

**CHM3400**  
**Physical Chemistry for the Biosciences**  
**Fall 2020**

ALL CLASSES WIL BE HELD ONLINE.

Information listed below is subject to change.

**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:**

MWF    Period 3      9:35 -10:25 AM

**Professor:**

Dr. Adrian E. Roitberg

Office Hours: TBA

**Graduate Teaching Assistant:**

Ignacio Pickering

Office Hours: TBA

**Prerequisites:** CHM 3120, MAC 2312 and two semesters of college physics.

**Textbook:**

There is no required textbook, **but you MUST have an undergraduate Physical Chemistry Book** that includes thermodynamics and kinetics. If you do not have the book described below, show any of the instructors the one you have, and they will tell you if it is ok.

We recommend

“Physical Chemistry: Principles and Applications in Biological Sciences”, 5th Edition, Tinoco, Sauer, Wang, Puglisi, Harbison and Rovnyak.

The 4<sup>th</sup> Edition would be perfectly fine also.

### **Course objectives**

By the end of the course the students should be able to

Understand and use the four laws of thermodynamics.

Understand and use the principles of chemical and biological kinetics.

### **Course Itinerary**

(Tentative)

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.

### **Homework:**

There will be homework assigned nearly every week. Homework is usually due one week after it is assigned. It has to be turned in before midnight on the due date. 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 homeworks. If not turned in before or at the deadline, the grade will be zero.

\*\*\* Since we are online this semester, each homework must be turned in as a single scanned pdf file. Please do not simply take a photograph, try to find an app that creates a scan. If the quality is not good enough for us to grade, we will ask you to resend it only once. If it is still not clear, it will be scored as non having been submitted.

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.

I do have access to the same web sites where UF students go looking for help. If I find that you have copied directly from one of those sites, you will be reported immediately for plagiarism. I work on computers all day, and can trace your IP and usernames without much trouble, so please do not do it !

**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. There will be no make-up exams. The exam dates will be announced shortly.

**Grading:** The grade will be determined by Homeworks (40%), 2 progress tests (40% total) and a final exam (20%).

Students can decide not to take the final exam. This decision can be made as late as the last week of classes.

The grades are absolute, there will be no curve grading.

If a student decides 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.

If they choose not to take it, then the two midterms will count for 60% of the grade, with 40% for the homeworks.

**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
E	<60

**Attendance:** Lecture attendance is essential for your success in this class. However, we will not take roll. Repeated absence in class will make it very difficult to earn full participation points.

**Course Evaluations:** Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

**HONOR CODE** The student honor code can be found at:

<http://www.registrar.ufl.edu/catalog/policies/students.html>

The students, instructor 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.*

*On all work submitted for credit by students at the university, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment.*

**Students with disabilities:** Students requiring special accommodations need to register at the Dean of Student Offices and bring the documentation to the instructor.

Counseling services are available at <http://www.counsel.ufl.edu> . or call (352)-392-1575 during regular service hours (8am-5pm). For other hours or weekends call the Alachua County Crisis Center (264-6789). Students may also call the clinician on-call at Student Mental Health for phone callback and consultation at (352)-392-1171

### **Class Recordings**

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.