

Syllabus

CHEM 344: Physical Chemistry II (for Biochemistry)

Lectures: Fall 2009, Mon, Wed, Fri, 2:00-2:50 p.m., Lecture Center C-1

Lecturer: Prof. Tim Keiderling

5407B SES, 6-3156, best contact: e-mail: tak@uic.edu

Office Hours: M, W -- 2:50-3:50 p.m. (i.e. after class) or appointment

Web Site: <http://www.chem.uic.edu/tak/Chem34409/>

Teaching Assistant: Ahmed Lakhani, aalakhan@uic.edu, Anjan Roy, aroy6@uic.edu and Yuan Ren, yren5@uic.edu

In 4344 SES, 6-2685, they will grade and help with problem solving

Office Hours: Wed 3-4 PM (Anjan), Thurs 10-11 AM (Ahmed), Thurs 2-3 (Yuan)

These may change! other times only by appointment

Prerequisites: Chemistry 340 (or 342) and Math 181 and one year of college physics

Class Attendance: required, random attendance checks will be taken, *will impact grade*

Drop/Add deadline: Friday Sept. 4, no penalty, (*under review?*) Deans drop date: Fri. Oct. 2 (*limited*)

Organized Problem/review sessions can be arranged with the graders if interest develops in semester

Textbook: Thomas Engel, Gary Drobny, Philip Reid, *Physical Chemistry for the Life Sciences* Prentice Hall, This was the text in Chem 340, so we will continue with it. We felt it had many good qualities, and reflected much of modern biophysical chemistry, but there are a frustrating number of errors in it, as with all new books. Its coverage of quantum chemistry seems much better than usual for Phys. Chem. books, but the kinetics is not good enough, so the Tinoco book was useful to students last year.

Problem sets will be in part from this book and in part from previous texts.

NOTE: some problems may use the Web-based problems in the book, for that you will need access to a text and its link to the animated problems

Optional Text just for Quantum Chemistry may be useful: but this is not specific or certain, see below, because last year only a few students found it useful, since Engel is strong for basic QM and spectroscopy

Note: the course material we will cover is present in many different Physical chemistry texts. Problem sets will reflect the chosen text, and related biochemically oriented texts, but the presentation of lectures will be more broadly based. However other texts may be clearer for you to read (or you may own them). You do not need to own this textbook, but you should have access to it for the homework/examples. Alternates:

Peter Atkins & Julio de Paula, *Physical Chemistry for the Life Sciences*, Freeman (Oxford) 2006.

This was a previous text, 2006, it is better for quantum, but worse for kinetics and has a number of irritating errors. Students seemed divided on its values.

Ignacio Tinoco, Kenneth Sauer, James C. Wang and Joseph D. Puglisi, *Physical Chemistry: Principles and Applications In Biological Sciences* Prentice Hall, This was 2007 text, solid book, good examples, nice kinetics, but frustration comes in QM section which is amazingly incomplete -- many students relied on this to complete homework, it has excellent examples

David Eisenberg & Donald Crothers, *Physical Chemistry with Applications to the Life Sciences*, Benjamin, -- one of the earlier bio-oriented texts, pretty good

[General Physical chemistry:](#)

Peter Atkins, *Physical chemistry*, any edition, Oxford?

Ira N. Levine, *Physical Chemistry*, any edition, general Phys Chem text, clear

Lionel M. Raff, *Principles of physical chemistry*, Prentice-Hall, Inc. (2001). [often used as a Chem 342 text]

Robert A. Alberty, *Physical Chemistry*, any edition, Wiley – simpler level, general text

For **Quantum** I think some specialized books have a real advantage for students just starting to learn QM and recommend you [survey them in library reserve](#), and if interesting [look for them used and cheap!](#) on various web sites (e.g. [Amazon.com](#), [bestbookbuys.com](#), [abebooks.com](#), [ebay.com](#), [half.com](#)). My experience is that the concepts of quantum mechanics strike some students as strange and reading it from different points of view can help overcome the “fear factor”. Our text actually has pretty extensive QM coverage, it is a matter of seeing the same topic in different language that can help here. The particular choice of alternate text is not vital, but titles emphasizing the words *Introduction* or *Fundamentals* are hints, and inclusion of *Chemistry* is a good sign:

J. E. House, *Fundamentals of Quantum Mechanics*, Academic, paper, successor to Hanna in style, ordered for bookstore, but earlier, simpler edition should be available cheaper (paper)

S. M. Blinder, *Introduction to Quantum Mechanics*, Elsevier, printed nicely, but not cheap

Mark A. Ratner, George C. Schatz, *Introduction to Quantum Mechanics in Chemistry*, Prentice Hall—hardback, higher quality and tougher level

Peter Atkins, *Molecular Quantum Mechanics*, Oxford, this is a deeper text, offers good physical insight

Clifford E. Dykstra, *Introduction to Quantum Chemistry*, Prentice Hall (paper)

Melvin W. Hanna, *Quantum Mechanics in Chemistry*, Benjamin (has 3 editions, paper, my favorite Introduction, out of print)—should be cheap on used book market

Daniel C. Harris & Michael D. Bertolucci, *Symmetry and Spectroscopy*, Dover (cheap) -- Chem 444 text, terrific to read, topics are just focused on molecular spectroscopy

NOTE: many of these books are on permanent reserve in the Science Library, 3rd Floor SES

Topics: We will continue from Chem. 340, i.e. I assume you now know thermodynamics, and in Chem. 344 we will go on to microscopic behavior and dynamics by use of biologically relevant

examples to explore fundamentals of kinetics and quantum chemistry with spectroscopic applications. That is probably too much to cover in a 3-hour semester course, but we will hit some highlights and try to make the connection to biochemistry apparent. [See chart with correlation of texts.](#)

Examinations: All examinations are closed book. Ideally we will have 2 hour exams in class and a 2+ hour *Comprehensive Final Exam* in the evening during Finals week (needs to be scheduled). Due to problems of fairness in exams last year, there will be NO EXTRA SHEETS allowed with equations or any other information during the tests, completely closed book exams, for which I will provide a list of equations

Tentative Schedule: 1st Hour Exam: Wednesday, Sept. 23, 2009
2nd Hour Exam: Monday, Oct. 19, 2009 (or later, if needed)
exact times to be set:

THERE ARE NO MAKE-UP EXAMS!

Homework: *It is vital that you learn to solve problems to master physical chemistry, therefore homework is mandatory and is graded.* Forming study groups can be a useful means of learning the material, but if you copy someone's else solution to a problem you will not learn it and your exam will show it. Besides we will know it! Homework grades are based on partly attempting all the problems and partly on your solutions determined for randomly selected problems.

Homework generally will be due on Friday, at the beginning of class, but there may be exceptions, which will be announced

NO LATE HOMEWORK WILL BE ACCEPTED!

Web Site will be used to post homework, answers and exam help plus occasional notes

<http://www.chem.uic.edu/tak/Chem34409/>

or link - www.chem.uic.edu then - [Coursework](#) then - [Chem 344](#)

NOTE: nothing but exams handed out in class on paper, all materials will be on web--electronic

Grading: Homework/Attendance: 100 points
First Hour Exam: 100 points
Second Hour Exam: 100 points
Final Exam: 200 points

Students with disabilities who require accommodations for access and participation in this course must be registered with the Office of Disability Services (ODS). Please inform me immediately and contact ODS at 312/413-2183 (voice) or 312/413-0123 (TTY).