

**Physical Chemistry—CHEM 403**  
Spring 2009

Instructor: Dr. Scott Nickolaisen, PS 820, (323) 343-2382  
Office hours: M: 10:00 – 11:30 a.m.  
                  T: 1:00 – 3:00 p.m.  
                  Th: 11:30 a.m. – 12:30 p.m.  
Text: *Physical Chemistry, 8<sup>th</sup> Edition* Atkins and DePaula

*Course Outline.* This course is the final course in the Physical Chemistry lecture series. The course material will concentrate on quantum mechanics and its application to atomic and molecular spectroscopy. The following chapters in the text will be discussed throughout the quarter:

Chapter 8—Quantum Theory: Introduction and Principles  
Chapter 9—Quantum Theory: Techniques and Applications  
Chapter 10—Atomic Structure and Atomic Spectra  
Chapter 11—Molecular Structure  
Chapter 13—Molecular Spectroscopy I: Rotational and Vibrational Spectra  
Chapter 14—Molecular Spectroscopy II: Electronic Transitions  
Chapter 12—Molecular Symmetry

Not every section in each chapter will be discussed in lectures, but students are highly encouraged to read the complete chapters, not only as preparation for homework and exams, but also as background for future subjects and courses.

*Course Objectives.* Students who successfully complete this class will understand how quantum mechanics, with appropriate approximations, can be used to predict important chemical properties. They will understand the theoretical implications for descriptions of bonding theories, how molecular orbitals are formed from atomic orbitals, how the properties of molecular orbitals are determined, and how these properties affect chemical behavior. They will be able to interpret infrared and UV/vis spectra to determine molecular geometric parameters and electronic energy levels in molecules.

*Grading.* Grades for this course will be based on the accumulated total of 440 points from three exams and seven homework sets. Exams will be 100 points each and will be held on the following dates:

Mid-term #1: Friday, April 18, 2008  
Mid-term #2: Friday, May 9, 2008  
Final exam: Wednesday, June 4, 2008 at 10:45 a.m.

In addition to the three regular exams, an assessment exam will be given on the last day of class. This exam will be cumulative of all materials covered during the quarter. The score on the assessment exam may be used to replace one lower score for one of the three other exams. If a student does not take the assessment exam, that student will receive a zero for a regular exam score. (Your performance on the assessment exam cannot hurt your grade unless you choose to skip it, and it may help your grade.)

Homework sets will be assigned for each chapter and are listed below. Due dates for each homework set will be determined as the assignments are given. Each homework assignment will be worth 20 points and will be graded for completeness only. Assignments will be due on the given date at the beginning of the class period.

Chapter 8: probs. 1, 2, 4, 6, 7, 14, 15, 18, 20

Chapter 9: probs. 2, 4, 5, 10, 12, 14, 15, 20, 23

Chapter 10: probs. 2, 3, 4, 7, 8, 12, 14, 17

Chapter 11: probs. 2, 4, 5, 8, 12, 24

Chapter 13: probs. 4, 5, 7, 8, 12, 14, 24

Chapter 14: probs. 1, 3, 6, 7, 21

Chapter 12: probs. 1, 4, 5, 8, 15

The approximate grading breakdown will be (plus/minus grading will not be used):

375 – 440 points: A

310 – 374 points: B

265 – 309 points: C

220 – 264 points: D

0 – 219 points: F