves to prevent backflow of blood. Capillaries form networks at organs and tissues, and are thin walled and have a large surface area, allowing exchange of materials. iv. Red blood cells contain haemoglobin and are specialised to carry oxygen. v. Rings of cartilage keep airways open. Oxygen and carbon dioxide are exchanged in the alveoli. Alveoli have a large surface	Investigate heart structure eg dissection, models, films. Investigate structure of arteries, veins, capillaries and blood cells. Investigate lungs eg dissection, model, films.	

area, a good blood supply and thin walls to allow diffusion of gases. Mucus traps dirt and microorganisms and cilia moves this up and out of the lungs. vi. Food is moved through the digestive system by peristalsis. Villi in the small intestine are thin walled, have a large surface area and a good blood supply to aid absorption of glucose and amino acids. The lacteals transport the products of fat digestion.	Comparisons can be made between cartilage in airways and lignin in xylem. Peristalsis model. Model gut.	
7 Effects of lifestyle choices on animal transport and exchange systems	Use health promotion and reference materials to identify how healthier lifestyle choices can directly and indirectly improve the physical and mental health of an individual. Take physiological measurements. Investigate the effect of moderate exercise on these measurements. Debate whether all illnesses should be treated for free under the National Health Service in the UK.	Possible examples of lifestyle choices could be high-fat or high-salt diet, lack of exercise, use of tobacco or alcohol, or high-stress experiences. These directly and indirectly increase the chances of fatty deposits in blood vessels, blood clots, heart attacks, strokes, diabetes and stress. Lack of iron means haemoglobin cannot be made and can lead to anaemia. Possible environmental factors could be heavy metals, radiation and pollution. Heredity plays a part in the incidence of some conditions.

Life on Earth		
Mandatory Course key areas	**Suggested learning activities**	**Exemplification of key areas**
1 Biodiversity and the distribution of life a. Biotic, abiotic and human influences are all factors that affect biodiversity in an ecosystem.	Investigate a range of human influences that affect national and global environments such as: pollution of air and water, habitat destruction by eg deforestation (tropical rain forest), desertification, endangered species, overfishing and lichen studies.	Various factors can increase or decrease the biodiversity of an ecosystem. pH and temperature can affect the variety of fish species.
b. Grazing and predation are biotic factors; pH and temperature are abiotic factors.	Interpret predator prey interaction graphs. Analyse Barn owl pellets from Barn Owl Trust website.	
c. Biomes are the various regions of our planet as distinguished by their similar climate, fauna and flora. Global distribution of biomes can be influenced by temperature and rainfall.	Research a range of biomes eg freshwater, marine, desert, forests, grassland, and tundra. Open Door website.	
d. An ecosystem consists of all the organisms living in a particular area and the non-living components with which the organisms interact.	Case studies/fieldwork on eg Caledonian forests, sea lochs, heather moorland, tropical rainforests, arctic tundra, coral reefs and deserts.	
e. A niche is the role that an organism plays within a community. It includes the use it makes of the resources in its ecosystem and its interactions with other organisms in the community including competition, parasitism, predation, light, temperature and nutrient availability.	Investigate examples of niches of Scottish wildlife eg wildcat, red squirrel, red grouse, Scottish crossbill, brown trout, bracken. Analyse data related to distribution of barnacles on rocky shores, native woodland and red deer numbers, distribution of ptarmigan.	

2 Energy in ecosystems a. At each level in a food chain 90% of energy is lost as heat, movement or undigested materials.	Investigate examples of pyramid of energy (as measured in kJ/m^2/year), pyramid of biomass (g/m^2) and pyramid of numbers.	Some losses can be accounted for through decomposition.
b. Definitions and comparison of pyramids of biomass, energy and numbers.	Investigate irregular pyramids of number eg a tree as a producer, presence of parasites.	Irregular shapes of pyramids of numbers based on different body sizes are represented as true pyramids of energy and of biomass.
c. Nitrogen in ecosystems Animal and plant proteins are produced from nitrates. The roles of nitrifying, denitrifying, root nodule and free-fixing soil bacteria. Decomposers convert proteins and nitrogenous wastes to ammonium and nitrate.	Construct simple flow diagrams that illustrate the cyclical activities in the Nitrogen cycle.	Fertilisers supply nitrates to increase yield.
d. Competition in ecosystems Interspecific competition is when individuals of different species compete for the same resource in an ecosystem.	Investigate interspecific competition eg red and grey squirrels, brown and rainbow trout.	Competition examples can include food, light, and water.
Intraspecific competition is when individuals of the same species compete for exactly the same resources.	Investigate intraspecific competition eg cress seedling seed number, trees of the same species growing close together, feeding in grasshoppers, territorial behaviour in birds eg robins, red grouse.	

3 Sampling techniques and measurement of abiotic and biotic factors a. Sampling plants and animals using quantitative techniques including quadrats and pitfall traps. b. Evaluation of limitations and sources of error in pitfall traps and quadrats. c. Measuring abiotic factors including light intensity, temperature, pH and soil moisture.	Techniques for biotic factors eg quadrats, transect, pitfall trap, Tullgren funnel, pooters, and tree beating/sweep net, pond netting. Techniques for abiotic factors; temperature using thermometer or temperature probes, light using light meters, moisture using moisture meters, pH using pH meters or chemical test. Use of probes linked to appropriate data logging software. Using data to assess the effect of abiotic factors on the distribution of organisms. Using and constructing paired-statement keys to identify organisms.	Representative sampling and adequate replication.
4 Adaptation, natural selection and the evolution of species a. A mutation is a random change to genetic material. Mutations may be neutral, confer an advantage or a disadvantage. Mutations are spontaneous and are the only source of new alleles. Environmental factors, such as radiation and chemicals, can increase rate of mutation.	Research different types of mutation — neutral, advantageous or disadvantageous. Research mutagenic agents.	

b. Variation within a population makes it possible for a population to evolve over time in response to changing environmental conditions.	Investigate examples of adaptations such as desert mammals, plants and specific pollinators eg orchids and moths, acacia ants and acacias, bee pollinated plants and flower colour related to bee vision. Galapagos finches. Desert plants Investigate the 'Red Queen' model of ecology in which competition is the engine of evolutionary change. Research consequences of over-prescription of antibiotics. Case Study on insect resistance to 'built-in' insecticides in GM crops eg bollworm moth in cotton, European corn borer in maize.	An adaptation is an inherited characteristic that makes an organism well suited to survival in its environment/niche.
c. Natural selection/survival of the fittest occurs when more offspring are produced than the environment can sustain. Only the best adapted individuals survive to reproduce, passing on the genes that confer the selective advantage.		
d. Speciation occurs after a population becomes isolated and natural selection follows a different path due to different conditions/selection pressures.	Research Scottish examples of isolation leading to speciation eg Arran Whitebeam, St Kilda Wren, Arctic Char. Research examples of rapid natural selection eg MRSA, insect resistance to GM crop toxins. Research the Tree of Life using OU/BBC chart to illustrate inter-connectedness of all life.	

5 Human impact on the environment a. Increasing human population requires an increased food yield. b. Fertilisers can leach into fresh water, causing algal blooms. This leads to a reduction in oxygen levels. c. Pesticides sprayed onto crops can accumulate in the bodies of organisms over time. As they are passed along food chains, toxicity increases and can reach fatal levels. d. Indicator species are species that by their presence or absence indicate environmental quality/levels of pollution. e. Biological control and GM crops may be alternatives to mitigate the effects of intensive farming on the environment.	Research GM crops, monoculture and intensive farming. Investigate the importance of minerals such as nitrates and magnesium for plant growth. Investigate bioaccumulation eg DDT. Research importance of different environmental indicator species. Survey local area for different varieties of lichen and assess local air quality. Sample freshwater invertebrates from local water courses/ponds and assess water quality. Investigate biological control eg using a virus (Myxomatosis) to kill rabbits, using ladybirds to kill aphids and scale insects, using caterpillar moth (Cactoblastis) to kill cacti (Opuntia).	There are opportunities throughout this topic for learners to investigate and debate ethical issues.

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 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, whenever 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 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment.

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

Preparation for Course assessment

Each Course has additional time which may be used at the discretion of the teacher or lecturer to enable learners to prepare for Course assessment. This time may be used near the start of the Course and at various points throughout the Course for consolidation and support. It may also be used for preparation for Unit assessment, and towards the end of the Course, for further integration, revision and preparation and/or gathering evidence for Course assessment.

During delivery of the Course, opportunities should be found:

- for identification of particular aspects of work requiring reinforcement and support
- to practise skills of scientific inquiry and investigation in preparation for the Assignment
- to practise question paper techniques

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 for 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 Question Paper and/or Assignment, where necessary. All adjustments currently available for the Question Paper would be available for Component 1. Learners will have a choice of Assignment topic for Component 2, for which reasonable adjustments can be made. 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

Published: April 2012 (version 1.0)

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 5)

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 5) 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*
- the *Course Assessment 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 structure
- Transport across cell membranes
- Producing new cells
- DNA and the production of proteins
- Proteins and enzymes
- Genetic engineering
- Photosynthesis and respiration

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 4 Biology Course

There may also be progression from National 4 Chemistry, National 4 Environmental Science, National 4 Physics and National 4 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 5 Biology *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other qualifications in Biology or related areas
- 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 that the alternative approaches 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 Sciences curriculum area*
- *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: Multicellular Organisms (National 5)

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 5) 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*
- the *Course Assessment 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:

- Cells, tissues and organs
- Stem cells and meristems
- Control and communication
- Reproduction, variation and inheritance
- The need for transport
- Effects of life-style choices on animal transport and exchange systems

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 4 Biology Course

There may also be progression from National 4 Chemistry, National 4 Environmental Science, National 4 Physics and National 4 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 5 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 or related areas
- 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 toassessment 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 that the alternative approaches 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
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- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
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- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
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Administrative information

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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 5)

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 5) 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*
- the *Course Assessment 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:

- Biodiversity and the distribution of life
- Energy in ecosystems
- Sampling techniques and measurement of abiotic and biotic factors
- Adaptation, natural selection and the evolution of species
- Human impact on the environment

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 4 Biology Course

There may also be progression from National 4 Chemistry, National 4 Environmental Science, National 4 Physics, and National 4 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 5 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 or related areas
- 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 that the alternative approaches 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.

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- *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)
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- *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)
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History of changes to Unit Support Notes

Unit details	Version	Description of change	Authorised by	Date