



# CHEM1002

## Foundations of Chemical and Biomolecular Sciences 2

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

*School of Natural Sciences*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff

Robert Willows

[robert.willows@mq.edu.au](mailto:robert.willows@mq.edu.au)

Credit points

10

Prerequisites

CHEM1001 or CBMS107 or CBMS103 or HSC Chemistry Band 5 and above

Corequisites

Co-badged status

Unit description

Molecular sciences is the basis for the development of new medicines, new materials, new ways of monitoring and improving our environment, and many other fields. This unit will focus on the properties and reactivity of matter and is an ideal unit for any student that wants to understand the atomic and molecular world within and around them. It will introduce chemical and physical properties of solids, liquids and gases, metals and solutions. It will examine specific reactions including precipitation, acid base chemistry and oxidation/reduction processes and will explore the energetics and rates of chemical change. It will also describe methods of detection and analysis of matter. Specific biological, environmental and new materials related to real world examples will be provided, with topics such as global warming, energy production and renewable fuels. This unit will provide an understanding and appreciation of 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 workshops 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:** Explain the chemical and physical properties of solids, liquids and gases, metals and solutions.

**ULO2:** Predict reactions of matter including precipitation, acid base chemistry, oxidation/reduction processes, and the energetics and rates of chemical change.

**ULO3:** Utilise chemistry and biomolecular sciences concepts covered in this unit to process and interpret relevant chemical data.

**ULO4:** Undertake laboratory investigations requiring basic laboratory skills related to the reactions of matter and the energetics and rates of reaction, and their detection and analysis, and demonstrate an awareness of general laboratory safety procedures.

**ULO5:** Record and analyse scientific data, as well as judge its reliability and significance and interpret and communicate conclusions, including using the basic elements of scientific report preparation.

**ULO6:** Discuss the central role and impact of the chemical and biomolecular sciences concepts covered in this unit in our lives and its modern applications.

## General Assessment Information

### Requirements to Pass this Unit

To pass this unit you must:

- Achieve a total mark equal to or greater than 50%, **and**
- Participate in a minimum of 8 Workshops and 4 practical classes, **and**
- Achieve at least 40% in the final examination

### HURDLE ASSESSMENTS:

#### Practice based classes:

- Development of knowledge and skills requires continual practice at authentic problems. This unit has five laboratory classes and ten Workshops classes where you must demonstrate your progress in developing and communicating knowledge and skills. Participation in a minimum of 4 of the 5 practical classes and 8 of the 10 Workshops classes is thus a hurdle requirement for this unit. This is a hurdle assessment meaning that failure to meet this requirement may result in a **fail** grade for the unit. Students are permitted up to three absences, consisting of one practical absence and 2 Workshops absences: **additional absences will require a Special Consideration to be applied for** (see below).

#### Final exam:

- Satisfactory completion of this unit requires students to demonstrate they have acquired sufficient knowledge and can apply this knowledge to answer questions in the chemical sciences. The final exam assesses whether this has been achieved. Your final grade will

be based on the mark from the aggregation of the individual assessments (in-class and online quizzes, mid-semester test, practical), but you must exceed the **hurdle threshold mark of 40% or greater** in the final examination to be awarded an overall Pass grade or better. That is, **you must meet this hurdle to be able to pass overall. If you get between 30-40% you will get a second attempt at the exam but ONLY if you can pass the unit with a grade of 40% in the final exam. The SECOND attempt is to demonstrate that you have obtained a minimum level of understanding to pass the unit and your maximum grade in the SECOND attempt will be 40% of the final exam mark. It is university policy that you cannot improve your mark more than the hurdle boundary mark if you are given a SECOND attempt.**

## ONLINE QUIZZES:

Due: 10 Weekly online quizzes from **Weeks 2-12** (*Check iLearn as any weeks without a Workshops do not have a quiz*). Weighting: **15%**

There will be 10 on-line quizzes. You will find that these quizzes assist you in revising the course material as the course progresses. Further specific details on the quizzes will be provided at the CHEM1002 iLearn site.

## PRACTICALS:

Due: **To be submitted at the conclusion of every practical class.** Weighting: **20%**

The pre-practical exercises, performance in the practical, the practical report, and the post-practical exercises will be used to calculate the final practical mark. The assessment tasks start off simple and build on skills and knowledge developed throughout the course.

Pre-practicals exercises for practicals 1, 3, 4 and 5 must be handed in online on iLearn **prior** to your scheduled practical class. See iLearn for dates for online submission prior to the practical class. These "pre-labs" represent 20% of the practical mark for these 4 lab classes and will guide you in the data analysis for the practical class. Feedback will be given.

Attendance: **If you are unable to attend a practical class, exam, or hand in a form of assessment due to illness or misadventure, you must submit a Disruption to Studies notification at [ask.mq.edu.au](http://ask.mq.edu.au) no later than five (5) working days after the assessment task date or due date. You should also immediately contact the Unit Convenor, Professor Robert Willows ([robert.willows@mq.edu.au](mailto:robert.willows@mq.edu.au)).**

## MID SEMESTER TEST:

Due: **Wednesday 7th September during the lecture time.** Weighting: **15%**

Covering lectures up to and including week 6 content. This is designed to give you specific feedback on your understanding of the topics up to this stage to assist you in your further study of the unit. See iLearn for location and details.

## FINAL EXAMINATION:

Due: **University Examination Period** Weighting: **50%**

The final exam is designed to address specific understanding of all the topics presented within the course and to show that the knowledge obtained can be applied to new problems. Details of the final exam length will be made available as part of the publishing of the university exam timetable.

The final exam is a hurdle assessment and you will need to get  $\geq 40\%$  in the final exam to meet the hurdle. In the event that you make **a serious first attempt at the final exam**, you will be provided with an opportunity to sit a new final exam to meet the hurdle. 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 meet the exam hurdle of 40% if you get below 30% in your first attempt.**

**Final Examination Details:** The examination timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in final form approximately four weeks before the commencement of the examinations. You are expected to present yourself for examination at the time and place designated by the University in the Examination Timetable. This could be any day after the final week of semester and up until the final day of the official examination period. It is Macquarie University policy to **not set early examinations** for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period.

The only exception to sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you should apply for a Supplementary Exam at [ask.mq.edu.au](http://ask.mq.edu.au).

## 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                                   |
|-------------------------------------|-----------|--------|---------------------------------------|
| <a href="#">Mid Semester test</a>   | 15%       | No     | 19/04/24 11:00am                      |
| <a href="#">Practice Based task</a> | 0%        | Yes    | On campus sessions                    |
| <a href="#">Final Examination</a>   | 50%       | Yes    | Exam period (TBA)                     |
| <a href="#">Laboratory work</a>     | 20%       | No     | Due at end of each practical session. |

| Name                           | Weighting | Hurdle | Due                               |
|--------------------------------|-----------|--------|-----------------------------------|
| <a href="#">Online Quizzes</a> | 15%       | No     | Sunday following weekly workshop. |

## Mid Semester test

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

Indicative Time on Task <sup>2</sup>: 6 hours

Due: **19/04/24 11:00am**

Weighting: **15%**

### Mid Semester Test

On successful completion you will be able to:

- Explain the chemical and physical properties of solids, liquids and gases, metals and solutions.
- Predict reactions of matter including precipitation, acid base chemistry, oxidation/reduction processes, and the energetics and rates of chemical change.
- Utilise chemistry and biomolecular sciences concepts covered in this unit to process and interpret relevant chemical data.

## Practice Based task

Assessment Type <sup>1</sup>: Practice-based task

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

Due: **On campus sessions**

Weighting: **0%**

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

Demonstration of practical laboratory skills and knowledge of protocols, and the submission of practical tasks

On successful completion you will be able to:

- Explain the chemical and physical properties of solids, liquids and gases, metals and solutions.
- Predict reactions of matter including precipitation, acid base chemistry, oxidation/

reduction processes, and the energetics and rates of chemical change.

- Utilise chemistry and biomolecular sciences concepts covered in this unit to process and interpret relevant chemical data.
- Undertake laboratory investigations requiring basic laboratory skills related to the reactions of matter and the energetics and rates of reaction, and their detection and analysis, and demonstrate an awareness of general laboratory safety procedures.
- Record and analyse scientific data, as well as judge its reliability and significance and interpret and communicate conclusions, including using the basic elements of scientific report preparation.
- Discuss the central role and impact of the chemical and biomolecular sciences concepts covered in this unit in our lives and its modern applications.

## Final Examination

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 25 hours

Due: **Exam period (TBA)**

Weighting: **50%**

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

It is designed to address specific understanding of all the topics presented within the unit and to show that the knowledge obtained can be applied to new problems.

On successful completion you will be able to:

- Explain the chemical and physical properties of solids, liquids and gases, metals and solutions.
- Predict reactions of matter including precipitation, acid base chemistry, oxidation/reduction processes, and the energetics and rates of chemical change.
- Utilise chemistry and biomolecular sciences concepts covered in this unit to process and interpret relevant chemical data.
- Discuss the central role and impact of the chemical and biomolecular sciences concepts covered in this unit in our lives and its modern applications.

## Laboratory work

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

Indicative Time on Task <sup>2</sup>: 15 hours

Due: **Due at end of each practical session.**

Weighting: **20%**

The pre-practical exercises, performance in the practical, the practical report, and the post-practical exercises will be used to calculate the final practical mark. The assessment tasks start off simple and build on skills and knowledge developed throughout the course.

On successful completion you will be able to:

- Predict reactions of matter including precipitation, acid base chemistry, oxidation/reduction processes, and the energetics and rates of chemical change.
- Utilise chemistry and biomolecular sciences concepts covered in this unit to process and interpret relevant chemical data.
- Undertake laboratory investigations requiring basic laboratory skills related to the reactions of matter and the energetics and rates of reaction, and their detection and analysis, and demonstrate an awareness of general laboratory safety procedures.
- Record and analyse scientific data, as well as judge its reliability and significance and interpret and communicate conclusions, including using the basic elements of scientific report preparation.

## Online Quizzes

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

Indicative Time on Task <sup>2</sup>: 13 hours

Due: **Sunday following weekly workshop.**

Weighting: **15%**

There will be 10 on-line quizzes during semester. You will find that these quizzes assist you in revising the course material as the course progresses.

On successful completion you will be able to:

- Explain the chemical and physical properties of solids, liquids and gases, metals and solutions.
- Predict reactions of matter including precipitation, acid base chemistry, oxidation/reduction processes, and the energetics and rates of chemical change.
- Utilise chemistry and biomolecular sciences concepts covered in this unit to process and interpret relevant chemical data.



- Discuss the central role and impact of the chemical and biomolecular sciences concepts covered in this unit in our lives and its modern applications.

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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

### Methods of communication:

General communications about the unit during semester will be via the **Announcements page on iLearn**.

As this unit is an infrequent offering with weekly workshops as the only regular contact, the **Discussion forum on iLearn** should be used to ask *and answer* questions. This forum is a means to communicate both between students and the teaching staff about unit content or issues with iLearn or Mastering Chemistry.

Email may also be used but if the enquiries are of a general nature you will be directed to the Discussion forum so that all students can benefit. The unit convenor may email you individually from time to time.

### Required Textbook:

"Chemistry the Central Science- Global Edition" by Brown and Lemay

### Lectures (RECORDED ON ECHO360 SYSTEM)

Lecture recordings and supplementary shorter summaries will be available through iLEARN ECHO, and powerpoint slides via iLearn. Lectures will also include working through examples of problems, to strengthen and increase understanding of the concepts. Learning is an active process, and as such, you must engage with the material. This means downloading and reading the lecture notes and relevant sections of the textbook (and beyond) before and after attending the lectures is strongly recommended. Weekly on-line quizzes will also be provided so it is strongly recommended that you listen and work through lecture examples prior to completing these quizzes. The quizzes are timed. The quizzes and mid session test are designed to allow you to continuously learn and to identify what you understand and the areas that you need to spend more time on, with minimal assessment penalty.

### Workshops (Weekly PARTICIPATION IS COMPULSORY)

Workshops will be run to assist your understanding of the course material. Attempting the

questions before the Workshop class to identify what you need assistance on is highly recommended. You will often be asked to assist in answering questions throughout the class. Participation records will be kept and logged and a minimum of 8 sessions need to have satisfactory participation to meet the hurdle. Anonymous teaching evaluations from past students have identified these teaching activities as a valuable learning tool and participation is thus a hurdle requirement for passing the unit.

## Laboratory classes (On campus and are compulsory)

Practical classes are designed to develop basic laboratory skills, general safety practices and 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 safety practices necessary. The pre-practical questions MUST be submitted on-line through iLearn by the due date as in iLearn PRIOR to the scheduled practical class. In-lab and post-lab work are designed to allow you to appropriately record your experimental observations and your calculations in a detailed and accurate manner and assess your understanding of the theory behind the experiments conducted and to use this understanding to solve related problems. The practicals are scaffolded such that the expectations of pre-practical, in-practical and post-practical reports increase throughout the course as understanding of the concepts and skill in how to record the data and interpret results develops.

## 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-faqs>. 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

### Unit Schedule:

Week 1-8 of semester is Monday 19th February till Friday the 12th of April.

### Workshops begin Week 2

**Practical 1 is on Sunday the 17th of March at Midday in 14SCO Room 308.**

Midsemester Break is Monday 15th April to Friday the 26th April

**Practicals 2-5 are from Wednesday the 17th of April - Friday the 19th of April**

Weeks 9-13 are from Monday 29th April to Friday the 31st of May

| WEEK | Lecture 1 MONDAY  | Lecture 2           | Workshop    |
|------|-------------------|---------------------|-------------|
| 1    | L1. Intro lecture | L2- Matter & Change | NO WORKSHOP |

|    |   |   |  |
|----|---|---|--|
| 2  | L3- Modern Atomic Theory I                        | L4- Modern Atomic Theory II                       | 1- Basic Concepts                      |
| 3  | L5- Chemical Bonding and Intermolecular Forces -I | L6- Chemical Bonding and Intermolecular Forces II | 2- Conversion and Electronic Structure |
| 4  | L7- Transition Metal Complexes I                  | L8- Transition Metal Complexes II                 | 3- Electronic Structure and Bonding    |
| 5  | L9- Gas Laws & Kinetic Theory I                   | L10- Gas Laws & Kinetic Theory                    | 4- Transition metals                   |
| 6  | L11- Chemical Kinetics                            | L12- Chemical Kinetics II                         | 5- Gases                               |
| 7  | L12- Chemical Equilibria                          |   | -6- Kinetics                           |
| 8  | Acid- Base Equilibria I                           | Acid-Base Equilibria II                           | NO WORKSHOP                            |
| 9  | Midsemester exam analysis                         | Buffers & Solubility I                            | 7- Equilibria                          |
| 10 | Buffers & Solubility II                           | Oxidation & Reduction I                           | 8- Acids and Bases and Solubility      |
| 11 | Oxidation & Reduction II                          | Thermochemistry I                                 | 9- Oxidation reduction                 |
| 12 | Thermochemistry II                                | Spectroscopy                                      | 10- Thermodynamics and Spectroscopy    |
| 13 | Revision Lecture (past Questions)                 |   |  |

## Policies and Procedures

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

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Unit information based on version 2024.04 of the [Handbook](#)