



# CHEM13083 *Physical Chemistry*

## Term 1 - 2024

Profile information current as at 19/05/2024 08:56 am

All details in this unit profile for CHEM13083 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.

## Corrections

### Unit Profile Correction added on 27-02-24

As per the timetable, the residential school should be listed for 1 - 2 May.

## General Information

### Overview

In this unit you will develop advanced understanding of the core areas of physical chemistry, based around the themes of systems, states and processes. You will study mixtures and phases, spectroscopy, molecular motion and ionic conductance. This unit will extend your theoretical knowledge to complex mixtures encountered in environmental studies and vibrational spectroscopy, which is rapidly emerging as a core analytical tool for screening and quantification of species in a myriad of disciplines.

### 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: CHEM19085 OR CHEM12077 OR CHEM12079 OR CHEM12080

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 1 - 2024

- 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. **Written Assessment**

Weighting: 20%

#### 2. **Report**

Weighting: 50%

#### 3. **Online Test**

Weighting: 30%

### 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 From students at res school.

##### Feedback

Students found the text difficult to use well and struggled with its style and mathematical detail.

##### Recommendation

Look into other texts that have an alternative way of presenting the material. As a unit with a significant mathematical component, consideration can be given to alternative ways to assist students.

#### Feedback from From students at res school and student evaluation

##### Feedback

Students found it difficult to make full links between the lab component and the theory components of the unit.

##### Recommendation

The res school experiments are under review to further enhance this important aspect of the unit. Restructure the lab manual to remove some of the extraneous theory that already exists in the lecture material.

## Unit Learning Outcomes

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

1. Evaluate the properties of mixtures
2. Predict the types of molecular motion in fluids and mixtures
3. Design and conduct practical assessments of molar conductance and conductivity
4. Assess the kinetics and determine the mass transfer process of various chemical reactions.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Written Assessment - 20%		•		•
2 - Report - 50%	•	•	•	•
3 - Online Test - 30%	•	•		•

### Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4

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 - Written Assessment - 20%	•		•	•						
2 - Report - 50%	•	•	•		•					
3 - Online Test - 30%		•	•							

## Textbooks and Resources

### Textbooks

CHEM13083

#### Prescribed

#### **Physical Chemistry: Thermodynamics, Statistical Thermodynamics, and Kinetics, Global Edition**

Authors: Thomas Engel and Philip Reid

Pearson

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)
- Endnote
- MS Office

## Referencing Style

All submissions for this unit must use the referencing style: [Vancouver](#)

For further information, see the Assessment Tasks.

## Teaching Contacts

**Shaneel Chandra** Unit Coordinator

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

## Schedule

### Week 1 - 04 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Fundamental Concepts of Thermodynamics	1	

### Week 2 - 11 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Heat, Work, Internal Energy, and the First Law of Thermodynamics	2	

### Week 3 - 18 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Internal Energy, Enthalpy and Thermochemistry	3, 4	

### Week 4 - 25 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Phase Diagrams and the Relative Stability of Solids, Liquids and Gases	8	<b>Evaluation of an AI-generated scientific essay</b> Due: Week 4 Friday (29 Mar 2024) 11:00 am AEST

<b>Week 5 - 01 Apr 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Electrochemical Cells and Batteries	11	
<b>Vacation Week - 08 Apr 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
<b>Week 6 - 15 Apr 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Transport Phenomena	17	
<b>Week 7 - 22 Apr 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Elementary Chemical Kinetics	18	
<b>Week 8 - 29 Apr 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Complex Reaction Mechanisms	19	
<b>Week 9 - 06 May 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Ideal and Real Solutions	9	
<b>Week 10 - 13 May 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Ideal and Real Solutions	9	<b>Practical and Written Assessment</b> Due: Week 10 Friday (17 May 2024) 11:00 am AEST
<b>Week 11 - 20 May 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Electrolyte Solutions	10	
<b>Week 12 - 27 May 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
Revision		<b>Online Test</b> Due: Week 12 Friday (31 May 2024) 12:00 pm AEST
<b>Review/Exam Week - 03 Jun 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic
<b>Exam Week - 10 Jun 2024</b>		
Module/Topic	Chapter	Events and Submissions/Topic

## Assessment Tasks

### 1 Evaluation of an AI-generated scientific essay

#### Assessment Type

Written Assessment

#### Task Description

You will be provided with a scientific essay generated using Artificial Intelligence (AI). You are to apply your own essay-writing experience and physical chemistry knowledge to evaluate the essay, and grade it according to the criteria that will be provided.

#### Assessment Due Date

Week 4 Friday (29 Mar 2024) 11:00 am AEST

To be submitted via Moodle

**Return Date to Students**

Week 7 Friday (26 Apr 2024)

Returned with feedback via Moodle

**Weighting**

20%

**Minimum mark or grade**

50%

**Assessment Criteria**

Your evaluation of the essay will be graded according to the following:

Demonstration of knowledge of the subject (with examples) as applied towards your evaluation (50%)

Critical analysis of the writing (50%)

**Referencing Style**

- [Vancouver](#)

**Submission**

Online

**Learning Outcomes Assessed**

- Predict the types of molecular motion in fluids and mixtures
- Assess the kinetics and determine the mass transfer process of various chemical reactions.

**Graduate Attributes**

- Communication
- Critical Thinking
- Information Literacy

## 2 Practical and Written Assessment

**Assessment Type**

Report

**Task Description**

The Assessment Task relates to the compulsory Residential School. At the Residential School, you may work in pairs or groups on experiments. For the Assessment Task, you will write up an individual scientific report of the experiments and activities undertaken during the Residential School.

**Assessment Due Date**

Week 10 Friday (17 May 2024) 11:00 am AEST

**Return Date to Students**

Review/Exam Week Friday (7 June 2024)

Returned with feedback via Moodle

**Weighting**

50%

**Minimum mark or grade**

50%

**Assessment Criteria**

Introduction and Background: 50%

Very convincing justifications for the merits of the experiments

Demonstration of theory to relate experiment to environmental analytical applications

Literature: 20%

Scientific literature, externally cited in the correct format to justify claims and explanations

Organization: 30%

Well-positioned to reinforce the argument(s)

Data tabulated and graphs generated on computer.

Correctly labelled figures and tables

Overall Presentation: 10%

No typos, cohesive and very easy to follow arguments

Word limit - 2000

### Referencing Style

- [Vancouver](#)

### Submission

Online

### Submission Instructions

To be submitted via Moodle

### Learning Outcomes Assessed

- Evaluate the properties of mixtures
- Predict the types of molecular motion in fluids and mixtures
- Design and conduct practical assessments of molar conductance and conductivity
- Assess the kinetics and determine the mass transfer process of various chemical reactions.

### Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Team Work

## 3 Online Test

### Assessment Type

Online Test

### Task Description

The Online Test will be an assortment of problem-solving and extended-answer questions. The mark allocations per question will be provided on the Assessment with each question.

The access to the Test will be for 24 hours, as explained below:

Open: 12.00 pm Thursday, 30 May

Close: 12.00 pm Friday, 31 May.

Duration of Test: 3 hours

You must open the Test within the 24 hour period and attempt it. Once opened, you will have 3 hours to answer the questions. Access to the Test within the 24-hour period will only be once. Please ensure that you have given yourself 3 hours to attempt all the questions and upload your answers and that you have Internet connectivity for the duration of the Test.

### Assessment Due Date

Week 12 Friday (31 May 2024) 12:00 pm AEST

To be attempted in Moodle

### Return Date to Students

Exam Week Friday (14 June 2024)

Marks will be released via Moodle at Certification of Grades.

### Weighting

30%

### Minimum mark or grade

50%

### Assessment Criteria

Each question will have the allocated marks stated.

### Referencing Style

- [Vancouver](#)

### Submission

Online

### Submission Instructions

To be submitted by the due date and time.



### Learning Outcomes Assessed

- Evaluate the properties of mixtures
- Predict the types of molecular motion in fluids and mixtures
- Assess the kinetics and determine the mass transfer process of various chemical reactions.

### 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