CHEM13083 *Physical Chemistry*
Term 1 - 2023

Profile information current as at 14/12/2025 04:57 am

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 - 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).

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 Student evaluation

Feedback

The summary of 2 weeks learning was useful and it also explained in another way/context that sometimes made things clearer to understand

Recommendation

The practice of regular drop-in sessions will continue to ensure that students are supported in their learning.

Feedback from Student evaluation

Feedback

The textbook was obtuse in some of its explanations, and some of the example problems were difficult to follow. The greatest frustration was that the answers that the textbook supplied to the tutorial questions were incorrect.

Recommendation

The issue with textbook errors has been escalated with the textbook publisher and a request made for the authors to re-check their answers and supply these before the start of the next offering for the Unit. In the meantime, alternative options are being explored around this challenge, including another resource.

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

— N/A Level ◦ Introductory Level • Intermediate Level • Graduate Level ◦ Professional Level ◦ Advanced Level

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
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

Additional Textbook Information
Hardcopy will be fine too but ecopies would be more cost-effective. BOTH paper and eBook copies can be purchased at the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code).

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 Bibliographical application
- MS Office

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
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Schedule

Week 1 - 06 Mar 2023

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

Week 2 - 13 Mar 2023

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

Week 3 - 20 Mar 2023

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

Week 4 - 27 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
Phase Diagrams and the Relative Stability of Solids, Liquids and Gases	8	**Written Assessment** Due: Week 4 Friday (31 Mar 2023) 11:45 pm AEST

Week 5 - 03 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Electrochemical Cells and Batteries	11	

Vacation Week - 10 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 17 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Transport Phenomena	17	

Week 7 - 24 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Elementary Chemical Kinetics	18	

Week 8 - 01 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Complex Reaction Mechanisms	19	Residential School (4-5 May)

Week 9 - 08 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Ideal and Real Solutions	9	

Week 10 - 15 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Ideal and Real Solutions	9	**Report** Due: Week 10 Friday (19 May 2023) 11:45 pm AEST

Week 11 - 22 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Electrolyte Solutions	10	

Week 12 - 29 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Revision		

Review/Exam Week - 05 Jun 2023

Module/Topic	Chapter	Events and Submissions/Topic
		Online test (date TBA)

Exam Week - 12 Jun 2023

Module/Topic	Chapter	Events and Submissions/Topic
		Online test (date TBA)

Assessment Tasks

1 Written Assessment

Assessment Type
Written Assessment

Task Description
For this Assessment Task, you will write a scientific review paper on a topic available on the Moodle site. The topic will be one of relevance to both the scientific and non-scientific communities. However, you will be writing as a scientist to try and explain the topic to a non-technical audience. The review must be be word-processed, with appropriate layout and use of headings/sub-headings. Tables and figures to illustrate specific aspects may be included with titles and acknowledgement where necessary. In addition, the word count should not exceed 2000 (excluding references).

Assessment Due Date
Week 4 Friday (31 Mar 2023) 11:45 pm AEST

To be submitted via Moodle

Return Date to Students
Week 6 Friday (21 Apr 2023)

Returned with feedback via Moodle

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
Assessment Criteria
Introduction and Background: 25%
Excellent detail to highlight the present scenario.
Very convincing argument provided for undertaking the present study

Literature: 20%
Coherent, with excellent merge of literature
All material is sourced externally cited in the correct format
Literature cited is recent (< 5 years), credible, relevant

Organization: 25%
Well-presented
Well-positioned to reinforce the argument(s)
Correctly labelled
Well-organized such that patterns and themes immediately become obvious

Analysis of the Literature: 20%
Critical examination of literature is evident
Demonstration of new knowledge to produce coherent understanding of the topic

Overall Presentation: 10%
No typos, cohesive and very easy to follow arguments

Referencing Style

- Vancouver

Submission
Online

Submission Instructions
To be submitted via Moodle

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 Report

Assessment Type
Report

Task Description
This 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 (19 May 2023) 11:45 pm AEST

To be submitted via Moodle

Return Date to Students
Week 12 Friday (2 June 2023)

Returned with feedback via Moodle

Weighting
50%

Minimum mark or grade
50%

Assessment Criteria
Assessment Criteria
Introduction and Background: 50%
Very convincing justifications for the merits of the experiments.

Literature: 20%
Scientific literature, externally cited in the correct format to justify claims and explanations
Literature cited is recent (< 5 years), credible, relevant

Organization: 30%
Well-positioned to reinforce the argument(s)
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. It will have a timed period in which it must be submitted. The specific details of the Assessment will be provided on Moodle.

Assessment Due Date

To be attempted in Moodle during the standard examination period at a date to be specified.

Return Date to Students

Marked tests will be returned via Moodle.

Weighting
30%

Minimum mark or grade
50%

Assessment Criteria
Due to the specific nature of questions in this activity, specific instructions and assessment criteria will be further explained in the Test itself.

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