



BMOL6202

Macromolecules

Session 2, In person-scheduled-weekday, North Ryde 2023

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Unit Convenor

Phani Rekha Potluri

phani-rekha.potluri@mq.edu.au

Contact via Email

By appointment

Lecturer

Alf Garcia-Bennett

alf.garcia@mq.edu.au

Contact via Email

By appointment

Lecturer

Yuling Wang

yuling.wang@mq.edu.au

Contact via Email

By appointment

Lecturer

Morten Andersen

morten.andersen@mq.edu.au

Contact via Email

By appointment

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.

Requirements to Pass this Unit

To pass this unit you must:

- Attempt the assessments, and
- Achieve a total mark equal to or greater than 50%

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au

Assessment Tasks

Name	Weighting	Hurdle	Due
SGTA Quiz	5%	No	In-class SGTA sessions (Weeks 4, 6, 8, 10 and 13)
Workshop reports x 3	15%	No	Two weeks after W'shop session (held in weeks 3, 7 and 9)

Name	Weighting	Hurdle	Due
Lab Reports	30%	No	Two weeks after Prac session (held in weeks 4, 6, 8 and 10)
Case study	10%	No	Weeks 11 - 12
Final Exam	40%	No	University Examination Period

SGTA Quiz

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 5 hours

Due: **In-class SGTA sessions (Weeks 4, 6, 8, 10 and 13)**

Weighting: **5%**

Five 10-15 minute short quizzes will be conducted during the scheduled SGTA sessions. Each quiz is worth 1%.

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

Workshop reports x 3

Assessment Type ¹: Report

Indicative Time on Task ²: 16 hours

Due: **Two weeks after W'shop session (held in weeks 3, 7 and 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. Each workshop assessment is worth 5% each.

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.

Lab Reports

Assessment Type ¹: Lab report

Indicative Time on Task ²: 24 hours

Due: **Two weeks after Prac session (held in weeks 4, 6, 8 and 10)**

Weighting: **30%**

There will be FOUR practicals in total. A lab report is to be submitted two weeks after each practical. All the four lab reports combined will constitute to 30% of total assessment.

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.

Case study

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 9 hours

Due: **Weeks 11 - 12**

Weighting: **10%**

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.

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

Methods of Communication: We will communicate with you via your university email and through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to the unit convenor via the contact email on iLearn.

COVID Information: For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus-faqs>. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

Week1 Classes: During Week1, we have two 1-hr Lectures as scheduled in the timetable. Additionally, we also have an SGTA in Week1.

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. There is One optional workshop to assist help with Prac reports. Case study presentations will be held during the scheduled workshop 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. 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 6 scheduled on-campus 1hr SGTA sessions in Weeks 1,4,6,8,10 and 13. First SGTA will be about Introducing the unit. Other 5 SGTAs will have short 10-15 min quizzes worth 1% each towards the end of the session.

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

Wk	Week starting	Lecture 1		Lecture 2		Workshop/ SGTA sessions	Practical (on campus)	Assessments Due
		4 Western Road, 220		4 Western Road, 320		(on campus, see timetable)	Wed 10-1 pm OR Wed 2-5 pm Held in 14 Sir Christopher Ondaatje Ave - 347/349/350 Labs	
		Tuesday 12 - 1 p.m		Thursday 12 - 1 p.m		Mon 3 - 5 (1 hr for SGTA, 2 hr for WS)		
						Thur 1 - 2 SGTA; 2 - 4 WS		
1	24-Jul	Introduction to topic	PP	Chemistry of non-covalent Interactions	PP	SGTA1: Introduction to Unit	-	
2	31-Jul	Chemistry of non-covalent Interactions	PP	Folding & stability of macromolecules in solution	PP	#WS1 - how to write prac reports (optional)	-	
3	7-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	14-Aug	Biological Macromolecules	MA	Biological Macromolecules	ZK	SGTA2: In-class quiz, 1%	Prac 1: Cyclodextrin Host-Guest Chemistry	WS2 Report; SGTA Quiz
5	21-Aug	Biological Macromolecules	PP	Biological Macromolecules	PP	#Workshop. Extra prac help session (optional)		

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6	28-Aug	Biological Macromolecules	PP	Synthesis & self-assembly	AGB	SGTA3: In-class quiz, 1%	Prac 2: Protein Unfolding/Polymer Chemistry	Prac1 Report; SGTA Quiz
7	4-Sep	Synthesis & self-assembly	AGB	Synthesis & self-assembly	AGB	#WS3. Biomolecules workshop Part A (oncampus, report to be submitted)	-	
Mid-semester break: 11-24 Sept								Prac2 Report -Wk1 of Break; WS4 Report - Wk2 of Break
8	25-Sep	Characterising Macromolecules	PP	Characterising Macromolecules	PP	SGTA4: In-class quiz, 1%	Prac 3: Spectroscopic characterization of amyloid fibril formation by lysozyme	SGTA Quiz
9	2-Oct	Special Topics: Molecules built to specific shapes (nanogold)	YW	Characterising Macromolecules	AGB	#WS4. Biomolecules workshop Part B (oncampus, report to be submitted)	-	*Mon Workshop students attends Thur or alternate sessions- Check iLearn
10	9-Oct	Characterising Macromolecules	AGB	Characterising Macromolecules	PP	SGTA5: In-class quiz, 1%	Prac 4: making and characterisation of nanogold particles	Prac3 Report; SGTA Quiz
11	16-Oct	Characterising Macromolecules	PP	Characterising Macromolecules	PP	#6. Case studies: Oral Presentations (15%)	-	WS4 Report; 3000 Level Presentations
12	23-Oct	Special Topics: Molecules built to specific shapes	PP	Special Topics: Molecules built to specific shapes	PP	#6. Case studies: Oral Presentations (15%)	-	Prac4 Report; 6000 Level Presentations
13	30-Oct	Special Topics: Molecules built for specific functions	BS	Revision		SGTA6: In-class quiz, 1%	-	SGTA Quiz
		Lecturer code: PP - Phani Potluri; YW - Yuling Wang; AGB - Alf Garcia Bennett; MA - Morten Andersen; BS - Bhumika Shah; ZK - Zahra Kabir						
		***Schedule is subject to change as the semester progresses						
		The unit guides below contain important information about scheduling of activities, assessments and other important policies such as the special consideration policy. Please read this document carefully.						

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policycentral.mq.edu.au\)](https://policycentral.mq.edu.au)

[s.mq.edu.au](https://www.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 Advocacy](#) provides independent advice on MQ policies, procedures, and processes

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.

Changes from Previous Offering

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Student feedback from the previous offering of this unit was very positive overall, with students pleased with the clarity around assessment requirements and the level of support from teaching staff. As such, no change to the delivery of the unit is planned, however we will continue to strive

to improve the level of support and the level of student engagement.