



# BMOL3202

## Macromolecules

Session 2, Weekday attendance, North Ryde 2021

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

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#### **Disclaimer**

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#### **Session 2 Learning and Teaching Update**

The decision has been made to conduct study online for the remainder of Session 2 for all units WITHOUT mandatory on-campus learning activities. Exams for Session 2 will also be online where possible to do so.

This is due to the extension of the lockdown orders and to provide certainty around arrangements for the remainder of Session 2. We hope to return to campus beyond Session 2 as soon as it is safe and appropriate to do so.

Some classes/teaching activities cannot be moved online and must be taught on campus. You should already know if you are in one of these classes/teaching activities and your unit convenor will provide you with more information via iLearn. If you want to confirm, see the list of [units with mandatory on-campus classes/teaching activities](#).

Visit the [MQ COVID-19 information page](#) for more detail.

## General Information

Unit convenor and teaching staff

Unit Convenor

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Credit points

10

Prerequisites

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

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:** 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

Your written reports may be subjected to analysis by Turnitin. Due dates for assessment tasks are on the ilearn site and assignments must be submitted through the ilearn site, where appropriate.

**No extensions will be granted, unless a case for Special Consideration (Disruption to Study) has been approved. Late reports will be penalised by deduction of 10% of total available marks for each 24 hour period delay.** It is your responsibility to ensure all documents submitted on line are correct and readable.

## Assessment Tasks

| Name                        | Weighting | Hurdle | Due                           |
|-----------------------------|-----------|--------|-------------------------------|
| <u>Workshop reports x 3</u> | 15%       | No     | Week 5, 8 and 11              |
| <u>Lab Reports</u>          | 30%       | No     | Week 6, 8, 10 and 12          |
| <u>Case study</u>           | 15%       | No     | Week 11 and 12                |
| <u>Final Exam</u>           | 40%       | No     | University examination period |

### Workshop reports x 3

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

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

Due: **Week 5, 8 and 11**

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.
- 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 <sup>1</sup>: Lab report

Indicative Time on Task <sup>2</sup>: 24 hours

Due: **Week 6, 8, 10 and 12**

Weighting: **30%**

There will be FOUR practicals in total. A lab report is to be submitted two weeks after all four practicals. The first two lab reports will be worth 5% each. The final two will be worth 10% each.

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 <sup>1</sup>: Case study/analysis

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

Due: **Week 11 and 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.

## Final Exam

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

Indicative Time on Task <sup>2</sup>: 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.

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<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

**Lectures:** there are two lectures per week as per the university timetable. Lectures are delivered online and will also be recorded. Some lectures may be pre-recorded and made available prior to the scheduled lecture; and then followed up by an online Q&A session with the lecturer. All lecture material will be made available in iLearn.

**Workshop Sessions (Dry-lab):** There are six scheduled workshop sessions in total. These will be delivered either online or on campus. Workshops 1 and 3 (week 2 and week 5, respectively) are optional in attendance and will cover lab report writing skills and provide

additional help to students on lab reports. Workshop 6 sessions will be held over two weeks (weeks 11 and 12) and is when oral presentations will be given (online). There are THREE workshop sessions that have associated reports to be submitted (workshops 2, 4 and 5). Workshops 2 and 4 will be held online in Weeks 3 and 7. Workshop 5 will be on campus in week 9. Participation for workshop sessions in Weeks 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.

\*\* Due to COVID, 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 on campus according to the timetable. There are two timetabled sessions available. Labs will be held in 14 Sir Christopher Ondaatje Ave (E7B) 349 Science Lab. In total, there are FOUR lab sessions held in weeks 4, 5, 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.

\*\* Due to COVID, students must bring their own labcoats 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.

**Textbooks:** There is no required text for this unit. Reading material 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 (online)                                | PP | Lecture 2 (online)                                | PP | Workshop sessions                                    | Practical (on campus)   |
|------|---------------|---|----|---|----|--|---|
|      |               | Monday: 12 - 1 p.m                                |    | Tuesday 1 - 2 p.m                                 |    | (online or on campus, see timetable)                 | Tuesday 2-5pm OR Wednesday 10-1pm. Held in 14 Sir Christopher Ondaatje Ave - 347/349/350 Labs |
| 1    | 26-Jul        | Introduction                                      | PP | Introduction                                      | PP | no workshop  | no prac   |
| 2    | 2-Aug         | Chemistry of non-covalent Interactions            | PP | Chemistry of non-covalent Interactions            | PP | #1 - how to write prac reports (online, optional)    | -   |
| 3    | 9-Aug         | Folding & stability of macromolecules in solution | PP | Folding & stability of macromolecules in solution | PP | #2: WorkshopFold IT (online, report to be submitted) | -   |

|   |        |  |     |   |     |   |  |
|---|--------|--|-----|---|-----|---|--|
| 4   | 16-Aug | Folding & stability of macromolecules in solution      | PP  | Biological Macromolecules                                     | PP  | -   | Prac 1: Cyclodextrin Host-Guest Chemistry                                      |
| 5   | 23-Aug | Biological Macromolecules                              | PP  | Biological Macromolecules                                     | PP  | #3. Extra prac help session (online, optional)                      | -  |
| 6   | 30-Aug | Biological Macromolecules                              | MA  | Synthesis & self-assembly                                     | AGB | -   | Prac 2: Myoglobin unfolding (thermodynamics)                                   |
| 7   | 6-Sep  | Synthesis & self-assembly                              | AGB | Synthesis & self-assembly                                     | AGB | #4. Biomolecules workshop Part A (online, report to be submitted)   | -  |
| <b>Mid-semester break: 13-24 Sept</b>   |        |  |     |   |     |   |  |
| 8   | 27-Sep | Characterising Macromolecules                          | PP  | Characterising Macromolecules                                 | PP  | -   | Prac 3: Spectroscopic characterization of amyloid fibril formation by lysozyme |
| 9   | 4-Oct  | Characterising Macromolecules                          | PP  | Special Topics: Molecules built to specific shapes (nanogold) | YW  | #5. Biomolecules workshop Part B (oncampus, report to be submitted) | -  |
| 10  | 11-Oct | Characterising Macromolecules                          | AGB | Characterising Macromolecules                                 | AGB | -   | Prac 4: making and characterisation of nanogold particles                      |
| 11  | 18-Oct | Characterising Macromolecules                          | PP  | Characterising Macromolecules                                 | PP  | #6. Case studies: Oral Presentations (15%) (online)                 | -  |
| 12  | 25-Oct | Special Topics: Molecules built to specific shapes     | PP  | Special Topics: Molecules built to specific shapes            | PP  | #6. Case studies: Oral Presentations (15%) (online)                 | -  |
| 13  | 1-Nov  | 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](#)
- [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](http://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.