Physical Chemistry: Chem 561 Course Syllabus Fall 2014

Instructor: Mark Ediger, Room 7303 (seventh floor, use elevators near building center), ediger@chem.wisc.edu, 262-7273. Office hours: 1:20 – 2:10 pm Monday and 3:00 – 3:50 pm Thursday (except when noted in class), and by appointment. Course information is available on Learn@UW.

Teaching Assistant: Mike Tylinski, tylinski@wisc.edu. Office hours: 2:25 pm Tuesday and 5:30 pm Thursday, Room 8335. (Exceptions: Thurs, Sept 4 and 18, 4:15 pm, Room 8335; Tues, Sept 23, 2:25pm, Room 9341)

Textbook: Silbey, Alberty, and Bawendi, "Physical Chemistry," 4th Edition, 2005. The overall course plan is indicated below, with the appropriate sections of Silbey, Alberty, and Bawendi indicated. It may be modified somewhat as the course progresses. You may assume that the textbook material will be covered in order, about 4 sections per class meeting. READ AHEAD!

Course Outline:

1. Zeroth Law of Thermodynamics, Equations of state for real gases (1.1-1.9)
2. First Law of Thermodynamics and applications (2.1-2.13)
   Exam I (Wednesday, Oct 1)
3. Second Law of Thermodynamics (3.1-3.7)
4. Third Law of Thermodynamics (3.8)
5. Fundamental equations of thermodynamics (4.1-4.9)
   Exam II (Friday, Oct 31)
6. Chemical equilibrium (5.1-5.9)
7. Phase equilibria of ideal and non-ideal systems (6.1-6.8)
   Exam III (Wednesday, Dec 3)
8. Kinetic theory of gases (17.1-17.5, 17.7, 19.1)
   Final exam (Monday, Dec 15, 10:05 am)

The three mid-term exams will be held during the regular class period.

Why you should learn this material: Physical chemistry utilizes both macroscopic and microscopic viewpoints. Thermodynamics is the most powerful *macroscopic* description for chemists and central to understanding chemical equilibrium; it is the foundation of much of modern science. The kinetic theory of gases, in contrast, introduces a rigorous *microscopic* view of the collisions that underpin gas laws and chemical reactivity in the gas phase.

Problems Sets: In physical chemistry, mastery of a concept is exhibited by the ability to solve problems. Mathematics is an integral part of physical chemistry and you need to understand the math well enough to solve the problems. I expect that you will work and understand all of the assigned problems.

Problem sets will be due approximately once per week, usually on Friday. They will be due at the beginning of class on the due date. Late problem sets will not be accepted. Problem sets will be returned in class or they can be picked up during the TA's office hours. In previous years, there has been a high correlation between problem set scores and exam scores. In recent years, nearly all students who failed to hand in 4 or more problem sets received a D or F in the course.

You are encouraged to work on your problem sets in a study group. Each person should hand in their own solutions to the problem set and should fully understand the solutions.

Class Participation: Active participation in class discussions and in the discussion sections will help you learn and can help you earn a good grade. In Spring 2010, students who did not come to class regularly on average earned 58% of the points in the course while students who did come to class regularly earned 78%. During our regular class periods, I will ask questions and you should be prepared to answer. Each student in the class will be a part of one of four groups, based on the first letter of your last name. Each lecture, I will announce which group I will call upon at the next lecture. Here are the groups: Group A-F, Group G-L, Group M-R, Group S-Z.

Participation in discussion section is highly recommended; much of this time will be spent solving problems. In Spring 2010, students who did not come to discussion section regularly on average earned 68% of the points in the course while students who did come to discussion regularly earned 80%.

Comments and Questions: I will provide opportunities for you to ask questions in class and I will linger after class to answer questions on most days. Office hours are another chance to ask questions and discuss the course material; recently, a student who regularly came to office hours started the course with a C but ended with an AB. Another way to ask a question or make a comment is to write it down and put it my mailbox. You are welcome to comment on any aspect of the course, anonymously if you wish. Your questions and comments are an important way for me to learn what parts of the course material are not being clearly presented.

Course Grade: My goal is for everyone to learn to the material and to earn a good grade. I do not grade on a curve. Everyone who earns at least 83% of the points in the course will get an A or an AB; 70% will earn a B or a BC. I will not set the cutoff for earning a C until the end of the course, but based upon student performance in 2009-13, I expect it to be 55%. In past years, the average grade in the class has been a B.

Approximate point breakdown: Mid-term exams (300 points total), final exam (140 points), and problem sets (165 points). Regrade requests must be turned in within 3 days after the graded exam or problem set has been returned to the class.

Library Reserve: Three alternate textbooks are on reserve in the library, each of which is entitled "Physical Chemistry". The authors of these books are Engel/Reid, Levine, and Atkins/de Paula. You should try reading one of these texts if you have trouble understanding a particular section in Silbey's book.

Errors in Silbey, Alberty, and Bawendi (4th edition):
Page 61, equations 2.95 and 2.96, all four " C_P " symbols should be " C_P^0 "
Page 68, point 5, "differential" should replace "variable"
Page 186, Figure 6.6, part a, x-axis label should read "x_1", i.e., "y_1" should not appear
Page 187, text just after equation 6.31, replace "6.23" with "6.27"
Page 192, Figures 6.11, x-axis label should be "x_1, y_1" in both panels
Page 193, Figures 6.12, x-axis label should be "x_1, y_1" in both panels
Page 687, text 3 lines after equation 19.4, replace "2" by "1/2"