

General Course Information

CHEM 111–24S2 Chemical Principles and Processes

0.125 EFTS 15 Points
Second 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 coordinator

Dr Anthea Lees, chemistry111@canterbury.ac.nz

Contact Anthea for laboratory queries.

Lecturers (list of topics is in the Detailed Course Objectives document on Learn)

- A/Prof Vladimir Golovko (topics 1 to 3): vladimir.golovko@canterbury.ac.nz
- Prof Paul Kruger (topic 4): paul.kruger@canterbury.ac.nz
- A/Prof Greg Russell (topic 5): greg.russell@canterbury.ac.nz
- A/Prof Laura Revell (topic 6): laura.revell@canterbury.ac.nz
- A/Prof Greg Russell (topics 7 and 8): greg.russell@canterbury.ac.nz
- Prof Ian Shaw (topics 9 & 10): ian.shaw@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

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|---------------------------------------|-----|
| • 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, Monday 16 September from 7 pm, venues to be announced.
- **Exam:** End of semester, 2.5 hours duration, time and venues 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 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 3, 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 Coordinator

For all queries, please contact the CHEM111 laboratory coordinator Dr Anthea Lees at the email address chemistry111@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 coordinator (at chemistry111@canterbury.ac.nz) to be assigned to a lab stream.
- **The first laboratory is held in 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 senior demonstrator who will deliver a safety talk. 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 them.

Safety Glasses and Laboratory Coats

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

Online Purchase

Safety glasses and laboratory coats are not provided and must 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/>

Collection

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):

Week 0 (11th & 12th): 9.00am – 10.00am

Weeks 1 and 2: 8.30 – 9.30am and 12.30 – 1.30pm

From Week 3: Tuesdays and Thursdays only, 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.

Covered shoes must be worn in the store area.

Dress Correctly for the Laboratory

You must put your **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 your glasses must have lenses of plastic or toughened glass and be fitted with side-protectors. You must wear your safety glasses 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.

You will not be allowed entry to the laboratory wearing gumboots, jandals, sandals, Crocs or Ugg boots.

Laboratory Manuals

A hard copy of your CHEM111 laboratory manual will be given to you when you collect your laboratory coats and safety glasses and boxes of manuals will also be available for collection from outside ER421 from Week 0. 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 and answer pre-lab questions.

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. A new safety quiz needs to be completed for each chemistry course (CHEM114, CHEM111 & CHEM112) and this forms part of your final laboratory grade.

Experiment videos, information files, pre-lab questions and results sheets.

Experiment videos (and skills videos) and experiment information files will be available on the CHEM111 AKO|LEARN website before each laboratory. You must watch each experiment 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).**

Experiment information files will help you complete your results sheets in the laboratory so you should download these and bring them to your laboratory class. You will be given a results sheet for the week's experiment which you need to complete in the laboratory and hand in for marking. These are marked and returned to you in the following laboratory. If you have any queries, please contact your demonstrators or the laboratory coordinator Anthea.

Laboratory Assessment

During the course you will 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. Your weekly mark will not just be on 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 must 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 contact the laboratory coordinator (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 you need to talk to the demonstrators who will contact the laboratory coordinator. Ensure you arrive in good time for the start of lab class.

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. **Multiple medical certificates may constitute unsatisfactory laboratory performance.**

Absence Due to Attendance at a National Sporting or Cultural Event

Contact the laboratory coordinator (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. Computers may be stored on the side benches, and it is recommended valuables should remain with you.

Food and drink

No food or drink can be consumed in the laboratory (including gum). Water bottles are not allowed in the laboratory.

Smoking and vaping

This is prohibited everywhere on the university campus.

No headphones or ear buds/air pods 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.

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
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