

CHEM 341: Physical Chemistry I

Dr. Dan Albert

Fall 2021

Contact Information

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The best way to reach me is via university email.

Office Hours

I have an open door policy for meeting with you outside of class. If you ever walk by my door and it is open please feel free to stop to talk about any questions, comments, or concerns you have. The following times you can be guaranteed to find me in my office:

- Monday Afternoons from 12 - 1 pm
- Wednesday Afternoons from 2 - 3:30 pm
- Thursday Mornings from 9:30 - 11 am
- Friday Afternoons from 1 - 2 pm

If you cannot make it to office hours please email to set-up an alternative time to meet.

Course Description

A thermodynamics study of chemical systems including ideal and nonideal solutions, chemical and phase equilibria, and electrochemistry. Investigation of the macroscopic behavior of gases and its theoretical explanations. Summary of the determination and application of additive properties.

Prerequisites

CHEM 265 with a grade of C or higher, PHYS 232, MATH 311, and ENGL 110.

Course Purpose

According to Gilbert N. Lewis Physical Chemistry is the study of anything that is interesting! We will use your chemistry, physics, and mathematics backgrounds to build underlying chemical principles from simple ideas. The goal of physical chemistry is to provide a rigorous (mathematical) model for understanding and predicting behavior of matter. In CHEM 341 we will focus on using thermodynamics and kinetics to understand the behavior of matter. *The problem solving techniques and approaches we use in this class are broadly applicable to thinking about many questions you will encounter in your life!*

Course Learning Objectives

- Use mathematics and physics to build a quantitative understanding for thermodynamics and kinetics of chemical processes.
- Use quantitative results and models to build a conceptual understanding of thermodynamics and kinetics of chemical processes.
- Safely and effectively plan, carry out, and analyze quantitative laboratory experiments.
- Clearly communicate scientific results and principles through writing.

Meeting Times

- Section 01A
Lecture: Monday, Wednesday, and Friday from 11:00 - 11:50 in 153 Roddy Hall
Laboratory: Tuesdays from 9:00 - 11:50 am in 226 Caputo Hall
- Section 01B
Lecture: Monday, Wednesday, and Friday from 11:00 - 11:50 in 153 Roddy Hall
Laboratory: Tuesdays from 1:10 - 4:00 pm in 226 Caputo Hall

Required Materials

- Textbook: Your textbook and readings for the course is available as an Open Educational Resource and is available on D2L. There are two primary sources for textbooks: “Physical Chemistry” by P. Fleming and “Free Energy” by P.T. Snee
- Scientific Calculator: Your calculator for this course must be able to handle logarithms and exponents. This type of calculator can be found for around \$10.
Mobile communication devices and calculator programs/internal memory are not acceptable for use on exams

- Laboratory Notebook: Permanently bound notebook (No perforations or binders)
- Safety Goggles: Available from Bookstore or Chemistry Supply Room: Caputo 330
- Regular access to a computing device with access to a word processing program, such as Microsoft Word, and a spreadsheet program, Microsoft Excel, as well as internet access for D2L (<https://millersville.desire2learn.com/>) and university email

Title IX

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment, comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, et seq., and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.

Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is available at <http://www.millersville.edu/social eq/title-ix-sexual-misconduct/index.php>

Class Environment

I value a learning environment that is engaging, respectful, and helpful. I ask that you help maintain a learning environment that meets these goals for everyone in the class. Anyone whose behavior is disruptive of the learning environment will be asked to leave.

My goal is for you to feel comfortable, appreciated, fairly treated, and encouraged to challenge yourself and obtain success. *Please come talk to me if there is anything I can do to help support you in achieving success.*

Grading

Your grade in this course will be calculated using the following components.

Category	Percent of Grade
Daily Problem Sets	20
Experiment Proposal	10
Regular Exams	40
Final Exam	10
Laboratory Assignments	20
Total	100

Your final grade will be determined by your overall points using the above grading scheme.

In order to pass CHEM 341 you must have a passing grade in both the lecture/recitation (Problem Sets, Regular Exams, and Final Exam) and laboratory portions of the class. The cut-off percentages for each grade are given below. I reserve the right to lower grade cut-offs, but under no circumstances will the grade cut-offs be higher than those listed below.

Grade Cut-off (%)	Letter Grade
93	A
90	A-
87	B+
83	B
80	B-
77	C+
73	C
70	C-
67	D+
63	D
60	D-
	F

Daily Problem Sets

Daily problem sets will be given out most class periods and due at the beginning of the next class period. These short problem sets are designed to work on skills for course success and will include conceptual problems, mathematical problems, and short writing assignments. Each daily problem set is designed to be completed in less than an hour. All assignments are equally weighted within this category.

All detailed solutions can be accessed via D2L (<https://millersville.desire2learn.com/>)

Experiment Proposal

You will be proposing a physical chemistry experiment that interests you during the semester. From the class this semester between 1 and 3 proposals will be “funded” and carried out next semester during CHEM 342.

Regular Exams

Four regular exams will be given during our regular lecture meeting times. Each exam will contain one or more of the following types of questions: multiple choice, short answer, and worked problems. All exams in this course are considered cumulative, but will focus on the material covered since the last exam. Each regular exam is equally weighted within this category. The dates of our four regular exams are 9/17, 10/15, 11/5, and 12/3.

If your percentage grade on the final exam is higher than your lowest percentage regular exam score, your percentage grade on the final will replace your lowest regular exam score. For example, if you earn a 60% on Exam 1, a 85% on Exam 2, a 95% on Exam 3, and an 80% on the Final Exam, your 60% on Exam 1 will be replaced and become an 80% (your percentage score on the Final Exam).

Final Exam

A two hour cumulative final exam will be given at the end of the semester. The final exam will take place on Friday December 10th from 8 - 10 am in 153 Roddy Hall.

Laboratory Assignments

A detailed description of all laboratory assignments will be distributed at the first lab meeting.

Attendance, Absences, and Make-Ups

Attendance at every lecture and lab is expected. If you must miss a lecture, please see a fellow classmate for notes. I will post all handouts and presentations during the semester to D2L.

Late or Make-Up Problem Sets, Labs, and Exams will not be allowed except under special circumstances and prior notification is required unless it is an emergency situation. Some examples of special circumstances are below.

- Required religious observation
- Participation in a Millersville University athletic event
- Armed forces related training or drills
- Medical Illness/Emergency
- Death in the family
- If you feel that you have a special circumstance that is of similar importance to the items listed above, please come talk with me as soon as possible and I will work with you to try and find a solution

Academic Honesty

The Millersville University Academic Honesty Policy states that:

Students of the University are expected to be honest and forthright in their academic endeavors. To falsify the results of one's research, to steal the words or ideas of another, to cheat on an examination, to allow another person to commit, or assist another in committing an act of academic dishonesty, corrupts the essential process by which knowledge is advanced.

The entire academic honesty policy can be found at <http://www.millersville.edu/english/faculty/academic-integrity/index.php>

All work that is turned in for a grade should be completed individually by the person whose name appears on the work. Students found to have violated the academic honesty policy will receive a score of zero on the assignment. Repeated instances of academic misconduct will be given the harshest punishment.

Suggestions for Course Success

My expectation is that you are working on CHEM 341 material for 8 hours every week outside of class. This effort needs to be consistent throughout the semester to get the most out of this course. If you find yourself putting in the work outside of class and still having difficulty with any part of the course, you should arrange to come meet with me as soon as possible so that we can work together to help you be successful. Here are my suggestions for being successful in this course.

- Work on physical chemistry a little bit every day.
- Read the textbook and work example problems before coming to class.
- Have a notebook and pencil with you to work through derivations while reading.
- Attend, participate, and take notes at all lectures.

Ask questions during class. I love to get questions during class.

Take notes to capture key points and ideas.

- Re-Read the textbook after class and fill-in your notes with additional details.
- Work problems from the end of the chapter everyday.

The way you work through a problem matters.

Try to work problems by minimally looking at your notes or the textbook.

Starting problems is the most difficult part. Give yourself five minutes.

Solve problems from start to finish by yourself.

- Utilize helpful resources.

Form study groups.

Stop by my office and ask questions. We can always find a time to meet.

Use materials available on D2L.

Important Dates

Date	Event
8/30	Last Day to Add or Drop a Course Online
9/6	No Classes for Labor Day
10/11 and 10/12	No Classes for Fall Break
10/29	Last Day to Withdraw from Course and Receive a 'W'
11/24 - 11/28	No Classes for Thanksgiving Break
12/10	CHEM 341 Final Exam from 8 - 10 am

Course Schedule

Week	Topics	Readings	Assignments and Exams	Laboratory Assignments
8/23	Introduction and Gases	Fleming 1 & 2; Snee 1		
8/30	First Law of Thermodynamics	Fleming 3; Snee 2		Error in the Lab Summary
9/6	Internal Energy and Enthalpy	Fleming 4; Snee 3		Propagation of Uncertainty Summary
9/13	Thermochemistry	Fleming 4; Snee 3	Exam #1 on 9/17	Curve Fitting Summary
9/20	Thermochemistry and Entropy	Fleming 5; Snee 4		
9/27	Second and Third Law	Fleming 6; Snee 5		Freezing Points of Mixtures Summary
10/4	Chemical Thermodynamics	Fleming 9; Snee 6		Enthalpy of Fusion Summary
10/11	Solutions and Colligative	Fleming 7; Snee 7	Exam #2 on 10/15	
10/18	Solutions and Colligative	Fleming 7; Snee 7	Proposal Executive Summary Due 10/22	
10/25	Phase Diagrams	Fleming 8; Snee 8		Experiment 1 Summary
11/1	Phase Diagrams	Fleming 8; Snee 8	Exam #3 on 11/5	Experiment 1 Report
11/8	Surface and Electrochemistry	Fleming 10; Snee 9	First Draft of Proposal Due 11/12	Experiment 2 Summary
11/15	Kinetics	Fleming 11		Experiment 2 Report
11/22	Kinetics	Fleming 12	Final Draft of Proposal Due 11/23	Experiment 3 Summary
11/29	Kinetics	Fleming 12	Exam #4 on 12/3	Experiment 3 Report
12/6	FINAL EXAM		Final Exam on 12/10 at 8:00 am	

This syllabus was created by Daniel Albert in the summer of 2021. Support for the project was generously provided by the Pennsylvania Grants for Open and Affordable Learning (PA GOAL) program, Grant #10. This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License and may not be reproduced for commercial purposes.