CBMS308

Chemical Analysis II

S1 Day 2018

Dept of Chemistry & Biomolecular Sciences

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General Information

Unit convenor and teaching staff
Danny Wong
danny.wong@mq.edu.au
Building F7B Room 235
No formal consultation hours.

Credit points
3

Prerequisites
(CBMS208 or CBMS200) and (CBMS204 or CBMS207 or CBMS203)

Corequisites

Co-badged status
CBMS825

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 describe the scope of analytical chemistry, following the foundations laid in CBMS208

* To display competency in the use of important analytical techniques commonly used in industrial and academic research
* To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
* To analyse and critique experimental data and present them in oral format
* To process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples
* To work effectively in off-campus laboratories
* To build teamwork with other members of the unit by working together in a laboratory envionment

General Assessment Information

In addition to hardcopies, all assignment and laboratory reports must be electronically submitted through turnitin. A record of all these items must also be kept on iLearn throughout the Session.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	4%	No	19-03-2018
Assignment 2	3%	No	9-04-2018
Assignment 3	3%	No	28-05-2018
Laboratory work	40%	No	Every two weeks
Final examination	50%	No	June 2018

Assignment 1

Due: **19-03-2018**
Weighting: **4%**

Numerical calculations and short answers.

On successful completion you will be able to:

- * To describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To 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

Due: **9-04-2018**
Weighting: **3%**

Numerical calculations and short answers.

On successful completion you will be able to:

- * To describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples

Assignment 3

Due: **28-05-2018**
Weighting: **3%**

Numerical calculations and short answers.

On successful completion you will be able to:

- * To describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To process and analyse chemical experimental data to draw scientifically sound conclusions, particularly 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 describe the scope of analytical chemistry, following the foundations laid in CBMS208

- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
- * To analyse and critique experimental data and present them in oral format
- * To process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-life samples
- * To work effectively in off-campus laboratories
- * To build teamwork with other members of the unit by working together in a laboratory envionment

Final examination

Due: **June 2018**
Weighting: **50%**

A three-hour examination.

On successful completion you will be able to:

- * To describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To process and analyse chemical experimental data to draw scientifically sound conclusions, particularly 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.C.Harris, *Quantitative Chemical Analysis*, 9th Edition, W.H.Freeman and Company (2016).

Recommended references

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, Pearson Education Inc (2011).

D.A.Skoog, F.J.Holler and S.R.Crouch, *Principles of Instrumental Analysis*, 7th Edition, Saunders College Publishing (2018).

Unit Schedule

Date	Time	Activity
February26	9:00 – 10:30	Outline of Unit
		Calibration Methods
	11:00 – 12:30	Voltammetry
	2:00 – 4:00	Information Retrieval
	4:00 – 6:00	Scientific Report Writing
March 5	9:00 – 10:30	Voltammetry
	11:00 – 12:30	Voltammetry
	1:30 – 5:30	Laboratory Session
March 12	9:00 – 10:30	Voltammetry
	11:00 – 12:30	Voltammetry
	1:30 – 5:30	Voltammetry

March 19	9:00 – 10:30	Atomic Spectroscopy
	11:00 – 12:30	Atomic Spectroscopy
	1:30 – 5:30	Laboratory Session
March 26	9:00 – 10:30	Atomic Spectroscopy
	11:00 – 12:30	Electrophoresis
	1:30 – 5:30	Laboratory Session
April 2	9:00 – 10:30	Electrophoresis
	11:00 – 12:30	Mass Spectroscopy
	1:30 – 5:30	Laboratory Session
April 9	9:00 – 10:30	Mass Spectroscopy
	11:00 – 12:30	Mass Spectroscopy
	1:30 – 5:30	Laboratory Session

April 30	9:00 – 10:30	Surface Analysis
	11:00 – 12:30	Surface Analysis
	1:30 – 5:30	Laboratory Session
June 4	9:00 – 10:30	Sensing Technologies
	11:00 – 12:30	Sensing Technologies
	1:30 – 5:30 Project Presentation	

April 25, May 16, May 23 and May 30 - Off-campus Laboratory Visits

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 (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 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://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 outcome

- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing

Assessment task

- Laboratory work

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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
- * To analyse and critique experimental data and present them in oral format
- * To process and analyse chemical experimental data to draw scientifically sound conclusions, particularly the significance and validity of analytical results involving real-

life samples
- * To work effectively in off-campus laboratories
- * To build teamwork with other members of the unit by working together in a laboratory envionment

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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
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- Assignment 2

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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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
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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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
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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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing

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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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
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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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
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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 describe the scope of analytical chemistry, following the foundations laid in CBMS208
- * To display competency in the use of important analytical techniques commonly used in industrial and academic research
- * To analyse and interpret experimental data and present them in a structured report utilising appropriate scientific referencing
- * To analyse and critique experimental data and present them in oral format
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- Assignment 2
- Assignment 3
- Laboratory work
- Final examination