



CHEM3601

Advanced Synthesis

Session 2, In person-scheduled-weekday, North Ryde 2026

School of Natural Sciences

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Disclaimer

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General Information

Unit convenor and teaching staff

Unit Convenor and Lecturer

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Credit points

10

Prerequisites

20cp in BMOL or CHEM units at 2000 level or above including CHEM2601

Corequisites

Co-badged status

Unit description

Synthetic chemistry involves the design and synthesis of complex molecules from simpler substances through precise chemical transformations. Synthetic chemistry is used to create new pharmaceuticals to treat diseases and improve health, to engineer advanced molecular sensors and diagnostic tools for detecting diseases and environmental pollutants and to develop next-generation energy solutions, including batteries, solar cells, and clean fuels. This unit examines advanced topics in modern synthetic organic and inorganic chemistry. Specific topics may include synthesis with selectivity, coordination chemistry, heterocyclic chemistry, rearrangement reactions, pericyclic reactions and advanced spectroscopic methods. The unit includes a series of laboratory sessions designed to develop practical skills in organic and inorganic synthesis, as well as in the spectroscopic identification of organic and inorganic compounds.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals ([UNSDGs](#)) Good Health and Well Being; 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: Apply knowledge of the fundamental molecular properties affecting chemical reactivity and selectivity to predict the products and propose the mechanisms of a range of organic and inorganic reactions.

ULO2: Use the primary scientific literature to plan efficient synthetic routes to complex organic and inorganic molecules starting from simple building blocks.

ULO3: Assess the risks and hazards associated with working in a synthetic laboratory environment and apply appropriate processes and controls to minimise these risks.

ULO4: Employ a set of advanced laboratory techniques to synthesise and purify selected organic and inorganic compounds safely and efficiently.

ULO5: Use modern spectroscopic techniques to elucidate the structures of organic and inorganic compounds.

ULO6: Communicate experimental observations clearly, concisely and accurately in the form of written scientific reports.

General Assessment Information

Requirements to Pass this Unit

To pass this unit you must:

- Achieve a total mark equal to or greater than 50%

Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded, even if the assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

Assessments where Late Submissions will be accepted

In this unit, late submissions will accepted as follows:

- Practical Competency Portfolio – YES, Standard Late Penalty applies

Special Consideration

The [Special Consideration Policy](#) aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through <https://connect.mq.edu.au/>.

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Principles of Advanced Synthesis	20%	No	24/08/2026	Individual	No	Observed
Practical Competency	40%	No	06/11/2026	Individual	No	Observed
Final Exam	40%	No	Exam Period	Individual	No	Observed

Principles of Advanced Synthesis

Assessment Type [1](#): Problem-based task

Indicative Time on Task [2](#): 10 hours

Due: **24/08/2026**

Weighting: **20%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

A selection of real-world problems designed to assess understanding of the lecture, practical and workshop materials.

On successful completion you will be able to:

- Apply knowledge of the fundamental molecular properties affecting chemical reactivity and selectivity to predict the products and propose the mechanisms of a range of organic and inorganic reactions.
- Use the primary scientific literature to plan efficient synthetic routes to complex organic and inorganic molecules starting from simple building blocks.
- Use modern spectroscopic techniques to elucidate the structures of organic and inorganic compounds.

Practical Competency

Assessment Type ¹: Portfolio

Indicative Time on Task ²: 30 hours

Due: **06/11/2026**

Weighting: **40%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

A collection of evidence demonstrating the development of practical skills in advanced synthetic chemistry. An industry-standard laboratory notebook will be maintained for the duration of the unit, recording details of experimental planning, risk assessments and safety precautions, laboratory procedures, observations, calculations, and interpretation of results. A comprehensive final laboratory report will be prepared to assess ability to communicate scientific information clearly, logically, and professionally.

On successful completion you will be able to:

- Apply knowledge of the fundamental molecular properties affecting chemical reactivity and selectivity to predict the products and propose the mechanisms of a range of organic and inorganic reactions.
- Use the primary scientific literature to plan efficient synthetic routes to complex organic and inorganic molecules starting from simple building blocks.
- Assess the risks and hazards associated with working in a synthetic laboratory

environment and apply appropriate processes and controls to minimise these risks.

- Employ a set of advanced laboratory techniques to synthesise and purify selected organic and inorganic compounds safely and efficiently.
- Use modern spectroscopic techniques to elucidate the structures of organic and inorganic compounds.
- Communicate experimental observations clearly, concisely and accurately in the form of written scientific reports.

Final Exam

Assessment Type ¹: Examination

Indicative Time on Task ²: 15 hours

Due: **Exam Period**

Weighting: **40%**

Groupwork/Individual: Individual

Short extension ³: No

AI Approach: Observed

You will undertake a final examination during the formal examination period.

On successful completion you will be able to:

- Apply knowledge of the fundamental molecular properties affecting chemical reactivity and selectivity to predict the products and propose the mechanisms of a range of organic and inorganic reactions.
- Use modern spectroscopic techniques to elucidate the structures of organic and inorganic compounds.

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
- [Academic Success](#) 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.

³ An automatic short extension is available for some assessments. Apply through the [Service Connect Portal](#).

Delivery and Resources

Overview

CHEM3601 Advanced Synthesis is a 10 credit point unit requiring 150 hours of work over the

semester (formal contact hours and self study time). This is an average of 10 hours of work per week over each of the 15 weeks of semester. Formal contact hours for CHEM3601 consist of 2 hours of lectures per week, along with 4 x 3-hour interactive workshops and 7 x 4-hour laboratory classes throughout semester. Students are strongly encouraged to participate in all lectures, workshops and laboratory classes. Active participation by students in all of these activities will be essential for success in the unit.

Lectures

NOTE: Lectures begin in Week 1

The unit will cover 2 hours of lecture material each week. You should use these lectures as a starting point and supplement their content with material from the text books, the scientific literature and from other reputable online sources. The unit content builds on material covered in previous weeks, so it will be essential to keep up to date with the lecture material throughout the semester.

Workshops

NOTE: Workshops begin in Week 5

Workshops consist of interactive problem solving sessions focused on authentic real-world problems in synthetic chemistry. The workshops are designed to develop independence in problem solving and provide students with an opportunity to ask questions and receive immediate feedback on their work.

Laboratory Classes

Note: Laboratory classes begin in Week 2, but risk assessments and pre-laboratory preparation is due in Week 1

You should use the allocated session in Week 1 to familiarise yourselves with the requirements of the practical component of the unit, to watch the essential lab technique videos provided on Echo360 and to complete all relevant prelab exercises, hazard identification and risk assessments for the first experiment. Before commencing each new experiment, you are required to complete the prelab component. This includes completing and uploading all risk assessments to iLearn and creating a flow chart in your laboratory notebook. Failure to do so will result in your exclusion from the practical, with consequences for the successful completion of the course. You must read each experiment carefully before attending the lab. Please refer to the Laboratory Manual provided on iLearn for full details of specific requirements for each laboratory class.

Communication

The web page for this unit can be found at ilearn.mq.edu.au.

Login with your MQ student ID number and password, then follow the prompts to "CHEM3601 Advanced Synthesis."

During semester, the CHEM3601 iLearn site will be used to communicate important information to you. It is your responsibility to regularly check the iLearn site for important announcements and updates.

We will communicate with you via your **university email address** or through the Announcements discussion board on iLearn. Queries to convenors can either be placed on the iLearn discussion board or emailed directly to the Unit Convenor from your **university email address**.

Office Hours

There are no formal office hours for this unit. The teaching staff are happy to receive students outside of the formal lecture, workshop and practical times, but please be aware that we are not always to be found in our offices. It is generally wise to organise an appointment in advance via email (using your university email address).

Recommended Text Books

- "Organic Chemistry", 10th Edition (2023) by John McMurry; Free from [OpenStax](#).
- "The Organometallic Chemistry of the Transition Metals", 6th Edition (2014) by Robert H. Crabtree. QD411.8.T73 C73

Recommended Oxford Chemistry Primers

- "Introduction to Organic Spectroscopy", (1996) by Laurence M. Harwood and Timothy D. W. Claridge; Oxford Chemistry Primer QD272.S6.H37
- "Aromatic Heterocyclic Chemistry", (1992) by David T. Davies; Oxford Chemistry Primer QD411.8.T73 C73
- "Pericyclic Reactions", (1999) by Ian Fleming; Oxford Chemistry Primer QD281.R5 F58
- "Polar Rearrangements", (1992) by Laurence M. Harwood; Oxford Chemistry Primer QD281.R35.H37
- "Organometallics 1: Complexes with Transition Metal-Carbon σ -bonds" (1994) by Manfred Bochmann; Oxford Chemistry Primer. QD411.8.T73 B63
- "Organometallics 2: Complexes with Transition Metal-Carbon π bonds: (1994) by Manfred Bochmann; Oxford Chemistry Primer. QD411.8.T73 B63
- "Applied Organometallic Chemistry and Catalysis" (2001) by Robin Whyman; Oxford Chemistry Primer. QD411.W48

You can also find a number of textbooks with "Organic Chemistry" and "Inorganic Chemistry" in the title in the University library. All cover similar material, but often use different notation. You may find that some of these other books explain certain topics more clearly. There also many web resources, but material placed on the web is not necessarily checked for accuracy, so use with caution.

Unit Schedule

Please check the iLearn site for this unit for the most up-to-date Unit Schedule

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/>

Academic Success

[Academic Success](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Ask a Study Coach](#)
- [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 <https://students.mq.edu.au/support/technology/service-desk>.

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

There have been no changes from the previous offering.

Unit information based on version 2026.02 of the [Handbook](#)

