



# CHEM13080 Analytical Science

## Term 2 - 2023

Profile information current as at 09/05/2024 05:33 am

All details in this unit profile for CHEM13080 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

## General Information

### Overview

In this unit, you will apply fundamental principles of analytical science and study analytical techniques, such as quantitative molecular spectrophotometry; atomic spectrometry; chromatographic methods; mass spectrometry; and the use of electrodes. You will interpret analytical data; examine error analysis, data handling and manipulation; and understand quality assurance. During a compulsory residential school, you will apply analytical theory, use advanced analytical instrumentation and enhance your laboratory skills.

### Details

Career Level: *Undergraduate*

Unit Level: *Level 3*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

CHEM11043 Atoms, Molecules and Matter or CHEM11041 Chemistry for the Life Sciences

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

### Offerings For Term 2 - 2023

- Mixed Mode

### Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

### Residential Schools

This unit has a Compulsory Residential School for distance mode students and the details are:

Click here to see your [Residential School Timetable](#).

### Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

## Class and Assessment Overview

### Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

### Class Timetable

#### [Regional Campuses](#)

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

#### [Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

### Assessment Overview

#### 1. **Presentation**

Weighting: 20%

#### 2. **Written Assessment**

Weighting: 20%

#### 3. **Practical and Written Assessment**

Weighting: 20%

#### 4. **Online Test**

Weighting: 40%

### Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

## CQUniversity Policies

**All University policies are available on the [CQUniversity Policy site](#).**

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

## Previous Student Feedback

### Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

#### Feedback from Student Unit Teaching Evaluation Comments

##### Feedback

Students commented that the residential school was very well organised, helpful, and that they learnt a lot from practicing the techniques.

##### Recommendation

Continue with the same format for the residential school in 2023.

#### Feedback from Student Unit Teaching Evaluation Comments

##### Feedback

One student commented that four assessments is too many and that it was difficult to complete the weekly tasks within 12 hours.

##### Recommendation

A change to the number of assessment items is not recommended at this stage. The assessments are staggered throughout the term and build on skills required to complete this third-year unit. The assessment items are designed to meet the Unit Learning Outcomes. Students are strongly encouraged to make contact with staff, and to commence work on their assessments, as early as possible in the term. It is recommended that additional support (e.g., zoom sessions) continue to be offered to students, as appropriate.

## Unit Learning Outcomes

**On successful completion of this unit, you will be able to:**

1. Explain the theory and applications of contemporary techniques in analytical science
2. Demonstrate practical laboratory skills in the use of advanced analytical instrumentation to make reliable analytical measurements
3. Demonstrate problem solving and analytical skills in the fundamentals of analytical science
4. Research the developments and trends in analytical science for a diverse range of applications.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Presentation - 20%	•			•
2 - Written Assessment - 20%			•	
3 - Practical and Written Assessment - 20%		•	•	•
4 - Online Test - 40%	•		•	

## Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Communication	•	•		•
2 - Problem Solving	•	•	•	
3 - Critical Thinking	•	•	•	•
4 - Information Literacy	•			•
5 - Team Work		•	•	
6 - Information Technology Competence	•	•	•	•
7 - Cross Cultural Competence				•
8 - Ethical practice				
9 - Social Innovation				
10 - Aboriginal and Torres Strait Islander Cultures				

## Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Presentation - 20%	•		•	•		•				
2 - Written Assessment - 20%	•	•	•	•		•				
3 - Practical and Written Assessment - 20%	•	•	•	•	•	•				
4 - Online Test - 40%		•	•							

## Textbooks and Resources

### Textbooks

CHEM13080

#### Prescribed

#### Quantitative Chemical Analysis

Edition: 10th (2020)

Authors: Daniel C. Harris; Charles A. Lucy

Macmillian

ISBN: 9781319274023

Binding: eBook

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

**You will need access to the following IT resources:**

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Microsoft Office (Word, Excel and PowerPoint)
- Zoom (both microphone and webcam capability)

## Referencing Style

All submissions for this unit must use the referencing style: [Vancouver](#)  
For further information, see the Assessment Tasks.

## Teaching Contacts

**Ray Marshall** Unit Coordinator

[r.marshall@cqu.edu.au](mailto:r.marshall@cqu.edu.au)

**Shaneel Chandra** Unit Coordinator

[s.chandra@cqu.edu.au](mailto:s.chandra@cqu.edu.au)

## Schedule

### Week 1 - 10 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to analytical science; Review of measurements, concentration units and basic analytical tools	0-2	

### Week 2 - 17 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Reliability of analytical data	3-5 (sections as directed in lectures)	

### Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Sampling and sample preparation	28	

### Week 4 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Quality Assurance 5

#### Week 5 - 07 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Acid-base equilibria and EDTA titrations	10 and 12 (sections as directed in lectures)	<b>Assessment 1 - Research presentation - Review of new or novel analytical methods</b> Due: Week 5 Wednesday (9 Aug 2023) 11:59 pm AEST

#### Vacation Week - 14 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
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#### Week 6 - 21 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Electrochemical analysis	Lecture slides are standalone (see cpt 14-17 of text for further reference)	

#### Week 7 - 28 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Molecular and atomic spectroscopy	18 and 21 (sections as directed in lectures)	<b>Assessment 2 - Data processing, calculations, and questions</b> Due: Week 7 Monday (28 Aug 2023) 11:59 pm AEST

#### Week 8 - 04 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Analytical separations - Part 1	23-25 (sections as directed in lectures)	

#### Week 9 - 11 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Analytical separations - Part 2	23-25 (sections as directed in lectures)	

#### Week 10 - 18 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Mass spectrometry	22	<b>Assessment 3 - Practical work &amp; Scientific laboratory report</b> Due: Week 10 Monday (18 Sept 2023) 11:45 pm AEST

#### Week 11 - 25 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Automation and flow analysis	19-4 and other references as directed by lecturer	

#### Week 12 - 02 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
		<b>Assessment 4 - Online Test - End of Term Assessment</b> Due: Week 12 Wednesday (4 Oct 2023) 1:00 pm AEST

#### Review/Exam Week - 09 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
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#### Exam Week - 16 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
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## Term Specific Information

### TERM SPECIFIC INFORMATION

Three days of Residential Schools at North Rockhampton campus are mandatory for all students. Students MUST register themselves. Visit the MyCQU Student Portal at <http://my.cqu.edu.au/> and log in using your Student ID and password.

## Assessment Tasks

### 1 Assessment 1 - Research presentation - Review of new or novel analytical methods

#### Assessment Type

Presentation

#### Task Description

Representative sampling, sample preparation, method optimisation, method validation and quality control are key components of Analytical Science. Additionally, analytical scientists are required to use a variety of sophisticated techniques and instrumentation to investigate and analyse, both known and unknown samples, with precision and accuracy.

In Assessment 1, you will conduct research to review at least three new and novel scientific methods published in credible scientific journals. In doing so, you will aim to better understand the main aspects of method development and validation. You will then prepare and record a short presentation (10 minutes maximum) that summarizes your key findings, reviews the selected methods and demonstrates your understanding of key analytical science principles. Your presentation should be prepared in PowerPoint (or similar) then recorded (use of Zoom Meeting recording option is recommended) and submitted as an .mp4 file.

Additional details and instructions will be provided via the CHEM13080 Moodle site.

#### Assessment Due Date

Week 5 Wednesday (9 Aug 2023) 11:59 pm AEST

#### Return Date to Students

Week 7 Wednesday (30 Aug 2023)

#### Weighting

20%

#### Minimum mark or grade

50% of the marks allocated for this Assessment

#### Assessment Criteria

- Relevance, reliability and depth of reviewed literature (including correct referencing) – 25%
- Demonstrated understanding of key analytical science concepts – 25%
- Slide content and layout – 25%
- Presentation delivery – 25%

#### Referencing Style

- [Vancouver](#)

#### Submission

Online

#### Submission Instructions

Presentation slides should be submitted via Moodle as a .pptx file; Presentation video should be submitted via Moodle as an .mp4 file.

#### Learning Outcomes Assessed

- Explain the theory and applications of contemporary techniques in analytical science
- Research the developments and trends in analytical science for a diverse range of applications.

#### Graduate Attributes

- Communication
- Critical Thinking
- Information Literacy
- Information Technology Competence

## 2 Assessment 2 - Data processing, calculations, and questions

### Assessment Type

Written Assessment

### Task Description

Analytical laboratories produce large amounts of measurement data. The ability to correctly process, interpret, and assess this data is a vital skill for scientists.

Assessment 2 has been designed to enhance your problem solving, data interpretation, and data presentation skills. You will complete a series of data processing, calculation, and short answer questions, to interpret real datasets generated from analytical instruments that you will later operate during your Residential School. Working through Assessment 2 will familiarise you with some of the measurement techniques you will use during the Residential School. It will also prepare you for data generation, processing, and interpretation aspects of standard analytical laboratory work. Additional details and instructions will be provided via the CHEM13080 Moodle site.

### Assessment Due Date

Week 7 Monday (28 Aug 2023) 11:59 pm AEST

Please supply your response as a word file with your name and student number in the title.

### Return Date to Students

Week 9 Wednesday (13 Sept 2023)

### Weighting

20%

### Minimum mark or grade

50% of the marks allocated for this Assessment.

### Assessment Criteria

- Data interpretation 25%
- Data processing and presentation 25%
- Correct calculations 25%
- Correctly addressing questions 20%
- Correct use of referencing to answer questions 5%

### Referencing Style

- [Vancouver](#)

### Submission

Online

### Submission Instructions

The assessment should be submitted via Moodle. Please supply your response as a word file with your name and student number in the title.

### Learning Outcomes Assessed

- Demonstrate problem solving and analytical skills in the fundamentals of analytical science

### Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

## 3 Assessment 3 - Practical work & Scientific laboratory report

### Assessment Type

Practical and Written Assessment

### Task Description

Working in a laboratory requires you to understand scientific theory and be able to correctly execute and troubleshoot



techniques to obtain useful, valid data. Additionally, laboratory work requires you to have good planning and organisational skills, often to work as part of a team of analysts, to produce high quality results. During the laboratory component of the compulsory residential school, you will enhance your proficiency in sample and standard preparation; chemical concentration calculations; instrument operation; method validation and overall technical competency as an analytical scientist.

In Assessment 3, you will work in pairs or groups to plan your work, to prepare samples and standards, to carry out experiments, and to utilise a variety of analytical instrumentation. You will then, individually, write a full scientific report for one of the completed practicals. The report should clearly demonstrate your understanding of the analysis and any steps you took to increase data quality or troubleshoot unexpected results.

Additional details and instructions will be provided via the CHEM13080 Moodle site.

**Assessment Due Date**

Week 10 Monday (18 Sept 2023) 11:45 pm AEST

**Return Date to Students**

Week 12 Monday (2 Oct 2023)

**Weighting**

20%

**Minimum mark or grade**

50% of the marks allocated for this Assessment Task.

**Assessment Criteria**

- Planning, effort and teamwork during residential school – 20%
- Demonstrated understanding of methodology and accurate sample and standard preparation; evidenced by correctly calculated results and/or description of procedural error - 30%
- Sound interpretation of data and discussion of results – 30%
- Correct formatting and presentation of report – 10 %
- Correct referencing and evidence of research to support conclusions – 10%

**Referencing Style**

- [Vancouver](#)

**Submission**

Online

**Submission Instructions**

The assessment should be submitted via Moodle. Please supply your response as a word file with your name and student number in the title

**Learning Outcomes Assessed**

- Demonstrate practical laboratory skills in the use of advanced analytical instrumentation to make reliable analytical measurements
- Demonstrate problem solving and analytical skills in the fundamentals of analytical science
- Research the developments and trends in analytical science for a diverse range of applications.

**Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Information Technology Competence

## 4 Assessment 4 - Online Test - End of Term Assessment

**Assessment Type**

Online Test

**Task Description**

Assessment 4 - Online test - End of Term Assessment, will be comprised of short answer, problem solving and critical thinking questions that address the learning outcomes of this unit.

The assessment will be conducted online, through the Moodle Quiz facility, and will be timed.

You will have 2 hours to complete the assessment during the allocated 24-hour testing period.

A scientific calculator and Periodic Table may be required for some questions.

Please ensure you have a good, stable internet connection during the assessment period. Additional details and instructions will be provided via the CHEM13080 Moodle site.

**Assessment Due Date**

Week 12 Wednesday (4 Oct 2023) 1:00 pm AEST

You will have 2 hours from when you open the quiz to complete the assessment within the allocated 24-hour testing period.

**Return Date to Students**

Marks will be returned within 14 days of the Online Test being completed

**Weighting**

40%

**Minimum mark or grade**

50% of the marks allocated for this Assessment Task

**Assessment Criteria**

Marks will be awarded for correctly addressing:

- Analytical methodology and data questions 30%
- Problem solving questions 40%
- Instrumentation questions 30%

**Referencing Style**

- [Vancouver](#)

**Submission**

Online

**Submission Instructions**

The online test will be conducted via the Moodle Quiz facility.

**Learning Outcomes Assessed**

- Explain the theory and applications of contemporary techniques in analytical science
- Demonstrate problem solving and analytical skills in the fundamentals of analytical science

**Graduate Attributes**

- Problem Solving
- Critical Thinking

## Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

### What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

### Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

### Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

### What can you do to act with integrity?



#### Be Honest

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own



#### Seek Help

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)



#### Produce Original Work

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem