University of the West of England
BRISTOL

MODULE SPECIFICATION

Part 1: Information			
Module Title	Practical applications of molecular biology and biotechnology		
Module Code	USSKNM-30-2	Level	2
For implementation from	September 2018		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Health and Applied Sciences	Field	Applied Sciences
Department	Applied Sciences		
Contributes towards	FdSc Biological Laboratory Sciences		
Module type:	Standard		
Pre-requisites	None		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

This module will cover the following topics within molecular biology field:

Principles of gene cloning: purification of DNA and manipulation of DNA fragments and vectors for gene cloning.

Manipulation of purified DNA with the use of enzymes: restriction endonucleases, DNA polymerase and ligase.

Introduction of DNA into living cells: transformations (the uptake of DNA by bacterial cells), identification and analysis of recombinants; evaluation of transformation efficiency; and introduction of DNA into non-bacterial cells.

Isolation a specific gene, clone identification and gene analysis: direct selection, identification and analysis of a clone from a gene library, DNA sequencing.

Amplification of DNA: the polymerase chain reaction (PCR), optimisation of PCR protocols, analysis or PCR products, real time PCR.

Protein analysis: an overview of protein structure and function. Protein folding and denaturation. The importance of protein folding in health and disease.

Analysis of gene expression: the structure of genes, RNA and protein synthesis and the control of gene expression.

Applications of gene cloning and DNA analysis in biotechnology

Production of a protein from cloned genes - Special vectors for expression of foreign genes in *E. coli*, problems with the production of recombinant protein in *E. coli*, production of recombinant protein by eukaryotic cells.

Gene cloning and DNA analysis in medicine – Production of recombinant pharmaceuticals, identification of genes responsible for human disease, gene therapy.

Gene cloning and DNA analysis in agriculture – Gene addition approach to plant genetic engineering, gene subtraction, problems with genetically modified plants.

Gene cloning and DNA analysis in forensic science– DNA analysis in the identification of crime suspects.

This module aims to deliver specialist knowledge through taught lectures, inductive tutorials, seminars and practical sessions to promote application of knowledge acquired, analytical and problem-solving skills. Student learning will be further supported through both UCW and UWE E-Learning Environment, with provision of materials and activities to guide independent study.

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion etc. These sessions constitute an average time per level as indicated in the table below.

Part 3: Assessment

The assessment strategy has been designed to support and enhance the development of subject-based knowledge and practical skills, whilst ensuring that the learning outcomes are achieved.

Component A is a 2 hour exam. This assessment will provide students with an opportunity to demonstrate depth and breadth of their knowledge on a broad range of topics through a series of questions and discussions. This assessment will test a range of the learning outcomes.

The course work consists of two parts: a 1500 literature review (B1) and a practical portfolio of laboratory reports (B2). This assessment will provide a valuable practical learning experience, the independent research of published literature will focus around the processes and ethical issues of DNA and cloning.

Opportunities for formative assessment and feedback are built into teaching and practical sessions, through discussion and evaluation of current research and review of past exam papers. Students are provided with formative feed-forward for their exam through a revision and exam preparation session prior to the exam and through the extensive support materials supplied through the E-Learning Environment.

All work is marked in line with the UWE generic assessment criteria and conforms to university policies for the setting, collection, marking and return of student work. Assessments are described in the module handbook that is supplied at the start of module.

Identify final timetabled piece of assessment (component and element)	**Component A**	
% weighting between components A and B (Standard modules only)	**A:**	**B**:
	40	**60**

First Sit	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Examination (2 hours)	100
Component B **Description of each element**	**Element weighting** **(as % of component)**

1. Literature review (1500 words)	40
2. Practical portfolio	60
Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Examination (2 hours)	100
2.	
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Literature review (1500 words)	40
2. Data interpretation	60

Part 4: Teaching and Learning Methods

Learning Outcomes	On successful completion of this module students will be able to: • Identify and review the current techniques used for the isolation, manipulation, cloning, analysis and characterisation of genes and their products within organisms (B2). • Evaluate the research process through appreciation of practical experience of molecular genetics and DNA analysis and be able to interpret data obtained from such analysis (B2). • Discuss key structural features of proteins and the forces directing protein folding highlighting the protein-function relationship (A). • Show an understanding of gene structure and explain the process of gene expression and regulation (A) • Evaluate current and potential applications of biotechnology and ethical issues raised (B1). • Discuss the impact of biotechnology on human society (B1). • Use appropriate information technology resources to seek, retrieve and interpret subject specific material alongside the acquisition of other key generic graduate skills (B1, B2)
Key Information Sets Information (KIS) Contact Hours	**30** *Number of credits for this module* 30 Hours to be allocated: 300 | Scheduled learning and teaching study hours: 90 | Independent study hours: 210 | Placement study hours: 0 | Allocated Hours: 300 The table below indicates as a percentage the total assessment of the module which constitutes a;

<table>
<tr><td>Total Assessment</td><td>
Written Exam: Unseen or open book written exam
Coursework: Written assignment or essay, report, dissertation, portfolio, project or in class test
Practical Exam: Oral Assessment and/or presentation, practical skills assessment, practical exam (i.e. an exam determining mastery of a technique)
<table>
<tr><td colspan="4">Total assessment of the module:</td><td></td><td></td></tr>
<tr><td colspan="4"></td><td></td><td></td></tr>
<tr><td colspan="4">Written exam assessment percentage</td><td>40%</td><td></td></tr>
<tr><td colspan="4">Coursework assessment percentage</td><td>60%</td><td></td></tr>
<tr><td colspan="4">Practical exam assessment percentage</td><td>0%</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>100%</td><td></td></tr>
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<tr><td>Reading List</td><td>
The following books are recommended as it covers most of the module material at an appropriate level.

• Alberts B.et al., Molecular Biology of the Cell, Abingdon: Garland Science.
• Brown, T.A. Gene Cloning and DNA Analysis. Oxford: Blackwell.
• Primrose, S.B. & R.M. Twyman, Principles of Gene Manipulation & Genomics. Oxford: Blackwell.

Extensive notes will be provided via blackboard on the scientific topics. Links to useful and credible websites will also be provided.

The students are also advised to consult the basic scientific texts in UCW, Frenchay and Glenside libraries, of which the following is a representative sample:

The latest editions of:

• Alberts B. et al., Essential Cell Biology, Abingdon: Garland Science.
• Brown T.A. Genomes 3. Abingdon: Garland Science
• Lodish H.et al., Molecular Cell Biology, New York: W.H. Freeman and Company
• Russell P.J. i Genetics Harlow: Pearson Education
• Watson J. et al. Molecular Biology of the Gene. San Francisco, California: Pearson/ Benjamin Cummings
• Brown, T.A Genetics – A Molecular Approach. London: Chapman and Hall.
• Robinson, T.R. Genetics for Dummies. New York: Wiley
• Turner et al. Molecular Biology – Instant Notes. New York: Wiley.

Further reading must include the following academic journals:
Trends in Genetics
Nature Genetics
Nature Reviews
PLoS
PNAS
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Revision Approval Date		Version	1	*APDG approval 26/1/18*