UNSW Course Outline

CHEM1021 Chemistry 1B: Elements, Compounds and Life - 2024

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General Course Information

Course Code : CHEM1021
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Chemistry
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

CHEM1021 covers a range of fundamental concepts that can be used to explain phenomena in

chemistry as well as the biological, medicinal, and material sciences. Students who have completed Chemistry 1A previously will build on their skills to explore topics such as kinetics, structure determination, stereochemistry, transition metal chemistry, and the study of organic chemical reactions and mechanisms. The course concludes with a capstone exploration of molecular machines, which encompasses all topics explored in Chemistry 1A and Chemistry 1B.

Students will engage with weekly digital lessons that introduce content which is extended in live lectures, problem solving workshops and tutorials. The weekly laboratory class gives students hands on experience while placing course theory into context.

Course Aims

This course will enable students to build a solid foundation in organic and inorganic chemistry, building on and complementing the concepts covered in Chemistry 1A. There is a focus on linking the theory of chemistry to real world situations such as drug development, functional materials, environmental chemistry, and renewable energies. The laboratory component aims to instill safe working practices in a chemistry laboratory and develops laboratory skills widely used in chemistry and chemistry related laboratories.

Relationship to Other Courses

Students have a choice of two courses that satisfy the second half of level one chemistry: CHEM1021 (Chemistry 1B) this course is available in T1, T2 and T3 or CHEM1041 (Higher Chemistry 1B) this course is available in T2 only.

- Both courses have the same core assessment tasks (tests, labs and exam) and assume the knowledge from CHEM1A, however in tutoirals and laboratory classes more time is taken in CHEM1021 on the fundamental principles and in CHEM1041 more time is spent on more complex content.
- CHEM1041 students are invited to participate in a series of extension workshops with assignments that are available for extra credit in the course.

Assumed Knowledge*

1. Electron configurations of atoms and ions, atomic orbital types and shapes.
2. Chemical bonding types and molecular geometries and shapes.
3. The fundamental principle of spectroscopy is that molecules can be promoted to an excited state by absorbing energy.
4. Nomenclature of organic structures.
5. Structural drawings (planar vs 3D).
6. Determine the empirical formula, molecular formula, and degrees of unsaturation from

elemental analysis.
7. Collision theory and factors that affect rates of reactions.
8. Recognition of organic functional groups: Lewis structures and nomenclature of alkanes, alkenes, alcohols, aldehydes, ketones, amines, amides, alkyl halides, benzene.

***** This assumed knowledge will be revised throughout the course but will not be the main focus of the lecture and tutorial content delivered.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Interpret qualitative and quantitate data to predict the properties and behavior of organic and inorganic chemical substances and related reactions.
CLO2 : Apply the principles of stereochemistry and spectral data analysis to determine and predict the structure, shape and spectral features for a given chemical substance.
CLO3 : Predict the products for chemical reactions of carbon compounds and propose reaction mechanisms and pathways for target compounds.
CLO4 : Synthesise substances and characterise their chemical and physical properties while maintaining safe and time-efficient laboratory practices.
CLO5 : Gather, analyse, and interpret data from first-hand scientific investigations and link this to chemical theory to draw valid conclusions to problems.

Course Learning Outcomes	Assessment Item
CLO1 : Interpret qualitative and quantitate data to predict the properties and behavior of organic and inorganic chemical substances and related reactions.	• Weekly revision quizzes • Midterm tests • Final exam
CLO2 : Apply the principles of stereochemistry and spectral data analysis to determine and predict the structure, shape and spectral features for a given chemical substance.	• Weekly revision quizzes • Midterm tests • Final exam
CLO3 : Predict the products for chemical reactions of carbon compounds and propose reaction mechanisms and pathways for target compounds.	• Weekly revision quizzes • Midterm tests • Final exam
CLO4 : Synthesise substances and characterise their chemical and physical properties while maintaining safe and time-efficient laboratory practices.	• Laboratory work
CLO5 : Gather, analyse, and interpret data from first-hand scientific investigations and link this to chemical theory to draw valid conclusions to problems.	• Laboratory work • Weekly revision quizzes • Midterm tests • Final exam

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

The learning and teaching activities in this course consist of multiple teaching methods and

modes of instruction which are delivered through a blended approach including Lectures, Tutorials, and Laboratories.

This course has been designed to engage you in learning by contextualising the material to students' prior experiences and knowledge. In addition, course content will be supplemented with interesting examples from research and industry. The laboratory component of this course will enable you to develop a proficiency in core chemistry laboratory skills while engaging in challenging and interesting laboratory practicals. In addition, this component of the course will contribute to the development of your higher-order analytical skills, while providing opportunity for cooperative learning with your peers.

Lectures and workshop

There are 4 hours of lectures and workshops each week. You may enrol in either the online stream or in person attendance. We recommend attending in person.

Lecture recordings will made available via the Lecture Recordings+ link on Moodle. However, there is no guarantee that the lecture recording software will capture the class correctly.

Tutorials

Each week you'll join a small-group online tutorial in which you will work collaboratively with your classmates on problems related to the previous week's topic. You are required to read through the tutorials in advance and identify questions that you would like the tutor to assist with answering. You are also encouraged to ask any further questions you might have regarding the focus topic.

Laboratory Classes

The laboratory classes provide an opportunity to learn the concepts and practice the calculations presented in lectures. Laboratory classes are also the place to learn practical skills and they are also the place where those skills are assessed.

You must **READ THE INTRODUCTION IN THE LABORATORY MANUAL** to be aware of all the requirements for passing the laboratory component of this course. Here are some of the main points regarding laboratory classes:

- The following items of personal protective equipment (PPE) must be worn at all times in the laboratory:

- safety eyewear
- a laboratory coat
- fully enclosed footwear

You will not be permitted to work in thongs or open-top shoes or sandals or without a laboratory coat, or safety eyewear.

- The schedule of experiments can be found on page 4 of the lab manual.
- All experiments require pre-lab work to be completed before your lab class.
- You must attend the laboratory class shown on your official timetable.
- You must arrive at the laboratory on time or you will be excluded from the class.

Repeat students must apply to the First Year Laboratory Coordinator before the end of week 2 if they want exemption from laboratory classes. Exemption is not automatic and is decided on a case-by-case basis. Each week you will have a 3-hour lab class which will begin with a discussion of questions from a worksheet with the assistance of your instructor. In the second and third hours of the lab class you will complete a report using observations provided in Moodle, again with guidance from your instructor. In the last 30 minutes of the lab class a quiz, based on the worksheet and report, will open in Moodle 11 to assess you on the content of the week's lab topic. You should check your UNSW timetable for the time of your lab class - you must attend the lab class you registered for.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Laboratory work Assessment Format: Individual	20%	Due Date: Weekly in lab class
Weekly revision quizzes Assessment Format: Individual	10%	Start Date: Every Friday at 9:00 AM (Wk 1-5,7-9) Due Date: Every Monday at 9:00 AM (Wk 2-6,8-11)
Midterm tests Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Week 5 and Week 9 during the exam timeslot
Final exam Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: See Exam Schedule closer to Exam Period

Assessment Details

Laboratory work

Assessment Overview

The laboratory classes are designed to provide you with practical experience in the lab as well as developing your observational and data analysis skills. You will be provided with feedback on your progress from your demonstrator during lab classes as well as through a personalized feedback web page that allows you to track and visualize your skill development.

You are required to attend a minimum of 6/8 laboratory classes to meet the hurdle pass requirement for this course.

Laboratory work is assessed in two parts:

Core skills: You are required to achieve all core skills as a hurdle requirement to pass this course. You will be given multiple opportunities across several lab classes to demonstrate each core skill. Your demonstrator will communicate with you when you have been marked as competent for a given skill. Once you have achieved all the core skills required in the lab you will be awarded 10% course marks.

Non-core skills: Each of the 8 laboratory exercises will require you to complete questions in your lab book relating to the non-core skills listed for that lab. You will submit at the end of the lab class for marking by your demonstrator. The grades for these are tracked on your personalised feedback page and will total 10% course marks across the 8 laboratory classes.

Course Learning Outcomes

- CLO4 : Synthesise substances and characterise their chemical and physical properties while maintaining safe and time-efficient laboratory practices.
- CLO5 : Gather, analyse, and interpret data from first-hand scientific investigations and link this to chemical theory to draw valid conclusions to problems.

Hurdle rules

You must attend a minimum of 6 laboratory classes, and obtain all core skills to be eligible to pass this course.

Weekly revision quizzes

Assessment Overview

There are 9 weekly revision quizzes that you must complete in the week following the delivery of

the topic in lecture classes. These are designed to assess the fundamental principles covered in the online lesson and lectures for each topic. The number of questions in this quiz varies depending on the topic and is typically 2-8 related questions. You have 3 attempts at each quiz, with the highest mark counted. Feedback for each question and hints are provided after each attempt. Your best 7 quiz marks will be added together and then scaled to a mark out of 10%.

Course Learning Outcomes

- CLO1 : Interpret qualitative and quantitate data to predict the properties and behavior of organic and inorganic chemical substances and related reactions.
- CLO2 : Apply the principles of stereochemistry and spectral data analysis to determine and predict the structure, shape and spectral features for a given chemical substance.
- CLO3 : Predict the products for chemical reactions of carbon compounds and propose reaction mechanisms and pathways for target compounds.
- CLO5 : Gather, analyse, and interpret data from first-hand scientific investigations and link this to chemical theory to draw valid conclusions to problems.

Detailed Assessment Description

Please see Assesment Hub on Moodle for details of the flexible extentions available for this task.

Midterm tests

Assessment Overview

There are two midterm tests that are designed as opportunities to obtain feedback on your learning of the core concepts covered in the course from topics 1-4 (Midterm test 1, usually scheduled in week 5) and topics 5-8 (Midterm test 2, usually scheduled in week 9).

Feedback is provided as a list of learning outcomes that correspond to your incorrect answers to help identify areas for further review.

Course Learning Outcomes

- CLO1 : Interpret qualitative and quantitate data to predict the properties and behavior of organic and inorganic chemical substances and related reactions.
- CLO2 : Apply the principles of stereochemistry and spectral data analysis to determine and predict the structure, shape and spectral features for a given chemical substance.
- CLO3 : Predict the products for chemical reactions of carbon compounds and propose reaction mechanisms and pathways for target compounds.
- CLO5 : Gather, analyse, and interpret data from first-hand scientific investigations and link this to chemical theory to draw valid conclusions to problems.

Detailed Assessment Description

The mid term test are held IN PERSON at the venue that appears in your course timetable for the

'EXAM' session in weeks 5 and 9

Students are required to bring the following equipment with them to both tests

- UNSW student ID card
- A 2B pencil
- An eraser
- A pen
- A scientific calculator (UNSW approved)

Students may also choose to bring the following

- A small molecular model
- A bottle of water

No other material is permitted at your desk during the test time. If you require your mobile phone to control medical devices please contact firstyearchem@unsw.edu.au BEFORE the test sitting.

Hurdle rules

You must achieve a minimum weighted average of 35 percent across the mid-term tests and final exam.

Final exam

Assessment Overview

The final exam is designed to summarise all topics and material covered in the course, including material from lectures, tutorials and labs. The exam is typically 2 hours 10 minutes and consists of MCQ, short numerical, chemical mechanism and short answer style responses - details will be confirmed during the course. The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Interpret qualitative and quantitate data to predict the properties and behavior of organic and inorganic chemical substances and related reactions.
- CLO2 : Apply the principles of stereochemistry and spectral data analysis to determine and predict the structure, shape and spectral features for a given chemical substance.
- CLO3 : Predict the products for chemical reactions of carbon compounds and propose reaction mechanisms and pathways for target compounds.
- CLO5 : Gather, analyse, and interpret data from first-hand scientific investigations and link this to chemical theory to draw valid conclusions to problems.

Detailed Assessment Description

You will complete the final exam online on Moodle. This wil require the use of a drawing tool

called 'chemDoodle'. Detailed instructions and self guided tutorials are available on Moodle. It is your responsibility to ensure you are comfortable wiht using this tool before your final exam.

Hurdle rules

You must achieve a minimum weighted average of 35 percent across the mid-term tests and final exam.

General Assessment Information

Grading Basis

Standard

Requirements to pass course

- You must attend a minimum of 6 laboratory classes
- You must be awarded all core laboratory skills (see laboratory manual for more details)
- You must achieve a mark of at least 35.0%, weight-averaged across the mid-term tests and the final exam (24.5/70)
- You must achieve a course mark of at least 50

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Inorganic Chemistry I – Transition metal complexes – d electron counts, coordination complexes and stability
	Tutorial	No Tutorial class this week.
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
Week 2 : 3 June - 9 June	Lecture	Inorganic Chemistry II – Crystal field theory, colour and magnetism
	Tutorial	Metal Complexes
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
	Assessment	Revision Quiz: "Course Orientation" due 9am Monday
Week 3 : 10 June - 16 June	Lecture	Isomerism and stereochemistry of organic and metal complex compounds
	Tutorial	Crystal Field Theory
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
	Assessment	Revision Quiz: "Inorganic I" due 9am Monday
Week 4 : 17 June - 23 June	Lecture	Structure determination - Interpreting and predicting IR, MS and NMR spectra
	Tutorial	Stereochemistry and Isomerism
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
	Assessment	Revision Quiz: "Inorganic II " due 9am Monday
Week 5 : 24 June - 30 June	Lecture	Kinetics - Integrated rate laws, half-lives, and reaction coordinate diagrams
	Tutorial	Structure determination
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
	Assessment	Revision Quiz: "Isomerism and stereochemistry" due 9am Monday
	Assessment	Mid-term Test 1 - IN PERSON
Week 6 : 1 July - 7 July	Other	Flexibility Week - No classes.
	Laboratory	Make-up labs (if required).
	Assessment	Revision Quiz: "Spectroscopy" due 9am Monday
Week 7 : 8 July - 14 July	Lecture	Organic chemistry I - Identifying electrophiles and nucleophiles, Predicting nucleophilic addition reactions
	Tutorial	Chemical Kinetics
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
Week 8 : 15 July - 21 July	Lecture	Organic chemistry II - Nucleophilic substitution reactions, SN1 and SN2 mechanisms
	Tutorial	Nucleophiles / Electrophiles, Curly Arrows, and Nucleophilic Addition to C=O
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
	Assessment	Revision Quiz: "Kinetics" due 9am Monday
Week 9 : 22 July - 28 July	Lecture	Organic chemistry III - Electrophilic addition reactions and stereochemical outcomes, electrophilic aromatic substitution reactions, resonance stabilisation
	Laboratory	Laboratory classes (3 hr) run most weeks during Term. See Lab Manual.
	Tutorial	Organic chemistry II
	Assessment	Revision Quiz: "Curly arrows & carbonyl chemistry" due 9am Monday
	Assessment	Mid-term Test 2 - IN PERSON
Week 10 : 29 July - 4 August	Lecture	Capstone - Multistep Synthesis and Molecular machines
	Tutorial	Organic chemistry III
	Laboratory	Make-up labs (if required).
	Assessment	Revision Quiz: "Alcohols & Alkyl Halides" due Monday 9am
Week 11 : 5 August - 11 August	Assessment	Revision Quiz: "Reactions of Alkenes & Aromatic Chemistry" due 9am Monday

Attendance Requirements

Laboratory class attendance is compulsory.

General Schedule Information

- The times and locations of classes can be found on myUNSW.
- You MUST attend the tutorial and laboratory times shown on your official timetable.

Course Resources

Prescribed Resources

Laboratory Manual and Tutorial Notes

- A printed course pack is available to purchase in book shop, or digital files can be downloaded from Moodle
- Note you must bring a blank printed copy of the relevant lab report to your weekly lab classes.

Recommended Resources

Blackman, Bottle, Schmid, Mocerino and Wille, "Chemistry," 5th Ed., Wiley.

- This is the recommended text for CHEM1A and CHEM1B
- This book is available in print through the UNSW Bookshop: https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9780730396673 or in print or as a digital copy from Wiley Direct Online: https://www.wileydirect.com.au/buy/chemistry

Aylward and Findlay, "SI Chemical Data," 6th Ed. or later

- Not essential to purchase, though recommended for chemistry majors. Available from the UNSW Bookshop: https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9780730302469

Both books can be purchased in a pack: https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9780730371526

Additional Costs

The following PPE must be supplied by students:

- Cotton button up lab coat
- Safety glasses

These can be purchased in the bookshop or grad store on campus or external retailers (eg

hardware stores).

Course Evaluation and Development

Feedback: Students requested more revision material

Action: All topics now have a set of revision questions in addition to the weekly workshop questions and tutorials.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Year coordinator	Shannan Maisey		Please email firstyearchem@unsw.edu.au unless inquiry is highly personal.		Mon - Fri (business hours)	Yes	No
Lecturer	John Stride		Lecturer (Weeks 1–5)		Mon - Fri (business hours)	No	No
Lab director	Ron Haines				Mon - Fri (business hours)	No	No
Administrator	First Year Support			9385-4651	Mon - Fri (business hours)	No	Yes
Lecturer	Karin Schaffarczyk McHale		Lecturer (Weeks 7-10)		Mon- Fri (Bussiness hours)	No	No

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.
Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct

Submission of Assessment Tasks

Penalty for Late Submissions
UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: UNSW has a "fit to sit/submit" rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre
- Science EDI Student Initiatives, Offerings and Guidelines

School-specific Information

UNSW Changes to Special Consideration: Short Extension

The School of Chemistry has carefully reviewed all of its assessments to determine whether they are suitable for automatic short extensions as set out by the UNSW Short Extension Policy. The current deadline structures for all assessment tasks in the School of Chemistry already accommodate the possibility of unexpected circumstances that may lead students to require

additional time for submission. **The School of Chemistry has opted out of the UNSW Short Extension provision for all its courses,** and we have already integrated flexibility into our assessment deadlines. This decision is subject to revision in response to the introduction of new course offerings. All students may still apply for Special Consideration for any assessment via the usual procedures.

School Contact Information

Level 1, Dalton Building (F12)

W: www.chemistry.unsw.edu.au

Also see: ***Contacts and Support*** section of the course Moodle page (where applicable)