CHEM 12BL: ORGANIC CHEMISTRY LABORATORY

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2021
Units:	2
Hours:	6 laboratory per week (72 total per quarter)
Prerequisite:	CHEM 12AL.
Corequisite:	Completion of or concurrent enrollment in CHEM 12B.
Advisory:	Not open to students with credit in CHEM 13BH.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- Interpret experimental data through application of theoretical models
- Safely handle Organic Chemicals
- Gain skill with common synthetic chemistry techniques

Description

Laboratory course to accompany CHEM 12B. Emphasis is on spectroscopic methods for the structure elucidation of organic compounds. Provides extensive practice in the synthesis, purification, isolation and characterization of organic target molecules. For chemistry and other STEM majors, and for pre-professional students in dentistry, medicine, pharmacy, veterinary medicine or any other interested students that have mastered the prerequisites.

Course Objectives

The student will be able to:
A. Safely handle and dispose of hazardous chemicals
B. Execute techniques common in experimental organic chemistry
C. Provide a rationale for each step in an experimental design
D. Analyze data to draw conclusions about chemical system
E. Communicate effectively using the language of organic chemistry
F. Work constructively and collaboratively in groups

Course Content

A. Safely handle and dispose of hazardous chemicals
1. Research and report published safety data sheets on all chemicals being manipulated
2. Categorize and segregate hazardous waste to avoid undesired reactions between incompatible compounds
3. Apply care and skill in following instruction to safely handle hazardous compounds
B. Practice common laboratory techniques to acquire skill in the preparation, isolation and purification of organic compounds using guided inquiry laboratory projects as exemplified below:
1. Multi-step syntheses of 4-bromoaniline from aniline
2. Free-radical chlorination of an alkane
3. Selective reduction of 3-nitroacetophenone
4. The Diels-Alder reaction with maleic anhydride as dienophile
5. Grignard reaction
6. Measure physical properties (mp or bp, mixed mp)
7. Identification of unknowns by IR and NMR
8. Acquisition of FT NMR (1H or 13C) and/or FT IR spectra on isolated products
9. Isolation/purification of organic compounds
10. Column chromatography as needed
11. Thin-layer chromatography to follow reaction progress and assess purity
12. Distillation (microscale to remove solvent, steam to isolate product)
13. Routine liquid-liquid extraction and recrystallization
14. Gas chromatographic separation of products
15. Assessing the optimal method for isolation or purification of an impure organic compound
C. Provide a rationale for each step in an experimental design
D. Data analysis and precision/error assessment
1. Computing margins of error in volume, weight and chromatographic signal integration measurements
2. Propagation of error in computation
E. Effective communication using the language of organic chemistry
1. Group work
2. Laboratory notebook preparation
3. Maintenance of complete and accurate records of experiments
F. Work constructively and collaboratively in groups

Lab Content

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Special Facilities and/or Equipment

A. Chemistry laboratory with adequate chemicals and equipment for conducting the prescribed course.
B. Each student is issued a laboratory bench locker containing specialized glassware and equipment for both mini and micro-scale organic synthesis.
C. Instrumentation maintained for shared routine use includes analytic balances, melting point apparatus, polarimeters, gas chromatographs, UV-visible spectrophotometers, FTIR spectrophotometers, GC-MS and 1H/multinuclear 60 MHz FT NMR instruments.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

A. Short answer examination
B. Written laboratory reports
C. Demonstrated safe handling of hazardous chemicals
D. Research and presentation of Material Safety Data Sheets

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

During periods of instruction the student will be:
A. Actively participating in lecture/discussion of experimental design
B. Engaged in the laboratory projects that build skill with laboratory techniques common in experimental organic chemistry
C. Working with partner(s) to analyze data and develop conclusions

Representative Text(s) and Other Materials

Mohrig, Jerry R. Laboratory Techniques in Organic Chemistry: Supporting Inquiry-driven Experiments. 4th ed. New York, NY: W.H. Freeman, 2014.
Pavia, D., G. Kriz, and G. Lampman. A Microscale Approach to Organic Laboratory Techniques. Boston, MA: Cengage Learning, 2018.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Weekly written laboratory reports, including discussion of interpretation of results and conclusions
B. Short answer examination questions
C. Weekly reading assignments from both lecture and laboratory texts

Discipline(s)

Chemistry