National Unit Specification: general information

UNIT Biotechnology (Higher)

NUMBER DF5J 12

COURSE Biotechnology (Higher)

SUMMARY

This unit seeks to develop knowledge and understanding, problem solving and practical abilities in the context of biotechnological processing, agriculture and horticulture applications, and clinical and forensic medicine applications. This is a component unit of Higher Biotechnology.

OUTCOMES

1 Demonstrate knowledge and understanding related to biotechnology.
2 Solve problems related to Higher Biotechnology.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following:

- Intermediate 2 Biotechnology
- Standard Grade Biology at Credit level
- Intermediate 2 Biology.

Administrative Information

Superclass: RH

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Source: Scottish Qualifications Authority

Version: 01

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CREDIT VALUE

1 credit at Higher (6 SCQF credit points at SCQF 6*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

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

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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 biotechnology.

Performance criteria

(a) Biotechnological processing is described correctly in relation to production methods.
(b) Biotechnology is described correctly in terms of its agricultural and horticultural applications, and clinical and forensic medicine applications.

Evidence requirements

Evidence of an appropriate level of achievement must be generated from a closed-book test with items covering both the above performance criteria.

OUTCOME 2

Solve problems related to Higher Biotechnology.

Performance criteria

(a) The problem to be solved is identified.
(b) Resources required to solve the problem are identified and obtained.
(c) Procedures appropriate to solving the problem are planned and designed.
(d) The planned procedures are carried out.
(e) The problem solving procedure is evaluated.

Evidence requirements

A report of one problem solving activity covering the above performance criteria in relation to the content and notes specified for Higher Biotechnology.
The report must be the individual work of the candidate. Depending on the activity, the problem solving may be groupwork.

National Unit Specification: support notes

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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

a) Biotechnological processing

1 Large scale cell and tissue culture production.
- i Laboratory models.
- ii Scaling up.
- iii Industrial fermenters.

2 Downstream processing as the extraction and purification of the desired end product (cells, solvent or solute).
- i Extracting cells from liquid culture.
- ii Obtaining solvent and solute.

3 Comparison of batch and continuous flow processes.

4 Enzymes in production.
- i Different processing techniques for production of intracellular and extracellular enzymes.
- ii Immobilisation of enzymes.
- iii Uses of enzymes.

5 Production of transgenic organisms.
- i Transgenic animals.
- ii Transgenic plants.

6 New breeding techniques.
- i Embryo manipulation.
- ii Embryo cloning.
- iii Somatic cell cloning.

b) Biotechnology applications

1 Agriculture and horticulture applications
- i Crop protection.
  Microbial pesticides.
  Transfer of gene for bacterial toxin into plants.
  Herbicide resistance.
- ii Plant production.

2 Clinical and forensic medicine applications
- i Producing vaccines by genetic engineering.
  Advantages over conventional production methods.
  Production of Hepatitis vaccine.

ii Monoclonal antibodies.
Production.
Uses.
iii Transgenic animals.
Production of medical products by transgenic animals.
Advantages and disadvantages over the use of micro-organisms.
iv Stem cell culture.
v DNA profiling.

3 Environmental application
i Biosensors as pollution detectors.
ii Bioremediation.

Outcome 2

Examples of suitable learning activities for this outcome include:

- set up a small scale laboratory fermenter and monitor and control various conditions such as pH and temperature
- autolyse yeast and test viability at different stages in a downstream process
- investigate the effect of pectinase, amylase, cellulase and RGase on the production and clarity of fruit juice
- investigate the action of cellulase on cellulose
- investigate methods of removing immobilised enzyme beads from the substrate
- analyse data on DNA profiling.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Details of suitable approaches are provided in the course specification.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Outcome 1

Outcome 1 for this unit is assessed by a test designed to provide evidence that the outcome and performance criteria have been achieved.

The National Assessment Bank will provide advice on suitable approaches.

Outcome 2

This involves the submission of one report of a problem solving activity related to Higher Biotechnology.

Candidates are only required to produce one report on a problem solving activity for Higher Biotechnology. This report can be used as evidence for Outcome 3 in 'Microbiology' and for Outcome 2 in 'Biology'.

National Unit Specification: support notes (cont)

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The 'Outcome 2: Teacher/Lecturer guide' is provided to indicate what might be addressed to achieve a specific performance criterion. The relevance of the items will vary according to the problem solving activity being undertaken eg bullet points which refer to variables would not apply in a case study type problem solving activity. The professional judgement of the teacher/lecturer will be important in deciding if a performance criterion has been met for a particular activity.

National Unit Specification: support notes (cont)

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Outcome 2: Teacher/Lecturer guide

All the performance criteria given in the left-hand column must be achieved in order to attain the outcome. The right-hand column gives suggestions which might aid the professional judgement of the assessor.

Performance criteria	**Suggestions to aid professional judgement**
(a) The problem to be solved is identified.	Main features of the problem are identified.
(b) Resources required to solve the problem are identified and obtained.	Resources might include: • sources of information • set procedures • people • equipment/physical resources • materials.
(c) Procedures appropriate to solving the problem are planned and designed.	The plan might include: • what is to be measured/collected • variable altered • variable kept constant • how many readings/measurements/observations/subjects • equipment/resources required • how data will be recorded, analysed and presented.
(d) The planned procedures are carried out.	This would include a record of the data collected, analysis and presentation of data. Data should be analysed and presented in tabular, graphical format or as a scatter diagram or equivalent as appropriate: • for tabular presentation this must include suitable headings and units showing averages or other appropriate computations • for 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 quantities and units and with data correctly plotted.
(e) The problem solving procedure is evaluated.	The evaluation might include: • as assessment of the effectiveness of the procedure including planning and organising and the outcome of the activity • drawing valid conclusions, which make use of the presented evidence • suggestions for alternative or modified strategies, further work, predictions or generalisations • an assessment/explanation of the relevance of the results.

National Unit Specification: support notes (cont)

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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).