

Physical Biochemistry (CHEM 305)

Fall Semester 2017

Instructor: Jan Florián

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Lecture: Tue, Th 2:30 – 3:45 PM, Flanner Hall Auditorium
Discussion: Th 10:00 – 10:50 AM, Dumbach Hall 227 or Th 1:00 – 1:50 PM, Flanner Hall 105
Office Hours: Fri 1:00 – 3:00 PM

Textbook: “*Physical Chemistry: Principles and Applications in Biological Sciences*” 5th edition, by Tinoco, Sauer, Wang, Puglisi, Harbison and Rovnyak, Pearson Education Inc. 2014, ISBN-10: 0-13-605606-7

Required Materials:

1. “Mastering Chemistry online learning system for Tinoco 5th edition.
2. A calculator capable of scientific notation.

Course Overview: Physical chemistry is a set of general principles and experimental methods for exploring chemical and biological systems. In this class, we will learn and discuss these principles and methods, while emphasizing their molecular interpretation and biochemical applications. We will cover chapters 2 – 4, 7 – 9 and 11 – 14 of Tinoco’s text; a tentative schedule of lecture topics accompanies this syllabus. Your attendance at lecture and discussion is expected. The correct answers of the exam questions may require knowledge of all information presented in the lecture, discussion, textbook, and Mastering, as well as the necessary general chemistry, physical and mathematical prerequisites. It is recommended that you read (and think about) appropriate chapter of the textbook prior to the lecture covering that chapter, and ask the questions relevant to the covered material during the lecture and the discussion.

Grade components	Maximum number of grading points
Homework	14
Sum of the two midterm exams	45
Final exam	41
Total	100 grading points

Homeworks: Homework problems use the *Mastering Chemistry* online learning system. You will need to buy the access code and register at <http://masteringchemistry.com/site/register/new-students.html> before accessing the homeworks for the first time. During the registration, select your textbook, school, and the course id **LUCPBIOCHEM2017**. Homework assignments will be due every Mo at 10:59 PM. Due date may be postponed, for excused absences that last five or more days.

Exams: Two 70 minute mid-semester exams and one 120 minute final exam will be cumulative. No make-up exams will be administered for mid-semester exams. Students who miss a mid-semester exam for a valid reason will have the grading-point value of the final exam increased by 15 points. For the absence to be classified as having valid reason, students must notify the instructor about their absence before the exam and provide valid excuse (e.g. a doctor’s note) that covers the exam day. The doctors note must be signed and contain legible name, hospital/office address and phone number and the reason for the absence. If the student disagrees with her/his score for the exam, she/he must request re-grading within one week from the day he/she received the graded exam. The exam questions will be based on modified end-of-chapter problems, modified Mastering homework problems, a college general chemistry testbank, and material covered in lecture and discussion. Exam will include a combination of multiple-choice questions, short-answer questions for questions with qualitative answers, and quantitative questions with partial positive or negative credit for all significant steps taken to arrive to the final answer. Partial-credit questions containing only the correct final answer without solution leading to this answer will receive 50 – 80% grading penalty. Students must follow the seating assignments.

Grading scheme: Your grade will be calculated using grading points that you earned in two mid-semester exams, final exam and homework assignments: 100% score from the better of your two mid-semester exams = 30 grading points, 100% score from the weaker of your two mid-semester exams = 15 grading points, 100% score from the final exam = 41 grading points, and 100% on the homework problems = 14 grading points.

Letter grades for the class will be calculated using both a fixed scale and a Gaussian scale. The scale that yields a better letter grade will determine your final letter grade.

Fixed scale

A = 100 - 81 grading points; A⁻ = 81 - 76; B⁺ = 76 - 70; B = 71 - 66; B⁻ = 66 - 61; C⁺ = 61 - 56; C = 56 - 51; C⁻ = 51 - 46; D⁺ = 46 - 41; D = 41 - 36; F = Less than 36 grading points.

Gaussian scale (M denotes a median value, and σ denotes standard deviation):

Earned Grading Points	Letter Grade	Earned Grading Points	Letter Grade
M - 0.2 σ to M + 0.2 σ	C+	M - 0.5 σ to M - 0.2 σ	C+
M + 0.2 σ to M + 0.5 σ	B-	M - 0.8 σ to M - 0.5 σ	C-
M + 0.5 σ to M + 0.8 σ	B	M - 1.1 σ to M - 0.8 σ	D+
M + 0.8 σ to M + 1.1 σ	B+	M - 1.4 σ to M - 1.1 σ	D
M + 1.1 σ to M + 1.4 σ	A-	less than (M - 1.4 σ)	F
More than (M + 1.4 σ)	A		

Midterm grade: Your midterm grading points will be based on midterm exam(s) (0.86 weight) and homework (0.14 weight).

Ethical Considerations:

Students will not collaborate on any exam or homework. Only those devices and materials permitted by the instructor may be used to assist in examinations. Students will not represent the work or nice points of others as their own. Any student caught cheating during exam, or student who modifies his/her exam after it was returned back to him/her for inspection will be reported to the Deans office and will receive zero points for the given exam.

Class preparation: In order to understand the material presented during lectures and discussions, it is important to come to the class with good background knowledge. This can be achieved by reading (and thinking about) material in the textbook, reviewing appropriate material from calculus, physics and general chemistry classes, and solving end-of-chapter problems. Work together with your classmates; if you don't understand something, someone else may. You will also find that explaining a solution to your classmate will improve your understanding and long-term retention of the material. It is recommended that students devote to the preparation for this class a minimum of two hours every day.

Course Repeat Rule: Effective with the Fall 2017 semester, students are allowed only THREE attempts to pass Chemistry courses with a C- or better grade. The three attempts include withdrawals (W). After the second attempt, the student must secure approval from the department for a third attempt.

Tentative Schedule (exact exam dates and coverage will be announced in class and on Sakai)

Week 1	Ch 2: The first law of thermodynamics, Kinetic molecular theory.
Week 2	Ch 2: Labor day. Heat capacity. Enthalpy, bond energies, molecular interpretations.
Week 3	Ch 3: The second law of thermodynamics, entropy.
Week 4	Ch 4: Gibbs and Hemholtz free energy. Noncovalent interactions.
Week 5	Ch 4: Exam 1. Free energy and chemical equilibria, biochemical applications of thermodynamics.
Week 6	Ch 8: Motions of biological macromolecules.
Week 7	Ch 9: Mid-semester break. Chemical kinetics. Transition-state theory.
Week 8	Ch 11: Foundations of quantum mechanics, Schrodinger equation.
Week 9	Ch 11: Particle -in-a-box, harmonic oscillator, electronic structure of atoms.
Week 10	Ch 12: Biomolecular interactions. Molecular dynamics, computational chemistry. Last-day to drop the class.
Week 11	Ch 13: Exam 2. Electromagnetic spectrum, optical spectroscopy.
Week 12	Ch 13: Fluorescence and phosphorescence, infrared and Raman spectroscopy.
Week 14	Ch 13: Nuclear magnetic resonance, nuclear spin. Thanksgiving break.
Week 14	Ch 14: Chemical shift, spin-spin coupling.
Week 15	Ch 14: Relaxation mechanisms, multidimensional NMR spectroscopy.

Final Exam, Saturday December 16, 4:15 – 6:15 PM, Flanner Hall Auditorium