GROSSMONT COLLEGE

Official Course Outline

CHEMISTRY 241L – ORGANIC CHEMISTRY I LABORATORY

1. Course Number Course Title Semester Units Semester Hours

*Based on a 16-18 week format*

CHEM 241L Organic Chemistry I 2 **6 hours laboratory**

Laboratory 96-108 total hours

2. Course Prerequisites

None

Corequisite

A “C” grade or higher or “Pass” in Chemistry 241or equivalent or concurrent enrollment in Chemistry 241.

Recommended Preparation

None

3. Catalog Description

First of a two semester organic chemistry laboratory sequence. The topics covered will include basic organic chemistry laboratory operations. Students will become familiar with organic structure and functional groups by performing organic reactions. These will include nucleophilic substitution, dehydration, and organic redox used to synthesize new compounds from starting materials. Students will become proficient at separation and purification techniques including TLC, column chromatography, recrystallizations and distillations. They will also utilize a variety of instrumentation including FTIR spectroscopy, gas chromatography, UV spectroscopy, and HPLC. They will also evaluate NMR data based on their experimental results.

4. Course Objectives

The student will:

1. In the laboratory, determine physical properties of melting point, boiling point and refractive index of organic compounds.
2. Become adept with basic organic laboratory operations such as liquid-liquid extraction, gravity and vacuum filtration, and both simple and fractional distillation.
3. Prepare, separate and purify products of organic syntheses using techniques including TLC, column chromatography, HPLC and GC. recrystallizations and distillations
4. In the laboratory, perform simple qualitative tests for detection of the different types of functional groups on compounds.
5. In the laboratory, characterize compounds based on modern spectrometric data including FTIR, NMR and GC/MS.
6. Determine the structure of molecules from their FTIR and NMR spectra.
7. In the laboratory, use GC/MS data to further characterize the nature of product and by-products of synthesis reactions.
8. Synthesize, isolate, purify and characterize both solid and liquid organic compounds using methods described in course objectives a through g, above.
9. Analyze and evaluate observations acquired in the laboratory by applying the theoretical principles being studied.
10. Organize data using appropriate laboratory notebook recordkeeping techniques. Summarize the structures of the reactants, solvents, and catalysts needed to optimize yields in a variety of organic reactions.
11. Demonstrate proficiency with a variety of laboratory instrumentation including but not limited to FTIR spectroscopy, gas chromatography, UV spectroscopy, and HPLC.

CHEMISTRY 241L – ORGANIC CHEMISTRY I LABORATORY Page 2

5. Instructional Facilities

a. Standard laboratory.

b. Smart Cart.

c. Wall mounted Periodic Chart.

d. Laboratory classroom including but not limited to:

(1) Drying ovens.

(2) pH meters.

(3) Fume hoods.

(4) Hot plates.

(5) Magnetic stir plates.

(6) Triple beam balances.

(7) Analytical balances.

(8) Melting point apparati.

(9) Bunsen burners and microburners.

(10) IR spectrometer.

(11) UV-vis spectrometer.

(12) GC.

(13) Oil baths and resistance heaters.

e. Individual student drawers including but not limited to:

(1) Kem-Kit (Kontes Company).

(2) Standard laboratory equipment including but not limited to beakers, Erlenmeyer flasks, graduated cylinders, filter flasks, Buchner funnels, glass funnels, pipets, test tubes, test tube racks, glass sample vials, drying tubes, and assorted scoopulas, stir rods and spatulas.

6. Special Materials Required of Student

1. Laboratory apron or jacket.
2. Scientific calculator with exponential and logarithmic functionality.
3. Approved safety glasses or goggles.
4. Molecular model kit.
5. Laboratory notebook

7. Course Content

1. Classes, properties and reactivity of organic compounds
2. Synthesis, isolation, purification and characterization of carbon compounds in the laboratory – using both traditional and modern instrumental techniques
3. Structure and function relationships will be investigated using modeling techniques which include model kits, Spartan molecular modeling software and ChemDraw.
4. Use of a variety of laboratory instrumentation including but not limited to FTIR spectroscopy, gas chromatography, UV spectroscopy, and HPLC to characterize products.
5. Quantitative analysis of theoretical and percent yields, Rf values, enantiomeric excess and other pertinent calculations.

8. Method of Instruction

1. Lecture.
2. Videos and appropriate media.
3. Computer assisted instruction.
4. Inquiry based laboratory experience.

CHEMISTRY 241L – ORGANIC CHEMISTRY I LABORATORY page 3

9. Methods of Evaluating Student Performance

1. Written exams and final exam.
2. Laboratory reports (for example descriptions and analysis of chemical reactions or analytical determinations).
3. Laboratory techniques to include proper safety procedures, use of laboratory equipment, and complete documentation of data.
4. Essays/presentations on topics such as experimental results, descriptive chemistry or current issues in chemistry.
5. Capstone project to demonstrate laboratory proficiency in experimental set-up, performing organic reactions, and isolating and characterizing the product using traditional and instrumental methods.
6. Homework.
7. Computer drills.

10. Outside Class Assignments

1. Laboratory reports (for example descriptions and analysis of chemical reactions or analytical determinations)
2. Essays/presentations on topics such as experimental results, descriptive chemistry or current issues in chemistry.
3. Reading and homework, both text and computer based.

11. Texts

1. Required Text(s):

(1) Wade, L.G. *Organic Chemistry*. 9th ed  Upper Saddle River, New Jersey: Pearson, 2016.

(2) Lehman, John W. *Multiscale Operational Organic Chemistry*.2nd ed  Upper Saddle River, New Jersey: Pearson, 2009.

1. Supplementary texts and workbooks:

None.

Addendum: Student Learning Outcomes

Upon completion of this course, our students will be able to do the following:

* 1. Demonstrate a working knowledge of the language of organic chemistry.
  2. Recognize the major functional groups of organic compounds.
  3. Predict the major products of chemical reactions of representative organic functional groups.
  4. Apply a theoretical approach to explain the chemical and physical behavior of organic compounds.
  5. Employ laboratory equipment and techniques to collect, analyze and evaluate experimental data.

Date approved by the Governing Board: December 13, 2016