

**Physical Chemistry - Fall 2015**  
**CHEM 410B**  
Room GMCS-308, MWF: 12:00-12:50 PM

Instructor: Dr. Karen Peterson  
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Office hours: TTh 2:00 – 3:00 PM and by appointment in CSL-309

Text: ***Physical Chemistry, 10th Edition*** by Peter Atkins and Julio de Paula. The **Book Companion Website** can be accessed at: <http://whfreeman.com/pchem9e>

Prerequisites: Chem 410A  
Chemistry 232, 232L, 251  
Mathematics 150, 151, 252  
Physics 195, 195L, 196, 196L Recommended: Physics 197, 197L

The second semester of the physical chemistry course covers chemical thermodynamics and kinetics. Thermodynamics is the science that studies the relationship between heat and work, and the transfer of these quantities between a system and its surroundings. It can be used to predict product and reactant concentrations in chemical systems at equilibrium. Kinetics is the study of the rates and mechanisms of chemical reactions. It is concerned with how fast a reaction occurs as it marches toward equilibrium. While thermodynamics relates macroscopic properties, microscopic details must often be considered in order to understand the relationships between reaction rates and mechanisms.

- Ch. 1 The Properties of Gases (parts 1A and 1C)
- Ch. 2 The First Law
- Ch. 3 The Second and Third Laws (also, parts of Ch. 17 will be covered)
- Ch. 4 Physical transformations of pure substances
- Ch. 5 Simple mixtures
- Ch. 6 Chemical Equilibrium
- Ch. 20 Chemical Kinetics
- Ch. 21 Reaction Dynamics (Ch. 1, part B, will also be covered)

Course Description

CHEM 410B. Physical Chemistry (3)

Three lectures.

Prerequisites: Chemistry 232, 232L, 251, 410A.

Theoretical principles of chemistry with emphasis on mathematical relations. Theory and practice in acquisition and statistical analysis of physical measurements on chemical systems.

## LEARNING OUTCOMES:

By the end of this course, you will be able to

- Understand the basic principles of thermodynamics as applied to chemical reactions and processes, particularly in terms of enthalpy and entropy.
- Calculate equilibrium constants, enthalpies, and entropies from experimental data and from information found in the literature.
- Analyze equilibrium problems and predict the direction of spontaneous change as expressed by the chemical potential
- Understand the basic principles of kinetics as applied to chemical reactions and processes.
- Determine rate parameters from experimental data.
- Analyze chemical reaction mechanisms through the corresponding rate equation.
- Be able to do advanced mathematical calculations using theoretical principles
- Derive fundamental equations in thermodynamics and kinetics
- Develop simple mechanisms which correspond to experimentally-derived rate laws
- Appreciate the molecular basis of chemical thermodynamics and kinetics

## COURSE REQUIREMENTS

### Chapter handouts with problems

For each chapter, you will be given a handout that will guide you in your reading. At least one problem will be given for each major and minor section of the chapter. These problems are intended to be straightforward, although not always easy, and should be done immediately after reading the relevant section. This will help you to better understand what you just read. Even if you aren't able to figure out the answer, trying the problem will help you on the daily quiz.

### Homework assignments:

**Blackboard submissions:** Throughout the semester, you will be assigned problems from the handouts to solve in detail and post on blackboard (Discussion Board). The deadline for posting is two class days after it is assigned. For full credit, your answer should be well written with the steps in any calculations explained. Points will be taken off for incorrect answers, but some of these points may be reinstated if the answer is corrected. As part of the assignment, I also expect you to answer any questions other students may have about your problem after it is posted. Extra credit (up to 10 points) will be given for correcting or clarifying answers posted on blackboard.

**Written homework:** A few of the problems in the handout will be assigned for everyone to turn in. Each set will be worth 10 points.

### Daily quizzes

A short (5-10 minute) quiz will be given at the beginning of class every day. It will cover the reading and problems assigned at the end of the previous class. There will be a total of about 40 quizzes given for 3 points each. The best 35 of these will be used toward your grade.

### **Midterm exams**

There will be three midterm exams. The dates are as follows:

Exam I – Wednesday, Sept 30

Exam II – Friday, Nov 6

If you cannot make it to the exam because of some personal catastrophe, please contact me within three days of the exam. I will need documentation in order to work something out with you.

### **Final exam**

The final exam takes place on Wednesday, Dec 16, at 10:30 AM. The exam will have one section covering the last five weeks of class, and another section that will be cumulative.

### **Grading**

Two midterm exams 300 pts (150 pts each)

Final exam 200 pts

Daily quizzes 3 x 35 = 105 points

Homework assignments (Blackboard) 100 – 150 points

Written homework; 10 points for each set. 80 -100 points

Total: ~800 pts

The grading scheme will be as follows:

A	89-100%	C+	66-70%
A-	85-89%	C	59-66%
B+	81-85%	C-	55-59%
B	74-81%	D+	51-55%
B-	70-74%	D	40-51%
		F	< 40%

*Add/Drop Procedure: The add/drop deadline is Sept 4, 2015. For details, see [http://arweb.sdsu.edu/es/registrar/schedule\\_adjustment.html](http://arweb.sdsu.edu/es/registrar/schedule_adjustment.html)*

#### *Students with Disabilities:*

*If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.*

Last day of classes: Thurs, Dec 10

Final: 10:30 – 12:30 Wed., Dec 16

This schedule is tentative. The lecture times for each chapter may vary during the course of the semester. An updated schedule will be available in Blackboard.

Week of:	Mon	Wed	Fri
Aug 24	Introduction	Ch. 1	Ch. 1
Aug 31	Ch. 2	Ch. 2	Ch. 2
Sep 7	<b>Labor Day</b>	Ch. 2	Ch. 2
Sep 14	Ch. 3	Ch. 3/17	Ch. 3/17
Sep 21	Ch. 3	Ch. 3	Ch. 3
Sep 28	Ch. 4	<b>Exam 1</b>	Ch. 4
Oct 5	Ch. 5	Ch. 5	Ch. 5
Oct 12	Ch. 5	Ch. 5	Ch. 6
Oct 19	Ch. 6	Ch. 6	Ch. 6
Oct 26	Ch. 6	Ch. 6	Ch. 6
Nov 2	Ch. 20	Ch. 20	<b>Exam II</b>
Nov 9	Ch. 20	<b>Veteran's Day</b>	Ch. 20
Nov 16	Ch. 20	Ch. 20	Ch. 20
Nov 23	Ch. 1B	<b>No class</b>	<b>Thanksgiving Holiday</b>
Nov 30	Ch. 21	Ch. 21	Ch. 21
Dec 7	Ch. 21	Finish Ch. 21 and/or review	Thursday, Dec 10 Last day of classes
Dec 14		<b>Final</b> 10:30AM - 12:30PM Wednesday, Dec 16	