CHEM3601

Advanced Synthesis

Session 2, Weekday attendance, North Ryde 2020

Department of Molecular Sciences

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Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and ot her small group learning activities on campus for the second half-year, while keeping an online ver sion available for those students unable to return or those who choose to continue their studies onli ne.

To check the availability of face-to-face and onlin e activities for your unit, please go to timetable vi ewer. To check detailed information on unit asses sments visit your unit's iLearn space or consult yo ur unit convenor.

General Information

Unit convenor and teaching staff
Convenor, Lecturer
Andrew Piggott
andrew.piggott@mq.edu.au
Contact via 98508251
4WW 334
By appointment (please email)

Lecturer
Peter Karuso
peter.karuso@mq.edu.au
Contact via 98508290
4WW 232
By appointment (please email)

Lecturer
Koushik Venkatesan
koushik.venkatesan@mq.edu.au
Contact via 98508296
4WW 123
By appointment (please email)

Credit points
10

Prerequisites
20cp in CBMS or BMOL or CHEM units at 2000 level or above including (CHEM2601 or CBMS203 or CBMS204)

Corequisites

Co-badged status
CHEM6631

Unit description
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. These topics build upon the foundation of "CHEM2601 Synthesis", using the same text books supplemented with inexpensive Oxford Chemistry Primers on the specified topics. This unit requires strong skills in organic and inorganic chemistry, while a background in other aspects of chemistry will be advantageous. The laboratory sessions are aimed at developing skills in organic and inorganic synthesis and in the spectroscopic identification of organic and inorganic compounds.

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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Mid-Semester Test	10%	No	Week 8
Workshop Performance	15%	No	Weeks 5,6,7,8,13

Name	Weighting	Hurdle	Due
Final Examination	50%	No	University examination period
Practical Classes	25%	No	Reports due before 5 pm Fri on Weeks 4,5,6,12,13

Mid-Semester Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 6 hours
Due: **Week 8**
Weighting: **10%**

A one-hour test covering all material presented in the first half of the unit. The test will consist of a combination of short-answer and mechanism-based questions.

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.

Workshop Performance

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 10 hours
Due: **Weeks 5,6,7,8,13**
Weighting: **15%**

Five workshops consisting of interactive problem solving sessions focused on exam-style questions. 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. Students are graded based on their level of preparedness and participation in each workshop.

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.

Final Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 18 hours
Due: **University examination period**
Weighting: **50%**

A three-hour examination covering course material from Weeks 1-13. The examination will assess understanding of all the topics presented within the course and the ability to apply the knowledge gained to solve new problems. The examination will consist of a combination of short-answer and mechanism-based questions.

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.

Practical Classes

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 20 hours
Due: **Reports due before 5 pm Fri on Weeks 4,5,6,12,13**
Weighting: **25%**

Five discrete laboratory-based experiments spanning the whole semester. The lab sessions provide advanced practical training in a range of modern synthetic chemistry techniques and allow students to apply the knowledge gained in lectures to solve synthetic challenges safely and efficiently. Students must maintain a laboratory notebook for the duration of the unit, conduct comprehensive risk assessments and produce a concise lab report for each experiment

performed.

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.

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[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 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

Office Hours

There are no formal office hours for this unit. The teaching staff are happy to receive students outside of the formal lecture 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, generally via email (using your university email address).

Recommended Text Books

"Organic Chemistry", 9th Edition (2016) by John McMurry; Cengage Learning (this is the same book as for CHEM2601).

"The Organometallic Chemistry of the Transition Metals", 6th Edition (2014) by Robert H. Crabtree. QD411.8.T73 C73

"Polar Rearrangements", (1992) by Laurence M. Harwood; Oxford Chemistry Primer QD281.R35.H37/1992

"Introduction to Organic Spectroscopy", (1996) by Laurence M. Harwood and Timothy D. W. Claridge; Oxford Chemistry Primer QD272.S6.H37

"Organometallics 2: Complexes with Transition Metal-Carbon π bonds: (1994) by Manfred Bochmann; Oxford Chemistry Primer. QD411.8.T73 B63 1994 V.2

Suggested Reading for Organometallic Chemistry

"Applied Organometallic Chemistry and Catalysis" (2001) by Robin Whyman; Oxford Chemistry Primer. QD411.W48 2001

"Organometallics 1: Complexes with Transition Metal-Carbon α-bonds" (1994) by Manfred Bochmann; Oxford Chemistry Primer. QD411.8.T73 B63 1994 V.1

Suggested Reading for Spectroscopic Identification of Organic Compounds

“Structural identification of organic compounds with spectroscopic techniques” (2005) Yong-Cheng Ning QD272.S6 N56

“Introduction to spectroscopy: A guide for students of organic chemistry” 2001 Donald L. Pavia, Gary M. Lampman, George S. Kriz QD272.S6.P38 2001

“Practical spectroscopy: The rapid interpretation of spectral data: For McMurry's Organic Chemistry, fifth edition” 2000 Paul R. Young QD95.Y68

Summaries of lecture material, lecture guides or directions to web-based material may also be provided.

You can 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 be careful when using it.

Technology Used and Required

You must regularly check the unit web page for course related information. The web page for this unit can be found at: http://ilearn.mq.edu.au

Teaching and Learning Strategy

Lectures will be presented as a combination of formal lectures (or recordings of lectures) and interactive tutorial sessions. Most of the lecture material will be available on the unit website, while there will be some provided in the lecture class. Historically, non-attendance at lectures

has a much more deleterious effect that is ultimately reflected in exam performance. It is your responsibility to manage your own study/work/life balance. Circumstances such as routine demands of employment/financial need or extra-curricular activities, routine family problems, and difficulties adjusting to university life and stress associated with the demands of academic work, are not unforeseeable circumstances beyond your control and should not be used as an excuse to miss a lecture.

Classes Timetable: Please check http://www.timetables.mq.edu.au for the official timetable of the unit.

Laboratory sessions commence in Week 2. You should use the allocated session in Week 1 to familiarise yourselves with the requirements of the practical component of the unit 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 in your laboratory notebook. This includes completing ALL risk assessments, flowcharts and answering any associated prelab questions. 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.

Due Date for Practical Reports: Electronic (typed) practical reports must be submitted through iLearn by the posted due date. Penalties for late submission will accumulate at the rate of 10% per day overdue unless special consideration has been approved through AskMQ.

Unit Schedule

Weeks 1-4: Polar Rearrangements (Prof. Peter Karuso)

Weeks 5-8: Advanced Spectroscopic Identification of Organic Compounds (Dr. Andrew Piggott)

Weeks 9-12: Inorganic Chemistry (A/Prof. Koushik Venkatesan)

Week 13: Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4*

December 2017 and replaces the Disruption to Studies Policy.)

Students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/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

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) 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

If you are a Global MBA student contact 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/.

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.