Faculty of Science Course Syllabus
Department of Chemistry
CHEM 1012/1022 - Concepts in Chemistry: Energy and Equilibrium

Welcome to Chemistry 1012/1022! We have put together a comprehensive course syllabus that will address any question you may have throughout the term. A course syllabus is meant to act as a guide, but also serves as a contract between you and your instructors, for you to set your expectations of the course and prepare yourself accordingly for the semester. Please make use of the following table of contents (with links) when navigating the course syllabus and reviewing the course due dates and policies. We hope you have an enjoyable experience in First Year Chemistry and look forward to having a productive semester.

The teaching team is proudly here to facilitate your learning. We acknowledge that this summer session of the course is fast paced and may present an intense learning experience (for both students and teaching team). While difficult, it is an opportunity to develop your independent time management and work ethic skills. Please seek support as needed! We are here to support you in this course.

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Land Acknowledgement

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights in Canada.

African Nova Scotian Acknowledgement

We recognize that African Nova Scotians are a distinct people whose histories, legacies and contributions have enriched that part of Mi'kma'ki known as Nova Scotia for over 400 years.

Section 1: General Course Information

Who to Contact?

If you have questions about Chem 1012/1022 please do not hesitate to contact one of the First Year Chemistry Coordinators. The best way to contact the First Year Chemistry Coordinators is by **email.** When emailing a course coordinator, please use your **Dalhousie email account** for all course correspondence. Please allow up to **3 business days** for a response and note that emails sent in the evening or on weekends may not be seen until the next business day.

For inquiries about the **Laboratory** portion of the course, please contact:

Dr. Jennifer MacDonald
(pronouns: she/her)
First Year Chemistry Lab Coordinator

Email: chemlab@dal.ca

For **all other inquiries** regarding the course, please contact:

Dr. Angela Crane-Garnier
(pronouns: she/her)
First Year Chemistry Course Coordinator

Email: chemlect@dal.ca

Please note, chemistry content related questions should be directed to the assortment of instructors, professors and teaching assistants (TAs) available to meet with students in the *Concept* Room and Resource Centre, not to the coordinator email accounts. The main reason for this is chemistry content questions are not easily answered via email, and students will likely get a much faster response in the *Concept* Room or Resource Centre. However, don't worry, we have plenty of staff to help students throughout the course!

Mode of Delivery

This course will be held entirely in-person on the Studley Campus of Dalhousie University in Halifax, Nova Scotia, Canada. All times listed in this syllabus are therefore based on the Atlantic time zone.

Important Academic Dates

Summer semester A1 (May 11-June 2, 2026)

Monday, May 11, 2026
First day of classes for CHEM1011/1021

Thursday, May 14, 2026
Last day to Add/Drop CHEM1011/1021

Monday, May 18, 2026
Victoria Day: University Closed

Tuesday, May 19, 2026
Last day to Drop CHEM1011/1021 without a “W”

Tuesday, May 26, 2026
Last day to Drop CHEM1011/1021 with a “W”

Tuesday, June 2, 2026
Last day of classes for CHEM1011/1021

Summer semester A2 (June 8-29, 2026)

Monday, June 8, 2026
First day of classes for CHEM1012/1022

Thursday, June 11, 2026
Last day to Add/Drop CHEM1012/1022

Monday, June 15, 2026
Last day to Drop CHEM1012/1022 without a “W”

Monday, June 22, 2026
Last day to Drop CHEM1012/1022 with a “W”

Monday, June 29, 2026
Last day of classes for CHEM1012/1022

Chemistry 1012/1022 Grading Scheme

To calculate a final numerical grade for Chemistry 1012/1022 the following grading scheme will be followed. A detailed breakdown of how grades are distributed for each course activity can be found in the individual section for each component.

Lecture Component:

Experience Points (Homework and Assignments)	10%
Mastery Points (Three Mastery Exams)	60%

Laboratory Component:

<u>Lab Orientation and Safety</u>	
Lab Map & Safety Module	1%
WHMIS Course Module	3%
Lab Station Clean-Up	1%
<u>Lab Work</u>	
Pre-Lab Assignments	5%
Post-Lab Reports	15%
Participation: Data Collection/Raw Data Submission	3%
Time Management & Preparedness	2%
Total:	100%

In order to obtain a passing grade in Chem 1012/1022, you must meet *<u>ALL</u>* of the following criteria:

- Obtain at least a grade of 30/60 on the “Mastery Points” portion of the course.
- Obtain at least a grade of 15.00/30 on the “Laboratory Component” of the course with 12.50/25 from “Lab Work.”
- Obtain at least a total combined grade of 50/100.

No additional assessments **(extra credit assignments or supplementary exam retakes) will be given. Final grades will be calculated based on the assessments laid out in this syllabus *<u>only</u>*.**

Under emergency circumstances that have a serious impact on the delivery of this class, *there may be a need to alter the syllabus*.

Dalhousie Common Grading Scheme

The final grade posted to your transcript will be determined based on the numerical grade calculated by the Chemistry 1012/1022 Grading Scheme and converted to a letter grade based on the Dalhousie Common Grading Scheme seen below. Note the expectations of students in each grade category as is outlined in the definition of each letter grade category.

Conversion of numerical grades to Final Letter Grades follows the
Dalhousie Common Grade Scale

A+ (90−100)	A (85−89)	A− (80−84)
B+ (77−79)	B (73−76)	B− (70−72)
C+ (65−69)	C (60−64)	C− (55−59)
D (50−54)	F (<50)	

Grade	Definition
A+, A, A−	Excellent: Considerable evidence of original thinking; demonstrated outstanding capacity to analyze and synthesize; outstanding grasp of subject matter; evidence of extensive knowledge base.
B+, B, B−	Good: Evidence of grasp of subject matter, some evidence of critical capacity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.
C+, C, C−	Satisfactory: Evidence of some understanding of the subject matter; ability to develop solutions to simple problems; benefitting from their university experience.
D	Marginal Pass: Evidence of minimally acceptable familiarity with subject matter: critical and analytical skills (except in programs where a minimum grade of ‘C’ is required).
F	Inadequate: Insufficient evidence of understanding of the subject matter; weakness in critical and analytical skills; limited or irrelevant use of the literature.

For more information about Dalhousie University’s Grading Practices, please refer to:
https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Frequently Asked Question: How do I email an Instructor/Professor?
The following section will be relevant to all your courses at Dalhousie.

When emailing an instructor/professor, please remember to:

- **Always use your "@dal.ca" email account**. This is very important, especially if you are discussing grades. Many instructors/professors will not respond with personal information, such as grades, unless you are writing from your Dalhousie email account. *This is particularly true in First Year Chemistry.*

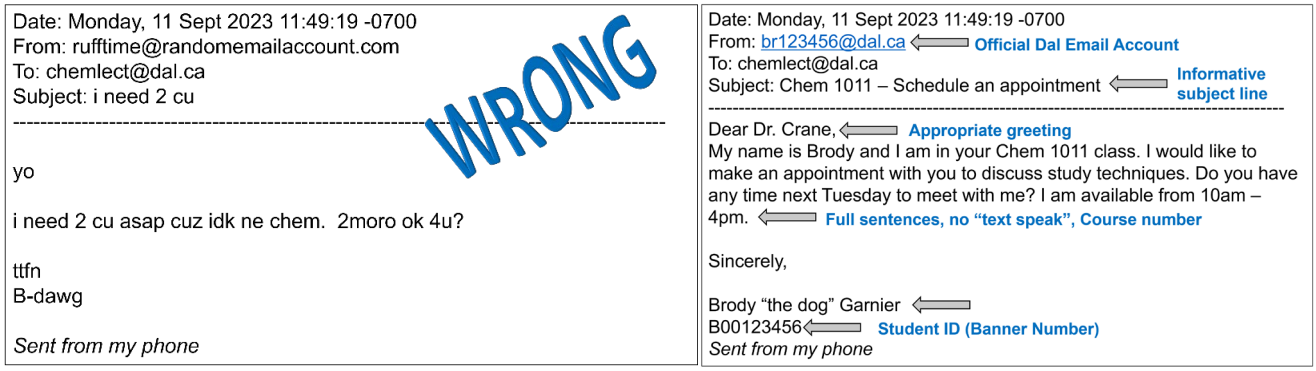
- Use an **informative subject line**. Many instructors/professors get hundreds of emails a day. This keeps an email from getting lost or forgotten.

- Use an **appropriate greeting**. Most faculty will let you know if they want to be addressed more formally (*example: Dr. Crane*) or more informally (*example: Angela*). If you are unsure, typically you would assume a formal greeting at first to maintain professionalism.

- Keep emails **professional**, this means no "text speak" and writing in full sentences.

- Include the **course code**. Many instructors/professors teach multiple classes, and will not be able to assist you if they do not know which course you are in.

- Sign your email with your **full name and student ID (Banner number, ie. B00######)**. This is very important as often classes can have students with the same or similar names, and we want to be able to make sure you get the correct information for you. *This is especially true in a big class like First Year Chemistry, where there are typically over 1000 students per term!*



- **Note: The student "Brody Garnier" used in this email example is fictious and no identification with actual persons (living or deceased) is intended or should be inferred. In fact, the "Brody Garnier" referred to here is Dr. Crane's dog.*

Frequently Asked Question: How do I access CAPA?

Many of the online assessments in both the lecture and laboratory component will be hosted on the online learning platform, CAPA, which can be accessed by going to https://capa.chemistry.dal.ca/. Please use the following instructions when logging into CAPA for the first time:

1. Go to https://capa.chemistry.dal.ca
2. Click "Forgot password?"
3. Input your LON-CAPA username (your NetID using **lowercase** letters, example: aa123456) and your Dalhousie e-mail address in LON-CAPA (your NetID@dal.ca, example: aa123456@dal.ca) and press "Proceed".
4. Check your Dalhousie e-mail. An email will be sent from LON-CAPA helpdesk containing a password reset link. Click this link.
5. Once again, input your LON-CAPA username (NetID, lowercase), your Dalhousie e-mail address (NetID@dal.ca) and set/confirm a password and click "Save".
6. You will get a confirmation page and email for the reset of your password. Next click "Go to the login page".
7. From now on you will be able to login as normal with your LON-CAPA username (NetID, lowercase) and the password you created.
8. If you have issues logging into CAPA please email help@conceptsinchemistry.ca

Frequently Asked Question: What happens if the course gets interrupted?

In the event that any course activity is interrupted due to snow, power outage, or any other event/circumstance in Halifax or at Dalhousie University that is beyond the First Year Chemistry Teaching Team's control, please pay close attention to your Dalhousie Email Account and the Announcements made on the Brightspace Course Sites for the most up to date information.

Frequently Asked Question: What should I do if I become sick during term?

As always, we realize that we are all human, and getting sick during term is something that happens to the best of us (even us as instructors!). This is particularly on our mind as we have just experienced the COVID-19 Global Pandemic, which in many ways is still affecting us. As such, we wanted to address this point specifically.

First, if you are ill and unable to complete course work, do not panic, and instead contact **both** chemlect@dal.ca and chemlab@dal.ca as soon as you can. The sooner we know the situation the sooner we can develop a plan. If it is a short illness, the course policies laid out in this syllabus may already cover the plan of action. Please take note of the policies surrounding individual course assessments as you read through. If it is a long-term illness that is affecting several weeks of classes then we will be working with students on a case-by-case basis, along with the Student Accessibility Centre and the Assistant Dean of Science dedicated to Student Affairs, to determine the best plan for finishing course work.

***Important Note**: No extensions or exemptions will be given for any assignment/assessment that counts towards Experience Points or are worth less than 5%. This is because there is already flexibility built into their grading (i.e. assignments are available for a long period of time, best before and expiry or late work due dates exist, only the top questions/assignments counting for full marks and the possibility to gain bonus marks) or these assignments are worth a negligible amount (≤1%).*

Section 2: Lecture Component

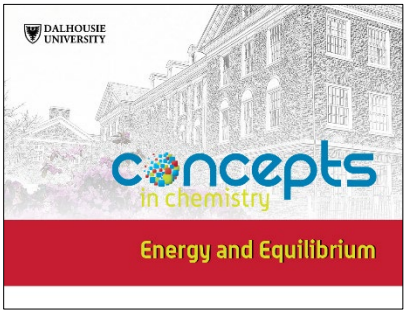
Required Lecture Materials

Course Textbook

Concepts in Chemistry: Energy and Equilibrium (2025−26 Ed.)

This course textbook is a custom eBook and is updated frequently to reflect changes in the curriculum. The textbook includes many practice problems, including exam bank problems which are located in an appendix at the end of the book, making this a valuable resource for mastering course content and preparing for the Mastery Exams.

This course textbook is available at the Dalhousie Bookstore only.



Non-programmable Scientific Calculator

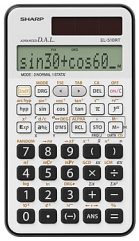
Only 2 types of calculators are permitted during exams in Chem 1012/1022.

It is required that students registered in engineering and physics have the **CASIO fx-991ES PLUS** calculator, or equivalent (such as the CASIO fx-991ES PLUS C, CASIO fx-991ES PLUS 2 and the CASIO fx-991ES PLUS C 2nd edition)

It is required that all other science students have the **SHARP EL-510 series calculator** (the current model is the SHARP EL-510RTB**,** but older models such as the SHARP EL-510RNB will be accepted).

Both calculators are available at the Dalhousie Bookstore, however students may be able to find these calculators from alternative vendors.

CASIO fx-991ES PLUS



SHARP EL-510RTB

Lecture Teaching Team

Sam Knight
(pronouns: she/her)

Main Lecturer
MTWRF 12:35pm – 2:55pm
Sir James Dunn Building,
Room 117

Tyler Ziehl
(pronouns: he/him)

Lecture TA
(In Class Support
& Concept Room)

Peter Fox
(pronouns: he/him)

Lecture TA
(Concept Room)

Lecture/Class Schedule

Each lecture/class will provide both a lecture/learning portion and a problem-solving portion. It will be critical that students come to class prepared having either read/skimmed the chapter in the textbook or watched the pre-class videos posted on the "CHEM1012 and CHEM1022 - Concepts in Chemistry II - Lecture – 2026 Summer" Brightspace Course Site. This course has an incredibly fast pace, so arriving in class prepared to learn *and* practice the material will be important.

Date	**Activity**	**Content**
Monday, June 8	Problem Solving Session 1	Topic 13 & Topic 14 (T14.1 to T14.4)
Tuesday, June 9	Problem Solving Session 2	Topic 14 (starting at T14.5)
Wednesday, June 10	Problem Solving Session 3	Topic 15 (T15.1 to T15.9)
Thursday, June 11	Problem Solving Session 4	Topic 15 (starting at T15.10) & Topic 16
Friday, June 12	Problem Solving Session 5	Topic 17
Monday, June 15	***Mastery Exam 1***	***Covers Topics 13-15***
Tuesday, June 16	Problem Solving Session 6	Topic 18
Wednesday, June 17	Problem Solving Session 7	Topic 19
Thursday, June 18	Problem Solving Session 8	Topic 20
Friday, June 19	Problem Solving Session 9	Topic 21 (T21.1 to T21.11)
Monday, June 22	***Mastery Exam 2***	***Covers Topics 16-20***
Tuesday, June 23	Problem Solving Session 10	Topic 21 (starting at T21.12) & Topic 22 (T22.1 to T22.4)
Wednesday, June 24	Problem Solving Session 11	Topic 22 (starting at T22.5) & Topic 23
Thursday, June 25	Problem Solving Session 12	Topic 24 (T24.1 to T24.5)
Friday, June 26	Problem Solving Session 13	Topic 24 (starting at T24.6) & Topic 25
Monday, June 29	***Mastery Exam 3***	***Covers Topics 21-25***

Experience Points

Experience points (XPs) are acquired by preparing for class, participating in-class, practicing the material, preparing/studying for exams and engaging with the chemistry content. There are **many** different ways in which you can acquire experience points. Each activity is listed below along with the XPs you can earn from the activity.

The more you prepare, participate, practice, and study, the more XPs you will acquire. In total there are 3 Mastery Exam units (see section on Mastery Points for details). Each Mastery Exam unit is worth 3.33 marks, for a total of 10 marks on XPs overall. Based on the number of XPs you obtain you will be assigned a grade out of 3.33, based on the following criteria **per each of the three (3) Mastery Exam units**:

Level 1: 40% of possible XPs – Grade of 0.67 out of 3.33
Level 2: 50% of possible XPs – Grade of 1.33 out of 3.33
Level 3: 60% of possible XPs – Grade of 2 out of 3.33
Level 4: 70% of possible XPs – Grade of 2.67 out of 3.33
Level 5: 80% of possible XPs – Grade of 3.33 out of 3.33
BONUS LEVEL: 90% of possible XPs – Grade of 3.67 out of 3.33

Note: No extensions or exemptions will be given for any assignment/assessment that counts towards Experience Points. This is because there is already flexibility built into their grading (i.e. best before and expiry due dates and only the top 80% of points per unit counting for full marks).

Daily Homework Questions

Description of this activity

These questions will be found on CAPA in the “First Year Chemistry Lectures – 2026 June” course space. You will have 5 attempts per question to get the question correct. Questions are open from the beginning of the course and ***best completed before the next class/topic is covered***. For example, questions from Topic 13 (covered on June 8) will be due at 12:35 pm on June 9. These questions could also be used for studying for exams at a lesser XP value.

How to gain XPs from this activity?

Each daily homework question is worth 2 XPs for getting the correct answer to each question by the “best before” date of ***12:35pm before the next scheduled class.***

- OR -

Each daily homework question is worth 1 XP for getting the correct answer to each question by the “expiry before” date of ***12:35pm before the Mastery Exam it is covered on.***

Example: A student completes 2 daily homework questions for June 8 correctly on June 8 in the evening, 1 daily homework question for June 8 correctly on June 10 and does not correctly answer 1 daily homework question for June 8 within the 5 tries. Therefore, this student will get 2 x 2 + 1 x 1 + 0 = 5 XPs (out of a maximum of 8 XPs) for the June 8 pre-class questions.

In-Class Engagement Questions

Description of this activity

These questions will be provided during class time based on the pre-class videos and questions. Attending class and collaborating with your peers is a valuable experience, therefore more points are awarded to students who submit these questions during class time. Students will be able to submit their response only on the days we have class, and these questions are submitted for grading **during class time online** via MS Forms. The MS Form is open from 12noon to 4:30pm on class days.

***Note**: Students are asked to bring an electronic device that can connect to the internet (smart phone, tablet, laptop) to class for this activity. If you do not have such a device, please reach out to chemlect@dal.ca and we can provide an alternative.*

How to gain XPs from this activity?

Each in-class engagement question is worth 3 XPs for getting the correct answer to each question ***during class time on class days.***

Example: A student attempts the in-class engagement questions for June 8, submitting their response during class online through the MS form. Imagine there are 6 questions for this class, and the student gets 4 questions correct, and the others incorrect. This student will get 12 XPs for June 8.

Post-Topic Checkpoints

Description of this activity

Post-Topic Checkpoints are timed assessments found on CAPA in the "First Year Chemistry Lectures – 2026 June" course space that can be used in order to prepare you for a Mastery Exam. Each checkpoint will consist of 5 questions based on the skills required to be successful in the given topic on an exam. Also, each Checkpoint will be delivered in the "escape room" game style, where correctly answering a question unlocks/opens the next question until the Checkpoint is complete. Once a Checkpoint is started a 45-minute timer will be activated during which time the Checkpoint must be completed. If all questions are answered correctly on the first try, it should take approximately 20 minutes for a Checkpoint to be completed. This timing is comparable to that of a Mastery Exam. Each question within a Checkpoint has 6 tries. Every attempt has a decreasing point value associated with it. For full marks, the question must be answered on the first try. Each subsequent try will see a loss of 0.1 marks per try on that question. This is summarized in full below:

Answer correctly on the 1st try – 1 out of 1 on the question
Answer correctly on the 2nd try – 0.9 out of 1 on the question
Answer correctly on the 3rd try – 0.8 out of 1 on the question
Answer correctly on the 4th try – 0.7 out of 1 on the question
Answer correctly on the 5th try – 0.6 out of 1 on the question
Answer correctly on the 6th try – 0.5 out of 1 on the question

If the question is not correctly answered in the 6 tries, then a grade of 0 will be given on that question and the next question will automatically unlock so students can continue.

How to gain XPs from this activity?

Up to 15 XPs per Post-Topic Checkpoint will be awarded based on the following rubric:

Grade out of 5	Number of XPs
4.5+	15
4-4.4	14
3-3.9	13
2-2.9	12
1-1.9	11
0.5-0.9	10

Note: Post-Topic Checkpoints must be completed ***BEFORE*** the relevant Mastery Exam begins at 12:35pm.

Example: A student completes the Post-Topic Checkpoint for Topic 15 on June 10 with a grade of 4.1/5. This student will receive 14 XPs since they have completed the Checkpoint before 12:35pm on June 15 (before Mastery Exam 1 occurs) given that Topic 15 is evaluated on Mastery Exam 1.

Practice Exams

Description of this activity

In order to prepare you for Mastery Exams, there will be a practice exam uploaded to CAPA in the “First Year Chemistry Lectures – 2026 June” course space. This practice exam will contain exam-like questions with 1 try each and be timed in a similar way to the Mastery Exam that you complete in person.

How to gain XPs from this activity?

Up to 50 XPs per Practice Exam will be awarded based on the following rubric:

Grade on Practice Exam	Number of XPs
90-100%	50
80-89%	40
70-79%	35
60-69%	30
50-59%	25
40-49%	20
30-39%	15
20-29%	10
10-19%	5

Note: Practice Exams must be completed ***BEFORE*** the relevant Mastery Exam begins at 12:35pm.

Example: A student completes the Practice Exam for Mastery Exam 3 on June 21. They get a grade of 68%. Therefore, the student will receive 30 XPs as the Practice exam was completed before the deadline of June 29 at 12:35pm (before Mastery Exam 3 occurs).

Mastery Points

Mastery points are acquired through Mastery Exams, which will be evaluating the learning objectives of the course. In order to be successful in subsequent courses it is critical that students have mastered the learning objectives in CHEM1012/1022. Mastery points will be awarded based on the final overall grade for each Mastery Exam, and each Mastery Exam is comprised of 2 parts – the individual portion and the group portion. Together, the combination of all three (3) Mastery Exam grades is worth 60% of the course overall at **20% per exam**.

Mastery Exams are graded based on skills mastery. The skills that we will be examining can be found in the Skills Inventory section at the beginning of each "Exam Bank" appendices at the end of the Course Textbook. Skills will be graded on a pass/fail basis, meaning part marks on questions are typically not awarded (i.e. the skill graded as fully mastered or not).

Individual Portion of Mastery Exams

The details of each individual Mastery Exam are as follows:

- Mastery Exams, including the main content covered on each, will occur on the following dates:

  Mastery Exam 1: Monday, June 15 covering Topics 13, 14, & 15
  Mastery Exam 2: Monday, June 22 covering Topics 16, 17, 18, 19 & 20*
  Mastery Exam 3: Monday, June 29 covering Topics 21, 22, 23, 24 & 25*

  *on these exams there will be 1-2 questions from ***any previously tested Topic***. Therefore, Mastery Exams 2 and 3 has "cumulative" element to them.

- Each Mastery Exam will occur **during class starting at 12:35pm sharp** and will be scheduled to last 60 minutes once started.
- Students will be provided with a copy of the ***"Data, Equations and Periodic Table"*** found on the "CHEM1012 and CHEM1022 - Concepts in Chemistry II - Lecture – 2026 Summer" Brightspace Course Site. In addition, students will need to **bring their own approved non-programmable scientific calculator. *Be sure to have an approved calculator as all other calculators are prohibited.*** See the "Required Lecture Materials" section of this syllabus for information on approved calculators. Besides a calculator and writing utensils, no other materials are permitted in the exam. This includes, but is not limited to the course textbook, course notes, extra paper, data sheets brought from home, "cheat" sheets and pocket periodic tables.
- Mastery Exams are **individual assessments**, therefore no collaboration with other students is allowed.

Group Portion of Mastery Exams

Group exams are the second phase in a two-stage testing model. Two-stage testing is when students complete an exam individually first, then get a chance to repeat the exam (or a similar version of the exam) as a member of a small group. The intention of the group exam is to allow an exam situation to not only be an assessment, but also a valuable learning experience. This is because writing a group exam has many advantages, such as discussing chemistry with your peers, learning from your mistakes soon after writing an exam, clearing up misconceptions you may have had, and an overall reduction in exam anxiety. Collaboration/teamwork and communicating about science are critical skills that scientists must begin to develop in their undergraduate degrees, therefore participating in the group exam portion of each Mastery Exam is **mandatory**.

Each Mastery Exam will have a corresponding group exam that takes place **directly after the individual exam, at 1:55pm**. The dates for the group exams are listed below.

Group Exam 1: Monday, June 15
Group Exam 2: Monday, June 22
Group Exam 3: Monday, June 29

The group exams will follow many of the rules of the Mastery Exam, however students will be allowed to create a **cue sheet** that can be brought to the **group portion of the exam only**. This cue sheet must be no larger than a standard 8.5x11 sized paper, hand-written, and can be completed on both sides (i.e. double sided). No other additional materials (textbooks, course notes, tablets/laptops and cell phones) will be permitted for the group portion of the exam.

The Group Exam is mandatory; take the Group Exam seriously since the grade on your group exam will affect your overall Mastery Exam grade. Your overall Mastery Exam grade will be calculated based on BOTH the individual Mastery Exam and the group exam grades, where individual Mastery Exam counts for 80% of the overall Mastery grade, and the Group Exam counts for 20% of the overall Mastery grade.

> For example, if a student receives 60% on the individual portion of the exam, and then 80% on the group exam, their final Mastery Exam grade would be 0.6x80 + 0.8x20 = 64%
>
> Similarly, if a student receives 60% on the individual portion of the exam, and then does not take the group exam, therefore getting 0%, their final Mastery Exam grade would be 0.6x80 + 0x20 = 48%!!!

Make-up Mastery Exams

Due to the pace and condensed nature of the summer term, each Mastery exam is considered a “Final Exam”. This means that if a student misses a Mastery Exam for illness, they will need to submit a doctor’s note stating the date of the exam they missed to chemlect@dal.ca within 72 hours of the exam (i.e. 12:35pm on Fridays). Make-up exams for students who have submitted a doctor’s note and approved for a make-up exam will occur on the Friday after the original exam after class.

Section 3: Laboratory Component

Location:
Basement of the Chemistry Building
Room 100−108P

Summer 2026 Lab Schedule:
The lab schedule is posted on Brightspace and in the syllabus.

Labs Begin:
Monday, June 8, 2026

Contacting Your Lab Instructor:

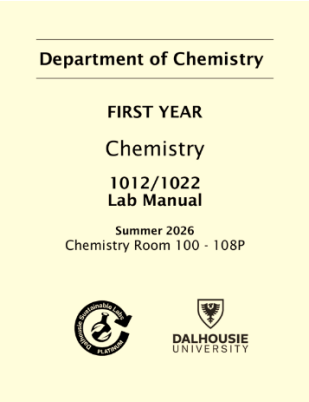
The laboratory instructor team communicates with students through one common email address, chemlab@dal.ca. Please include your lab section in the email subject line.

Laboratory Instructors

Please note that differing laboratory sections have differing laboratory instructors. Refer to the sections written on the right to determine who your laboratory instructor is. Please note that lab sections/instructors may change, and for the most up-to-date list of instructors and sections, please refer to the Lab Brightspace Page.

Instructor Photo	Instructor Name	Lab Sections
	Dr. Joshua Bates (pronouns: he/his)	Lab Section A
	Dr. Mark Wall (pronouns: he/his)	Lab Section B
	Dr. Gianna Aleman (pronouns: she/her)	Lab Section C

Required Materials for Lab

Lab Material Photo	Lab Material Description
	**Lab Manual** Available at the Dalhousie Bookstore (~$25.99 + tax)
	**Hardcover Lab Notebook** Available at the Dalhousie Bookstore (~$10.99 + tax)
	**Safety Glasses** Must be stamped with standards numbers of: CSA−Z94−3 (Class 1A) Available at the Dalhousie Bookstore Safety Glasses (~$8.99 + tax) “OR” Safety Glasses For Over Glasses (~$8.99 + tax)
	**Knee−length Lab Coat (100% cotton)** Available at the Dalhousie Bookstore (~$29.99 + tax)

Safety Module and Lab Map

As a chemistry student, part of your training involves understanding the hazards that are present within a chemistry lab and learning the measures that must be taken in order to maximize your safety and the safety of your peers. As part of your lab assignment, you are required to complete a Chemistry Safety Module and Lab Map. **Students who do not successfully complete this requirement will not be allowed to perform experiments in any Dalhousie undergraduate chemistry lab. Experiments missed due to incomplete Safety Modules do not qualify for a make-up lab session.** The Safety Module and Lab Map Content is found in the "CHEM1012 & CHEM1022 – Concepts in Chemistry II – Lab – 2026 Summer" Brightspace Course Site in the content area "Laboratory Orientation and Safety". Successful completion of the Safety Module Assignment includes reading the General Safety Statement on Brightspace and obtaining a perfect mark (i.e., 100%, 25 out of 25) on the five Safety Module Quizzes (located in CAPA on the First Year Chemistry Labs − 2026 June course space). Successful completion of the Lab Map Assignment includes completing the virtual laboratory tour on Brightspace, submitting your responses on CAPA, and obtaining a perfect mark (i.e. 100%, 35 out of 35). After completion of these requirements, you should feel comfortable working in a chemistry lab and have the tools you need to promote a safe lab environment.

Completion of the Safety Module and Lab Map, which is evaluated based on the submission of the CAPA Assignments, is **worth 1% of the overall final grade**. To receive a grade of 1 out of 1 on the Safety Module and Lab Map Assignment, the Safety Module and Lab Map Assessments must be submitted via CAPA by **5:30 pm local Halifax time on Thursday, June 11, 2026.**

Students who do not successfully complete this requirement will not be allowed to perform experiments in any Dalhousie undergraduate chemistry lab. Experiments missed due to incomplete Safety Module and Lab Map Assessments do not qualify for a make-up lab session.

Any Safety Module and Lab Map Assessments completed after the due date will not be graded, and partially complete Safety Module and Lab Map Assessments will receive a grade of zero (0).

No deadline extensions will be given on the Safety Module and Lab Map Assessments and "Student Declaration of Absence" forms cannot be applied to the Safety Module and Lab Map Assessments, as the assessments are open and available to students for more than 3 days.

If you have completed the Safety Module and Lab Map in May 2026, receiving scores of 25/25 and 35/35, respectively your grade will be transferred to your June 2026 course.

WHMIS Course Module

WHMIS, the Workplace Hazardous Materials Information System, is a global harmonized system used to classify and label hazards and regulate handling procedures within industry and academic fields, especially those in science and engineering. Regardless of your chosen field of study within science and engineering beyond first year, being familiar with WHMIS is a significant asset. As such, it is required that ALL students in first year chemistry enrol in and complete the Dalhousie University WHMIS Safety course provided by the Dalhousie Environmental Health and Safety Office offered through the Faculty of Open Learning and Career Development. As this course is substantial in nature, **completion of the course will be worth 3% of your final grade.** Instructions for how to register for the course are found on the Lab Brightspace Site under the content area "Laboratory Orientation and Safety." Please ensure that you register and complete the WHMIS course well in advance of the deadline (**5:30 pm local Halifax time on Thursday, June 11, 2026**).

Students who do not successfully complete this requirement will not be allowed to perform experiments in any Dalhousie undergraduate chemistry lab. Experiments missed due to incomplete WHMIS Training do not qualify for a make-up lab session.

Completion of the WHMIS Course Module is worth 3% of the overall final grade. **Only the Dalhousie WHMIS Safety Course Completion will be accepted for credit in Chem 1012/1022.**

Any WHMIS Course Modules completed after the due date will not be graded for credit and partially complete WHMIS Course Modules will receive a grade of zero (0).

No deadline extensions will be given on the WHMIS Course Module and "Student Declaration of Absence" forms cannot be applied to the WHMIS Course Module, as the Module is open and available to students for more than 3 days.

NOTE: Please ensure that you retain a copy of your WHMIS Completion Certificate. If you take any further chemistry courses at Dalhousie or work in a chemistry research lab, you will be required to provide your proof of WHMIS training.

If you have submitted a valid Dalhousie WHMIS Completion Certificate and received a grade of 3/3 in May 2026, your WHMIS Grade will be transferred to your June 2026 course.

Laboratory Format, Expectations and Policies

You will complete seven lab sessions this term. Some experiments run for 1.5 hours while others run for 3 hours. Please be sure to check your experiment start time in the course syllabus as it may differ from the start time noted on your DalOnline class schedule. Before leaving your first in-person lab period, make sure that you understand your Lab Schedule.

Experimental work must be completed during the scheduled time for your particular section. Attendance is mandatory for in-person labs.

Online Experiments:

Suggested Pathway Through an Online Lab Module

Each lab module contains:

1. The experimental background/theory
2. Pre-laboratory assignment support/practice questions and link to CAPA Site
3. Experiment content, data acquisition, and recording observations
4. Post-Lab Report

When beginning your experiment, you should work through the experimental background/theory sections of the module and the pre-laboratory assignment support/practice questions. Once you have completed these sections of the module and feel comfortable with the content, launch your CAPA Pre-lab Assignment and work through this assignment before the deadline.

After you have completed the Pre-Lab Assignment, you should move on to the experimental section of the laboratory module. Within this section of the module, you will be guided through the laboratory procedure and observe the experiment as it is being carried out through video. You will be able to record your observations in real-time in the module, this will become your experimental raw data set. Your experimental raw data set will be summarized at the end of the experimental section as a “Raw Data Summary” page. It is strongly recommended that you print (there is a print button available on the raw data slides) or write down a copy of your data to ensure a secondary back-up of your work. This raw data set will be required to complete your post-lab report.

Post-Lab Reports for online experiments will be submitted at your first in-person laboratory session.

In-Person Experiments:

Before Your Experiment

You are expected to read the experiment, prepare your hard−covered notebook, and complete the pre−lab questions on CAPA.

A hard−covered notebook is required for this course. The notebook is a permanent record of your work; therefore, all entries must be written in ink and only on the right-hand page. Prior to each lab period, your notebook must be prepared with:

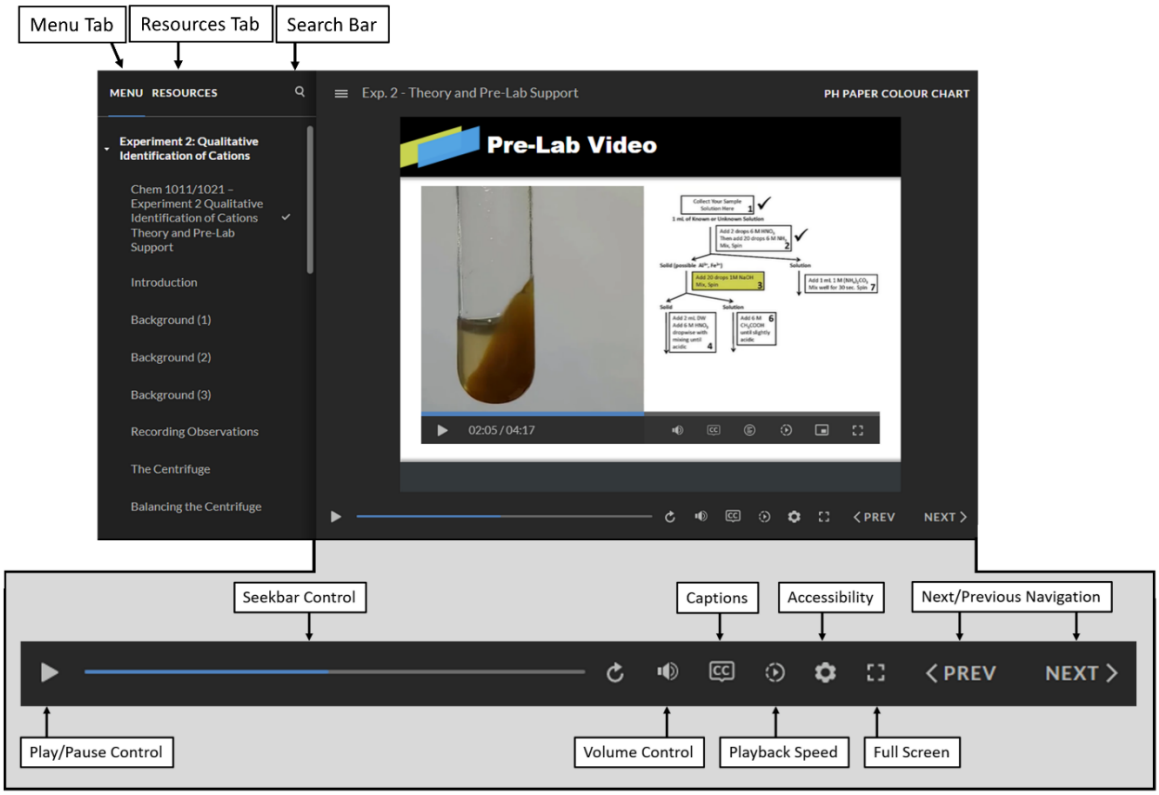
- Date
- Title of Experiment
- Data Tables and Observations from Raw Data Sheet. *If the experiment does not have a Raw Data Sheet, please use the Grade Sheet in your lab manual as a guide to prepare your lab notebook.*

Theory and Pre-Lab Support Module Structure

In addition to the content in your lab manual, there are optional Theory and Pre-Lab Support Modules on Brightspace that you may wish to use as you prepare for your CAPA Pre-Lab Assignments and your upcoming experiments. These modules contain a detailed walkthrough of theory, experimental videos, and interactive practice problems (with solutions!).

The lab module player features a menu, resources tab, and many more navigation controls to customize your experience. The Menu at the left allows you to navigate to any point in the module by slide title. The Resources tab at the left contains useful links and downloadable files (printable audio transcripts, data tables, and links to the CAPA pre-lab assignment site).

An image of a Theory and Pre-Lab Support module can be found below, pointing out the menu and resources tabs, as well as the search bar, play/pause, seekbar, volume, captions, playback speed, accessibility, full screen, and previous/next navigation controls.



During Your Experiment

Each laboratory period begins with a lab lecture and/or video. New techniques are demonstrated, and safety considerations discussed. During this time, a teaching assistant will check and initial your notebook for the above entries and collect laboratory reports that are due that day.

During the experiment, **all data must be recorded in ink** in your notebook. Erasers or liquid paper are not permitted. Simply cross out errors, which are part of the scientific process.

After completing the experiment, you must have the data in your notebook initialed again by the instructor or teaching assistant. If the experiment requires the submission of a Raw Data Sheet, your instructor or teaching assistant will initial this sheet at the same time as your data in your notebook. **Only the initialed data from the Raw Data Sheet may be used to complete your post−lab report**. Ensure your glassware and lab bench are left clean and neat.

After Your Experiment

There will be a post-lab report (the Grade Sheet found in the lab manual). More information about the post-lab report weighting scheme and due dates can be found in the Post-Lab Report Weighting Scheme and Post-Lab Due Dates sections of the syllabus. Written reports **must be completed in dark pen (blue or black ink).**

Laboratory Schedule

The exact laboratory schedule will be different for each student depending on their laboratory section. Please find **your lab section** and highlight the row to find **your laboratory experiment schedule**. Online lab sessions are asynchronous and in-person lab sessions are synchronous.

Sect.	Exp. 8	Exp. 9	Exp. 10	Exp. 11	Exp. 12 & 13	Exp. 14	Exp. 15	Exp. 16
A/B	Jun 8-11 Online	Jun 8-11 Online	Fri., Jun 12 9-10:30 am	Tues., Jun 16 9-12 pm	Thurs., Jun 18 9-12 pm	Tues., Jun 23 9-10:30 am	Jun 23-24 Online	Thurs., Jun 25 9-12 pm
C	Jun 8-11 Online	Jun 8-11 Online	Fri., Jun 12 10:30 am-12 pm	Wed., Jun 17 9-12 pm	Fri., Jun 19 9-12 pm	Tues., Jun 23 10:30 am-12 pm	Jun 23-24 Online	Fri., Jun 26 9-12 pm

Pre-Lab CAPA Assignments

All pre-lab Assignments will be hosted on the online learning platform, CAPA in the First Year Chemistry Labs – 2026 June course space, which can be accessed by going to https://capa.chemistry.dal.ca. Please refer to the instructions in the syllabus when logging into CAPA for the first time.

Pre-Lab Assignments will open *at least* 1 week before the Pre-Lab Assignment due date.

The online pre−lab assignments have been developed to help you prepare for the lab. Pre-Labs are **individual assessments**. Students may seek support through the online Theory and Pre-Lab Support Modules, Concept Room, Resource Centre, and discussion boards from TAs/Instructors, the laboratory coordinator, and classmates. However, all pre-lab work submitted for grading must be completed individually. This includes, but not limited to, data analysis (such as calculations and graphs) and discussions (such as answers to questions and conclusions). The Theory and Pre-Lab Support Module for each experiment contains content to support you in completing the pre-lab assignment. We encourage you to start early to ensure you are able to get help with the questions that cause you difficulty. You will be given **13 tries at each question.** The first 3 tries will be for full marks. For each subsequent try 10% of the questions point value will be deducted. **Each Pre-Lab is worth equal weight for a total of 5%.**

Online Labs: CAPA pre-labs assignment for are due:

Experiment 8 & 9: June 11th at 5:30 PM local Halifax time.

Experiment 15: June 24th at 5:30PM local Halifax time.

In-Person Labs: CAPA pre−labs for in-person labs are due **5 minutes before your regularly scheduled lab**. For example, if a student is in lab section A and has a lab session beginning on June 12, 2026 at 9:00 AM, their pre-lab would be due on June 12, 2026 at 8:55 AM. **If for any reason you have made alternate arrangements for your lab session, your pre-lab deadline will remain the same, 5 minutes before your regularly scheduled lab.** No deadline extensions will be given on CAPA Pre-Lab Assignments as these assessments are open and available to students for more than 3 days.

Preparedness
When working in the lab it is important and expected that you arrive prepared for your session to ensure that you are a supportive and safe member of your lab group. For each Laboratory Experiment, students will be graded on their preparedness for the experiment. Preparedness includes completing the Pre-Lab Assignment on CAPA as well as arriving to the lab with their laboratory notebook prepared for in-person experiments. Student preparedness is **worth 1% of the overall lab grade**. A student who is unprepared 3 or more times during term will not be awarded this grade.

Participation: Data Collection and Raw Data Submission
Chemistry is first and foremost an experimental science. Your time in the laboratory is an important part of your chemical education. As such, participation is worth 3% of the overall lab grade. Participation is assessed via submission of your experimental data set through raw data sheets or in-lab report submissions for experiments that do not have a raw data sheet. **Each experiment's participation grade is worth equal weight for a total of 3%.**

Lab Station Clean-Up
Developing good lab housekeeping habits reduces the occurrence of lab accidents while also improving efficiency and quality of lab work completed in shared lab spaces. It is our shared responsibility (students and teaching team) to ensure the laboratory is a safe working environment. As such, lab station clean-up is worth 1% of the overall lab grade. The lab station clean-up grade will be assessed at the end of all 3-hour lab sessions. To be awarded this grade, your locker should contain only the required glassware and your bench space is left clean. **Each lab station clean-up grade is worth equal weight for a total of 1%.**

Post-Lab Due Dates
A detailed table of all post-lab due dates is to follow. Please find **your lab section** and highlight the row to find **your post-lab due date schedule.**

Sect.	Exp. 8	Exp. 9	Exp. 10	Exp. 11	Exp. 12 & 13	Exp. 14	Exp. 15	Exp. 16
A/B	Jun 12 9am	Jun 12 9am	Jun 16 9am	Jun 18 9am	Jun 23 9am	Jun 25 9am	Jun 25 9am	Jun 25 12pm
C	Jun 12 10:30am	Jun 12 10:30am	Jun 17 9am	Jun 19 9am	Jun 23 10:30am	Jun 26 9am	Jun 26 9am	Jun 26 12pm

Post-Lab Report Weighting Scheme
Each Post-Lab Report contributes to your lab grade according to the following weighting scheme:

Experiment 8:	1.0 %
Experiment 9:	1.0 %
Experiment 10:	3.0 %
Experiment 11:	2.5 %
Experiment 12:	1.5 %
Experiment 13:	1.0 %
Experiment 14:	2.0 %
Experiment 15:	1.5 %
Experiment 16:	1.5 %
Total:	**15%**

Time Management

Besides arriving to the laboratory experiments on time, we expect students to manage their time outside of lab accordingly such that their post-lab reports are submitted on time. Therefore, effective time management is **worth 1% of the overall lab grade**. We do realize that occasionally a student may submit a post-lab report late; therefore, students with a maximum of 1 late report will still receive the time management grade. Post-lab reports submitted after the scheduled due dates will be accepted, but marked late, **if and only if** the post-lab report is submitted **BEFORE** the Late Work Submission Deadline. Late work is not accepted after the Late Work Submission Deadline as marked reports and feedback will be returned to students.

Missed Labs and Make-up Experiments

Online Labs: All online experiments will be available for students to complete after the Post-Lab Due Dates and until the Late Work Submission Deadlines. You do not need to make arrangements for a make-up lab for online experiments.

In-Person Labs: Please note that due to our high course enrollment, you are only guaranteed that your timetabled lab session will be available to you for your experiments as outlined in the syllabus. If you miss a lab, **you must email your lab instructor (chemlab@dal.ca) within 24 hours** of the missed lab to schedule a make−up experiment. Failure to do so may result in a grade of 0 for the missed lab. Make-up experiments are scheduled based on available seats in the laboratory, as a result, make-up lab session availability cannot be guaranteed.

Your email must include:

Subject line:	Body of your message:
1. course number 2. lab section (e.g. B01)	1. your name 2. student ID (B00#) 3. course number and lab section 4. experiment(s) missed 5. your availability to attend lab sections leading up to the last opportunity for make-up labs (see the Lab Schedule and Last Opportunity for Make−up Labs Schedule before providing your availability)

This process filters your message to the correct instructor automatically (based on section in the subject line) which allows us to help you faster! The lab instructor will then email you a letter of permission to do a make−up experiment at an agreed−upon time and assign a due date for your post−lab report. When you arrive to your make−up experiment you must check-in with the instructor to be assigned a temporary locker space.

A few notes about make-up experiments:

1. No student will be admitted to the lab for a make−up experiment without prior instructor permission.
2. No student will be allowed to do a make−up after posted deadlines.
3. No report will be accepted after the posted late submission deadlines.

Final Dates for Make-up Experiments and Late Work Submissions

Exp.	Last Opportunity for Make−up Lab (Group A/B)	Last Opportunity for Make−up Lab (Group C)	Late Work Submission Deadline (ALL Groups)
8	***Online***	***Online***	June 16 **before** 9 am
9	***Online***	***Online***	June 16 **before** 9 am
10	June 16	June 16	June 18 **before** 9 am
11	June 17	June 18	June 23 **before** 9 am
12	June 19	June 23	June 25 **before** 9 am
13	June 19	June 23	June 25 **before** 9 am
14	June 25	June 25	June 29 **before** 12pm
15	***Online***	***Online***	June 29 **before** 12pm
16	June 26	June 26	*In−lab submission only*

Please ensure that you know what group you are in (based on your lab section) to adhere to the above deadlines.

Laboratory Exemptions

Lab exemptions will be granted to those who have already completed the course (with a letter grade of A−F), have a grade of 40% or higher on the lecture component, and have a lab grade of 67% (20/30) or better on the lab component of the course. Lab grades for lab exemption carry forward if the student repeats the course within a 24-month period of the original start date. For example, if a student enrols in Chem 1012/1022 in Summer 2026 and completes the course with a grade of F, has 45% on the lecture component, and a lab score greater than 67% (20/30) the student would qualify for lab exemption in the following terms: Winter 2027, Summer 2027, and Winter 2028. After the 24-month window has passed the student will be required to retake the lab component when repeating the course.

Labs exemptions will not automatically be granted. You must contact the first-year lab coordinator (chemlab@dal.ca) prior to the term add/drop date to apply for a lab exemption.

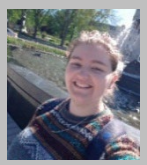
Section 4: *Concept* Room & Chemistry Resource Centre

The ***Concept* Room** is staffed by members of the First Year Chemistry Lecture team who are available to answer lecture content only.

The **Chemistry Resource Centre** is staffed by lab instructors who can assist you with any aspect of the course in lecture or lab, including CAPA assignments, and pre−lab and post−lab questions.

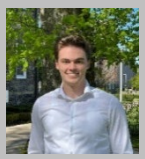
The Full *Concept* Room and Chemistry Resource Centre schedule can be found below:

	Monday	Tuesday	Wednesday	Thursday	Friday
	June 8	***June 9***	***June 10***	***June 11***	***June 12***
Concept Room	3:30 – 4:30pm Peter	3:30 – 4:30pm Peter	10 – 11am Sam 3:30 – 4:30pm Peter	3:30 – 4:30pm Peter	10 – 11am Sam 3:30 – 4:30pm Peter
Resource Center	n/a	n/a	n/a	9am – 12pm Gianna	n/a
	June 15	***June 16***	***June 17***	***June 18***	***June 19***
Concept Room	9 – 10am Tyler 10 – 11am Sam 11am – 12pm Peter	3:30 – 4:30pm Peter	10 – 11am Sam 3:30 – 4:30pm Peter	3:30 – 4:30pm Peter	10 – 11am Sam 3:30 – 4:30pm Peter
Resource Center	9am – 12pm Mark	9am – 12pm Gianna	9am – 12pm Mark	9am – 12pm Gianna	9am – 12pm Mark
	June 22	***June 23***	***June 24***	***June 25***	***June 26***
Concept Room	9 – 10am Tyler 10 – 11am Sam 11am – 12pm Peter	3:30 – 4:30pm Peter	10 – 11am Sam 3:30 – 4:30pm Peter	3:30 – 4:30pm Peter	10 – 11am Sam 3:30 – 4:30pm Peter
Resource Center	9am – 12pm Gianna	n/a	n/a	9am – 12pm Gianna	9am – 12pm Mark
	June 29				
Concept Room	9 – 10am Tyler 10 – 11am Sam 11am – 12pm Peter				
Resource Center	9am – 12pm Mark				



Sam (she/her)

Peter (he/him)



Tyler (he/him)

Mark (he/him)

Gianna (she/her)

Section 5: Course Content & Learning Objectives

Course Description

Credit Hours: 3

The principles of thermodynamics and kinetics are used to explain chemical reactivity and the principles of organic chemistry are used to develop an understanding of organic synthesis.

Special topics include electrochemistry, spectroscopy, chirality, polymers, and the chemistry of living systems to illustrate the relevance of chemistry in everyday life.

PRE-REQUISITE: CHEM 1011.03, CHEM 1021.03 or equivalent
COORDINATORS: A. Crane, J. MacDonald
FORMAT: Lecture | Lab
LECTURE HOURS PER WEEK: 12.5 LAB HOURS PER WEEK: 15
EXCLUSIONS: Credit will be given for only one of the following combinations:
CHEM 1011.03/1012.03 or CHEM 1021.03/1022.03

Course Objectives and Goals

Our primary objective for First Year Chemistry is to offer you a comprehensive and relevant course on the fundamental concepts in chemistry. Our focus is on using problem solving techniques which are applicable and transferrable to all fields of science and engineering and are not limited to just the chemistry lens used in this course. We aim to help students build good independent study habits, time management skills, group collaborations and foster critical thinking in the sciences. By exemplifying the role of chemistry in our daily lives and in an interdisciplinary way, we hope that our students gain an appreciation for chemistry, regardless of their end academic goals.

Course Learning Outcomes

- State the name or chemical formula for common chemical species.
- Demonstrate problem solving skills in the context of chemistry.
- Draw organic molecules using multiple representations and use curly arrow mechanisms to show reaction transformations.
- Apply spectroscopic theories to determine chemical structure from spectra.
- Demonstrate understanding of proper laboratory techniques including pipetting, spectroscopy, and separations (centrifuging and column chromatography), while maintaining safety standards in the context of a chemical laboratory.
- Record laboratory observations and data in an organized and logical manner.
- Analyze and interpret observations and data to arrive at experiment conclusions.
- Report laboratory observations and data in an organized and logical manner.
- Manage time appropriately through preparing before laboratory sessions and submitting post-lab work on-time.
- Develop an experimental plan (with support of Pre-Lab assignment) to identify unknown samples.

Course Content

Self-Study B1: Foundations in Chemistry

Significant Figures
Multiple Measurements: Averages and Standard Deviations
Logarithms/Mathematics and Chemistry
Solving Problems Using Dimensional Analysis
Naming of Inorganic Compounds
Molecular Mass and Formula Mass
The Mole and Molar Mass
Writing Chemical Reactions
Stoichiometry and Limiting Reagents
Lewis Structures and Molecular Shape
Chromatography
Acid and Base Review

Topic 13: Ideal Gas Behaviour

The Mercury Barometer and Pressure
The Ideal Gas Law
Density of Gases
Dalton's Law of Partial Pressures

Topic 14: Chemical Equilibria

The Equilibrium and Reaction Quotient Expressions
The Equilibrium Constant
Quantitative Data from the Equilibrium Expression
Relationship between the Equilibrium Constant and Gibbs Energy
Le Châtelier's Principle Gibbs Energy Change under Non-Standard Conditions
Apply the concepts of Chemical Equilibria to Gas Phase Reactions
Relate the Reaction Quotient to the Equilibrium Constant to determine how the Reaction will establish Equilibrium
Calculate equilibrium quantities using initial conditions and the equilibrium constant
Calculate Gibbs Energy under standard and non-standard conditions
Apply Le Chatelier's Principle to predict the effect of perturbing an equilibrium

Topic 15: First Law of Thermodynamics

Kinetic Energy and Potential Energy
System and Surroundings
Specific Heat Capacity and Heat Capacity and Calorimetry
Heat and Temperature
Work and Volume
First Law of Thermodynamics: Heat and Work
State Functions
Enthalpy
Heating, Cooling and Enthalpies of Phase Changes

Explain the transfer of energy from a chemical perspective
Use heat capacity and specific heat capacity to explain how heat is transferred between the system and surroundings
Apply heat and work calculations to calculating the change in internal energy for a system
Distinguish between a reversible and an irreversible process for work
Describe a state function
Describe the relationship between enthalpy, heat and the reaction conditions (constant volume or constant pressure)
Distinguish between the different types of phase changes and relate the enthalpy changes to these processes
Apply heat calculations to calorimetry to explain the experimental determination of heat transfer

Topic 16: Hess's Law

Standard State and Standard Enthalpy Change
Thermochemical Equations and Enthalpy Diagrams
Hess's Law
Standard Enthalpy of Formation
Bond Enthalpies and Enthalpy of Reaction
Enthalpy Changes for Biological Processes
Calculate reaction enthalpies and enthalpy changes using Hess's Law
Calculate reaction enthalpies using standard enthalpies of formation
Estimate reaction enthalpies using bond enthalpies
Relate reaction enthalpies to the corresponding balanced chemical equations, reactant/product quantities and standard types of reactions (including formation, combustion and phase changes)

Topic 17: Defining the Second Law of Thermodynamics: Entropy

Entropy
Predicting Entropy Changes
Second Law of Thermodynamics
Third Law of Thermodynamics and ΔS^{o}_{rx}
Define spontaneous processes and relate them to the concept of Entropy
Distinguish the entropy of the universe from the entropy of the system using the second law of thermodynamics
Calculate entropy changes in physical and chemical processes using the third law of thermodynamics
Predict the sign of entropy changes for physical and chemical processes

Topic 18: Gibbs Energy

Gibbs Energy
Gibbs Energy and Temperature
Calculating ΔG
Relate Gibbs Energy to the Entropy of the Universe
Assess the Gibbs Energy Dependence on Enthalpy, Entropy and temperature.

Relate the properties of state functions to Gibbs Energy

Topic 19: Reduction-Oxidation (Redox) Reactions

The Fundamentals of Redox Reactions
Assigning Oxidation Numbers
Balancing Redox Reactions in Acidic Solution
Balancing Redox Reactions in Basic Solution
Assign oxidation numbers to elements, molecules and molecular ions
Balance redox reactions in acidic and basic solutions
Identify oxidation and reduction processes

Topic 20: Electrochemistry

Electrochemical Cells
Standard Half-Cell Potentials and Standard Cell Potentials
Calculations of Standard Cell Potentials
Cell Potentials, Gibbs Energies and Spontaneity
Cell Potentials under Non-Standard Conditions
Construct a simple electrochemical cell
Calculate cell potentials under standard and non-standard conditions for an electrochemical cell
Calculate Gibbs energy for an electrochemical cell under standard and non-standard conditions

Topic 21: Alkanes, Cycloalkanes and Functional Groups

Saturated Hydrocarbons
Cycloalkanes
Functional Groups in Organic Chemistry
Rules for Systematic Naming of Hydrocarbon Compounds
Alkenes, Alkynes and Aromatics
Alcohols and Ethers
Aldehydes and Ketones
Carboxylic Acids and Esters
Amines and Amides
Chirality
Apply systematic naming of organic compounds (name to structure and structure to name) with one functional group
Distinguish between a functional group and a substituent
Identify chiral centers (carbon only)
Distinguish between chiral and achiral compounds

Topic 22: Spectroscopy

Ultraviolet and Visible (UV/Vis) Spectroscopy
Infrared Spectroscopy (IR)
Nuclear Magnetic Resonance (NMR) Spectroscopy
Chemical Equivalence and Non-Equivalence
Calculate quantities using Beer's Law

Interpret infrared spectra for simple organic molecules
Interpret ^{13}C NMR spectra for simple organic molecules

Topic 23: Introduction to Chemical Reactions

Reactions of Organic Compounds
S_N2 Substitution Reactions
Addition Reactions of Lithium Reagents
Diels-Alder Reactions
Predict products and draw curly arrow mechanisms for S_N2, Diels Alder and Alkyl Addition reactions

Topic 24: Rates of Chemical Reactions

Average Rate of Reaction
Instantaneous Rate of Reaction
Integrated Rate Laws for First & Second Order Reactions
Half-Life for First Order Reactions
Calculate quantities associated with the average rate of reaction
Determine the rate law for a reaction using experimental data
Calculate quantities associated with the first and second order integrated rate laws

Topic 25: Reaction Mechanisms

Mechanisms of Reactions
Temperature and the Rate of Reaction
Catalysis
Sketch a simple reaction coordinate diagram
Calculate quantities associated with the temperature dependence of rate constants (Arrhenius equation)
Describe the effect of a catalyst on a reaction coordinate diagram and activation energy
Differentiate between homogeneous and heterogeneous catalysis

Laboratory Experiments

Exp. 8 – Determination of the Atomic Mass of Magnesium
Exp. 9 – Using Solubilities to Identify 8 Unknown Solutions
Exp. 10 – Thermochemistry and the Heat of Reaction
Exp. 11 – Spectroscopic Determination of Copper in a Complex
Exp. 12 – A Series of Reactions Involving Copper
Exp. 13 – Partitioning and Spectroscopic Identification of Food Dyes
Exp. 14 – Organic Qualitative Analysis
Exp. 15 – A Clock Reaction
Exp. 16 – Identification of Six Household Projects

Section 6: University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

Information: https://www.dal.ca/academics/important_dates.html

University Grading Practices

Information: https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Section 7: University-wide Student Resources and Support

Advising

General Advising: https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines: https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program

Information: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Dalhousie COVID-19 information and updates

Information: https://www.dal.ca/covid-19-information-and-updates.html