



CBMS308

Chemical Analysis II

S1 Day 2015

Dept of Chemistry & Biomolecular Sciences

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General Information

Unit convenor and teaching staff

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No formal consultation hours.

Christopher McRae

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Building F7B Room 328

No formal consultation hours.

Credit points

3

Prerequisites

CBMS208 and (CBMS204 or CBMS207)

Corequisites

Co-badged status

Unit description

This unit covers advanced aspects of chemical analysis, building on the foundations laid in CBMS208. 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. Examples of applications to environmental and biological samples include: analysis of heavy metals by atomic absorption spectroscopy; inductively coupled plasma atomic emission spectroscopy; advanced chromatographic separation and detection; electrochemical detection of biochemicals and environmental pollutants; analysis by mass spectrometry. The unit emphasises hands-on experience in analysing real life samples, using many of these techniques. Each student also devotes a proportion of the session to gain relevant work experience in off-campus laboratories in chemical industry and research organisations, such as CSIRO.

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:

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
- * To provide an opportunity for students to gain work experience in several off-campus laboratories.
- * To acquire experience in interacting with other members in teamwork.

Assessment Tasks

Name	Weighting	Due
<u>Assignment 1</u>	4%	27-03-2015
<u>Assignment 2</u>	3%	24-04-2015
<u>Assignment 3</u>	3%	29-05-2015
<u>Laboratory work</u>	40%	Every two weeks
<u>Final examination</u>	50%	June 2015

Assignment 1

Due: **27-03-2015**

Weighting: **4%**

Numerical calculations and short answers.

On successful completion you will be able to:

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To familiarise with chemical data processing and to draw scientifically sound

conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.

Assignment 2

Due: **24-04-2015**

Weighting: **3%**

Numerical calculations and short answers.

On successful completion you will be able to:

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.

Assignment 3

Due: **29-05-2015**

Weighting: **3%**

Numerical calculations and short answers.

On successful completion you will be able to:

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.

Laboratory work

Due: **Every two weeks**

Weighting: **40%**

For each experiment, students are required to complete some Pre-laboratory work including Materials Safety Data Sheets and an oral assessment of the general understanding of aim and procedure of the experiment. Following the completion of a laboratory session, students will then decide on either completing a written report or performing an oral assessment on the laboratory work. Students must complete a total of 3 written reports and 2 oral assessments.

On successful completion you will be able to:

- * To further appreciate the scope of analytical chemistry, following the foundations laid in

CBMS208.

- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
- * To provide an opportunity for students to gain work experience in several off-campus laboratories.
- * To acquire experience in interacting with other members in teamwork.

Final examination

Due: **June 2015**

Weighting: **50%**

A three-hour examination.

On successful completion you will be able to:

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.

Delivery and Resources

Technology used

It is important that you have a scientific calculator as hand-held calculators will be used during laboratory sessions, for assignments, 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, links to other on-line material will be placed on the unit website.

Prescribed text

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

Recommended references

D.C.Harris, *Quantitative Chemical Analysis*, 8th Edition, W.H.Freeman and Company (2010).

D.S.Hage, J.D.Carr, *Analytical Chemistry and Quantitative Analysis*, International Edition, Pearson Education Inc (2011).

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

Unit Schedule

Date	Time	Activity
February 23	9:00 – 10:30	Outline of Unit
		Calibration Methods
	11:00 – 1:00	Voltammetry
	2:00 – 4:00	Information Retrieval
	4:00 – 6:00	Scientific Report Writing
March 2	9:00 – 1:00	Laboratory Session
	2:00 – 3:30	Voltammetry
	4:00 – 5:30	Voltammetry
	Tutorial Set 1 on Voltammetry	
	Assignment 1 due at 6 pm, April 2, 2015	
March 9	9:00 – 1:00	Laboratory Session
	2:00 – 3:30	Voltammetry
	4:00 – 5:30	Voltammetry
March 16	9:00 – 1:00	Laboratory Session

	2:00 – 3:30	Atomic Absorption Spectroscopy
	4:00 – 5:30	Atomic Absorption Spectroscopy
	Tutorial Set 2 on Atomic Absorption Spectroscopy	
March 23	9:00 – 1:00	Laboratory Session
	2:00 – 3:30	Electrophoresis
	4:00 – 5:30	Electrophoresis
	Tutorial Set 3 on Electrophoresis	
March 30	9:00 – 1:00	Laboratory Session
	2:00 – 3:30	Mass Spectroscopy
	4:00 – 5:30	Mass Spectroscopy
	Assignment 2 due at 6 pm, April 24, 2015	
April 20	9:00 – 1:00	Laboratory Session
	2:00 – 3:30	Mass Spectroscopy
	4:00 – 5:30	Chromatography
	Tutorial Set 4 on Mass Spectroscopy	
April 27	9:00 – 1:00	Laboratory Session
	2:00 – 3:30	Chromatography
	4:00 – 5:30	Chromatography
	Tutorial Set 4 on Chromatography	

	Assignment 3 due at 6 pm, May 22, 2015	
June 1	9:00 – 10:30	Immunoassays
	11:00 – 12:30	Immunoassays
	Tutorial Set 5 on Immunoassays	
	1:30 – 5:30	Presentation of project work (CBMS825)

May 4, May 11, May 18 and May 25 - Off-campus Laboratory Visits

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student_conduct/

Results

Results shown in *iLearn*, 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](#).

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

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use 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 outcome

- * To improve further on students' scientific writing ability.

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 outcomes

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
- * To provide an opportunity for students to gain work experience in several off-campus laboratories.
- * To acquire experience in interacting with other members in teamwork.

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Laboratory work
- Final 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

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in

industrial and academic research.

- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
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- Assignment 3
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- Final 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

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
- * To provide an opportunity for students to gain work experience in several off-campus

laboratories.

Assessment tasks

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- Final 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

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
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- Final 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

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To provide an opportunity for students to gain work experience in several off-campus laboratories.

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Laboratory work
- Final 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

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.

- * To improve further on students' scientific writing ability.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
- * To provide an opportunity for students to gain work experience in several off-campus laboratories.
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Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Laboratory work
- Final examination

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
- * To provide an opportunity for students to gain work experience in several off-campus laboratories.
- * To acquire experience in interacting with other members in teamwork.

Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Laboratory work
- Final examination

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- * To further appreciate the scope of analytical chemistry, following the foundations laid in CBMS208.
- * To acquire hands-on experience in important analytical techniques commonly used in industrial and academic research.
- * To improve further on students' scientific writing ability.
- * To acquire new generic skills including oral presentation of scientific findings.
- * To familiarise with chemical data processing and to draw scientifically sound conclusions from experimental results, leading to an understanding of the significance and validity of analytical results involving real-life samples.
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Assessment tasks

- Assignment 1
- Assignment 2
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- Final examination