C h e m i s t r y 4 5 3 - W i n t e r Q u a r t e r 2 015 (posted 2 Jan. 2015)

INSTRUCTOR:

Gary DrobnyProfessor of ChemistryTelephone 206 685 2052Mailbox 10Office Hours: F 1:10 pm - 2:10 pm Bagley 217 (or by arrangements)

Recommended TEXT:

Peter Atkins & Julio De Paula *Physical Chemistry for the Life Sciences* W.H. Freeman and Company (2011).

Note: This text was used in Chemistry 452. For Chemistry 453 this text is recommended for the sections on quantum theory and kinetics, which will occur later in the course. Much of the course dealing with statistical concepts in biological systems will be based on lecture notes.

CLASS TIMES:

Chemistry 453 A

- Lecture: MWF 10:30 am 11:20 am, Bagley 260
- Tutorial: Th. 10:30 am– 11:20 am, Bagley 260 Chemistry 453 B
 - Lecture: MWF 8:30 am 9:20 am, Bagley 260
 - Tutorial: Th. 8:30 am– 9:20 am, Bagley 260

COURSE WEB SITE: http://faculty.washington.edu/gdrobny .

The web site contains course lecture notes that correspond closely to the material being taught in class. Notes will usually be posted shortly after each lecture. You are strongly encouraged to familiarize yourselves with the material before coming to class by reading relevant text sections assigned in the course schedule: it will greatly help you following the lecture content. Homework assignments will also be posted. Please pay attention to announcements that will be posted from time to time; they may contain suggestions on homework and important administrative matters related to the course as well as answers to frequently asked questions.

LECTURES: Material covered in lecture will not necessarily follow the sequence used in the text. An approximate schedule, which describes the chapters to be covered each week, is given on the final page of this syllabus. Lecture notes are posted on the course Web site as mentioned above. Laptops are permitted only for the purpose of note taking. If a laptop is used during lecture for other than course purposes you will be required to turn it off. Arrive on time and with cell phones silenced.

HOMEWORK: High exam grades correlate with high-quality homework sets: many exam questions will be based on the homework.

• You are required to complete 8-9 homework assignments. Your performance on the homework problems will count for 20% of your grade. Homework assignments are posted weekly at the course web site and are due no later than 5 p.m. on the date indicated on the assignment. We do not have enough graders assigned to this course to thoroughly grade all assigned problems, so 2-3 problems will be selected for partial credit grading for each homework set.

- If you obtain >75% of the possible homework points, you will be credited 100% achievement for the homework. If you reach the 75% limit before the last homework assignment, you still must complete the final homework assignment.
- With the exception of grade point addition errors, homework is NOT re-graded.
- To complete the required homework problems do the following:
 - o Down load the homework assignment from the course Web site.
 - Scan your handwritten homework into a single .pdf file and submit it via Catalyst.
 - Late homework will not be accepted, so do not wait until the last moment to scan your homework. If you plan to be out of town on the day homework is due, turn it in early or access a scanner and computer while you are out of town.
 - View all pages of your .pdf file before submitting it. Verify that (1) it is a .pdf and not a .jpg or other format, (2) all pages are right side up, (3) all writing is dark enough to read, (4) you have made only one file containing many pages rather than many files of one page each, and (4) all writing falls within the area of the page that can be scanned.
 - The TA will grade the single, last file that you upload before the deadline. *Do not upload each page as a separate pdf*. You may upload new versions if you have last-minute corrections, but anything submitted after the deadline will be ignored.
 - Solutions homework problems will be posted on the Chemistry 453 Catalyst Web site.

HOMEWORK HELP – Students who require help with homework problems may: 1) attend the optional Thursday tutorial, 2) attend scheduled office hours, 3) ask brief questions via email (<u>drobny@chem.washington.edu</u>). Email should have Chem 453 on the subject line. Email will usually be answered within 48 hours, but in many cases answers to questions asked by numerous students will be posted at the Chemistry 453 Web site (<u>http://faculty.washington.edu/gdrobny</u>). There is no guarantee that email will be answered soon after you send it, so avoid this form of communication if you need or expect help immediately. Please keep email messages brief. Email should be limited to 1-2 sentence questions with the expectations of a short, one sentence answer. Attempts to render equations via email are not effective, so if your question requires discussion of several equations in detail, your question should be addressed at office hours or at the tutorial.

EXAMINATIONS (8.5"x11" blue books are required): The midterm examination will include all material covered during the first 5 weeks of the course. The final examination is a two hour examination. The first half of the final exam will emphasize material covered since the midterm, i.e. week 6-10. However, questions on material covered earlier may also be asked as chemical principles building upon what has been covered earlier. To each exam you must bring: 1) blue book; 2) a calculator of any type; 3) a straight edge; 4) pen; 5) one double-sided page of notes containing any information you find helpful. You may not enter exam notes into your calculator. Graded exams will be returned at the end of the lecture hour. The grade will be written on the inside cover of the blue book. Laptops are not permitted at the examinations.

EXAMINATION DATES: The midterm examination for Chemistry 453 A and B will take place on Friday 6 February during the respective lecture periods. The final examination for Chemistry 453A is scheduled for 830-1020 Monday, March 16. The final examination for Chemistry 453B is 830-1020 Tuesday, March 17. You may only take the midterm and final examinations during the periods assigned to your lecture course (i.e. Chemistry 453A students may NOT take exams during the Chemistry 453B periods nor may Chem 453B students take exams during the Chemistry 453B periods nor may Chem 453B students take exams during the midterm exam your grade will be determined by your homework score and your final exam score. If you miss the final exam you must take an incomplete.

STANDARDS: It is required that students have passed Chemistry 452 or its equivalent and thus have a working knowledge of equilibrium thermodynamics. The mathematical level of the course assumes students are familiar with introductory integral and differential calculus. Some familiarity with differential equations is useful but not necessary. In Chemistry 453 students are required to demonstrate the ability to solve quantitative chemical/biochemical/biophysical problems and to provide satisfactory answers to text problems. To obtain partial credit on homework and examination problems, solutions/answers must be displayed in a detailed, organized and readable format. This means equations and physical relationships upon which any problem solution is based must be clearly written, mathematical manipulations required to obtain any solution must be displayed in detail, numerical substitutions must be shown in full (even if a calculator is used) and must be accompanied by proper units. Finally, graphs, diagrams and clearly-written expository composition must accompany a solution, if explicitly requested. The significant figure convention used in homework and exams is that used in the text: unless specified explicitly or implicitly to be otherwise, the default is to complete calculations using three significant figures. Partial credit is usually (but not always) awarded in units not smaller than 2-3 points. Obtaining the correct numeric solution is an important grading criterion.

OVERALL COURSE GRADE: Grades will be based on an absolute standard of achievement set by the Chemistry 453 professor. This standard is directly measured by the number of course points earned. Here are some guidelines to help you understand levels of achievement required to obtain various grades. To obtain a grade of 4.0, >95% of the course points have to be earned. To obtain a grade of 3.0, >75% of the course points have to be earned. To obtain a grade of 2.0, >55% of the course points have to be earned. To obtain a grade of 1.7, >50% of the course points must be earned. Students who fail to earn more than 35% of the course points will receive a grade of 0.0.

Homework (100 points)	20%
Midterm Exam (100 points)	30%
Final Exam Part 1 (100 points)	25%
Final Exam Part 2 (100 points)	25%
	Homework (100 points) Midterm Exam (100 points) Final Exam Part 1 (100 points) Final Exam Part 2 (100 points)

REGRADING OF EXAMS OR QUESTIONS ON EXAMS: Exam questions are graded on a partial credit basis (see *standards* section, above). If you wish your exam to be re-graded, the blue book must be placed in faculty mailbox 10 on the first floor of Bagley Hall (i.e. labeled Drobny) within 24 hours of its return to you along with a note explaining briefly (i.e. less than 100 words) what you want changed and why. Under no circumstances will verbal requests be accepted. Exams will not be re-graded if the disputed points are below a cutoff (5 points) unless there was an addition error made in totaling the score.

COLLOQUIA AND SEMINARS: At this point in your college career, you are contemplating future jobs or graduate school. The Chemistry Department maintains graduate school files in the front office and also produces a weekly "Bagley Bulletin" listing jobs and seminars. Extra copies are found in the mailroom. I *strongly* encourage you to attend seminars and especially colloquia, which are more general talks. Going to seminars is the easiest way to learn about current research. Almost all talks begin with a 5-minute introduction to the field. It is perfectly acceptable to sit in the back near the door and then quietly slip out after the speaker's introduction.

DISABLED STUDENT SERVICES: If you need to request academic accommodations due to a disability, please contact Disability Resources for Students (DRS), 011 Mary Gates Hall <u>uwdrs@uw.edu</u>. Tel. (Voice) 206-543-8924.

Week	Торіс	Text Reading
05 Ion	1 Statistics in Chamistry & Physics	(chapter.section)
05 Jan.	2. Statistical Thormodynamics of Isolated Systems	Lecture Notes
07	2. Statistical Thermodynamics of Isolated Systems	Lecture Notes
09 10 I	3. Statistics & Non-Isolated Systems	Lecture Notes
12 Jan.	4. Partition Functions	Lecture Notes
14	5. Equilibrium & Partition Functions	Lecture Notes
16	6. Conformational Changes in Proteins & DNA	3.5-3.6+ Lecture Notes
19 Jan.	Holiday	
21	7. Statistics of Ligand-Protein Binding	Lecture Notes
23	8. Statistical Properties of Monatomic Gases	Lecture Notes
26 Jan.	9. Properties of Crystals and Diatomic Gases	Lecture Notes
28	10. Energy Quantization	9.1-9.3+ Lecture Notes
30	11. Quantized translation: Particles-in-Boxes	9.4+ Lecture Notes
02 Feb.	12. Quantized Vibrations: Harmonic Oscillator	9.6+ Lecture Notes
04	13. Quantized Rotations: Rigid Rotor	9.5+ Lecture Notes
06	Midterm Exam	
09 Feb.	14. Electronic Motions & Partition Functions	Lecture Notes
11	15. Molecular Partition Functions: Diatomics	Lecture Notes
13	16. Complex Molecules and Equilibrium	Lecture Notes
16 Feb.	Holiday	
18	17. Introduction to Spectroscopy	12.1-12.2+ Lecture Notes
20	18. Vibrational-Rotational Spectroscopy	12.3-12.5+ Lecture Notes
23 Feb.	19. Electronic Absorption Spectroscopy	12.6-12.8+ Lecture Notes
25	20. Fluorescence and Photobiology	12.9, 12.11-12.13+ Lecture
		Notes
27	21. Brownian Motion & Random Walks	8.5-8.6+ Lecture Notes
02 Mar.	22. Translational Friction & Protein Hydration	11.1+ Lecture Notes
04	23. Principles of Kinetics	7.1-7.3+ Lecture Notes
06	24. Diffusion-Controlled Kinetics	7.4-7.5+ Lecture Notes
09 Mar.	25. Transition State Theory	7.6-7.7+ Lecture Notes
11	26. Michaelis-Menten Enzyme Kinetics	8.1-8.2+ Lecture Notes
13	27. Enzyme Inhibition	8.3-8.4+ Lecture Notes
16 Mar.	Final Examination for Chemistry 453A	
17 Mar.	Final Examination for Chemistry 453B	

Chemistry 453: Tentative Schedule of Topics Version 1