

Physical Chemistry
CHM3400
Syllabus
Fall 2012
MWF Period 5 (11:45-12:35)
Lei 207

Professor: Dr. Ken Merz
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Office Hours: MWF 10:00-11:00 CLB 220 or by appointment

Teaching Assistant: Ms. LiLi Pan
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Office Hours: T 2:30-3:30PM, Th 4:30-5:30 or by appointment

Course Description:

This course introduces basic physical chemistry concepts. The focus is on thermochemistry and kinetics and their application to biological problems.

Required Text:

“Physical Chemistry: Principles and Application in Biological Sciences” by I. Tinoco, Jr.; K. Sauer; J. C. Wang; J. D. Puglisi. Fourth Edition (Prentice Hall)

Prerequisites:

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

Homework:

There will ~8 homework assignments made during the course of the semester. The homework assignments will be e-mailed to the class, so make sure you check your e-mail daily. All homework will be due 1 week after it is assigned at the start of class. They will be graded and returned and solutions will be provided after the submission deadline. Answers should be turned in on time and should be neat and legible. One answer per page is required to facilitate grading. Late homework will be assessed a 20% deduction for each day late. Each homework problem has to show the full derivation, using SI units (except as requested). No points will be given for answers that do not show your work. Please be aware that even failing to hand in one homework problem set can significantly impact your grade.

Topics:

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

Chapter 2. The First Law: Energy Is Conserved.

Energy Conversion and Conservation. Describing the State of a System.
Phase Changes. Chemical Reactions.

Chapter 3. 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.

***Chapter 4. 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

Chapter 11. Molecular Distributions and Statistical Thermodynamics.

Introduction to statistical thermodynamics. Work and heat.
Boltzmann most probable distributions.
Statistical mechanical entropy. Partition functions.

Chapter 7. 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.

Chapter 8. Enzyme Kinetics.

Enzyme Kinetics. Michaelis-Menten Kinetics. Competition and Inhibition.

Grading:

The grade will be determined by the homework (40%), 2 "midterm" tests (30% total), a final exam (20%) and 10% at my discretion. Students can decide not to take the final exam. If you do, the final grade could go up or down since all exams will count. If you choose not to take the final exam, then the two midterms will count for 50% of the grade. This decision can be made as late as the last week of classes. The grades will be assigned as follows:

A > 90
B+ 85-90
B 80-85
C+ 75-80
C 70-75
D+ 65-70
D 60-70
F <60

Conflicts with the "midterm" exams should be resolved with the instructor no later than 1 week prior to the exam date. There will be no make-up exams.

Students with Disabilities:

Appropriate accommodations will be provided, according to the policy stated at <http://www.chem.ufl.edu/~itl/disabilities.html>.

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.