

BIOLOGY
Intermediate 1

Fourth Edition – published June 2002

NOTE OF CHANGES TO ARRANGEMENTS FOURTH EDITION PUBLISHED JUNE 2002

COURSE TITLE: Biology (Intermediate 1)

COURSE NUMBER: C007 10

National Course Specification

Course Details:

Assessment: section inserted which details Instruments for Internal Assessment and emphasises need for only one report for Outcome 3 being required across the course.

Clarification to Content and Notes throughout to give indication of depth of treatment.

National Unit Specification:

All Units

Statement of Standards

Wording of Outcome 3 changed to refer to Intermediate 1 Biology instead of the title of the unit.

Evidence Requirements of Outcome 3 changed to refer to the context of the report being within the content and notes specified for Intermediate 1 Biology instead of within the context of each unit.

Support Notes

Additional guidance is given on the content and context for each unit.

Guidance on Approaches to Assessment for the units includes:

- additional guidance which emphasises the need to produce only one report across the course and that a report from one unit may be used as evidence for Outcome 3 for the other units
- advice on redrafting only being required for the specific performance criterion in need of further attention
- advice on the conditions required to complete the report which indicates that reports may be completed outwith class time provided reasonable measures are taken to ensure that the report is the individual work of the candidate
- advice on the use of IT for production of the Outcome 3 report
- advice on the transfer of evidence.

National Course Specification

BIOLOGY (INTERMEDIATE 1)

COURSE NUMBER C007 10

COURSE STRUCTURE

The course has three 40 hour units. The units cover the following content areas:

D023 10	<i>Health and Technology (Int 1)</i> <ul style="list-style-type: none">• <i>What is Health and Technology?</i>• <i>A Healthy Heart</i>• <i>A Healthy Lungs</i>• <i>A Healthy Body</i>	<i>1 credit (40 hours)</i>
D024 10	<i>Biotechnological Industries (Int 1)</i> <ul style="list-style-type: none">• <i>Dairy Industries</i>• <i>Yeast-Based Industries</i>• <i>Detergent Industries</i>• <i>Pharmaceutical Industries</i>	<i>1 credit (40 hours)</i>
D025 10	<i>Growing Plants (Int 1)</i> <ul style="list-style-type: none">• <i>Growing Plants from Seeds</i>• <i>Vegetative Propagation</i>• <i>Plant Production</i>	<i>1 credit (40 hours)</i>

In common with all courses, this course includes 40 hours over and above the 120 hours for the component units. This may be used for induction, extending the range of learning and teaching approaches, support, consolidation, integration of learning and preparation for external assessment. This time is an important element of the course and advice on its use is included in the course details.

Administrative Information

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National Course Specification (cont)

COURSE Biology (Intermediate 1)

RECOMMENDED ENTRY

While entry is at the discretion of the centre and no previous biology experience is required, the course would be suitable for those with an award in Standard Grade Biology, Chemistry, Physics or Science at Grades 4-7.

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, 2001).

National Course Specification: course details

COURSE Biology (Intermediate 1)

RATIONALE

The course provides a broad-based biology experience designed to stimulate interest in a range of applied and vocational areas of biology. The areas selected for study are those of economic, vocational and social importance. Intermediate 1 Biology is intended to broaden the experience of science for those candidates not intending to pursue a career in science and it will also allow candidates who do wish to progress in a biology-related occupation to make informed choices. The course also develops an understanding of the importance of biological issues facing the individual and society. The study of Intermediate 1 Biology contributes to the candidate's general and vocational education by developing the general attitudes and abilities related to the processes of science, as well as the ability to work both cooperatively and independently, and fosters positive attitudes to themselves and others.

The course provides opportunities for candidates to acquire:

- knowledge and understanding of biological principles and facts and their applications
- appreciation of the relevance of biology to themselves and to society and industry
- skills in problem solving
- practical abilities associated with biology
- positive attitudes such as being open-minded and being willing to recognise alternative points of view, having an interest in biology, in themselves and their environment, being aware that they can make decisions which affect the well-being of themselves and others, and the quality of their environment.

COURSE CONTENT

Intermediate 1 Biology comprises three units each of which has a short introduction summarising the content. The content has been specifically chosen to provide articulation with and progression from Standard Grade Science and Biology. The course develops the elements of knowledge and understanding, problem solving and practical abilities.

Knowledge and understanding

Candidates are not required to acquire and retain a large quantity of biological knowledge but should develop the ability to display and use knowledge as evidence of understanding the facts and principles detailed in the course content and notes.

National Course Specification: course details (cont)

COURSE Biology (Intermediate 1)

Problem solving and practical skills

Practical work is the main focus of the course, with emphasis on the use of techniques from applied areas of biology. Practical work fosters familiarity with apparatus, equipment and how it works as a useful preparation for further study or employment. Problem solving is developed through investigations relevant to the work of the course. As a result of engaging in practical work and investigations, candidates can generally:

- follow experimental procedures accurately and safely
- record relevant measurements and observations in appropriate formats
- identify and collect appropriate data
- analyse and present collected data in a variety of forms, including written summaries, tables and graphs
- draw valid conclusions.

The following tables contain the content and suggested learning activities through which knowledge and understanding, problem solving and practical abilities are to be developed. The learning activities are designed to provide the main focus for learning and teaching. The function of the content and notes is to provide guidance on the contexts in which these activities may take place. The unit specifications and details of the instruments of external assessment emphasise the importance of problem-solving skills rather than the retention and recall of information. This different emphasis in learning and teaching from Biology courses at other levels should allow the development of a more practically based investigative approach.

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

Introduction

The Unit is designed to familiarise candidates with the use of technology in measuring, recording and monitoring health. During the work of the unit, candidates should be encouraged to develop personal and interpersonal skills which will increase their abilities to make informed decisions and take positive action concerning their own health.

CONTENT	NOTES	LEARNING ACTIVITIES
<p>1 What is health and technology?</p> <p>i The meaning of health.</p> <p>The health triangle.</p> <p>The importance of a healthy lifestyle.</p> <p>ii The value of physiological measurements as indicators of health.</p> <p>The advantages and disadvantages of high tech and low tech approaches to measuring temperature, body fat, blood pressure and heart rate (pulse rate).</p>	<p>To include: social, mental and physical aspects.</p> <p>To include: eating an appropriate range of foods, taking regular exercise, taking part in pleasurable activities, taking regular relaxation, avoiding unnecessary health risks such as smoking cigarettes, drinking alcohol and taking drugs.</p> <p>Examples of high tech instruments to include digital thermometer or liquid crystal thermometer, body fat sensor, digital sphygmomanometer, pulsometer or heart rate monitor.</p> <p>Examples of low tech instruments to include clinical thermometers, skin fold callipers, stethoscope and mercury manometer, stethoscope/finger and stop watch.</p>	<p>Collect and discuss newspaper/magazine cuttings relating to health and relate to the three aspects of health.</p> <p>Discuss advantages and disadvantages of high tech and low tech approaches.</p>

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>2 A healthy heart</p> <p>i The heart and circulatory system.</p> <p>The heart as a muscle which pumps blood around the body.</p> <p>The three main blood vessels are arteries, veins and capillaries.</p> <p>Transport function.</p> <p>ii Pulse rate as a health indicator.</p> <p>Pulse rate, its measurement and the normal range of values.</p> <p>Recovery time.</p> <p>Effect of exercise on pulse rate and recovery time.</p>	<p>The names of heart chambers and attached vessels are not required.</p> <p>Arteries carry blood away from the heart. Veins carry blood towards the heart. Capillaries link arteries with veins.</p> <p>Blood carries oxygen, nutrients, carbon dioxide and waste products around the body. Capillaries allow nutrients and oxygen to pass from the blood to the tissues and allow carbon dioxide and other waste to leave the tissues.</p> <p>Pulse can be measured using a pulsometer or heart rate monitor, stethoscope/finger and stop watch.</p> <p>The normal range of values for pulse rate depends on size, age, sex and fitness of person.</p> <p>A high resting pulse rate can lead to heart disease. A low resting pulse rate and a short recovery time can indicate fitness.</p> <p>Recovery time is the time taken for the pulse rate to return to normal after exercise.</p> <p>Resting pulse rate and recovery time can be reduced by taking regular exercise.</p>	<p>View video material of heart beating. Examine a sheep's heart.</p> <p>Carry out Harvey's demonstration of the emptying of veins in the arm.</p> <p>LO2 – Measuring pulse rate.</p> <p>Use a variety of techniques to measure heart rate, eg take pulse with stop watch, stethoscope, pulsometer, heart rate monitor.</p> <p>Carry out an investigation on the effect of exercise on pulse rate.</p>

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>iii The concept of blood pressure.</p> <p>Blood pressure, its measurement and average value.</p> <p>Blood pressure under different conditions and its significance for health.</p>	<p>Blood pressure can be measured using a digital sphygmomanometer or a stethoscope and mercury manometer.</p> <p>The average blood pressure is 120/80. A blood pressure greater than 160/90 indicates high blood pressure. The terms systolic and diastolic are not required.</p> <p>High blood pressure can be caused by being overweight, lack of exercise, a diet containing too much fat or salt or excessive drinking of alcohol.</p> <p>High blood pressure can lead to angina, heart attack or stroke. Low blood pressure can lead to fainting or indicate heart failure.</p>	<p>Measure blood pressure using a digital sphygmomanometer or a stethoscope and mercury manometer.</p>
<p>iv Blood tests and cell counts.</p> <p>Detection of infection and other medical conditions to include anaemia, diabetes and leukaemia.</p> <p>Identification of blood groups.</p> <p>Measurement of alcohol or drug concentration in blood.</p>	<p>In blood, presence of antibodies can indicate an infection, a low iron content can indicate anaemia, and high sugar can indicate diabetes. An abnormal white blood cell count can indicate leukaemia.</p> <p>Blood groups (ABO and Rhesus) which must be tested for before transfusion. There is no requirement for details of compatibility.</p>	<p>View material showing normal and abnormal blood cell counts.</p> <p>Obtain and present information to compare the occurrence of blood groups.</p> <p>Discuss alcohol and blood testing in relation to society ie drink/drugs and driving etc.</p>

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>3 Healthy lungs</p> <p>i The lungs and breathing.</p> <p>Positions and parts of the breathing system.</p> <p>The function of the lungs.</p> <p>The effect of exercise on breathing and recovery time.</p> <p>ii The physiological measurements of the lungs.</p> <p>Tidal volume, vital capacity and peak flow depend on the size, age, sex and fitness of a person.</p> <p>Peak flow can be used in the diagnosis and management of asthma.</p>	<p>To include: windpipe, bronchi, bronchioles and air sacs.</p> <p>To take oxygen from the air into the blood and to remove carbon dioxide from the blood.</p> <p>Exercise results in faster, deeper breathing and increases gas exchange in the lungs. During the recovery time after exercise breathing depth and rate return to normal. A short recovery time indicates fitness.</p> <p>Tidal volume is the volume of air breathed in or out of the lungs in one normal breath.</p> <p>Vital capacity is the maximum volume of air which can be breathed out in one breath after a maximum inspiration.</p> <p>Peak flow is the maximum rate at which air can be forced from the lungs.</p>	<p>Examine heart and lungs from a sheep.</p> <p>Measure breathing rate using, eg plethysmograph or simple counting.</p> <p>Carry out an investigation on the effect of exercise on breathing rate.</p> <p>Measure tidal volume, vital capacity and peak flow rates.</p>

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>iii Health risks and effects of smoking.</p> <p>4 A healthy body</p> <p>i The importance of diet and energy balance.</p> <p>The main food groups and their uses.</p> <p>A healthy diet contains a balance of the three food types.</p> <p>ii The relationship between body fat and health.</p> <p>Body fat, its measurement and the normal range of values of body mass.</p> <p>Implications for health of being overweight or underweight.</p>	<p>The tar in cigarette smoke increases the risk of cancer. Carbon monoxide in the smoke reduces the ability of the blood to carry oxygen round the body. Smoking can lead to heart disease. Smoking when pregnant can damage the health of the baby.</p> <p>Fats and carbohydrates are energy-giving foods, proteins are used for growth and repair of cells/tissues and vitamins and minerals protect against deficiency diseases.</p> <p>Body fat can be measured using skin fold callipers or body fat sensors. Body fat measurements can be used to find the percentage body fat.</p> <p>The normal range of body mass depends on height, age, and sex.</p> <p>Being overweight can lead to increased risk of heart disease, kidney failure, arthritis and diabetes. Being underweight can indicate cancer or anorexia.</p>	<p>Collect tobacco tar in simple mechanical smoker.</p> <p>Demonstrate carbon monoxide in cigarette smoke using a carbon monoxide detector.</p> <p>Use computer software and analyse diets.</p> <p>Examine resources on healthy diet.</p> <p>Measure body fat using, eg skin fold callipers or body fat sensor.</p> <p>Discuss BMI graphs for males/females and for different age groups.</p>

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>iii The relationship between body temperature and health.</p> <p>Body temperature, its measurement and the normal range of values.</p> <p>Implications for health of high and low temperatures.</p> <p>iv Exercise and the health of muscles.</p> <p>The importance of regular exercise in the maintenance of the size and strength of muscles.</p> <p>Muscle size and strength decrease if muscles are not exercised regularly.</p>	<p>Body temperature can be measured using thermometers of various types. The normal human body temperature is 37°C.</p> <p>A body temperature above 40°C can lead to heatstroke or indicate fever as a result of fighting infection.</p> <p>A body temperature below 35°C indicates hypothermia. Temperatures below 30°C can lead to death. Babies and the elderly are particularly at risk.</p> <p>During exercise oxygen uptake in the muscles is increased.</p> <p>Muscle fatigue during exercise occurs when insufficient oxygen is available to the muscles and can be relieved by relaxation.</p> <p>The concept of oxygen debt through the production of lactic acid is not required.</p>	<p>LO2 – Measure body temperature using, eg a clinical thermometer, liquid crystal thermometer, thermocouple or thermistor.</p> <p>Measure muscle strength and fatigue using, eg a dynamometer.</p> <p>Carry out a simple investigation to experience muscle fatigue and the effect of rest on the muscles.</p>

National Course Specification: course details (cont)

Unit 1: Health and Technology (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>v Reaction time as an indicator of health.</p> <p>Reaction time and its measurement.</p> <p>Factors that can affect reaction time.</p> <p>Implications for health of long reaction time.</p> <p>vi Health risks and the effects of alcohol and other drugs.</p>	<p>Reaction time is the time taken to respond to a stimulus and can be measured using a dropped ruler or electronic timer.</p> <p>Reaction time can be affected by drugs, alcohol and excitement. Practice can reduce the reaction time.</p> <p>A long reaction time can indicate diabetes, brain or nerve disorders or arterial disease.</p> <p>Alcohol is taken into the blood and is carried round the body.</p> <p>In the short term, alcohol and other drugs in the blood lead to a longer reaction time, poor muscle control and poor judgement which may increase the risk of accident.</p> <p>Taking alcohol and other drugs when pregnant can damage the health of the baby.</p> <p>Drinking alcohol can cause liver and brain damage in the long term.</p>	<p>Measure reaction times using, eg a dropped ruler, an electronic reaction timer or by using computer software.</p> <p>Investigate the effect of practice on reaction time.</p> <p>Measurement of alcohol in exhaled air using, eg a breathalyser or alcometer.</p> <p>Discuss data on road accidents and drink driving.</p>

National Course Specification: course details (cont)

Unit 2: Biotechnological Industries (Intermediate 1)

Introduction

This unit is designed to familiarise candidates with the applications of biology to industry. Candidates will be encouraged to consider the possible benefits and hazards to medicine, industry and to the environment.

CONTENT	NOTES	LEARNING ACTIVITIES
<p>1 Dairy industries</p> <p>i Milk.</p> <p>Milk as a food containing sugar, fats, proteins, vitamins and minerals.</p> <p>Different processing treatments to produce evaporated milk, skimmed and semi-skimmed milk, pasteurised milk and UHT milk.</p> <p>Microbial tests are carried out on milk to test for fitness for consumption.</p>	<p>The processes used to produce evaporated milk, skimmed and semi-skimmed milk. Evaporated milk is heated to remove some liquid making it more concentrated-method of preserving milk. Skimmed milk has nearly all its fat removed and semi-skimmed milk has had some of its fat removed.</p> <p>Milk is heat-treated to destroy harmful microbes. Pasteurisation destroys disease-causing microbes. UHT treatment preserves milk and prolongs shelf life by destroying the microbes which cause milk to sour.</p> <p>The taste of the milk is changed by the way in which it is treated.</p> <p>The resazurin test is used to demonstrate the presence of bacteria.</p>	<p>Treat milk samples to show the effects of heating, evaporating and rehydrating milk samples.</p> <p>View video material on treatment of milk.</p> <p>LO2 – Resazurin test.</p> <p>Use resazurin to establish bacterial content of stored milks.</p>

National Course Specification: course details (cont)

Unit 2: Biotechnological Industries (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>ii Yoghurt.</p> <p>Bacterial cultures can be added to pasteurised milk to make yoghurt.</p> <p>Making yoghurt is a method of preserving milk.</p> <p>iii Cheese.</p> <p>Use of rennet and bacterial cultures in the production of cheese.</p> <p>iv Environmental impact.</p> <p>Potential impact on the environment of disposal of whey in rivers.</p>	<p>Milk sugar is converted into an acid which thickens the milk and gives yoghurt its flavour.</p> <p>Rennet is added to milk to make cheese. The rennet clots the protein in milk to make curds. Rennet can be obtained from a variety of sources: from calves or from genetically engineered fungi grown in fermenters.</p> <p>Whey is the liquid left when the curds are formed.</p> <p>Bacterial cultures are also added to the milk. They convert sugar to an acid which helps clot the protein and also affect the flavour of the cheese.</p> <p>Whey as a food source of bacteria, increase in numbers of bacteria, reduction in availability of oxygen for other organisms, and therefore reduction in the numbers and types of other organisms.</p>	<p>Produce yoghurts using different milks and different cultures in aseptic conditions.</p> <p>Investigate the effect of adding a starter yoghurt culture to milk. Monitor the changing pH.</p> <p>Investigate adding rennet to milk. Separate the curds from the whey by straining.</p> <p>Carry out food tests on curds and whey.</p> <p>Investigate the effect of pH on the activity of rennet.</p> <p>Discuss the advantages and disadvantages of the different sources of rennet.</p> <p>View video material on the effect of adding organic material to rivers.</p> <p>Use methylene blue dye to establish oxygen demand of water contaminated with yeast.</p>

National Course Specification: course details (cont)

Unit 2: Biotechnological Industries (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>Upgrading and use of whey.</p> <p>2 Yeast-based industries</p> <p>i Bread.</p> <p>The use of yeast in bread dough.</p> <p>ii Beer.</p> <p>The type of yeast, the temperature and the fermentation time affect the alcohol content of the beer produced.</p> <p>Cask conditioned beer.</p> <p>Brewery conditioned beer.</p>	<p>Whey is a waste product which can be upgraded. Whey can be used as a food source for growing yeasts in fermenters to produce a creamy alcoholic drink. Whey can also be used to feed animals.</p> <p>Yeast is a simple fungus.</p> <p>In bread dough, yeast produces carbon dioxide gas which causes the bread to rise.</p> <p>In beer making yeast converts sugar into alcohol and carbon dioxide. This process is called fermentation.</p> <p>Cask conditioned beer (real ale) differs from other beer because the yeast is not removed and as a result fermentation and carbon dioxide production continue in the cask.</p> <p>Yeast is removed from brewery conditioned beer and additional carbon dioxide is added.</p>	<p>Grow yeast in liquid culture and on agar.</p> <p>Comparison of yeasts and their effectiveness at raising dough.</p> <p>Use yeasts to show alcohol production.</p> <p>Carry out investigations using different types of yeast, different temperatures and different fermentation times.</p>

National Course Specification: course details (cont)

Unit 2: Biotechnological Industries (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>iii Fermented milk drinks.</p> <p>Produced using an enzyme and yeast.</p> <p>Immobilisation technique in the production of fermented milk drinks.</p>	<p>An enzyme can be added to milk to convert some sugar to lactic acid. Yeast is also added and converts some sugar to alcohol and carbon dioxide. The product is a fermented milk drink.</p> <p>Both the yeast and the enzyme can be immobilised so that they can be separated from the end-product and can be used again.</p>	<p>LO2 – yeast immobilisation.</p> <p>Make a fermented drink using immobilisation techniques with milk products and yeast.</p>
<p>iv Flavouring and food colouring.</p>	<p>Production of flavourings and food colourings from yeast. Crisps can be flavoured and salmon flesh coloured using yeast products.</p>	<p>Demonstrate flavour development in yeast.</p> <p>Examine fish foods.</p>
<p>v Environmental impact.</p> <p>Potential impact on the environment of disposal of waste in rivers from yeast-based industry.</p> <p>Upgrading and use of waste.</p>	<p>Waste from yeast-based industry can have the same effect on rivers as whey [see Section 1 (iv)].</p> <p>Yeast-based industries upgrade their waste by producing animal feeds such as cattle cake.</p> <p>Yeast is involved in the upgrading of waste whey.</p>	<p>Use methylene blue dye to establish oxygen demand of water contaminated with yeast.</p> <p>Examine cattle cake.</p>

National Course Specification: course details (cont)

Unit 2: Biotechnological Industries (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>3 Detergent industries</p> <p>i Production of biological washing powders and liquids. Use of enzymes.</p> <p>ii Value and use of product.</p> <p>iii Environmental impact. Reduced fuel consumption and pollution. Detergents in waste water can be toxic to wildlife. Methods of reducing environmental impact.</p>	<p>Enzymes are produced in large quantities by bacteria cultured in industrial fermenters. Enzymes are enclosed in a harmless coating to prevent allergic reactions which can cause skin rashes and eczema.</p> <p>Enzymes in biological washing powders digest stains at moderate temperatures. It is claimed that this saves energy and results in less damage to delicate fabrics.</p> <p>Washing at lower temperatures reduces fuel consumption and can contribute to reducing the pollution caused by the burning of fossil fuels in power stations.</p> <p>Detergents contain other chemicals which can increase the growth of algae in lakes and rivers. When algae die this can have the same effect as whey [see Section 1 (iv)] released into rivers.</p> <p>To include: reducing the chemicals in detergents, sewage works removing these chemicals before releasing water into the environment.</p>	<p>Examine the contents and effectiveness of biological and non-biological washing powders.</p> <p>Create and test home-made washing powders.</p> <p>LO2 – biological enzyme assay.</p> <p>Discuss manufacturers’ claims that biological washing powders and liquids reduce energy costs and remove stains more effectively than non-biological powders at low temperatures.</p> <p>View video material of water pollution.</p> <p>View video material of algal blooms.</p> <p>View simple video material of a sewage works.</p>

National Course Specification: course details (cont)

Unit 2: Biotechnological Industries (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>4 Pharmaceutical industries</p> <p>i Antibiotics.</p> <p>ii Antifungals.</p> <p>iii Modern production methods including genetic engineering and computer-control technology.</p> <p>iv Environmental impact.</p>	<p>Antibiotics are produced naturally by fungi originally isolated from soil by Alexander Fleming.</p> <p>Antibiotics destroy and prevent the further growth of bacteria. Antibiotics only act on bacteria and not on viruses. Different antibiotics are effective against different bacteria.</p> <p>Antibiotics are produced commercially in automated industrial fermenters.</p> <p>Antifungals are chemicals which limit fungal growth. They are used to treat fungal infections such as athlete's foot and thrush.</p> <p>Use of fermenters, and the use of micro-organisms which have been genetically engineered to produce the desired product. Details of genetic engineering techniques are not required.</p> <p>Computer-control technology to monitor and adjust growing conditions eg temperature. Easier purification of final product.</p> <p>Over-use of antibiotics can lead to bacteria developing resistance to the antibiotics.</p>	<p>View video on history of antibiotic production.</p> <p>Obtain and present information on the effectiveness of different antibiotics.</p> <p>Carry out simple investigations using antibiotic multidiscs.</p> <p>Demonstrate the effect of antifungals on the growth of yeast.</p> <p>Construct and use a simple fermenter.</p> <p>Discuss the consequences of over-prescription of antibiotics.</p>

National Course Specification: course details (cont)

Unit 3: Growing plants (Intermediate 1)

Introduction

This unit is designed to familiarise candidates with the propagation and growth of plants. Candidates should develop skills related to plant husbandry and should be encouraged to take responsibility collectively for their own work through, for example, enterprise activities.

CONTENT	NOTES	LEARNING ACTIVITIES
<p>1 Growing plants from seeds.</p> <p>i Seed biology.</p> <p>ii Germination.</p> <p>Conditions for germination.</p> <p>Dormancy and its natural advantage in delaying germination.</p> <p>iii Photosynthesis as the process of food production in sunlight.</p> <p>iv Growing plants from seeds.</p> <p>Methods of seed sowing.</p>	<p>Simple seed structure: embryo root and shoot (which grow into the new plant), food store (for growth) and seed coat (protects the seed).</p> <p>Germination as growth of embryo and use of food reserves.</p> <p>A suitable temperature, water and oxygen.</p> <p>Germination is delayed until the spring when the soil temperature rises.</p> <p>The food produced by photosynthesis is used for growth. No further detail of photosynthesis raw materials and products is required.</p> <p>Spacing of seeds: individual sowing of large seeds, mixing of fine seeds with silver sand before sowing.</p>	<p>Collect and examine seeds from a variety of plants, eg French marigolds, pansies, tree seeds and berries.</p> <p>Measure water content of stored and fresh seeds (eg peas).</p> <p>Carry out food tests on seeds.</p> <p>Grow a collection of plants from a variety of seeds.</p> <p>Demonstrate the conditions needed for the germination of seeds.</p> <p>Demonstrate plant life cycle using 'fast plants'.</p> <p>Measure changes in mass of germinating seeds and photosynthesising seedlings.</p> <p>LO2 – Sowing seeds.</p>

National Course Specification: course details (cont)

Unit 3: Growing plants (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
Pelleted seeds.	Pelleted seeds are fine seeds enclosed in a ball of clay. Sowing of pelleted seeds. Pelleted seeds take longer to germinate than non-pelleted seeds and require more water.	Compare germination in pelleted and non-pelleted seeds.
Pre-germinating (chitting) seeds.	Seeds with thick seed coats are pre-germinated (chitted) before sowing. Thick seed coats are slit or cracked to allow germination.	Carry out an investigation using sweet pea or other leguminous seeds to show the effect of chitting.
2 Vegetative propagation.		
i Plant propagation structures.		
Methods of making use of plant propagation structures.	Use of food storage organs such as bulbs and tubers. Use of attached offspring such as runners, offsets and plantlets. Runner is a horizontal stem with a plantlet at the end. An offset is a small plantlet produced as a side shoot at the base of the parent plant. A plantlet is a miniature plant attached to the parent plant.	Grow plants from bulbs and tubers, eg daffodil, dahlia and potatoes. Grow plants such as <i>Chlorophytum</i> or <i>Bryophyllum</i> to show runners and plantlets. Grow a variety of plants propagated by divisions of offsets eg Mother-in-law's tongue plant.
ii Artificial propagation.		
Growing points.	Nodes as points of plant growth. Growth as a response to wounding.	
Techniques of taking stem and leaf cuttings.	The use of rooting powders.	LO2 – Taking cuttings.
Methods of reducing water loss.	To include: reducing leaf surface area or by increasing humidity by enclosing cuttings or by placing cuttings in a mist propagator.	Propagate a variety of plants from stem or leaf cuttings.

National Course Specification: course details (cont)

Unit 3: Growing plants (*Intermediate 1*)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>Layering and its advantages.</p> <p>The advantages and disadvantages of heat during propagation.</p> <p>3 Plant production.</p> <p>i Conditions for plant growth.</p> <p>Loam and loamless composts.</p> <p>Properties of granular and liquid fertilisers.</p> <p>Watering.</p>	<p>Layering as pegging down stems into soil until roots form at nodes. The advantages of layering including larger plants produced, success with plants which are difficult to propagate from cuttings.</p> <p>Advantages to include faster growth and prevention of frost damage.</p> <p>Disadvantages to include high water losses leading to wilting, higher energy costs and faster growth/spread of diseases.</p> <p>Making loam and loamless composts for a range of purposes. Loam (nutrients); peat and peat substitutes (water retention); grit, sand and perlite (improve drainage).</p> <p>Mineral ratios in fertilisers. The importance of trace minerals N, P and K as major plant minerals for leaf (N), root (P), flower and fruit growth (K).</p> <p>Watering plants to include supplying sufficient moisture by watering can, hose or others including use of capillary matting, water retentive gel and automatic irrigation systems to provide water; signs of over and under watering.</p>	<p>Use layering to propagate more difficult subjects.</p> <p>Make and use rooting and potting composts.</p> <p>Demonstrate the water-holding capacity of different composts.</p> <p>Investigate drainage of composts with different compositions.</p> <p>Demonstrate the importance of plant nutrients.</p> <p>LO2 – Watering.</p> <p>Design and make a watering system for house plants which could run for a week or more.</p>

National Course Specification: course details (cont)

Unit 3: Growing plants (Intermediate 1)

CONTENT	NOTES	LEARNING ACTIVITIES
<p>Heating and ventilation.</p> <p>ii Plant maintenance.</p> <p>The needs of mature plants.</p> <p>Methods of maintaining plants.</p> <p>Methods of controlling pests and disease.</p> <p>Protected cultivation under glass, plastic and floating fleece.</p>	<p>Ways of providing heat in greenhouses and polythene tunnels. The need for ventilation. Types of ventilation including fans and automatically opening windows. Thermostats to control temperature and ventilation.</p> <p>To include: water, light, temperature, humidity with examples from cacti, ferns, foliage and flowering plants.</p> <p>To include: dead heading (removal of dead flower heads which encourages plant to continue to flower); pricking out (removal of seedlings to provide less crowded growing conditions), and potting on (placing growing plant into larger container). Plant needs potting on if the roots fill the pot and grow out of the holes in the bottom.</p> <p>To include: insecticides, pesticides, fungicides, soapy water, biological control, crushing pests and burning affected plants. The aphid and grey mould as examples of a common pest and a common disease.</p> <p>Advantages to include: protection from low temperatures, wind, rain, and pests.</p>	<p>Monitor environmental conditions such as minimum and maximum temperatures, relative humidity and wind speed.</p> <p>Examine leaflets etc on greenhouse design, heating systems and ventilation devices.</p> <p>Demonstrate the use of a thermostat.</p> <p>Prick out seedlings sown earlier. Dead head bedding plants in the vicinity. LO2 – Pricking out.</p> <p>LO2 – Potting on.</p> <p>Dead head, prick out and pot on plants.</p> <p>Compare different methods of controlling pests and diseases.</p> <p>Examine leaflets on cloches and tunnels. Examine horticultural fleece.</p>

National Course Specification: course details (cont)

COURSE Biology (Intermediate 1)

ASSESSMENT

To gain the award of the course, the candidate must achieve all the component units of the course as well as the external assessment. External assessment will provide the basis for grading attainment in the course award.

When units are taken as component parts of a course, candidates will have the opportunity to demonstrate achievement beyond that required to attain each of the unit outcomes. This attainment may, where appropriate, be recorded and used to contribute towards course estimates, and to provide evidence for appeals. Further information on the key principles of assessment are provided in the paper *Assessment* (HSDU, 1996) and in *Managing Assessment* (HSDU, 1998).

DETAILS OF THE INSTRUMENTS FOR EXTERNAL ASSESSMENT

The course examination will consist of one paper of 1 hour 30 minutes for 75 marks. The paper will consist of two sections:

Section A

This section will contain 25 multiple choice questions (of these 9-11 will test problem solving and practical abilities). Section A will have an allocation of 25 marks. Candidates will be expected to answer all the questions.

Section B

This section will contain structured questions with an allocation of 50 marks (of these 25-30 marks will test problem solving and practical abilities). Candidates will be expected to answer all the questions.

GRADE DESCRIPTIONS

Grade C

Candidates at Grade C will have demonstrated success in achieving the component units of the course. In the course assessment, candidates will generally have demonstrated the ability to:

- retain knowledge and skills over an extended period of time
- integrate knowledge and understanding, problem solving and practical abilities acquired across component units
- apply knowledge and understanding, problem solving and practical abilities in contexts similar to those in the component units.

Grade A

In addition, candidates at Grade A will generally have demonstrated the ability to:

- retain an extensive range of knowledge and skills over an extended period of time
- integrate an extensive range of knowledge and understanding, problem solving and practical abilities acquired across component units

National Course Specification: course details (cont)

COURSE Biology (Intermediate 1)

- apply knowledge and understanding, problem solving and practical abilities in contexts less familiar and more complex than in the component units.

Testing of the course outcomes

Each of the three units develops the three outcomes relating to knowledge and understanding, problem solving and practical abilities within the context of the units. The following gives advice on how these outcomes will be assessed in the course assessment.

Knowledge and understanding

Candidates should be tested on their ability to recall learning and understand facts and principles detailed in the content statements and supplementary notes in the course specification.

Problem solving and practical abilities

Questions relating to each of the following points will be included in the course examination in order to test the candidates' ability to:

1. identify and select relevant information from texts, tables, charts, keys, graphs and/or diagrams
2. present information appropriately in a variety of forms, including written summaries, tables, line graphs, bar graphs, pie charts and/or diagrams
3. plan the identification and collection of data: this could include identification of variables (what is altered, what is kept constant), controls and measurements or observations required
4. analyse data by carrying out calculations including percentages, averages and/or ratios
5. identify strengths and weaknesses of experimental procedures by commenting on the purpose of approach, the suitability and effectiveness of procedures, the control of variables, the limitations of equipment, possible sources of error and/or suggestions for improvement
6. draw valid conclusions making use of the presented evidence.

Complexity of Data

The following advice is intended as general guidelines in setting the complexity of data to be used in problem solving questions.

At Intermediate 1 typically one source of data (text, tables, charts, keys, diagrams or graphs) should be provided from which the problem has to be solved.

National Course Specification: course details (cont)

COURSE Biology (Intermediate 1)

The provided data should typically have one pattern, trend, condition, variable or set of results from which information has to be selected and presented or which has to be used as a source of evidence for conclusions. The analysis of data should involve one set of data.

The identification of strengths and weaknesses of an investigation should involve one of the following: one treatment, adequate controls, limitations of equipment, sources of error and/or possible improvements as appropriate.

DETAILS OF THE INSTRUMENTS FOR INTERNAL ASSESSMENT

Outcome 1

Outcome 1 in each unit is assessed by a closed-book test with questions covering the performance criteria for each unit.

Outcome 2

Outcome 2 in each unit is assessed by a checklist of techniques.

Candidates should be allowed the opportunity to practice the techniques a number of times until they become familiar with the procedures.

Outcome 3

A report of one investigation is required covering all the performance criteria set out in the unit specifications.

Candidates are only required to produce one report for Outcome 3 which relates to the contents and notes specified for Intermediate 1 Biology. This report can then be used as evidence for Outcome 3 for all the units of the course.

APPROACHES TO LEARNING AND TEACHING

Suggestions for appropriate learning activities are contained in the tables of course content. Learning and teaching should be candidate-centred. Candidates should be encouraged to take responsibility for their own learning, both individually and collectively. By working co-operatively in groups, opportunities arise for candidates to develop interpersonal skills such as respecting the views of others, negotiation and compromise in reaching a common goal. The course lends itself to these approaches by providing opportunities for candidates to develop informed attitudes and values concerning their own health, to consider the impact of biotechnological industries on their present and future lives, and to plan and engage in enterprise activities.

Laboratory work should include the use of instrumentation and equipment that reflects current scientific use. Opportunities should be taken to capture data through computer interfacing, data loggers or videos. Such data may then be analysed by information technology (IT) or used for control technology.

National Course Specification: course details (cont)

COURSE Biology (Intermediate 1)

Use of the additional 40 hours

This time may be used:

- to provide an introduction to the course and assessment methods
- to allow more practical work to be undertaken by the candidate
- for remediation of particular aspects of work in which candidates require to be re-assessed
- for consolidation and integration of learning
- to practise techniques in answering examination questions
- to practise applying knowledge and understanding, problem solving and practical abilities in contexts more complex than in the units
- to complete learning Outcome 3 reports.

SPECIAL NEEDS

This course specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

National Unit Specification: general information

UNIT	Health and Technology (Intermediate 1)
NUMBER	D023 10
COURSE	Biology (Intermediate 1)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities related to the use of technology in measuring, recording and monitoring health.

OUTCOMES

- 1 Demonstrate knowledge and understanding related to physiological measurements.
- 2 Carry out physiological measurements related to health and technology.
- 3 Solve problems by an investigation related to Intermediate 1 Biology.

RECOMMENDED ENTRY

While entry is at the discretion of the centre and no previous biology experience is required, the unit would be suitable for those with an award in Standard Grade Biology, Chemistry, Physics or Science at grades 4-7.

CREDIT VALUE

1 credit at Intermediate 1.

Administrative Information

Superclass:	PE
Publication date:	June 2002
Source:	Scottish Qualifications Authority
Version:	04

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National Unit Specification: general information (cont)

UNIT Health and Technology (Intermediate 1)

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, 2001).

National Unit Specification: statement of standards

UNIT Health and Technology (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to physiological measurements.

Performance criteria

- (a) Facts, ideas and terminology are described correctly in relation to physiological measurements.
- (b) Explanations given are supported by evidence.

Note on range for the outcome

Physiological measurements related to: heart, lungs, whole body.

Evidence requirements

Evidence of an appropriate level of attainment must be generated from a closed book test with items covering all the performance criteria for all of the range.

OUTCOME 2

Carry out physiological measurements related to health and technology.

Performance criteria

- (a) The procedures are followed accurately and safely.
- (b) Relevant measurements and observations are recorded in an appropriate format.

Note on range for the outcome

Physiological measurements: pulse rate, body temperature.

Evidence requirements

A checklist of the individual work of the candidate must be produced for all of the performance criteria for both categories in the range.

National Unit Specification: statement of standards (cont)

UNIT Health and Technology (Intermediate 1)

OUTCOME 3

Solve problems by an investigation related to Intermediate 1 Biology.

Performance criteria

- (a) The aims of the investigation are clearly stated.
- (b) Appropriate data is identified and collected.
- (c) The collected data is analysed and presented in an appropriate format.
- (d) Conclusions drawn are valid.

Evidence requirements

A report of one investigation must be provided covering all of the performance criteria and related to the contents and notes specified for Intermediate 1 Biology.

The teacher/lecturer responsible must attest that the report is the individual work of the candidate derived from participating in solving a problem involving the candidate in planning, deciding how the activity is to be managed, identifying and obtaining the necessary resources, and carrying out the activity. Depending on the activity, the investigation may be carried out as group work.

National Unit Specification: support notes

UNIT Health and Technology (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

Outcome 1

1 What is health and technology?

- i The meaning of health.
The health triangle
The importance of a healthy lifestyle.
- ii The value of physiological measurements as indicators of health.
The advantages and disadvantages of high tech and low tech approaches to measuring temperature, body fat, blood pressure and heart rate (pulse rate).

2 Healthy heart

- i The heart and circulatory system.
The heart as a muscle which pumps blood around the body.
The three main blood vessels are arteries, veins and capillaries.
Transport function.
- ii Pulse rate as a health indicator.
Pulse rate, its measurement and the normal range of values.
Recovery time.
Effect of exercise on pulse rate and recovery time.
- iii The concept of blood pressure.
Blood pressure, its measurement and average value.
Blood pressure under different conditions and its significance for health.
- iv Blood tests and cell counts.
Detection of infection and other medical conditions to include anaemia, diabetes and leukaemia.
Identification of blood groups.
Measurement of alcohol or drug concentration in blood.

3 Healthy lungs

- i The lungs and breathing.
Positions and parts of the breathing system.
The function of the lungs.
The effect of exercise on breathing and recovery time.
- ii The physiological measurements of the lungs.
Tidal volume, vital capacity and peak flow depend on the size, age, sex and fitness of a person.
Peak flow can be used in the diagnosis and management of asthma.
- iii Health risks and effects of smoking.

National Unit Specification: support notes (cont)

UNIT Health and Technology (Intermediate 1)

4 Healthy body

- i The importance of diet and energy balance.
The main food groups and their uses.
A healthy diet contains a balance of the three food types.
- ii The relationship between body fat and health.
Body fat, its measurement and the normal range of values of body mass.
Implications for health of being overweight or underweight.
- iii The relationship between body temperature and health.
Body temperature, its measurement and the normal range of values.
Implications for health of high and low temperatures.
- iv Exercise and the health of muscles.
The importance of regular exercise in the maintenance of the size and strength of muscles.
Muscle size and strength decrease if muscles are not exercised regularly.
- v Reaction time as an indicator of health.
Reaction time, its measurement.
Factors that can affect reaction time.
Implications for health of long reaction time.
- vi Health risks and the effects of alcohol and other drugs.

Further detail is given in the course content section of the course specification.

Outcome 2

The physiological measurements required for this outcome are:

- pulse rate
- body temperature.

Outcome 3

An investigation related to Intermediate 1 Biology should be carried out. Data may be collected by candidates taking measurements directly or it may be provided as case-study material.

Suitable examples in the context of this unit would include:

- investigate fitness in peer group by measuring pulse rate before and after exercise
- investigate handgrip strength and muscle fatigue in peer group
- investigate the dietary habits of peer group
- investigate aspects of lifestyle of peer group
- investigate the incidence and causes of a named disease in Scotland
- investigate preventable and non-preventable factors in a named disease.

National Unit Specification: support notes (cont)

UNIT Health and Technology (Intermediate 1)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Details of suitable approaches are detailed in the course specification.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcome 1 should be assessed by an integrated end of unit test with questions covering both of the performance criteria for knowledge and understanding and all of the range.

A checklist appropriate to the apparatus used to make physiological measurements should be produced to cover the performance criteria for Outcome 2.

Candidates should provide a report for Outcome 3 which should be related to the performance criteria as follows:

Performance criteria	Suggestions to aid professional judgement
(a) The aims of the investigation are clearly stated.	Main features to be investigated are identified.
(b) Appropriate data is identified and collected.	The plan should include: <ul style="list-style-type: none">• what is to be measured/collected• what (variable) is to be altered• what (variable) is to be kept constant• how many readings/measurements/observations/subjects• equipment/resources required• how data will be recorded. Collected data must be recorded in a clear table with correct headings, appropriate units and results/readings entered correctly.
(c) The collected data is analysed and presented in an appropriate format.	Data should be analysed and presented in tabular or graphical format as appropriate: <ul style="list-style-type: none">• for a tabular presentation this may be an extension of the table used for PC (b) above, and must include: suitable headings and units showing averages or other appropriate computations• for a graphical presentation this must include: data presented as a histogram, bar chart, connected points, line of best fit as appropriate, with suitable scales and axes labelled with quantity and units and with data correctly plotted.
(d) Conclusions drawn are valid	Conclusions should make use of the presented evidence and could: <ul style="list-style-type: none">• consider the implications for health of the presented evidence and suggest possible courses of action• identify strengths and weaknesses of the investigation based on the evidence.

National Unit Specification: support notes (cont)

UNIT Health and Technology (Intermediate 1)

Re-drafting of a report after necessary supportive criticism is to be encouraged both as part of the learning and teaching process and to produce evidence for assessment. Redrafting and resubmission is only required for the specific performance criterion identified in need of further attention ie the entire report does not need to be rewritten.

Candidates are only required to produce one report for Outcome 3 in relation to the contents and notes specified for Intermediate 1 Biology.

This report can then be used as evidence for Outcome 3 for the other units of the course.

Conditions required to complete the report

Candidates may complete their report outwith class time provided reasonable measures are taken to ensure that the report is the individual work of the candidate.

Teachers and lecturers may wish candidates to write up reports under their direct supervision so that they can provide appropriate advice and support. However, they may feel confident that any redrafting required need not be undertaken under such close supervision as it will be evident in the candidate's response that it is his or her unaided work. Under such circumstances it would be acceptable for such redrafting to take place outwith class time.

Use of IT

Candidates may, if they wish, present their reports in a word-processed format. Candidates may use Excel (or any other suitable data analysis software) when tackling Outcome 3. However, candidates must not be given a spreadsheet with pre-prepared column headings nor formulae, as they are being assessed on their ability to enter quantities and units into a table. The use of clip art or images captured by digital camera may also be used in recording details of experimental methods.

Transfer of evidence

Candidates, who are repeating a course, may carry forward evidence of an appropriate standard, generated in a previous year.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

National Unit Specification: general information

UNIT Biotechnological Industries (Intermediate 1)

NUMBER D024 10

COURSE Biology (Intermediate 1)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities related to the applications of biology to industry.

OUTCOMES

- 1 Demonstrate knowledge and understanding related to biotechnological industries.
- 2 Carry out practical techniques related to biotechnological industries.
- 3 Solve problems by an investigation related to Intermediate 1 Biology.

RECOMMENDED ENTRY

While entry is at the discretion of the centre and no previous biology experience is required, the unit would be suitable for those with an award in Standard Grade Biology, Chemistry, Physics or Science at grades 4-7.

CREDIT VALUE

1 credit at Intermediate 1.

Administrative Information

Superclass: RH

Publication date: June 2002

Source: Scottish Qualifications Authority

Version: 04

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National Unit Specification: general information (cont)

UNIT Health and Technology (Intermediate 1)

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, 2001).

National Unit Specification: statement of standards

UNIT Biotechnological Industries (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to biotechnological industries.

Performance criteria

- (a) Facts, ideas and terminology are described correctly in relation to biotechnological industries.
- (b) Explanations given are supported by evidence.

Note on range for the outcome

Biotechnological industries: dairy, yeast-based, detergent, pharmaceutical.

Evidence requirements

Evidence of an appropriate level of attainment must be generated from a closed book test with items covering all the performance criteria for all of the range.

OUTCOME 2

Carry out practical techniques related to biotechnological industries.

Performance criteria

- (a) The procedures are followed accurately and safely.
- (b) Relevant measurements and observations are recorded in an appropriate format.

Note on range for the outcome

Techniques: resazurin test, yeast immobilisation, biological enzyme assay.

Evidence requirements

A checklist of the individual work of the candidate must be produced for all of the performance criteria for one technique related to each of the categories in the range.

National Unit Specification: statement of standards (cont)

UNIT Biotechnological Industries (Intermediate 1)

OUTCOME 3

Solve problems by an investigation related to Intermediate 1 Biology.

Performance criteria

- (a) The aims of the investigation are clearly stated.
- (b) Appropriate data is identified and collected.
- (c) The collected data is analysed and presented in an appropriate format.
- (d) Conclusions drawn are valid.

Evidence requirements

A report of one investigation must be provided covering all of the performance criteria and related to the contents and notes specified for Intermediate 1 Biology.

The teacher/lecturer responsible must attest that the report is the individual work of the candidate derived from participating in solving a problem involving the candidate in planning, deciding how the activity is to be managed, identifying and obtaining the necessary resources, and carrying out the activity. Depending on the activity, the investigation may be carried out as group work.

National Unit Specification: support notes (cont)

UNIT Biotechnological Industries (Intermediate 1)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

Outcome 1

1 Dairy industries

- i Milk.
Milk as a food containing sugar, fats, proteins, vitamins and minerals.
Different processing treatments to produce evaporated milk, skimmed and semi-skimmed milk, pasteurised milk and UHT milk.
Microbial tests are carried out on milk to test for fitness for consumption.
- ii Yoghurt.
Bacterial cultures can be added to pasteurised milk to make yoghurt.
Making yoghurt is a method of preserving milk.
- iii Cheese.
Use of rennet and bacterial cultures in the production of cheese.
- iv Environmental impact.
Potential impact on the environment of disposal of whey in rivers.
Upgrading and use of whey.

2 Yeast-based industries

- i Bread.
The use of yeast in bread dough.
- ii Beer.
The type of yeast, the temperature and the fermentation time affect the alcohol content of the beer produced.
Cask conditioned beer.
Brewery conditioned beer.
- iii Fermented milk drinks.
Produced using an enzyme and yeast.
Immobilisation technique in the production of fermented milk drinks.
- iv Flavouring and food colouring.
- v Environmental impact.
Potential impact on the environment of disposal of waste in rivers from yeast-based industry.
Upgrading and use of waste.

National Unit Specification: support notes (cont)

UNIT Biotechnological Industries (Intermediate 1)

3 Detergent industries

- i Production of biological washing powders and liquids.
Use of enzymes.
- ii Value and use of product.
- iii Environmental impact.
Reduced fuel consumption and pollution.
Detergents in waste water can be toxic to wildlife.
Methods of reducing environmental impact.

4 Pharmaceutical industries

- i Antibiotics.
- ii Antifungals.
- iii Modern production methods including genetic engineering and computer control technology.
- iv Environmental impact.

Further detail is given in the course content section of the course specification.

Outcome 2

The techniques required for this outcome are:

- resazurin test
- yeast immobilisation
- biological enzyme assay.

Outcome 3

An investigation related to Intermediate 1 Biology should be carried out. Data may be collected by candidates carrying out a practical investigation or it may be provided as case-study material.

Suitable examples in the context of this unit would include:

- investigate the effect of different temperatures on the raising of a flour-yeast dough
- investigate how a local biotechnological industry monitors waste disposal.

National Course Specification: support notes (cont)

UNIT Biotechnological Industries (Intermediate 1)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Details of suitable approaches are detailed in the course specification.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcome 1 should be assessed by an integrated end of unit test with questions covering both of the performance criteria for knowledge and understanding and all of the range.

A checklist appropriate to the techniques used should be produced to cover the performance criteria for Outcome 2.

Candidates should provide a report for Outcome 3 which should be related to the performance criteria as follows:

Performance criteria	Suggestions to aid professional judgement
(a) The aims of the investigation are clearly stated.	Main features to be investigated are identified.
(b) Appropriate data is identified and collected.	The plan should include: <ul style="list-style-type: none">• what is to be measured/collected• what (variable) is to be altered• what (variable) is to be kept constant• how many readings/measurements/observations/subjects• equipment/resources required• how data will be recorded. Collected data must be recorded in a clear table with correct headings, appropriate units and results/readings entered correctly.
(c) The collected data is analysed and presented in an appropriate format.	Data should be analysed and presented in tabular or graphical format as appropriate: <ul style="list-style-type: none">• for a tabular presentation this may be an extension of the table used for PC (b) above, and must include: suitable headings and units showing averages or other appropriate computations• for a graphical presentation this must include: data presented as a histogram, bar chart, connected points, line of best fit as appropriate, with suitable scales and axes labelled with quantity and units and with data correctly plotted.
(d) Conclusions drawn are valid	Conclusions should make use of the presented evidence and could: <ul style="list-style-type: none">• identify strengths and weaknesses of the investigation based on the evidence.

National Course Specification: support notes (cont)

UNIT Biotechnological Industries (Intermediate 1)

Re-drafting of a report after necessary supportive criticism is to be encouraged both as part of the learning and teaching process and to produce evidence for assessment. Redrafting and resubmission is only required for the specific performance criterion identified in need of further attention ie the entire report does not need to be rewritten.

Candidates are only required to produce one report for Outcome 3 in relation to the contents and notes specified for Intermediate 1 Biology. This report can then be used as evidence for Outcome 3 for the other units of the course.

Conditions required to complete the report

Candidates may complete their reports outwith class time provided sufficient measures are taken to ensure that the report is the individual work of the candidate.

Teachers and lecturers may wish candidates to write up reports under their direct supervision so that they can provide appropriate advice and support. However, they may feel confident that any redrafting required need not be undertaken under such close supervision as it will be evident in the candidate's response that it is his or her unaided work. Under such circumstances it would be acceptable for such redrafting to take place outwith class time.

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Transfer of evidence

Candidates, who are repeating a course, may carry forward evidence of an appropriate standard, generated in a previous year.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).

National Unit Specification: general information

UNIT Growing Plants (Intermediate 1)

NUMBER D025 10

COURSE Biology (Intermediate 1)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities related to the propagation and growth of plants.

OUTCOMES

- 1 Demonstrate knowledge and understanding related to plant propagation.
- 2 Carry out practical techniques related to plant propagation.
- 3 Solve problems by an investigation related to Intermediate 1 Biology.

RECOMMENDED ENTRY

While entry is at the discretion of the centre and no previous biology experience is required, the unit would be suitable for those with an award in Standard Grade Biology, Chemistry, Physics or Science at grades 4-7.

CREDIT VALUE

1 credit at Intermediate 1.

Administrative Information

Superclass: SD

Publication date: June 2002

Source: Scottish Qualifications Authority

Version: 04

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National Unit Specification: general information (cont)

UNIT Growing Plants (Intermediate 1)

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, 2001).

National Unit Specification: statement of standards

UNIT Growing Plants (Intermediate 1)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to plant propagation.

Performance criteria

- (a) Facts, ideas and terminology are described correctly in relation to plant propagation.
- (b) Explanations given are supported by evidence.

Note on range for the outcome

Plant propagation: growing plants from seed, vegetative propagation, plant production.

Evidence requirements

Evidence of an appropriate level of attainment from a closed book test with items covering all performance criteria for all of the range.

OUTCOME 2

Carry out practical techniques related to plant propagation.

Performance criteria

- (a) The procedures are carried out accurately and safely.
- (b) Relevant measurements and observations are recorded in an appropriate format.

Note on range for the outcome

Techniques: sowing seeds, watering, pricking out, potting on, taking cuttings.

Evidence requirements

A checklist of the individual work of the candidate must be produced for all performance criteria for all of the range.

National Unit Specification: statement of standards (cont)

UNIT Growing Plants (Intermediate 1)

OUTCOME 3

Solve problems by an investigation related to Intermediate 1 Biology.

Performance criteria

- (a) The aims of the investigation are clearly stated.
- (b) Appropriate data is identified and collected.
- (c) The collected data is analysed and presented in an appropriate format.
- (d) Conclusions drawn are valid.

Evidence requirements

A report of one investigation must be provided covering all of the performance criteria and related to the contents and notes specified for Intermediate 1 Biology.

The teacher/lecturer responsible must attest that the report is the individual work of the candidate derived from participating in solving a problem involving the candidate in planning, deciding how the activity is to be managed, identifying and obtaining the necessary resources, and carrying out the activity. Depending on the activity, the investigation may be carried out as group work.

National Unit Specification: support notes

UNIT Growing Plants (Intermediate 1)

This part of the unit specification is offered for guidance. The support notes are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

Outcome 1

1 Growing plants from seeds

- i Seed biology.
- ii Germination
 - Conditions for germination.
 - Dormancy and its natural advantage in delaying germination.
- iii Photosynthesis as the process of food production in sunlight.
- iv Growing plants from seeds.
 - Methods of seed sowing.
 - Pelleted seeds.
 - Pre-germinating (chitting) seeds.

2 Vegetative propagation

- i Plant propagation structures.
 - Methods of making use of plant propagation structures.
- ii Artificial propagation.
 - Growing points.
 - Techniques of taking stem and leaf cuttings.
 - Methods of reducing water loss.
 - Layering and its advantages.
 - The advantages and disadvantages of heat during propagation.

3 Plant production

- i Conditions for plant growth.
 - Loam and loamless composts.
 - Properties of granular and liquid fertilisers.
 - Watering.
 - Heating and ventilation.
- ii Plant maintenance.
 - The needs of mature plants.
 - Methods of maintaining plants.
 - Methods of controlling pests and disease.
 - Protected cultivation under glass, plastic and floating fleece.

Further detail is given in the course content section of the course specification.

National Unit Specification: support notes (cont)

UNIT Growing Plants (Intermediate 1)

Outcome 2

The techniques required for this outcome are:

- sowing seeds
- watering
- pricking out
- potting on
- taking cuttings.

Outcome 3

An investigation related to Intermediate 1 Biology should be carried out and enterprise activities could be built in. Data may be collected by candidates carrying out a practical investigation or it may be provided as case-study material.

Suitable examples in the context of this unit would include:

- investigate the effects of rooting powder on the rooting of cuttings
- investigate the effects of different fertilisers on the growth of seedlings.

National Unit Specification: support notes (cont)

UNIT Growing Plants (Intermediate 1)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Details of suitable approaches are detailed in the course specification.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcome 1 should be assessed by an integrated end of unit test with questions covering both of the performance criteria for knowledge and understanding and all of the range.

A checklist appropriate to the techniques used should be produced to cover the performance criteria for Outcome 2.

Candidates should provide a report for Outcome 3 which should be related to the performance criteria as follows:

Performance criteria	Suggestions to aid professional judgement
(a) The aims of the investigation are clearly stated.	Main features to be investigated are identified.
(b) Appropriate data is identified and collected.	The plan should include: <ul style="list-style-type: none">• what is to be measured/collected• what (variable) is to be altered• what (variable) is to be kept constant• how many readings/measurements/observations/subjects• equipment/resources required• how data will be recorded. Collected data must be recorded in a clear table with correct headings, appropriate units and results/readings entered correctly.
(c) The collected data is analysed and presented in an appropriate format.	Data should be analysed and presented in tabular or graphical format as appropriate: <ul style="list-style-type: none">• for a tabular presentation this may be an extension of the table used for PC (b) above, and must include: suitable headings and units showing averages or other appropriate computations• for a graphical presentation this must include: data presented as a histogram, bar chart, connected points, line of best fit as appropriate, with suitable scales and axes labelled with quantity and units and with data correctly plotted.
(d) Conclusions drawn are valid	Conclusions should make use of the presented evidence and could: <ul style="list-style-type: none">• identify strengths and weaknesses of the investigation based on the evidence.

National Unit Specification: support notes (cont)

UNIT Growing Plants (Intermediate 1)

Re-drafting of a report after necessary supportive criticism is to be encouraged both as part of the learning and teaching process and to produce evidence for assessment. Redrafting and resubmission is only required for the specific performance criterion identified in need of further attention ie the entire report does not need to be rewritten.

Candidates are only required to produce one report for Outcome 3 in relation to the contents and notes specified for Intermediate 1 Biology. This report can then be used as evidence for Outcome 3 for the other units of the course.

Conditions required to complete the report

Candidates may complete their reports outwith class time provided sufficient measures are taken to ensure that the report is the individual work of the candidate.

Teachers and lecturers may wish candidates to write up reports under their direct supervision so that they can provide appropriate advice and support. However, they may feel confident that any redrafting required need not be undertaken under such close supervision as it will be evident in the candidate's response that it is his or her unaided work. Under such circumstances it would be acceptable for such redrafting to take place outwith class time.

Use of IT

Candidates may, if they wish, present their reports in a word-processed format. Candidates may use Excel (or any other suitable data analysis software) when tackling Outcome 3. However, candidates must not be given a spreadsheet with pre-prepared column headings nor formulae, as they are being assessed on their ability to enter quantities and units into a table. The use of clip art or images captured by digital camera may also be used in recording details of experimental methods.

Transfer of evidence

Candidates, who are repeating a course, may carry forward evidence of an appropriate standard, generated in a previous year.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).