# BMOL3202

## Macromolecules

Session 2, Weekday attendance, North Ryde 2020

*Department of Molecular Sciences*

## Contents





**Notice**

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and ot her small group learning activities on campus for the second half-year, while keeping an online ver sion available for those students unable to return or those who choose to continue their studies onli ne.

To check the availability of face-to-face and onlin e activities for your unit, please go to timetable vi ewer. To check detailed information on unit asses sments visit your unit's iLearn space or consult yo ur unit convenor.

# General Information

Unit convenor and teaching staff
Unit Convener
Louise Brown
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Contact via Email
E8C Room 305
Tuesday to Friday (9am to 4pm) by appointment

Lecturer
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Lecturer
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Tutor
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Credit points
10

Prerequisites
(CHEM2201 or CBMS200) or (BMOL2201 or CBMS201)

Corequisites

Co-badged status
This unit is co-badged with 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

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 |
|---|---|---|---|
| Workshop reports x 3 | 15% | No | Two weeks after w'shop session (held in weeks 3, 7 & 9) |
| Lab Report x 3 | 30% | No | Two weeks after lab session (Labs run in weeks 4, 6, 8 & 10) |
| Case study | 15% | No | Weeks 11-12 |
| Final Exam | 40% | No | University exam 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. Each workshop report is worth 5%.

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 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. Each lab report is worth 10%. Only 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.
- 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]: 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.

## Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **University exam 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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[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 **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 either be delivered online (workshops 1, 3 and 6) OR on campus (workshops 2, 4 and 5 - see timetable for location of on-campus sessions). 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). These are **held on campus in weeks 3, 7 and 9**. Participation for workshop sessions 3, 7 and 9 (held on campus) 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. Also, workshop sessions cannot run for the full two hours due to university COVID attendance restrictions. Workshop sessions will run for a total of 1 hr and 40 minutes. You will be asked to leave the room 15 minutes before the end of the second hour.

**Laboratory Sessions (Wet-lab):** 3 hour Laboratory sessions are scheduled according to the timetable. There are three 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 to 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

This table is an indication only of lecture topics and the scheduling of practical/workshop sessions. The order/content and dates for certain activities may change. Changes to this schedule will be communicated via iLearn.

| Week | Week starting | Date for **both** online Friday lectures | **Lecture 1 (online)**<br><br>Friday:<br>9-10am | | **Lecture 2 (online)**<br><br>Friday:<br>11-12pm | | **Workshop sessions** Wednesday: 2-4pm (online or on campus, *see* timetable) | **Pr se ca** 2-5 We 10 We 2-5 Sir On 34 |
|---|---|---|---|---|---|---|---|---|
| 1 | 27-Jul | 31-Jul | Introduction | LB | Introduction | LB | | |
| 2 | 3-Aug | 7-Aug | Chemistry of non-covalent Interactions | LB | Chemistry of non-covalent Interactions | LB | #1 - how to write prac reports (online, optional) | |
| 3 | 10-Aug | 14-Aug | Folding & stability of macromolecules in solution | LB | Folding & stability of macromolecules in solution | LB | #2: WorkshopFold IT (on campus, report to be submitted) | |
| 4 | 17-Aug | 21-Aug | Folding & stability of macromolecules in solution | LB | Biological Macromolecules | LB | | Pra Cy Ho Ch |
| 5 | 24-Aug | 28-Aug | Biological Macromolecules | LB | Biological Macromolecules | LB | #3. Extra prac help session (online, optional) | |
| 6 | 31-Aug | 4-Sep | Biological Macromolecules | MA | Synthesis & self-assembly | AGB | | Pra My un (th |
| 7 | 7-Sep | 11-Sep | Synthesis & self-assembly | AGB | Synthesis & self-assembly | AGB | #4. Biomolecules workshop Part A (on campus, report to be submitted) | |
| **Mid-semester break: 14-25 Sept** | | | | | | | | |
| 8 | 28-Sep | 2-Oct | Characterising Macromolecules | LB | Characterising Macromolecules | LB | | Pra Sp ch of for lys |
| 9 | 5-Oct | 9-Oct | Characterising Macromolecules | LB | Special Topics: Molecules built to specific shapes (nanogold) | YW | #5. Biomolecules workshop Part B (on campus, report to be submitted) | |
| 10 | 12-Oct | 16-Oct | Characterising Macromolecules | AGB | Characterising Macromolecules | AGB | | Pra an ch na pa |
| 11 | 19-Oct | 23-Oct | Characterising Macromolecules | LB | Characterising Macromolecules | LB | #6. Case studies: Oral Presentations (15%) | |

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|---|---|---|---|---|---|---|---|
| 12 | 26-Oct | 30-Oct | Special Topics: Molecules built to specific shapes | LB | Special Topics: Molecules built to specific shapes (nanodiamonds) | LB | #6. Case studies: Oral Presentations (15%) |
| 13 | 2-Nov | 6-Nov | Special Topics: Molecules built for specific functions | LB | Revision | | |

# Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

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

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/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

# 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) 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

If you are a Global MBA student contact 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/.

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

This is the second offering of 'Macromolecules'. There are additional optional workshop sessions to help students with report writing (workshops 1 and workshops 3). There are no other changes to this unit. However, due to COVID, please note that some workshop and laboratory activities have been modified.