



CHEM1001

Foundations of Chemical and Biomolecular Sciences 1

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Natural Sciences

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General Information

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Make Appointment

Credit points

10

Prerequisites

Corequisites

Co-badged status

Unit description

Foundations of Chemical and Biomolecular Sciences 1 introduces students to the principles and practical aspects of molecular sciences, from simple chemicals to life's biomolecules. No prior chemistry or biology knowledge is assumed, making it ideal for anyone keen to understand the atomic and molecular world. The unit covers the language of chemistry, starting with atoms, molecules, elements, and compounds, and uses inorganic, organic, and biomolecular examples to explain their structures, functions, and reactions. It builds on this to predict the reactivity and behaviour of compounds, focusing on acids, bases, and organic biomolecules. Contemporary applications will show the role of chemical and biomolecular sciences in sustainable environments, health, disease, and molecular technologies. Practical sessions and workshops reinforce learning.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals ([UNSDGs](#)) Good Health and Well Being; Clean Water and Sanitation; Climate Action; Industry, Innovation and Infrastructure

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: Use the language and principles of chemical science to explore the composition and properties of matter and discuss how molecular sciences are important in our lives.

ULO2: Name and write (or describe) the chemical structures for representative inorganic and organic compounds, including peptides, carbohydrates and nucleic acids.

ULO3: Analyse the chemical structure of chemical compounds to predict their function, reactivity and physical properties.

ULO4: Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.

ULO5: Demonstrate laboratory skills used for the preparation, separation and analysis of chemical compounds, including an understanding of general laboratory safety procedures.

ULO6: Record and analyse scientific data, as well as communicate conclusions using the basic elements of scientific report preparation.

General Assessment Information

To successfully pass this unit, you are required to:

1. Achieve a minimum total unit mark of 50%.
2. Complete the **hurdle activities** to a satisfactory standard, as outlined below.

Practical Competency (Practice-based task) (40%):

Your average score over the four practicals must be 50% (= 20% of your unit mark) or greater to meet the hurdle threshold.

The practical assessment comprises:

- **prelab exercises** (10% each = 4% of unit mark).
- **in-lab execution and the “prac report”** (80% = 32% of unit mark).
- **postlab exercises** (10% = 4% of unit mark).

Chemistry practical classes are designated as **hurdle assessments** for several reasons:

- **Hands-on Experience:** Laboratory classes provide essential hands-on experience that cannot be replicated through theoretical study alone. This practical exposure is crucial

for understanding chemical concepts and techniques.

- **Skill Development:** These classes help you to develop critical laboratory skills, including accurate measurement, data analysis, bench skills, and the use of specialised equipment. These skills are fundamental for any aspiring chemist and are best learned through direct practice.
- **Safety Training:** Laboratory work involves handling potentially hazardous materials and equipment. Mandatory practical classes ensure that you receive proper safety training, understand risk management, and can conduct experiments safely.
- **Application of Theory:** Practical classes bridge the gap between theory and practice. They allow you to apply theoretical knowledge in real-world scenarios, reinforcing your understanding and retention of the material.
- **Problem-Solving Abilities:** Laboratory experiments present unexpected challenges. By working through these problems, you enhance your critical thinking and problem-solving abilities, which are valuable skills in any career.
- **Collaboration and Communication:** Laboratory classes require teamwork and effective communication. These experiences help to prepare you for collaborative work environments and help you develop interpersonal skills.
- **Assessment of Competence:** Hurdle assessments ensure that all students meet a minimum standard of competence in practical skills. This is essential for maintaining the integrity and quality of the chemistry program.
- **Accreditation Requirements:** The Royal Australian Chemical Institute (RACI) mandates practical laboratory classes as part of the accreditation process for chemistry programs. This ensures that the program meets professional standards and adequately prepares students for careers in chemistry.

Prelab questions must be completed with a minimum score of 60% at least 24 hours prior to your practical class. Failure to meet this requirement will result in denial of entry to the laboratory. These questions are designed to ensure you have adequately prepared for the laboratory class, including understanding the associated risks and safety issues, and becoming familiar with the apparatus and techniques to be used.

The prelabs will be done online via iLearn Quizzes and will be due **24 hours before the start of your class**, i.e. if you have a 9 am class the prelab will be due at 9 am the day before your class.

The **practical report** will be completed during the lab class and submitted to your demonstrator **before you leave that class**. Part of your practical report mark will be based on your:

- **Preparation:**
 - **Personal Protective Equipment (PPE):** Ensure you have all necessary PPE, including a lab coat, safety glasses, and enclosed shoes. This is crucial for your

safety and the safety of others.

- **Laboratory Notes:** Bring your laboratory manual or notes, which include the experiment procedures and safety guidelines.
 - **Understanding Safety Protocols:** Familiarise yourself with the laboratory's safety rules and emergency procedures. Know the location of safety equipment such as fire extinguishers, eye wash stations, and first aid kits.
 - **Knowledge of the Experiment:** Review the experiment's background, objectives, and procedures. Understand the theory behind the experiment and the steps you will be performing.
 - **Materials and Equipment:** Ensure you have all the necessary materials and equipment for the experiment. Check that all equipment is in working order and that you know how to use it properly.
 - **Time Management:** Plan your time effectively to ensure you can complete the experiment within the allotted class period. This includes setting up, conducting the experiment, and cleaning up.
 - **Mental Preparedness:** Approach the lab with a focused and attentive mindset. Be ready to engage actively with the experiment and follow instructions carefully.
- **Safety Conduct:** Demonstrating the ability to conduct yourself in a safe manner.
 - **Ethical Conduct:** Demonstrating the ability to conduct yourself in an ethical manner.
 - **Engagement:** Showing a high level of engagement with the activities.

The **postlab exercises** for all practicals will be due on the Friday of Week 12.

If you miss a Practical class you are NOT entitled to automatically 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 a special consideration request. If possible, you may be provided the opportunity to attend another practical class in the same block of prac classes.

A make-up class for one missed class may be offered in Week 12.

Principles of Chemistry and Biomolecular Sciences (Problem Set) (10%):

The Principles of Chemistry and Biomolecular Sciences Problem Set will contribute 10% to your overall mark. It will be completed through the Mastering Chemistry system, accessed via iLearn, but external to it.

The Problem Set will be due on the Friday of Week 7.

The Problems Set will cover all topics up to and including those delivered in Week 7.

Final Examination (Examination) (50%):

- The final examination will be two (2) hours, with 10 minutes reading time, consisting of

multiple choice and free-text questions. The final examination questions will be drawn from all components of the unit (lectures, lab practicals, workshops and assignments) and is designed to address specific understanding of all the concepts presented within the unit.

Supplementary exams:

- 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.

Special Considerations

If you have difficulty attending and participating in a hurdle assessment 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. In the circumstances that you miss a hurdle assessment task, you must apply for a special consideration. To support your extension, you must submit a "Special Consideration Request". 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:

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.

Late Assessment Submission

Late assessments are not accepted in this unit unless a Special Consideration has been submitted and approved.

Assessment Tasks

Name	Weighting	Hurdle	Due
Practical Competency	40%	Yes	Forthnightly from Week 4 or Week 5
Principles of Chemistry and Biomolecular Sciences	10%	No	11/04/2025
Final Examination	50%	No	Formal Examination Period

Practical Competency

Assessment Type ¹: Practice-based task

Indicative Time on Task ²: 16 hours

Due: **Forthnightly from Week 4 or Week 5**

Weighting: **40%**

This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)

A collection of evidence of the development of practical skills and data analysis competency.

On successful completion you will be able to:

- Use the language and principles of chemical science to explore the composition and properties of matter and discuss how molecular sciences are important in our lives.
- Name and write (or describe) the chemical structures for representative inorganic and organic compounds, including peptides, carbohydrates and nucleic acids.
- Analyse the chemical structure of chemical compounds to predict their function, reactivity and physical properties.
- 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.

Principles of Chemistry and Biomolecular Sciences

Assessment Type ¹: Problem set

Indicative Time on Task ²: 20 hours

Due: **11/04/2025**

Weighting: **10%**

Questions designed to assess understanding of the lecture, practical, and workshop material.

On successful completion you will be able to:

- Use the language and principles of chemical science to explore the composition and properties of matter and discuss how molecular sciences are important in our lives.
- Name and write (or describe) the chemical structures for representative inorganic and organic compounds, including peptides, carbohydrates and nucleic acids.
- Analyse the chemical structure of chemical compounds to predict their function, reactivity and physical properties.
- Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.

Final Examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 20 hours

Due: **Formal Examination Period**

Weighting: **50%**

The final exam will be designed to address specific understanding of all topics presented within the course and to show that the knowledge obtained can be applied to new problems.

On successful completion you will be able to:

- Use the language and principles of chemical science to explore the composition and properties of matter and discuss how molecular sciences are important in our lives.
- Name and write (or describe) the chemical structures for representative inorganic and organic compounds, including peptides, carbohydrates and nucleic acids.
- Analyse the chemical structure of chemical compounds to predict their function, reactivity and physical properties.

- 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.

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

Communication

During the semester, the CHEM1001 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 CHEM1001 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

- **Lectures:** Lectures commence in Week 1. 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.
- **Workshops:** Workshops commence in Week 2, but in Week 1 you should use your scheduled class time to find the room in which your classes will be held. Workshops will be held on campus. During the Workshops, you will work through problems (the Workshop Question Set) with your classmates in a collaborative and interactive manner. You will be using an online system (Mastering Chemistry/Learning Catalytics), so you should bring a device that can be used to give you access to the internet. A laptop is best. Mobile phones can be used but you may experience some difficulty in manipulating some of the items in the questions.

- **Practicals:** Practical classes commence in Week 4 or Week 5, depending on which stream you are in. 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.

The practical classes for CHEM1001 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** (9:20 am for the morning classes, and 2:20 pm for the afternoon classes). 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 by the end of Week 12.

Attendance and participation in the practicals is a requirement of this unit, that is, it is a HURDLE task.

Teaching and Learning Strategy

CHEM1001 is a 10 credit-point, half-year unit and will require, on average, 10 hours study per week (contact hours plus self-study time).

CHEM1001 is designed to introduce you to the principles of the molecular sciences, including developing an understanding of the practical skills required to undertake simple chemistry experiments in an efficient and safe manner. The lecture materials, workshops 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 take notes on the lecture materials

provided on the iLearn site. During lectures, the lecturers will explain key concepts and demonstrate important methods, such as calculations, interpretations, and drawing representations. You should bring any questions you have to class. There may also be non-assessed quizzes available to help you check your understanding of the material. Most lecture content will be accessible on the unit's iLearn site, with additional material provided during lectures. Based on observations of student behaviour and performance, **attending lectures is crucial to avoid falling behind and performing poorly.**

Learning is an active process, so you must engage with the material. It is strongly recommended to review lecture notes and relevant textbook sections (and beyond) both before and after lectures.

- **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. During the Workshops we will use an online question system, Mastering Chemistry/Learning Catalytics. The problems assigned for that week's workshop will be undertaken during the class. This will give you an opportunity to seek help on areas you are having difficulty with.
- **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: Openstax McMurray Organic Chemistry: A Tenth Edition** (free) Download or view at no cost from <https://openstax.org/details/books/organic-chemistry>
- **Strongly Recommended: Pushing Electrons: a Guide for Students of Organic Chemistry** by Daniel P. Weeks, Fourth Edition, 2014, Brooks/Cole, Cengage Learning. (<https://au.cengage.com/c/isbn/9781133951889/>) (QD476 .W38 2014)
- **Openstax Chemistry 2e** (free) Download or view at no cost at <https://openstax.org/details/books/chemistry-2e>
- **Introductory Chemistry by David W. Ball** (free) Download or view at no cost from <http://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/textbooks/clue-chemistry-life-the-universe-and-everything>
- **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)

Unit Schedule

The following schedule is indicative only and may change.

CHEM1001 S1 2025 Schedule

Week 1

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

Week 2

1. 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

2. Matter and Change – definitions of Chemistry, molecules/compounds, representations of Chemistry: chemical equations, balancing equations, Naming binary and simple polyatomic inorganic compounds.

Week 3

1. Quantification – significant figures, scientific notation. The mole and molar mass; conversions between amount (molecular) and amount (molar) and between amount and mass.
2. 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

1. 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. Alkyl halides - Reactivities Part 1
2. Alkyl halides - Reactivities Part 2

Week 10

1. Alcohols - Reactivities

2. Aldehydes and Ketones - Reactivities

Week 11

1. Carboxylic Acids and Derivatives - Properties and Reactivities
2. Biomolecules Part 1 - Carbohydrates

Week 12

1. Biomolecules Part 2 - Amines, Amino Acids, Peptides and Proteins
2. Biomolecules Part 3 - Nucleic acids

Week 13

1. Revision
2. Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](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 [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 connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe [academic integrity](#) – 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 [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

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](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the [Service Connect Portal](#), 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 [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Changes from Previous Offering

In alignment with the recently introduced Macquarie University Assessment Policy, which limits assessments to only three assessment types, we have revised the assessment structure for this unit. This change ensures compliance with the policy.

The new assessment structure will include the following three types of assessments:

1. **Written Assignment:** These will evaluate students' understanding and application of theoretical concepts.
2. **Practical Reports:** These will assess students' hands-on skills and ability to conduct and report on laboratory experiments.
3. **Examination:** These will test students' comprehensive knowledge and problem-solving abilities.

Unit information based on version 2025.04 of the [Handbook](#)