

CHEM A220L: ORGANIC CHEMISTRY A LAB

Item	Value
Curriculum Committee Approval Date	12/04/2024
Top Code	190500 - Chemistry, General
Units	2 Total Units
Hours	108 Total Hours (Lab Hours 108)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Associate Arts Local General Education (GE)	Area 5 Physical and Biological Sciences, Scientific Inquiry, Life Science (OB)
Associate Science Local General Education (GE)	Area 5 Physical and Biological Sciences, Scientific Inquiry, Life Science (OSB)
California General Education Transfer Curriculum (Cal-GETC)	Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	CSU B3 Laboratory Activity (B3)

Course Description

Theory and techniques of separation, purification, synthesis, and analysis of organic compounds including instrumental methods of chromatography and spectroscopy. PREREQUISITE: CHEM A185. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Explain the theoretical basis and applications of common techniques in organic chemistry including melting points, recrystallization, distillation, extraction, chromatography, and infrared spectroscopy.
2. Execute simple organic chemistry experiments using the common techniques of organic chemistry including melting points, recrystallization, distillation, extraction, chromatography, refractometry, and infrared spectroscopy.
3. Write the observations and results of organic chemistry experiments in a notebook journal using proper techniques for recording scientific experiments.
4. Identify the structures of unknown substances using infrared spectroscopy and nuclear magnetic resonance spectroscopy.
5. Apply safe and proper laboratory techniques while making accurate, reproducible measurements of masses and volumes, and reproducible experimental observations.

Course Objectives

- 1. Apply comprehension of Hazardous Material Data with respect to chronic and/or acute exposure.
- 2. Demonstrate safe and environmentally sound methods of handling and disposing of hazardous wastes in the laboratory.
- 3. Adopt standard practices required to operate in a chemical laboratory safely and efficiently.
- 4. Make careful observations and maintain a laboratory notebook using commonly accepted laboratory practice.
- 5. Demonstrate methods of identification and assessment of purity of organic compounds.
- 6. Demonstrate standard lab techniques of separation and isolation of organic compounds from mixtures.
- 7. Discuss the laboratory synthesis of organic compounds via some of the prominent reactions and mechanisms discussed in lecture.
- 8. Demonstrate the use of gas chromatographic techniques to analyze organic mixtures.

Lecture Content

Laboratory safety in the use and disposal of hazardous materials. Introduction to laboratory theory and techniques employed in the separation, purification, and identification of organic compounds. These techniques include crystallization, filtration, distillation, extraction, and sublimation, as well as chromatographic and spectroscopic methods of analysis. Special emphasis is given to the maintenance of a laboratory notebook. Experiments and laboratory exercises are chosen to illustrate standard laboratory techniques and to correlate with reactions and mechanisms covered in the first semester lecture. These experiments and exercises include the following:

1. Identification and estimation of purity by the method of mixed melting points.
2. Purification of a solid by re crystallization.
3. Isolation and purification of natural products by extraction.
4. Separation of liquid mixtures by distillation techniques.
5. Column chromatography: separation and analysis of pigment mixtures.
6. Thin layer chromatography used in the analysis of drugs.
7. Purification of a natural product by sublimation.
8. Isolation of a natural product by steam distillation
9. Synthesis of an analgesic drug.
10. Nucleophilic substitution: relative reactivities.
11. Synthesis of an ester: separation and purification by distillation.
12. Dehydration of alcohols: analysis by gas chromatography
13. Resolution of a racemate using a chiral compound: analysis by polarimetry.

Lab Content

Laboratory safety in the use and disposal of hazardous materials. Introduction to laboratory theory and techniques employed in the separation, purification, and identification of organic compounds. These techniques include crystallization, filtration, distillation, extraction, and sublimation, as well as chromatographic and spectroscopic methods of analysis. Special emphasis is given to the maintenance of a laboratory notebook. Experiments and laboratory exercises are chosen to illustrate standard laboratory techniques and to correlate with reactions and mechanisms covered in the first semester lecture. These experiments and exercises include the following:

1. Identification and estimation of purity by the method of mixed melting points.
2. Purification of a solid by re crystallization.
3. Isolation and purification of natural products by extraction.
4. Separation of liquid mixtures by distillation techniques.
5. Column

chromatography: separation and analysis of pigment mixtures.

6. Thin layer chromatography used in the analysis of drugs.
7. Purification of a natural product by sublimation.
8. Isolation of a natural product by steam distillation
9. Synthesis of an analgesic drug.
10. Nucleophilic substitution: relative reactivities.
11. Synthesis of an ester: separation and purification by distillation.
12. Dehydration of alcohols: analysis by gas chromatography
13. Resolution of a racemate using a chiral compound: analysis by polarimetry.

Method(s) of Instruction

- Lab (04)

Instructional Techniques

1. Demonstration and discussion of laboratory techniques.
2. Lecture on experiment reactions and mechanisms.

Reading Assignments

.

Writing Assignments

Maintenance of a laboratory notebook wherein a record of each experiment performed will be kept. Each record will include a written introduction, data, observations, and a conclusion. Many experiments will also require a section for analysis and calculation.

Out-of-class Assignments

.

Demonstration of Critical Thinking

1. Successful on time participation in each lab meeting; on time completion of each lab.
2. Examinations based on procedure, data, observations, and conclusions recorded in student's laboratory notebook.
3. Quizzes on laboratory techniques, safety, and experiments (short answer and essay).
4. Evaluation of experimental results on designated experiments with regard to yield and purity.

Required Writing, Problem Solving, Skills Demonstration

Maintenance of a laboratory notebook wherein a record of each experiment performed will be kept. Each record will include a written introduction, data, observations, and a conclusion. Many experiments will also require a section for analysis and calculation.

Textbooks Resources

1. Required Pavia, Lampman, Kriz, Engle. Introduction to Organic Laboratory Techniques, A Microscale Approach, ed. Chicago: Saunders College Publishing, 1995
- Rationale: Pavia, Lampman, Kriz, Engle. Introduction to Organic Laboratory Techniques, A Microscale Approach. Chicago: Saunders College Publishing, 1995, latest.