

**Physical Chemistry - Spring 2018**  
**CHEM 410B**  
Room GMCS-314, MWF: 12:00-12:50 PM

Instructor: Dr. Karen Peterson  
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Office hours: MW 10:00-11:00 AM and by appointment; CSL-309

Text: **Physical Chemistry, 10th Edition** by Peter Atkins and Julio de Paula.

The second semester of the physical chemistry course covers chemical thermodynamics, kinetics, and some statistical thermodynamics. 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 forms a theoretical basis for predicting 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. Statistical thermodynamics connects the microscopic properties to bulk (macroscopic) properties of matter. 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
- Ch. 2 The First Law
- Ch. 3 The Second and Third Laws
- Ch. 17 Statistical Thermodynamics
- Ch. 4 Physical Transformations of Pure Substances
- Ch. 5 Simple mixtures
- Ch. 6 Chemical Equilibrium
- Ch. 20 Chemical Kinetics
- Ch. 21 Reaction Dynamics

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
- Apply the basic principles of kinetics to chemical reactions and processes.
- Determine rate parameters from experimental data.
- Analyze chemical reaction mechanisms through the corresponding rate equation.
- Calculate physical parameter of compounds 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. 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 and also help you understand the lecture better.

### **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). Your first attempt must be posted before the next class period. The final deadline is two days after the material is covered in class. Other students may help by posting their answers after the initial-post deadline. If you are assigned a particular problem, and another student posts the correct answer, you must still post an answer to receive credit. 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.

- Post an answer before the class period for which it was assigned (penalty -1 pts).
- Post a final answer two days after the class period for which it was assigned (penalty varies depending on how late the final answer is posted).
- The answer should be clearly written and steps explained.

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 may be assigned for everyone to turn in. The points for these sets will vary.

### **Daily quizzes**

A short (5-10 minute) quiz will be given sometime during the class period. This semester, it will most likely be given at the end of the period, and it will cover material explained during class. It is important to have done the assigned reading so that the lecture is a review and/or clarification

of what you have already read. The quiz format will vary; in some cases it will be composed of multiple questions asked throughout the lecture. 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 two midterm exams. The dates are as follows:

Exam I – Wednesday, February 21, 2018

Exam II – Wednesday, April 4, 2018

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, May 9, 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 200 pts (100 pts each)

Final exam 150 pts

Daily quizzes 3 x 35 = 105 points

Homework assignments (Blackboard) ~64 points

Miscellaneous assignments ~50 points

Total: ~570 pts

The grading scheme will be as follows:

A	89-100%	C	59-66%
A-	85-89%	C-	55-59%
B+	80-85%	D+	50-55%
B	74-81%	D	44-50%
B-	70-74%	D-	40-44%
C+	65-70%	F	< 40%

*Add/Drop Procedure: The add/drop deadline is January 31, 2017. 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, May 4

Final: 10:30 – 12:30 Wed., May 10

This schedule is tentative. The lecture times for each chapter may vary during the course of the semester.

Week of:	Mon	Wed	Fri
Jan 15	<b>Martin Luther King Day</b>	Introduction	Ch. 1
Jan 22	Ch. 1	Ch. 1	Ch. 2
Jan 29	Ch. 2	Ch. 2	Ch. 2
Feb 5	Ch. 2	Ch. 3	Ch. 3
Feb 12	Ch. 3	Ch. 3	Ch. 3/15
Feb 19	Ch. 15/ review	<b>Exam 1</b>	Ch. 15
Feb 26	Ch. 15	Ch. 15	Ch. 15/4
Mar 5	Ch. 4	Ch. 4	Ch. 5
Mar 12	Ch. 5	Ch. 5	Ch. 5
Mar 19	Ch. 5	Ch. 5	Ch. 5/6
Mar 26	<b>Spring Recess</b>		
Apr 2	Ch. 6/review	<b>Exam II</b>	Ch. 6
Apr 9	Ch. 6	Ch. 20	Ch. 20
Apr 16	Ch. 20	Ch. 20	Ch. 20
Apr 23	Ch. 21	Ch. 21	Ch. 21
Apr 30	Ch. 21	Finish Ch. 21 and/or review <b>Last day of class</b>	
May 7		<b>Final</b> 10:30AM - 12:30PM Wednesday, May 9	

Thursday, May 3 – last day of classes