Chemistry 341 (01:160:341), Fall 2016

Physical Chemistry of Biochemical Systems

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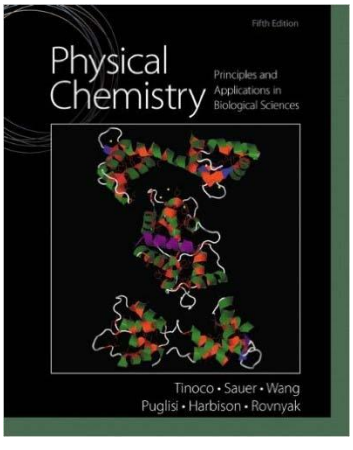
FALL 2016, MONDAYS AND WEDNESDAYS, 1:40 TO 3:00 PM,

SEC Building, 203.



Textbook:

Physical Chemistry: Principles and Applications in Biological Sciences; 5th edition

By Tinoco, Sauer, Wang, Puglisi, Harbison, and Rovnyak ISBN-10: 0-13-605606-7

Course Description

This is the first semester of a two-semester course in *physical chemistry* with an emphasis on applications to biochemical systems and life sciences. We will use themes of energy and structure to examine the relationship between theory, macroscopic properties and biochemical function. This semester will cover parts of two broad fields of biophysical chemistry:

1. *Structure* (including nature and variety of biomolecule organization on different lengthscales)
2. *Biomolecule Characterization* (including tools to achieve subnanometer resolution)

The majority of our time will be spent on structural characterization of biomolecules, covering chapters 1,5 and 11-15 of the textbook. The remaining chapters of the book will be covered in the second semester class, Chem 342. The following table provides a detailed, tentative schedule of when we will cover each chapter of the text. Changes to this schedule as well as other course information will be updated throughout the semester on the Sakai course website.

Class Meetings	Subject	Book Chapter(s)
Sep. 2, 8, 9, 14, 16	Introduction, Molecular Structure & Interactions: Biomolecules	1, 12
Sep. 21, 26, 28, Oct. 3	Molecular Structure & Interactions: Theory	11,12
OCTOBER 5	**EXAM 1**	**1, 11, 12**
Oct. 5, 10, 12, 17	Optical Spectroscopy	13
Oct. 19, 24, 26, 31	Magnetic Resonance	14
Nov. 2, 7, 9	Macromolecular Structure & X-ray diffraction	15
NOVEMBER 16	**ASSIGNMENT 1**	**1,11-15**
Nov. 14, 16, 21, 23	Macromolecular Structure & X-ray diffraction	15
Nov. 28, 30, Dec. 5, 7, 12	Statistical Foundations of Biophysical Chemistry	5
TBD (Dec. 15—Dec. 22)	**FINAL EXAM**	**1,5,11-15**

Exam 1	
Assignment 1	25%
Mid-term Exam 1	25%
Final Exam	30%
Homework / quizzes	20%

Course Schedule

NOTE: Labor Day is Monday, Sep. 5 and there are no classes that day. However, Monday classes are scheduled for Tuesday, Sep. 6.

Exams

There will be one midterm exams on October 19 and an assignment due November 16, and one final exam at a date to be determined by the school. The mid-term exam will cover only the material since the last exam. The final exam will be cumulative, with a heavy emphasis on the material covered after the second midterm exam.

Homework

Homework & quizzes will be assigned regularly and will be collected and graded every 1 to 2 weeks. Your homework must be legible and enough work should be shown to demonstrate your understanding of the material for full credit. Assignments and due-dates will be posted on the website and announced in class at least one week prior to that due date. Many homework questions will be assigned from the textbook. Deadline extensions *may* be offered if you email me at least 1 day in advance justifying why you need to hand it in late. You may hand in homework either in-class, by email, or at my office the date it is due.

Grading Policy

Grades will be determined by the two midterm examinations, the final examination, and regular homework assignments. The relative weights for each of these components on your final grade is shown below.

Class Meetings	Subject	Book Chapter(s)
Sep. 2, 8, 9, 14, 16	Introduction, Molecular Structure & Interactions: Biomolecules	1, 12
Sep. 21, 26, 28, Oct. 3	Molecular Structure & Interactions: Theory	11,12
OCTOBER 5	**EXAM 1**	**1, 11, 12**
Oct. 5, 10, 12, 17	Optical Spectroscopy	13

Your Responsibilities

Unless otherwise stated in class or on the website, you are responsible for all of the material in the relevant textbook chapters. If you miss lectures, you are responsible for finding out any information that may have been announced during class. While I will try to keep the website updated with important announcements, you are still responsible for any announcements that were not posted online.

The Math in Physical Chemistry

Physical chemistry is a fundamental science in the sense that the laws and models can be rigorously defined by a mathematical equation. At a minimum, you should have a strong mastery of basic algebra and you should be familiar with concepts in calculus and multivariable calculus. More important than knowing how to differentiate or integrate complex equations is to understand the physical significance of what a derivative or an integral represents.

Units are also critically important in physical chemistry, and you should understand how units behave in the context of taking derivatives or integrals. If you are careful with units while solving a problem, it can often help you find mistakes quickly.

Your textbook has an appendix devoted to reviewing the prerequisite math required for the material in Chem 341 and 342 that you may find helpful when reviewing.

Getting Help

In all likelihood, you will encounter *something* during this course that you have trouble understanding, or will encounter a problem that you can't seem to figure out. I will hold scheduled office hours twice a week at a time to be determined later when you are welcome to ask me for help or assistance in understanding the material. If you need additional help beyond my office hours, we can schedule an appointment via email. If we schedule an appointment, I will show up on time and I expect you to do the same. If you need to cancel, please do so at least 30 minutes in advance through email.

Tips For Success

Physical chemistry is a challenging and demanding course, but I hope that you find itenlightening, interesting, and useful going forward in your studies. I think that following thefollowing tips will help prepare you to achieve the best marks you can in this course. You may not have the time to do all of these, but the more you can do, the better prepared you will be:

. Review the appendix covering the prerequisite math skills you will need before the coursebegins (or before the end of the first week of classes) and make sure you can solve theproblems and examples. Since we will not cover Quantum Mechanics in Chem 341, the parton Hilbert spaces is unnecessary for this semester.

. Read the textbook for the material we are going to cover *before coming to lecture*. We need to cover more material in each lecture than you can hope to remember in a single sitting.Use the lectures as an opportunity to clarify a couple tricky points or find a new way ofapproaching a problem; not to learn completely new material.

. Write down questions you may have about the material we are going to cover that you donot understand. There will likely be time to ask questions during class if the lecture has notalready clarified those points for you.

. Do the examples in the text as you are reading. Cover up the solution and attempt to solvethe problem. If you have trouble figuring out how to start, uncover just enough to get youstarted and continue from there.

. If you could not solve all of the in-text examples while reading the text, re-read the sections that gave you trouble ~30+ minutes later, redoing the examples in the same way. Continue this until you can work through the examples without help.

. Do more problems than just the ones I assign! The odd-numbered ones have solutions inthe back of the book that you can use to check yourself.

. If you have questions on the material or some of the extra problems you are working on,

come to office hours or schedule an appointment!

✦Form study groups. There is no better way to learn material than to teach it. Help teach each other.

✦Avoid stress (as much as possible). Do *not* save homework and studying for the day before due-dates and exams.