BMOL3202
Macromolecules
Session 2, Weekday attendance, North Ryde 2021

Department of Molecular Sciences

Contents

General Information .................................. 2
Learning Outcomes .................................. 3
General Assessment Information ................. 3
Assessment Tasks .................................... 4
Delivery and Resources .............................. 6
Unit Schedule ....................................... 7
Policies and Procedures .............................. 8

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Notice
Some on-campus classes have moved online for the first two weeks of Session, before returning to campus in Week 3. If you are studying a unit outside of the primary Session 2 timetable, please contact your teaching staff team for further details.

Some classes/teaching activities cannot be moved online and must be taught on campus. To find out if you are enrolled in one of these classes/teaching activities, you can check to see if your unit is on the list of units with mandatory on-campus classes/teaching activities.

Your Unit Convenor will provide more information via an iLearn announcement when your iLearn unit becomes available.
## General Information

**Unit convenor and teaching staff**

**Unit Convenor**
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Lecturer
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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://students.mq.edu.au/important-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 online are correct and readable.

### Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop reports x 3</td>
<td>15%</td>
<td>No</td>
<td>Week 5, 8 and 11</td>
</tr>
<tr>
<td>Lab Reports</td>
<td>30%</td>
<td>No</td>
<td>Week 6, 8, 10 and 12</td>
</tr>
<tr>
<td>Case study</td>
<td>15%</td>
<td>No</td>
<td>Week 11 and 12</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
<td>No</td>
<td>University examination period</td>
</tr>
</tbody>
</table>

**Workshop reports x 3**

Assessment Type ¹: Report  
Indicative Time on Task ²: 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 ¹: Lab report  
Indicative Time on Task ²: 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 ¹: Case study/analysis
Indicative Time on Task ²: 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 ¹: Examination
Indicative Time on Task: 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 Learning Skills Unit 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 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 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

<table>
<thead>
<tr>
<th>Week starting</th>
<th>Lecture 1 (online)</th>
<th>Lecture 2 (online)</th>
<th>Workshop sessions</th>
<th>Practical (on campus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday: 12 - 1 p.m</td>
<td>PP Introduction</td>
<td>PP Introduction</td>
<td>(online or on campus, see timetable)</td>
<td>Tuesday 2-5pm OR Wednesday 10-1pm. Held in 14 Sir Christopher Ondaatje Ave - 347/349/350 Labs</td>
</tr>
<tr>
<td>Tuesday 1 - 2 p.m</td>
<td>PP Chemistry of non-covalent Interactions</td>
<td>PP Chemistry of non-covalent Interactions</td>
<td>PP</td>
<td>-</td>
</tr>
<tr>
<td>Thursday 10 - 12</td>
<td>PP Folding &amp; stability of macromolecules in solution</td>
<td>PP Folding &amp; stability of macromolecules in solution</td>
<td>PP</td>
<td>-</td>
</tr>
</tbody>
</table>

1. Introduction PP PP no workshop no prac
2. Chemistry of non-covalent Interactions PP PP #1 - how to write prac reports (online, optional) -
3. Folding & stability of macromolecules in solution PP PP #2: WorkshopFold IT (online, report to be submitted) -
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Module</th>
<th>Lecturer</th>
<th>Practical</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>16-Aug</td>
<td>Folding &amp; stability of macromolecules in solution</td>
<td>PP</td>
<td>PP</td>
<td>Prac 1: Cyclodextrin Host-Guest Chemistry</td>
</tr>
<tr>
<td>5</td>
<td>23-Aug</td>
<td>Biological Macromolecules</td>
<td>PP</td>
<td>PP</td>
<td>#3. Extra prac help session (online, optional)</td>
</tr>
<tr>
<td>6</td>
<td>30-Aug</td>
<td>Biological Macromolecules</td>
<td>MA</td>
<td>AGB</td>
<td>Prac 2: Myoglobin unfolding (thermodynamics)</td>
</tr>
<tr>
<td>7</td>
<td>6-Sep</td>
<td>Synthesis &amp; self-assembly</td>
<td>AGB</td>
<td>AGB</td>
<td>#4. Biomolecules workshop Part A (online, report to be submitted)</td>
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<tr>
<td></td>
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<td><strong>Mid-semester break: 13-24 Sept</strong></td>
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<tr>
<td>8</td>
<td>27-Sep</td>
<td>Characterising Macromolecules</td>
<td>PP</td>
<td>PP</td>
<td>Prac 3: Spectroscopic characterization of amyloid fibril formation by lysozyme</td>
</tr>
<tr>
<td>9</td>
<td>4-Oct</td>
<td>Characterising Macromolecules</td>
<td>PP</td>
<td>YW</td>
<td>#5. Biomolecules workshop Part B (oncampus, report to be submitted)</td>
</tr>
<tr>
<td>10</td>
<td>11-Oct</td>
<td>Characterising Macromolecules</td>
<td>AGB</td>
<td>AGB</td>
<td>Prac 4: making and characterisation of nanogold particles</td>
</tr>
<tr>
<td>11</td>
<td>18-Oct</td>
<td>Characterising Macromolecules</td>
<td>PP</td>
<td>PP</td>
<td>#6. Case studies: Oral Presentations (15%) (online)</td>
</tr>
<tr>
<td>12</td>
<td>25-Oct</td>
<td>Special Topics: Molecules built to specific shapes</td>
<td>PP</td>
<td>PP</td>
<td>#6. Case studies: Oral Presentations (15%) (online)</td>
</tr>
<tr>
<td>13</td>
<td>1-Nov</td>
<td>Special Topics: Molecules built for specific functions</td>
<td>PP</td>
<td>Revision</td>
<td>no workshop</td>
</tr>
</tbody>
</table>

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://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

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https://unitguides.mq.edu.au/unit_offerings/130944/unit_guide/print 8
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/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

**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.
Student Enquiry Service
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

Equity 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.

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.