



BMOL6202

Macromolecules

Session 2, In person-scheduled-weekday, North Ryde 2022

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Unit Convenor

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14 EaR 174

By appointment

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Credit points

10

Prerequisites

Admission to GradDipBiotech or GradCertLabAQMgt or GradDipLabAQMgt or MBiotech or MBioBus or MLabAQMgt or MRadiopharmSc or MSc or MScInnovationChemBiomolecularSc

Corequisites

Co-badged status

BMOL3202

Unit description

This unit outlines molecular principles underlying macromolecules and nano-materials that find a wide range of applications from nanotechnology, biomedical research, to bio-engineering. Practices common in these fields to design, prepare, synthesise and then isolate new materials will be emphasized. Molecular properties leading to the 3D shape of macromolecules will be reviewed. Contemporary structural and imaging based methods to view and characterise macromolecules, both natural and synthetic, will be examined. In particular, attention will be given to the chemical, biochemical and structural characterisation of the building blocks of the living world including nucleic acids, proteins, and polysaccharides. Recent advances and landmark reports from the current literature will be examined. The unit will be delivered through workshops, seminars, lab work and project-based learning.

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 and apply the underlying principles for synthesising and engineering macromolecules and other synthetic particle-based nanomaterials. Apply this knowledge to design and conduct experiments to synthesise macromolecules in the laboratory.

ULO2: Describe bio-macromolecular forms and architectures (size/shape) for proteins, sugars and nucleotides.

ULO3: Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.

ULO4: Describe the principles of contemporary analytical tools to image and characterise the structural features of bio-macromolecules and synthetic macromolecules. Utilise these techniques to collect experimental data on one or more macromolecule.

ULO5: Interpret and draw sound conclusions from analytical and biophysical data.

ULO6: Extract and interpret information from a variety of sources concerning macromolecules, including the contemporary scientific literature.

General Assessment Information

Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see <https://students.mq.edu.au/stud>

[y/assessment-exams/assessments](#) for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for [Special Consideration](#).

Assessments where Late Submissions will be accepted:

In this unit, late submissions will be accepted as follows:

PRACTICAL AND WORKSHOP REPORTS - Standard Late Penalty applies, unless Special Consideration is Granted

Assessment Tasks

Name	Weighting	Hurdle	Due
Workshop reports x 3	15%	No	Two weeks after w'shop session (held in weeks 3,7 & 9)
Case study	15%	No	Weeks 11-12
Lab Report x 3	30%	No	Two weeks after lab session (labs run in weeks 4,6,8 & 10)
Final Exam	40%	No	University examination period

Workshop reports x 3

Assessment Type ¹: Report

Indicative Time on Task ²: 18 hours

Due: **Two weeks after w'shop session (held in weeks 3,7 & 9)**

Weighting: **15%**

There will be five workshops in total. THREE short workshop reports (from workshops 2, 3 and 4) will be due two weeks after the workshop sessions. The first submission is formative, the second worth 7% and the third worth 8% of the total.

On successful completion you will be able to:

- Describe bio-macromolecular forms and architectures (size/shape) for proteins, sugars and nucleotides.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.
- Interpret and draw sound conclusions from analytical and biophysical data.

Case study

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 10 hours

Due: **Weeks 11-12**

Weighting: **15%**

A short 10 minute presentation will be given in small groups on the topic of a contemporary macromolecule. Half of the marks are for the group and half the marks are for your individual contribution.

On successful completion you will be able to:

- Describe bio-macromolecular forms and architectures (size/shape) for proteins, sugars and nucleotides.
- Describe the principles of contemporary analytical tools to image and characterise the structural features of bio-macromolecules and synthetic macromolecules. Utilise these techniques to collect experimental data on one or more macromolecule.
- Extract and interpret information from a variety of sources concerning macromolecules, including the contemporary scientific literature.

Lab Report x 3

Assessment Type ¹: Lab report

Indicative Time on Task ²: 24 hours

Due: **Two weeks after lab session (labs run in weeks 4,6,8 & 10)**

Weighting: **30%**

There will be FOUR practicals in total. A lab report is to be submitted two weeks after all four practicals. EachThe first two lab report isreports will be worth 5% each. The final two will be worth 10%. Only each. the top THREE marks from your four practicals will contribute to 30% of your final grade.

On successful completion you will be able to:

- Describe and apply the underlying principles for synthesising and engineering macromolecules and other synthetic particle-based nanomaterials. Apply this knowledge to design and conduct experiments to synthesise macromolecules in the laboratory.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.
- Describe the principles of contemporary analytical tools to image and characterise the structural features of bio-macromolecules and synthetic macromolecules. Utilise these techniques to collect experimental data on one or more macromolecule.
- Interpret and draw sound conclusions from analytical and biophysical data.

Final Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 20 hours

Due: **University examination period**

Weighting: **40%**

The final 3hr examination will cover all sections of the unit (lectures, lab practicals, workshops and assignments) and is designed to address specific understanding of all the concepts presented within the course.

On successful completion you will be able to:

- Describe and apply the underlying principles for synthesising and engineering macromolecules and other synthetic particle-based nanomaterials. Apply this knowledge to design and conduct experiments to synthesise macromolecules in the laboratory.
- Describe bio-macromolecular forms and architectures (size/shape) for proteins, sugars and nucleotides.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.
- Describe the principles of contemporary analytical tools to image and characterise the structural features of bio-macromolecules and synthetic macromolecules. Utilise these techniques to collect experimental data on one or more macromolecule.
- Interpret and draw sound conclusions from analytical and biophysical data.

¹ 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.

² 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

Lectures: There are two lectures per week as per the university timetable. Lectures are delivered on-campus and will also be recorded. All lecture material will be made available in iLearn.

Workshop Sessions (Dry-lab): There are four scheduled on-campus workshop sessions in total. Workshop 1 (week 2) will cover lab report writing skills and provide additional help to students on lab reports. There are THREE workshop sessions that have associated reports to be submitted (workshops 2, 3 and 4). These are held online in weeks 3, 7 and 9. Participation for workshop sessions 3, 7 and 9 is a required part of the unit to complete the associated workshop reports. If you cannot attend, a Special Consideration request must be submitted if you wish your absence to be considered.

** It is a requirement that students **bring their own laptops** to workshop sessions held on-campus. Please ensure your laptop is fully charged as powerpoints may not be available for all students. If you require a loan of a laptop, this can be arranged PRIOR to the workshop session by contacting the unit convenor.

Laboratory Sessions (Wet-lab): 3 hour Laboratory sessions are scheduled according to the timetable. There are two timetabled sessions available.

Practicals 1 - 4 will be held on-campus at Science labs in 14 Sir Christopher Ondaatje Ave (E7B) 347/349/350 Science Lab. In total, there are FOUR lab sessions held in weeks 4, 6, 8 and 10. Attendance at laboratory sessions is COMPULSORY. If you cannot attend, you must submit a Special Consideration request if you wish your absence to be considered. All the FOUR practicals have associated reports to be submitted due after two weeks

** Students must bring their own lab coats to be allowed to enter the labs. It is also recommended that students bring their own safety glasses. However, these will be provided if students do not have their own safety glasses. Other PPE will be provided.

SGTA sessions: There are 8 scheduled on-campus 1hr SGTA sessions in Weeks 1,4,5,6,8,10,11,12. Case study presentations will be held during the scheduled SGTA sessions in Weeks 11 and 12. A short presentation (~ 10 mins) will be given in small groups on the topic of a contemporary macromolecule. Half of the marks are for the group and half the marks are for your individual contribution.

Textbooks: Reading material and required text will be advised by your lecturer. A list of suggested reading material and text will be made available on iLearn and through the library website <https://libguides.mq.edu.au/leganto>.

Unit Schedule

Week	Week starting	Lecture 1 (on campus)		Lecture 2 (on campus)		Workshop and SGTA sessions	Practical (on campus)
		9 Wallys Wlk - 102 Theatre		4 Western Rd - 320 Tutorial Rm		(on-campus, see timetable)	Wednesday 10-1pm OR Wednesday 2-5pm. Held in 14 Sir Christopher Ondaatje Ave - 347/349/350 Labs
		Tuesday 9 - 10 a.m		Thursday 12 - 1 p.m		Monday 4 p.m - 6 p.m and Thursday 5 p.m - 7 p.m	
1	25-Jul	Introduction	PP	Introduction	PP	SGTA	-
2	1-Aug	Chemistry of non-covalent Interactions	PP	Chemistry of non-covalent Interactions	PP	#WS1 - how to write prac reports (on campus)	-
3	8-Aug	Folding & stability of macromolecules in solution	PP	Folding & stability of macromolecules in solution	PP	#WS2: WorkshopFold IT (on campus, report to be submitted)	-
4	15-Aug	Folding & stability of macromolecules in solution	PP	Biological Macromolecules	PP	SGTA	Prac 1: Cyclodextrin Host-Guest Chemistry
5	22-Aug	Biological Macromolecules	PP	Biological Macromolecules	PP	SGTA	-
6	29-Aug	Biological Macromolecules	MA	Synthesis & self-assembly	AGB	SGTA	Prac 2: Myoglobin unfolding (thermodynamics)
7	5-Sep	Synthesis & self-assembly	AGB	Synthesis & self-assembly	AGB	#WS3. Biomolecules workshop Part A (on campus, report to be submitted)	-
Mid-semester break: 12-23 Sept							
8	26-Sep	Characterising Macromolecules	PP	Characterising Macromolecules	PP	SGTA	Prac 3: Spectroscopic characterization of amyloid fibril formation by lysozyme
9	3-Oct	Characterising Macromolecules	PP	Special Topics: Molecules built to specific shapes (nanogold)	YW	#WS4. Biomolecules workshop Part B (on campus, report to be submitted)	-
10	10-Oct	Characterising Macromolecules	AGB	Characterising Macromolecules	AGB	SGTA	Prac 4: making and characterisation of nanogold particles
11	17-Oct	Characterising Macromolecules	PP	Characterising Macromolecules	PP	Case studies: Oral Presentations (15%)	-

12	24-Oct	Special Topics: Molecules built to specific shapes	PP	Special Topics: Molecules built to specific shapes	PP	Case studies: Oral Presentations (15%)	-
13	30-Oct	Special Topics: Molecules built for specific functions	PP	Revision		no workshop	no prac
Lecturer code: PP - Phani Potluri; YW - Yuling Wang; AGB - Alf Garcia Bennett; MA - Morten Andersen							

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](#)
- [Assessment Procedure](#)
- [Complaints Resolution 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the

expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

Student Support

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

The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the 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

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)

Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

IT Help

For help with University computer systems and technology, visit 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.

Unit information based on version 2022.02 of the [Handbook](#)