

**Physical Chemistry - Spring 2020**  
**CHEM 410B**  
Room GMCS-307, MWF: 12:00-12:50 PM

Instructor: Dr. Karen Peterson  
Office: CSL-309 Phone: 594-4507  
e-mail: kpeterson@sdsu.edu

Office hours: MWF 10:00-11:00 AM; 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. 15 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 parameters 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 by listing problems that you should be able to solve. Specific reading and problems from this handout will be assigned each class period. Although everyone should do the problems, they will be formally assigned to specific students for posting on blackboard. Even if you are not able to figure out the answer, trying the problem will help you on the next daily quiz and also help you understand the lecture better.

### **Daily quizzes**

A short (~5 minute) quiz will be given at the beginning of the class period, and it will be based on the reading and problems assigned for that day. Often, I will announce a more specific topic for the quiz. In order to do well on the quiz, make sure you review and understand those parts of the reading that are related to material you learned in general chemistry! For the new material, make sure you understand how to use the equations that are given, particularly with respect to the meanings of the parameters. Also, look carefully at the figures. There will be a total of 40 quizzes given for 3 points each. The best 34 of these will be used toward your grade. Since 6 quizzes are dropped, no make-ups for quizzes are given.

**Blackboard submissions in the Discussion Board:** The individual students who are assigned particular problems from the handouts must post a trial answer before the next class period after the assignment is given. The final deadline is the class day after the material is covered in class. Other students may help by posting replies to the initial post. If you are assigned a particular problem, and another student posts the complete correct answer, you must still post an answer to receive credit. For full credit (6 pts), 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. Late submissions will almost always get some credit.

- 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, clarifying, or adding to answers posted on blackboard.

**Written homework:** A few of the problems will be assigned for everyone to turn in. The points for these sets will vary.

### **Midterm exams**

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

Exam I – Friday, February 14

Exam II – Wednesday, March 11

Exam III – Wednesday, April 15

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 13, at 10:30 AM. The exam will have one section covering the last quarter of class, and another section that will be cumulative.

### **Grading**

Three midterm exams 225 pts (75 pts each)

Final exam 125 pts

Daily quizzes 3 x 34 = 102 points

Problem assignments for Blackboard ~42 – 48 points (6 pts each)

Homework assignments ~30 – 40 points

Total: ~524 – 540 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 February 4, 2020. For details, see [http://arweb.sdsu.edu/es/registrar/schedule\\_adjustment.html](http://arweb.sdsu.edu/es/registrar/schedule_adjustment.html)

***Accommodations:*** If you are a student with a disability and are in need of accommodations for this class, please contact Student Ability Success Center at (619) 594-6473 as soon as possible. Please know accommodations are not retroactive, and we cannot provide accommodations based upon disability until we have received an accommodation letter from Student Ability Success Center.

***Religious observances:*** Notify the instructor of planned absences for religious observances by the end of the second week of classes. We will accommodate conflicts with the exam schedule.

**Academic Honesty:** *The University adheres to a strict policy prohibiting cheating and plagiarism. Examples of academic dishonesty include but are not limited to:*

- *copying, in part or in whole, from another's test or other examination;*
- *obtaining copies of a test, an examination, or other course material without the permission of the instructor;*
- *collaborating with another or others in work to be presented without the permission of the instructor;*
- *falsifying records, laboratory work, or other course data;*
- *submitting work previously presented in another course, if contrary to the rules of the course;*
- *altering or interfering with grading procedures;*
- *assisting another student in any of the above;*
- *using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work);*
- *copying and pasting work from an online or offline source directly and calling it your own;*
- *using information you find from an online or offline source without giving the author credit;*
- *replacing words or phrases from another source and inserting your own words or phrases.*

*The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities.*

**Resources for students:** *A complete list of all academic support services--including the Writing Center and Math Learning Center--is available on the Student Affairs' Academic Success website. Counseling and Psychological Services (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at [http://go.sdsu.edu/student\\_affairs/cps/therapist-consultation.aspx](http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx) between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.*

**Classroom Conduct Standards:** *SDSU students are expected to abide by the terms of the Student Conduct Code in classrooms and other instructional settings. Prohibited conduct includes:*

- *Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.*
- *Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.*
- *Unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.*
- *Conduct that threatens or endangers the health or safety of any person within or related to the University community, including*
  1. *physical abuse, threats, intimidation, or harassment.*
  2. *sexual misconduct.*

*Violation of these standards will result in referral to appropriate campus authorities.*

**Medical-related absences:** *Contact the instructor in the event they need to miss an exam due to an illness, injury or emergency. We will try to accommodate valid reasons for absence.*

**SDSU Economic Crisis Response Team:** *If you or a friend are experiencing food or housing insecurity, or any unforeseen financial crisis, visit [sdsu.edu/ecrt](http://sdsu.edu/ecrt), email [ecrt@sdsu.edu](mailto:ecrt@sdsu.edu), or walk-in to Well-being & Health Promotion on the 3rd floor of Calpulli Center.*

Last day of classes: Thurs, May 7

Final: 10:30 – 12:30 Wed., May 13

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

**Spring 2020**

Week of:	Mon	Wed	Fri
Jan 20	<b>Martin Luther King Day</b>	Introduction	Ch. 1
Jan 27	Ch. 1	Ch. 1	Ch. 2
Feb 3	Ch. 2	Ch. 2	Ch. 2
Feb 10	Ch. 2	Ch. 3	<b>Exam I</b>
Feb 17	Ch. 3	Ch. 3	Ch. 3
Feb 24	Ch. 15	Ch. 15	Ch. 15
Mar 2	Ch. 15	Ch. 15	Ch. 4
Mar 9	Ch. 4	<b>Exam II</b>	Ch. 4
Mar 16	Ch. 5	Ch. 5	Ch. 5
Mar 23	Ch. 5	Ch. 5	Ch. 5
Mar 30	<b>Spring Recess</b>		
Apr 6	Ch. 6	Ch. 6	Ch. 6
Apr 13	Ch. 6	<b>Exam III</b>	Ch. 20
Apr 20	Ch. 20	Ch. 20	Ch. 20
Apr 27	Ch. 21	Ch. 21	Ch. 21
May 4	Ch. 21	Finish Ch. 21 and/or review <b>Last day of class</b>	Thursday, May 7, last day of classes
May 11		<b>Final</b> 10:30AM - 12:30PM Wednesday, May 13	

Thursday, May 7 – last day of classes