



# CHEM1001

## Foundations of Chemical and Biomolecular Sciences 1

Session 1, Special circumstance, North Ryde 2021

*Archive (Pre-2022) - Department of Molecular Sciences*

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#### Disclaimer

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#### Notice

As part of [Phase 3 of our return to campus plan](#), most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to [timetable viewer](#). To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

## General Information

Unit convenor and teaching staff

Convenor and Tutor

Ian Jamie

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4WW 236

Open Door

Lecturer and Tutor

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4WW 231

By Appointment

Lecturer and Tutor

Alison Rodger

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6WW 302

By Appointment (via Grace Cooper)

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.

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

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

**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 **ONLINE** practical classes to pass CHEM1001.
- You must attend and participate in at least 9 of the 12 weekly **ONLINE** tutorials to pass CHEM1001. Attendance and Participation will be assessed by engagement with Mastering Chemistry.
- **Note:** If you miss a practical class or tutorial class you are **NOT** entitled to a make-up class. Such an opportunity may be offered if possible, provided sufficient warning is provided.

#### **Tutorial Assessment (20%):**

- During tutorials you will be required to join Mastering Chemistry and complete a set number of questions, which will be based on the lecture material, text book and question sets available on iLearn. Your final tutorial quiz mark will be the average of 10 best individual quiz marks. In addition, you may be assigned further work to complete if the outcome of your tutorial assessment is not satisfactory. This will be done automatically via Mastering Chemistry using a method called Adaptive Learning.

#### **Practical class exercises (20%):**

- You must complete four practicals, each worth 5%. The practicals are composed of prelab exercises (40%), lab work itself (10%), the report (40%), and postlab exercises (10%) .

#### **In-Session Test (20%):**

- The In-Session Test is a hurdle assessment and you will need to get  $\geq 40\%$  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 an opportunity to sit a second test. The faculty define 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 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 academic penalty is 28 April 2021.**

#### **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 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, 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 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](http://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).**

Decisions to approve/not approve a special consideration request are made by the university (and NOT the unit convenor).

## Assessment Tasks

| Name   | Weighting | Hurdle | Due                |
|--|-----------|--------|--------------------|
| <a href="#">Tutorial and Practical Participation</a> | 0%        | Yes    | Weekly             |
| <a href="#">Mid Semester Test</a>                    | 20%       | Yes    | Week 7             |
| <a href="#">Practical Class Exercises</a>            | 20%       | No     | Check Timetable    |
| <a href="#">Final Examination</a>                    | 40%       | Yes    | Examination Period |
| <a href="#">Tutorial Quizzes</a>                     | 20%       | No     | Weekly             |

### Tutorial and Practical Participation

Assessment Type <sup>1</sup>: Participatory task

Indicative Time on Task <sup>2</sup>: 0 hours

Due: **Weekly**

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.

You must attend and participate in at least nine tutorial 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.

## Mid Semester Test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 7 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 a mid-session test in Week 7 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.
- Calculate the physical quantities that characterize chemical composition, including solids and solutions, as well as chemical reactions.

## Practical Class Exercises

Assessment Type <sup>1</sup>: Lab report

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **Check Timetable**

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 <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 14 hours

Due: **Examination Period**

Weighting: **40%**

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

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.

## Tutorial Quizzes

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 3 hours

Due: **Weekly**

Weighting: **20%**

Ten 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.

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<sup>1</sup> 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.

<sup>2</sup> 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, email will be sent to your student email account. Please check your messages frequently.

We cannot overstate the importance of **regularly checking your email and the CHEM1001 iLearn site**.

### Classes

See <https://timetables.mq.edu.au/2021> for class times and locations.

- **Lectures:** Lectures will be held via Zoom. Links can be found on the iLearn site. Lecture material will be pre-recorded and made available as videos PRIOR to the lecture time.

- **Tutorials:** Tutorials will be held on-campus, with some online classes for those students with a valid reason for not being able to attend in person. During tutorials, we will use Mastering Chemistry, the web-based learning system that accompanies the textbook (Chemistry: The Central Science). The problems assigned for that week's tutorial will be undertaken during the class. For that reason, you must bring a device that can be used to give you access to the Mastering Chemistry site.
- **Practicals:** The practical classes for CHEM1001 are run in 14SCO 320 and 14SCO 308 (note that these rooms are connected).

**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") and enclosed, study footwear (e.g. ugg boots are not acceptable).** For hygiene reasons the Department does not provide lab coats or footwear.

Safety glasses and disposable gloves are supplied.

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 summarises 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 tutorial 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 set of lecture videos allocated to that session (or week). At the Zoom meeting 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 related units, we emphasize that coming to lectures and/or keeping up to date with lecture 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.
- **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 Mastering Chemistry, the web-based learning system that accompanies the textbook (Chemistry: The Central Science). 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 grade 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, using a technique called Adaptive Learning.
- **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.

**Recommended Textbooks:**

- Chemistry: The Central Science, 3rd Edition, By Theodore L. Brown, H. Eugene LeMay, Bruce E. Bursten, Catherine Murphy, Patrick Woodward, Steven Langford, Dalius Sagatys, Adrian George (<https://www.pearson.com.au/9781442554603>)
- N.B. Mastering Chemistry is strongly aligned to this textbook. The Department has

bought you your license for Mastering Chemistry, but not the text book itself.

### 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/details/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 S1 2021 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](#)
- [Grade Appeal Policy](#)
- [Complaint Management 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](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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](https://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)

- [Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## 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](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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/](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.