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 2020		
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, compulsory		
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, application of enzymes in molecular biology. .

Cloning: t transformations (the uptake of DNA by bacterial cells), identification and analysis of recombinants; evaluation of transformation efficiency.

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. Protein purification and analysis of proteins by gel electrophoresis.

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

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, seminars and practical sessions to promote application of knowledge acquired and analytical and problem-solving skills.

Generic Graduate Skill	*Specific strand (eg presentation) - Optional*	**Introduced**	**Developed**	**Evidenced**
1. Communication	Written communication [A, B1, B2]	☐	☐	☒
2. Professionalism	Reflective practice [B2]	☐	☐	☒
3. Critical Thinking	Literature review and evaluation of experiments [B1, B2]	☐	☐	☒
4. Digital Fluency	Digital assignments [B1, B2]	☐	☐	☒
5. Innovative and Enterprising	Via class discussion, debate, literature review, evaluation of current and potential applications of biotechnology, evaluations of ethical issues [B1, B2]	☐	☒	☐
6. Forward Looking	Via class discussion, debate, literature review, evaluation of current and potential applications of biotechnology, evaluations of ethical issues [B1, B2]	☐	☒	☐

7. Emotional Intelligence	Via class discussion, debate	☒	☐	☐
8. Globally Engaged	Via class discussion, debate, literature review, evaluation of current and potential applications of biotechnology, evaluations of ethical issues [B1, B2]	☐	☒	☐

Part 3: Assessment: Strategy and Details

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 the depth and breadth of their knowledge on a broad range of topics. This assessment will test a range of the learning outcomes.

The coursework consists of two parts: a 1500 literature review (B1) and a portfolio of laboratory reports based on primary or secondary data (B2). Component B2 will provide a valuable practical learning experience and will further develop laboratory skills and understanding of molecular biology applications. Component B1 will include independent research of published literature focused around biotechnological processes and ethical issues of DNA manipulation and cloning.

Opportunities for formative feedback are built into teaching and practical sessions, through discussion and evaluation of current research and practical sessions. Students are provided with formative feed-forward for their exam through a revision and exam preparation session prior to the exam

Identify final timetabled piece of assessment (component and element)	**Component B1**	
% weighting between components A and B (Standard modules only)	**A:** **40**	**B**: **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 based on primary or secondary data	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
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Literature review (1500 words)	40
2. Practical portfolio based on secondary data	60

Part 4: Learning Outcomes & KIS Data

Learning Outcomes

On successful completion of this module students will be able to:

- Review current techniques used for the isolation, manipulation and analysis of genes and their products within organisms (B2)
- Evaluate the research process through appreciation of practical experience of molecular biology and be able to interpret primary or secondary experimental data (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, the ethical issues raised and the impact on human society (B1)
- Use appropriate information technology resources and sources of information to seek, retrieve and interpret subject specific material alongside the acquisition of other key generic graduate skills, such as academic writing, interpreting information, evaluating research data and critical thinking (B1, B2)

Key Information Sets Information (KIS)

Key Information Set - Module data

Number of credits for this module 30

Hours to be allocated	Scheduled learning and teaching study hours	Independent study hours	Placement study hours	Allocated Hours
300	90	210	0	300

Contact Hours

The table below indicates as a percentage the total assessment of the module which constitutes a;

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)

Total Assessment	Total assessment of the module: Written exam assessment percentage: 40% Coursework assessment percentage: 60% Practical exam assessment percentage: 0% 100%
Reading List	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

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Revision CAP Approval Date Update this row each time a change goes to CAP		Version	1	APDG approval 26/1/18
	06/11/2018		2	