

SYLLABUS

COURSE OBJECTIVES

1. To study and discuss topics fundamental to physical chemistry, including thermodynamics and kinetics.
2. To practice laboratory applications of thermodynamic and kinetic principles.

COURSE OUTCOMES

1. The students will demonstrate critical thinking, quantitative reasoning, and scientific knowledge related to physical chemistry, especially in the application of physical principles to the description of matter in the environment around us.
2. The students will acquire more advanced laboratory skills associated with the collection, handling, and evaluation of experimental data related to thermodynamic and kinetic principles.
3. The students will demonstrate competence in writing scientific reports in journal article format.

MATERIALS REQUIRED FOR THIS COURSE

All of the following books and supplies are available in the campus bookstore.

Physical Chemistry, Robert J. Sibley, Robert A. Alberty, and Mounji G. Bawendi, 4th Edition, John Wiley & Sons, New York (2005).  
ISBN 0-471-21504-X

Experiments in Physical Chemistry, Carl W. Garland, Joseph W. Nibler, and David P. Shoemaker, Eighth Edition, McGraw-Hill Companies, Inc., New York (2009). ISBN 978-0-07-282842-9

Laboratory Notebook, W. H. Freeman and Company.

Scientific hand calculator.

Eye protection - safety glasses or goggles bookstore.

MEETING TIMES

Lecture: M W F at 12:00 noon - 12:50 PM in room Miller 33

Laboratory: Section 01 Thursday 1:00 - 4:00 PM in SCI 128 Mr. Raker  
Section 02 Thursday 8:00 - 11:00 AM in SCI 128 Dr. Sein

Instructor's Office: SC 130; Phone extension 3508.

Office Hours: Dr. Kistler's schedule will be posted on the bulletin board across the hall from her office. Her e-mail address is pdkistle@cedarcrest.edu. She will also accept telephone calls at home before 11:00 PM. Home phone (610) 258-4892.

### GRADING SYSTEM

This 4-credit course is divided into two portions: lecture (3 credits) and laboratory (1 credit). The lecture portion constitutes 75% of the overall final grade, while the laboratory portion constitutes 25%. However, you must pass BOTH the lecture and laboratory portions to earn a passing grade in this course.

To assist you in determining your performance in the course, printouts indicating your current status will be posted on the bulletin board outside the instructor's office at regular intervals.

#### Lecture Grade

The grade for the lecture portion of the course will be based on performance with respect to four items: homework, hour-exams, a final exam, and an evaluation by the instructor.

Homework will be assigned in the classroom from the problems at the end of the chapters in the text. The scores obtained on these assignments will be averaged and the average will constitute 20% of the lecture grade.

There will be three hour-exams and a final exam. Each of these examinations will consist of two parts: a take-home, open-book portion containing mathematical problems; and an in-class, closed-book portion covering the theory presented in the lecture. The three hour-exam scores will be averaged and the exam average will constitute 54% of the lecture grade. The final exam will be comprehensive and constitute 21% of the lecture grade.

The remaining 5% of the lecture grade will reflect classroom participation. Awarding of this 5% is left to the discretion of the instructor.

In summary, the lecture grade will be computed as follows:

$$0.20(\text{Homework Average}) + 0.54(\text{Hour-Exam Average}) \\ + 0.21(\text{Lecture Final Exam}) + \text{Instructor Evaluation [0 - 5 \%]}$$

#### Laboratory Grade

The grade for the laboratory portion of the course will be based on performance with respect to two items: the actual experiments and an evaluation by the instructor.

In the laboratory, students will work in groups of 3 or 4. The members of each group will be assigned by the laboratory instructor. There will

be 6 laboratory experiments. Each group of students is required to write a laboratory report for each of the 6 experiments. The laboratory reports are extensive and must be a group effort. Each report will be graded separately. The grades for the individual experiments will be averaged to produce a single grade for the experiments. This laboratory report grade will constitute 90% of the final laboratory grade.

The remaining 10% of the final laboratory grade will be assigned by the instructor based on the student's performance with respect to such attributes as:

- Compliance with laboratory safety rules
- Competence with respect to laboratory techniques
- Completeness and organization of laboratory notebook
- Organization and efficiency when performing experiments
- Degree of contribution to the group when performing experiments and writing laboratory reports
- General attitude in the laboratory.

In summary, the laboratory grade will be computed as follows:

$$0.90(\text{Experiment Average}) + \text{Instructor Evaluation} \quad [0 - 10 \%]$$

#### Final Grade for the Course

The final average will be computed as follows:

$$0.75(\text{Lecture Grade}) + 0.25(\text{Laboratory Grade})$$

The final letter grade will be awarded according to the following scale:

93-100%	A	80-82.9%	B-	67-69.9%	D+
90-92.9%	A-	77-79.9%	C+	60-66.9%	D
87-89.9%	B+	73-76.9%	C	Below 60%	F
83-86.9%	B	70-72.9%	C-		

### POLICIES

#### Lecture Attendance

Classroom attendance will not be taken on a regular basis. However, regular attendance is expected and necessary. Students are responsible for all assignments given in class.

#### Attendance on Examination Days

Students are required to attend class on all testing days. See the Testing Schedule later in this syllabus. If the student has some other important responsibility which prevents her from attending on a testing day, she must inform the instructor in advance and make arrangements for an alternate testing time. If this policy is followed, a make-up test will be given. If an exam is missed with no advance notice, a make-up test may be given

at the discretion of the instructor. In such instances, a valid written excuse is required:

- (1) from a doctor or the school nurse in case of illness.
- (2) from the Dean of Students' Office in the case of family emergency.
- (3) from the student giving a satisfactory and reasonable explanation of why the test was missed.

If these procedures are not followed, no make-up will be given and the student will receive a zero for the missed exam.

### Obtaining Assistance

The instructor will be glad to provide individual assistance, answer any questions, or discuss your concerns during office hours or at ANY other time in which she does not have a previously scheduled commitment.

DO NOT HESITATE TO SEEK ASSISTANCE OR ADVICE WHEN YOU NEED IT!

### Extra Credit Policy

Since the normally assigned work associated with this course is relatively extensive and should be sufficient for the mastery of the subject matter, the instructor will not provide opportunities for extra credit.

### Laboratory

Attendance in the laboratory is MANDATORY. All six experiments must be completed as scheduled and six reports submitted when due. If, due to circumstances beyond your control, you are unable to do an experiment at your scheduled time, it may be possible to perform the experiment during some other period when the laboratory is not in use. The student should understand that making up missed experiments causes some difficulties. You may not work in the laboratory alone. Scheduling the make-up period must be done in cooperation with the laboratory instructor.

### Honor Philosophy

"The Cedar Crest College Honor Philosophy states that students should uphold community standards for academic and social behavior in order to preserve a learning environment dedicated to personal and academic excellence. Upholding community standards is a matter of personal integrity and honor. Individuals who accept the honor of membership in the Cedar Crest College community of scholars pledge to accept responsibility for their actions in all academic and social situations and for the effect their actions may have on other members of the College community."

The instructor expects each student to abide by the college's honor code. This honor code applies to ALL activities associated with this course, including homework as well as exams. The student should realize that the honor code is an important aspect of the educational process at Cedar Crest College.

## Community Standards for Academic Conduct:

"Academic integrity and ethics remain steadfast, withstanding technological change. Cedar Crest College academic standards therefore apply to all academic work, including, but not limited to, handwritten or computer-generated documents, video or audio recordings, and telecommunications.

As a student at Cedar Crest College, each student shall:

- Only submit work which is his/her own.
- Adhere to the rules of acknowledging outside sources, as defined by the instructor, never plagiarizing or misrepresenting intellectual property.
- Neither seek nor receive aid from another student, converse with one another when inappropriate, nor use materials not authorized by the instructor.
- Follow the instructions of the professor in any academic situation or environment, including taking of examinations, laboratory procedures, the preparation of papers, properly and respectfully using College facilities and resources, including library and computing resources to ensure that these resources may be effectively shared by all members of the College community.
- Abide by the Cedar Crest Computer Use Policy.
- If a student perceives a violation of the Academic Standards, he/she will go to their instructor.
- If you are unable to resolve the problem with the instructor, you should go to the chair of the department. If you need further assistance after consultation with the instructor and the chair, you should see the Provost."

It is the instructor's policy to deal with violations of these Standards for Academic Conduct by awarding a grade of 0 for the assignment or examination in question.

## Classroom Protocol:

"Appropriate classroom behavior is implicit in the Cedar Crest College Honor Code. Such behavior is defined and guided by complete protection for the rights of all students and faculty to a courteous, respectful classroom environment. That environment is free from distractions such as late arrivals, early departures, inappropriate conversations, and any other behaviors that might disrupt instruction and/or compromise students' access to their Cedar Crest College education."

During class times, all cell phones and pagers must be either turned off or set on vibrate. Laptop computers may be used for note taking purposes ONLY. Cell phone use, text messaging, and the playing of any entertainment media during the class period are strictly forbidden. Violators will be

dismissed from the course. Cell phones may be on vibrate to accept emergency notices ONLY. You may NOT have conversations either by voice or text message during class.

### Students with Learning Disabilities

"Students with documented disabilities who may need academic accommodations should discuss these needs with their professors during the first two weeks of class. Students with disabilities who wish to request accommodations should contact the Advising Center."

### CHRONOLOGICAL PLAN FOR THE COURSE

The schedules given on the following pages list the dates and topics which constitute the lecture portion of this course and the homework problems to be assigned. For convenience, the testing schedule and the material to be covered on the tests are summarized in a separate list. Due to various circumstances, these schedules may be amended during the term.

In the laboratory, students will be working in groups of three or four. Usually, each group of students will be working on a different experiment. Hence, the specific dates on which a given experiment is to be performed will differ for each group of students. A detailed schedule will be provided in the laboratory. The experiments to be performed are Experiments 3, 8, 9, 11, and 20 from the Eighth Edition of your Garland, Nibler, and Shoemaker laboratory textbook, and Experiment 15 from the Seventh Edition of the laboratory text.

### Testing Schedule Summary

<u>2009 Date</u>	<u>Test</u>	<u>Material Included</u>
Fri 9/18	Exam 1 Take-Home	Chapters 1 and 2
Mon 9/21	Exam 1 In-Class	
Fri 10/16	Exam 2 Take-Home	Chapters 3 and 4
Mon 10/19	Exam 2 In-Class	
Fri 11/20	Exam 3 Take-Home	Chapters 5, 6, and 18
Mon 11/23	Exam 3 In-Class	
	Final Exam	Comprehensive

Date and Time to be set by the Registrar during the final exam period, December 11 - 15, 2009

The instructor supports the following administrative policy:

"Your obligations for this course include attendance at the final exam, on the day and time scheduled by the Registrar's Office. You should not make travel arrangements until the final exam schedule is published; if you must make plans early, you should schedule your travel after the last final exam day."

## Lecture Topics Schedule

<u>2009</u> <u>Date</u>	<u>Subject</u>	<u>Reading Assignment:</u> <u>Section Number in Textbook</u>
8/24	Introduction	
8/26	0 <sup>th</sup> Law of Thermodynamics	1.1 - 1.5
8/28	Equations of State	1.6 - 1.8
8/31	Equations of State	1.9 - 1.10
9/2	1 <sup>st</sup> Law of Thermodynamics	2.1 - 2.4
9/4	"	2.5 - 2.6
9/7	Labor Day	No Classes
9/9	1 <sup>st</sup> Law of Thermodynamics	2.7 - 2.9
9/11	"	2.10 and Handout
9/14	"	2.11 - 2.12
9/16	"	2.13
9/18	Review of Material for Exam 1, Receive	Take-Home Portion
9/21	Exam 1	
9/23	Discussion of Exam 1	
9/25	2 <sup>nd</sup> and 3 <sup>rd</sup> Laws of Thermodynamics	3.9, 3.1 - 3.2
9/28	"	3.3 - 3.5
9/30	"	3.6 - 3.8
10/2	Gibbs and Helmholtz Energies	4.1 - 4.4
10/5	"	4.5 - 4.6
10/7	"	4.7 - 4.9
10/9	Chemical Equilibria	5.1 - 5.2
Fall Break		
10/14	Chemical Equilibria	5.3
10/16	Review of Material for Exam 2, Receive	Take-Home Portion
10/19	Exam 2	
10/21	Discussion of Exam 2	
10/23	Inauguration	No Classes
10/26	Chemical Equilibria	5.4 - 5.5
10/28	"	5.6 - 5.7
10/30	"	5.8 - 5.9
11/2	Phase Equilibria	6.1 - 6.3
11/4	"	6.4 - 6.5
11/6	"	6.6 - 6.8
11/9	Experimental Kinetics	18.1 - 18.2
11/11	"	18.3 - 18.4
11/13	"	18.6 - 18.7
11/16	"	18.8 - 18.10
11/18	"	18.11 - 18.12
11/20	Review of Material for Exam 3, Receive	Take-Home Portion
11/23	Exam 3	
Thanksgiving Break		
11/30	Discussion of Exam 3	
12/2	Diffusion	20.1 - 20.2
12/4	"	20.4 - 20.5
12/7	Catalysis	20.6 - 20.8
12/8	"	20.10



## Assignments

The following list is a tentative schedule of assignments. The dates given below are estimates of the date the problems will be assigned. The problems associated with a given date will probably be altered as the term progresses according to the amount of material covered in the lecture. At the end of each lecture period, the assignment due the next period will be announced.

The chapter and problem numbers refer to the textbook, Physical Chemistry, Robert J. Sibley, Robert A. Alberty, and Mounji G. Bawendi, 4th Edition, John Wiley & Sons, New York (2005).

The "Homework Problems" listed below were selected to help the student study the information and practice the techniques required for mastery of this course. Detailed solutions to these problems are to be submitted to the instructor for evaluation, correction, and comment at the beginning of the next class period after they are assigned.

Due to the complexity of the assignments, the students are encouraged to discuss the approach to the problems in groups. However, the details of the solutions submitted for evaluation MUST be the student's own work.

Approx.

<u>Date</u>	<u>Problem Set #</u>	<u>Chapter</u>	<u>Homework Problems</u>
9/2	1	1	2, 7, 25
9/4	2	1	12, 16(+ T <sub>B</sub> ), 17, 20(a), 31
9/9	3	2	10, 12(ideal), 13, 42
9/11	4	2	14, 15, 17, 19
9/14	5	2	23, 25, 26, 29
9/28	6	3	7, 8, 27, 32(a)
10/2	7	3	10, 12, 22
10/5	8	4	6, 12, 13, 14
10/7	9	4	23, 24, 25, 26
10/28	10	5	1, 2, 4, 10, 58
10/30	11	5	22, 23, 32, 40
11/2	12	5	31, 77, 78, 79
11/4	13	6	5, 7, 10, 17, 61
11/6	14	6	20, 21, 57, 78
11/9	15	6	28(ideal), 35, 38, 39
11/11	16	18	1, 3, 9, 10
11/14	17	18	15, 21(U --> Th only), 26, 27
11/16	18	18	31(a), 34, 78
12/4	19	20	1, 3, 8, 10