Physical Chemistry II: Quantum Mechanics & Spectroscopy -
Chemistry 262

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Science Bldg. Room 304 x6274

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. We meet on Wednesday and Friday in Room 306 at 3:00 PM. A third meeting time each week, to be determined at the first class, will also be held in room 306. 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 and 1-2, Tuesday from 9-11, and Thursday from 9-11. 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 7 homework problem sets which will account for 20 points each and due after we finish each chapter. 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. For the next three laboratory experiments you will come to my office for a 15-20 minute oral exam and for the last you will turn in a 5-8 page formal laboratory report. You may choose any of the four laboratory experiments for you formal report. There will be two one hour long tests each worth 150 points with mostly problems taken from the text. The tentative test days will be Wednesday, October 4th and Monday, November 20th. There will be a final exam worth 250 points on Wednesday, December 13th at 3 p.m. The final will be a cumulative standardized exam while the tests will cover only recent material. You will be required to come to class prepared each day to discuss the assigned exercise of the day. One name will be chosen each day as the presenter (though you are not required to present completely or absolutely without help). This will be counted as class participation in the oral communication requirement of the course. Finally, at the last lab period you will present a problem of your choosing (in consultation with me) from any of the chapters we have covered in this and the previous course. This presentation will be worth 20 points and should demonstrate a complete solution of the problem on the board with oral explanation. This means there will be a total of about 830 points. The grading will be such that 85% is an A, 70% is a B, 50% is a C. I do not anticipate any grades lower than C. For each midterm exam you will be allowed a single sheet (double sided) with any information on it you like. Note that you can use a computer to increase the information density as well as to record those facts you find use-

ful as you proceed with the reading. The book used for this course is *Physical Chemistry*, 5th Ed., by P. Atkins.

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 30 point deduction from your total score for each two missed days. 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 1-4	Quantum Theory: Introduction and Principles (28 pages)	Chapter 11
Lecture 5-9	Quantum Theory: Techniques and Applications (28 pages)	Chapter 12
Lecture 10-14	Atomic Structure and Atomic Spectra (38 pages)	Chapter 13
Examination 1		Wednesday, October 4th
Lecture 16-20	Molecular Structure (34 pages)	Chapter 14
Lecture 21-24	Symmetry: Its Description and Consequences (28 pages)	Chapter 15
Lecture 25-32	Rotational and Vibrational Spectra (39 pages)	Chapter 16
Examination 2		Monday, November 20th
Lecture 34-36	Electronic Transitions (34 pages)	Chapter 17
Lecture 37-38	Magnetic Resonance (32 pages)	Chapter 18
Lecture 39	Review all material covered (finish up final details)	
Final Exam	ACS Standardized	Wednesday, December 13th, 3 p.m.

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Laboratory Sessions

Lab 1	Literature Review Lab	
Lab 2	Rotational Resolved IR Spectra of HCl	See Handout
Lab 3	Vibrational Resolved Electronic Spectra of I_2	See Handout
Lab 4	Chemical Exchange Experiment (NMR) Alternate: Calorimetry Lab	See Handout
Lab 5	Point Group Analysis and IR Spectrum of Small Molecule	