Syllabus: Physical Chemistry for Health Professions (CHEM 4600)
Spring 2020

MW, 2:15-3:30 PM, 2127 Ingersoll, Instructor: Prof. Laura Juszczak

Course description: a one-semester introduction to physical chemistry concepts and applications suitable for students pursuing biology- or health-related careers. Not recommended for students who intend to take graduate courses in chemistry or biochemistry. Assumes mastery of general chemistry (I and II), general physics (I and II) and calculus (I and II). Familiarity with multivariate calculus, analytical chemistry and biochemistry is highly recommended.

Learning goals: students who successfully complete this course will acquire:

Conceptual and quantitative understanding of:

- chemical thermodynamics notions such as the enthalpy, entropy and free energy of chemical reactions, and the chemical potential of substances and how these relate to chemical, biological and life processes.
- notions of kinetic theory of chemical reactions and how these are applied to the study of chemical and biological reactions.
- Conceptual, mathematical, and quantitative understanding of quantum mechanical theory and how it relates to the properties of molecules and their interactions, including notions and applications of molecular spectroscopy.

Texts:
https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Map%3A_Physical_Chemistry_(Atkins_et_al.)

Text II: Physical Chemistry 6th ed. Ira Levine PDF (out-of-print)

There are several other physical chemistry texts available on chem.libretexts.org which may be helpful.

Required items: Scientific calculator, Computer web access (for blackboard, see below)

Blackboard page

Course material, announcements, homework assignments, practice quizzes, test grades and more will be distributed via the Blackboard homepage for this course. Confirm that you have access to Blackboard, and that the email address listed is the one you want to receive messages at (Help→Tools→Update email).

Grading: The overall percent grade for the course will be determined based on the percent grades of two midterm exams and the final as follows:

30% Midterm Exam #1
30% Midterm Exam #2
40% Final Exam
The letter grade will be assigned based on the percent grade above according to the following scale:
94 or more A+; 93-87 A; 86-80 A-; 79-75 B+; 74-70 B; 69-65 B-; 64-60 C+; 59-55 C; 54-50 C-; 49 or less F.

Exam absences: Unjustified absences for midterm exams are graded as 0 (zero). The only exception is a missing grade on one of the midterms due to a justified absence (i.e. with a doctor's note), which will be calculated as the weighted average of the grades of the other midterm and the final exam, with 40% weight on the midterm and 60% on the final exam grade.

Attendance: attendance will be recorded but not graded. Lecture attendance is HIGHLY recommended to do well in this course. The textbooks are a guide to the topics that will be emphasized and that will be the subject of the exams.

Exam dates:
- Midterm #1: Monday March 9
- Midterm #2: Wednesday April 7
- Final exam: Wednesday May 18

Equation sheets for midterms and exams
For in class exams, you will be allowed to have a single page of key equations for each exam. It is suggested that you begin creating your page with the first lecture. No handwritten pages will be allowed; only PDF format. The page will have to be submitted to me a week prior to the exam for approval. A group page can be submitted. More rules will be announced as we approach the first midterm date.

Office hours
Prof. Laura Juszczak, LJUZAK@brooklyn.cuny.edu, Office: 3119N, Phone: 718-951-5000 x 1426
M 4:00-6:00 PM
F 2:00-3:00 PM
or by appointment. E-mail questions are welcome. However, do not expect answers on weekends or holidays.

Study guide: Physical chemistry requires a LOT OF WORK, make sure you have enough study time to dedicate to this course. Pay particular attention to the material from lectures, lecture notes, examples, assignments, and practice tests. The textbook(s) will be used mainly as a reference. This course covers only a fraction of the topics in any one textbook. In addition, the course emphasizes specific aspects of those topics that are covered. Sometimes one textbook “speaks to you” better than another one. Since there is much related material on libretexts.org, I encourage you to find the best textbook for you.

It is a bad idea to try to tackle this course on your own. Study and work on problem sets in a group. Do not be left behind. Attend the lectures and stay on top of the assignments. If you can, read up on upcoming topics before they are presented in lecture. Refresh your knowledge in general chemistry, physics and especially math. Having to relearn background material while also studying for physical chemistry is not a good recipe for success. It is best to tackle this course with a mindset towards an in-depth scientific understanding of the material, rather than
trying to memorize and second-guess what is going to be on the exams. You will do well on the exams if you can reach a real understanding of the concepts. **While homework assignments, and practice tests are not graded, they are essential to your success in this course.**

### COURSE TOPICS

NB: corresponding chapters refer to the Levine, 6th Ed. Text.

1. General chemistry and math review: chapter 1
2. Foundations of Chemical Thermodynamics:
   1. Principles of thermodynamics: chapters 2-4
   2. Ideal Solutions: chapters 9.5–9.8
   3. Thermodynamic functions of reactions, chemical equilibrium: chapters 5 and 6.1–6.4
   4. Special topic 1: molecular binding equilibria
   5. Special topic 2: bioenergetics
3. Foundations of Chemical Kinetics:
   1. Reaction kinetics: chapter 16
   2. Transport and diffusion: topics from chapter 15
   3. Special topic 3: enzymatic kinetics
4. Foundations of Quantum Mechanics and Spectroscopy
   1. Principles of Quantum Mechanics: lecture notes, chapter 17
   2. Electronic structure of atoms and molecules: topics from chapters 18 and 19
   3. Spectroscopy and photochemistry: topics from chapter 20

**Weekly reading and homework assignments:** See Blackboard. Course assignments will be distributed on Blackboard also.

**Academic Integrity:** The faculty and administration of Brooklyn College support an environment free from cheating and plagiarism. Each student is responsible for being aware of what constitutes cheating and plagiarism and for avoiding both. The complete text of the CUNY Academic Integrity Policy and the Brooklyn College procedure for policy implementation can be found at www.brooklyn.cuny.edu/bc/policies. If a faculty member suspects a violation of academic integrity and, upon investigation, confirms that violation, or if the student admits the violation, the faculty member must report the violation.

**Student Disability Services:** In order to receive disability-related academic accommodations students must first be registered with the Center for Student Disability Services. Students who have a documented disability or suspect they may have a disability are invited to set up an appointment with the Director of the Center for Student Disability Services, Ms. Valerie Stewart-Lovell at (718) 951-5538. If you have already registered with the Center for Student Disability Services, please provide your professor with the course accommodation form and discuss your specific accommodation with him/her.

**Policy on non-attendance due to religious beliefs:** refer to p. 66 in the Undergraduate Bulletin.