

## CHEM 235: Physical Chemistry II: Kinetics of Chemical Reactions Syllabus for Fall 2016 Term

### GENERAL INFORMATION

This 3-credit course introduces the student to the theory and measurement of chemical reactions rates. It requires CHEM 234 (Physical Chemistry I), and is itself a prerequisite for CHEM 324 (Organic Chemistry III), CHEM 326 (Natural Products), CHEM 327 (Organic Chemistry of Polymers), CHEM 334 (Physical Chemistry: Laboratory), CHEM 335 (Biophysical Chemistry), CHEM 421 (Physical Organic Chemistry), CHEM 424 (Organic Synthesis), and CHEM 445 (Industrial Catalysis).

**Course Format:** Lectures and laboratories

**Instructor:** **Dr. Guillaume Lamoureux**

Office: SP-201.09

Office Hours: Tuesdays from 10:00 to 10:30 (after the lecture)

Any other time: By appointment

Email: [guillaume.lamoureux@concordia.ca](mailto:guillaume.lamoureux@concordia.ca)

Websites: Access from <http://moodle.concordia.ca/moodle/>  
(also <http://faculty.concordia.ca/glamoure/teaching.html>)

**Lectures:** Tuesdays and Thursdays from 8:45 to 10:00

Location: CC-312

**Lab Instructor:** **Ms. Zornitsa Stoyanova**

Office: SP-201.10

Office Hours: By appointment

Email: [zornitsa.stoyanova@concordia.ca](mailto:zornitsa.stoyanova@concordia.ca)

Website: Access from <http://moodle.concordia.ca/moodle/>

**Laboratories:** Section 01: Mondays from 13:30 to 17:30

Section 51: Thursdays from 18:30 to 22:30

Location: SP-220

**Textbook:** **Atkins & De Paula, *Atkins' Physical Chemistry*, 10th Ed., Volume 1.**

(available at the Concordia Bookstore)

The textbook is sold as a package that includes access to the book's website. It is highly recommended.

### COURSE OUTLINE

The following topics will be covered: molecular motion in gases and liquids, experimental techniques, theories of reaction rates, steady-state approximation, unimolecular reactions, enzyme catalysis, and some elements of reaction dynamics (collision theory, diffusion-controlled reactions, transition state theory).

### COURSE GRADE

The final grade for the course is composed as follows: 15% for each of the two midterm exams, 50% for the final exam, and 20% for laboratories. The grade for the laboratories includes pre-lab, lab performance, lab reports, and lab exam. The lab exam will be written in class, will last 30 minutes, and will be worth 5% of the final grade. See the lab Moodle webpage for details. The minimum passing grade for the course is 50%, but **of these 50 points, at least 10 should come from the laboratories and at least 40 should come from the midterm and final exams.**

## EXAMINATIONS

The midterm exams will be held on **October 6** and **October 27**. The final exam date is set by the Examinations Office. If a student is absent from a midterm, he/she must produce a written excuse appropriately signed (e.g., by a doctor or an employer) on letterhead paper. This letter must be delivered to the instructor **no later than one week after the exam**. If the absence is not valid, the student will receive a mark of zero for that exam.

## MANDATORY SEMINAR AND QUIZ

As part of this course, you are **required** to i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and ii) pass the online quiz associated with this seminar. (Note: The passing grade for the quiz is 100%.) (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 2011 or more recently**, otherwise you are required to repeat both this term. (You are exempt if you can find your ID in the PDF file located on the CHEM 101 Moodle site. For guest login, go to <http://moodle.concordia.ca/moodle>, Arts and Science, Chemistry and Biochemistry, Specialized Chemistry Sites, CHEM 101, and look under FAQ.) Dates and times at which you can attend the seminar will be posted in the Departmental office (SP-201.01) and you will have to sign up to your preferred time. 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 this requirement is completed. Please refer to the Undergraduate Calendar (section 16.3.6) for details on removal of an "INC" notation

## PLAGIARISM AND OTHER FORMS OF ACADEMIC DISHONESTY

The academic code of conduct can be found in section 17.10 of the Undergraduate 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

## LECTURE MATERIAL AND PRACTICE PROBLEMS

All concepts related to the course material will be covered in the lectures. The student is expected to read the appropriate sections of the textbook. There are no formal assignments for this course, but a list of suggested practice problems from the book will be provided with each section. It is the student's responsibility to use these problems to practice in applying the course material.

## LABORATORY INFORMATION

All questions on matters related to the labs should be addressed to Ms. Zornitsa Stoyanova, the Lab Instructor. **Laboratories start on Monday, September 12**. Labs will be performed on a rotation basis such that you perform one lab every other week. Although experiments are performed with lab partners, you must submit your own, individual lab report for all experiments. Joint lab reports are not acceptable. Do not expect a particular laboratory experiment to be related directly to the material covered in the lectures of the preceding week. Consider the laboratory work as an additional, independent learning experience.

## LABORATORY MANUAL AND MATERIALS

The lab manual can be found online from the lab Moodle webpage. You do not need to purchase a lab manual but you should print out the necessary pages. Other items such as lab coats and safety glasses (which are mandatory) are available at the bookstore.

## LABORATORY EXEMPTION

Students who are repeating the course, and have passed the lab component within the past two (2) years, may request a lab exemption. Applications for the exemption (forms available in SP-201.01) must be completed by the end of the first week of term (i.e. prior to the start of the laboratory); late applications will not be accepted. Signed and completed forms are to be returned to Hilary Scuffell, (SP-275.01). Students **MUST** register for the appropriate lab exemption lab/tutorial section; students registered in any other lab/tutorial sections will be required to complete the lab portion of the course (NO EXCEPTIONS).

## CALENDAR OF LECTURES

Please note that this calendar may change as the semester proceeds. The chapter numbers refer to the 10th edition of the textbook.

Date		Topics	Reading
Sep. 6	Lecture	Introduction, Motion in gases	1A–B
Sep. 8	Lecture	Transport in gases	19A
Sep. 13	Lecture	Motion in liquids	19B
Sep. 15	Lecture	Motion in liquids (cont'd)	
Sep. 20	Lecture	Rates of chemical reactions	20A
Sep. 22	Lecture	Rates of chemical reactions (cont'd)	
Sep. 27	Lecture	Integrated rate laws	20B
Sep. 29	Lecture	Reactions approaching equilibrium	20C
Oct. 4	Lecture	Arrhenius equation, Problems in class	20D
<b>Oct. 6</b>		<b>Midterm Exam #1 (covers Chapters 1A–B, 19A–B, and 20A–C)</b>	
Oct. 11	Lecture	Reaction mechanisms	20E
Oct. 13	Lecture	Reaction mechanisms (cont'd)	
Oct. 18	Lecture	Examples of reaction mechanisms	20F
Oct. 20	Lecture	Examples of reaction mechanisms (cont'd)	
Oct. 25	Lecture	Problems in class	
<b>Oct. 27</b>		<b>Midterm Exam #2 (covers Chapter 20A–F)</b>	
Nov. 1	Lecture	Enzymes	20H
Nov. 3	Lecture	Enzymes (cont'd)	
Nov. 8	Lecture	Enzymes (cont'd)	
Nov. 10	Lecture	More complex kinetics	
Nov. 15	Lecture	Reactive encounters	21A.1
Nov. 17	Lecture	Reactions in solution	21B.1
Nov. 22	Lecture	Transition state theory	21C
Nov. 24	Lecture	Transition state theory (cont'd)	
Nov. 29	Lecture	Problems in class	
Dec. 1	Lecture	Problems in class	
<b>TBA</b>		<b>Final Exam (covers Chapters 20A–F (again), 20H, and 21A–C)</b>	