Higher National Unit specification

General information for centres

Unit title: Animal and Plant Cell Culture: An Introduction

Unit code: DH2H 34

Unit purpose: This Unit is intended to provide the candidate with an introduction to the principles and techniques of animal and plant cell culture. It is intended for candidates undertaking a Biotechnology related qualification and/or career where knowledge and understanding of these concepts and practical skills are required.

On completion of the Unit the candidate should be able to:

1. Describe the principles and applications of animal cell culture.
2. Describe the techniques of animal cell culture.
3. Describe the principles and applications of plant cell culture.
4. Apply the techniques of plant cell culture.

Credit value: 1 HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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.*

Recommended prior knowledge and skills: Access to the Unit will be at the discretion of the centre. It would, however be recommended that candidates should have completed relevant units of the first year HNC Applied Sciences programme.

Core Skills: There may be opportunities to gather evidence towards Core Skills in Communication and Problem Solving at higher level in this Unit although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: This Unit is included in the framework of the Group Award, HND Biotechnology. It is recommended that it should be taught and assessed within the subject area of the particular Group Award to which it contributes.

Assessment: Outcomes 1 and 3 should be assessed by a holistic closed-book, supervised assessment with a cut off score of 60%. Outcome 2 is assessed as an open-book assignment as detailed in the Evidence Requirements. Outcome 4 is assessed on the basis of candidates demonstrating good laboratory techniques and should be assessed by an appropriate checklist and submission of a laboratory report.

Higher National Unit specification: statement of standards

Unit title: Animal and Plant Cell Culture: An Introduction

Unit code: DH2H 34

The sections of the Unit stating the Outcomes, knowledge and/or skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the principles and applications of animal cell culture

Knowledge and/or Skills

- Principles of animal cell culture
- Growth requirements of animal cells in culture
- Applications of animal cell culture

Evidence Requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing they can:

- describe the principles of animal cell culture
- describe the growth requirements of animal cell culture
- describe the applications of animal cell culture

For this Outcome two of the three knowledge and skills items listed above must be assessed on each occasion.

Assessment Guidelines

Outcome 1 and 3 should be assessed as an holistic, closed-book, supervised test with a cut off score of 60%. This should take the form of an assessment composed of a series of restricted response and/or structured questions.

Higher National Unit specification: statement of standards (cont)

Unit title: Animal and Plant Cell Culture: An Introduction

Outcome 2

Describe the techniques of animal cell culture

Knowledge and/or Skills

- Equipment for animal cell culture
- Materials for animal cell culture
- Animal cell culture techniques
- Recording results and observations

Evidence Requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing they can:

- appropriately select and describe the equipment required for animal cell culture
- appropriately select and describe the materials required for animal cell culture
- correctly describe the techniques used in animal cell culture
- accurately record and observe results of animal cell culture

Assessment Guidelines

Assessment for Outcome 2 should take the form of a problem solving, written assignment. The assessment should be open-book and should be assessed by the lecturer using a checklist appropriate to the assignment. The candidate should describe the equipment, materials and techniques required to complete a given task or tasks and also describe what observations and results should be recorded. The candidate should be given access to appropriate research materials in order to help with the completion of the assignment and they may complete the assignment in their own time. The centre may wish to informally question candidates to ensure that the work submitted is the individual's own.

Outcome 3

Describe the principles and applications of plant cell culture

Knowledge and/or Skills

- Principles of plant cell culture
- Growth requirements of plant cells in culture
- Applications of plant cell culture

Higher National Unit specification: statement of standards (cont)

Unit title: Animal and Plant Cell Culture: An Introduction

Evidence Requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing they can:

- describe the principles of plant cell culture
- describe the growth requirements of plant cells in culture
- describe the applications of plant cell culture.

For this Outcome two of the three knowledge and skills items listed above must be assessed on each occasion. One of the assessed items must be different from the items assessed for Outcome 1.

Assessment Guidelines

See assessment guidelines for Outcome 1.

Outcome 4

Apply the techniques of plant cell culture

Knowledge and/or Skills

- Equipment for plant cell culture
- Materials for plant cell culture
- Plant cell culture techniques
- Recording results and observations

Evidence Requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing they can:

- demonstrate and understand use of equipment required for plant cell culture
- demonstrate and understand use of materials required for plant cell culture
- demonstrate and understand techniques used in plant cell culture
- accurately record and observe results of plant cell culture

Assessment Guidelines

Outcome 4 focuses on the practical aspects of plant cell culture and assessment should take the form of a practical task which should be completed in 2 hours. A laboratory report should be submitted as written evidence of an understanding of the knowledge and/or skills and this should also be assessed by an appropriate checklist. The candidate may complete the laboratory report in their own time. The candidate must achieve a satisfactory level in both the practical demonstration and in the laboratory report.

Administrative Information

Unit code: DH2H 34

Unit title: Animal and Plant Cell Culture: An Introduction

Superclass category: RH

Original date of publication: August 2004

Version: 02 (June 2009)

History of changes:

Version	Description of change	Date
02	Changes made to standardise assessment guidelines.	03/06/09

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Animal and Plant Cell Culture: An Introduction

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 the content and context for this Unit

This Unit is primarily intended to provide the candidate with an introduction to and an understanding of the basic concepts of animal and plant cell culture. One half of the Unit focuses on the underlying theory, principles and practical aspects of animal cell culture, while the other half of the Unit looks at the same aspects of plant cell culture. Practical experience is of as much importance as understanding the theory of animal culture. It is acknowledged that access to equipment and materials required for cell culture may be restricted, however it is recommended that candidates should be allowed to practice the techniques underpinning successful animal and plant cell culture wherever possible.

Outcome 1 focuses on the theory of animal cell culture, namely principles, conditions and applications. Candidates should be familiar with the following:

Principles: Cell growth in vivo and in vitro
Establishing and characteristics of primary cell cultures
Establishing and characteristics of cell lines:- clonal, continuous and transformed lines, immortalisation and The Hayflick limit
The cell cycle, types of cells used (animal and human), types of growth (suspension and monolayers)

Conditions: Composition and types of growth media.
Buffering systems and pH.
Temperature, oxygen and carbon dioxide requirements
Use of serum and antibiotics
Sterile environment
Substrate

Applications: Use in basic research, as a diagnostic tool, monoclonal antibody production, gene therapy, vaccine production, toxicity testing, genetic manipulation and tissue engineering.

Outcome 2 looks at the practical aspects of animal cell culture and focuses on the materials, equipment and techniques used as well as accurate recording of results. It is recommended that students be given adequate demonstration and/or practice of these aspects of animal cell culture wherever possible. Candidates should be familiar with the following:

Equipment: Plastic-ware, incubators, laminar flow hood

Higher National Unit specification: support notes (cont)

Unit title: Animal and Plant Cell Culture: An Introduction

Materials: Cell lines, culture media and trypsinisation solutions.

Techniques: Aseptic technique
Trypsinisation and passaging of cells
Cell counting by trypan blue exclusion
Use of inverted microscope
Cell incubation and growth and assessment of cell growth
Cryopreservation of cells and retrieval from liquid nitrogen.

Outcome 3 looks at the principles, conditions and applications of plant cell culture. Candidates should be familiar with the following:

Principles: Cell growth in vivo and in vitro
Establishing and characteristics of callus tissue and meristems
Use of hormones
Micropropagation
Explants and transplantation
Types of cells used and their growth
Vegetative and sexual propagation

Conditions: Composition and types of growth media
Plant hormone requirements
Growth in flasks and on agar
Incubation conditions
Light

Applications: Micropropagation in agriculture and horticulture use in plant breeding programmes, genetic manipulation and germplasm conservation

Outcome 4 looks at the practical aspects of plant cell culture and focuses on the materials, equipment and techniques used as well as accurate recording of results. As for animal cell culture, competency in the practical aspects of plant cell culture is extremely important and it is recommended that students be given adequate demonstration and/or practice wherever possible. Candidates should be familiar with the following:

Equipment: Culture vessels, agar plates, laminar flow hood and incubator

Materials: Plant material and culture medium

Techniques: Aseptic technique
Explants from fresh material and growth of explant material
Transplantation of plantlets.
Cauliflower meristem and carrot callus culture
Use of inverted microscope

Higher National Unit specification: support notes (cont)

Unit title: Animal and Plant Cell Culture: An Introduction

Guidance on the delivery and assessment of this Unit

This Unit is designed to form part of the Group Award HND Biotechnology. It is designed to introduce candidates to basic animal and plant cell culture theory and practical skills. Candidates should have completed the first year of the HNC Applied Sciences award.

Assessment for Outcomes 1 and 3 should be a closed-book written assessment as detailed in the Evidence Requirements.

Assessment for Outcome 2 should take the form of a written assignment as detailed in the Evidence Requirements. For example candidates may be asked to describe which materials, equipment and techniques they would use in order to establish a culture of a particular frozen cell line and what observations and results they would record. Each candidate would be assigned a different cell line and the submitted work should be their own. Candidates should be given access to the appropriate catalogues and laboratory manuals in order to research the project. The assessment should be open-book and should be assessed using an appropriate checklist.

Access to animal cell culture equipment and materials is difficult for many centres and establishing plant cell culture is probably more achievable. As a result, assessment of practical skills in this Unit is covered in Outcome 4 and is by observation and an appropriate checklist as well as submission of a written laboratory report that may be completed in the candidate's own time. The written evidence should be the individual's own work. For example, cauliflower meristem and/or carrot callus culture may be attempted. This involves selection and use of the appropriate materials and equipment as well as the correct demonstration of techniques and accurate recording of results and observations.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**

General information for candidates

Unit title: Animal and Plant Cell Culture: An Introduction

This 1 credit HN Unit at SCQF level 7 is intended for candidates undertaking the Group Award, HND Biotechnology. It is designed primarily for candidates who have already successfully completed the first year of the HND Biotechnology programme.

This Unit will provide you with an introduction to:

1. The principles and applications of animal cell culture
2. Practical aspects of animal cell culture
3. The principles and applications of plant cell culture
4. Practical aspects of plant cell culture

The four Outcomes that make up this Unit are described below:

Outcome 1 looks at the theory of animal cell culture. The lectures and tutorials focus on the different types of animal cell cultures and how they grow. You will learn about the cell cycle and how cells grow in humans and animals as opposed to in the laboratory. You will also learn about what animal cells need to grow successfully in culture and the applications of animal cell culture in research, medicine and industry.

Outcome 2 focuses on the practical aspects of animal cell culture and you will learn about the equipment, materials and techniques required for successful animal cell culture. Practical classes and demonstrations will focus on proper use and choice of equipment and materials and how carry out the techniques routinely used in animal cell culture. You will also learn how to accurately observe and record your results.

Outcome 3 looks at the theory of plant cell culture. The lectures and tutorials focus on different types of plant cell culture and how they grow. You will also learn the basic difference between plant and animal culture. You will learn about the conditions required for successful plant cell culture and how plant cell culture is used in research, medicine and industry.

Outcome 4 focuses on the practical aspects of plant cell culture. You will learn about the equipment, materials and methods used in plant cell culture and how to observe and record your results properly. You will be given demonstrations of aspects of plant cell culture and allowed to practice them yourself.

Assessment

Your knowledge and/or skills of the topics covered in this Unit will be tested by a combination of closed-book assessment, practical tasks and an open-book assignment and laboratory report.

Successful completion of this Unit requires you to achieve a satisfactory level of performance in all assessments.