

Instructor: Dr. Charles H. Mahler, Phone 321-4351 or 322-8840 (h), mahler@lycoming.edu

Office Hours: **Heim 202, MWF 10 - 11 AM, MW 1:30 – 2:30 PM**, by appointment, or drop by.

If you have questions or comments about anything in the course, please come see me. I am ready and willing to meet with you and discuss your concerns, answer questions, explain concepts, solve problems, etc. I would rather help you to understand something before a lab or test or other assignment, than to find out you don't understand it while grading your work.

CLASS: MWF from 9:00 to 9:50 AM in Heim 215. **LAB:** T from 7:45 to 11:35 AM in Heim 204.

Prerequisites: CHEM 111, MATH 129 and one year of physics; or consent of instructor.

Materials for Course:

Physical Chemistry, 8th Ed. Peter Atkins and Julio de Paula; *ACS Style Guide, 3rd Ed.* Calculator with logarithmic and exponential functions (no passing or sharing allowed in exams); Bound Laboratory Notebook with quadrille pages (for lab use only); Safety Glasses or Goggles; The Laboratory Manual for 330-331W will be distributed in class (for cost). The lab deposit will be \$10.

Evaluation and Grading:

Grades will be based on the following weighting scheme: 3 Exams (45%), a Final Exam (20%), Labs (25%), and Homework and Quizzes (10%). 3 extra credit points (to a limit of 20, on a 1000 point scale) will be given for each Chemistry Colloquium attended. Alternative extra credit will be available for those whose schedules conflict with colloquium (but you must see me to arrange this by Friday, November 7, 2008).

ALL EXAMINATIONS ARE COMPREHENSIVE, ESPECIALLY THE FINAL.

The following scale will be applied to determine the final letter grade: **A** \geq 90% > **B** \geq 80% > **C** \geq 70% > **D** \geq 60% > **F**. Plus and minus grades are included in these ranges and will be determined at the end of the semester. Adjustments to this scale are possible, but unlikely.

<u>Exams:</u>	<u>Hour Exam 1</u>	Tuesday, September 30, 2008 (in lab)
	<u>Hour Exam 2</u>	Tuesday, October 28, 2008 (in lab)
	<u>Hour Exam 3</u>	Tuesday, November 25, 2008 (in lab)
	<u>Final Exam</u>	Friday Dec. 12, 2008, 8:30 AM

Content:

Physical Chemistry provides the theoretical basis for explaining and interpreting chemical systems by focusing on the energy and time involved as they change. In this course we plan to cover many topics in the text. We will study and attempt to understand many of the basic principles and phenomena of chemical systems in equilibrium, including Gases and their properties, Chemical Thermodynamics, Phase Relationships and Diagrams, Chemical Equilibrium, Electrochemistry, and (time allowing) Statistical Thermodynamics. Physical Chemistry II 331W will continue where this course ends. Both semesters have comprehensive, multiple-choice ACS exams as part of the final (over both semesters in the Spring).

Lecture Attendance and Absences:

Lecture attendance with calculator and textbook is required. All unexcused lecture absences after three will be penalized 2 percent (of total possible points) per day. **Only absences notified ahead of time may be excused.** Notification is expected as soon as possible for planned (athletic events, class trips) or emergency (illness) absences; call or e-mail me or the Department Secretary (321-4180). The cause of absences must be verified by the Dean or substantiated (note from coach or parent, doctor's excuse, etc.).

Exam and Lab Absences:

No make-up exams will be given. The (cumulative) final exam grade (as a %) will be substituted for **one** excused absence exam grade (as a %). Barring exceptional circumstances, **all** subsequent missed exams will receive a grade of zero. Because students often work in groups in lab, absences hurt everyone and should be avoided. Make up labs will vary (and may not be possible), depending on the circumstances of that week's experiment. In some cases, students may be allowed to work outside scheduled lab hours by first obtaining permission from a chemistry professor (who must be in the building while they work and be notified when they leave), and then having a "buddy" present.

Quizzes:

There will be eight quizzes on Mondays this semester: Sept. 1, Sept. 8, Sept. 15, Sept. 22, Oct. 13, Oct. 20, Nov. 10, Nov. 17. Quizzes will be given at the end of the period. The lowest quiz grade will be dropped.

Homework:

Each chapter will have a set of recommended problems (see below) which students are strongly encouraged to work. In addition, many days there will be graded homework problems assigned. These are due at the start of the next lecture (or as soon as you enter lecture, if late), and we will go over the solution in that lecture. Many students find it useful to keep a copy of the problem to review. No late homework will be accepted and the lowest homework grade will be dropped. *If you must be absent, have someone else take notes and hand in any assignments for you.*

Initial homework assignments are given below. More recommended homework exercises may be distributed in class or posted on the web. Almost all of the 'discussion questions' are useful (i.e. the first several exercises for each chapter). Note that answers for the (a) exercises and some problems are given in the back of the textbook.

Chapter One Exercises: 1, 2, 3, 8, 10, 13, 16, 18, 21 (all a exercises - b answers in the back of the textbook). [Chapter Twenty One Exercises: 1, 2, 4, 5, 6](#). Chapter Two Exercises: 2, 3, 4, 7, 10, 14, 17, 18, 21, 28. Chapter Three Exercises: 1, 3, 4, 6, 7, 8, 9, 10, 12, 14, 15, 18, 22 Problems 19, 24, 25, 26, 30. Chapter Four Exercises: 1, 2, 5, 8, 9. Chapter Five Exercises: 2, 3, 4, 6, 7, 9, 11, 16. Chapter Six Exercises: 1, 3, 6, 9, 10, 13, 14. Chapter Seven Exercises: 14, 15, 16

Review Sessions:

A review session will be held before each exam. The reviews will be in Heim 204 (the lab) or other announced room (Heim 215 or G41) from 8:30 to 10 PM the Sunday evening prior. Review session notes, and keys for problems and exams will be posted and/or reviewed in class. Final exam review time is TBA.

Miscellaneous:

Administrative procedures (withdrawals, etc.) will follow the published guidelines and rules of the college and department. There will be a class web page and Moodle will also be used. This syllabus is also available online at <http://www.lycoming.edu/chem/fall2008/330syl.htm>.

General Comments:

Students are responsible for knowing material in the assigned reading, problems, labs, and lectures. Working problems, studying and understanding the material are keys to doing well. It is assumed that the students are familiar with the background material in Chemistry, Physics and Mathematics. While I am glad to help you in reviewing these topics, it is your responsibility to make up any weaknesses or deficiencies you might have. Much of the course material involves a high degree of conceptual understanding (not simple memorization), so adequate preparation and study are essential. It is **not** sufficient to learn the material from the lecture alone - you should read and think about the topics covered **before** attending lecture. If you still can't get a problem or concept, please see me for help. We will cover much detailed and difficult material this semester, so our pace must be geared toward those who are prepared to learn. In homework and exams be neat, box answers, show your work and units (partial credit will be given).

Academic Honesty:

On all exams and lab reports, copying someone else's work or allowing another to copy your work and submit it as their own is academic dishonesty and can lead to penalties such as failing the assignment or even dismissal from the college. Unless otherwise stated, all work submitted for a grade should be your own work (although you can study with others to understand the concepts). Always include citations for all sources consulted in labs or homework to avoid plagiarism. For further information on the college policy on academic dishonesty, see the *Pathfinder* or *Student Handbook*.

Scores will be posted, generally after exams, using a secret, four-character code chosen by each student. If you prefer not to have your scores posted, let me know (in writing) by 8/29/2008.

Laboratory: In the first lab (8/26/2008), we will go over the lab schedule, safety issues, writing lab reports, error analysis, and the use of spreadsheet programs in the Heim ITS lab. Experiments will be done by one group of all the students. The first lab will also have an overview for each experiment. Please be sure to bring your notebook and take good notes. Lab report due dates are given on the schedule (below). For the first three reports you will be allowed to turn in a draft report. You can see how you've done, then revise only the calculations, results, and conclusions of the report (if need be). Start work on lab reports well before they are due - these can not be done well at the last minute. Many Physical Chemistry Lab Reports involve as much time (or more) in writing and calculation as the original experimental procedure did. More information and experimental procedures will be given out in lab.

Pre-Labs:

There will be a pre-lab overview of all experiments the first week. There will also be a detailed pre-lab including electrochemistry theory and some sample calculations for the first experiment. For subsequent weeks, many of the experiments will have online photographic pre-labs available through the web page for the course. These will chiefly be for experiments using new or unfamiliar equipment or techniques (so NMR or typing in a computer is not included). Instead, each online pre-lab will illustrate some of the equipment and techniques used in that experiment. Each student is

responsible for looking at the online pre-lab before the experiment starts. Students who do not look at the online pre-lab first will be penalized in their grade for that experiment. Printouts of the photographs will also be available in lab for reference of the group(s) doing that experiment that week. The instructor will also be available for any questions.

Writing Project: In response to student feedback from previous years, we will start the Writing Project at the end of the semester. Only the "Project Topic" (due Mon. Nov. 10) and draft "Project References" (draft due Mon Dec. 8, final version due Fri. Jan. 16, 2009) will be due this semester. More information about all aspects of the writing project is in the Lab Manual and will be discussed later. The grades will count in the homework and quizzes category. This is designed to allow more time for the Writing Project as it continues in the Spring Semester in Physical Chemistry II 331W.

College Policies:

Because this course meets a distribution requirement, it includes a writing component. At least 10 pages of writing must be produced by each student during the semester and some of those assignments will be formally evaluated for writing. I will be reserving some class or office time to help each student with written work.

If you have a specific disability and choose to request academic accommodations to meet your needs, please consult with Mr. Dan Hartsock, Co-ordinator of Services for Students with Disabilities. His office is in the Academic Resource Center on the third floor of Snowden Library.

Departmental and ACS policy:

The following are not allowed to be used during quizzes and exams: programmable calculators (unless the memory is cleared by the instructor), cell phones, PDA's, headphones, or other personal electronic devices.

Learning Objectives:

Our objectives in this two semester sequence of courses is to learn the theory, application and practice of Physical Chemistry.

- Thermodynamics will cover: Equations of state, Laws of thermodynamics and state functions, Mathematical relationships in thermodynamics, Chemical and phase equilibria, and brief Statistical mechanics.
- Kinetics will cover the kinetic molecular theory, transport properties, rate laws, kinetic mechanisms, and reaction dynamics.
- Quantum mechanics will cover fundamental concepts, wave functions, eigenvalues and operators, the particle in a box, the harmonic oscillator, basic molecular orbital theory and spectroscopy.
- The associated mathematical operations are also learning objectives, as are basic laboratory skills and techniques.

Important Dates for Physical Chemistry 330 Fall 2008 (These are all tentative)

Date (Tues.)	Group Earth	Group Air	Group Fire	Group Water
Aug. 26	Check In, Pre-Labs, Excel, etc.	Check In, Pre-Labs, Excel, etc.	Check In, Pre-Labs, Excel, etc.	Check In, Pre-Labs, Excel, etc.
Sept. 2	Electrochemistry Due F Sept. 12	Electrochemistry Due F Sept. 12	Electrochemistry Due F Sept. 12	Electrochemistry Due F Sept. 12
Sept. 9	Bomb Cal. Part I	Bomb Cal. Part I	Solution Cal. Part I	Solution Cal. Part I
Sept. 16	Bomb Cal. Part II Due F Oct. 10	NMR Due F Oct. 10	CAChe Due F Oct. 10	Solution Cal. Part II Due F Oct. 10
Sept. 23	NMR Due F Oct. 24	Bomb Cal. Part II Due F Oct. 24	Solution Cal. Part II Due F Oct. 24	CAChe Due F Oct. 24
Sept. 30	EXAM ONE	EXAM ONE	EXAM ONE	EXAM ONE
Oct. 7	Cp/Cv Ratio Part I	Cp/Cv Ratios Part I	Bomb Cal. Part I	Bomb Cal. Part I
Oct. 14	Cp/Cv Ratio Part II Due F Nov. 7	CAChe Due F Nov. 7	Bomb Cal. Part II Due F Nov. 7	Library Time
Oct. 21	CAChe Due F Nov. 14	Cp/Cv Ratio Part II Due F Nov. 14	Library Time	Bomb Cal. Part II Due F Nov. 14
Oct. 28	EXAM TWO	EXAM TWO	EXAM TWO	EXAM TWO
Nov. 4	Solution Cal. Part I	Solution Cal. Part I	Cp/Cv Ratio Part I	Cp/Cv Ratio Part I
Nov. 11	Library Time	Solution Cal Part II Due F Nov. 21	Cp/Cv Ratio Part II Due F Nov. 21	NMR Due F Nov. 21
Nov. 18	Solution Cal. Part II Due F Dec. 5	Library Time	NMR Due F Dec. 5	Cp/Cv Ratio Part II Due F Dec. 5
Nov. 25	EXAM THREE	EXAM THREE	EXAM THREE	EXAM THREE
Dec. 2	Checkout, review	Checkout, review	Checkout, review	Checkout, review
Dec. 12	FINAL EXAM	FINAL EXAM	FINAL EXAM	FINAL EXAM

Important Dates for Physical Chemistry 330 Fall 2008

Exams (Tuesdays): Sept. 30, Oct. 28, Nov. 25

Quizzes (Mondays): Sept. 1, Sept. 8, Sept. 15, Sept. 22, Oct. 13, Oct. 20, Nov. 10, Nov. 17

Labs Due (all Fridays): Sept 12 (all four groups, Electrochem.), Oct. 10 (all four groups), Oct. 24 (all four groups), Nov. 7 (3 of 4 groups), Nov. 14 (3 of 4 groups), Nov. 21 (3 of 4 groups), Dec. 5 (3 of 4 groups)

Fall Semester 2008 Writing Project Deadlines:

- Topics due by Mon. Nov. 10
- References Draft due by Mon. Dec. 8 (Monday of Finals Week)
- References Final Version due Fri. Jan 16, 2009 (start of Spring Semester)