



BMOL3202

Macromolecules

Session 2, In person-scheduled-weekday, North Ryde 2024

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Unit Convenor

Phani Rekha Potluri

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14 EaR 306

By appointment

Lecturer

Shahrzad Rezvani Baboli

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By appointment

Credit points

10

Prerequisites

130cp at 1000 level or above including CHEM2201 or CBMS200 or BMOL2201 or CBMS201

Corequisites

Co-badged status

BMOL6202

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

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

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/study/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 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	WK 3,5,7,9,11
Workshop reports x 3	15%	No	Wk 7,11,13
Lab Reports	30%	No	Two weeks after Prac class
Case study	10%	No	Week 12, 13
Final Exam	40%	No	University Examination Period

SGTA Quiz

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 5 hours

Due: **WK 3,5,7,9,11**

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.

- Interpret and draw sound conclusions from analytical and biophysical data.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.
- 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: **Wk 7,11,13**

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.
- Interpret and draw sound conclusions from analytical and biophysical data.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.

Lab Reports

Assessment Type ¹: Lab report

Indicative Time on Task ²: 24 hours

Due: **Two weeks after Prac class**

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.

- Interpret and draw sound conclusions from analytical and biophysical data.
- 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.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.

Case study

Assessment Type ¹: Case study/analysis

Indicative Time on Task ²: 9 hours

Due: **Week 12, 13**

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.
- Interpret and draw sound conclusions from analytical and biophysical data.
- 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.
- Apply basic concepts from thermodynamics and kinetics to interpret molecular mechanisms of macromolecule systems.

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.

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, 2 hrs): There are five 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, 4 and 5). These are held online in weeks 5, 9 and 11. Participation for workshop sessions 2, 4 and 5 is a required part of the unit to complete the associated workshop reports. There is One optional workshop (workshop 3) to assist help with Prac reports.

SGTA Quiz (1 hr): SGTA quizzes will be held during the scheduled workshop sessions (3 hrs - 1 hr SGTA + 2 hr Workshops) on-campus in Weeks 3,5,7,9 and 11. Each SGTA quiz session will involve a 30 min discussion followed by a 10-15 min online quiz worth 1%.

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.

Case study presentations: Will be held during the scheduled SGTA sessions in Weeks 12 and 13. 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.

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
		23 Wally's Walk T2	23 Wally's Walk T2	(on campus, see timetable)		

		Tuesday: 9-10 a.m		Thursday 12 - 1 p.m		Mon 12-3 (12-1 SGTA Quiz; 1-3 Workshop) p.m 25WW A208	Wed 10-1 pm OR Wed 2-5 pm Held in14 Sir Christopher Ondaatje Ave - 347/349/350 Labs	
						Tues 11-2 p.m (11-12 SGTA Quiz; 12-2 Workshop) 11WW 140		
1	22-Jul	Introduction to Unit	PP	Introduction to Topic	SR	-	-	
2	29-Jul	Chemistry of non-covalent Interactions	SR	Chemistry of non-covalent Interactions	SR	-	-	
3	5-Aug	Folding & stability of macromolecules in solution	PP	Folding & stability of macromolecules in solution	PP	#WS1 - how to write prac reports (optional); SGTA Quiz 1	-	SGTA Quiz 1 - 1%
4	12-Aug	Folding & stability of macromolecules in solution	PP	Biological Macromolecules	PP	-	Prac 1: Cyclodextrin Host-Guest Chemistry	
5	19-Aug	Biological Macromolecules	PP	Biological Macromolecules	PP	#WS2: WorkshopFold IT (on campus, report to be submitted); SGTA Quiz 2	-	SGTA Quiz 2 - 1%
6	26-Aug	Biological Macromolecules	MA	Biological Macromolecules	ZK	-	Prac 2: Protein Unfolding/Circular Dichroism	Prac 1 Report - 7.5%
7	2-Sep	Special Topics: Molecules built to specific shapes (nanogold)	YW	Synthesis & self-assembly	AGB	#WS3: Extra prac help session (optional); SGTA Quiz 3	-	WS2 Report - 5%; SGTA Quiz 3 - 1%
8	9-Sep	Synthesis & self-assembly	AGB	Introduction to Polymer Chemistry	AGB	-	Prac 3: making and characterisation of nanogold particles	Prac2 Report - 7.5%
semester break: 16-29 Sept				Mid-				Prac3 Report - Wk2 of Break
9	30-Sep	Characterising Macromolecules - Scattering methods	AGB	Characterising Macromolecules - Electron Microscopy	AGB	#WS4: Biomolecules workshop Part A (on campus, report to be submitted); SGTA Quiz 4		SGTA Quiz 4 - 1%

10	7-Oct	Characterising Macromolecules - Fluorescence microscopy and X-Ray	PP	Characterising Macromolecules - NMR & Force Based Methods	PP	-	Prac 4: Polymer Chemistry	*Mon Workshop students attends Thur or alternate sessions- Check iLearn
11	14-Oct	Characterising Macromolecules - Molecular Mass	PP	Characterising Macromolecules - Analytical Centrifugation	PP	#WS5: Biomolecules workshop Part B (oncampus, report to be submitted); SGTA Quiz 5		WS4 Report - 5%; SGTA Quiz 5 - 1%
12	21-Oct	Characterising Macromolecules - Optical Methods	PP	Special Topics: Molecules built to specific shapes	PP	#6. Case studies: Oral Presentations (10%)	-	Prac 4 Report - 7.5%; Presentations -10%
13	28-Oct	Special Topics: Molecules built for specific functions	SR	Special Topics: Molecules built to specific shapes	SR	#6. Case studies: Oral Presentations (10%)	-	WS5 Report - 5%; Presentations -10%
Lecturer code: PP - Phani Potluri; YW - Yuling Wang; AGB - Alf Garcia Bennett; MA - Morten Andersen; SR - Shahrzad Rezvani; 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 \(https://policies.mq.edu.au\)](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 connect.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 the [Service Connect Portal](#), 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 2024.01R of the [Handbook](#)