CHEM11045 *Chemical Investigation and Theory*
Term 1 - 2022

Profile information current as at 07/05/2024 02:34 am

General Information

Overview

In Chemical Investigation and Theory you will learn about chemical bonding theories and apply these to justify the observed properties of matter. This unit will extend your knowledge of nuclear chemistry by introducing different types of nuclear radiation and the representation of these processes by chemical equations and also the application of half-life calculations. You will use the First Law of Thermodynamics to study heat energies associated with chemical reactions and also consider the effects of changing conditions on established chemical equilibria. The nature of solutions will be investigated with particular focus on colligative properties and the Ideal Gas Equation will be used to describe the nature of gases. Aspects of environmental chemistry will be introduced.

Details

Career Level: *Undergraduate*
Unit Level: *Level 1*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

There are no requisites for this unit.
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 - 2022

- Online

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: 30%
2. **Online Quiz(zes)**
Weighting: 30%
3. **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 and Teaching Evaluation Survey

Feedback

Students commented that the feedback on assessments was of a good standard.

Recommendation

Continue to provide similar level of assessment feedback in 2022.

Feedback from Personal Reflection and Student Unit and Teaching Evaluation Survey

Feedback

The quality of some of the tutorial and lecture recordings could be improved.

Recommendation

Improve quality of recordings for the next offering.

Unit Learning Outcomes

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

1. Describe the structure of the atom and its sub-atomic particles and relate this to the trends observed in the Periodic Table
2. Apply bonding theories to explain the shape, polarity and bonding that occurs in and between molecules
3. Describe the composition and synthesis of organic polymers
4. Describe the nature of colligative properties
5. Apply chemical laws to explain chemical reactions and gas behaviour
6. Describe types of nuclear radiation and perform half life calculations
7. Discuss important reactions in the environment.

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	5	6	7
1 - Written Assessment - 30%		•	•	•			•
2 - Online Quiz(zes) - 30%	•				•	•	
3 - Online Test - 40%	•	•	•	•	•	•	

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
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 - 30%	•	•	•	•						
2 - Online Quiz(zes) - 30%		•	•	•		•				
3 - Online Test - 40%	•	•	•							

Textbooks and Resources

Textbooks

CHEM11045

Prescribed

Chemistry
Edition: Fourth (2019)
Authors: Blackman, Bottle, Schmid, Mocerino, Wille
Wiley
Milton , Queensland , Australia
ISBN: ISBN 0-471-44891-5
Binding: eBook

Additional Textbook Information
Either the eBook or physical copy of the textbook are suitable. Both the paper and eBook text can be purchased at the CQUni Bookshop. Click on the Check for eBook link to be directed to Vitalsource. Search on the unit code here:http://bookshop.cqu.edu.au

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

Referencing Style

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

Teaching Contacts

Mani Naiker Unit Coordinator
m.naiker@cqu.edu.au

Schedule

Week 1 - 07 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to atomic structure, quantum numbers and the Periodic Table	**Lecture 1: Atomic Structure** **1.1 The essential concepts in brief** **1.3 The structure of the atom** **1.5 Electrons in atoms** **Lecture 2: The Periodic Table - layout, groups, periods, blocks** **1.4 The Periodic Table of the Elements** **Lecture 3: The nature of electrons - quantum numbers** **4.4 Quantisation and quantum numbers**	

Week 2 - 14 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic

Electronic configuration and Periodicity	**Lecture 1: Electronic orbitals and the Periodic Table** **4.5 Atomic orbital electron distributions and energies** **Lecture 2: Electronic configurations and valence electrons** **4.6 Structure of the Periodic Table** **4.7 Electron configurations - only up to Configuration of ions** **Lecture 3: Trends in the Periodic Table** **4.8 Periodicity of atomic properties**	

Week 3 - 21 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Lewis Dot structures and Valence Shell Electron Pair Repulsion Theory (VSEPR)	**Lecture 1: Introduction to atomic bonding** **5.1 Fundamentals of bonding** **5.2 Ionic Bonding** **Lecture 2: Lewis Structures** **5.3 Lewis Structures** **Lecture 3: Fundamentals of VSEPR** **5.4 VSEPR theory**	**Assessment Item 2, Online Quiz (1) due**: 5:00 PM (AEST) Friday 25 March 2022.

Week 4 - 28 Mar 2022

Module/Topic	Chapter	Events and Submissions/Topic
Valence Bond Theory	**Lecture 1: Properties of covalent bonds** **5.5 Properties of Covalent Bonds** **Lecture 2: Valence Bond Theory** **5.6 Valence Bond Theory** **Lecture 3: Worked examples of VSEPR and VBT** **(no specific readings)**	

Week 5 - 04 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic
Molecular Orbital Theory	**Lecture 1: Molecular orbital theory - homonuclear diatomic molecules - *s* orbital overlap** **5.7 Molecular orbital theory: diatomic molecules - to end of Molecular orbitals of H_2** **Lecture 2: Molecular orbital theory - homonuclear diatomic molecules - *p* orbital overlap** **5.7 Molecular orbital theory: diatomic molecules - Molecular orbitals of O_2** **Lecture 3: Heteronuclear diatomic molecules** **5.7 Molecular orbital theory: Heteronuclear diatomic molecules**	

Vacation Week - 11 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 18 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic

Liquids and solids	**Lecture 1: Intermolecular Forces** **6.8 Intermolecular forces** **Lecture 2: Macroscopic properties of liquids and solids** **7.1 Liquids** **7.2 Solids** **Lecture 3: Phase changes and phase diagrams** **7.3 Phase changes** **7.4 Order in solids**	**Assessment Item 1, Written Assessment (Task A) due:** 5:00 PM (AEST) Friday 22 April 2022

Week 7 - 25 Apr 2022

Module/Topic	Chapter	Events and Submissions/Topic
Solutions and solubilities	**Lecture 1: Nomenclature of inorganic compounds** **2.3 Nomenclature (up to and not including naming organic compounds)** **Lecture 2: Solubility and solubility product** **10.1 Introduction to solutions and solubility** **10.4 Carry out calculations involving slightly soluble salts** **Lecture 3: Colligative properties** **10.5 Quantify the effects that arise in solutions as a result of colligative properties.**	

Week 8 - 02 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
Gases	**Lecture 1: Gas behaviour** **6.1 The states of matter** **6.2 Describing gases** **Lecture 2: Properties of gas mixtures** **6.4 Gas mixtures** **Lecture 3: Applying the Ideal Gas Equation** **6.5 Applications of the Ideal Gas equation** **6.6 Gas Stoichiometry**	

Week 9 - 09 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
Polymers	**Lecture 1: Introduction to polymers** **26.1 The architecture of polymers** **26.2 Use correct notation and nomenclature to describe polymers** **Lecture 2: Condensation polymers** **26.3 Formation of polymers (only condensation or step-growth polymers)** **Lecture 3: Addition polymers** **26.3 Formation of polymers (only addition or chain-growth polymers)**	**Assessment Item 2, Online Quiz (2) due:** 5:00 PM (AEST) Firday 13 May 2022

Week 10 - 16 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
Chemistry in the Environment	No readings from the text. See eReading list on Moodle	

Week 11 - 23 May 2022

Module/Topic	Chapter	Events and Submissions/Topic

Nuclear Chemistry	**Lecture 1: Nuclear stability and decay** **27.1 Nuclear stability** **27.2 Unstable nuclei** **Lecture 2: Formation of new elements - dating methods** **27.3 Synthesis of new elements** **27.4 Radioactive dating methods** **Lecture 3: Applications of nuclear processes** **27.5 Applications of nuclear processes**	**Assessment Item 1, Written Assessment (Task B) due**: 5:00 PM (AEST) Friday 27 May 2022

Week 12 - 30 May 2022

Module/Topic	Chapter	Events and Submissions/Topic
Review	All unit content	**Assessment Item 2, Online Quiz (3) due**: 5:00 PM (AEST) Friday 3 June 2022

Term Specific Information

All the lectures and tutorials will be recorded and posted online.

Assessment Tasks

1 Written Assessment - Bonding Theories, Colligative Properties, Chemistry in the Environment, Polymers

Assessment Type
Written Assessment

Task Description
There will be two components to this written assessment, Task A and Task B.
Task A
This task will require you to

- Explain bonding in a molecule using bonding theories covered in the unit
- Show any calculations
- Clearly draw the molecule bonding according to the relevant theory used

A task document and any additional detail and instructions will be provided via the Unit Moodle site.
Task B
This task will require you to

- Explain the nature of colligative properties and perform relevant calculations
- Discuss polymer formation
- Discuss reactions in the environment

A task document and any additional detail and instructions will be provided via the Unit Moodle site.

Assessment Due Date

Task A of this assessment is due 5:00 PM (AEST), Friday 22 April (End of week 6). Task B of this assessment is due 5:00 PM (AEST), Friday 27 May (End of week 11)

Return Date to Students

Part A of this assessment will be returned by end of week 8. Part B will be returned by during Review/Exam Week.

Weighting
30%

Assessment Criteria
Marks for each question will be awarded as indicated on the Assessment Item 2, Task A and B documents, provided on

Moodle.
Marks will be awarded for

- Application and explanation of relevant bonding theories
- Relevance and clarity of diagrams
- Clarity of explanations
- Demonstrated understanding of the nature of colligative properties
- Demonstrated understanding of the composition and synthesis of organic polymers
- Accurate, informed discussion of important reactions in the environment
- Correct calculations and use of significant figures and units

Note: all working must be shown

Referencing Style

- Vancouver

Submission
Online

Submission Instructions
A word document should be uploaded via the Moodle assessment submission function.

Learning Outcomes Assessed

- Apply bonding theories to explain the shape, polarity and bonding that occurs in and between molecules
- Describe the composition and synthesis of organic polymers
- Describe the nature of colligative properties
- Discuss important reactions in the environment.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

2 Online Quizzes - Atomic Structure, Gases, Nuclear Chemistry

Assessment Type
Online Quiz(zes)

Task Description
This assessment is comprised of three (3) online quizzes which will assess your understanding of topics presented in this unit. This assessment requires you to apply concepts to answer a series of multiple choice questions. All questions in each quiz are of equal value.
The three online quizzes will contribute a total of 30% of the assessment for this unit, each quiz contributing 10%.
Quiz 1 will cover Atomic Structure, Periodic Table, Electronic Configurations,
Quiz 2 will cover Gases,
Quiz 3 will cover Nuclear Chemistry
The quizzes are not timed and you are allowed two attempts; the highest score of the two attempts will be recorded.
Note that questions are generated randomly and you will receive different questions on subsequent attempts.

Number of Quizzes
3

Frequency of Quizzes
Other

Assessment Due Date

The quizzes will be due at 5:00 PM (AEST) on the Friday at the end of Weeks 3, 9 and 12.

Return Date to Students

Quiz results will be released after the completion of each attempt.

Weighting
30%

Assessment Criteria
All questions are of equal weighting. One mark will be awarded for each correct response.

Referencing Style

- Vancouver

Submission
Online

Submission Instructions
Complete each quiz by following the link on the Moodle site.

Learning Outcomes Assessed

- Describe the structure of the atom and its sub-atomic particles and relate this to the trends observed in the Periodic Table
- Apply chemical laws to explain chemical reactions and gas behaviour
- Describe types of nuclear radiation and perform half life calculations

Graduate Attributes

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

3 (2-hour) Online Test - End of Term Assessment

Assessment Type
Online Test

Task Description
This assessment will be comprised of higher-order multiple-choice questions that address the learning objectives 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 within the allocated 24-hour testing period (during the University's standard exam period) at the end of the term.
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.
More information on this assessment task will be made available on Moodle.

Assessment Due Date

You will have 2 hours to complete the assessment within the allocated 24-hour testing period at the end of the term (during the university's standard exam period). The exact date will be advised on Moodle.

Return Date to Students

Marks will be returned within 7 days of the Online Test being completed

Weighting
40%

Minimum mark or grade
50%

Assessment Criteria
All questions will be of equal weighting. Marks will be awarded for each correct response.

Referencing Style

- Vancouver

Submission
Online

Submission Instructions
The assessment will be conducted online, through the Moodle Quiz facility and will be timed. You will have 2 hours to complete the assessment within the allocated 24-hour testing period at the end of the term.

Learning Outcomes Assessed

- Describe the structure of the atom and its sub-atomic particles and relate this to the trends observed in the Periodic Table
- Apply bonding theories to explain the shape, polarity and bonding that occurs in and between molecules

- Describe the composition and synthesis of organic polymers
- Describe the nature of colligative properties
- Apply chemical laws to explain chemical reactions and gas behaviour
- Describe types of nuclear radiation and perform half life calculations

Graduate Attributes

- Communication
- 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