

Physical Chemistry II: Quantum Mechanics, Spectroscopy & Statistical Mechanics - Chemistry 262

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In this course I hope to introduce you to the fundamentals of quantum mechanics and chemical spectroscopy. We will learn the basics of how to use Dirac notation and solve the important problems in introductory quantum theory (particle in a box, harmonic oscillator, rigid rotor). These theoretical models will be used to interpret basic experiments in the real world. As well you will learn about the fundamentals behind molecular structure (molecular orbits) and how these interact to give the multitude of compounds you learned about in organic and biochemistry. Also you will be introduced to fundamental ideas in statistical mechanics, which has in many ways served as an alternate though equivalent view of thermodynamics. In preparing for this course, it is worthwhile to go back and review mathematical tools such as derivatives, integrals and basic algebra as well as reviewing your freshman chemistry textbook for introductory quantum mechanics information. We meet on Monday, Wednesday and Friday in Room 306 at 11:00 AM. Normally the Monday and Wednesday class periods will be used as lecture sections to cover current material in depth while the Friday section will be used to answer student questions and discuss material as a group. I will hold 9 office hours where I will guarantee normally to be available in my office unless otherwise posted. These will be Monday from 9-10, Wednesday from 9-10 and 1-2, Friday 9-10, Tuesday from 9-11 and 1-2, and Thursday from 9-11 and 1-2. Any other times that my door is open I am available for questions or comments.

The grading policy will be based on the following tentative schedule. You will be required to hand in 4 homework problem sets which will account for 25 points each and due after we finish each chapter. You are expected to read all material assigned and will be required to come to class each day with a single index card containing at least one question from the current reading. This card will be turned in each day; failure to turn in a card will result in a 3 point deduction for each incident. Also, each day in class a student will be randomly selected to present a problem at the board. This should already be completed before class and will be from the current chapter. Any student selected in this fashion who fails to have a problem completed will be docked 5 points for each incident after the first. There will be 5 laboratory assignments worth 20 points each. The first will consist of a 20 minute oral review of a paper selected from a chemistry journal in the field of quantum mechanics or statistical mechanics. For the second laboratory experiment you will turn in a 5-8 page formal laboratory report. The remaining laboratories will be graded based on evaluation of your laboratory notebook and a second oral presentation to the class on the laboratory of your choice. There will be two one hour long tests each worth 150 points with problems taken primarily from the text. *The tentative test days will be Friday, October 11th and Mon-*

day, November 25th. There will be a final exam worth 200 points on Monday, December 16th at 10 a.m. The final will be a cumulative standardized exam while the tests will cover only current material. This means there will be a total of about 700 points. The grading will be such that 88% is an A (616 points), 72% is a B (504 points), 58% is a C (406 points), 50% is a D (350 points). For each midterm exam you will be allowed a single sheet (double sided) with any information on it you like.

Assignment	Points each	Total Points
Homework (4)	25	100
Laboratory Write-ups (5)	20	100
Midterm Exams (2)	150	300
Final Exam	200	200
Grand Total		700

The book used for this course is *Physical Chemistry: Principles and Applications in Biological Sciences*, 3rd Ed., by Tinoco, Sauer & Wang. The attendance policy shall be that all labs must be completed, including laboratory write-ups and oral exams. Also, it is expected that the student attend all lectures. Up to two days may be missed without excuse, any subsequent absences will lead to a 15 point deduction from your total score for each additional missed day. Absence shall not be an excuse for failure to learn information covered in the course examinations. In cases involving extended absences for a good reason (i.e. hospitalization, emergency at home, etc.) a special arrangement will be made between myself and the student as to how to make up the missed material or exams.

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Lecture 1-14	Molecular Structures & Interactions : Theory	Chapter 9
Examination 1		Friday, October 11th
Lecture 16-25	Molecular Structures & Interactions : Spectroscopy	Chapter 10
Lecture 26-32	Macromolecular Structure & X-Ray Diffraction	Chapter 12
Examination 2		Monday, November 25th
Lecture 34-38	Statistical Mechanics	Chapter 11
Lecture 39	Review all material covered (finish up final details)	
Final Exam	ACS Standardized	Monday, December 16th at 10 a.m.

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Laboratory Sessions

Lab 1	Literature Review Lab
Lab 2	Rotational Resolved IR Spectra of HCl
Lab 3	UV/Vis Spectroscopy of Dye Molecules
Lab 4	Student Chosen Laboratory
Lab 5	Point Group Analysis and IR Spectrum of Small Molecule