CBMS334

Macromolecules

S2 Day 2019

Dept of Molecular Sciences

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General Information

Unit convenor and teaching staff
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Tuesday to Friday (9am to 4pm) by appointment

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Credit points
3

Prerequisites
CBMS200 and CBMS201

Corequisites

Co-badged status
This unit is co-badged with CBMS634

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 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:

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.

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

Develop presentation skills (written, oral) relevant to the biomolecular and chemical sciences to communicate clearly and concisely.

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 2	15%	No	Two weeks after workshops
Lab Report x 3	30%	No	Two weeks after practical
Case study	15%	No	Week 12 during class time
Final Exam	40%	No	University Exam Period

Workshop reports x 2

Due: **Two weeks after workshops**
Weighting: **15%**

Workshops will be held in Weeks 2 and Week 7. The report from each workshop is worth 7.5%. They are to be submitted two weeks after the workshop.

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 Report x 3

Due: **Two weeks after practical**
Weighting: **30%**

There will be FOUR practicals in total. These will be held in Weeks 3, 5, 9, and 11. A lab report is to be submitted two weeks after the practicals. Each lab report is worth 10%. The top THREE marks from your four practicals will contribute 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.
- 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.
- Develop presentation skills (written, oral) relevant to the biomolecular and chemical sciences to communicate clearly and concisely.

Case study

Due: **Week 12 during class time**
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.
- Develop presentation skills (written, oral) relevant to the biomolecular and chemical sciences to communicate clearly and concisely.

Final Exam

Due: **University Exam Period**
Weighting: **40%**

The final examination will be 3 hours in length with 10 minutes reading time. The final 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 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.

Delivery and Resources

Lectures: lectures are held twice per week. Tuesday: 11-12pm at 25a Wallys Walk 114 Tut Rm AND Wednesday: 11-12pm at 14 Sir Christopher Ondaatje Ave - 264 Tute Rm. Lecture material will be made available in iLearn.

Workshop Sessions (Dry-lab): Workshop sessions are scheduled on Wednesday afternoons from 2-4pm. Workshops will be held in 7 Wallys Wlk - 149 Briefing Room. There are TWO workshop sessions in **weeks 2 and 7**. There will be a third workshop in **week 12** where oral presentations will be given. Attendance at workshop sessions is **COMPULSORY**. If you cannot attend, you must submit a Special Consideration request if you wish your absence to be considered.

Laboratory Sessions (Wet-lab): Laboratory sessions are scheduled on Wednesday afternoons from 2-5pm. Labs will be held in 14 Sir Christopher Ondaatje Ave (E7B) 349 Science Lab. There are FOUR lab sessions in total to be held in **weeks 3, 5, 9 and 11**. 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.

Textbooks: There is no required text for this unit. Reading material may be advised by your lecturer. A list of suggested reading material and text will be made available on iLearn.

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	Date (wk starting)	**Lecture 1:** Tuesday 11-12pm 25a Wallys Walk: 114 Tut Rm	**Lecture 2:** Wednesday: 11-12pm 14 Sir Christopher Ondaatje Ave - 264 Tute room	**Workshop:** Wednesday 2-4pm 7 Wallys Wlk - 149 Briefing room	**Practical:** Wednesday 2-5pm 14 Sir Christopher Ondaatje Ave - 347/349/ 350 Labs
1	29-Jul	Introduction	Introduction		
2	5-Aug	Chemistry of non-covalent Interactions	Chemistry of non-covalent Interactions	1: Workshop 10%	

3	12-Aug	Folding & stability of macromolecules in solution	Folding & stability of macromolecules in solution		Prac 1
4	19-Aug	Folding & stability of macromolecules in solution	Biological Macromolecules		
5	26-Aug	Biological Macromolecules	Biological Macromolecules		Prac 2
6	2-Sep	Biological Macromolecules	Synthesis & self-assembly		
7	9-Sep	Synthesis & self-assembly	Synthetic Macromolecules	2: Workshop 10%	
Mid-semester break: 16-27 Sept					
8	30-Sep	Characterising Macromolecules	Characterising Macromolecules		
9	7-Oct	Characterising Macromolecules	Characterising Macromolecules		Prac 3
10	14-Oct	Characterising Macromolecules	Characterising Macromolecules		
11	21-Oct	Special Topics: Molecules built to specific shapes	Special Topics: Molecules built to specific shapes		Prac 4
12	28-Oct	Special Topics: Molecules built to specific shapes	Special Topics: Molecules built to specific shapes	3: Oral Presentations 15%	
13	4-Nov	Special Topics: Molecules built for specific functions	Special Topics: Molecules built for specific functions		

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.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (htt

ps://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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Assessment task

- Case study

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- 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.

Assessment task

- Case study

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcome

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

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- 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.

Assessment tasks

- Workshop reports x 2
- Lab Report x 3
- Case study
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

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

Assessment tasks

- Workshop reports x 2
- Lab Report x 3

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- 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.

Assessment tasks

- Workshop reports x 2

- Lab Report x 3
- Final Exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Extract and interpret information from a variety of sources concerning macromolecules, including the contemporary scientific literature.
- Develop presentation skills (written, oral) relevant to the biomolecular and chemical sciences to communicate clearly and concisely.

Assessment tasks

- Lab Report x 3
- Case study

Changes from Previous Offering

This is a new unit.

Changes since First Published

Date	Description
18/09/2019	Error with months on schedule.
12/07/2019	Workshops are 2 hr in length (not 3hr).