Higher National Unit specification

General information

Unit title: DNA Molecular Techniques (SCQF level 8)

Unit code: H92A 35

Superclass: RH

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Version: 02

Unit purpose:

This Unit is designed to enable learners to understand practical applications of some of the fundamental principles of molecular DNA technology. Learners will also develop practical skills in techniques relevant to molecular biology. The Unit is suitable for learners studying at HND level, and will provide the necessary underpinning knowledge and skills to enable progression to further study of molecular biology at degree level or to seek employment in science based industries.

Outcomes

On successful completion of the Unit the learner will be able to:

1 Describe the general principles of cloning DNA.
2 Describe the techniques involving RNA extraction and cDNA library synthesis.
3 Describe the basic principles of PCR and Real Time PCR.
4 Describe molecular technology of DNA sequencing, microarray analysis and whole genome sequencing.
5 Explain the use of DNA technology in animal models.
6 Perform practical experiments related to molecular biology techniques.

Credit points and level

2 Higher National Unit credits at SCQF level 8: (16 SCQF credit points at SCQF level 8)

Higher National Unit specification: General information (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Recommended entry to the Unit

Entry is at the discretion of the centre, however it is recommended that learners should have completed the HN Units H929 34 *DNA and Genetics*, H92G 34 *Microbiology: Theory and Laboratory Skills*, H927 34 *Cell Biology: Theory and Laboratory Skills* and H926 34 *Biotechnology: An Introduction* or equivalent.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

The Assessment Support Pack (ASP) for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website **(http://www.sqa.org.uk/sqa/46233.2769.html)**.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

Higher National Unit specification: Statement of standards

Unit title: DNA Molecular Techniques (SCQF level 8)

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 SQA.

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. Learners 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 general principles of cloning DNA.

Knowledge and/or Skills

- Transformation of E.Coli by plasmid vectors
- Subcloning of DNA
- Genomic libraries
- General features of cloning vectors
- Key features of expression vectors

Outcome 2

Describe the techniques involving RNA extraction and cDNA library synthesis.

Knowledge and/or Skills

- Eukaryotic genomes
- Poly (A) $^{+}$mRNA
- cDNA from poly (A) $^{+}$mRNA
- cDNA libraries

Outcome 3

Describe the basic principles of PCR and Real Time PCR.

Knowledge and/or Skills

- Design of primers for automated PCR
- Automated PCR
- Real Time PCR
- Applications of Real Time PCR

Higher National Unit specification: Statement of standards (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Outcome 4

Describe molecular technology of DNA sequencing, microarray analysis and whole genome sequencing.

Knowledge and/or Skills

- DNA sequencing
- Genetic mapping and mutation detection
- Microarray analysis
- Whole genome sequencing

Outcome 5

Explain the use of DNA technology in animal models.

Knowledge and/or Skills

- Methods of creating transgenic animals
- Use of animal models in studying genetic disease

Outcome 6

Perform practical experiments related to molecular biology techniques.

Knowledge and/or Skills

- Molecular biology experiments
- Working safely, within current health and safety regulations
- Consistent and accurate results
- Recording observations and results
- Evaluation skills
- Result analysis and conclusions

Higher National Unit specification: Statement of standards (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Evidence Requirements for this Unit

Written and/or oral recorded evidence for Outcomes 1−5 should be assessed using a holistic closed-book assessment under supervised conditions. The assessment will use a sampling approach to the Knowledge and/or Skills as detailed below. It is recommended that the assessment be completed within 90 minutes.

Written and/or oral recorded evidence for Outcome 6 should be assessed by production of a full laboratory report, or by completion of an appropriate pro forma. An assessor's observation checklist could be used to record performance evidence of practical experiments.

Outcome 1

The assessment will sample 3 of the 5 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe the process of the transformation of E. Coli by a plasmid vector.
- Describe the subcloning of a DNA fragment from a recombinant plasmid into another plasmid vector.
- Describe the basic principles of genomic libraries.
- Describe the general features of a good cloning vector.
- Describe the key features of expression vectors.

Outcome 2

The assessment will sample 3 of the 4 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe the basic organisation of higher eukaryotic genomes.
- Describe the isolation of poly (A) $^{+}$mRNA.
- Describe the synthesis of cDNA from poly (A) $^{+}$mRNA.
- Describe the construction and uses of cDNA libraries.

Outcome 3

The assessment will sample 3 of the 4 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe the general design of primers for automated PCR.
- Outline the stages of amplification using automated PCR.
- Outline the general stages of Real Time PCR procedure.
- Identify the applications of Real Time PCR.

Outcome 4

The assessment will sample 3 of the 4 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe the basic stages of the DNA sequencing procedure.
- Describe the use of DNA sequencing in mutation detection and genetic mapping of disease genes.
- Identify the practicalities of microarray analysis.
- Describe the process of sequencing a genome using DNA molecular technology.

Outcome 5

The assessment will sample 1 of the 2 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe a method of creating transgenic animals.
- Explain the uses of animal models in studying genetic diseases.

Outcome 6

Learners will perform a minimum of four practical experiments, the content of which will be related to at least two of the Outcomes 1−5. A learner's response will be judged satisfactory where the evidence shows that the learner can achieve all of the following:

- Follow instructions to perform experiments related to molecular biology.
- Work in a safe manner regarding current health and safety regulations.
- Achieve consistent and accurate results.
- Record experimental observations and results clearly and accurately.
- Evaluate validity of results in terms of sources of and values of experimental errors.
- Analyse results correctly and state valid conclusions.

Higher National Unit specification: Statement of standards (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

An assessor observation checklist will be used to record the learner's performance of the practical work in line with given instructions and health and safety requirements.

Learners must report two of the four practical experiments by production of a full laboratory report, and practical experiments which are written as full laboratory reports must be commensurate with SCQF level 8. Learners may report the remaining two practical experiments by production of a full laboratory report or by completion of an appropriate pro forma. Where a pro forma approach is deployed, the pro forma will not present information or assistance to the learners on how to correctly perform calculations, analyse experimental results or experimental errors. Learners will be expected to perform such activities independently on the basis of the experimental data.

Where a learner does not perform an assessed experiment to the required standard, they will be given the chance to either reattempt the same practical experiment, or to undertake a different practical experiment of similar complexity. Where a laboratory report or pro forma does not meet required standard, then the learner will be given a single opportunity to re-draft. If the required standard is still not attained, then an alternative practical experiment will be set.

Higher National Unit Support Notes

Unit title: DNA Molecular Techniques (SCQF level 8)

Unit Support Notes are offered as guidance and 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 intended as part of the framework for HND Applied Biological Sciences but may be suitable for inclusion in other HN Science awards. It is designed to develop the theoretical and practical aspects of molecular biology introduced in the HN Units H929 34 *DNA and Genetics*, H92G 34 *Microbiology: Theory and Laboratory Skills* and H927 34 *Cell Biology: Theory and Laboratory Skills.*

Outcome 1 — Describe the general principles of cloning DNA

This Outcome provides an overview of the general principles of cloning DNA. The emphasis is on the transformation of E. Coli by bacterial plasmid vectors. Learners should become familiar with the following:

- Transformation: how competent cells can be produced and the attributes of a competent cell, antibiotic resistance genes on vectors and the use of antibiotic resistance when screening transformants, calculation of transformation efficiency, transformation of E. Coli by plasmid vector procedure.
- Subcloning: restriction digest by restriction endonucleases, palindromic recognition sites, production of sticky and blunt ends, ligation by DNA ligase.
- Genomic libraries: fragmentation of the genome by restriction endonucleases, cloning into host cells, calculations using the Clarke and Carbon equation, outline of screening methods.
- Cloning vectors: multiple cloning sites, selectable markers, screening methods for inserts, alternative cloning vectors.
- Expression vectors: sequences required for expression of inserts, E. Coli expression vectors, inducible expression, fusion proteins.

Higher National Unit Support Notes (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Outcome 2 — Describe the techniques involving RNA extraction and cDNA library synthesis

This Outcome provides an overview of the general eukaryotic genomic structure and the techniques involved in mRNA isolation and cDNA production. Learners should become familiar with the following:

- Organisation of eukaryotic genomes: introns and exons, small percentage of coding DNA, basic control of gene expression, promoter sequences, splicing of introns, mature mRNA structure.
- Isolation: poly (A) $^{+}$mRNA, methods for isolating RNA, handling of RNA.
- Synthesis of cDNA: reverse transcription procedure.
- cDNA libraries: use of linkers, outline methods of screening cDNA libraries.

Outcome 3 — Describe the basic principles of PCR and Real Time PCR

This Outcome provides an overview of automated PCR and the design of primers for automated PCR, Real Time PCR and the applications of these methods. Learners should become familiar with the following:

- Primer design for Automated PCR: length, known complementary sequence, base composition, size of PCR product.
- Automated PCR: stages of a PCR cycle leading to exponential amplification of a short PCR product by thermal cycler.
- Real Time PCR: quantitative PCR method, use of probes that can be used to allow the progress of a PCR reaction to be monitored, quantitation of DNA and RNA.
- Applications of Real Time PCR: provide examples of different applications of Real Time PCR.

Outcome 4 — Describe molecular technology of DNA sequencing, microarray analysis and whole genome sequencing

This Outcome allows learners to become familiar with different molecular technology such as DNA sequencing, microarray analysis and whole genome sequencing and the practicalities of these technologies. Learners should become familiar with the following:

- Basic stages of DNA sequencing: PCR using fluorescently labelled dideoxynucleotides, capillary electrophoresis.
- Genetic mapping and mutation detection: recombination, linkage mapping, microsatellite markers, production of electropherogram to detect point mutations, insertions and deletions.

- Microarray: comparison of expression from different sources of tissue, creating labelled DNA, hybridisation of DNA to microarray plate, microarray scanner and analysis, uses of microarray technology.
- Whole genome sequencing: Human Genome project, methods of sequencing a genome, advantages for genetic research of sequencing genomes.

Outcome 5 — Explain the use of DNA technology in animal models

This Outcome concentrates on allowing learners to become familiar with the basic concepts in creating transgenic animals and the practicalities of creating transgenic animals. Learners should become familiar with the following:

- Methods of creating transgenic animals: DNA microinjection, embryonic stem cell-mediated gene transfer, retrovirus mediated gene transfer.

Learners should also be aware of some of the following practicalities:

- Uses of animal models in studying genetic disease: improving livestock, analysis of gene expression, study of disease process, production of specific proteins.

Outcome 6 — Perform practical experiments related to molecular biology techniques

Due to the limited availability of specialist equipment within centres, it is anticipated that the practical experiments will focus on Outcomes 1 and 3. Guidance on suitable practical experiments for assessment purposes is given elsewhere in this document. However, it is envisaged that learners will also participate in a range of other practical experiments which will both develop their laboratory skills and support the theory covered in Outcomes 1−5.

In carrying out such activities, learners should follow Good Laboratory Practice (GLP) and carry out or be familiar with the risk and Control of Substances Hazardous to Health (COSHH) assessments on all procedures undertaken. Opportunities should be taken to develop awareness of the sources of experimental error and of the accuracy of measurements, with quantification of errors where possible.

Guidance on approaches to delivery of this Unit

Outcomes 1−5 would best be delivered in order to ensure that the learners have covered the basic principles of DNA molecular technology before building on this knowledge to cover more advanced techniques and practicalities. It is envisaged that laboratory work and demonstrations will feature across the delivery of Outcomes 1 and 3 and that the assessed practical experiments for Outcome 6 will be undertaken in a similar timeframe to the underpinning theory. This will ensure that learners have the opportunity to complete some practical techniques that are accessible within most classroom settings. Other practical techniques such as microarray analysis could be demonstrated by the use of online virtual labs.

Higher National Unit Support Notes (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

It is envisaged that delivery of Outcome 1 could commence with a basic overview of transformation. Each aspect of the transformation procedure should be covered, ie producing competent cells, isolation of insert using restriction enzymes, purification of insert, and ligation into vector. Learners would be expected to develop an understanding of the procedure as a whole in addition to developing specific knowledge of the individual components of the transformation procedure. Learners should then build on this knowledge to look at how the same principles and procedures can be applied to subcloning and the production of genomic libraries. Approaches to this Outcome could include online tutorials, video clips, practical work, calculation worksheets and online animations. Different types of vectors should be included and the use of each depending on the size of insert and transformation efficiency should be discussed. Examples of vectors should include plasmid vectors, bacteriophage vectors, and cosmids.

Outcome 2 could commence with the complexity of the eukaryotic genome with regards to structure and basic control of gene expression. Delivery could include research into the differences between eukaryotic genomes which could then introduce the structure of genes and the presence of coding and non-coding DNA. Once learners are familiar with the structure of primary and mature mRNA transcript, the method for extracting mRNA from cells and the procedures that must be followed when handling mRNA could be introduced. The learner should understand the unstable nature of mRNA and the requirement to produce a DNA copy of the expressed genes. Delivery of the production of cDNA and cDNA libraries could include the opportunity for learners to research the differences between genomic and cDNA libraries, and then be able to demonstrate an understanding of when each would be used when studying molecular biology. Use of video footage and virtual labs is particularly effective to explain how cDNA libraries are constructed and screened. There is also the opportunity for utilisation of the learner's IT skills for research and also for presentation of findings as display posters, scientific reports or by PowerPoint.

In Outcome 3, a PCR practical could be used to underpin the knowledge and understanding developed by the learner. Learners should understand the desirable features of PCR primers such as the optimum length of the primer, G/C composition, Tm, size of PCR product which would be produced in addition to possible problems such as self-annealing or dimer formation. The topics could also be covered using online DNA databases, primer design tools and case studies. Learners could enhance their learning by carrying out projects such as designing primers to analyse a specific sequence of DNA. There are online genome databases that provide the genetic sequence needed for such a project, which provides learners with an ideal opportunity to use databases that would be used in research situations. Learners should also understand the basic principles of Real Time PCR. The use of virtual Real Time PCR labs, animations or online tutorial videos would provide the learner with experience of the procedure. Learners should become familiar with the different types of fluorogenic probes that are used to enable the detection of a specific PCR product as it accumulates during PCR cycles, and they could also use case studies and journal articles to cover the practicalities of Real Time PCR such as Stem Cell research, Oncology and Genetics research and Pathogen Detection and Infectious Disease research.

Higher National Unit Support Notes (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Outcome 4 should expand on the knowledge and understanding developed in Outcome 3 to cover the use of PCR to provide information about the sequence of template DNA. Learners should understand the use of fluorescently labelled dideoxynucleotides as 3' end chain terminators to enable the detection of nucleotide sequence and the use of capillary electrophoresis to separate the fragments produced. This Outcome provides an ideal opportunity to engage learners in utilising the accessible online sequencing animations to illustrate the process of automated sequencing of template DNA. The Outcome also covers genetic mapping and mutation detection. Learners should become familiar with microsatellite markers and linkage maps; in order to do this they should understand the concept of genetic recombination during meiosis. Case studies could also be used to study the use of linkage analysis in mapping disease genes. Learners can be provided with electropherograms to determine types of mutation that can be determined by automated sequencing. Use of IT to work through virtual microarray labs provides the learners with experience of the practical aspects of microarray technology to complement the theoretical knowledge they will be covering. Learners could also investigate examples of microarray practicalities such as determining genes switched on or off in tumour tissue samples compared to normal tissue samples using journal databases to find current research. There are a large number of online resources about the Human Genome project which could be used to look at the timeline of sequencing the genome, the background to the project and understanding the implications for genetic research.

Outcome 5 should cover the different methods for creating transgenic animals and the uses of animal models in studying genetic disease. The practicalities of transgenic animals would allow learners to study current research. Case studies could be used to demonstrate the use of transgenic animals in the study of disease. There is an opportunity for the learners to carry out their own investigative work into current research using transgenic animals and prepare a presentation or scientific poster on their findings. Learners could also discuss the ethics of using animals' models to study genetic diseases.

It is envisaged that Outcome 6 will be delivered alongside the theoretical based Outcomes 1 and 3. A range of practical experiments could be utilised to both support understanding of the underlying theory and to prepare learners for undertaking the assessed practical experiments. Aspects suitable for experimental investigation might include isolation of nucleic acids, restriction digestion of plasmid, gel electrophoresis, PCR and transformation of E.Coli.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Outcomes 1−5 could be assessed by a single holistic closed-book assessment with an appropriate cut off score that covers the sampling requirements as detailed in the Evidence Requirements. Assessment should be carried out in supervised conditions, and it is recommended that the assessment be completed within 90 minutes.

Where evidence of Outcomes 1-5 is assessed by sampling, the whole of the content listed in the Knowledge and/or Skills must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed, and different items should be sampled on each assessment occasion. Any items not sampled in the first assessment must be included in the alternative (re-sit) assessment.

Higher National Unit Support Notes (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

In Outcome 6 learners are required to undertake four assessed practical experiments, the content of which will be related to at least two of the Outcomes 1−5. Examples of suitable experiments are given below. However, this list is not prescriptive, and other practical experiments of similar complexity may be used by the centre.

Suitable practical experiments are:

- Isolation of nucleic acids from cheek cells samples
- Restriction digestion of plasmid DNA
- Gel electrophoresis of restriction fragments
- PCR
- Transformation of E.Coli

Assessed practical experiments will usually be performed individually. However, there may be some experiments that are suitable to be undertaken in pairs or small groups. If this is the case then the assessor should ensure that all participants are actively involved and are able to adequately demonstrate the required skills.

An exemplar instrument of assessment with marking guidelines has been produced to indicate the national standard of achievement at SCQF level 8.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities for developing Core and other essential skills

The delivery and assessment of this Unit will provide learners with the opportunity to develop the Core Skills of *Numeracy* and *Problem Solving* at SCQF level 5, and *Information and Communication Technology (ICT)* at SCQF level 4.

Numeracy — Using Number SCQF level 5

Learners will be required to decide on the steps and operations to carry out sustained and complex calculations, eg performing calculations related to transformation efficiency and probability (P) of any DNA sequence being included in a library of random fragments.

Higher National Unit Support Notes (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Problem Solving — Reviewing and Evaluating SCQF level 5

Following assessed practical experiments learners will be required to review and evaluate the effectiveness of the exercise with a thorough interpretation of random and systematic sources of error. Learners will be required to reach sound conclusions on the basis of the data collected and the inherent errors.

Information and Communication Technology (ICT) — Providing/Creating Information at SCQF level 4

Learners could make effective and appropriate use of ICT packages to produce laboratory reports or pro formas in an appropriate format. Packages used will likely include word processing, spreadsheets, and graph drawing software. Learners will also be required to utilise internet search engines to source information on research topics.

History of changes to Unit

Version	Description of change	Date
02	H926 34 *Biotechnology: An Introduction* added to the recommended entry to the unit	July 2019

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General information for learners

Unit title: DNA Molecular Techniques (SCQF level 8)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This is a 2 credit Unit at SCQF level 8, which you are likely to be studying as part of the second year of a HND science programme. Before progressing to this Unit it would be beneficial to have completed the HN Units H929 34 *DNA and Genetics*, H92G 34 *Microbiology: Theory and Laboratory Skills* and H927 34 *Cell Biology: Theory and Laboratory Skills*, where you will have learned underpinning aspects of molecular biology and developed your practical skills. There will be a strong emphasis on the importance of experimental data in understanding molecular biology techniques, and on the applications of this knowledge in practical situations.

On completion of the Unit you should be able to:

1 Describe the general principles of cloning DNA.
2 Describe the techniques involving RNA extraction and cDNA library synthesis.
3 Describe the basic principles of PCR and Real Time PCR.
4 Describe molecular technology of DNA sequencing, microarray analysis and whole genome sequencing.
5 Explain the use of DNA technology in animal models.
6 Perform practical experiments related to molecular biology techniques.

Outcome 1

In this Outcome you will cover the general principles of cloning DNA. You will focus on bacterial plasmids and cloning vectors, and you will look at the different types of cloning vectors and the common beneficial features of vectors. You will cover how foreign fragments can be inserted into vectors and transformed into bacterial cells. You will also gain knowledge of the production and screening of genomic libraries.

Outcome 2

In this Outcome you will gain an understanding of the differences between eukaryotic structure and the control of gene expression. You will cover the techniques involving mRNA isolation and reverse transcription to produce cDNA. You will also study the production and screening of cDNA libraries.

Outcome 3

In this Outcome you will be introduced to the techniques involved in PCR. You will cover the design of primers for use in PCR, automated PCR and the application of this technique in quantitative PCR.

Outcome 4

In this Outcome you will develop an understanding of different molecular technologies such as DNA sequencing, genetic mapping and the comparison of levels of gene expression in different tissues. You will learn about the Human Genome project; how it was achieved and the benefits it has introduced in the study of genetics and molecular biology.

General information for learners (cont)

Unit title: DNA Molecular Techniques (SCQF level 8)

Outcome 5

In this Outcome you will cover the production of transgenic animals. You will learn about how transgenic animals are produced and the uses of transgenic animals in studying genetic disease.

Outcome 6

In this Outcome you will undertake practical experiments, based on the content of Outcomes 1−5.

During this practical work, you will also be expected to develop good laboratory practices as well as improve your skills of manipulation, observation and measurement. You will be encouraged to develop safe working practices and to strive constantly to improve the accuracy and reliability of your results. The reporting and analysis of experimental data is an important aspect of the practical sessions.

Assessment

For Outcomes 1 to 5 you will take a closed-book, end of Unit assessment.

Outcome 6 will be assessed after you have learned the necessary practical skills, and will take the form of four practical experiments, for which you will record your results either in full laboratory reports, or by completion of pro forma reports.

Core Skills

Although there is no automatic certification of Core Skills in the Unit, you will have opportunities to develop the Core Skills of *Numeracy* and *Problem Solving* at SCQF level 5, and *Information and Communication Technology (ICT)* at SCQF level 4.