

Spring 2013 course outline for Chemistry 352

Professor John Head

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The main focus of Chemistry 352 will be understanding the physical chemistry of microscopic systems. During most of the semester we will discuss quantum mechanics and spectroscopy and will essentially work through the book 'Quantum Chemistry, 2nd Edition' by McQuarrie. Chapters 7–10 and 12–14 in Atkins' Physical Chemistry book which was used in Chem 351 will serve as useful additional reading.

Grading

The grading of 352 will consist of the following components.

1) Homework. (15% of the course grade). The best way to understand physical chemistry is by problem solving. Weekly problem sets will be assigned and graded. In addition suggestions for practice problems from the text will be given. These practice problem will not be collected but may appear on the midterms and final.

2) 3 Midterms. (Each 15% of the course grade). The dates of the mid-terms will be:

i) Friday February 1

ii) Wednesday February 27

iii) Monday April 8

Each midterm will be at the usual lecture period time.

3) Final examination. (40% of the course grade).

Date of Final: Friday May 10 9:45-11:45

A third of the final will test your understanding of material from the last quarter of the semester, the other two thirds will consist of questions which draw on your knowledge from the complete course.

Note: time does not permit any make up exams. Mark in your diaries now the time of these exams because there will be no special scheduling of tests.

CHEM 352L. PHYSICO-CHEMICAL MEASUREMENTS

SPRING 2013

INSTRUCTOR: Prof. John Head Email: johnh@hawaii.edu

TEACHING ASSISTANTS: Chris Nold (cpnold@hawaii.edu), Bilger 216
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REQUIRED TEXT: Experiments in Physical Chemistry, 8th Edition
C.W. Garland, J.W. Nibler, and D.P. Shoemaker
McGraw-Hill (2007)

COURSE DESCRIPTION: Chemistry 352L is a Writing Intensive laboratory course that couples experimentation with scientific writing. The course focuses on the understanding and application of principles of physical chemistry, the use of scientific instrumentation and the organization and explanation of results in laboratory reports.

CHEM 352L IS A WRITING-INTENSIVE COURSE. A brochure on writing courses is posted at our Laulima site. Also see <http://www.hawaii.edu/gened/focus/w.htm> for information on WI courses.

Also available at our Laulima website: "Guide to Writing a Lab Report for Chemistry Students"

GRADING:

1. YOUR SEMESTER GRADE WILL BE CALCULATED FROM:

Written Reports and Notebooks	80%
Calculated from the scores of experiments run during the weeks of 1/24-1/25 and 1/31-2/1, <u>and</u> the best 7 of the remaining 8 experiments.	
Final Assignment ("Take-Home Final")	10%
Performance in the Laboratory (as evaluated by TAs)	<u>10%</u>
(Total:	100%)

2. EACH OF THE 10 EXPERIMENTS WILL HAVE THE FOLLOWING POINT BREAKDOWN:

Notebook	15%
Abstract	5%
Introduction	20%
Experimental	5%
Data/Results	10%
Calculation/Error Analysis	15%
Discussion	25%
References	<u>5%</u>
(Total	100%)

3. **THE “REVISION” PROCESS FOR EXPERIMENTS RUN ON 1/24-1/25 AND 1/31-2/1**

To learn to write well, you need to practice, and you also need timely feedback.

You are strongly encouraged to submit your reports when they are due (see next section). There are no extensions for the lab reports (see next section for due dates and late penalties). Exceptions are made only for documented medical/family emergencies.

The first two reports must be resubmitted after they have been graded. Your first two lab reports will be extensively critiqued. The revisions must address the points of the critique. Your grade will be the average of the original and revised reports. Revised reports will be due in one week.

4. **DEADLINES FOR LAB REPORTS AND LATE PENALTY:** All reports are due at 1:30 PM exactly one week after the completion of the experimental work. Submit the lab report to your TAs, not Prof. Head.

If you submit your report on-time, your graded report should be returned to you in ~1 week.

For Experiments 1-5 (run from 1/22-2/20): Late reports will be assessed a penalty of 20% per weekday late.

For Experiments 7-11 (experiments from 3/5 onwards): Late reports will be assessed a penalty of 10% per weekday late, with the additional condition that **all** reports are due by Friday, April 26, 2013, 4:30 p.m. No reports will be accepted after this deadline.

5. **THE IMPORTANCE OF A GOOD LABORATORY NOTEBOOK.** In principle, it is probably the most important “15%” of your lab report grade.

As discussed on the first day, the lab notebook is a critically important tool in experimental chemistry. Prior to your lab class, you should read the experiment carefully. As part of your preparation (i.e., all written in your notebook before you get to class!), you should state the **OBJECTIVE** of the experiment for the week, outline the **PROCEDURE**, and prepare for **DATA COLLECTION** (e.g., table). Your TAs will provide additional guidance on what to include.

To reinforce good habits, **lab notebooks must be initialed by your TA before you leave the laboratory.** He'll initial all the pages that you've used for the day. A photocopy of the relevant pages of the laboratory notebook must accompany the report for each experiment. If these photocopies are missing from your lab report, then it (your report) will be returned to you without a grade (and will be assessed the appropriate penalty starting from the day it was due, not the day you get it back), if the pages are missing.

We want to see your writeup based on your data. There is no benefit in using someone else's data. PChem Lab is not Analytical Chem lab, so your grade does not depend on the accuracy or precision of your experimental data (clearly, however, your report will be much harder to write in the extremely bad cases, right?).

6. **PLAGIARISM DOES NOT PAY**, so don't do it. The possible results range from a “0” for the lab report to an “F” for this course (and worse!).

7. **SCHEDULING NOTE:** You'll see that only 3 of the 4 teams are assigned experiments for the weeks of 3/20-4/17. I.e., there is one week in this period that you are not assigned to a lab. It's a quirk of the scheduling. Your TAs will advise on you on what you will do that week, as the end of March approaches.

CHEM 352L EXPERIMENT SCHEDULE:

	1	2	3	4	5	6	7	8	9	10	11	12
1/8	General Safety Overview											
1/15	Review of Syllabus; Writing Lab Reports; Error Analysis											
1/22	A	B	C	D								
1/29		A	B	C	D							
2/5	D		A	B	C							
2/12	C	D		A	B							
2/19	B	C	D		A							
2/26						All						
3/5							A,B	C,D				
3/12							C,D	A,B				
3/19									A	B	C	
3/26	<i>Spring Break</i>											
4/2									D	A	B	
4/9									C	D	A	
4/16									B	C	D	
4/23												All

- 1 Exp. 17, Conductance of Solutions (Handout) [Nold]
- 2 Exp. 15, Binary Solid-Liquid Phase Diagram (7th ed.) (Handout) [Shinsato]
- 3 Exp. 12, Chemical Equilibrium in Solution (Handout) [Shinsato]
- 4 Handout: "Exp. 28, Second-Order Reaction Kinetics" [Nold]
- 5 Exp. 34, Absorption Spectrum of a Conjugated Dye [Shinsato]
- 6 NMR Spectroscopy - Lecture only (no experiment this week) [Dr. Niemczura]
- 7 NMR lab (Exp. 42 or Handout) [Shinsato]
- 8 Exp. 31, Magnetic Susceptibility [Nold]
- 9 Exp. 6, Heats of Combustion [Nold]
- 10 Exp. 39, Absorption & Emission Spectra of Iodine (Absorption only) [Nold]
- 11 Exp. 37, Vibrational-Rotational Spectra of HCl and DCl [Shinsato]
- 12 Laboratory Cleanup/ Course Evaluation/ Take Home Final

TEAMS:

- Section 1**
- A:** Dylan Ropert, Nicholas Tsoi, William Lewis
- B:** Alicia Bonifacio, Hiromi Kobayashi, Michelle Lam
- C:** Isaac DeMello, Brandon Takusi, Hanieh Mirzaei
- D:** Kyan Agbayau, Gladys Lorenzo, Robert Morris
- Section 2**
- A:** Julia Cramer, Leon Truong, Kent Harada
- B:** Jessica Janiga, Jim Jacobs
- C:** Erica Lei, Tracy Lopez, Audrey Vitin
- D:** Kaya Terem, Kiyo Noguchi, Neil Holified

Notes on the Assigned 352L Experiments

- 1 Exp. 17, Conductance of Solutions** **Grader: Nold**
This experiment will be supplemented with a handout. (I.e., follow the book, but expect a handout with additional, required information.)
- 2 Exp. 15, Binary Solid-Liquid Phase Diagram** **Grader: Shinsato**
This experiment is taken from a previous edition of your book, so you will follow a handout.
- 3 Exp. 12, Chemical Equilibrium in Solution** **Grader: Shinsato**
This experiment will be supplemented with a handout
- 4 Exp. 28, Second-Order Reaction Kinetics** **Grader: Nold**
Use handout.
- 5 Exp. 34, Absorption Spectrum of a Conjugated Dye** **Grader: Shinsato**
- 6 NMR Spectroscopy - Lecture only**
During your regular lab period, we'll have a lecture that introduces you to nuclear magnetic resonance (NMR) spectroscopy. Your attendance is required. To prepare, you should read Atkins Ch. 15.
- 7 NMR lab (Exp. 42 or Handout)** **Grader: Shinsato**
You will either do Experiment 42 ("NMR Determination of Keto-Enol Equilibrium Constants") or another NMR-related lab.

Two teams are assigned to this experiment on a given afternoon. One team will visit the NMR facility to run their experiment from 1:30-3:00. The other team will visit the NMR facility from 3:00 to 4:30 p.m. Your TA will coordinate the schedule with the NMR facility.
- 8 Exp. 31, Magnetic Susceptibility** **Grader: Nold**
Two teams are assigned to this experiment on a given afternoon. Your TA will instruct you on how to proceed.
- 9 Exp. 6, Heats of Combustion** **Grader: Nold**
As part of the preparation for this experiment, you should read the overview of calorimetry (pp. 145-151).
- 10 Exp. 39, Absorption & Emission Spectra of Iodine** **Grader: Nold**
You will work on the absorption spectrum only (not the emission).
- 11 Exp. 37, Vibrational-Rotational Spectra of HCl and DCI** **Grader: Shinsato**
- 12 Laboratory Cleanup/ Course Evaluation/ Take Home Final**