SYLLABUS

Course: CH 331 Physical Chemistry I
Semester: Fall, 2007

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Required Text: J.N. Spencer, R.S. Moog, & J.J. Farrell, *Physical Chemistry: A Guided Inquiry Thermodynamics*, Houghton Mifflin 2004,

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.

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 understands 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 approximately each week. See the schedule of topics for assigned problems. By the way, these homework assignments are the **exercises** at the end of each chapter in the workbook, **not the critical thinking questions**. Don't confuse them.

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.

You should plan to **work all the exercises and problems** in *A Guided Inquiry*. 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.) While you are studying the text, you should look at the exercises. You should read **all the exercises** at the end of each chapter in Atkins because they closely follow the presentation of the text, and therefore aid comprehension of the material. If you really want to learn from the Atkins book, try to work **about half of the exercises at the end of the chapter.** That will get you ready for my tests!

Tentative Schedule

Our goal this semester is to cover calculus, thermodynamics and thermochemistry, and chemical kinetics.

Topics Chapter Section *(Guided Inquiry)* and Assigned Problems

Calculus Review Handouts
Gases G1, G2
Thermodynamics T1-T23
Kinetics K1-K5

Atkins Material
Real Gases Chapter 1 2,3,6,8,15,18
The First Law Chapter 2 2-6,9-12,15-17
Chapter 3 1-8,10
The Second Law Chapter 4 1-8,15-20
Chapter 5 1-6
Phase Transitions Chapter 6 1-9
Chemical Equilibrium Chapter 9 1-12

Evaluation

Twelve tests will be given on Thursdays through out the semester. These tests are scheduled for Sept 6, 13, 20, 27, Oct 4, 18, 25, Nov 1, 8, 15, 29 and Dec 6. Note that there are no tests scheduled on the week of Fall Break or the week of Thanksgiving. The two lowest test grades will be dropped from your average; however, you may only drop the score of a test that you 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**.

The final grade will be determined as follows:

Comprehensive Final exam **20%**

Homework and computer projects **15%**

Tests **40%**

Lab reports **25%**

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. 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.

Attendance: After two unexcused absences you will receive written notice that a third unexcused absence will result in failure of the course. 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.

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 twenty 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.