

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

Office Hours: **Heim 202, MWF 11:10 AM-noon, 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 330 (and its prerequisites)

Materials for Course:

*Physical Chemistry, 8<sup>th</sup> Ed.* Peter Atkins and Julio de Paula; *ACS Style Guide, 3<sup>rd</sup> 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 2008-2009 Laboratory Manual for 330-331W.

Evaluation and Grading:

Grades will be based on the following weighting scheme: 3 Exams (45%), a Final Exam (20%), Lab, including Writing Project (25%), and Homework and Quizzes (10%). Because this course is Writing Intensive, special emphasis will be placed on learning through writing in all assignments, but especially the Writing Project (see below, manual). 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, March 27, 2009). The final exam will be a comprehensive, multiple-choice test, prepared by the American Chemical Society, covering **both** semesters (330 and 331W).

**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, February 10, 2009 (in lab)             |
|               | <u>Hour Exam 2</u> | Tuesday, March 17, 2009 (in lab)                |
|               | <u>Hour Exam 3</u> | Tuesday, April 14, 2009 (in lab)                |
|               | <u>Final Exam</u>  | 1:00 to 4:00 PM, Monday April 27, 2009 (in lab) |

Content:

Physical Chemistry provides the theoretical basis for explaining and interpreting chemical systems by focusing on their structure and the energy and time involved as they change. In this course we will study and attempt to understand many of the basic principles and phenomena of chemical systems including Molecular Motion & Kinetics, Quantum Theory, and, time allowing, some aspects of Spectroscopy and Statistical Thermodynamics.

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 seven quizzes this semester: Jan. 19, Jan. 26, Feb. 2, Feb. 23, Mar. 9, Mar. 30, and Apr. 6. Quizzes will be given Mondays at the end of the period, with the lowest quiz grade dropped.

Homework:

Each chapter has a set of recommended problems which students are strongly encouraged to work. In addition, some 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.*

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 21** Exercises 21.1 (mean speed), 2 (mean speed, mean free path, collision frequency), 4 (mean free path), 5 (collision frequency), 6 (mean free path), 10, 11 (effusion), 15 (viscosity), 20 (thermal conductivity), 25 (limiting molar conductivity).

**Chapter 22** Exercises 2, 4, 5, 6, 7, 8, 9, 10, 11 (rates, rate laws, rate constants and half lives) 14 (Arrhenius). Problems 13, 20 (Mechanisms)

**Chapter 23** Exercises 1a and b, 2, 3, 4, 5 (all solving mechanisms), 6 (Michaelis Menten).

**Chapter 8:** Exercises 3 (uncertainty principle), 4 (photon tricks), 8 (Black Body Radiation), 10 (de Broglie relation), 13 (Ionization, like photoelectric effect)

**Chapter 9:** Exercises 1, 4, 5, 6 (particle in a box) 8, 9 10 (harmonic oscillator)

Other chapters to be announced.

Review Sessions, Keys, and Scores:

A review session will be held before each exam in Heim 204 (the lab) from 8:30 to 10 PM the Sunday prior. Final exam review time is TBA. There is a class Moodle page. The syllabus will be there and at: <http://www.lycoming.edu/chem/spring2009/331syl.htm>. Homework and exam keys

will be reviewed in class and/or posted on Moodle. *Scores* will be posted using a secret, four-character code, unless you write me not to by 1/16/2009.

Writing in this Writing Intensive Course:

Every aspect of the course will incorporate writing in an effort to help you become a better scientific writer. There will be at least thirteen pages of formal writing (revised, typed) done as the Writing Project. The laboratory procedure you research, write, test, and revise will be at least six pages. The formal lab report based on another student's procedure will be at least five pages, and the evaluation of it at least two pages. There will also be at least fifteen pages of informal writing. All exams will include one to two pages of brief essay questions each, as well as sections of more numerical problems where you may be asked to write about and explain your results. Some quizzes and homework problems will involve writing about topics we have studied, and there will even be short writing exercises in lecture to assess learning about new topics. As usual, there will be several pages of writing in each lab report and a revision may be submitted for one report. Each student will also make a brief in-class oral presentation on their project (more information on this given out later).

For more help with writing, please see me or Shanna Wheeler and the staff of the Writing Center on the third floor of the Snowden Library (phone 321-4392).

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*.

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).

Safety and Labs:

Please refer to the 330 syllabus, 330-331W laboratory manual, and lab safety contract for course expectations regarding safety, lab, and lab reports.

Departmental and ACS policies:

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. Personal electronic devices (except calculators) are also not to be used in the laboratory.

College Policies:

*Administrative procedures* (withdrawals, etc.) will follow the published guidelines and rules of the college and department.

Disabilities:

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.

**Important Dates for Physical Chemistry II 331W, Spring 2009**

*Exams* (Tuesdays): Feb. 10, Mar. 17, Apr. 14

*Quizzes* (Mondays): Jan. 19, Jan. 26, Feb. 2, Feb. 23, Mar. 9, Mar. 30, Apr. 6

*Labs Due*: Fri. Jan. 25, Fri. Feb. 1, Fri. Mar. 7, and Wed. Mar. 19.

*Spring Semester 2009 Writing Project Deadlines:*

- References Final Version due by Fri. Jan 16
- A list chemical reagents and equipment needed by Fri. February 13
- The write-up for your own project is due in draft form by Mon. March 9
- The final version (two copies) is due by Mon. March 30
- Formal reports on the project you evaluate are due in draft form by Mon. April 20, and in final form by Mon. April 27 (Monday of Finals week)
- There will be brief oral presentations on the Writing Projects in the lab period, Tues. April 21

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**Tentative Laboratory Schedule for Physical Chemistry II 331W, Spring 2009**

| <b>Date<br/>(Tues.)</b> | <b>Group Alpha</b>                           | <b>Group Beta</b>                            | <b>Group Gamma</b>                           |
|-------------------------|--|--|--|
| Jan. 13                 | Pre-Labs, Writing<br>Projects, etc.          | Pre-Labs, Writing<br>Projects, etc.          | Pre-Labs, Writing<br>Projects, etc.          |
| Jan. 20                 | Iodine Clock<br>Due F Jan. 30                | Iodine Clock<br>Due F Jan. 30                | Iodine Clock<br>Due F Jan. 30                |
| Jan. 27                 | Microscale Kinetics<br>Due F Feb. 6          | Microscale Kinetics<br>Due F Feb. 6          | Microscale Kinetics<br>Due F Feb. 6          |
| Feb. 3                  | Surface Tension<br>Due F Feb. 27             | Surface Tension<br>Due F Feb. 27             | Surface Tension<br>Due F Feb. 27             |
| Feb. 10                 | EXAM ONE                                     | EXAM ONE                                     | EXAM ONE                                     |
| Feb. 17                 | Library Time                                 | Library Time                                 | Library Time                                 |
| Feb. 24                 | Dye Abs. Spectra<br>Due W Mar. 21            | Dye Abs. Spectra<br>Due W Mar. 21            | Dye Abs. Spectra<br>Due W Mar. 21            |
| Mar. 3                  | SPRING BREAK                                 | SPRING BREAK                                 | SPRING BREAK                                 |
| Mar. 10                 | Project: Do Own I<br>Draft Due M Mar. 9      | Project: Do Own I<br>Draft Due M Mar. 9      | Project: Do Own I<br>Draft Due M Mar. 9      |
| Mar. 17                 | EXAM TWO                                     | EXAM TWO                                     | EXAM TWO                                     |
| Mar. 24                 | Project: Do Own II<br>Due M Mar. 30          | Project: Do Own II<br>Due M Mar. 30          | Project: Do Own II<br>Due M Mar. 30          |
| Mar. 31                 | Project: Do Other's I<br>Draft Due M Apr. 20 | Project: Do Other's I<br>Draft Due M Apr. 20 | Project: Do Other's I<br>Draft Due M Apr. 20 |
| Apr. 7                  | Project: Do Other's II<br>Due M Apr. 26      | Project: Do Other's II<br>Due M Apr. 26      | Project: Do Other's II<br>Due M Apr. 26      |
| Apr. 14                 | EXAM THREE                                   | EXAM THREE                                   | EXAM THREE                                   |
| Apr. 21                 | Oral Presentations,<br>Review, Checkout      | Oral Presentations,<br>Review, Checkout      | Oral Presentations,<br>Review, Checkout      |
| Apr. 27 –<br>May 1      | FINAL EXAMS                                  | FINAL EXAMS                                  | FINAL EXAMS                                  |

Group Alpha: Brittany Bryan, John Stutzman

Group Beta: Zach Carroll, Tess Duffin, Oscar Wheeler

Group Gamma: Trisha Lindenmuth, Kyle Totaro