

# SYLLABUS

Course: CH 332 Physical Chemistry II

Semester: Spring, 2014

Professor: Carl Salter

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Required Text: *A Guided Inquiry to Quantum Chemistry* by Tricia Shepard and Alex Grushow, in beta release for testing

Optional Texts: P. W. Atkins, *Physical Chemistry*, 6th Ed. Freeman, 1998  
Rodney J. Sime, *Physical Chemistry: Methods, Techniques, and Experiments* Saunders College Publishing, 1990

Physical chemistry is the application of physics and mathematics to chemical systems. Physical chemistry is therefore a demanding interdisciplinary subject, requiring a working knowledge of calculus, mechanics, and chemistry.

**Catalog Description:** States of matter, chemical thermodynamics, theory of solutions, chemical equilibria, electrochemistry, chemical kinetics, elementary quantum theory. Problems and laboratory reinforce theoretical discussion. *Prerequisites:* Chemistry 220.2 or 222, Mathematics 171, and Physics 112. Three 50-minute periods, one 50-minute problem session, one three-hour laboratory.

**Course Objectives:** To understand the application of quantum mechanics to chemical bonding and other chemical phenomena.

**Lecture:** You will receive copies of my lecture notes throughout the course of the semester. These notes plus the textbook should allow you to solve homework problems on your own. Because you have already received the lecture notes, the **lecture periods will usually be group problem-solving sessions** involving the POGIL exercises from the *Guided Inquiry* workbook. The critical thinking questions are worked in class by your group. Your team work must **work together** on these questions, so that every member of the team agrees with the team answer. There will also be some group assignments which don't come from the workbook.

Homework sets including computer projects will be due at the end of each week. You will **work all the exercises** in *A Guided Inquiry to*

*QC.* The **exercises** are distributed through out the activity, not just at the end. **Donot turn in the critical thinking questions.**

This workbook is **not** a textbook; it is not a complete description of the course content. My lecture notes should help you, but you should also read the textbook by Atkins, which has both exercises and problems at the end of each chapter. The **exercises** are relatively simple "plug and chug" calculations that are based directly on the text. (The problems at the end of the chapter are more difficult.) Working the exercises in Atkins will help you prepare for the weekly tests.

It is crucial that you **keep up with assignments**. If you have struggled with a problem and no solution is in sight, please call me or come by my office. It is much easier for both of us if you deal with these problems immediately. When I took physical chemistry, I saw my professor about twice each day. There is simply too much information to absorb by yourself; you need to "talk out" these new ideas with someone: if not me, then a classmate.

**Tentative Schedule:** Our goal this semester is to cover introductory quantum theory and its applications to chemistry.

Atomic and Molecular Energies  
Electronic Structure of Atoms  
Electronic Structure of Molecules  
The Distribution of Energy States  
Spectroscopy

Atkins Material  
Quantum Theory Chapter 11 2,4,5,6,9,10,16  
Quantum Theory Chapter 12 2,3,4,12,14,15  
Atomic Structure Chapter 13 3,4,7,9,10,11,14  
Molecular Structure Chapter 14 2,3,5,6,10,11,14

**Evaluation:** Twelve tests will be given; they will be given on the following Thursdays: January 23, and 30, February 6, 13, 20, and 27, March 13, 20, and 27, April 3, 10, and 17. These quizzes are scheduled for every Thursday except the Thursday of the week after Easter. **The two lowest test grades will be dropped from your average; however, you may only drop tests that you actually take. An unexcused absence from a test will result in a grade of zero which cannot be dropped.** Each test will contain a bonus question; points from the bonus question may be retained in your average even if the test grade is dropped. Tests can be picked up in Lou Ann's office on the day that it is taken. Return the tests to Lou Ann.

The Final Exam is scheduled for Wednesday, April 30, 1:30 PM. You may bring with you one sheet of paper with written notes.

No homework may be submitted after 5 pm, Friday April 25, the last day of class.

Lab reports are an important part of this course. Lab reports for each lab experiment will be due one week after the completion the experiment. You must turn in all lab reports to receive a passing grade in the course. Unacceptable lab reports will not be accepted! You will be required to resubmit an unacceptable lab report. You are required to work with your lab partner--the two of you must read and evaluate lab reports before they are turned in to me. An extensive list of online advice about [lab report format, style, and content](#) is available on my web site. The lab report [evaluation form](#) is also on my web site. During the semester there will be lab report writing workshops during lecture--it is crucial that you bring writing assignments to class on those days. No lab reports or resubmitted lab reports will be accepted after 5 pm, Monday April 28, two days before the final exam.

**Attendance:** Three unexcused absences results in failure of the course. After two unexcused absences you and your advisor will receive an email notice. Absences may be excused by a written doctor's slip or an email from an athletic coach or college trip organizer (a planned absence). Students are required to complete missed material immediately after their return from any absence. For planned absences such as travel for a college event, students are expected to complete missed material before the absence occurs.

**The final grade will be determined as follows:**

**Comprehensive Final exam**                      **20%**

**Homework and computer projects**            **15%**

**Tests**                                                      **40%**

**(N.B. Because of the bonus points, it is possible to earn up to 50% from the tests.)**

**Lab reports**                                              **25%**

**It is within the instructor's purview to apply qualitative judgment in determining grades for an assignment or for the course.**

Students who wish to request accommodations in this class for a disability should contact Elaine Mara,

Assistant Director of Learning Services for Disability Support, 1307 Main Street (extension 1510).  
Accommodations cannot be provided until authorization is received from the office of Learning Services.

## Laboratory

The laboratory course gives you the opportunity to measure physical and chemical constants. I will emphasize the importance of statistics in determining how precisely you have measured these constants. In fact, the early experiments are designed to teach you the use of statistics in evaluating experimental data.

**Some form of eye protection, either plastic glasses or goggles, is required whenever you are in lab, except when you are working at the computer. There are no restrictions on the clothing you wear in lab. You may work in the lab at night, but you must not work alone! The person in the lab with you does not have to be a member of the physical chemistry class.**

You will find that I do not provide detailed lab handouts that tell you exactly how to do an experiment. In the lab you will find general information about the goal of the experiment, but it is up to you to decide how to do your experiment. And it is [your experiment](#); you should have the pleasure of deciding how you want to do it. If I tell you how to do the experiment, [you won't have as much fun](#) because you'll be trying to get results that please me. All I care about is that you design an experiment that really measures what you want to measure, and that you estimate the precision of your measurement. Of course, I'll be there whenever you want to talk to me about your experiment. And in that regard, let me warn you that **I am very opinionated and hold very definite ideas about the way things should be done in the lab.** This is an inevitable consequence of spending fifteen years of my life doing chemical research. My job is to use my experience to help you avoid bad ideas and mistakes. **Nevertheless, if you believe an idea you have is right, don't drop it just because I say it's wrong. Stick with it until you understand why it is wrong, or until you can prove to me that it is right.**

You should keep some organized record of the work you do in lab, but I want you to decide how you want to do that; I am not going to grade your personal notebook. I will from time to time call you into my office and ask you to answer questions about your lab work; you can bring in your notebook and refer to it during these interviews. Therefore you need to record information in your notebook so that several weeks later you will be able to look at it and know what you did in the lab. By the way, you do not need to write down a

detailed experimental procedure in the notebook; instead, refer to the lab textbook where you found the procedure. If you modify the procedure or apparatus, be sure to record that.

[Suggestions for writing Lab Reports and recommended outline](#)