Contact Information

Instructor: Roy K. Okuda, PhD
Office Location: Duncan Hall 9A (basement)
Telephone: (408) (924-2525)
Email: roy.okuda@sjsu.edu
Office Hours: Tues 3:00pm - 4:25pm; Wed 10:30 - Noon
Class Days/Time: Lab: MW 2:30-5:20; Seminar W 1:30-2:20
Classroom: Science 139
Prerequisites: Completed Chem 113A with grade of "C" or better (and appropriate prerequisites for this course): "C-" from 113A is not acceptable.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on my Canvas page for this course. I will also use the email address listed on your mySJSU account regularly to send information on Chem 113B (make sure your email is current). You are responsible for checking for messages on this email on a regular basis to learn of any updates. Many important files will be posted to Canvas, and you must submit each report to Canvas Assignments, so be sure you can access Canvas from your computer. If not, ask me for information to gain access.

Course Description

Chem 113B is intended to provide you with experience in more advanced procedures over what you learned in Chem 113A. It is particularly designed to give you greater familiarity with the manipulation, synthesis, and analysis of organic compounds. Several experiments involve multiple steps, including preparation, purification and analysis of the product at each step. The use of modern spectroscopic techniques for structure determination is emphasized.

Course Goals and Learning Objectives

Course Learning Outcomes (CLO)

• Demonstrate understanding of core concepts and to effectively solve problems in organic chemistry as covered in Chem 112A and 112B
• Mastering advanced laboratory techniques for manipulation of organic compounds (synthesis, separation, purification)
• Characterization of organic compounds by physical and spectroscopic methods including but not limited to: mass, infrared (IR), 1-D and 2-D proton NMR, and $^{13}$C NMR spectroscopies
  • Apply mass spectroscopy (exact mass, and fragmentation patterns) to organic structural analysis.
  • Select conditions for GC analysis and analyze GC chromatographic data.
  • Maintain useful contemporaneous notes of experimental procedures.
  • Write original formal laboratory reports in ACS journal style.
  • Locate scientific data as needed.
  • Design experimental procedures for new reactions, and modify existing procedures as needed. (deduce reasons for the success or failure of a procedure)
  • Operate safely in the laboratory, and dispose of waste properly

Program Learning Outcomes (PLO)

Chemistry 113B satisfies the following Program Learning Outcomes for the Chemistry Department:

PLO #2 - Demonstrate understanding of core concepts and to effectively solve problems in organic chemistry.
PLO #6 - Answer questions regarding safe practices in the laboratory and chemical safety.
PLO #7 - Demonstrate safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.
PLO #10 - Write a formal scientific laboratory report, using the format and style of an article in a peer-reviewed American Chemical Society journal

Required Texts/Readings

Textbook
Available at the Spartan Bookstore, or other book sellers such as Amazon.com


Do not obtain electronic (eBook) versions. You may use paper copies (only) during quizzes and exams, but computers are not allowed.

From the Chemistry Club (DH20)
Obtain the Chem 113B Lab Manual for the Okuda section - this will contain all the experimental background and detail you need for every experiment!

Other Readings
- American Chemical Society (ACS) Style Guide
- McMurry, John, Organic Chemistry, or any organic chemistry textbook

Other equipment / material requirements
- Scientific laboratory notebook with duplicate numbered pages - if you still have space in the notebook from 113A, you can continue using it; otherwise obtain a new notebook from the Chemistry Club or Bookstore.
- basic calculator
- pencils, rulers

Library Liaison
The Chemistry Library Liaison is Yen Tran (yen.tran@sjsu.edu)
Catalog Description  Continuation of Chem 113A including more advanced work. Prerequisite: Chem 113A (with a grade of "C" or better; "C-") not accepted. Pre/Corequisite: Chem 112B. Misc/Lab: Lecture 1 hour/lab 6 hours.

Details:  Chem 113B is a continuation of Chem 113A, including more advanced laboratory techniques used in the isolation, purification, characterization, and synthesis of organic compounds. Emphasis will be placed on the practical skills and knowledge required to successfully carry out multi-step syntheses and to adapt or design laboratory procedures, rather than merely to follow "cookbook" instructions. Formal lab reports in ACS (Journal of Organic Chemistry) style will emphasize writing and communication skills. See the "Schedule of Experiments, Quizzes and Final" for the specific course content.

The scheduled lab time for this section is MW 2:30PM to 5:20 PM. Since this course is primarily based on practical experience, attendance for all scheduled lab and lecture sections is mandatory: repeated absences will affect your progress in the experiments and will likely have an impact on your final grade. A lecture for this course is scheduled every Wednesday at 1:30 to 2:20 PM. These lectures will describe general background and applications of several spectroscopic techniques that we will use in Chem 113B. In general, we have limited time to cover problem solving during these Wednesday sessions. You will be expected to work problems on your own, including from the textbooks and problem sets provided on Canvas and handouts.

From Chem 113A, you should already be familiar with the website that Dr. Straus has created. Bookmark and refer to this site often as it contains information about nearly all of the techniques you will encounter in Chem 113B:

http://www.chemistry.sjsu.edu/straus/visioche.htm

In Chem 113B, you will be expected to have a working knowledge of the techniques that were covered in Chem 113A, including being able to troubleshoot problems if they arise. In general I will not review techniques in detail, so if you need to refresh yourself, look at your 113A notes and the 113A website.

Tentative Course Calendar:

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Report Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 30</td>
<td>Introduction, greensheet, schedule, safety, check-in</td>
<td></td>
</tr>
<tr>
<td>Jan 30 to Feb 8</td>
<td>0: Experiment Zero</td>
<td>February 15</td>
</tr>
<tr>
<td>Feb 13 to Mar 8</td>
<td>1: Stilbene</td>
<td>March 22</td>
</tr>
<tr>
<td>Mar 13 to Apr 3</td>
<td>2: Menthol and Derivatives</td>
<td>April 10</td>
</tr>
<tr>
<td>Apr 5 to Apr 19</td>
<td>3: Unknown Ester</td>
<td>May 1</td>
</tr>
<tr>
<td>Apr 24 to May 10</td>
<td>4: Dimedone</td>
<td>May 15</td>
</tr>
<tr>
<td>May 22</td>
<td>Final Exam</td>
<td>12:15 to 2:30pm in lab</td>
</tr>
</tbody>
</table>

This is a tentative schedule and is subject to modification (except for the Final Exam and due date for Exp. 4). See the end of this Greensheet for the week-by-week schedule and schedule of readings.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus. In addition to time spent in the lab, you are expected to take additional time outside of class to prepare for each lab, learn topics such as techniques and spectroscopy and work on your reports.

NOTE that University policy F69-24, “Students should attend all meetings of their classes, not only because it is a requirement of the university but because participation is frequently essential to personal and professional success.”
Grading Policy

GRADING (see below for numerical breakdown and percentages)

Formal Reports: Grading for each experiment includes 20 pts for the report and products (if requested), and 5 pts for the lab quiz. Points are deducted for reports turned in after the due date for that report (up to 1 pt/day). Late reports will not be accepted after the graded reports are returned to the class. The report for Experiment 4 dimedone has a firm deadline - no late reports will be accepted after the Final Exam.

All reports must be submitted both as paper copies in lab and also to the appropriate "Assignment" link in the Chem 113B Canvas page. Both submissions must be done at the start of the lab period in which the report is due, or the report is considered "late."

Included in the Formal Report grade are points for the Laboratory Notebook - at the end of each lab day, you must present your lab notebook to be signed by the instructor. If not signed, -1 point/missing signature will be deducted from the total grade for that report.

Spectroscopy Quizzes: A total of 6 spectroscopy quizzes (20 pts each) will be given during the Wednesday 1:30 PM class periods (see schedule). You may take all 6 (lowest score will not be counted), or choose to take 5 quizzes (all quizzes count). If you miss a quiz for any reason, this will be the quiz which does not count for your grade.

Final Exam: a comprehensive Final Exam (150 pts) will cover aspects of both lab and spectroscopy lectures.

Note that the final 113B grade is based on a conglomerate of the individual graded items (each item is not assigned a "grade"). So, if you have a somewhat low point total on one item, you can make it up with a better point total of another graded item. The course grades are given on a "+/-" system, and the instructor may modify the point total up to 10% higher or lower based on a student's performance in the lab (such as preparation and efficient use of time, attendance, general lab skills, etc.).

All quizzes and exams are open notes and open book (only for the course textbooks). You are required to bring your OWN books for the exams. Sharing of books during tests is not allowed. Books must be paper copies; computers are not allowed during quizzes and exams.

Grading information:

The grades for this course will assigned as "plus/minus" and will be based on the following categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 experiments @ 50 pts each*</td>
<td>= 250 (50%)</td>
</tr>
<tr>
<td>5 spectroscopy quizzes @ 20 pts each**</td>
<td>= 100 (20%)</td>
</tr>
<tr>
<td>Final exam @ 150 pts</td>
<td>= 150 (30%)</td>
</tr>
<tr>
<td>Total possible for 113B</td>
<td>= 500 pts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>100-97%</td>
</tr>
<tr>
<td>A</td>
<td>96-93%</td>
</tr>
<tr>
<td>A-</td>
<td>92-90%</td>
</tr>
<tr>
<td>B+</td>
<td>89-87%</td>
</tr>
<tr>
<td>B</td>
<td>86-83%</td>
</tr>
<tr>
<td>B-</td>
<td>82-80%</td>
</tr>
<tr>
<td>C+</td>
<td>79-77%</td>
</tr>
<tr>
<td>C</td>
<td>76-73%</td>
</tr>
<tr>
<td>C-</td>
<td>72-70%</td>
</tr>
<tr>
<td>D+</td>
<td>69-67%</td>
</tr>
<tr>
<td>D</td>
<td>66-63%</td>
</tr>
<tr>
<td>D-</td>
<td>62-60%</td>
</tr>
<tr>
<td>F</td>
<td>59-0%</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td></td>
</tr>
</tbody>
</table>

Except in unusual circumstances, any missed deadline for a report will be assessed a penalty of up to 1 point per day past the due date (weekend days will count!). Late reports for Experiments will be accepted only up until graded reports are returned to the class. The formal report for Experiment 5 dimedone must be received by the date shown on your schedule (no reports accepted after the final exam is given). Use the attached schedule to plan your time accordingly. Preparation for the lab will help you immensely. All formal
For upper division courses (R, S, V) include the following statements:

“A minimum aggregate GPA of 2.0 SJSU Studies (R, S, & V) shall be required of all students as a graduation requirement.” To see full text, review University Policy S11-3 at http://www.sjsu.edu/senate/docs/S11-3.pdf.

Equipment

You will be assigned an individual locker of equipment for your use during this course. You will be checked into your locker during the first lab period by the instructor, and sign an acknowledgement that you have all of your equipment. You are responsible for keeping track of all of the contents of your drawer. If you lose or break any item, you will be assessed a replacement fee at the end of the semester, so be careful with your equipment. It is possible to complete this course with a relatively small bill for expendable items: it is also possible to end up with a >$100 bill. At the end of each lab period, make sure you have collected all your locker items before leaving.

When you check in, you will be given a coded check out pad from the storeroom. You will also be given a printed copy of Stockroom policies - read this carefully. You may use your check out pad to check out additional equipment from the storeroom which may be required for a particular experiment. **Note that certain equipment items checked out must be returned the same day to avoid a late fee.** Remember, the code on your pad is assigned to you only, don't lose it, or someone else can check out items which will be charged to you.

At the end of the semester, you must clean out your locker, replace all broken equipment or glassware, and have the instructor sign the check-out form. If this process is not completed fully, you may be charged a fee to clean and refurbish your locker. If you drop the class or do not complete Chem 113B, you must checkout by the **last lab meeting** to avoid this fee (see the schedule). **No checkouts will occur after this date.**

Classroom Protocol

SAFETY

Before beginning any lab work, the following items must be completed:

1. Attend the Safety Lecture
2. Read and sign the statement on Chemical Safety for Chemistry Labs:

   http://www.sjsu.edu/chemistry/docs/Safety_Sheet_IIc.pdf

3. View the Chemistry Safety film and sign the viewing voucher
4. Take the Lab Safety Quiz and obtain a score of 80% or better; retake the quiz if score is <80%.

All of the above conditions are required, and must be completed before you will be allowed to work in the lab!

In addition to the points covered above, the following rules are emphasized in this lab:

1. **AS SOON AS ONE PERSON BEGINS WORK IN THE LAB, YOU MUST ALWAYS WEAR SAFETY GOGGLES, EVEN IF YOU ARE NOT DOING ANY WORK YOURSELF!!!** (over your eyes, not on your forehead!) If you see a fellow student not wearing eye protection, you are obligated to remind them to protect their eyes.

2. Be aware that we will be using some flammable solvents, do not have any flames when you (or someone else in the room) are handling these

3. Similarly, treat all acids, bases, and reagents as potential hazards. Avoid skin contact with all of these, and treat any contact immediately. If you have a spill, never leave it unattended (let the instructor know).

4. Dispose of all glassware in the special bins, **not in the trash cans**! This includes broken glass, as well as expendible items such as pipettes and melting point capillaries.
7. Everyone working in the lab is expected to conduct yourself in a professional manner; no horseplay or unsafe actions are allowed.

8. If you are not sure, ask!!

* Failure to comply with proper procedures and prescribed safety cautions shall subject the student to disciplinary action. 1) Any student who engages in unauthorized experimentation, or who seriously disregards safety, thereby endangering self or others shall be withdrawn immediately from the class with a grade of F. 2) Any student who shows persistent disregard for safety may have his/her grade lowered, and may risk being withdrawn with a final grade of F.

**Special rules of safety and conduct apply when using the Bruker Fourier 300 NMR and the HP GCMS and other instruments. These will be provided by the instructor.**

With preparation and organization, it is possible to complete all of your lab work during the scheduled lab period. In general, no lab work will be permitted outside of the scheduled lab times. Usually, the only situation where this may be allowed is in cases of illness where more than a few periods are missed and for which you provide verification by your doctor. However, if you miss more than a few lab periods during the semester, it may be difficult to complete the course In any case, under NO circumstances are you to perform any laboratory work for 113B outside of the scheduled lab time. Any student found performing unauthorized lab work for 113B may be disenrolled from the class.

**Visitors:** No visitors are allowed in the lab at any time. If someone is waiting for you, they must wait outside the lab.

**Cell Phone/computer usage:** Cell phones may not be used in the lab, they must be turned off and put away. Computers/tablets may only be used for purposes related to Chem 113B. While working in the lab, distractions while working must be kept to a minimum - this includes music and videos.

**•Emergencies and Building Evacuations**

If you hear a continuously sounding alarm, or are told to evacuate the building by an Emergency Coordinator, walk quickly to the nearest exit (facing Tower Lawn). Take your personal belongings as you may not be allowed to return. Follow the instructions of the Emergency Coordinators. Be quiet so you can hear instructions. Once outside, move away from the building. Do not return to the building unless the Police or the Emergency Coordinator announces that this is permissible.

**Chemical Safety (CHEM 120S)**

Chemistry 120S (Chemical Safety) is a required course for all chemistry majors and minors, and a prerequisite for all students involved in Chemistry 180 or 298 research courses.

**University Policies**

As a student at SJSU, you should review these University Policies which apply to ALL university courses.

http://www.sjsu.edu/gup/syllabusinfo/#GeneralExpectations

The topics include the following:

- General Expectations, Rights and Responsibilities of the Student
- Dropping and Adding
- Consent for Recording of Class and Public Sharing of Instructor Material
- Academic integrity
In addition to the university policies above, I have additional policies that apply specifically to Chem 113B. Please note the following:

Consent for Recording of Class and Public Sharing of Instructor Material
Audio recording of lectures is allowed. I do not allow video recording of lectures. Much of the material I prepare for Canvas is prepared by me and is considered my personal property. It may not be shared with anyone who is not enrolled in Chem 113B.

Academic Integrity
Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Integrity Policy S07-2 requires approval of instructors.

For Chem 113B, any form of cheating or unfair advantage will be dealt with seriously in this course, and will result in an appropriate penalty. All reports must be submitted to Canvas Assignments, where they will be screened for originality using turnitin.com. At minimum, an infraction will result in "0" points for that exam and it will count as one of two Hour Exam Scores (meaning the second highest exam score will be dropped); a grade of "F" for the course may also be given. The SJSU "Policy on Academic Dishonesty" as described in detail in the SJSU Catalog will be the guideline for any action taken, and the case will be referred to the SJSU Office of Judicial Affairs. The instructor or the SJSU Office of Judicial Affairs may apply more serious penalties. An infraction may also result in a student's name being placed in a Chemistry Department file and other sanctions.

Campus Policy in Compliance with the American Disabilities Act
If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/aec/ to establish a record of their disability.

Note that accommodations for exams should be made well in advance of the exam date, since both I and the AEC need to make arrangements.

The Chem 113B Lab Schedule and Lecture / Reading Schedules are below.
NOTE: this is a tentative schedule for the semester. Any changes will be announced in class.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 30 &amp; Feb 1</td>
<td>Introduction, greensheets, schedule, policies; safety lecture; check-in; Begin Exp 0</td>
</tr>
<tr>
<td>2</td>
<td>Feb 6 &amp; 8</td>
<td>Continue Exp Zero</td>
</tr>
<tr>
<td>3</td>
<td>Feb 13 &amp; 15</td>
<td>Feb 15 Begin Exp One (stilbene); <strong>Feb 15 Exp Zero report due &amp; Quiz</strong></td>
</tr>
<tr>
<td>4</td>
<td>Feb 20 &amp; 22</td>
<td>Continue Exp One; <strong>Feb 22 @ 1:30 Spectroscopy Quiz One</strong></td>
</tr>
<tr>
<td>5</td>
<td>Feb 27 &amp; Mar 1</td>
<td>Continue Exp One</td>
</tr>
<tr>
<td>6</td>
<td>Mar 6 &amp; 8</td>
<td>Continue Exp One</td>
</tr>
<tr>
<td>7</td>
<td>Mar 13 &amp; 15</td>
<td>Begin Exp Two (Menthol); <strong>Mar 15 @ 1:30 Spectroscopy Quiz Two</strong></td>
</tr>
<tr>
<td>8</td>
<td>Mar 20 &amp; 22</td>
<td>Continue Exp Two; <strong>Mar 22 Exp One due and Quiz</strong></td>
</tr>
<tr>
<td>9</td>
<td>Mar 27 &amp; 29</td>
<td>SPRING BREAK - No class</td>
</tr>
<tr>
<td>10</td>
<td>April 3 &amp; 5</td>
<td>Apr 6 begin Exp Three (ester); <strong>Apr 5 @1:30 Spectroscopy Quiz Three</strong></td>
</tr>
<tr>
<td>11</td>
<td>April 10 &amp; 12</td>
<td><strong>April 10 Exp Two due and Quiz;</strong> Continue Exp Three;</td>
</tr>
<tr>
<td>12</td>
<td>April 17 &amp; 19</td>
<td>Continue Exp Three; <strong>Apr 19 @1:30 Spectroscopy Quiz Four</strong></td>
</tr>
<tr>
<td>13</td>
<td>April 24 &amp; 26</td>
<td>Apr 25 begin Exp Four (dimedone)</td>
</tr>
<tr>
<td>14</td>
<td>May 1 &amp; 3</td>
<td>Continue Exp Four; **May 1 Exp Three due and Quiz; <strong>May 3 @ 1:30 Spectroscopy Quiz 5</strong></td>
</tr>
<tr>
<td>15</td>
<td>May 8 &amp; 10</td>
<td>Continue Exp Four; <strong>May 10 @ 1:30 Spectroscopy Quiz 6;</strong></td>
</tr>
<tr>
<td>16</td>
<td>May 15</td>
<td>Check-out day. No lab work, <strong>Exp Four due and Quiz</strong></td>
</tr>
<tr>
<td></td>
<td>Final Exam</td>
<td>May 22 (Mon) 12:15 to 2:30pm in Science 139 (or designated room);</td>
</tr>
<tr>
<td>DATE</td>
<td>TOPIC(S)</td>
<td>READING*</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| Feb 1 | Intro to Structure Determination  
Review of Hydrogen Deficiency Index (HDI)  
Review Proton (1H) NMR and IR  
Introduce Carbon (13C) NMR | PLK Ch 1 (all); Ch 2 (all-review); Ch 3 (all-review); Ch 4 (all)  
SWK Ch 2 (all); Ch 3 (all) |
| Feb 8 | Chemical Shift Interpretation and Prediction in 1H NMR and 13C NMR   | PLK Ch 3 (3.6; 3.10; 3.11); Ch 4 (4.2)  
SWK Ch 3 (3.4; App A; App B.1; App B2a; App C; App D); Ch 4 (4.2.2; 4.3; 4.5; 4.7; App A-D) |
| Feb 15| 1H NMR coupling constants and splitting "trees"  
Use of HDI and Elemental Analysis; Rule of 13 | PLK Ch 1 (all); Ch 3 (3.13-3.18); Ch 4 (4.13-4.16); Ch 5 (all)  
SWK Ch 3 (3.5; 3.12-3.14; App F) |
| Feb 22| Spectroscopy Quiz 1                                                      |          |
| Mar 1 | Isotopic vs Atomic Weights  
High Resolution Mass Spectroscopy (MS) | PLK Ch 8 (8.1-8.7)  
SWK Ch 1 (1.1 to 1.5 all sections) |
| Mar 8 | Low Resolution MS  
Using the M+ Region  
More Discussion of Hydrogen Deficiency Index and Elemental Analysis | PLK Ch 8 (8.1-8.7)  
SWK Ch 1 (1.5) |
| Mar 15| Spectroscopy Quiz 2                                                     |          |
| Mar 22| 2-Dimensional NMR                                                       | PLK Ch 10 (10.7)  
SWK Ch 5 (5.1-5.4) |
| Apr 5 | Spectroscopy Quiz 3                                                     |          |
| Apr 12| Mass Spectroscopy Fragments I                                           | PLK Ch 8 (8.8)  
SWK Ch 1 (1.5.4 to 1.6.17) |
| Apr 19| Spectroscopy Quiz 4                                                     |          |
| Apr 26| Mass Spectroscopy Fragments II                                          | PLK Ch 8 (8.8)  
SWK Ch 1 (1.5.4 to 1.6.17) |
| May 3 | Spectroscopy Quiz 5                                                     |          |
| May 10| Spectroscopy Quiz 6                                                     |          |
| May 22| Final Exam 12:15 - 2:30pm                                               |          |

If time permits, additional topics may be included.


Problems in these books are not assigned, but you are encouraged to work on them to get additional practice! Also, ANY organic chemistry textbook will have basic spectroscopy questions for you to get more practice.