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  Physical Chemistry, 10th Ed., 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  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.  
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.  
Topics  The two topics we will cover in Chem 410A are Quantum Mechanics and Spectroscopy.  
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  
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)  
• 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.
There will be one or two problem sets per chapter. Problem sets will not 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.**

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.

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.

### Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Exams (2)</td>
<td>30% total</td>
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<tr>
<td>Quizzes (5)</td>
<td>20% total</td>
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<tr>
<td>Final</td>
<td>25%</td>
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<tr>
<td>Computer Lab</td>
<td>25%</td>
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<tr>
<td>Lecture part of 410A</td>
<td>75%</td>
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Lecture part of 410A = 75%

Final grades, +/- grading and curved scale will be used.

### Student Learning Outcomes

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

The add/drop deadline is Friday Sept. 4, 2015. For details, see [http://arweb.sdsu.edu/es/registrar/schedule_adjustment.html](http://arweb.sdsu.edu/es/registrar/schedule_adjustment.html)

### Students with Disabilities

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.