



# BMOL3402

## Molecular Biology and Genomics

Session 1, Weekday attendance, North Ryde 2021

*Archive (Pre-2022) - Department of Molecular Sciences*

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#### Disclaimer

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#### Notice

As part of [Phase 3 of our return to campus plan](#), most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to [timetable viewer](#). To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

## General Information

Unit convenor and teaching staff

Convenor, Lecturer

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Credit points

10

Prerequisites

130cp at 1000 level or above including BMOL2201 or CBMS201 or CBMS223

Corequisites

Co-badged status

### Unit description

Molecular biology is a central science in twenty-first century biology and biotechnology. Understanding the fundamentals of molecular biology is essential for many other fields in the life sciences, including microbiology, cell biology, immunology, and development. Molecular biology makes a significant and increasing contribution to major sectors of our society including agriculture and medicine, and is also important in environmental science and forensics. In this unit we explore topics that allow students to obtain an advanced understanding of the mechanisms of molecular biology, including those of DNA replication and recombination, prokaryotic gene expression, eukaryotic gene expression, mobile elements, the functions of the nucleus, and epigenetics. We also address topics on the rapidly changing technologies in molecular biology, including those used in genome sequencing, metagenomics, systems and synthetic biology. Practical sessions complement the lectures and provide students with hands-on experience with a range of critical laboratory skills including those required for DNA and RNA isolation, PCR and RT-PCR, cloning, and bioinformatics. Students gain experience in working with both bacterial and eukaryotic systems in the laboratory classes so that their skills and experience are valuable for a variety of positions in both industry and research.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** Describe the theory behind and demonstrate competency in the use of a range of molecular biology experimental techniques, including PCR, restriction enzyme digestion, gel electrophoresis, cloning, site-directed mutagenesis, DNA sequencing and DNA hybridization.

**ULO2:** Describe and discuss essential molecular processes in the cell, especially as related to DNA and RNA. These molecular processes include transcription, translation, DNA replication, recombination, DNA repair, and transposition.

**ULO3:** Relate the revolutionary impact of genomics across all biological sciences.

**ULO4:** Analyse and interpret experimental data and present this in a structured report utilising appropriate scientific referencing.

## General Assessment Information

### Assignments

**All assignments must be submitted as soft copy on the date specified.**

**All written work must be submitted to Turnitin for plagiarism checking. Instructions will be provided on iLearn.**

**Criteria and standards required for the assessment tasks will be available on iLearn.**

Extensions will only be granted under exceptional circumstances. There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission – 20% penalty). This penalty does not apply for cases in which an application for disruption of studies is made and approved.

### Problem Set

Problems 1 - 12 should be done in time for marking and discussion during the practical session of the Week 12.

### Requirements

Assessment tasks involve the practical assignments and the problem sets which are both integral components of the unit. Apart from the marks formally allocated to these components, a comprehensive understanding of them will greatly assist you in the final exam. You should remember that the final exam covers ALL components of the unit. Participation in ALL practical sessions is required in order to complete the practical reports.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Midsemester Test</u>	10%	No	Week 7
<u>Bioinformatic Report</u>	10%	No	May 31, 2021
<u>Problem set</u>	5%	No	Week 12
<u>Lab reports</u>	25%	No	Mar 29, Apr 12, May 31 2021
<u>Final Examination</u>	50%	No	Final Exam Period

### Midsemester Test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **Week 7**

Weighting: **10%**

Test carried out during regularly scheduled laboratory time.

On successful completion you will be able to:

- Describe the theory behind and demonstrate competency in the use of a range of molecular biology experimental techniques, including PCR, restriction enzyme digestion, gel electrophoresis, cloning, site-directed mutagenesis, DNA sequencing and DNA hybridization.

## Bioinformatic Report

Assessment Type <sup>1</sup>: Qualitative analysis task

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **May 31, 2021**

Weighting: **10%**

Report on Bioinformatic Analysis

On successful completion you will be able to:

- Relate the revolutionary impact of genomics across all biological sciences.
- Analyse and interpret experimental data and present this in a structured report utilising appropriate scientific referencing.

## Problem set

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 5 hours

Due: **Week 12**

Weighting: **5%**

Problem Set from Prac Manual

On successful completion you will be able to:

- Describe the theory behind and demonstrate competency in the use of a range of molecular biology experimental techniques, including PCR, restriction enzyme digestion, gel electrophoresis, cloning, site-directed mutagenesis, DNA sequencing and DNA hybridization.

## Lab reports

Assessment Type <sup>1</sup>: Lab report

Indicative Time on Task <sup>2</sup>: 30 hours

Due: **Mar 29, Apr 12, May 31 2021**

Weighting: **25%**

Three lab reports 1500 words each

On successful completion you will be able to:

- Describe the theory behind and demonstrate competency in the use of a range of molecular biology experimental techniques, including PCR, restriction enzyme digestion, gel electrophoresis, cloning, site-directed mutagenesis, DNA sequencing and DNA hybridization.
- Analyse and interpret experimental data and present this in a structured report utilising appropriate scientific referencing.

## Final Examination

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 18 hours

Due: **Final Exam Period**

Weighting: **50%**

Final Examination held in university examination period

On successful completion you will be able to:

- Describe the theory behind and demonstrate competency in the use of a range of molecular biology experimental techniques, including PCR, restriction enzyme digestion, gel electrophoresis, cloning, site-directed mutagenesis, DNA sequencing and DNA hybridization.
- Describe and discuss essential molecular processes in the cell, especially as related to DNA and RNA. These molecular processes include transcription, translation, DNA replication, recombination, DNA repair, and transposition.
- Relate the revolutionary impact of genomics across all biological sciences.

<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes

There are two weekly lectures of 1 hour each on Monday 12 - 1 pm and Monday 1 - 2 pm which will be held virtually via Zoom (Zoom links will be provided through iLearn). There is one weekly practical session of 3 hours on Monday 2 - 5 pm (practical groups 1 and 2) and Tuesday 10 am - 1 pm (practical groups 3 and 4) at 14 Eastern Road E8A science labs 130 and 150. Attendance at practical sessions is a compulsory component of this unit. Lecture recordings and graphics slides are available online through iLearn (<https://ilearn.mq.edu.au/login/MQ/>), although lecture attendance in person is highly recommended. The practical manual is also available online through iLearn.

### Required and Recommended Texts

The course syllabus is defined by all of the subject material presented in lectures and practicals, much of which is beyond standard textbooks. The prescribed text for this unit is Molecular Biology Fifth edition by Robert F Weaver. Available from the Co-op bookshop. The following texts may also be useful and are available in the library:

GenesIX by Benjamin Lewin

Mobile Genetic Elements by Sherratt

Molecular Cloning: A Laboratory Manual by Maniatis, Fritsch and Sambrook

An Introduction to Genetic Engineering by Des Nicholl.

### Technology Requirements

Within this Unit, you will be introduced to web-based search engines that are commonly used in molecular biology. Our expectation is that you will be able to readily access the internet and have a computer available to you for web browsing and preparation of your laboratory reports. Handwritten reports will not be accepted. Your laboratory reports will be submitted and circulated via the online Turnitin program on iLearn, for which access instructions will be given at submission time. Your practical reports will require you to carry out minor computational tasks, for which a calculator and access to basic statistical tools will be required. We place a large emphasis on correct referencing style in all your reports, and use of the program EndNote is encouraged, but not essential.

## Unit Schedule

Week	Date	Lecture	Title	Lecturer
1	Feb 22	1	Introduction/What is Molecular Biology/Genome Structure	Haynes
	Feb 22	2	Gene Organization/function	Haynes
2	Mar 1	3	Molecular Biology Techniques	Haynes
	Mar 1	4	Molecular Biology Techniques	Haynes
3	Mar 8	5	Molecular Cloning	Haynes
	Mar 8	6	Tools for studying Gene Activity	Haynes
4	Mar 15	7	Transcription in Prokaryotes	Paulsen
	Mar 15	8	Structure of Prokaryotic Operons	Paulsen
5	Mar 22	9	Bacterial Gene Regulation	Paulsen
	Mar 22	10	Transcription in Eukaryotes	Paulsen
6	Mar 29	11	Eukaryotic Gene Regulation	Paulsen
	Mar 29	12	Nucleosomes/Histones/Chromatin	Paulsen
			Semester break	
7	Apr 19	13	Messenger RNA splicing	Paulsen
	Apr 19	14	Mechanism of Translation	Paulsen
8	Apr 26	15	Ribosomes and transfer RNA	Paulsen
	Apr 26	16	DNA replication	Paulsen
9	May 3	17	DNA recombination	Paulsen
	May 3	18	DNA repair	Paulsen
10	May 10	19	Mobile DNA elements #1	Paulsen



	May 10	20	Mobile DNA elements #2	Paulsen
11	May 17	21	Genome Sequencing	Paulsen
	May 17	22	Genomes, Pan-Genomes and Metagenomics	Paulsen
12	May 24	23	Bioinformatics and Genome Annotation	Paulsen
	May 24	24	Functional Genomics and Systems Biology	Paulsen
13	May 31	25	Synthetic Biology	Paulsen
	May 31	26	Revision	Paulsen

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA

student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Changes from Previous Offering

The Bioinformatic Project is now run as a Synthetic Biology Design Challenge (see iLearn and the Prac Manual for details). It now runs from week 2 to week 13 in prac classes, rather than being in a discrete period (weeks 9-11) as previous.