

CHEM 235: Physical Chemistry II: Kinetics of Chemical Reactions Syllabus for Winter 2008 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: Wednesdays from 10:00 to 12:00 (or by appointment)

Telephone: 514-848-2424 ext. 5314

Email: glamoure@alcor.concordia.ca

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

Lectures: Wednesdays and Fridays from 8:45 to 10:00

Location: SI-H01

Lab Instructor: **Ms. Maria Dochia**

Office: SP-234.01

Office Hours: by appointment

Telephone: 514-848-2424 ext. 3358

Email: marica_dochia@hotmail.com

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

Laboratories: Section 02: Mondays from 13:30 to 17:30
Section 03: Tuesdays from 13:30 to 17:30
Section 04: Wednesdays from 13:30 to 17:30
Section 05: Thursdays from 13:30 to 17:30
Section 52: Wednesdays from 18:30 to 22:30
Location: SP-220

Textbook: **Atkins & De Paula, *Atkins Physical Chemistry*, 8th Ed., Volume 1.**

(available in the Concordia Bookstore)

(The textbook is sold as a package that includes the *Solutions Manual*, the electronic version of the full textbook (Volumes 1 and 2), and 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: **25% for the midterm exam, 55% for the final exam, and 20% for laboratories**. The grade for the laboratories includes pre-lab, lab performance, lab reports, and lab exam. See the lab website for the details. The minimum passing grade for the course is 50%, and **of these 50 points, at least 10 should come from the laboratories**.

EXAMINATIONS

The midterm exam will be held on **March 5, 2008**. The final exam date is set by the Examinations Office. If a student is absent from the 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**. The Department determines the validity of the absence. If the absence is not valid, the student will receive a mark of zero for the exam. If it is valid, the final exam will be worth 80% of the final grade.

MANDATORY SEMINAR AND QUIZ

As part of this course, you are **required** to i) attend a one-hour 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 it. (*Note*: Passing grade for the quiz is 100%.) 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. Should you have already attended these sessions you are not required to repeat them this semester. 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" notation until this requirement is completed. Please refer to the undergraduate calendar (section 16.3.6) for details on removal of an incomplete notation.

PLAGIARISM AND OTHER FORMS OF ACADEMIC DISHONESTY

The academic code of conduct can be found in section 16.3.14 of the academic calendar in either the printed or online (<http://registrar.concordia.ca/calendar/pdf/sec16.pdf>) versions. Any form of cheating, copying or plagiarism will be reported and appropriate sanctions will be applied. Ignorance of these regulations is no excuse and will not reduce the sanction.

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 for practice in applying course material. A solution manual is available from the Concordia Bookstore.

LABORATORY INFORMATION

All questions on matters related to the labs should be addressed to Ms. Maria Dochia, the Lab Instructor. Laboratories **start on Monday, January 7, 2008**. All students must attend the section for which they are registered during this week and a copy of documentation of enrollment in that section must be submitted to the demonstrator or staff member on duty. Changes will be considered only in exceptional circumstances. All requests for changes must be made to Ms. Dochia. 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 for the five experiments can be found online from the CHEM 235 website listed above. You do not need to purchase a lab manual but should print out the necessary pages from this website. 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 those who have reasons to believe that they may be exempted from the laboratory, must verify this with Ms. Dochia during the first week of lectures, no later than Friday, January 11, 2008. A student who is denied exemption must repeat the laboratory.

CALENDAR OF LECTURES

Please note that this calendar may change as the semester proceeds. The chapter numbers refer to the full textbook. (Chapter 21 corresponds to Chapter 8 of Volume 1, and so on.)

Date		Topics	Reading
Jan. 4	Lecture	Introduction, Molecular motion in gases	21.1
Jan. 9	Lecture	Molecular motion in gases (contd.)	21.2–21.4
Jan. 11	Lecture	Molecular motion in liquids	21.5–21.6
Jan. 16	Lecture	Molecular motion in liquids (contd.)	21.7–21.8
Jan. 18	Lecture	Experimental techniques	22.1
Jan. 23	Lecture	Rate laws	22.2
Jan. 25	Lecture	Rate laws (contd.), Integrated rate laws	22.2–22.3
Jan. 30	Lecture	Integrated rate laws (contd.)	22.3
Feb. 1	Lecture	Problems in class	
Feb. 6	Lecture	Reactions close to equilibrium	22.4
Feb. 8	Lecture	Reactions close to equilibrium (contd.), Arrhenius equation	22.4–22.5
Feb. 13	Lecture	Accounting for the rate laws	22.6–22.7
Feb. 15	Lecture	Accounting for the rate laws (contd.)	22.7
		(Midterm break)	
Feb. 27	Lecture	Unimolecular reactions	22.8
Feb. 29	Lecture	Problems in class	
Mar. 5		Midterm Exam (covers Chapters 21 and 22)	
Mar. 7	Lecture	Chain reactions	23.1–23.2
Mar. 12	Lecture	Polymerization kinetics	23.3–23.4
Mar. 14	Lecture	Homogeneous catalysis, Enzymes	23.5–23.6
Mar. 19	Lecture	Enzymes (contd.)	23.6
Mar. 21		No class	
Mar. 26	Lecture	Reactive encounters	24.1
Mar. 28	Lecture	Reactive encounters (contd.)	24.2
Apr. 2	Lecture	Transition state theory	24.4
Apr. 4	Lecture	Transition state theory (contd.)	24.5
Apr. 9	Lecture	Problems in class	
Apr. 10	Lecture	Problems in class (<i>Note: This class is on a Thursday.</i>)	
TBA		Final Exam (covers Chapters 22, 23, and 24)	