

CHM 3400
Physical Chemistry for the Biosciences
Fall 2023

Class # **25423**

Sections P341

Canvas e-learning site:

All communications must be done through the e-learning site, including homework, deadlines, grades, and announcements. It is your responsibility to check this site for updates. Please do not email the instructors (or the TAs) personal email accounts.

Schedule:

M,W,F: Period 2,3 . 8:30 - 9:20 AM, Lei 207

Professors:

Dr. Alberto Perez. Leigh Hall, Room 240 F

Office Hours: TBA

Graduate Teaching Assistant: Rangana

Office Hours: TBA

Prerequisites: CHM2210 (or CHM2200), MAC 2312 and two semesters of college physics.

Textbook:

We recommend:

“Physical Chemistry for the biosciences”, Raymond Chang

“Physical Chemistry: Principles and Applications in Biological Sciences”, Tinoco, Sauer, Wang, Puglisi, Harbison and Rovnyak.

This textbook is not required, but you MUST have an undergraduate Physical Chemistry Book that includes thermodynamics and kinetics.

Homework:

There will be homework assigned nearly every week. Homework is due one week after it is assigned. It has to be turned in before or at the beginning of the lecture class. They will be graded and returned. Solutions will be provided after the deadline. Answers should be turned in on time and should be neat and legible. Write your name and UFID clearly on each page. Computer-typed is preferable. Each problem must be solved in a different page. Each homework problem has to show the full derivation. Units and numerical

results will be checked and graded. Several of the homework assignments involve interpretation of computational and experimental data. When preparing graphs, you must use Excel or a comparable graphing program. If you are doing a curve fit you must justify the choice of fitting function. No points will be given for a final result without justification. There will be no partial credit for late homework. If not turned in before or at the deadline, the grade will be zero.

While you might work in groups the homework assignments must be turned in individually, thus you must turn in your own work to receive any credit! Any sort of plagiarism will not be tolerated. You must also reference the other members of your study group. Failure to adhere to these requirements will result in zero credit for the assignment.

Submitting Homework: All homework will be submitted via canvas. Upload as a single pdf file. This can be your scanned hand-written work – but make sure that it is legible (especially if you are writing with a pencil).

Exams: There will be two progress exams. Conflicts with these exams' dates should be resolved with the instructor no later than one week prior to the exam date. The exam dates will be announced shortly. Final Exam: TBA

First midterm Tentative on Oct 11th Lei207 5:10-7:10pm
Second midterm Tentative Nov 29th Lei207 5:10-7:10pm

Grading: The grade will be determined by Homework (45%), 2 progress tests (35% total) and a final exam (20%).

Students can decide not to take the final exam. If they choose not to take it, then the two midterms will count for 55% of the grade. If they do decide to take the final, their grades could go up or down, so they should choose carefully. We will not take the better of the grades. This decision can be made as late as the last week of classes. The grades are absolute, there will be no curve grading.

Grading scale:

A > 90
A- 87.5 to 89.99
B+ 82.5 to 87.49
B 77.5 to 82.49
B- 75 to 77.49
C+ 72.5 to 74.99
C 67.5 to 72.49
C- 65 to 67.49
D+ 62.5 to 64.99
D 57.5 to 62.49
D- 55 to 57.49

Attendance: Lecture attendance is essential for your success in this class. However, we will not take roll. The hand-written notes of each class will be uploaded to canvas at the end of each class.

Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. [Find more information in the university attendance policies.](#)

Disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center by providing appropriate documentation. Once registered, students will receive an accommodation letter, which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester.

Counseling: The University of Florida provides counseling services for students, staff, and faculty. See <https://counseling.ufl.edu> or call (352) 392 1575 during regular service hours (8 am– 5 pm). For other hours or on weekends call the Alachua County Crisis Center (352) 264 6789.

Cell Phones: Please put all cell phones and other digital devices on “silent mode” during all class periods. During exams, your cell phone must be placed on the table in front of you, face down, for the entire test period.

Honor Code: This class will operate under the policies of the student honor code, which can be found at: <https://sccr.dso.ufl.edu/process/student-honor-code/>
The students, instructors, and TAs are honor-bound to comply with the Honors Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Honor Code.

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied:

THE PLEDGE

“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

Academic Honesty:

Students are expected to obey the University of Florida Honor Code, detailed at <http://regulations.ufl.edu/chapter4>. Violations, including plagiarism, will be reported to the Office of Students Judicial Affairs.

GatorEvals:

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

Course Syllabus
(Tentative schedule)
CHM 3400 – Physical Chemistry

Note: Items marked with an asterisk (*) will depend on the time available.

Why Physical Chemistry ?

The First Law: Energy Is Conserved.
Energy Conversion and Conservation.
Describing the State of a System.
Phase Changes. Chemical Reactions.

The Second Law: The Entropy of the Universe Increases.
A New State Function, Entropy.
The Second Law of Thermodynamics: Entropy Is Not Conserved.
Chemical Reactions. Third Law of Thermodynamics.
Gibbs Free Energy. Helmholtz Free Energy. Noncovalent Reactions.

Free Energy and Chemical Equilibria.
Chemical Potential (Partial Molar Gibbs Free Energy).
Reactions of Gases: The Ideal Gas Approximation.
Nonideal Systems.*
The Eq. Constant and the Standard Gibbs Free Energies of the Reactants and Products.
Biochemical Applications of Thermodynamics

Kinetics: Rates of Chemical Reactions.
Kinetics. Reaction Mechanisms and Rate Laws. Temperature Dependence.
Transition-State Theory. Electron Transfer Reactions: Marcus Theory.
Ionic Reactions and Salt Effects. Isotopes and Stereochemical Properties.
Very Fast Reactions. Diffusion-Controlled Reactions.
Photochemistry and Photobiology. Photosynthesis.

Enzyme Kinetics. Michaelis-Menten Kinetics. Competition and Inhibition.
Spectroscopy principles
Molecular dynamics of proteins and nucleic acids: kinetics and relative binding affinities.