CBMS620

Analysis and Measurement

S2 Day 2019

Dept of Molecular Sciences

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General Information

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Credit points
4

Prerequisites
Admission to MLabQAMgt or MRadiopharmSc or MSc or MBiotech or MBioBus or MScInnovation

Corequisites

Co-badged status
CBMS200

Unit description
Analysis and measurement of the molecular composition and structure of matter is widely conducted in research and industry. Understanding the principles of molecular analysis and measurement is an essential part of any scientist's education. Molecular analysis involves separating molecules, measuring the molecular reaction rate (kinetics), determining identity, concentration and properties of analytes. This unit introduces the basic principles and approaches to undertake measurements of samples from across the chemical, biomolecular, microbiology and medical disciplines. Student will develop knowledge through lectures, tutorials, workshops and practicals, and become gain hands-on experience with instrumentation used to make measurement and conduct analyses. The unit is a core component for students majoring in chemical and biomolecular sciences.

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:

Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.

Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.

Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.

Develop intermediary chemistry laboratory skills and understand and implement laboratory safety procedures.

Interpret and draw sound conclusions from analytical chemical data.

Communicate effectively within the conventions of the molecular sciences discipline.

General Assessment Information

Please refer to the Macquarie University Assessment policy regarding submission of assignments, plagiarism, extensions, late submission etc.

Attendance at laboratory practicals and workshops: Please note that attendance at all 5 lab practicals and 6 workshops is **compulsory.** The laboratory component of CBMS620 is a **hurdle** requirement. There will be 10% (of the practical work) per day penalty for late submission of the report. Late submission will not be accepted after 7 days due and a mark of zero will be received. If you are unable to attend class, or hand in a form of assessment due to illness or misadventure, you must submit a Special Consideration Request at 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, Dr Yuling Wang (yuling.wang@mq.edu.au).

Assessment Tasks

Name	Weighting	Hurdle	Due
Laboratory Work	25%	Yes	Two weeks after each lab
Workshops	10%	No	One week after each workshop
Mid-semester Test	10%	No	Week 7
Online Quizzes	10%	No	Week 9, 12
Final 3 hour examination	45%	No	University Examination Period

Laboratory Work

Due: **Two weeks after each lab**
Weighting: **25%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

There will be 5 lab practicals with each lab assessment contributes 5%.

Pre-lab exercise: Before each practical, you will complete the pre-lab questions and prepare your lab notebook by writing the title and summary of the experimental methods, which are designed to ensure you are familiar with the topics and activities in each practical session.

This will contribute to 5% of your overall course mark.

Performance in the practical: In each practical, you conduct the experiment as directed by the student lab-notes and by your demonstrators. You will record the data and write up your observations in a lab notebook. This notebook should be available for inspection at any time, and needs to be signed-off by your demonstrator before you leave the laboratory.

This will contribute to 5% of your overall course mark.

Laboratory report: As part of each practical, you will complete a report on the experiment. Doing this will strengthen your understanding of the principles of the technique and enhance your data analysis and the scientific writing skills. A full laboratory report is required for 4 lab practicals and is due by two weeks after each lab.

This will contribute to 15% of your overall course mark.

The laboratory component of CBMS620 is a “hurdle” requirement. That is, you must

complete the laboratory component to a satisfactory level to be able to pass the unit overall, which means that the aggregate mark for your practical component must be 50% or greater of the lab practicals (25%), to allow a pass mark to be awarded for the unit.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
- Develop intermediary chemistry laboratory skills and understand and implement laboratory safety procedures.
- Interpret and draw sound conclusions from analytical chemical data.
- Communicate effectively within the conventions of the molecular sciences discipline.

Workshops

Due: **One week after each workshop**
Weighting: **10%**

There will be 6 workshops but only 4 workshops will be assessed. Each workshop assessment contributes 2.5% of your overall course mark.

Pre-workshop exercise: Before the workshop, the pre-workshop questions are designed to ensure you are familiar with the workshop topics and the activities, and to ensure the workshop can run smoothly.

In-class tasks: In each workshop class, you are asked to complete 3 tasks.

Post-class bonus questions (optional): After the workshop class, there will be bonus questions designed to enhance your understanding of the principles and applications of the technique.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
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- Interpret and draw sound conclusions from analytical chemical data.

- Communicate effectively within the conventions of the molecular sciences discipline.

Mid-semester Test

Due: **Week 7**
Weighting: **10%**

Mid Semester Test will be run in the Workshop and the topics within this test cover the basic data evaluation and the kinetics.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
- Interpret and draw sound conclusions from analytical chemical data.

Online Quizzes

Due: **Week 9, 12**
Weighting: **10%**

There will be Two online quizzes (multiple choice questions) to help you understand the concepts presented in the lectures.

- Quiz 1: Separation (Week 9)
- Quiz 2: Spectroscopy and Imaging (Week 12)

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Interpret and draw sound conclusions from analytical chemical data.

Final 3 hour examination

Due: **University Examination Period**
Weighting: **45%**

The final examination will be 3 hours in length with 10 minutes reading time. 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.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
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- Interpret and draw sound conclusions from analytical chemical data.
- Communicate effectively within the conventions of the molecular sciences discipline.

Delivery and Resources

Classes

Lectures

Lectures will be presented formally. Some lecture material will be available on the unit website beforehand (in iLearn: http://ilearn.mq.edu.au), while other material will be provided in the lecture class. You are strongly encouraged to review the lecture material and bring it into the lecture class, so you can spend most of time engaging with the lecture and ask questions in the class if you have them. There are two one-hour lectures per week for 13 weeks. Two Revision lectures will be provided in the last week of the semester.

Laboratory Classes

Practical classes are designed for you to develop basic laboratory, safety and critical and analytical analysis skills. There will be 5 three-hour lab practicals run fortnightly. Laboratory notes will be available on iLearn for download, you must bring a copy with you to your laboratory class and are expected to have read through all of the planned activities. Please also bring a lab coat and laboratory notebook to your lab session.

Please note that practical classes are a **hurdle** component for this unit with medical certificates being required should a student be absent due to illness. These should be submitted online together with a Special Consideration Request, which can be found at: https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration.

Workshop Classes

Workshop classes are designed to introduce students to a range of problem-solving skills and mainly consist of material related to lab practical, lecture topics, using a series of activities,

problems or questions during the workshop. There will be 6 two-hour workshops run fortnightly. Workshop notes will be available on iLearn for download, you must bring a copy with you to your workshop class and are expected to have read through all of the planned activities.Please also bring your own laptop for the workshop activities. We will provide the laptop in case you don't have one.

Optional Weekly Online Questions

- There are no formal tutorial classes in this unit, but optional weekly online questions with answer sheet will be provided in iLearn site of this unit.

Required and Recommended Texts and/or Materials

Prescribed text:

- D.C. Harris, Quantitative Chemical Analysis, 9th Edition, Macmillan Publishing (2015) (Chapters 0-5, 18-26).

Recommended Textbook and/or Materials

- Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, Fundamentals of Analytical Chemistry, 9th Edition, Brooks/Cole, Thomson Learning, Inc (2014) (Chapters 1-8; 24-34).
- Top Hat General Chemistry AUS Edition: Franklin Ow et al. (Part IV: Chemical Reaction Dynamics).
- D. S. Hage, J. D. Carr, Analytical Chemistry and Quantitative Analysis, 1st Edition, Pearson (2011). (Chapter 23).
- D. Sheehan, Physical Biochemistry: Principles and Applications, 2nd Edition, John Wiley & Sons Ltd (2009) (Chapters 2, 5).

Technology Used and Required

iLearn: You are expected to access the unit website on a frequent basis and download PDF files provided. You are strongly encouraged to make use the discussion forum available on the unit website for general discussion of the materials presented in this unit.

General use computers are provided by the University, but it would be advantageous to have your own computer and internet access. Microsoft Office is available free-of-charge to Macquarie University students. See https://wiki.mq.edu.au/display/microsoftstu/About

It is important that you have a scientific calculator as hand-held calculators will be used in practicals, workshops, for assignments, tests and in the final examination. Note that text-retrieval calculators are not allowed in the final examination.

Use will be made of Excel and other data processing and display software. Computers carrying this software are available in the teaching laboratories. Items of interest and links to other on-line material will be placed on the unit iLearn website.

Unit Schedule

Lectures begin on the 30 July 2019 and will be held on:

Day	Time	Location
Tuesday	8-9 am	23 Wally's Walk-T1 Theatre
Thursday	11-12 pm	23 Wally's Walk - T2 Theatre

Laboratory practicals start the second week of the semester and will be held on:

Session	Weeks	Day	Time	Location
1	2, 4, 6, 8,10	Friday	9-12 pm	14SCO (E7B)-347 Teaching Lab
2	2, 4, 6, 8,10	Friday	2-5 pm	14SCO (E7B)-347 Teaching Lab

Students will need to register for one session only.

Workshop classes start the third week of the semester and will be held on:

Session	Weeks	Date	Time	Location
1	3, 5, 7, 9, 11, 13	Friday	9-11 am	7 Wallys Wlk - 149 Briefing Room
2	3, 5, 7, 9,11, 13	Friday	2-4 pm	7 Wallys Wlk - 149 Briefing Room

Students will need to register for one session only.

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.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (htt

ps://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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
- Interpret and draw sound conclusions from analytical chemical data.
- Communicate effectively within the conventions of the molecular sciences discipline.

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Communicate effectively within the conventions of the molecular sciences discipline.

Assessment tasks

- Laboratory Work
- Workshops
- Final 3 hour examination

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
- Develop intermediary chemistry laboratory skills and understand and implement laboratory safety procedures.
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- Communicate effectively within the conventions of the molecular sciences discipline.

Assessment tasks

- Laboratory Work
- Workshops
- Mid-semester Test
- Online Quizzes
- Final 3 hour examination

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
- Develop intermediary chemistry laboratory skills and understand and implement

laboratory safety procedures.
- Interpret and draw sound conclusions from analytical chemical data.
- Communicate effectively within the conventions of the molecular sciences discipline.

Assessment tasks

- Laboratory Work
- Workshops
- Mid-semester Test
- Online Quizzes
- Final 3 hour examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Explain the principles of a range of techniques used for the analysis and measurement employed in the molecular sciences.
- Apply quantitative analysis methods and statistical techniques for the collection and analysis of data relevant to the molecular sciences.
- Develop intermediary chemistry laboratory skills and understand and implement laboratory safety procedures.
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Assessment tasks

- Laboratory Work
- Workshops
- Mid-semester Test
- Online Quizzes
- Final 3 hour examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
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Assessment tasks

- Laboratory Work
- Workshops
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- Online Quizzes
- Final 3 hour examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Develop intermediary chemistry laboratory skills and understand and implement laboratory safety procedures.

- Interpret and draw sound conclusions from analytical chemical data.

Assessment tasks

- Laboratory Work
- Workshops