

General Course Information

CHEM 111–24S1 Chemical Principles and Processes

0.125 EFTS 15 Points
First Semester 2024

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Course Description

This course deals with a series of topics in physical and inorganic chemistry and is a prerequisite for those students wishing to proceed to a BSc majoring in Chemistry or majoring in other subjects while including advanced chemistry courses. This course also meets the chemistry requirement for entry into the BE (Hons) degree.

Topics covered are: atoms and the periodic table; chemical bonding; reduction and oxidation reactions; properties of gases; introduction to thermodynamics; kinetics; chemical equilibrium; Gibbs energy and the second law of thermodynamics; aqueous chemistry; acid-base equilibrium.

Students should note that in the Science Faculty the average student should undertake approximately three hours of additional study for each hour of lectures at the 100-level.

Prerequisites

The prerequisites for CHEM111 are:

- 1) NCEA: at least 14 level-3 credits in Chemistry, or
- 2) CIE: at least a D grade in A Level Chemistry, or at least an A grade in ASL Chemistry, or
- 3) IB: at least Grade 4 in HL Chemistry or Grade 6 in SL Chemistry
- 4) CHEM114, or
- 5) at least B+ grade in TRNS006, or
- 6) equivalent preparation approved by the Head of School.

Goals of the Course

To provide a solid understanding of basic principles of physical chemistry and related areas.

Course Coordinator

A/Prof Owen Curnow, owen.curnow@canterbury.ac.nz

Contact Owen for general course queries.

Laboratory coordinators

Dr Anthea Lees, chemistry111@canterbury.ac.nz

Contact Anthea for morning lab session queries.

Dr Justine Cottam chemistry111@canterbury.ac.nz

Contact Justine for afternoon lab session queries.

Lecturers (list of topics is on pages 8 & 9)

- A/Prof Owen Curnow (topics 1 to 3): owen.curnow@canterbury.ac.nz
- A/Prof Laura Revell (topic 4): laura.revell@canterbury.ac.nz
- A/Prof Deborah Crittenden (topics 5, 6 and 7): deborah.crittenden@canterbury.ac.nz
- A/Prof Greg Russell (topic 8): greg.russell@canterbury.ac.nz
- A/Prof Owen Curnow (topics 9 & 10): owen.curnow@canterbury.ac.nz

Timetable

36 Lectures and 12 tutorials: Check the web (<https://courseinfo.canterbury.ac.nz/> and enter CHEM111 for confirmation of times and venues for the semester, *which may be subject to change*. Generally, three lectures and one tutorial will be held each week each week in the time slots labelled Lectures A-D. Some lecturers may instead incorporate their tutorials into their lectures.

Assessment

- | | |
|---------------------------------------|-----|
| • Laboratory (including safety quiz): | 15% |
| • <i>BestChoice</i> on-line problems: | 5% |
| • Mid-semester test: | 30% |
| • Final exam: | 50% |

Failure to achieve a mark of at least 40% in the final exam will result in a grade no higher than a restricted pass (R grade). The school reserves the right to adjust this mark/grade conversion, up or down, to achieve consistency of assessment standards.

Examination and Test

- **Test:** Mid semester, 1.5 hours duration, Tuesday 23 April from 7 pm, venues to be announced.
- **Exam:** End of semester, 2.5 hours duration, time and venue to be advised.

BestChoice on-line problems: *BestChoice* is a computer-based service provided by the University of Auckland. It contains a comprehensive selection of exercises ("topics") that cover most aspects of CHEM111 course material. You should use these topics both to reinforce the lecture material and also as revision for tests and exams. You are required to achieve a total of **at least 1300 marks** in the **assessable topics** (marked with orange flags to the right on the *BestChoice* website) to obtain the maximum 5% grade allocated for *BestChoice*. There are also additional **revision topics** available that you may find useful but which do not count towards your final grade. These are indicated by the preface "More" and are not marked by an orange flag.

The total marks available from the assessable section is approximately 2,250. If you collect fewer than 1300, you will be given a proportionate assessment mark, e.g. 650 marks would translate to 2.5 out of 5, because 650 is half of 1,300. Note that many *BestChoice* questions are worth 5–10 marks, with one mark being assigned for each step of working. Also note that if you get a *BestChoice* question wrong, then you may try again to get it correct. As long as you eventually get the correct answer, this will be logged as a correct answer for your assessment mark.

There are no weekly deadlines for completing *BestChoice* questions. Rather, you should complete these questions at your own pace and according to your own needs. In other words, it is self-directed learning. However, it is clearly desirable to work consistently with *BestChoice*, striving to achieve at least 100 marks every week. The only **deadline** in terms of marks is **on midnight after the final exam** for the course.

PALS

PALS are casual group study sessions held every week; they are hosted by PALS Leaders who are past successful students of CHEM111 in their 2nd or 3rd year. PALS is a central place for you to stay up to date with the material. PALS sessions are a great opportunity to have a regular study time and space in your week to study for CHEM111, and we encourage you to pick a session to attend every week. Attending each week will allow you to hold yourself accountable with your study, stay up to date with content, work through your Bestchoice questions and go over any sticky points with PALS Leaders before moving on to the next topic! PALS sessions start in Week 3 of Term 1, they are open to everyone. :)

Bethany Kaye-Blake (pals@canterbury.ac.nz) is the PALS Subject Lead for engineering and science if you have any questions about PALS, or you can visit the PALS section on the CHEM111 Learn page.

Textbook

The course textbook is *Chemistry*³ by Burrows *et al.* [UC bookshop offers 4th edition for sale.](#)

Earlier editions, either the 2nd or 3rd edition may be used too.

It is recommended that students have a copy.

Learning Outcomes

Develop skills in the critical analysis of chemical information

Develop problem-solving skills in chemistry

Enhance applied mathematical skills relevant to chemistry

Develop a working understanding of:

- Atomic structure and periodicity
- Chemical bonding and material properties
- Chemical reactions, especially redox reactions
- Quantities and dimensions (IUPAC conventions and SI units)
- Physical models and the properties of gases
- Thermochemistry, including the 1st law of thermodynamics
- Entropy and the 2nd and 3rd laws of thermodynamics
- Gibbs energy and its relationship to chemical equilibrium
- Chemical kinetics, reaction mechanisms and integrated rate laws
- Equilibria, equilibrium constants and Le Châtelier's principle
- The chemistry of water
- Acid-base equilibria

Laboratory Information

All CHEM111 laboratory sessions are compulsory and assessed; worth 15% of your total mark.

If your overall completion of laboratories is judged unsatisfactory you will not be given a pass in the laboratory course and will FAIL CHEM111.

Laboratory Coordinators

For all queries, please contact the laboratory coordinators Dr Anthea Lees and Dr Justine Cottam at the email address chem111@canterbury.ac.nz

Laboratory allocation

- You must allocate yourself to a lab stream through MyTimetable before the laboratory classes begin. If you do not do this before the start of term you will be allocated into a laboratory class.
- If you enrol late and your lab session does not appear on your timetable, or there is a clash, you will also need to contact the laboratory coordinators (at chemistry111@canterbury.ac.nz) to be assigned to a lab stream.
- **The first laboratory is held either in Week 2 of semester one (S1) or Week 1 of semester two (S2).** The laboratories will be held in 419 on Level 4 of the Ernest Rutherford Building. **Attend the laboratory group to which you are assigned.**

Laboratory Organization

Each laboratory is overseen by a laboratory supervisor. They will be accompanied by demonstrators and together they will be responsible for grading your lab assignments and answering queries. If you encounter difficulties during the laboratory please consult any demonstrator, the supervisor, or the laboratory coordinators.

Dress correctly for the Laboratory

Safety glasses and laboratory coats are not provided but can be purchased:

Approved safety glasses and laboratory coats may be purchased from the University Shop at:
<https://www.canterbury.ac.nz/science/current-students/shop/>

Laboratory coats can be collected before the start of term on the following dates:
(please ensure you bring your Student ID with you, and your receipt number):

Thursday 15th February and Friday 16th February between the hours of 9.00 – 10.00am and:

First two weeks of Term 1: 19th February to 23rd February and 26th February to 1st March,
Mon - Fri between the hours of 8.30 – 9.30am or 12.30 – 1.30pm

From 4th March, pickup will be from same venue on Tuesday and Thursday, 1.30 – 2.00pm

Coats and glasses can be collected inside the southern entry to the Ernest Rutherford Building

Physical and Chemical Pickup location is: Ernest Rutherford, Chemistry Stores, 130A.

Note: covered shoes must be worn in the store area.

TIP: Coats need to be tried on for fit so do not leave pickup until the last minute before your lab class

You must put **safety glasses on before entering any laboratory** and they must be always worn. If you normally wear prescription glasses, you must either wear clear plastic safety glasses over them or they must have lenses of plastic or toughened glass and be fitted with side-protectors. You must leave your safety glasses on at all times when you are in the laboratory.

Laboratory coats must be always worn in the laboratory and be fully done up.

Suitable footwear must be worn at all times in the laboratory. This means footwear **that is closed to spills and that covers all of your feet. No open-topped, open-toed, or backless footwear – and absolutely no gumboots, jandals or sandals.** Students who come to a laboratory in bare feet or unsuitable footwear will not be allowed to enter the laboratory.

Laboratory Manuals

A hard copy of your CHEM111 laboratory manual will be given to you when you collect your laboratory coats and safety glasses. An electronic copy can be downloaded from the Course information and Assessment sections of the CHEM111 AKO|LEARN website. You are required to read and understand the introduction, theory, and experimental sections for each experiment in your laboratory manual.

Safety Quiz

All students must complete an online Safety Quiz prior to their first laboratory. Details of this will be given in your lectures and on the CHEM111 AKO|LEARN website.

Experiment videos and pre-lab questions.

Experiment videos (and skills videos) will be available online before each laboratory. You must watch each video and answer written pre-laboratory questions in your laboratory manual BEFORE attending your laboratory class. Pre-laboratory answers will be checked as you enter the laboratory. MINUS 4 marks for non-completion/not completed to an acceptable standard (no exceptions).

You will also be expected to read a PowerPoint file and watch the experimental skills video BEFORE attending the laboratory class (details will be provided on the CHEM111 AKO|LEARN page on the week of your laboratory class). For each experiment you will be supplied with a results sheet for the week's experiment which you need to complete in the lab and hand in for marking. These are marked and returned to you in the following laboratory. If you have any queries please contact your senior demonstrator.

Laboratory Assessment

During the course you will be expected to become proficient at common laboratory techniques such as weighing, titrating, making observations, recording data, making calculations, and interpreting results. Your supervisor and demonstrators will assess your performance in these areas, and your general attitude, application, and organisation in the laboratory. This means your weekly mark will not purely be on the basis of what is written in your report sheet.

During the first laboratory session, you will be instructed about laboratory procedures and safety.

Each week you complete a report sheet and hand it in to your demonstrators before leaving. Your demonstrators will grade and return it to you at the next laboratory session. **You must retain your report sheets after marking because: (a) they represent proof that you attended the laboratory that week and (b) some of the test/exam questions will be based on laboratory experiments.**

Attendance at Laboratory Classes

You are expected to attend every laboratory session. A satisfactory record of attendance and performance at laboratory classes is a condition for passing the course. Students who are unable to attend their laboratory in a particular week because of an unavoidable commitment should, in the first instance, contact the laboratory coordinators (chemistry111@canterbury.ac.nz) and attempt to arrange attendance at one of the other times that same week. (Please note that you cannot make up the missing lab the following week.)

If you miss the safety talk at the start of the laboratory, you will not be able to do the experiment and will be assigned zero marks for that session. Ensure you arrive in good time for the start of class.

Unexcused Absences

This may constitute an unsatisfactory record and result in you failing the laboratory requirement and hence CHEM111. At the very least, they will lead to your being assigned a mark of zero for the experiment and will degrade your final mark.

Absence Due to Illness

This will be excused, provided a medical certificate from a registered medical practitioner, registered dental surgeon, registered midwife or a student counsellor is presented at the next laboratory attended.

Absence Due to Attendance at a National Sporting or Cultural Event

Contact the course coordinators (chemistry111@canterbury.ac.nz) well in advance of the event and with suitable documentation. You may be excused attendance at that week's laboratory, but it is not guaranteed.

Bags

These may be stored in lockers outside the lab. They must not be taken into the lab although computers may be stored on the side benches and it is recommended valuables should remain with you.

Food or drink

This may not be consumed in the laboratory. Water bottles are not allowed in the laboratory.

Smoking and vaping

This is prohibited everywhere on the university campus.

No headphones or ear buds to be worn in laboratories.

Permitted Personnel

Only those students who are enrolled in CHEM114 are permitted to enter the laboratories. You must not bring anyone else into the laboratories. Anyone waiting for you must do so outside the laboratory rooms.

Hair

Must be tied up and securely fastened off the face or put securely under a beanie.

Policy on 'Dishonest Practice' | Ngā Takahitanga me ngā Tinihanga

The University has strict guidelines regarding 'dishonest practice' and 'breach of instructions' in relation to the completion and submission of examinable material. In cases where dishonest practice is involved in tests or other work submitted for credit, a department may choose to not mark such work – see the online guidelines in relation to '[Academic Integrity](#)'.

The School of Physical and Chemical Sciences upholds this policy. It considers plagiarism, collusion, copying and ghost writing – all detailed below – to be unacceptable and dishonest practices:

- **Plagiarism | Tārua Whānako** is the presentation of any material (text, data or figures, on any medium including computer files) from any other source without clear and adequate acknowledgement of the source. Note that the use of **AI generative tools such as ChatGPT** for assessment work is *strictly forbidden*, except where the lecturer concerned has specifically granted approval.
- **Collusion** is the presentation of work performed in whole, or in part, in conjunction with another person or persons, but submitted as if it has been completed by the named author alone. This interpretation is not intended to discourage students from having discussions about how to approach an assigned task and incorporating general ideas that come from those discussions into their own individual submissions, but acknowledgement is necessary.
- **Copying** is the use of material (in any medium, including computer files) produced by another person or persons with or without their knowledge and approval. **This includes copying of the lab reports (raw data may be shared within the group if permitted or required by the experiment) – data analysis and interpretation of obtained results MUST be performed individually.**
- **Ghost writing** is the use of other person(s) (whether with or without payment) to prepare all or part of an item of work submitted for assessment.

Special consideration of assessment | Ngā Pairuri Motuhake

'[Special Consideration](#)' for an item of assessment is for students who have covered the work involved but have been prevented from demonstrating their knowledge or skills at the time of the assessment due to unforeseen circumstances, whether illness, injury, bereavement, car crash or any other extenuating circumstance *beyond one's control*. Special Consideration for a test/exam may be because a student has not sat it or has done so with impaired performance. Applications can be submitted via the above link and must be made **no later than five working days after the assessment due date**. Note that special consideration is **not available for items worth less than 10% of the overall course mark**. In the case of illness or injury, medical consultation should normally have taken place either shortly before or within 24 hours after the due date for the required work or test/examination.

Note that you may be required to sit a special exam or your grade may not be changed if there is insufficient evidence of your performance from other invigilated assessment items in the course. **You have the right to appeal any decision.**

It is important to understand that Special Consideration is only available *where course work has been covered*, and the inability to demonstrate this fully is both *no longer possible* AND is due to *unexpected circumstances beyond one's control*. Thus Special Consideration is **NOT available for**:

- essays, assignments or quizzes where an extension of time is available to complete the assessment item (see below for the process to involved);
- missed lectures during the semester;
- experiencing examination anxiety;
- having several examinations or assessments close together;
- known impairment, such as chronic illness (medical or psychological), injury or disability unless medical evidence confirms that the circumstances were exacerbated, despite appropriate management, at the time of assessment;
- mistaking the date or time of an examination (this is a circumstance one can control!);
- failing to turn up to an examination or test because of sleeping in (a circumstance as above!);
- where applications are repeatedly made for the same or similar reason, then the application may be declined on the grounds that the reason is not unexpected;
- where the application is made at the time of the assessment but the supporting documentation is received significantly after this date or after the date results are released; or
- the application is made following the release of results (unless under exceptional circumstances).

Extensions of deadlines | Tononga Wā Āpiti

Where an extension may be granted for an assessment item, this will be decided by application to the course co-ordinator and/or the lecturer concerned.

Late withdrawal from a course

If you are prevented by extenuating circumstances from completing the course after the final date for withdrawing from the course, you may apply for special consideration for late discontinuation. For details on special consideration, or to make an application, refer to the Examinations Office website <http://www.canterbury.ac.nz/exams/>. Applications must be submitted **within five days** of the end of the main examination period for the semester.

Missing of tests | Te Matangaro i ngā Whakamātautau

In rare cases a student will not be able to sit a test. In such cases, the student should consult with the course co-ordinator to arrange alternative procedures. **This must be done well in advance of the set date for the test.**

Past tests and exams

Past tests can be found on our [Chemistry Undergraduate](#) website. Past exams can be found on the [Library website](#).

Submission of reports and assignments

Reports (including lab reports) and assignments should be handed in on time. Extensions will be granted only in exceptional circumstances (such as illness or bereavement). If an extension is required, as early as possible you should request it from the lecturer concerned.

Note: If you do not submit an assignment for assessment, you will be allotted zero marks, which will affect your final result. You should ensure that you pick up marked assignments and keep them until the end of the course as evidence that the work was completed and marked in the case that either is disputed. To guard against accidental loss, it would be prudent to keep photocopies or electronic copies of anything submitted.

Late Work

Acceptance of late work for assessment will be at the discretion of the course coordinator and/or the lecturer concerned. If your assessment is likely to be late, please contact the relevant of these people **before the assessment is due**. Never assume that an extension will be automatically granted – some courses have the policy of no late work being accepted. A commonly exercised policy is to deduct 10% of the total marks for each day that the work is late, where weekends and public holidays also count as such days.

Marks and Grades | Taumata Ako

The following numbers should be considered as a guide to the expected grades under normal circumstances.

Please note that for all invigilated assessments (tests and exams) worth 33% and above, failure to obtain a mark of at least 40% will result in a final grade no higher than an R at 100 and 200 level; in general this requirement will not be applied at 300 level, but if it is then the course coordinator will inform the class and it will result in a final grade no higher than a C–.

Grade:	A+	A	A–	B+	B	B–	C+	C	C–	D	E
Minimum mark %:	90	85	80	75	70	65	60	55	50	40	0

The School reserves the right to adjust this mark/grade conversion, up or down, to achieve consistency of assessments standards.

Reconsideration of Grades

Students should, in the first instance, speak to the course co-ordinator about their marks. If they cannot reach an agreeable solution, or have questions about their grade in a course, students should then speak to the Director of Undergraduate Studies, [Assoc Prof Greg Russell](#). Students can appeal any decision made on their final grade. You can apply at the Registry for reconsideration of the final grade within four weeks of the date of publication of final results. Be aware that there are time limits for each step of the appeals process.

Student Accessibility Services | Te Whaikaha

Students can speak with someone at [Student Accessibility Service](#), phone: 369 3334 (or ext. 93334), email: sas@canterbury.ac.nz.

Academic Advice

[Assoc Prof Greg Russell](#) is the coordinator of undergraduate chemistry courses. His interest is in the academic performance and well-being of all such students. Anyone experiencing problems with their chemistry courses or requiring guidance about their B.Sc. in Chemistry should get in contact with Greg.

Staff-Class Rep Liaison

[Assoc Prof Greg Russell](#) is in charge of liaison with students in chemistry courses. Your class will appoint a student representative to the liaison committee at the start of the semester. Please feel free to talk to the Academic Liaison or the student rep about any problems or concerns that you might have.

Greg Russell (greg.russell@canterbury.ac.nz, tel. 369 5129)

Director of Undergraduate Studies

School of Physical and Chemical Sciences

2024