Higher National Unit specification

General information for centres

Unit title: Immunological Techniques: Theory and Practice

Unit code: DH2L 35

Unit purpose: This Unit is designed to develop knowledge and understanding of the principles underlying immunological techniques and to develop the practical skills required to undertake these techniques. The Unit is suitable for candidates who are studying for an HN Biosciences who are currently working in or who are intending working in a laboratory using immunological techniques.

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

1. Demonstrate knowledge and understanding of the principles underlying immunological techniques.
2. Demonstrate knowledge and understanding of the uses of immunological techniques in clinical, research and industrial environments.
3. Perform practical work related to immunology.

Credit value: 1 HN credit at SCQF level 8: (8 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, however it is recommended that candidates should have experience of studying biology at SCQF level 7.

Core Skills: There may be opportunities to gather evidence towards the 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 could be used for all HN Bioscience qualifications. It is recommended that it should be taught and assessed within the subject area of the particular Group Award to which it contributes.

General information for centres (cont)

Assessment Guidelines:

Outcomes 1 and 2 should be assessed together by a closed-book, holistic, supervised assessment as detailed in the Evidence Requirements. Outcome 3 should be assessed by two laboratory based exercises, and should be evidenced by an appropriate checklist and a laboratory report for each technique.

Higher National Unit specification: statement of standards

Unit title: Immunological Techniques: Theory and Practice

Unit code: DH2L 35

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

Demonstrate knowledge and understanding of the principles underlying immunological techniques

Knowledge and/or Skills

- The principles underlying precipitation reactions
- The principles underlying agglutination reactions
- The principles of using labelled antibodies or antigens in immunoassays
- The principles of using complement in immunoassays
- The principles of vaccine design

Evidence Requirements

The candidate will require written evidence to demonstrate their knowledge and understanding of the principles underlying immunological techniques.

This evidence will take the form of a single holistic assessment that involves sampling of the knowledge and skills listed in the above Outcome. On each occasion, 3 of the 5 bullet points in the knowledge and skills section for Outcomes One must be assessed. A different sample should be chosen on each assessment occasion to prevent candidates being able to foresee what they will be asked.

Where knowledge and skills is sampled, a candidate's response will be judged to be satisfactory where the evidence provided is sufficient to meet the requirements for each knowledge and/or skills item by showing that the candidate is able to:

- explain the principles underlying one immunoprecipitation reaction
- explain the principles underlying one agglutination reaction
- explain the principles underlying an immunoassay using a labelled antibody or antigen
- explain the principles underlying one immunoassay using complement
- explain the principles of the design of a vaccine

Higher National Unit specification: statement of standards (cont)

Unit title: Immunological Techniques: Theory and Practice

Assessment Guidelines

Assessment of this Outcome is by a single holistic assessment that provides the opportunity to cover the Evidence Requirements for both Outcomes one and two. The assessment should be taken under supervised, closed-book conditions. The cut off score for the assessment should be set at 60%. The questions could be a combination of structured and restricted responses.

Outcome 2

Demonstrate knowledge and understanding of the uses of immunological techniques in clinical, research and industrial environments

Knowledge and/or Skills

- The uses of precipitation reactions
- The uses of agglutination reactions
- The uses of immunoassays using labelled antibodies or antigens
- The uses of immunoassays using complement
- The uses of antibodies to purify proteins

Evidence Requirements

The candidate will require written evidence to demonstrate their knowledge and understanding of the uses of immunological techniques.

This evidence will take the form of a single holistic assessment that involves sampling of the knowledge and skills listed in the above Outcome. On each occasion, 3 of the 5 bullet points in the knowledge and skills section for Outcome two must be assessed. A different sample should be chosen on each assessment occasion to prevent candidates being able to foresee what they will be asked.

Where knowledge and skills are sampled, a candidate's response will be judged to be satisfactory where the evidence provided is sufficient to meet the requirements for each knowledge and skills item by showing that the candidate is able to:

- describe one application of an immunoprecipitation reaction
- describe one application of an agglutination reaction
- describe one application of an immunoassay using a labelled antibody or antigen
- describe one application of an immunoassay using complement
- describe one application where an antibody is used to purify a protein.

Higher National Unit specification: statement of standards (cont)

Unit title: Immunological Techniques: Theory and Practice

Assessment Guidelines

Assessment of this Outcome is by a single, holistic assessment that provides the opportunity to cover the Evidence Requirements for both Outcomes one and two. The assessment should be taken under supervised, closed-book conditions. The cut off score for the assessment should be set at 60%. The questions could be a combination of structured and restricted responses.

Outcome 3

Perform practical work related to immunology

Knowledge and/or Skills

- Plan and perform immunological techniques
- Record measurements and/or observations in an appropriate format
- Analyse recorded information
- Draw valid conclusions
- Evaluate the results and/or techniques with supporting argument

Evidence Requirements

Two different immunological techniques must be performed under supervised conditions. Examples of immunological techniques are ELISA assays and immuno (western) blotting.

Evidence that the candidate can plan and perform each experimental technique will be recorded in the form of checklists that are completed and signed by the lecturer/supervisor.

The candidate will be required to produce one laboratory report written in the standard format for each technique for the other knowledge and/or skills items not recorded on the checklists.

Assessment Guidelines

The candidate should perform two practical exercises using different immunological techniques under supervised conditions. Checklists and the production of 2 laboratory reports should provide evidence covering all of the bullet points under knowledge and skills.

Administrative Information

Unit code: DH2L 35

Unit title: Immunological Techniques: Theory and Practice

Superclass category: RH

Original date of publication: August 2004

Version: 03 (June 2009)

History of changes:

Version	Description of change	Date
02	Amendment to Guidance and delivery of this Unit and recommended prior knowledge and skills.	18/05/06
03	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: Immunological 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 40 hours.

Guidance on the content and context for this Unit

This Unit is intended for a candidate who is studying for a Group Award in Biosciences and who is intending to work or is already working in a laboratory environment using immunological techniques. Therefore this Unit is intended to provide the candidate with underpinning knowledge and practical experience required to undertake these techniques.

Outcome 1

Precipitin reactions: principles of antigen excess, antibody excess and equivalence.

Agglutination reactions: interaction between antibody and particulate antigen, prozone effects.

Principles of RIA: competitive binding of radio labelled antigen and unlabelled antigen to a high affinity antibody. Methods of separating bound and free antigen.

Principles of enzyme labelled antibodies: the principles underlying ELISA (indirect, competitive and sandwich) and Western blots should be covered. Concept of primary and secondary antibodies, enzymes used to label antibodies, substrates used, coloured products formed.

Principles of the use of labelled antibodies in microscopy: direct and indirect methods with fluorochrome labelled antibodies using light microscopy, colloidal gold-labelled antibodies using electron microscopy.

Complement cascade system: concept that one component is activated by another component. Final component being membrane attack complex which lyses cells.

Types of vaccines: attenuated, inactivated (heat or chemical), macromolecular, recombinant, synthetic peptide.

Problems with vaccines: organisms with large number of serotypes, toxic products, side effects, localisation of the vaccine, cell mediated response or humoral immunity, use of adjuvants.

Higher National Unit specification: support notes (cont)

Unit title: Immunological Techniques: Theory and Practice

Outcome 2

Applications of precipitin reactions in gels:

- qualitative immunoprecipitation (Ouchterlony double diffusion).
- quantitative immunoprecipitation (single radial immunodiffusion) immunoelectrophoresis.

Applications of agglutination reactions: haemagglutination, passive agglutination, agglutination inhibition.

The uses of techniques using labelled antibodies and antigens are extremely widespread and examples should be chosen with the consideration of the background and aspirations of the candidate. It is recommended that uses of these immunoassays include their use in diagnostic kits.

Complement fixation tests: use of antibody-sensitised erythrocytes (EA). Use of guinea pig serum as a source of complement. Tests can be used to determine total complement activity or individual component activity. Tissue typing: HLA typing of potential donors and recipients.

Protein purification: use of specific antibodies in affinity chromatography, immunoprecipitation.

Outcome 3

Immunological techniques should encompass the techniques described in Outcomes One and Two. It is recommended that the techniques chosen reflect the aims and aspirations of the candidates undertaking the Unit.

Guidance on the delivery and assessment of this Unit

This Unit is likely to form part of a Group Award which is primarily designed to prepare candidates for employment in a biological sciences/ biotechnology - related post.

Independent study should be encouraged by using candidate-centred, resource based methodologies.

Assessment of Outcomes 1 and 2 is by production of appropriate written evidence which should be generated by a sampled, holistic approach to assessment.

Higher National Unit specification: support notes (cont)

Unit title: Immunological Techniques: Theory and Practice

Assessment of Outcome 3 is by two practical exercises accompanied by checklists and two standard laboratory reports.

Where evidence for Outcome 3 is found to be unsatisfactory, candidates may be questioned orally (by direct questioning) to identify particular problems with specific areas. Support tutorials may be useful in helping to provide a solution to these problems.

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

General information for candidates

Unit title: Immunological Techniques: Theory and Practice

This is a one credit Unit at SCQF level 8 intended for candidates undertaking the second year of a biological science-related qualification. It is designed to provide you with information regarding some of the most common immunological techniques used in a wide variety of research, clinical and industrial laboratories. Emphasis is on you being provided with the opportunity to gain hands-on experience of some of these techniques.

On completion of this Unit you should be able to:

1. Demonstrate knowledge and understanding of the principles underlying immunological techniques
2. Demonstrate knowledge and understanding of the uses of immunological techniques in clinical, research and industrial environments
3. Perform techniques related to immunology

The three Outcomes that make up the Unit are described below:

Outcome 1

In this Outcome you will be given information about the underlying principles of a variety of immunological techniques such as immunoprecipitation, immunoagglutination and immunoassays involving labelled antibodies and antigens. One of the aspects of this Outcome is to explore the different types of vaccines which are available and some of the issues which must be considered when designing a vaccine.

Outcome 2

This Outcome gives you details about the uses and applications of the techniques covered in Outcome 1. Many of these techniques are in regular use in a wide range of laboratories, including those involved in clinical medicine, research and industry.

Outcome 3

You will be given the opportunity to perform some of the techniques covered in Outcomes one and two. In this way you will gain valuable practical skills in immunological techniques that will allow you to work in a laboratory. You will also be required to write laboratory reports in which you record, discuss and critically analyse the results and techniques used.

Your knowledge and/or skills of the topics covered in this Unit will be tested by a combination of laboratory exercises (including the production of laboratory reports) and a closed-book holistic assessment.

To pass in this Unit, you must achieve a satisfactory level of performance in all assessments.