



CBMS208

Chemical Analysis I

S2 Day 2014

Chemistry and Biomolecular Sciences

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General Information

Unit convenor and teaching staff

Unit Convenor

Christopher McRae

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F7B 328

Students are encouraged to arrange a meeting via email.

Lecturer

Danny Wong

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F7B 235

Credit points

3

Prerequisites

CBMS101(Cr) or CBMS102 or admission to GCertBiotech

Corequisites

Co-badged status

Unit description

The measurement of chemical composition is a necessary requirement for forensic science, local and international trade, manufacture and production, government regulatory agencies, biotechnology, and nearly every field of science. Thus, an understanding of the principles of chemical analysis is an essential part of any scientist's education. This unit is designed to serve the needs of students majoring in chemical, biomolecular, environmental, earth and medical sciences. The unit introduces the principles of chemical analysis that enable the separation, detection, identification and quantification of the chemical matter found in a variety of samples. Such samples may range from those associated with forensic science such as drugs in biological tissue to contaminants in river systems, soils and the general environment, to heavy metals in ores and alloys, to neurochemicals present in a single neuron. Topics include: statistical analysis of chemical data; sampling methods; all modes of chromatographic separation with applications to environmental and biotechnological issues; methods of flow analysis of environmental and biological samples; ion-selective electrodes; potentiometric titration; titrimetry and buffer solutions. Understanding of these techniques is reinforced with practical, hands-on experience using instrumentation in our well-equipped analytical teaching laboratory.

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:

- appreciate and understand the basic principles of some commonly used analytical techniques;
- perform basic analytical experiments with awareness of uncertainty in measurements;
- interpret and draw sound conclusions from analytical chemical data obtained;
- prepare written scientific documents at a satisfactory level;
- develop fundamental interpersonal skills during laboratory sessions.

Assessment Tasks

Name	Weighting	Due
<u>Final 3 hour examination</u>	50%	University Examination Period
<u>Assignments</u>	15%	TBA
<u>Laboratory work</u>	35%	2 Weeks after each Lab session

Final 3 hour examination

Due: **University Examination Period**

Weighting: **50%**

The final examination will be 3 hours in length and will cover all sections of the unit (lectures, tutorial problems, assignments and laboratory exercises).

On successful completion you will be able to:

- interpret and draw sound conclusions from analytical chemical data obtained;

Assignments

Due: **TBA**

Weighting: **15%**

The assignments are designed to help you learn the material during the semester, rather than trying to cram on the day before the examination. They are relatively low risk (a small component of the aggregate score) but they are very valuable for you as measures of your understanding of the topics.

On successful completion you will be able to:

- appreciate and understand the basic principles of some commonly used analytical techniques;
- interpret and draw sound conclusions from analytical chemical data obtained;

Laboratory work

Due: **2 Weeks after each Lab session**

Weighting: **35%**

The laboratory sessions will allow you to put the material that you have been exposed to in the lectures into practice. They will provide concrete expositions of theory. They also provide the opportunity for you to continue your development of bench, data collection and data analysis skills. Writing up the experiments and verbal presentation of the results obtained will give you skills in communicating in the chemistry context.

On successful completion you will be able to:

- appreciate and understand the basic principles of some commonly used analytical techniques;
- perform basic analytical experiments with awareness of uncertainty in measurements;
- interpret and draw sound conclusions from analytical chemical data obtained;

- prepare written scientific documents at a satisfactory level;
- develop fundamental interpersonal skills during laboratory sessions.

Delivery and Resources

Classes

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

Lectures: The material presented in the lectures is important and you should not assume that all examinable material is available in the textbook or in printed notes. On the otherhand, do not assume that all examinable material is to be found in the lecture notes.

Tutorial: There are three optional tutorial sessions organised in this unit.

Laboratory Work: Laboratory sessions commence in Week 2. You will undertake five experiments in the 2nd / 3rd Year Teaching Laboratories.

Required and Recommended Texts and/or Materials

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, 2004).

Recommended references (all available in University Library)

- D.C.Harris, Quantitative Chemical Analysis, 8th Edition, W.H.Freeman and Company (2010).
- D.C.Harris, Exploring Chemical Analysis, W.H.Freeman & Company (1997).
- H.H.Willard, L.L.Merritt, Jr., J.A.Dean, F.A.Settle, Jr., Instrumental Methods of Analysis, 7th Edition, Wadworth Publishing Company (1988).
- D.A.Skoog, F.J.Holler and T.A.Nieman, Principles of Instrumental Analysis, 5th Edition, Saunders College Publishing (1998).
- J.F.Rubinson and K.A.Rubinson, Contemporary Chemical Analysis, Prentice Hall (1998).

If you feel you need to strengthen your mathematical skills, you might like to refer to Maths for Chemistry – A Chemist's toolkit of calculations, P.Monk, Oxford University Press (2006).

A useful guidebook for studying science subjects is Essential Skills for Science and Technology, P.Zeegers, K.Deller-Evans, S.Egege, C.Klinger, Oxford University Press (2008).

Technology Used and Required

The web page for this unit can be found at: <http://ilearn.mq.edu.au>

Lecture notes will be available on the Web for downloading one week prior to the scheduled lecture. You are strongly encouraged to make use the discussion forum available on the CBMS208 website for general discussion of materials presented in this unit.

Teaching and Learning Strategy

Students are required to attend lectures and laboratory classes. Active participation by the students in all of these fora is expected. This means that you are expected to ask questions during lectures, and particularly in laboratory sessions. Learning is an active process, and as such, you must engage with the material. This means reading the textbook (and beyond) before and after lectures, attempt the assignment questions and other questions, discuss the concepts with your classmates and lecturers. Do not be afraid to ask questions – your classmates will probably want to ask the same thing.

Assignment questions are issued so that you will have the opportunity to use the information provided in the lectures and textbook and to test your degree of understanding of those topics.

Laboratory exercises are designed to provide a concrete example of the abstract topics covered in the course work, and to give you the opportunity to discover the principles and applications for yourself. Laboratory exercises also offer the opportunity to explore the uncertainty inherent in scientific investigations and the limitations of models and theories by allowing comparison with real systems.

Changes to unit since last offering

No changes have been made to the unit since the last offering

Unit Schedule

Note: This schedule is tentative and may be subject to change

Week	Week starting	Monday 4 pm	Tuesday 10 am	Thursday 12 noon	LABORATORY 9am – 1pm/ 2 – 6 pm E7B 349
1	August 4	Introduction, Statistics	Statistics	Statistics	Workshop (E7B 346 or F7B 322)
2	August 11	Statistics	Statistics	Statistics	Experiment 1 (E7B 349)
3	August 18	Statistics	Sampling methods	Sampling methods	Experiment 2 (E7B 349)
4	August 25	Titrimetry	Titrimetry	Titrimetry	–
5	September 1	Titrimetry	Titrimetry	Titrimetry	Experiment 3 (E7B 349)
6	September 8	Flow injection	Flow injection	Flow injection	Optional Tutorial

7	September 15	Flow injection	Flow injection	Electroanalytical chemistry	Experiment 4(i) / 4(ii) / 5
Mid-Semester Break (September 22 – October 3)					
8	October 6	Electroanalytical chemistry	Electroanalytical chemistry	Electroanalytical chemistry	Experiment 4(i) / 4(ii) / 5
9	October 13	Electroanalytical chemistry	Electroanalytical chemistry	Electroanalytical chemistry	Optional Tutorial
10	October 20	Chromatography	Chromatography	Chromatography	Experiment 4(i) / 4(ii) / 5
11	October 27	Chromatography	Chromatography	Chromatography	–
12	November 3	Chromatography	Chromatography	Chromatography	Experiment 4(i) / 4(ii) / 5
13	November 10	Chromatography	Chromatography	Optional Tutorial	Optional Tutorial

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/

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

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

- appreciate and understand the basic principles of some commonly used analytical techniques;

- perform basic analytical experiments with awareness of uncertainty in measurements;
- prepare written scientific documents at a satisfactory level;

Assessment tasks

- Final 3 hour examination
- Assignments
- Laboratory work

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

- perform basic analytical experiments with awareness of uncertainty in measurements;
- interpret and draw sound conclusions from analytical chemical data obtained;
- prepare written scientific documents at a satisfactory level;

Assessment tasks

- Final 3 hour examination
- Assignments
- Laboratory work

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

- interpret and draw sound conclusions from analytical chemical data obtained;
- prepare written scientific documents at a satisfactory level;

Assessment tasks

- Assignments

- Laboratory work

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

- prepare written scientific documents at a satisfactory level;
- develop fundamental interpersonal skills during laboratory sessions.

Assessment task

- Laboratory work

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 outcome

- develop fundamental interpersonal skills during laboratory sessions.