

CHEM 2100 Lab I Syllabus (CRN 86011) Fall 2018

Instructor:	Dr. Jianmei Cui
E-mail:	jcui@gsu.edu
Time:	8:00-12:45pm Tuesdays, lecture in PSC362, Lab in PSC357
Office Hours:	<u>PSC317; please email me before your visit</u>
Required Texts	1. CHEM 2100 Lab Manual (available free during first lab) 2. Experimental Organic Chemistry by Wilcox and Wilcox
Optional Texts	Introduction to Spectroscopy by Pavia, Lampman and Kriz

Grading:

*Final Exam:	100 points
*Final Report	100 points
Quizzes, homework, notebook, attendance, and work reports	<u>200 points</u>
	Total 400 points

*Must be submitted to receive a passing grade.

A+: 96%, A: 92%; A-: 89%; B+: 86% B: 82%, B-: 78%, C+: 76% C: 72% C-: 68% D 64% D- 60% F<60%.

Course Objective:

In **part 1** of this project, you will isolate and purify compounds from natural products and you will practice organic synthesis, liquid distillation, and analysis liquid sample. In **part 2** of the semester, three unknown liquids will be purified by distillation and the structure analyzed. Spectroscopy is an integral part of a modern organic chemistry laboratory. Therefore, you will have lectures throughout the semester on infrared spectroscopy (IR), and mass spectrometry (MS) where you will learn the fundamental principles behind each technique and how to interpret spectra in the assignment of organic structure. These spectroscopic techniques will be used during the laboratory portion of the course. **You will be held responsible for the material discussed in lectures and that assigned from the textbooks in all quizzes and final exam.**

Part 1 (labs 1-5):

Techniques for isolation and characterization of organic compounds.

Part 2 (lab 6-13):

Purification and identification of unknowns (Final report), **Final Report: neat liquid, low boiler and high boiler: A good boiling point is the most valuable information you will obtain from distillation.** Check what substances have the boiling points close to the one you have measured. You will find many different types of compounds with the same boiling point. Narrow down to those substances that contain the functional groups you tested in the lab. Then use the density and refractive index (RI) to assign the best candidate. If you have the MS, that gives you the molecular weight, draw structures and play with the fragmentation patterns to match the one given. **The final written examination will test your knowledge and comprehensive of basic techniques and processes employed in an organic laboratory and the spectroscopic techniques used during the semester.**

Final Topics:

1. Concepts and calculations used in first 4 experiments, extraction, such as neutralization, density, solubility (Benzoic acid/Acetanilide), sublimation, recrystallization, melting points, etc.
2. All chemical tests to determine functional groups of organic compounds assigned in the book, not only those that you have carried out for your unknowns, but all taught, you need to state the changes during the reactions (colors, heat, precipitates, or any other observations, not only the name of the test).
3. Distillation (simple and fractional, differences and equipment used).
4. Gas chromatography, concepts and % composition determination of a mixture.
5. **IR interpretation is 30 % of the final.** Practice with the homework, quizzes and lab manual examples.
6. Mass spectroscopy, practice fragmentations.

Miscellaneous:

1. Department of Chemistry Statement on Student Integrity applies to this course (see below).
2. **Attendance to lecture and lab will be recorded. Absences can result in loss of points and lower grades (Sign-in/out of lab required). Every effort should be made to arrive on time! Students should be responsible for the timely completion of all assignments, regardless of any reason of absence.**
3. **No make-up quizzes & homework will be given! If a student misses a quiz or homework will be counted as zero.**
3. Lab notebooks must be recorded **in ink** at the time the measurements are made. **They will be graded during the lab section without announcing! Lab notebooks must be bound.**
4. **Safety glasses are required and must be worn at all times.**
5. **Gloves MUST be worn when handling chemicals.**
6. **Failure to follow safety procedures will result in EXPULSION from that lab session with no make-up allowed and loss of credit.**
7. **Use fume hoods all the time during your lab.**

Department of Chemistry Policy Statement Regarding Student Integrity:

The Department of Chemistry follows the university policy on academic honesty published in the "Faculty Affairs handbook" and the "On Campus: The Undergraduate Co-Curricular Affairs handbook." Any suspected offenses may be referred to the Department Chair for appropriate action. All tests taken must represent your individual, unaided efforts. To receive or offer information during an examination is cheating. The use of unauthorized supplementary materials during tests is also cheating. All laboratory work performed during this course must reflect your individual effort. Only original data obtained by your own laboratory experimentation are to be used, except when specifically authorized by your laboratory professor. Data from supplementary sources (handbooks, reference literature, etc.) must be clearly referenced (title, author, volume, page(s), etc.). Falsification or destruction of data constitutes cheating.

Tentative schedule:

Changes and deviations from this syllabus may come and will be announced during class (quizzes, homework, and others).

Date	Lab #	Tentative Schedule of Lecture	Miscellaneous	Reading assignments Quizzes
Aug. 21 th	1	Safety, Lab Check-in, Students receive unknowns, Project Overview, Extraction of trimyristin from nutmeg	Introduction Lecture Write unknown numbers in the notebook and roll	Safety Quiz HW1, Work Report1 Reading: 103-117, 84, 89
Aug. 28 th	2	Natural Product Extraction Caffeine from Tea & Sublimation	Lecture Instrumentation Demo	HW2, Work Report2 Reading: 89; 103; 118-119; 97
Sep. 4 th	3	Liquid/Liquid Extraction Separation of Benzoic Acid and Acetanilide	Lecture Instrumentation Demo	Notebook check 1 Quiz1, HW3, Work Report3 Reading: 117, 103, 89
Sep. 11 th	4	Esterification of Acetic acid Boiling point & Distillation	Lecture: Discussion Simple Distillation Instrumentation Demo	HW4, Quiz2, Work Report4 Reading:378-379
Sep. 18 th	5	Make up lab	Lecture	43-68
Sep. 25 th	6	Simple distillation: Purification of neat liquid	IR	Quiz3 & HW5 Notebook check 2 234-253
Oct. 2 nd	7	Fractional distillation of unknown mixture.	IR	HW6 43-68 234-253
Oct. 9th		Last day to withdraw and receive a W		
Oct. 9 th	8	CONTINUE: Separation of Low boiler (LB) and high boiler (HB), Boiling Point, Gas Chromatography (GC)	GC ON	Quiz4
Oct. 16 th	9	Fractional distillation: (IR) Spectroscopy, Chemical Tests Continue separation of high boiler and low boiler <i>IMPORTANT: save LB and HB for chemical tests on week 10</i>	GC ON	HW7 529
Oct. 23 th	10	Boiling point checkup for LB. Continue separation of LB, HB, Chemical Characterization Tests	GC ON	HW8
Oct. 30 th	11	Chemical Characterization Tests Introduction Mass Spectrometry	GC ON	Quiz5 -IR HW9
Nov. 6 th	12	Mass Spectrometry, slides, request one mass spectrum of the unknowns you have more difficulty to identify	Last week to use GC	208-231
Nov. 13 th	13	Miscellaneous Topics, how to study for the FINAL EXAM. Form of Final Report / Lab work completion, only bp, chemical tests, IR, density, and books search are allowed, no more distillations	GC OFF Last week to request MS of ONLY ONE of the unknowns	CHECK OUT
Nov. 27 th	14	<u>FINAL EXAM(8:30-10:00am)</u> Final report and notebook are due before 8:30am	Report is not accepted without notebook	Final report and notebook are due before 8:30am