

**CHEM 234-01**

**Thermodynamics (3 credits)**

**Final Course Outline**

**Fall 2021**

Gregor Kos

September 13, 2021

## **1 Course description**

CHEM 234 is an introductory course in Physical Chemistry focusing on thermodynamics, the transfer of energy that accompanies chemical and physical change. It allows for the quantitative evaluation of equilibria and the determination of the direction of natural change. Thermodynamics provides a mathematical framework to discuss processes as diverse as gas chemistry, phase transitions. Topics covered include the properties of gases, internal energy, enthalpy & the First Law, entropy, free energy & the Second and Third Laws, phase equilibria, simple mixtures and chemical equilibria.

## 2 Course administration

**Instructor:** Gregor Kos, [gregor.kos@concordia.ca](mailto:gregor.kos@concordia.ca)

**Office:** Chemistry & Biochemistry, SP 265.20

**Office hours:** Wed, 12h30–14h00 & Thu, 10h30–12h00; and by appointment

**Prerequisites:** CHEM205, 206; PHYS204, 206, 224, 226; MATH 203, 205

**Class time:** Wed & Fri, 08h45 – 10h00

**Room:** CC 308 LOY

**Course website:** <http://moodle.concordia.ca> (automatic enrolment)

**Course text:** Peter Atkins and Julio De Paula, Physical Chemistry, Volume 1: Thermodynamics and Kinetics, 11ed, 2018, Oxford University Press; available for **rent through Perusall (see below)**

## 3 Electronic teaching tools

In addition to Moodle, electronic teaching tools will support your preparation for in-person class. These are –

- **Perusall** (<https://perusall.com>) for pre-reading and online discussions; sign-up required with real name and Student ID for grading.
- **myDalite** (<https://mydalite.org>) for online quizzes; sign-up required with real name and Student ID for grading.
- **iClicker** response system for in-class exercises.

The iClicker system will be used during lectures and tutorials for discussion questions and short quizzes. You need to bring your own, **registered clicker** to lectures in order to participate. **You cannot use the REEF app!** You also need to register your clicker through Moodle. **Clicker usage will start on 15 Sep 2021** for tutorials and in-class work. No accommodations will be made for forgotten clickers.

Regarding the use of third-party software and transmission of personal information, please see below.

## 4 Assessment

During the lecture one midterm exam will be given. Together with the pre-reading, pre-reading quiz, cumulative final exam and the tutorial (scheduled separately) the final mark will be calculated:

- Weekly pre-reading & discussions (Persuall): 12%
- Weekly quizzes (myDalite): 6%
- Clickers: 6%
- Midterm (in-class): 16%
- Final (centrally scheduled): 40%
- Tutorial: 20%

**You need a passing grade for both, the lecture and tutorial portion of the course.** For the class a passing grade from midterm and final exams ( $> 50\%$ ) is required. The passing grade for the tutorial is also  $> 50\%$ .

**For the midterm and the final exam, a single letter-sized page (one-sided) with notes of any kind is allowed.** Bring your draft to class for practice sessions and update it frequently before the exams. You may use programmable calculators for exams only after a hard reset in front of the instructor before the exam.

For calculation of exam marks, **missing units** ( $-1$  mark) and an incorrect number of **significant figures** ( $-0.5$  marks) in a final result will lead to **automatic deductions** outside the regular marking scheme for each occurrence of the error(s) in the exam. Revise unit analysis and significant figures as early as possible, if needed.

## 5 Important dates

Every week assigned pre-reading sections will be posted on Perusall. Marks will be awarded for participating in discussions (asking good questions, providing answers). You have until Sunday evening (11 pm) of the week to complete the pre-reading, discussions and a weekly quiz on myDalite.

<b>Date</b>	<b>Event</b>
Weekly (Sun, 11 pm)	Pre-assigned reading
Weekly (Sun, 11 pm)	Mandatory quiz
7 Sep 2021	Classes start
13 Sep 2021	Labs start
20 Sep 2021	Deadline to add and withdraw (DNE) from fall courses
27 Oct 2021	Midterm 1
17 Oct 2021	Deadline to complete CHEM 101 quiz (23h55)
8 Nov 2021	Deadline for withdrawal (DISC) from fall courses
TBD	Final exam

## 6 Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the Academic Regulations, the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the changes.

## 7 Attendance

### 7.1 Lecture

**I strongly suggest to attend class regularly.** Midterm and final examinations will be conducted following university regulations. For a missed midterm during a short absence an alternate exam will be scheduled during class time; please contact me as soon as possible. For a missed midterm with a doctor's note during an extended absence marks will be transferred to the final exam (for a contribution of 51% to the course mark). Missed midterms, pre-reading assignments, online quizzes and clicker sessions will be marked zero.

### 7.2 Tutorial

**Attendance at the tutorials is mandatory.** You must go to the section you are registered in; otherwise you will receive zero marks and the tutorial will be marked as missed (unless permission is granted by the tutorial leader). For any missed tutorial a doctor's note or other official note for the day of the tutorial is the only acceptable excuse, otherwise zero marks will be given. For missed tutorials you must schedule a make-up tutorial within 1 week with the tutorial instructor. If you miss more than one tutorial without a suitable excuse and fail to attend the make-up tutorial, you will get a failing grade for the course.

You must show all your work when answering a quiz or assessment ques-

tion, otherwise you will get zero marks for the question. You can use your personal formula sheet (letter-sized, single sided) for all assessments, but the use of class notes is not permitted. Anti-plagiarism and Academic Dishonesty rules will be strictly enforced!

### **Tutorial times (starting Mon, Sep 13, 2021)**

01T-TUT, Mon 13:15 – 14:30, CJ 1.121 LOY

02T-TUT, Tue 13:15 – 14:30, CC 301 LOY

03T-TUT, Wed 13:15 – 14:30, CJ 1.129 LOY

04T-TUT, Thu 13:15 – 14:30, CC 301 LOY

51T-TUT, Tue 18:00 – 19:15, CC 321 LOY

## **8 Course content**

Chemistry CHEM 234 is an introduction to thermodynamics. The course will closely follow selected topics from Chapters 1–6 of the assigned textbook.

### **8.1 Review chapters**

In preparation for the course, **I strongly suggest to review the following chapters from General Chemistry.** Recommended review chapters were taken from the following resource: Steven S. Zumdahl and Susan A. Zumdahl, Chemistry, 8ed, 2008, Brooks Cole, ISBN-13: 978-0547168173, ISBN-10: 0547168179. If you have access to an alternative textbook, e.g.,

Kotz-Treichel, please have a look at the equivalent chapters. Do not forget to extensively practice your problem-solving skills.

- Stoichiometry (Zumdahl, Chapters 3 & 4 )
- Gases (Zumdahl, Chapter 5)
- Thermochemistry (Zumdahl, Chapters 6 & 17)
- Liquids and Solids (Zumdahl, Chapters 10)
- Properties of Solutions (Zumdahl, Chapters 11)
- Chemical Equilibrium (Zumdahl, Chapter 13)

## **8.2 Chapters covered in detail**

Chapter 1 – The Properties of Gases (1A and 1C)

Chapter 2 – The First Law

Chapter 3 – The Second and Third Laws

Chapter 4 – Physical Transformation of Pure Substances

Chapter 5 – Simple Mixtures

Chapter 6 – Chemical Equilibrium (6A and 6b)

## **8.3 Preparatory reading & quiz**

Every week assigned pre-reading sections will be posted on Perusall. Marks will also be awarded for participation in discussions (asking questions, pro-



viding answers). You have until Sunday evening (11 pm) of the week to complete the pre-reading, discussions and a weekly quiz on myDalite.

The questions and answers from Perusall and the quiz results from myDalite will aid me in preparing lectures, examples and exercises to cover the most challenging sections of the course material. In-class peer exercises using clickers will allow you to solidify and test your knowledge of the course material.

## 9 Academic Integrity

### 9.1 Mandatory seminar & quiz

As part of this course, you are required to –

1. attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources.
2. pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). **The deadline to take and pass the quiz is Sun, 17 Oct 2021 at 23h55.**

**Note:** This is not the University's quiz you may have been asked to take when you first registered and logged into the myConcordia portal; the one you must take is similar, but graded by the Department of Chemistry and Biochemistry, and you cannot take it until after you have attended the seminar.

The aim of this seminar is to clarify the academic conduct code in terms of what practices will be considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. You are only exempt from repeating the seminar and the quiz if you have done both in Fall 2016 or more recently [\*], otherwise you are required to repeat both this term.

This short seminar (1 hour) will be held on Zoom at the following times (note that you will not be given credit if you join too late and/or leave too early):

1. Wed, 22 Sep 2021, 21h00-22h00, [https://concordia-ca.zoom.us/meeting/register/tZIucumrqTouHdDujCve8eeyjRsM\\_\\_6XiQUD](https://concordia-ca.zoom.us/meeting/register/tZIucumrqTouHdDujCve8eeyjRsM__6XiQUD)
2. Thu, 23 Sep 2021, 21h00-22h00, <https://concordia-ca.zoom.us/meeting/register/tZEsdeyupjIuGNdupvk7KE33YXJ6MyAak0An>
3. Mon, 27 Sep 2021, 19h00-20:00, [https://concordia-ca.zoom.us/meeting/register/tZIud-urqTMiH91iodapd5geAi05rQtcr\\_y6](https://concordia-ca.zoom.us/meeting/register/tZIud-urqTMiH91iodapd5geAi05rQtcr_y6)

As space for each of the Zoom seminars is limited, please register for your preferred evening slot. We will take attendance at the Zoom seminar.

**If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is**

**completed. Please refer to the undergraduate calendar (section 16.3.6) for details on removal of an incomplete notation.**

[\*] You are exempt, if you can locate your ID in the pdf file on the departmental website at <http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf>.

## **9.2 Plagiarism and other forms of academic dishonesty**

The Academic Code of Conduct can be found in section 17.10 of the academic calendar (<http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html>). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

## **10 Privacy and use of external software**

### **10.1 Personal data**

Students are advised that external software and/or websites will be used in the course and students may be asked to submit or consent to the submission

of personal information (for example, name and email) to register for an online service. Students are responsible for reading and deciding whether or not to agree to any applicable terms of use. Use of this software and service is voluntary. Students who do not consent to the use the software or service should identify themselves to the course instructor as soon as possible, and in all cases before the DNE deadline, to discuss alternate modes of participation.

## **10.2 Submission of work**

Students are further advised that external software and/or websites will be used in the course and students may be asked to submit or consent to the submission of their work to an online service. Students are responsible for reading and deciding whether or not to agree to any applicable terms of use. Use of this software and service is voluntary. Students who do not consent to the use the software or service should identify themselves to the course instructor as soon as possible to discuss alternate modes of participation that do not require them to give copyright or the right to use their work to a third party.

By using the external software or websites, students agree to provide and share their work and certain personal information (where applicable) with the website/software provider. Students are advised that the University cannot guarantee the protection of intellectual property rights or personal information provided to any website or software company. Intellectual property and personal information held in foreign jurisdictions are subject to the laws of

such jurisdictions.

## **11 Intellectual property**

Content belonging to instructors shared in courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

## **12 Behaviour**

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications. Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students en-

gaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

## **13 List of student services**

1. Access Centre for Students with Disabilities (<http://www.concordia.ca/students/accessibility>)
2. Student Success Centre (<http://www.concordia.ca/students/success>)
3. Counselling and Psychological Services (<http://www.concordia.ca/students/counselling-life-skills>)
4. Concordia Library Citation and Style Guides (<https://library.concordia.ca/help/citing>)
5. Health Services (<http://www.concordia.ca/students/health>)
6. Financial Aid and Awards (<http://www.concordia.ca/offices/faao>)
7. Academic Integrity (<http://www.concordia.ca/students/academic-integrity>)
8. Dean of Students Office (<http://www.concordia.ca/offices/dean-students>)

9. International Students Office (<http://www.concordia.ca/students/international>)
10. Student Hub (<http://www.concordia.ca/students>)
11. Sexual Assault Resource Centre (<http://www.concordia.ca/students/sexual-assault>)
12. As a Concordia student, you are a member of the Concordia Student Union and have many resources available to you including HOJO (Off Campus Housing and Job Bank: <https://www.csu.qc.ca/services/hojo/>) and the CSU Advocacy Centre (<https://www.csu.qc.ca/services/advocacy/>).
13. Aboriginal Student Resource Centre (<http://www.concordia.ca/students/aboriginal>)
14. Concordia Mental Health (<https://www.concordia.ca/students/health/mental-health.html>)

## **14 Territorial acknowledgement**

We would like to begin by acknowledging that Concordia University is located on unceded Indigenous lands. The Kanien'kehá:ka Nation is recognized as the custodians of the lands and waters on which we gather today. Tiohtià:ke/Montréal is historically known as a gathering place for many First Nations. Today, it is home to a diverse population of Indigenous and other

peoples. We respect the continued connections with the past, present and future in our ongoing relationships with Indigenous and other peoples within the Montreal community.