



CHEM1001

Foundations of Chemical and Biomolecular Sciences 1

Session 2, In person-scheduled-infrequent, North Ryde 2022

School of Natural Sciences

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General Information

Unit convenor and teaching staff

Convenor and Tutor

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By 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 the molecular sciences, from the smallest of chemical substances through to the molecules of life - the biomolecules. This unit does not assume prior knowledge of chemistry or biology and is ideal for any student that wants to understand the atomic and molecular world within and around them. It will commence with the language of chemistry by introducing atoms and molecules and elements and compounds and using representative inorganic and organic compounds, including biomolecules, to show how their structures, functions and reactions are described. It will build on this language to allow prediction of the reactivity, behaviour and function of different classes of compounds, with a focus on acids and bases and organic compounds including biomolecules. Contemporary applications will be highlighted to show the role of chemical and biomolecular sciences in our lives, now and in the future, including in helping to achieve a sustainable environment, understanding health and disease, and advancing new molecular technologies. Practical sessions and tutorials will reinforce learning throughout this unit.

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

Attendance at practical and tutorial classes:

- You must attend and participate in all four practical classes to pass CHEM1001/CHEX1001.
- You must attend and participate in the SGTA (tutorial) classes.
- Note: If you miss a practical class or tutorial class you are NOT automatically entitled to a make-up class. Such an opportunity may be offered, if possible, provided sufficient warning is provided. Note that for CHEM1001/CHEX1001 these opportunities are very limited.

Weekly Quizzes (20%) and SGTA/Tutorial Attendance (0% but Hurdle):

- SGTA/Tutorial Assessment is composed of two components - Weekly Quizzes (worth 20% of your aggregate unit mark), and SGTA Problem Sets + Attendance (worth 0% but are a HURDLE requirement)

- **Weekly Quiz (20%):** The Weekly Quizzes will contribute 20% to your overall mark. Your lowest quiz mark will **NOT** be used to calculate your average mark. The Weekly Quiz will be provided through Mastering Chemistry.
- **SGTA Problem Set and Attendance (HURDLE):** During the SGTAs (tutorials) you will be given a problem set of questions through Mastering Chemistry, which will be based on the lecture material and textbook. A score of 50% or more on each Problem Set is required to allow the Problem Set to be counted towards. Tutorial attendance will be recorded and, along with completion of the SGTA Problem Set, will count towards reaching the hurdle requirement. Attainment level of 80% over the SGTA Problem Sets and attendance together is necessary to meet the hurdle requirement.
- The Weekly Quiz and SGTA Problem Sets are due by 11:55 pm on the Sunday at the end of the week. There is a penalty for late submission. **No** concession for technical difficulties will be provided for up to three hours before the deadline. Do not leave it until the last meant to complete the quiz.

Practical class exercises (20%):

- You must complete four practicals, each worth 5%. The practicals are composed of prelaboratory (prelab) exercises (10%), performance in the laboratory and practical (prac) report (80%), and after laboratory (postlab) exercises (10%).
- **Prelab exercises:** Prelab exercises will be completed via an iLearn Quiz (not Mastering Chemistry). These are due by 11:55 pm on the Sunday prior to your practical class. Note that for CHEM1001/CHEX1001 S2 this is approximately a week BEFORE your weekend practical classes. Late submissions will not be accepted. There will be no concession for technical difficulties. Do not leave submission until the last moment.
- **Postlab exercises:** Postlab exercises will be completed via an iLearn Quiz (not Mastering Chemistry). These are due by 11:55 pm on the Sunday of the week following your laboratory classes, giving you between 10 to 14 days to complete. Late submissions will not be accepted. There will be no concession for late submission. There will be no concession for technical difficulties. Do not leave submission until the last moment.
- **Prac Report:** Your prac report will be submitted at the end of your practical class. Late submissions will not be accepted. Ensure that you hand in your report before leaving the laboratory.

In-Session Test (20%):

- The In-Session Test is a hurdle assessment, and you will need to achieve at least 40% in this assessment to meet the hurdle. In the event that you make a serious first attempt at the In-Session Test but fail to make the hurdle, you will be provided with second attempt. The University defines a serious attempt as a mark of 10% below the hurdle, which in this instance is a mark between 30-40%. You will NOT be given a second attempt to pass the In-Session Test if you get below 30% in your first attempt. The maximum mark achievable on a resit of a hurdle assessment is the threshold mark. In this case that is 40%.
- The Test will be provided as an iLearn quiz. The test will be available in a window of approximately three days (precise dates will be provided on iLearn). Once commenced the Test must be completed within the set time limit (see iLearn). The test will close at the end of this time limit, or at the conclusion of the overall window, whichever comes first. There are no late submissions. **No concession** for technical difficulties for be given for technical issues for 3 hours before the close of the window. It is in your interest to start the test well in advance of the close of the window.
- The mid-session test will be held in Week 7, as this will allow failing students to withdraw without academic penalty. Note that the last day to withdraw without fail is 19 August 2022.

Final Exam (40%):

- The final examination will be two (2) hours in length, 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 assignments) and is designed to address specific understanding of all the concepts presented within the course.

Information on 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 resit 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.

Your marks will be displayed on Gradebook in iLearn. 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 hurdle assessment task, please contact the Unit Convenor, in ADVANCE if possible, or immediately after if not, as there may be alternatives available to make-up a missed task. If there are circumstances that mean you miss a hurdle 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).

Assessment Tasks

Name	Weighting	Hurdle	Due
Weekly Quizzes	20%	No	Weekly starting Week 2
In-Session Test	20%	Yes	Week 7
Final Examination	40%	No	Examination Period
Practical Participation	0%	Yes	Practical Session
Tutorial Participation	0%	Yes	Weekly from Week 2
Practical Class Exercises	20%	No	20/21-Aug, 13/14/15/16-Sep, 15/16-Oct

Weekly Quizzes

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 12 hours

Due: **Weekly starting Week 2**

Weighting: **20%**

Weekly quizzes based on the tutorial question sets available at iLearn.

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.

In-Session Test

Assessment Type ¹: Quiz/Test

Indicative Time on Task ²: 10 hours

Due: **Week 7**

Weighting: **20%**

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

There will be an in-session test that will be designed to give you specific feedback on your understanding of the topics up to this stage of the unit.

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: **Examination Period**

Weighting: **40%**

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.

Practical Participation

Assessment Type ¹: Participatory task

Indicative Time on Task ²: 0 hours

Due: **Practical Session**

Weighting: **0%**

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

You must attend and participate in all practical classes. Rescheduling may be possible for missed classes.

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.

Tutorial Participation

Assessment Type ¹: Participatory task

Indicative Time on Task ²: 0 hours

Due: **Weekly from Week 2**

Weighting: **0%**

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

You must attend and participate in a weekly tutorial class.

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.

Practical Class Exercises

Assessment Type ¹: Lab report

Indicative Time on Task ²: 12 hours

Due: **20/21-Aug, 13/14/15/16-Sep, 15/16-Oct**

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.

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**.

Classes

See <https://timetables.mq.edu.au/2022> for class times and locations.

- **Lectures:** Lectures are in two formats. There are pre-recorded lecture videos on the iLearn page/Echo360 site that you are expected to have watched and taken notes on **PRIOR** to the weekly “live lectures”. At the “live lectures” we will go through examples and take questions from you.
- **SGTAs (Tutorials):** SGTAs will be held on-campus. During the SGTAs, you will work through problems (the SGTA Problem Set) with your classmates in a collaborative and interactive manner. You will be using an online system, so you must bring a device that can be used to give you access to the internet. A laptop is best. Mobiles phones can be used but you may experience some difficulty in manipulating some of the items in the questions.
- **Practicals:** 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,**

study 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 general behaviour and competence, as well as the quality of your results. You are to submit a report ("lab report") that summaries the outcomes of your investigation. There are post-laboratory exercises to be completed within a week of the lab session ("post-labs").

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, tutorials 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:

- Watch the pre-recorded lecture videos and attend all lectures.
- Actively engage in the SGTA classes and attempt the set 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 should be able to develop a strong understanding of the general and organic chemistry presented, and perform well in this unit and develop a deep understanding of the concepts covered. Students who fail to do this and try to cram just before the exam will not do well in this unit.

- **Lectures:** You are required to view and take notes on the lecture videos provided. In addition to the topic lectures, recordings of the "live lectures" from Session will be available. In these live lectures the lecturers spent time explaining key concepts and demonstrating how to perform important methods (calculations, interpretations, drawing representations, etc). **Based on observations of related units, we emphasise that watching the lectures videos 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.

- **SGTA (Tutorial) classes** are run to assist your understanding of the course material. Experience has demonstrated that there is a strong correlation between participation in all activities, including the tutorial classes, and success in the unit and. During tutorials, we will use an online question system. The problems assigned for that week's tutorial will be undertaken during the class. This will give you an opportunity to seek help on areas you are having difficulty with. A minimum standard must be achieved to be seen to have reached competency in the topic covered by the tutorial. If this is not achieved, further questions will be automatically assigned by **Mastering Chemistry**. The SGTA Problem Set questions do not contribute to the overall unit mark but participation in the SGTA is a HURDLE requirement. Participation will be assessed by attendance at the class and achieving competency in the topic.
- **Practical classes** are designed to develop basic laboratory skills, general safety practices, as well as critical and analytical thought. Pre-practical questions are designed to make sure 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. Post-lab exercises are designed to assess your understanding of the theory behind the experiments conducted.

Provided 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 bought you 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 by the MasteringChemistry license as you already have this.

Other Recommended Texts:

- **Highly 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/detail>

[Is/books/chemistry-2e](#)

- **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 are useful substitutes.

Unit Schedule

The following schedule is indicative only and may change.

CHEM1001 S2 2022 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 – concept, expression as K_c (use 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 and VSEPR

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 ask.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](#).

COVID Information and on-campus classes

On-campus teaching continues to be scheduled for Session 1, 2022. Masks are compulsory for all classes in indoor spaces and social distancing will be implemented wherever possible. Students will also be required to sanitise surfaces before and after use.

Students are requested to minimise the risk of spreading COVID to themselves and others in accordance with the university and NSW Health guidelines: <https://www.mq.edu.au/about/corona-virus-faqs> and <https://www.nsw.gov.au/covid-19/stay-safe>.

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 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 [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.