



CHEM13080 Analytical Science

Term 2 - 2020

Profile information current as at 07/05/2024 10:44 pm

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 - 2020

- Mixed Mode
- Rockhampton

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 survey, email and face-to-face during residential school.

Feedback

Students particularly enjoyed the residential school and commented that their skills improved as a result.

Recommendation

Continue with the delivery of a high standard of laboratory practicals that require students to carry out chemistry calculations, prepare reagents, gain hands-on experience with analytical instrumentation and learn how to optimise several instrumental and methodological parameters to improve the reliability of the data collected.

Feedback from Student survey and face-to-face.

Feedback

The audio of some of the live lecture recordings was distorted.

Recommendation

Review the audio quality of the live lecture videos and investigate ways to improve future live recordings.

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: 9th edn (2015)

Authors: Daniel C. Harris

W.H Freeman

ISBN: 9781319154141

Binding: Hardcover

Additional Textbook Information

If you prefer to study with a paper copy, they are available at the CQUni Bookshop here: <http://bookshop.cqu.edu.au> (search on the Unit code). eBooks are available at the publisher's website.

[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

Catherine Jones Unit Coordinator
c.e.jones@cqu.edu.au

Schedule

Week 1 - 13 Jul 2020

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

Week 2 - 20 Jul 2020

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

Week 3 - 27 Jul 2020

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

Week 4 - 03 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Quality Assurance	5	
Week 5 - 10 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Acid-base equilibria and EDTA titrations	10 and 12 (sections as directed in lectures)	Research presentation - review of new or novel analytical methods Due: Week 5 Friday (14 Aug 2020) 12:00 pm AEST
Vacation Week - 17 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Week 6 - 24 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Electrochemical Analysis	Lecture slides are standalone (see cpt 14-17 of text for further reference)	
Week 7 - 31 Aug 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Molecular and atomic spectroscopy	18 and 21 (sections as directed in lectures)	Data processing, calculations and questions Due: Week 7 Monday (31 Aug 2020) 12:00 pm AEST
Week 8 - 07 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Analytical Separations Part 1	23-25 (sections as directed in lectures)	
Week 9 - 14 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Analytical Separations Part 2	23-25 (sections as directed in lectures)	
Week 10 - 21 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Mass spectrometry	22	
Week 11 - 28 Sep 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Automation and flow analysis	19-4 and other references as directed by lecturer	
Week 12 - 05 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Revision	All resources	
Review/Exam Week - 12 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic
Exam Week - 19 Oct 2020		
Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Due to COVID-19 impacts at the time of preparing this unit profile, the residential school attached to this unit for Term 2 2020 has been postponed and will need to be completed at a later date.

Assessment 3 relates to practical work that will be conducted in the residential school and will be due two weeks after the residential school is completed.

Further details will be made available on the unit Moodle site in due course.

Assessment Tasks

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 that summarises your main 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 Unit Moodle site.

Assessment Due Date

Week 5 Friday (14 Aug 2020) 12:00 pm AEST

Return Date to Students

Week 6 Friday (28 Aug 2020)

Weighting

20%

Minimum mark or grade

40

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

Offline Online

Submission Instructions

Presentation slides should be submitted via Moodle; presentation video should be submitted via Moodle or a cloud storage folder (depending on file size)

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 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 all scientists.

In Assessment 2, you will be provided with sets of real data from the same instruments you will later operate during the laboratory component of your residential school. You will use this data to complete a series of data processing and calculation questions. This will enhance your problem solving, data interpretation and data presentation skills.

Completion of Assessment 2 will have the added benefit of familiarising you with the output of the various measurement techniques you will later utilise in the residential school (date of residential school to be advised).

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

Assessment Due Date

Week 7 Monday (31 Aug 2020) 12:00 pm AEST

Return Date to Students

Week 9 Monday (14 Sept 2020)

Marks and feedback will be given via Moodle.

Weighting

20%

Minimum mark or grade

40 %

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.

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 Scientific laboratory report

Assessment Type

Practical and Written Assessment

Task Description

Please note: Assessment 3 directly relates to the compulsory residential school, which at the time of preparing this Unit Profile has been postponed and will need to be completed at a later date.

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 (exact date to be advised), 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 Unit Moodle site.

Assessment Due Date

The assessment will be due two weeks after the residential school takes place and should be submitted via Moodle.

Return Date to Students

The assessment will be returned two weeks after it is submitted. Marks and feedback will be given via Moodle.

Weighting

20%

Minimum mark or grade

40 %

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

Submit via Moodle two weeks after the residential school takes place.

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 Online Test

Assessment Type

Online Test

Task Description

The online test will be comprised of short answer, problem solving and critical thinking questions that address the learning outcomes of this unit.

The test will be timed, and you will have 2 hours to complete the assessment within the allocated testing period at the

end of the term. The exact date will be advised on Moodle.
Additional details and instructions will be provided via the Unit Moodle site.

Assessment Due Date

End of term - exact date to be advised

Return Date to Students

End of term - exact date to be advised

Weighting

40%

Minimum mark or grade

50

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