Chemistry 455 ***Quantum Chemistry and Spectroscopy*** Autumn 2006
MWF 9:30-10:20 in Bag 260
Tutorial Th 9:30-10:20 in Bag 260

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| **Instructor:** | Assistant Professor David Ginger<br>Office: Bagley Hall 213 Phone: 5-2331<br>***Address ALL subject related questions to the discussion forum below so your peers may contribute to, and benefit from, the discussion!*** |
| **Office Hours:** | Prof.: David Ginger Fri. 4-5pm, Bag 213, or by appointment,<br>TA: Eric Bott, by appointment (bott@u.washington.edu)<br>Group Study Sessions: CHB 339 Mon 1:00-2:30pm, Weds 2:30-3:30pm<br>(The prof or TA will often come for part of the group study sessions) |
| **Text:** | *Quantum Chemistry and Spectroscopy*, by Thomas Engel (455 only) **-OR-**<br>*Physical Chemistry*, by Thomas Engel and Philip Reid (455, 456, 457 sequence) |
| **Additional References:** | *Physical Chemistry* by Peter Atkins<br>*Elementary Modern Physics* by Paul A. Tipler<br>*Quantum Chemistry* by Donald A. McQuarrie<br>*Introduction to Quantum Mechanics* by David J. Griffiths |
| **Discussion Forum:** | https://catalyst.washington.edu/webtools/epost/register.cgi?owner=dginger&id=16766 |
| **Course Website:** | http://faculty.washington.edu/dginger/CHEM455_A2006/index.html |

## TENTATIVE CLASS SCHEDULE

**At times, lectures may deviate significantly from the text – you should still keep reading it!**

| Day | Week | Reading |
|---|---|---|
| **M** | | Chapters 1-2: From Classical to |
| **W** | Sep 27 | Quantum Mechanics, Math Review, |
| **F** | Sep 29 | The Schrödinger Equation |
| **M** | Oct 2 | Chapters 2-3, 4.2: The Schrödinger |
| **W** | | Equation, Postulates, 1D Box |
| **F** | | |
| **M** | Oct 9 | Chapters 4-6: Particle in the Box and |
| **W** | | the Real World, Commuting and |
| **F** | | Noncommuting Operators |
| **M** | Oct 16 | Chapters 7-8: Quantum Mechanical |
| **W** | | Vibrations and Rotations |
| **F** | | |
| **M** | Oct 23 | **EXAM I** |
| **W** | | Chapter 9: The Hydrogen Atom |
| **F** | | |
| **M** | Oct 30 | Chapter 10: Multielectron atoms |
| **W** | | |
| **F** | | |

| Day | Week | Reading |
|---|---|---|
| **M** | Nov 6 | Chapter 12: Chemical Bonding in |
| **W** | | Diatomic Molecules I |
| **F** | **Nov 10** | **Veterans Day No Class Nov 10** |
| **M** | Nov 13 | Chapter 12-13: Chemical Bonding in |
| **W** | | Diatomic Molecules II |
| **F** | | **EXAM II** |
| **M** | Nov 20 | Chapter 13: Chemical Bonding |
| **W** | Nov 22 | |
| **F** | Nov 24 | **Thanksgiving, No Class** |
| **M** | Nov 28 | Chapters 14-15: Molecular |
| **W** | | Structure |
| **F** | | |
| **M** | Dec 5 | Chapters 14-15: Molecular |
| **W** | | Structure |
| **F** | **Dec 8 LAST DAY OF CLASS** | |
| | **Final Exam:**<br>**8:30-10:20 a.m. Weds, Dec 13, 2006**<br>**Bag 260** | |

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## TRANSITION TO DIFFERENT METHODS OF LEARNING

In your future careers you will need to learn a variety of things and there will not be a textbook written for most of them. The goal of education is ultimately to teach you how to think about new problems, and to make sure you are proficient at finding information by yourself, evaluating the validity of that information, and combining it with your prior experience, to apply that information to the problem at hand. In your professional life you will never find a real problem to solve in which exactly all of the right information is given to you, in the right units. What this means in terms of this class is that I will INTENTIONALLY give you problems that aren't answered in your textbook, or that are substantially different than the example problems. I also view exams as tools for teaching, as well as for evaluating. This means that exam problems will often be new and different from problems you have worked on homework or in class.

## HOMEWORK

Homework will be assigned and due weekly, with a schedule to be modified as on the website and announced in class. Assignments will usually take at least 6 hours to complete, many more if you have to catch up with the reading. More so than even other science classes, physical chemistry is a cumulative subject, understanding the material in one week requires mastery of the material from each previous week. You will NEVER master the material if you wait till the day before a homework set is due to attempt the problems. You are encouraged to work in groups, BUT, it is your responsibility to make sure you understand what the group does as you will be on your own on the exams. Each homework will be graded out of 10 points as follows: 5 points for content (sometimes only select problems will be graded at random) 4 points for attempting to complete the assignment in a thorough and thoughtful fashion, 1 point for NEATNESS (answers circled, legible handwriting/printouts, black/blue ink). *Note that these points are the discretion of the grader and are non-negotiable*.

## CLASS SESSIONS

Class sessions will be more useful if you 1) read the text prior to lecture and 2) attempt the homework throughout the week rather than the night before it is due. Come to discussion section with QUESTIONS, they will be used as a time in which the students and instructors can discuss the material and work examples.

## TEAMWORK

Collaboration on the problem sets is not only permitted, but is encouraged. However, each student **MUST** turn in their **own** completed problem set. Copying, or allowing another to copy, problems to which they have not contributed is plagiarism. Take home exams may be given. In the event a take-home exam is given students will NOT be permitted to communicate with anyone except the instructor in any form or manner regarding any test problems or material until after all exams have been returned. Plagiarism and giving or receiving inappropriate assistance of any kind shall be regarded as academic misconduct. All cases of academic misconduct will be submitted to the registrar with an X as a final grade with a recommendation for the maximum UW sanction.

## GRADING

There will be two hourly exams and a two-hour final exam, as indicated on the schedule. Grading will be based on the total number of points obtained on the exams and the homework. Unannounced 'pop quizes' may be given during lectures, and will each count as one homework grade.

Total Points: 500
Problem Sets: 100 total (20%)
Exam 1: 100 (20%)
Exam 2: 100 (20%)
Final: 200 (40%)

**Extra Credit—Bonus points up to 5% of the total hw score will be added to the homework score for correct, thoughtful replies to other students questions on the discussion board, for finding a major error in a problem answer or derivation (not just 3.14159 instead of 3.14 for pi, or a dropped – sign on one side of an equation). The awarding of any and all extra credit will rest with the non-negotiable judgement of the professor and TA/grader.**