COURSE SYLLABUS

I. BASIC INFORMATION

Department of Chemistry
CHE 324
Organic Chemistry Lab
Two (2) semester credit hours
Corequisite: CHE 314

Giley Wright
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II. SCOPE OF COURSE

This course will allow the student to establish the critical link between atomic, ion, and molecular interactions and the macroscopic manifestations called chemical and physical properties. The logical applications of differences in chemical and physical properties to effect chemical separations, validate the identity of a known compound, differentiate between similar compounds, and identify previously unknown compounds will be investigated. Laboratory techniques, instrumentation, and skills (distillation, extraction, chromatography, crystallization, etc.) learned in the early part of the course will be utilized to successfully complete several simple synthetic experiments and natural product isolations during the later part of the course. Laboratory safety and prudent practices in handling, rendering less harmful, and disposing of chemical waste will be emphasized. Finally, the techniques of good scientific and technical writing will be studied in order to develop the ability to properly interpret and communicate scientific results.

III. COURSE OBJECTIVES

The general objectives of the course are:

1. To become familiar with the factors affecting the chemical and physical properties of organic molecules.
2. To develop the manual skills needed to determine the chemical and physical properties of organic compounds.
3. To continue the development of mental skills needed to assimilate and correctly interpret scientific data.
4. To become acquainted with a limited number of synthetic techniques.
5. To learn to write scientific reports which clearly present scientific data and which include lucid, logical conclusions based on the experimental data.

IV. TEXTBOOKS AND MATERIALS

The required textbook for the course is **Microscale and Macroscale Techniques in the Organic Laboratory** (3rd edition) by Donald L. Pavia, Gary M. Lampman, George S. Kriz, and Randall G. Engel. The lecture textbook**, Organic Chemistry** (7td edition) by John McMurray is also used as a reference for two of the experiments. The laboratory procedures students will use are located on the O drive in the shenrie folder under the CHE324 folder. An Avery bound notebook with quadrille paper should be purchased for used as a laboratory

journal/notebook. ChemBioOffice 2009 may be used to publish organic structures in reports and papers and is available to all students with an email address @uu.edu. It can be installed from the Cambridgesoft.com website. A **Sharpie** Permanent Marker will be needed to label glassware in various experiments, and a scientific calculator will be indispensable in the course.

Each student will be required to wear safety glasses at all times in the laboratory. Since safety glasses will be worn for several hours at a time, it is important that they be as comfortable as possible; therefore, it is strongly suggested that a personal pair of safety glasses which meet the ANSI standard be purchased from your optician or local optical laboratory if you wear corrective lenses. For those students that do not require corrective lenses, safety glasses can be purchased from the Union University Student Affiliate Chapter of the American Chemical Society at a very normal price. **Students who depend on contact lenses for eye correction are required to wear glasses in the organic chemistry laboratory instead of contact lenses.** Students are to wear suitable clothing and shoes when working in the lab. A laboratory apron or lab smock may be worn to protect clothing.

V. ASSIGNED READING AND RESEARCH

The required reading for this course includes the chapters associated with each experiment of the textbooks as shown in the schedule. It will be necessary to consult a wide range of sources in the chemical literature including handbooks, chemical dictionaries, and journals. Helpful sources may be found in the bibliography section of this syllabus. Students will be shown how to access the ACS journal data base during the second laboratory period.

VI. METHOD OF INSTRUCTION

At the beginning of the course students will divide into teams of three or when necessary four students. Team members will rotate between the following roles:

Team Leader
Assistant Leader (only in groups of 4 members)
Data Collection Expert
Experiment Technique Expert

Each laboratory experiment will be preceded by a pre-lab lecture that will last approximately one hour. The pre-lab lecture will be given during the laboratory period prior to the lab period the experiment is to be started. Students are expected to read the referenced text and laboratory procedure to be discussed before the pre-lab lecture. They are also expected to come prepared to perform the responsibilities for their role in the lab. Following the pre-lab lecture, students will break into their teams and under the guidance of the Team Leader, thoroughly study and plan the laboratory procedure they will be performing. Each team member is expected to maintain a laboratory journal. It should include a title page and a Table of Contents. All pages are to be numbered and sectioned. Before leaving the break-out session, each member should have recorded in their laboratory journal the following:

Experiment's Title
Experiment's Objective(s)
Reaction Equation(s) (if applicable)
Table of Physical Constants – This is a list of the relevant physical constants and hazards for all chemical reactants and products that will be encountered in the given experiment. This list is to be prepared by the data collection expert for the lab prior to the break-out session. A good site to look up the information is www.chemfinder.cambridgesoft.com/reference/chemfinder.asp. The group is to carefully consider the proper handling and disposal of each chemical during the planning session.
Procedure
Flow Chart and/or listing that outlines how the tasks are assigned – Tasks are to be assigned in such a manner that each team member will become acquainted with each technique being learned.
Any necessary pre-lab calculations
Any other assigned pre-lab tasks

After students have finished planning, the Team Leader's laboratory journal will be checked to make sure the lab has been adequately planned.

When in the lab, data and observations are to be directly recorded into the journal while the experiment is being performed. After the experimental part is completed, students are to meet as a team and exchange data, prepare relevant graphs, make calculations, and prepare a discussion and conclusion of what was determined. The data collection expert's journal for the lab is then to be turned in by the end of the last lab period designated for that experiment.

References and handbooks that are needed for this class may be found in the organic chemistry laboratory, in the Emma Waters Summar Library, or at websites such as chemfinder.com. All references used should be noted. Website references should include the date they were accessed.

VII. FORMAL REPORTS

Each student is required to submit two formal reports. The two formal laboratory reports are to be chosen from the labs that they are the Team Leader. The last two labs cannot be chosen for formal reports.

Formal reports are to be prepared using a word processor application and should contain the following information.

1. Title Page
2. Introduction
3. Objective(s)
4. Reaction Equation(s) (if applicable)
5. Table of Physical Constants (including hazards)

6. Procedure (in 3rd person, past tense) including relevant observations
7. Data
8. Calculations
9. Discussion (relate procedure and observations to theory and results)
10. Conclusions
11. References
12. ACS Journal Articles

It is required that at least two ACS journal articles are referenced. The articles are to be printed and turned in with the formal report.

Although formal reports are composed and submitted by the Team Leader for the lab, team members are to review, edit and sign off on every formal report. Formal reports are to be ready for the team members to review and edit one week after the lab is completed. Each team member is to review and edit four formal reports and all formal reports are to be reviewed and edited by four team members. The reviewed/edited versions are to be signed by the team member who edited the paper and given to the Team Leader/author by the next lab period. The Team Leader is then to make appropriate corrections. The final version of the formal and each member's edited version are to be submitted to the course instructor two weeks after the lab is completed. Edits may be performed and submitted on Blackboard.

VIII. METHOD OF EVALUATION

Each student's grade in the course shall be determined by his/her performance on a mid-term examination, formal laboratory reports, the identification of organic unknowns, experimental notes kept in a laboratory journal/notebook, and a comprehensive final examination. Each student may accumulate a total of 1000 points. No make-up exams shall be given unless arrangements are made in advance of foreseen absences or immediately following the unforeseen absences due to sickness or family trauma.

Each activity shall be weighted as follows:

Activity	**Points**
Formal laboratory reports (125 points/report)	250
Formal report reviews/edits (25 points each)	100
Laboratory journal/notebook (30 points/lab+5 Safety)	275
Identification of unknowns	100
Mid-term examination	125
Final examination (comprehensive)	150
TOTAL	**1,000**

The final course grade will be assigned utilizing the following scale:

Total Points	Course Grade
1000-900	A
899-800	B
799-700	C
699-600	D
Below 600	F

IX. ATTENDANCE POLICY

It should be noted that courses of study which are most worthwhile are those which evoke much study and preparation by the student and then instructor. It is the instructor's opinion (and personal goal) that each meeting of the laboratory will be interesting and possibly exciting, thus worthy of the student's attendance and participation. Students are responsible for completing all scheduled experiments. Due to the nature of the course, close supervision is required in the laboratory. Thus, to make the most efficient use of the instructor's time and effort, students are expected to perform each experiment when scheduled. Students will not be allowed to make-up scheduled experiments for unexcused absences. Excessive absences will render it impossible to achieve the course objectives. No make-up labs will be allowed unless arrangements are made in advance of excused foreseen absences or immediately following excused unforeseen absences due to sickness or family trauma. For absences to be considered excused, students must submit appropriate documentation.

X. ACADEMIC HONESTY

The penalty for cheating (giving or receiving aid on a test, plagiarism of lab reports, etc.) is an F in this course. The student will also be reported to the academic center as required by Union University's policy.

This syllabus is intended to help the student plan his work in this course and is no way considered to be a contract. It is subject to change at any time by the instructor should a change be in the best interest of the class.

XII. LABORATORY SCHEDULE

Monday/Wednesday Labs

Date	Experiment	Lab Text Chapters
8/26	Syllabus, Laboratory Safety, and Check-in	1, 3
8/31	Lab Notebook, Formal Reports, Pre-lab Lab 1	2, 4
9/2	Lab 1: Solubility and Crystallization Lab Time	10, 11
9/***7***	***Labor Day Holiday***	
9/9	Lab 1 Write-up / Pre-lab Lab 2	
9/14-9/16	Lab 2: Melting Pts, Boiling Pts, and RI* Lab Time	9, 13, 24
9/21	Lab 2 Write-up / Pre-lab Lab 3	
9/23	Lab 3: Simple vs Fractional Distillation Lab Time	14, 15
9/28	Lab 3 Write-up / Pre-lab Lab 4	
9/30	Lab 4: Extraction of Clove Oil Lab Time	18
10/5	Lab 4 Write-up / Pre-lab Lab 5	
10/7	***Mid-Term Examination***	
10/12-10/14	Lab 5: Acid/Base Extraction and Isolation of Caffeine Lab Time	12
10/15-19	***Fall Holiday***	
10/21	Lab 5 Write-up / Pre-lab Lab 6	
10/26	Lab 6: Thin Layer Chromatography* Lab Time	20
10/28	Lab 6 Write-up / Pre-lab Lab 7	
11/2-11/9	Lab 7: Column Chromatography and HPLC	19, 21
11/4	***Day of Remembrance***	
11/11	Lab 7 Write-up / Pre-lab Lab 8	
11/16	Lab 8: Nucleophilic Substitution: Alkyl Halides Lab Time	McMurry 11
11/18	Lab 8 Write-up / Pre-lab Lab 9	
11/23	Lab 9: Dehydration of 2-Methyl-2-Butanol Lab Time	7, 22, 29, & McMurry 11, 12
11/25-27	***Thanksgiving Holiday***	
11/30	Lab 9 Write-up and Clean-up/ Check out	
12/2	***Final Examination***	
12/4	***Laboratory Journal Due***	

*Unknowns are identified in these experiments.

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XII. LABORATORY SCHEDULE

Tuesday/Thursday Labs

Date	Experiment	Lab Text Chapters
8/27	Syllabus, Laboratory Safety, and Check-in	1, 3
9/1	Lab Notebook, Formal Reports, Pre-lab Lab 1	2, 4
9/3	Lab 1: Solubility and Crystallization Lab Time	10, 11
9/***7***	***Labor Day Holiday*** (Open Lab time 9/8)	
9/10	Lab 1 Write-up / Pre-lab Lab 2	
9/15-9/17	Lab 2: Melting Pts, Boiling Pts, and RI* Lab Time	9, 13, 24
9/22	Lab 2 Write-up / Pre-lab Lab 3	
9/24	Lab 3: Simple vs Fractional Distillation Lab Time	14, 15
9/29	Lab 3 Write-up / Pre-lab Lab 4	
10/1	Lab 4: Extraction of Clove Oil Lab Time	18
10/6	***Mid-Term Examination***	
10/8	Lab 4 Write-up / Pre-lab Lab 5	
10/13-10/20	Lab 5: Acid/Base Extraction and Isolation of Caffeine Lab Time	12
10/15-19	***Fall Holiday***	
10/22	Lab 5 Write-up / Pre-lab Lab 6	
10/27	Lab 6: Thin Layer Chromatography* Lab Time	20
10/29	Lab 6 Write-up / Pre-lab Lab 7	
11/3-11/5	Lab 7: Column Chromatography and HPLC	19, 21
11/4	***Day of Remembrance***	
11/10	Lab 7 Write-up / Pre-lab Lab 8	
11/12	Lab 8: Nucleophilic Substitution: Alkyl Halides Lab Time	McMurry 11
11/17	Lab 8 Write-up / Pre-lab Lab 9	
11/19	Lab 9: Dehydration of 2-Methyl-2-Butanol Lab Time	7, 22, 29, & McMurry 11, 12
11/25-27	***Thanksgiving Holiday (open Lab 11-24)***	
12/1	Lab 9 Write-up and Clean-up/ Check out	
12/3	***Final Examination***	
12/4	***Laboratory Journal Due***	

*Unknowns are identified in these experiments.

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