MD998-10 Molecular Biology: Principles and Techniques

26/27

Department
Warwick Medical School
Level
Taught Postgraduate Level
Module leader
Andrew Bowman
Credit value
10
Module duration
5 weeks
Assessment
50% coursework, 50% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

Module web page

Module aims

This module aims to provide students with a physical sciences background a comprehensive understanding of the principles of modern molecular biology and equip the students with both the theoretical and practical skills necessary to analyse and manipulate nucleic acids and proteins. The module explores structure-function relationships of proteins, nucleic acids and lipids, the structure of the cell and its compartments, the flow of information from DNA to protein, chromosome duplication and segregation, the regulation of cell proliferation, gene expression and an extensive repertoire of molecular analysis and cloning techniques.
Students will learn how to purify and quantify nucleic acids, how to clone a gene into a bacterial vector, how to express and purify a recombinant proteins, modern methods to investigate protein-protein interactions, strategies for mutagenesis.
Students will be able to appraise the practical considerations and theoretical limitations of each approach.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

1. Properties and structure of biomolecules

- Properties of DNA, RNA and proteins
- Recombinant DNA technology
  Practical session 1
  Molecular cloning: PCR, restriction digests, gel purification, ligation, transformation

1. From DNA to protein and control of gene expression

- Gene expression in prokaryotes
- Gene expression in eukaryotes
- Translation
- Gene libraries
  Practical session 2
  Library preparation & analysis

1. DNA replication, repair and segregation

- DNA replication in bacteria and eukaryotes
- DNA repair (e.g., mismatch-repair and double-strand break repair)
- Chromosome alignment and segregation
  Practical session 3
  Library screening: 96 well format, ELISA

1. Molecular analysis and protein-protein interactions

- Antibodies and their applications
- Protein interaction analysis
- Display technologies
  Practical session 4
  Antibodies as tools: Western-blotting, immunoprecipitation

1. Introduction to emerging techniques

- Next generation sequencing
- Genome editing & genome synthesis
- Lab-on-a-chip

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate a systematic knowledge of the fundamental properties of nucleic acids and

proteins critically assess how these features affect cellular process and their experimental manipulation.
- Perform practical experimental manipulations withbiomolecules, and critically evaluate the experimental outcomes and key biophysical principles used.
- Contrast between the cellular structure and principles of gene regulation and gene expression in prokaryotes and eukaryotes and analyse the steps from DNA to RNA to proteins
- Summarise the steps required for DNA replication andchromosome segregation and illustrate the different pathways of DNA repair.
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Indicative reading list

Reading lists can be found in Talis

Subject specific skills

Sound understanding of subject
Critically evaluate
Reflection

Transferable skills

Numeracy
Thinking and problem solving
written communication
oral communication
Teamwork
Organisation & time management
Use of tools and technology
Commercial awareness
Independence and initiative
Adaptability/Flexibility

Study

Study time

Type	Required
Seminars	20 sessions of 1 hour (20%)
Practical classes	20 sessions of 1 hour (20%)
Total	100 hours

Type	Required
Private study	60 hours (60%)
Total	100 hours

Private study description

60 hours of self-directed study (course reading,
preparation for practical classes, writing up of laboratory reports).

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group C1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Laboratory Report 3000 to 4000 words	50%	10 hours	Yes (extension)
Reassessment component is the same			
Assessment component			
Oral examination (20 mins)	50%	10 hours	No
Reassessment component is the same			

Feedback on assessment

Written feedback will be provided for the written and oral assessments in line with WMS\r\npostgraduate assessment criteria.\tFurther verbal feedback will be made available to \r\nstudents on request.\r\n

Past exam papers for MD998

Availability

Courses

This module is Core optional for:

- Year 1 of TMDA-B91Z Postgraduate Taught Interdisciplinary Biomedical Research