ACHM 332L - ORGANIC CHEMISTRY LABORATORY II
Spring 2007
(1 Hr.)

ACHM 332L -- A continuation of Organic Chemistry Laboratory. Synthesis and spectroscopic identification of carbon compounds. Three laboratory hours per week.

Sec. 001 T 9:25 a.m-12:05 p.m., Sec. 002 W 2:30 - 5:20 p.m. Room 320 SBDG.

INSTRUCTOR: Dr. A. Willbrand Telephone: 648-6851, Ext. 3409 Aiken; 278-1967 N. Augusta, Augusta; 641-3409 after hours. email: annwillb@aiken.sc.edu

OFFICE HOURS: MWF 9:00 - 10:00 MWF, 11:00-12:00 MWF or by appointment.


CO-REQUISITE: For all degree seeking USCA students, ACHM 332L is a corequisite to ACHM 332.

COURSE OBJECTIVES:

This course provides an introduction to the principles and practice in the organic chemistry laboratory including:

Purification, separation, and identification of solid and liquid organic compounds and the application of these techniques to their synthesis. Reactions will be conducted that illustrate many of the principles covered in the lecture (ACHM 332). Spectroscopic identification of reaction products and unknowns will be emphasized. Laboratory safety is emphasized.

EDUCATIONAL OUTCOMES:

At the completion of the course, a student should be proficient with all the basic laboratory techniques and should be able to use them in the synthesis and characterization of organic compounds. The student should be able to operate instruments used in the course with little supervision and should be able to interpret the data obtained from the instruments.

ATTENDANCE:

Attendance in lab is required. If a lab is missed due to an excused absence for an emergency or a severe illness, the lab must be made up as soon as the student is able, preferably the same week the lab is scheduled. The student’s notebook and product will be graded according to the normal grading policies stated below.
If a lab is missed due to an \textit{unexcused absence}, \textit{it still must be made up}, preferably during the same week that the lab is scheduled. However, under these circumstances, the student will receive a penalty for the notebook and product grades. When the missed lab covers a technique that will be used in a subsequent experiment, the student with either an excused or unexcused absence will not be allowed in the lab to conduct this experiment until the missed lab is made up. If a student has not received the necessary training in a technique, his/her presence in that subsequent lab constitutes an unacceptable safety hazard to him/herself and to others in the lab.

If you know in advance that you must miss a lab, please make arrangements with the instructor in advance. Scheduling will be determined by mutual agreement of instructor and the student. If the student must miss a lab for any reason, the instructor should be notified no later than the day the lab is scheduled. A message on the answering machine with a return phone number is sufficient.

If the University is closed due to inclement weather or extenuating circumstances on a lab day, the scheduled lab \textbf{must be made up}. The instructor will work with individual students to find a mutually agreeable time.

\textbf{GRADING:}

\begin{verbatim}
Products: 15 pts each X 9 = 135 pts
Notebook: 20 pts each X 8 = 160 pts
Lab Quiz: 10 pts each X 9 = 90 pts
Benzocaine Lab Report: = 50 pts
NMR Training = 5 pts
Qual Analysis:
  Unknowns: 50 pts each X 2 = 100 pts
  Preliminary Report -- 10 pts X 2
  Correct Identification -- 10 pts X 2
  Technique and Preparation -- 10 pts X 2
  Lab Report -- 20 pts X 2
Notebook: 20 pts each X 2 = 40 pts
SQUALOR (2 X 10) = 20 pts
Lab Final:* = 150 pts
Total = 750 pts
\end{verbatim}

\textbf{LABORATORY REPORTS:}

A formal report on the benzocaine synthesis and preliminary and final reports on each of the qualitative analysis unknowns are required. These reports should include an introduction, a description of each experiment or reaction conducted and an analysis of the data collected to support the final conclusion. Information on the format is provided in the Lab Manual and handouts. In addition to a report on each unknown, you will be required to turn in a form summarizing your data on both of the Qual Analysis unknowns. These forms will not be graded or returned. They provide documentation on the unknown for my future use.
The Preliminary Report on each qualitative analysis unknown must include a complete summary and analysis of the information that has been collected to date for each unknown including the solubility data, elemental analysis, and spectra analysis. A proposal of the classification tests that appear to be most suitable based on the available data and the most likely derivatives to be prepared and their expected melting points, should be listed with a justification. The qual analysis final reports will include the information from the preliminary reports as well as a description of the subsequent work and conclusions. All reports are to be typed with structures drawn in ink.

LABORATORY NOTEBOOKS:

The notebook for each experiment will be due at the beginning of class the week after the experiment is complete with the exception of the qualitative analysis projects which will be due when the work is finished and the report is turned in but no later than April 20. There will be a penalty of up to 10 points (50% of the maximum for individual experiments) on the notebook grade if the pre-lab preparation is incomplete (title, reaction, purpose, data table, theoretical yield, etc.). There will be a penalty of up to 5 points (25% of maximum for individual experiments) if the experimental write-up of the previous lab is not finished by the beginning of the next period (completed procedure). There will be a penalty of up to 5 points if the Results are incomplete (results table: grams, % yield, mp for each product, complete tabulation and analysis of spectral data). Proportional penalties will be levied for comparable deficiencies during the Qualitative Analysis.

LAB FINAL

The lab final will be cumulative with the emphasis on the reactions used in the qual. analysis. This exam will be given at one time for both sections on Monday, May 1, at 2:00 p.m. Alternate arrangements will be made for students in Sec. 001 who have a conflict with this time.

DISABLED STUDENT ASSISTANCE:

If you have a physical, psychological and/or learning disability which might affect your performance in this class, please contact the Office of Disability Services 126A B&E, (803) 641-3609, as soon as possible. The Disability Services Office will determine appropriate accommodations based on medical documentation.
## 2007 LAB SCHEDULE

<table>
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<tr>
<th>DATE</th>
<th>EXPERIMENT</th>
<th>QUIZ</th>
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<tr>
<td>Jan. 16, 17</td>
<td>Check-in, Grignard Reaction (Part 1)</td>
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| Jan. 23, 24| Grignard Reaction (part 2)  
IR Training (Thin Film) Sign-Up for Time 303 SBDG | Quiz 1 (Safety)       |
| Jan. 30, 31| Diels-Alder Reaction  
IR (Thin Film)                                               | Quiz 2 (Grignard)     |
| Feb. 6, 7  | Acetyl Ferrocene  
FTIR (KBr Pellet)  
NMR Training                                                 | Quiz 3 (Diels-Alder)  |
| Feb. 13, 14| Prep. of Benzocaine (Part 1)  
NMR and FTIR of reactant and product.                          | Quiz 4 (Acetyl Fer.)  |
| Feb. 20, 21| Prep. of Benzocaine (Part 2)  
FTIR and NMR of product.                                       | Quiz 5 (Benzoc. 1)    |
| Feb. 27, 28| Prep. of Benzocaine (Part 3)  
FTIR and NMR of pd. A total of 4 FTIR's and 4 $^1$H NMR spectra will be collected. | Quiz 6 (Benzoc. 2)    |
| Mar 6, 7   | Aldol Condensation  
FTIR and NMR, determine coupling constant of alkene protons  
Benzocaine Lab Report Due. Begin SQUALOR | Quiz 7 (Benzoc. 3)    |
| Mar. 12-16 | Spring Break                                                              |                       |
| Mar. 20, 21| Qualitative Analysis (Week 1)  
FTIR and $^1$H, $^{13}$C, DEPT NMR of both unknowns.  
SQUALOR Due | Quiz 8 (Aldol)       |
| Mar. 27, 28| Qualitative Analysis (Week 2)  
Elemental Analysis, Begin Classification Tests                  |                       |
| Apr. 3, 4  | Qualitative Analysis (Week 3)  
Finish Classification Tests, Begin Derivatives. PRELIMINARY REPORT DUE |                       |
| Apr. 10, 11| Qualitative Analysis (Week 4)  
Make Derivatives                                                |                       |
| Apr. 17, 18| Qualitative Analysis (Week 5)  
Continue Derivatives                                            |                       |
| Apr. 24, 25| Qualitative Analysis (Week 6)  
Finish Work/Check Out                                           |                       |
| Apr. 26    | Lab Notebooks and QUAL ANALYSIS REPORTS Due by NOON.                      |                       |
| May 9      | Final Exam -- 2:00 p.m. Room TBA                                           |                       |

The analytical data listed above are required for each product prepared in Experiments 1-7 and should be listed in the notebook:

1) melting point of the product  
2) weight in grams, and % yield  
3) IR and/or NMR spectra with interpretation. The appropriate spectra for each sample are to be obtained during the week designated above. (For individual preparations, the week the sample is made; for Qual. Analysis, by the end of the first week.) Once trained on the use of the IR and NMR spectrometers, each student may use the instruments during week outside of class time to acquire data. A schedule will be posted at each instrument of times the instruments are available that do not conflict with other classes.