



CHEM3202

Advanced Analysis and Measurement

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Natural Sciences

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General Information

Unit convenor and teaching staff

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Credit points

10

Prerequisites

CHEM2201

Corequisites

Co-badged status

CHEM6231

Unit description

This unit covers advanced aspects of chemical analysis, building on the foundations laid in Analysis and Measurement. Modern chemical principles and practice of identifying substances and of determining their composition are discussed. Topics include many analytical techniques commonly employed in both industrial and academic research laboratories. The unit emphasises hands-on experience in analysing real life samples, using a wide range of techniques from a chemical, structural and physical perspective.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals ([UNSDGs](#)) Industry, Innovation and Infrastructure; Responsible Consumption and Production

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

ULO2: Demonstrate competency in the selection and use of important analytical techniques commonly used in industrial and academic research.

ULO3: Communicate effectively within the conventions of the analytical molecular

sciences discipline.

ULO4: Process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples.

ULO5: Communicate analytical chemical knowledge by appropriately documenting the essential details of procedures undertaken, key observations, results and conclusions.

General Assessment Information

To pass this unit you must:

- Achieve a total mark equal to or greater than 50% from the Laboratory, Problem Sets and Examination Assesmenets
- Laboratory, Problem Sets are all handed in electronically via the I-Learn page
- Late submissions will only be allowed after approval of a Special Consideration with appropriate justification

Assessment Tasks

Name	Weighting	Hurdle	Due
Final Examination	50%	No	Exam Period
Assignment 1	10%	No	Week 8
Assignment 2	10%	No	Week 13
Laboratory	30%	No	Fortnightly

Final Examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 35 hours

Due: **Exam Period**

Weighting: **50%**

Closed book examination.

On successful completion you will be able to:

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

- Communicate effectively within the conventions of the analytical molecular sciences discipline.
- Process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples.
- Communicate analytical chemical knowledge by appropriately documenting the essential details of procedures undertaken, key observations, results and conclusions.

Assignment 1

Assessment Type ¹: Problem set

Indicative Time on Task ²: 15 hours

Due: **Week 8**

Weighting: **10%**

Qualitative and quantitative questions requiring processing and critically analysis.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Communicate effectively within the conventions of the analytical molecular sciences discipline.
- Process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples.

Assignment 2

Assessment Type ¹: Problem set

Indicative Time on Task ²: 15 hours

Due: **Week 13**

Weighting: **10%**

Qualitative and quantitative questions requiring processing and critically analysis.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement

in the molecular sciences.

- Communicate effectively within the conventions of the analytical molecular sciences discipline.
- Process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples.
- Communicate analytical chemical knowledge by appropriately documenting the essential details of procedures undertaken, key observations, results and conclusions.

Laboratory

Assessment Type ¹: Lab report

Indicative Time on Task ²: 30 hours

Due: **Fortnightly**

Weighting: **30%**

For each experiment, students are required to complete some Pre-laboratory work including Materials Safety Data Sheets and the general understanding of aim and procedure of the experiment. Following the completion of a laboratory session, students will then complete a written report.

On successful completion you will be able to:

- Demonstrate an understanding of the concepts of molecular analysis and measurement in the molecular sciences.
- Demonstrate competency in the selection and use of important analytical techniques commonly used in industrial and academic research.
- Communicate effectively within the conventions of the analytical molecular sciences discipline.
- Process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples.
- Communicate analytical chemical knowledge by appropriately documenting the essential details of procedures undertaken, key observations, results and conclusions.

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

Lecture notes, laboratory notes, tutorial videos and assignments can all be downloaded from iLearn.

Prescribed text: D.C.Harris, Quantitative Chemical Analysis, 9th Edition, W.H.Freeman and Company (2016).

Recommended references (all available in University Library):

D.A.Skoog, D.M.West, F.J.Holler, S.R.Crouch, Fundamentals of Analytical Chemistry, 9th Edition, Brooks/Cole, Thomson Learning, Inc (2014).

D.S.Hage, J.D.Carr, Analytical Chemistry and Quantitative Analysis, International Edition, Prentice Hall (2011).

D.A.Skoog, F.J.Holler and S.R.Crouch, Principles of Instrumental Analysis, 6th Edition, Saunders College Publishing (2007).

D. Sheehan, Physical Biochemistry: Principles and Applications, 2nd Edition, John Wiley & Sons Ltd (2009)

Unit Schedule

Module	Week	Topics
Module 1: Calibration, Sampling, Regulation	Week 1	Introduction Revision on Core Concepts in Analytical Chemistry
	Week 2 Prac 1: UV-Vis (A)	Accuracy and Error Analysis: Sampling, Limits of Detection, Repeatability, Reproducibility, Selectivity, Sensitivity, Error Analysis and Propagation
	Week 3 Prac 1: UV-Vis (B)	Analytical Chemistry in Industry: Calibration, Metrology, Regulations, and Standards (ISO, GMP, GLP, QA, QC)
	Week 4 Prac 2: AS (A)	Chemometrics: Multivariate Calibration, Classification, Pattern Recognition, Clustering

Module 2: Spectroscopy	Week 5	Atomic Spectroscopy (Including ICP Analysis, Fluorescence Spectroscopy)
	Prac 2: AS (B)	
	Week 6	Advanced Spectroscopy: UV-Vis Applications, IR, NIR, Circular Dichroism
	Prac 3: Ion Selective Electrode (A)	
PROBLEM SET 1	Week 7	Mass Spectroscopy: Basics, MALDI, Fragmentation Patterns and Analysis
	Prac 3: Ion Selective Electrode (B)	
Module 3: Electrochemistry	Week 8	Electrochemistry I: Redox Reactions, Cells, Nernst Equation, Electrodes, Potentiometry
	Prac 4: DLS (A)	
	Week 9	Electrochemistry II: Electroanalytical Techniques, Electric Double Layer, Voltammetry, High-Performance Electrophoresis
	Prac 4: DLS (B)	
Module 4: Scattering	Week 10	Scattering I: Fundamentals, Light Scattering Applications, DLS, X-Ray Scattering
	Prac 4: XRD/SEM (A)	
PROBLEM SET 2	Week 11	Scattering II: XRD, Structural and Compositional Analysis, XPS, Neutron Scattering
	Prac 5: XRD/SEM (B)	
	Week 12	Analytical Microscopy: TEM, SEM, EDAX, EELS, Image Analysis
	Week 13	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](#)
- [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/>

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 the [Service Connect Portal](#), 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/.

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.

Unit information based on version 2025.03 of the [Handbook](#)