

BMOL1001

Biomolecules

Session 1, In person-scheduled-weekday, North Ryde 2024

School of Natural Sciences

Contents

General Information	2
Learning Outcomes	2
General Assessment Information	3
Assessment Tasks	6
Delivery and Resources	9
Unit Schedule	13
Policies and Procedures	14

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General Information

Unit convenor and teaching staff

Unit Convenor

Su Su Thae Hnit

susuthae.hnit@mq.edu.au

Contact via Contact via Email

4WW-220

By appointment

Credit points

10

Prerequisites

Admission to BClinSc

Corequisites

Co-badged status

Unit description

This unit provides students with an understanding of fundamental concepts and principles in chemistry and biochemistry in a clinical context. Health professionals require a sound comprehension of molecular mechanisms and physiology, and this is only possible with a good understanding of the principles and practical aspects of the molecular sciences, from the smallest of chemical substances through to the molecules of life - the biomolecules. You will explore from atoms and molecules, all the way to the function, structure, and reactions of inorganic and organic compounds, including the four major groups of biomolecules (lipids, proteins, nucleic acids, and carbohydrates). Practical classes and workshops will reinforce the content delivered in lectures and integrate it with Clinical Science.

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: Explain and relate general, inorganic, and organic chemistry principles applicable to the discipline of clinical science.

ULO2: Name and write (or describe) the chemical structures for representative inorganic

and organic compounds, including peptides, carbohydrates, lipids and nucleic acids.

ULO3: Describe the structure, function and properties of biomolecules using chemical and biochemical concepts.

ULO4: Predict chemical and physical behaviours of molecules from their structures.

ULO5: Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.

ULO6: Demonstrate laboratory skills used for the preparation, separation and analysis of chemical compounds, including an understanding of general laboratory safety procedures.

ULO7: Record and analyse scientific data, as well as communicate conclusions using the basic elements of scientific report preparation.

General Assessment Information

Practicals (20%):

- You must complete four practicals, each worth 5%.
- The practicals are composed of
 - prelab exercises (10%),
 - the "prac report" (80%) and
 - postlab exercises (10%).
- The prelabs will be done online and will be due at midnight of the Sunday before your lab class.
- The prac report will be completed during the lab class hand submitted to your demonstrator before you leave that class.
- The postlab exercises will be due at midnight of the Sunday of the week after you lab class.
- If you miss a Practical class you are NOT automatically entitled to rescheduling or a
 make-up class. Such an opportunity may be offered, if possible, provided sufficient
 warning is provided. Justification for rescheduling or make-up (Special Consideration
 requests) must be lodged via ask.mq.edu.au.

Short Quizzes (30%):

- Short Quizzes will contribute 30% to your overall mark. Your Five (5) highest individual quiz marks will be used to calculate your average mark for the Quizzes.
- · Short Quizzs will be completed during workshop sessions.
- The quizzes will be available for short window during the workshop session
- · The quizzes are designed to test your understanding of fundamental chemical and

biochemical concepts and some will be GAMSAT style.

Practical and Workshops Participatory Tasks:

- You must attend and participate in the Practical classes to pass BMOL1001. Your participation will be on aspects, such as but not limited to:
 - Preparation completion of prelaboratory exercises, bringing personal protective equipment (lab coat, safety glasses, enclosing shoes, etc), bringing laboratory notes
 - Behaving safely
 - Behaving ethically
 - Engaging with the activities
- You must attend and participate in the Workshop classes. Participation will be reviewed
 by attendance at the class, engagement with the Problem Sets, and achieving
 competency in the topic. Workshop attendance will be recorded.
- Note: If you miss a Practical class or Workshop class you are NOT automatically entitled
 to rescheduling or a make-up class. Such an opportunity may be offered, if possible,
 provided sufficient warning is provided. Email the convenor as you may be able to attend
 an alternative session.

Presentations (10%):

- All students will be required to select from a set of topics (related to blood tests in clinical practice) available on iLearn to test their understanding of the fundamental aspects of chemistry and how they apply to clinical medicine.
- The presentations will in form of a PANEL DISCUSSION where students will be required
 to answer questions and talk about their topic. This is not a group task, each student
 must prepare individually.
- The panel discussion will take place in the workshop session in weeks 7-11. Students
 will be required to self-select the topic (and therefore week) they wish to present on
 iLearn.

Final Exam (40%):

- The final examination will be two (2) hours, with 10 minutes reading time, consisting of
 multiple choice and long answer questions. The final examination will cover all sections
 of the unit (lectures, lab practicals, workshops and presentations) and is designed to
 address specific understanding of all the concepts presented within the course.
- If you receive a special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next

session. By requesting a special consideration for the final exam you are declaring yourself available for a re-sit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure that you are familiar with the policy prior to submitting an application.

Gradebook:

Your marks will be displayed on iLearn through Gradebook. It is your responsibility to regularly verify that the records displayed at iLearn (Tools>Grades) are correct.

If you have difficulty attending and participating in a task, please contact the Unit Convenor, in ADVANCE if possible, and immediately after if not, as there may be alternatives available to make-up a missed task. If there are circumstances that mean you miss assessment task, you may apply for a special consideration. To support your extension, you must submit a "Special Consideration Request" request via www.ask.mq.edu.au. See the SPECIAL CONSIDERATIONS web page for instructions on how to do this. Please note that evidence must be given to support your request for an extension. You have a limited time after the event to submit a special consideration request (see SPECIAL CONSIDERATIONS web page)

Submission Deadlines:

Online quizzes, in-class activities, or scheduled tests and examinations must be undertaken at the time indicated in the unit guide. Should these activities be missed due to illness or misadventure, you may apply for Special Consideration.

Assessments not submitted by the due time will receive a mark of zero unless late submissions are specifically allowed as indicated in the unit guide or on iLearn.

Requirements to Pass this Unit

To pass this unit you must:

- · Attempt all assessments, and
- Achieve a total mark equal to or greater than 50%

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation 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. The submission time for all uploaded assessments is 11:55 pm. A 1-hour grace period will be 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, please apply for **Special Consideration**.

Assessments where Late Submissions will be accepted

- Assessment Practical Exercises YES, Standard Late Penalty applies
- · Assessment Final Exam NO, unless Special Consideration is Granted

Special Consideration

The **Special Consideration Policy** aims to support students who have been impacted by shortterm circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment.

Exam: If you experience circumstances or events that affect your ability to complete the written assessments (exam) in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

Workshop Quiz: To pass the unit you need to demonstrate ongoing development of skills and application of knowledge in 5 of the 6 of the workshop quizzes. If you miss a weekly workshop class due to a serious, unavoidable and significant disruption, contact your convenor ASAP as you may be able to attend another class that week. There is no need to submit a special consideration request.

If it is not possible to attend another class, you should still contact your convenor for access to class material to review in your own time.

Presentations: To pass the unit you need to demonstrate ongoing development communication skills. If you miss your scheduled presentation due to a serious, unavoidable and significant disruption, contact your convenor ASAP as you may be able to attend another class that week or present in an alternative session. There is no need to submit a special consideration request.

Assessment Tasks

Name	Weighting	Hurdle	Due
Short quizzes	30%	No	Week 3, 5, 7, 10, 11, 12, 13
Biomolecule Presentation	10%	No	During the workshops of Week 7-11
Practical Class Exercises	20%	No	Pre lab and Post lab submission
Final Examination	40%	No	Exam session

Short quizzes

Assessment Type 1: Quiz/Test Indicative Time on Task 2: 20 hours Due: **Week 3, 5, 7, 10, 11, 12, 13**

Weighting: 30%

A series of short quizzes using a combination of questions to assess lecture, practical and workshop material.

On successful completion you will be able to:

- Explain and relate general, inorganic, and organic chemistry principles applicable to the discipline of clinical science.
- Name and write (or describe) the chemical structures for representative inorganic and organic compounds, including peptides, carbohydrates, lipids and nucleic acids.
- Describe the structure, function and properties of biomolecules using chemical and biochemical concepts.
- Predict chemical and physical behaviours of molecules from their structures.
- Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.
- Demonstrate laboratory skills used for the preparation, separation and analysis of chemical compounds, including an understanding of general laboratory safety procedures.

Biomolecule Presentation

Assessment Type 1: Presentation Indicative Time on Task 2: 11 hours

Due: During the workshops of Week 7-11

Weighting: 10%

Short presentations that applies the knowledge acquired in lectures and workshops.

On successful completion you will be able to:

- Explain and relate general, inorganic, and organic chemistry principles applicable to the discipline of clinical science.
- Describe the structure, function and properties of biomolecules using chemical and biochemical concepts.
- Predict chemical and physical behaviours of molecules from their structures.
- Record and analyse scientific data, as well as communicate conclusions using the basic elements of scientific report preparation.

Practical Class Exercises

Assessment Type 1: Lab report Indicative Time on Task 2: 12 hours

Due: Pre lab and Post lab submission

Weighting: 20%

Practical classes are designed to develop laboratory skills and scientific data analysis capabilities. The pre-practical, practical and post-practical exercises will be used to calculate the final mark for each practical class.

On successful completion you will be able to:

- Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.
- Demonstrate laboratory skills used for the preparation, separation and analysis of chemical compounds, including an understanding of general laboratory safety procedures.
- Record and analyse scientific data, as well as communicate conclusions using the basic elements of scientific report preparation.

Final Examination

Assessment Type 1: Examination Indicative Time on Task 2: 20 hours

Due: **Exam session** Weighting: **40%**

Formal written exam using a combination of question types assessing content delivered across the session. This task is completed under examination conditions during the University examination period.

On successful completion you will be able to:

- Explain and relate general, inorganic, and organic chemistry principles applicable to the discipline of clinical science.
- Name and write (or describe) the chemical structures for representative inorganic and organic compounds, including peptides, carbohydrates, lipids and nucleic acids.

- Describe the structure, function and properties of biomolecules using chemical and biochemical concepts.
- Predict chemical and physical behaviours of molecules from their structures.
- Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.
- 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.

Delivery and Resources

Communication

During the semester, the BMOL1001 iLearn site will be used to communicate important information to you. In addition, emails will be sent to your student email account. Please check your messages frequently.

We cannot overstate the importance of regularly checking your emails and the BMOL1001 iLearn site.

Please feel free to communicate directly with your unit convenor using the contact details provided on the iLearn. Questions about the unit content and administration that may be of general interest will be best posted the Student Q&A on the iLearn site so that everybody can see the answer.

Classes

Log in your <u>estudent</u> for class times and locations. Lectures will commence in Week 1. Workshop classes will begin in Week 2. Practical classes will begin in Week 4.

Lectures: Lecture notes will be available from the iLearn site. You are expected to have
read through them before the lectures. The lectures will be used for emphasising certain
points from the notes and to provide some examples of solving questions pertaining to
the topics. It is a time for you to ask questions about the topics. NOTE: Lectures will be
shared between BMOL1001 and CHEM1001 unit.

The lectures are scheduled for Tuesday 1 pm - 2 pm in 21 Wallys Walk (MACTH Theatre) and Tuesday 1 pm - 2 pm in 21 Wallys Walk (MACTH Theatre).

• Workshops: Workshops will be held on campus and run for 1.5 hrs each week. During

² Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

the Workshops, you will be working mostly in groups on interactive problems and activities that will help you consolidate the content you have learned in lectures with a clinical/biological application. We therefore strongly advise students to attend these sessions. Students are REQUIRED to bring a laptop/device to do the online tasks and quizzes.

Attendance and participation in the workshops is a requirement of this unit. Participation will ensure competency in the unit.

Practicals: In the practicals you will do actual chemistry in the laboratory. You will be
able to put into practice the theory you have seen in the lectures and
workshops. NOTE: The practical classes will be shared between BMOL1001 and
CHEM1001 unit.

The practical classes for CHEM1001/BMOL1001 are run in 14SCO 308. It is very important that you understand that you will not be allowed to attend the laboratory if you do not have a laboratory coat ("lab coat"), safety glasses and enclosed, sturdy footwear (e.g. ugg boots are not acceptable). For hygiene reasons the Department does not provide lab coats, safety glasses or footwear. Disposable gloves are supplied. It is also important that you understand that the doors to the laboratory will be closed 15 minutes after the official start of the class. Entry to the class will not be permitted after this time.

You are required to undertake prelaboratory exercises (prelabs) before coming to the session, to help you prepare for the lab. During the lab you will be assessed on preparedness, general behaviour, ethical behaviour, and competence, as well as the quality of your results. You are to submit a report ("lab report") that summarises the outcomes of your investigation. There are post-laboratory exercises to be completed within a week of the lab session ("post-labs").

Attendance and participation in the practicals is a requirement of this unit.

MASTERING CHEMISTRY

This is a service provided by the department to help consolidate your understanding of the topics covered in lectures and workshops. Quizzes (non-assessed) will be set in mastering chemistry to help you practice and test yourself and your understanding. Questions in the final exam may come directly from the quizzes set up in Mastering.

Teaching and Learning Strategy

BMOL1001 is a 10 credit-point, half-year unit and will require, on average, **10 hours study per week** (contact hours plus self-study time).

BMOL1001 is designed to introduce you to the principles of the molecular sciences in a clinical context, including developing an understanding of the practical skills required to undertake simple chemistry experiments in an efficient and safe manner. The lecture materials, workshop and practical classes complement each other, and along with quizzes, have been developed to increase your understanding of the topics so that you can achieve the learning outcomes.

The unit expectation is that you will:

- Attend all lectures.
- Actively engage in the Workshop classes and attempt the exercises.
- Demonstrate competence in all practical exercises.
- Spend an average of no less than 3 hours per week of private study in addition to class contact.

If you prepare, study and attend all components of the unit and work consistently and continuously throughout the session, you will be able to develop a strong understanding of the general, inorganic and organic chemistry presented, and perform well in this unit. Students who fail to do this and try to cram just before the exam will not do well in this unit.

Lectures: You are expected to read through and make your own notes on set of lecture notes provided on the iLearn site. At the live lectures the lecturers will spend time explaining key concepts and demonstrating how to perform important methods (calculations, interpretations, drawing representations, etc). You are expected to bring your questions to the class. There may also be non-assessed quizzes for you to use to check on your understanding of the material. Most lecture material will be available at the unit iLearn site, while other material will be provided in the lectures. Based on observations of student behaviour and performance, we emphasise that coming to lectures is essential to prevent falling behind and performing poorly. Learning is an active process, and as such, you must engage with the material. Reviewing lecture notes and relevant sections of the textbook (and beyond) before and after lectures is strongly recommended.

Workshop classes are run to assist your understanding of the course material. Experience has demonstrated that there is a strong correlation between engagement with all activities, including the Workshop classes, and success in this unit. The workshops are designed to be interactive and fun activities to apply concepts developed in the lectures into a clinical context. A minimum standard must be achieved to be seen to have reached competency in the topic covered by the workshops. If this is not achieved, further questions will be assigned using the adaptive learning system in Mastering Chemistry as an optional resource to help develop your skills.

Practical classes are designed to develop basic laboratory skills, safety practices, and critical and analytical reasoning skills. Pre-practical ("prelabs") questions are designed to ensure that you are ready for the practical work and have grasped the relevant theory and necessary safety practices. In-lab work is designed to teach you to appropriately record your experimental observations and to present your calculations in a detailed manner. Postlab exercises are designed to assess your understanding of the theory behind the experiments conducted.

Textbook:

- Chemistry: The Central Science in SI Units, Expanded Edition, Global Edition, 15th edition, by Theodore L. Brown, H. Eugene LeMay, Bruce E. Bursten, Catherine Murphy, Patrick Woodward, Steven Langford, Dalius Sagatys, Adrian George
- N.B. Mastering Chemistry is strongly aligned to this textbook. The Department has paid

for your license for Mastering Chemistry, which includes the textbook itself. You may wish to purchase a hardcopy or e-text for yourself, if you find it easier to use and if you wish to keep the text beyond this unit. If you do so, do not buy the MasteringChemistry license as you already have this.

Other Recommended Texts:

- Strongly Recommended: Appling et al. Biochemistry: Concepts and Connections: Global Edition, 2nd Edition, Pearson. (https://www.pearson.com/store/p/biochemistryconcepts[1]and-connections-global-edition/) - Copies are available in the library.
- Any basic biochemstry text can be a useful especially for weeks 9-13 lectures.
 Numerous titles are available in the MQ library.

Additionally, some of the resources below could be useful.

- Openstax Chemistry 2e (free) Download or view at no cost at https://openstax.org/detail
 s/books/chemistry-2e
- Introductory Chemistry by David W. Ball (free) Download or view at no cost at https://open.umn.edu/opentextbooks/textbooks/22
- CLUE: Chemistry, Life, the Universe and Everything by Melanie M. Cooper and Michael
 W. Klymkowsky (free) Download or view at no cost at https://open.umn.edu/opentextbooks/clue-chemistry-life-the-universe-and-everything
- Fundamentals of Organic Chemistry by John McMurry. 7th ed., Belmont, CA:Brooks/ Cole,C 2011 (QD251.2.M4 2011)
- Introductory Chemistry by Nivaldo J. Tro, Fifth Edition (Pearson New International Edition), 2015, Pearson Education (QD33.2 .T76 2015)

Other general and organic chemistry textbooks may also be useful.

High school textbooks may be useful for those students who have not studied Chemistry prior to this unit:

- Chemistry in Focus Year 12 by Debra Smith, Anne Disney, Anna Davis (ISBN: 9780170408998)
- Excel Year 11 Chemistry Study Guide by Geoffrey Thickett (ISBN: 9781741256758)
- Excel Year 12 Chemistry Study Guide by: Geoffrey Thickett (ISBN: 9781741256765)
- Chemistry Essentials for Dummies by John T. Moore (ISBN: 9781119591146)

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-fags. 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.

Unit Schedule

The following schedule is indicative only and may change.

CHEM1001/BMOL1001 S1 2023 LECTURE Schedule - Workshop topics are aligned to the lectures.

Week 1

- Introductions, Administration (Practical Classes, etc), Tools (Textbook, Mastering Chemistry)
- 2. Introduction to Chemistry definitions: matter, states, reactions

Week 2

- The Periodic Table Structure of Atoms, emphasis on Electron Number, electron arrangement (shells), Trends Periods and Groups in the Periodic Table – atomic radius, ionic radius, electronegativity, ionisation energy, reactivity
- Matter and Change definitions of Chemistry, molecules/compounds, representations of Chemistry: chemical equations, balancing equations, Naming binary and simple polyatomic inorganic compounds.

Week 3

- Quantification significant figures, scientific notation. The mole and molar mass; conversions between amount (molecular) and amount (molar) and between amount and mass.
- Quantification concentration and dilutions

Week 4

- 1. Equilibria K_{eq} . K_{sp} , K_a , K_b as examples of K_{eq} under specific contexts.
- 2. Acids and Bases examples of equilibria. K_a , K_b , K_w ; pH etc.

Week 5

- Buffers concepts, quantification, Henderson-Hasselbalch Equation
- 2. Molecular Shape Lewis Diagrams 3. Electronegativity and polarisation

Week 6

- 1. Organic Chemistry: Functional Groups and Drawing Structures
- 2. Organic Compound Naming

Week 7

- 1. Conformations, Isomerism and Stereochemistry
- 2. Predicting Reactivity and Electron Pushing

Week 8

- 1. Alkanes, Alkenes and Alkynes Reactivities
- 2. Aromatic Compounds Properties and Reactivities

Week 9

- 1. Alcohols, Aldehydes and Ketones- Reactivities
- 2. Carboxylic Acids and Derivatives- Properties and Reactivities

Week 10

- 1. Lipids
- 2. Carbohydrates I

Week 11

- 1. Carbohydrates II
- 2. Proteins I

Week 12

- 1. Proteins II
- 2. Nucleic acids

Week 13

- 1. Revision
- 2. Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (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 <u>Student Policies</u> (<u>https://students.mq.edu.au/support/study/policies</u>). 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.e du.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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe <u>academic integrity</u> – 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 <u>online writing and</u> d maths support, academic skills development and <u>wellbeing consultations</u>.

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
- <u>Safety support</u> to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- <u>Student Advocacy</u> provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via AskMQ, 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 <u>Acceptable Use of IT Resources Policy</u>. The policy applies to all who connect to the MQ network including students.

Unit information based on version 2024.01R of the Handbook