



Higher National Unit specification

General information for centres

Unit title: Microbiological Techniques: Theory and Practice

Unit code: DH2P 35

Unit purpose: This Unit is designed to introduce candidates to the concepts and techniques employed in the application of microbiology. It introduces candidates to the underpinning knowledge of microbiological techniques and allows the candidates to understand these concepts. It is intended for candidates undertaking an HN Science related qualification and would require an understanding of the importance of these concepts and the relevant skills.

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

1. Analyse and explain the mechanisms of variation in bacteria and fungi.
2. Describe the significance of clinical microbiology.
3. Demonstrate a knowledge of cellular microbiology.
4. Collect and analyse information from experiments using microbiological techniques.

Credit value: 2 HN credits at SCQF level 8: (16 SCQF credit points at SCQF level 8*)

**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 this Unit will be at the discretion of the Centre. It would, however, be beneficial if candidates have completed an appropriate HN Unit at SCQF level 7 in microbiology. This may be demonstrated by possession of HN Unit: Microbiology: Theory and Practice.

Core Skills: There may be opportunities to gather evidence towards Core Skills in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: This Unit is intended to be part of the HNC/D Science Group Awards. It is recommended that it should be taught and assessed within the context of the particular Group Award to which it contributes.

General information for centres (cont)

Assessment:

~~Outcomes 1-3 of this Unit should be assessed by a closed-book, holistic, supervised assessment with a cut off score of 60%. Outcome 4 should be assessed by laboratory reports. This unit should be assessed by a single holistic end of unit assessment and four laboratory practicals. For Outcomes 1-3 this would take the form of written responses to questions as detailed in the evidence requirements. In Outcome 4, where practical skills are assessed, evidence could be recorded in the form of a checklist and laboratory reports. Candidates must meet the level of performance specified in the evidence requirements for the unit after the outcomes to achieve the unit.~~

Higher National Unit specification: statement of standards

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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

Analyse and explain the mechanisms of variation in bacteria and fungi

Knowledge and/or Skills

- ◆ Genetic variation in bacteria
- ◆ Genetic variation in fungi
- ◆ Form and function of plasmids
- ◆ Nature of transposons

Evidence Requirements

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

- ◆ analyse and explain gene transfer and recombination in bacteria
- ◆ analyse and explain recombination in fungi
- ◆ demonstrate an understanding of the role of plasmids in genetic transfer
- ◆ demonstrate an understanding of the role of transposons in genetic variation.

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

Assessment Guidelines

Outcomes 1-3 should be assessed by a closed-book, holistic ~~end-of-unit-supervised~~ assessment ~~of 1½-2 hours duration~~ with a cut-off score of 60%. This ~~closed-book~~ assessment should take the form of a set of restricted responses and/or structured questions evenly spread across the Outcomes to reflect the workload of each Outcome.

Higher National Unit specification: statement of standards (cont)

Unit title: Microbiological Techniques: Theory and Practice

Outcome 2

Describe the significance of clinical microbiology

Knowledge and/or Skills

- ◆ Aetiology and epidemiology of microbial infections
- ◆ Methods of laboratory identification of pathogens
- ◆ Biotechnology applications in the therapy of microbial infections

Evidence Requirements

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

- ◆ identify the causative pathogen of selected microbial infections
- ◆ describe the epidemiology of selected microbial infections
- ◆ describe the application of modern molecular biology methods in the identification of pathogenic micro-organisms
- ◆ describe novel methods of therapy arising from the biotechnology industry.

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

Assessment Guidelines

Outcomes 1-3 should be assessed by a closed-book, holistic, supervised end-of-unit assessment ~~of 1½-2 hours duration~~ with a cut-off score of 60%. This ~~closed book~~ assessment should take the form of a set of restricted responses and/or structured questions evenly spread across the Outcomes to reflect the workload of each Outcome.

Higher National Unit specification: statement of standards (cont)

Unit title: Microbiological Techniques: Theory and Practice

Outcome 3

Demonstrate a knowledge of cellular microbiology

Knowledge and/or Skills

- ◆ Prokaryotic signalling mechanisms
- ◆ Bacterial virulence mechanisms
- ◆ Interactions between host cells and bacteria in infection

Evidence Requirements

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

- ◆ describe the process of signalling molecules involved in prokaryotic organisms
- ◆ describe the molecular techniques in defining virulence
- ◆ explain adhesion to host cells
- ◆ explain invasion of host cells

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

Assessment Guidelines

Outcomes 1-3 should be assessed by a closed-book, holistic, supervised end-of-unit assessment ~~of 1½-2 hours duration~~ with a cut-off score of 60%. This ~~closed-book~~ assessment should take the form of a set of restricted responses and/or structured questions evenly spread across the Outcomes to reflect the workload of each Outcome.

Outcome 4

Collect and analyse information from experiments using microbiological techniques

Knowledge and/or Skills

- ◆ Experiments are performed in accordance with instructions
- ◆ Experiments are performed safely
- ◆ Data is presented in appropriate format in practical reports
- ◆ Data is analysed correctly
- ◆ Appropriate conclusions are drawn

Higher National Unit specification: statement of standards (cont)

Unit title: Microbiological Techniques: Theory and Practice

Evidence Requirements

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

- ◆ perform laboratory practicals involving gene transfer and/or recombination in bacteria and/or fungi
- ◆ use modern laboratory methods to isolate and identify selected micro-organisms within the safety specifications of the laboratory.

Assessment Guidelines

This Outcome should be assessed by laboratory based practical experiments. ~~It is suggested that at least four laboratory practicals be undertaken. Candidates should submit four laboratory reports and checklists should be used to record practical skills. Candidates should~~ submit at least one laboratory report for each Evidence Requirements

Administrative Information

Unit code: DH2P 35

Unit title: Microbiological Techniques: Theory and Practice

Superclass category: RH

Original date of publication: August 2004

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History of changes:

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

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Higher National Unit specification: support notes

Unit title: Microbiological Techniques: Theory and Practice

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 80 hours.

Guidance on the content and context for this Unit

This Unit is primarily intended to provide the candidate with an understanding of micro-organisms with respect to their genetics, the role they play in infection at cellular level and the application of our knowledge to taxonomy and industrial manufacture of microbial products. In addition the integration of practical activities allows the candidate to gain experience in a variety of techniques and skills. The knowledge of genetic exchange and recombination gained here will be useful in Units such as molecular biology and bioinformatics.

Outcome 1 looks at microbial genetics and recombination.

- ◆ Bacterial cells: conjugation; transformation; transduction
- ◆ Fungi: independent assortment; segregation; tetrad analysis.
- ◆ Plasmids: size; function; number of copies per cell; conjugative ability; promiscuity.
- ◆ Transposons: transposable elements to include insertion sequence; transposons; transposition; conjugative transposons.

Outcome 2 introduces candidates to the emerging importance of clinical microbiology in the 21st century and the applications of the revolutionary new techniques in microbial identification and therapy emerging from the biotechnology industry. Emphasis should be placed on the causative agents and epidemiology of topical microbial infections currently giving concern, current techniques used in the laboratory in their identification and new therapies available to treat these infections. Reference should be made to the culture of micro-organisms of clinical importance.

- ◆ Viruses
- ◆ Fungi
- ◆ Bacteria
- ◆ Protozoa

Higher National Unit specification: support notes (cont)

Unit title: Microbiological Techniques: Theory and Practice

Outcome 3 introduces candidates to the relatively new area of cellular microbiology which brings together microbiology, molecular and cell biology. Candidates should become familiar with:

- ◆ Prokaryote signalling mechanisms: bacterial pheromones; quorum sensing
- ◆ Bacterial virulence mechanisms: molecular biology protocols; gene transfer; protein and cDNA approaches
- ◆ Bacterial and host cell interactions: bacterial adhesion and invasion; toxins; applications in disease treatment

Outcome 4 enables candidates to acquire practical skills relevant to Outcomes 1 and 2. It also encourages them to apply their knowledge and/or skills from these Outcomes to the analysis of experimental data. Centres should devise experiments, appropriate to their laboratory safety specifications, in microbial genetics and identification methods.

Guidance on the delivery and assessment of this Unit

This Unit is designed to form part of the HNC/D Science Group Awards. It is not a Unit which candidates are likely to find accessible at an introductory level. It is therefore recommended that this Unit is delivered only as part of a HND second-year programme. Candidates should have experience of a background in basic microbiology and preferably related topics such as genetics, cell biology and biochemistry.

Owing to the breadth of the topics it is recommended that the key areas of each topic are covered to an appropriate level. Where possible emphasis should be placed on industrial applications.

Outcomes 1-3 should be assessed by a closed-book, holistic, ~~end-of-unit test supervised~~ assessment with a cut-off score of 60%. ~~Written e~~ Evidence should be generated on a sample basis evenly spread across each Outcome to reflect the workload of each Outcome.

Outcome 4 should be assessed by laboratory based experiments. Assessment of practical skills should be by ~~checklists and~~ submission of at least four one laboratory reports.

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.

Higher National Unit specification: support notes (cont)

Unit title: Microbiological Techniques: Theory and Practice

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: Microbiological Techniques: Theory and Practice

This is a 2 credit HN Unit at SCQF level 8 and is intended for candidates undertaking a Biological Sciences/Biotechnology related qualification. It is designed for candidates who already have a good knowledge of microbiology achieved at SCQF level 7.

The Unit introduces you to more advanced concepts of microbiological practices. You will study microbial genetics which underpins many of the present day techniques such as genetic engineering and strain improvement in the fermentation industry.

You will also learn some of the basic principles employed in clinical microbiology and cellular microbiology. In addition, you will acquire practical skills in these areas.

In order to complete this Unit successfully, you should be able to:

1. Analyse and explain the mechanisms of variation in bacteria and fungi.
2. Describe the significance of clinical microbiology.
3. Demonstrate a knowledge of cellular microbiology.
4. Collect and analyse information from experiments using microbiological techniques.

The Unit will be delivered by lectures/tutorials and laboratory practicals.

Your knowledge and skills acquired in this Unit will be tested by production of ~~written~~ evidence ~~produced~~ through ~~an end-of-unit a holistic,~~ closed-book ~~written~~ assessment for Outcomes 1-3. In Outcomes 4 practical skills will be assessed by laboratory-based practicals (for which you will write four laboratory reports) and checklists and one laboratory report.

You must achieve a satisfactory level of performance in all assessments in order to achieve this Unit.