CBMS208
Chemical Analysis I
S2 Day 2013

Chemistry and Biomolecular Sciences

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**General Information**

<table>
<thead>
<tr>
<th>Unit convenor and teaching staff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit Convenor</strong></td>
</tr>
<tr>
<td>Christopher McRae</td>
</tr>
<tr>
<td><a href="mailto:christopher.mcrae@mq.edu.au">christopher.mcrae@mq.edu.au</a></td>
</tr>
<tr>
<td>Contact via <a href="mailto:christopher.mcrae@mq.edu.au">christopher.mcrae@mq.edu.au</a></td>
</tr>
<tr>
<td>F7B 328</td>
</tr>
<tr>
<td>Students are encouraged to arrange a meeting via email.</td>
</tr>
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<table>
<thead>
<tr>
<th>Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danny Wong</td>
</tr>
<tr>
<td><a href="mailto:danny.wong@mq.edu.au">danny.wong@mq.edu.au</a></td>
</tr>
<tr>
<td>Contact via <a href="mailto:danny.wong@mq.edu.au">danny.wong@mq.edu.au</a></td>
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<table>
<thead>
<tr>
<th>Credit points</th>
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<table>
<thead>
<tr>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>CBMS101(Cr) or CBMS102 or admission to GCertBiotech</td>
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<table>
<thead>
<tr>
<th>Corequisites</th>
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<tr>
<th>Co-badged status</th>
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</table>
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://students.mq.edu.au/important-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

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final 3 hour examination</td>
<td>50%</td>
<td>University Examination Period</td>
</tr>
<tr>
<td>Assignments</td>
<td>15%</td>
<td>TBA</td>
</tr>
<tr>
<td>Laboratory work</td>
<td>35%</td>
<td>TBA</td>
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</tbody>
</table>
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: TBA
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

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 other hand, 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:


Recommended references (all available in University Library)


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).


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 in tenative and may be subject to change

<table>
<thead>
<tr>
<th>Week</th>
<th>Week starting</th>
<th>Tuesday 9 am</th>
<th>Tuesday 10 am</th>
<th>Thursday 9 am</th>
<th>LABORATORY 2 – 6 pm E7B 349</th>
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<tbody>
<tr>
<td>1</td>
<td>July 29</td>
<td>Introduction, Statistics</td>
<td>Statistics</td>
<td>Statistics</td>
<td>Workshop (E7B 346 or F7B 322)</td>
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<tr>
<td>2</td>
<td>August 5</td>
<td>Statistics</td>
<td>Statistics</td>
<td>Statistics</td>
<td>Experiment 1 (E7B 349)</td>
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<tr>
<td>3</td>
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<td>Statistics</td>
<td>Sampling methods</td>
<td>Sampling methods</td>
<td>Experiment 2 (E7B 349)</td>
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<tr>
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<td>August 19</td>
<td>Titrimetry</td>
<td>Titrimetry</td>
<td>Titrimetry</td>
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<tr>
<td>5</td>
<td>August 26</td>
<td>Titrimetry</td>
<td>Titrimetry</td>
<td>Titrimetry</td>
<td>Experiment 3 (E7B 349)</td>
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<tr>
<td>6</td>
<td>September 2</td>
<td>Flow injection</td>
<td>Flow injection</td>
<td>Flow injection</td>
<td>Optional Tutorial</td>
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<tr>
<td>7</td>
<td>September 9</td>
<td>Flow injection</td>
<td>Flow injection</td>
<td>Electroanalytical chemistry</td>
<td>Experiment 4(i) / 4(ii) / 5</td>
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</table>
## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](http://www.mq.edu.au/policy/docs/). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- **Special Consideration Policy** [http://www.mq.edu.au/policy/docs/special_consideration/policy.html](http://www.mq.edu.au/policy/docs/special_consideration/policy.html)

In addition, a number of other policies can be found in the [Learning and Teaching Category](http://www.mq.edu.au/policy/docs/) of Policy Central.

## Student Support

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at: [http://students.mq.edu.au/support/](http://students.mq.edu.au/support/)

**UniWISE provides:**

- Online learning resources and academic skills workshops [http://www.students.mq.edu.au/support/learning_skills/](http://www.students.mq.edu.au/support/learning_skills/)
- Personal assistance with your learning & study related questions.
- The Learning Help Desk is located in the Library foyer (level 2).
- Online and on-campus orientation events run by Mentors@Macquarie.

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<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Lecture</th>
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<th>Lecture</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>September 30</td>
<td>Electroanalytical chemistry</td>
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<tr>
<td>9</td>
<td>October 7</td>
<td>Electroanalytical chemistry</td>
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<tr>
<td>10</td>
<td>October 14</td>
<td>Chromatography</td>
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<td>Thermal methods</td>
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<tr>
<td>13</td>
<td>November 4</td>
<td>Revision</td>
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Student Enquiry Service
Details of these services can be accessed at http://www.student.mq.edu.au/ses/.

Equity 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.

IT Help
If you wish to receive IT help, we would be glad to assist you at 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 and it outlines what can be done.

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 task

- 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 task**

- 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 task**

- 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.