

# Minnesota State University Moorhead

## CHEM 365: Organic Chemistry II Lab

### A. COURSE DESCRIPTION

Credits: 1

Lecture Hours/Week: 0

Lab Hours/Week: 3

OJT Hours/Week: \*.\*

Prerequisites:

This course requires the following prerequisite

CHEM 355 - Organic Chemistry I Lab

Corequisites: None

MnTC Goals: None

Purification, synthesis, and identification of organic compounds, and the study of organic reactions.

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

### C. OUTLINE OF MAJOR CONTENT AREAS

1. Conducting Chemical Reactions
2. Handling Air-Sensitive Reagents (Grignard reaction)
3. Working with Mixed Solvents
4. Working with Contaminated Samples
5. Organic Chemical Purification Techniques
6. Spectroscopy in Organic Chemistry
7. Structure Identification for Unknown Organic Chemicals
8. Chemical Derivatization
9. Working with Contaminated Chemicals
10. Chemical Library Synthesis/Research Module: Multi-week multi-step synthesis sequence projects with research components

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

1. Analyze organic samples, using tools such as H-NMR, C-NMR, GC-MS, tlc, and melting-range determination. This will include demonstrating an understanding of the impact of contaminants.
2. 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, to analyze and identify the reaction products, and to analyze product purity.
3. Conduct an air-sensitive reaction. This will involve preparing and then reacting an RMgBr organometallic in anhydrous solvent.
4. Demonstrate the ability to conduct multi-step, multi-week research-style synthetic sequences. This will involve demonstrating the ability to make decisions about reaction progress (when is my first reaction complete enough so that I can work it up and move forward?); product purity (when is my product pure enough to use in a subsequent reaction); chemical analysis (analysis will often be complicated by side products and impurities); solvent removal; and stoichiometry.
5. Effectively use NMR spectroscopy.
6. Identify unknown organic chemicals by some combination of chemical tests, chemical derivatization, H-NMR, C-NMR, GC-MS, TLC, and melting-range measurement.
7. Purify organic samples. Effective decision-making while using procedures such as recrystallization, distillation, chromatography, and liquid-liquid extraction will need to be demonstrated.
8. Work effectively with contaminated samples.
9. Work effectively with mixed solvents. The use of mixed solvents and perhaps the choice of which solvents to use may be involved in phase-transfer reactions; in reactions where a single solvent is unable to dissolve both organic and ionic reactants; in mixed-solvent recrystallizations; and in liquid-liquid extraction procedures.
10. 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