

# Minnesota State University Moorhead

## CHEM 355: Organic Chemistry I Lab

### A. COURSE DESCRIPTION

Credits: 1

Lecture Hours/Week: 0

Lab Hours/Week: 3

OJT Hours/Week: \*.\*

Prerequisites: None

Corequisites: None

MnTC Goals: None

Techniques for the purification, synthesis, and characterization of organic compounds and the study of organic reactions.

**B. COURSE EFFECTIVE DATES:** 05/19/1998 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. Recrystallization.
2. GC-MS (Gas Chromatography-Mass Spectrometry).
3. TLC (thin-layer chromatography).
4. H-NMR: Hydrogen Nuclear Magnetic Resonance spectroscopy.
5. C13-NMR: Carbon-13 Nuclear Magnetic Resonance spectroscopy.
6. Structure Identification of Unknown Organic Chemicals.
7. Purity Analysis.
8. Chemical Reactions.
9. Distillation.
10. Liquid/liquid extraction.
11. Chromatography.
12. Melting Range Determination.

#### **D. LEARNING OUTCOMES (General)**

1. Analyze and identify organic samples by C-NMR.
2. Analyze and identify organic samples by H-NMR. This will also involve demonstrating the ability to operate the NMR spectrometer hands-on.
3. Analyze organic samples by GC-MS.
4. Analyze organic samples by TLC. This will include demonstrating an understanding of the impact of sample polarity and of eluent polarity.
5. Analyze organic samples using melting-range determination. This will include demonstrating an understanding of the impact of contaminants.
6. Build molecular models for organic chemicals, and to draw their 3-dimensional structures on paper.
7. Carry out chemical reactions. This will involved demonstrating the ability to conduct stoichiometry calculations, calculate theoretical yields, and calculate actual percent yields. This will also involve demonstrating the ability to purify the reaction products, and to analyze the products and their purities.
8. Identify unknown organic chemicals by some combination of H-NMR, C-NMR, GC-MS, TLC, and melting-range measurement.
9. Purify organic samples by chromatography. This will involve both manual column chromatography and automated chromatography.
10. Purify organic samples by either simple or fractional distillation. This will include vacuum distillations.
11. Purify organic samples by liquid/liquid extraction.
12. Purify organic samples by recrystallization. This will include the ability to choose solvents; determine appropriate amounts of solvent; and the ability to select and execute mixed-solvent recrystallizations.
13. Write organized synthesis-style lab reports for experiments involving chemical reactions and chemical syntheses.

#### **E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

None

#### **F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

#### **G. SPECIAL INFORMATION**

None noted