



# CHEM13080 Analytical Science

## Term 2 - 2017

Profile information current as at 28/04/2024 09:19 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 ion-selective and gas-sensing electrodes. You will interpret analytical data; examine error analysis, data handling and manipulation; and understand quality assurance. During a compulsory residential school you will use state-of-the-art analytical instrumentation and apply your learnt theoretical techniques and methods.

### 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

Prerequisite: CHEM 11041 - Chemistry for the Life Sciences, knowledge of mathematics and formula manipulation are essential.

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 - 2017

- Distance
- 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 and Written Assessment**

Weighting: 25%

#### 2. **Practical and Written Assessment**

Weighting: 10%

#### 3. **Practical Assessment**

Weighting: 15%

#### 4. **Examination**

Weighting: 50%

### 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 Moodle

##### Feedback

we either need a prerequisite course (or included in a bridging course such as STEP or WIST) or a voluntary short term 'upgrade' to have at least the most necessary ground knowledge

##### Recommendation

As part of the science review - this will be a point to action for the future proofing of student experience, knowledge transfer and ability to perform well on this course.

## 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 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 chemical and biomedical science 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 and Written Assessment - 25%	•			•
2 - Practical and Written Assessment - 10%		•	•	•
3 - Practical Assessment - 15%		•		
4 - Examination - 50%	•		•	

### Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Communication	•	•		•

Graduate Attributes	Learning Outcomes			
	1	2	3	4
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 and Written Assessment - 25%	•	•	•	•	•	•		•		
2 - Practical and Written Assessment - 10%	•	•	•	•	•	•		•		
3 - Practical Assessment - 15%	•	•	•	•		•		•		
4 - Examination - 50%	•	•	•	•						

## Textbooks and Resources

### Textbooks

CHEM13080

#### Prescribed

#### Exploring Chemical Analysis

Edition: 5th (2012)

Authors: Daniel C Harris

WH Freeman

New York, New York, USA

ISBN: 978-1429275033

Binding: Hardcover

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

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

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- MS Office

## Referencing Style

**All submissions for this unit must use the referencing styles below:**

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Turabian](#)

For further information, see the Assessment Tasks.

## Teaching Contacts

**James Chapman** Unit Coordinator  
[j.chapman@cqu.edu.au](mailto:j.chapman@cqu.edu.au)

## Schedule

### Week 1 - 10 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to analytical science. Measurements, concentration units and basic analytical tools.	1-2 (Study Guide, SG); 0-2 (Textbook - Exploring Chemical Analysis, ECA)	Unit coordinator will assign research groups and provide the background analytical problem. Students to self-assign a research group manager.

### Week 2 - 17 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic
Reliability of analytical data; quality assurance.	3 (SG); 3-5 (ECA)	

### Week 3 - 24 Jul 2017

Module/Topic	Chapter	Events and Submissions/Topic
Sampling and sample preparation.	4 (SG); web resources	1-page research plan to be submitted to unit coordinator.

<b>Week 4 - 31 Jul 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Chemical equilibria in analysis	5 (SG); 8-10, 16 (ECA)	
<b>Week 5 - 07 Aug 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Molecular and atomic spectroscopy	6 (SG); 18-20 (ECA)	
<b>Vacation Week - 14 Aug 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
<b>Week 6 - 21 Aug 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Sensors & Separations	7 (SG); 14-15, 17 (ECA)	Full experimental plan - 5 pages - to be submitted to unit coordinator.  <b>Design a Research Based Experiment</b> Due: Week 6 Monday (21 Aug 2017) 11:45 pm AEST
<b>Week 7 - 28 Aug 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Electrochemical Analysis		Residential School 31st August - 2nd September 2017.
<b>Week 8 - 04 Sep 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Analytical Separations	8 (SG); 21-22 (ECA)	
<b>Week 9 - 11 Sep 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Analytical Separations (continued)	8 (SG); 21-22 (ECA)	<b>Write Up of Experiment</b> Due: Week 9 Monday (11 Sept 2017) 11:45 pm AEST
<b>Week 10 - 18 Sep 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Mass spectrometry	9 (SG); 21 (ECA); web resources	
<b>Week 11 - 25 Sep 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Contemporary Research Using Analytical Techniques	10 (SG); web resources	<b>Report on Computer Based Experiment</b> Due: Week 11 Monday (25 Sept 2017) 11:45 pm AEST
<b>Week 12 - 02 Oct 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
Revision	All resources	
<b>Review/Exam Week - 09 Oct 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>
<b>Exam Week - 16 Oct 2017</b>		
<b>Module/Topic</b>	<b>Chapter</b>	<b>Events and Submissions/Topic</b>

## Assessment Tasks

# 1 Design a Research Based Experiment

## Assessment Type

Presentation and Written Assessment

## Task Description

As analytical chemists, you are often required to analyse substances both quantitatively and qualitatively. In Assessment Task 1, you will be working as part of a team of scientists. Your unit coordinator will provide you with a list of peers who you will be working with and an analytical science-based problem which you will be expected to solve. The analytical-based problem will give you the following background information on the sample: (1) the matrix you will be working with; (2) the analytes you will need to quantitatively/qualitatively determine, and (3) the instrumentation available to you.

This assessment task is broken down in the following chronological order:

Week Number and Completion Date	Task
(15th July 2017)	Unit coordinator will assign research groups and provide the background analytical problem. Students self-assign a research group manager. Your plan should include how you will obtain the analytes, removing matrix effects (if any) and how you intend to use advanced analytical instrumentation to run your sample(s).
(24th July 2017)	1-page research plan submitted to unit coordinator from research group manager(s).
(21st August 2017)	A full research experimental plan (5 pages maximum) which should be 'recipe-styled' with clear steps and rationale for these steps.
(31st August 2017)	A group presentation at the beginning of the residential school 15 minutes maximum. Each member of the group will be expected to talk and present the experiment they are intending on carrying out. Your aim is to provide a comprehensive plan to analyse your samples at the residential school through experimentation.

During the residential school, you will be assessed on your ability to conduct advanced research-based experiments in the laboratory including exercising safety and good laboratory practice.

## Assessment Due Date

Week 6 Monday (21 Aug 2017) 11:45 pm AEST

Word Document Only - Moodle Submission

## Return Date to Students

Monday (28 Aug 2017)

Feedback will be given through Moodle

## Weighting

25%

## Minimum mark or grade

40% of the total marks allocated for the assessment task

## Assessment Criteria

### Assessment criteria

You will be marked throughout the year on the following criteria with feedback:

- Analytical method plan from group (10%);
- Full experimental plan (40%);
- Group presentation of experimental plan, you will be marked individually on your ability to deliver rationale, your ability to reason and overall delivery (20%); and
- Practical skills assessment; use of laboratory glassware, ability to make up solutions with accuracy, use of instrumentation. These skills will be individually assessed at the residential school (30%).

## Referencing Style

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Turabian](#)

## Submission

Online Group

## Submission Instructions

Moodle Submission

## 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 chemical and biomedical science applications.

### Graduate Attributes

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

## 2 Write Up of Experiment

### Assessment Type

Practical and Written Assessment

### Task Description

This assessment task consists of a group, **practical write-up** of the work carried out during the residential school only. Your group will write a publication using the guidelines of the [Journal of Analytical Chemistry](#) (hyperlinked herein). You will be expected to process your data in the form of figures and graphs and perform statistical validation on all data your group obtained.

Further information on this assessment will be provided during the residential school on structure, figure and table layout, statistical analysis and research integrity throughout the unit.

A panel presentation on 'how to collaborate' on producing a research article will be delivered during the residential school. You will lead this Q&A forum which will assist you in your manuscript preparation.

Further information on this assessment will be provided during the residential school on structure, figure and table layout, statistical analysis and research integrity throughout the unit.

### Assessment Due Date

Week 9 Monday (11 Sept 2017) 11:45 pm AEST

Word Document ONLY.

### Return Date to Students

Week 10 Friday (22 Sept 2017)

Feedback will be given through Moodle.

### Weighting

10%

### Minimum mark or grade

40% of total marks allocated for the task

### Assessment Criteria

The following assessment criteria are applied to this task:

#### General assessment criteria

- Completeness - ability to follow the guidelines of the journal (5%);
- Structure of the manuscript - use headings and subheadings accordingly (5%)
- Appropriate treatment of experimental data - correct calculations, including use of correct number of significant figures and statistics (30%)
- Valid interpretations of your data - your ability to draw conclusions, placed in the context of analytical chemistry (25%)
- References - appropriately used and correct for the Journal. (15%)
- Peer input/evaluation (20%)

### Referencing Style

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Turabian](#)

### Submission

Online Group

### Learning Outcomes Assessed

- Demonstrate practical laboratory skills in the use 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 chemical and biomedical science applications.

#### **Graduate Attributes**

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

### **3 Report on Computer Based Experiment**

#### **Assessment Type**

Practical Assessment

#### **Task Description**

The task is a computer-based experiment which requires you to use and manipulate specific functionalities within Excel using real data obtained from a previously conducted experiment. Details of the experiment are found in the Lab Manual which is available on Moodle, including guidelines on writing the report.

#### **Assessment Due Date**

Week 11 Monday (25 Sept 2017) 11:45 pm AEST

Word report ONLY submitted through Moodle.

#### **Return Date to Students**

Week 12 Friday (6 Oct 2017)

Feedback Will be Given Through Moodle.

#### **Weighting**

15%

#### **Minimum mark or grade**

40% of the marks allocated for this assessment task.

#### **Assessment Criteria**

##### **Assessment criteria**

- Organisation and completeness (including answers to questions given in the Lab Manual) and clarity of expression (10%);
- Appropriate treatment of experimental data and correct calculations, including the use of the correct number of significant figures (50%);
- Valid interpretations of data and conclusions (30%);
- Evidence of research, i.e. consultation of references other than the Laboratory Manual or Study Guide (10%).

#### **Referencing Style**

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Turabian](#)

#### **Submission**

Online

#### **Submission Instructions**

Through the Moodle site

#### **Learning Outcomes Assessed**

- Demonstrate practical laboratory skills in the use advanced analytical instrumentation to make reliable analytical measurements.

#### **Graduate Attributes**

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

- Ethical practice

## Examination

**Outline**

Complete an invigilated examination.

**Date**

During the examination period at a CQUniversity examination centre.

**Weighting**

50%

**Length**

120 minutes

**Minimum mark or grade**

40%

**Exam Conditions**

Closed Book.

**Materials**

Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).

## 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