

Chemistry 410A: Physical Chemistry

Course Syllabus

Fall 2015, Mon, Wed, & Fri 12:00 to 12:50, GMCS-314

Instructor	Dr. David Pullman, CSL-301, 619-594-5573, dpullman@mail.sdsu.edu				
Office Hours	Mon, Tues, & Wed from 1:00-2:00 in CSL-301				
Textbook	<i>Physical Chemistry, 10th Ed.</i> , P.W. Atkins and J. de Paula				
Prerequisites	Chemistry 232, 232L, 251; Mathematics 252 (Mathematics 150, 151; 252 or Physics 195, 195L, 196, 196L for chemistry teaching major); Physics 195, 195L and 196, 196L. Recommended: Physics 197 and 197L				
Catalog Description	Theoretical principles of chemistry with emphasis on mathematical relations. Theory and practice in acquisition and statistical analysis of physical measurements on chemical systems.				
Course Overview	<p>The focus of the lecture portion of Chem 410A is on Quantum Mechanics and its main application, spectroscopy. After developing the basic principles of Quantum Mechanics to describe the translational, vibrational, and rotational motion of particles, we will extend our knowledge to understand the motion of electrons and nuclei in atoms and molecules. This knowledge of atomic and molecular properties will lead in a natural way to a discussion of various types of spectroscopy (including rotational, vibrational, electronic, and nuclear magnetic resonance spectroscopy), which are key techniques in modern science for analyzing chemical samples.</p> <p>The computer lab portion of Chem 410A is designed to reinforce some of the concepts from the lecture and to introduce additional topics, such as error analysis and curve fitting, which are important in the analysis of scientific data. You will use Microsoft Excel, Maple, and Gaussian to carry out the scientific calculations. Further details are given in the lab manual, available in the bookstore.</p>				
Topics	<p>The two topics we will cover in Chem 410A are Quantum Mechanics and Spectroscopy.</p> <table><tr><td>Quantum Mechanics</td><td>Chap 7 Introduction to Quantum Theory Chap 8 The Quantum Theory of Motion Chap 9 Atomic Structure and Spectra Chap 10 Molecular Structure</td></tr><tr><td>Spectroscopy</td><td>Chap 12 Rotational and Vibrational Spectra Chap 13 Electronic Transitions Chap 14 Magnetic Resonance</td></tr></table>	Quantum Mechanics	Chap 7 Introduction to Quantum Theory Chap 8 The Quantum Theory of Motion Chap 9 Atomic Structure and Spectra Chap 10 Molecular Structure	Spectroscopy	Chap 12 Rotational and Vibrational Spectra Chap 13 Electronic Transitions Chap 14 Magnetic Resonance
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Course Structure	Chem 410A consists of three hour-long lectures each week in addition to a three hour computer lab each week. The lectures will roughly follow the text, with additional material occasionally added.				
Exams/Quizzes	Exam 1 Tentatively chapters 7 and 8 Exam 2 Tentatively chapters 9 and 10 Final Tentatively chap 12, 13, 14 and cumulative Wed Dec 16, 10:30-12:30 6 ~biweekly quizzes (~15 minutes in length, to be given at the start of lecture) <ul style="list-style-type: none">• No makeup exams or quizzes will be given.• The lowest quiz score will be dropped.• Dedicated calculators may be used during exams and quizzes; cell phones and other electronic gadgets, such as ipods and ipads, must be turned off before the start.				

Problem Sets	<p>There will be one or two problem sets per chapter. Problem sets will <i>not</i> be graded; you do not need to hand them in. You can download them from the Blackboard website for Chem 410A. Doing the problem sets is of the utmost importance to learning the material and doing well on exams.</p> <p>The BAD, but easy, way to do a problem is to look at the solution while you think about the problem. Nearly as bad is to think about a problem for five minutes, give up, and then look at the solution key. You are doing yourself a substantial disservice if you approach the problem sets in this fashion.</p> <p>The GOOD, but more difficult, way is to focus your energy on a problem for a sustained period (say 30 minutes or longer). If you can't answer the problem, go on to another problem— but do not look at the answer key if it is already available. Later on, after you have done other problems, things may gel in your mind, and you may see how you should approach the problem. Real learning involves, among other things, recognizing patterns in problems and comes only after a significant effort on the part of your brain.</p>										
Grading	<table border="0" style="margin-left: 20px;"> <tr> <td>Exams(2)</td> <td>30% total</td> <td rowspan="4" style="font-size: 3em; vertical-align: middle;">}</td> <td rowspan="4" style="vertical-align: middle;">Lecture part of 410A = 75%</td> </tr> <tr> <td>Quizzes(5)</td> <td>20% total</td> </tr> <tr> <td>Final</td> <td>25%</td> </tr> <tr> <td>Computer Lab</td> <td>25%</td> </tr> </table> <p>Final grades, +/- grading and curved scale will be used.</p>	Exams(2)	30% total	}	Lecture part of 410A = 75%	Quizzes(5)	20% total	Final	25%	Computer Lab	25%
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Student Learning Outcomes	<p>Upon completing Chem 410A, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand and articulate the basic principles of Quantum Mechanics, as well as the differences between Classical and Quantum Mechanics 2. Use the fundamental model systems of Quantum Mechanics to calculate or estimate properties of real atoms and molecules 3. Understand how Quantum Mechanics enables one to interpret atomic and molecular spectra in terms of the energies and motions of atoms and molecules 4. Perform scientific calculations and simulations using Excel, Maple, and Gaussian 										
Add/Drop Procedure	<p>The add/drop deadline is Friday Sept. 4, 2015. For details, see http://arweb.sdsu.edu/es/registrar/schedule_adjustment.html</p>										
Students with Disabilities	<p>If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.</p>										