Virginia Western Community College
CHM 246
Organic Chemistry Laboratory II

Prerequisites
CHM 241 and CHM 245

Corequisites
CHM 242

Course Description
Introduces various methods and procedures used in present day organic laboratories. Covers the general techniques, organic synthesis, and the use of common spectroscopic instrumentation; synthesizing a variety of compounds; and analyzing the products through physical properties and spectroscopy. Part II of II. Lecture 1 contact hour. Lab 3 contact hours. Total 4 contact hours.

Semester Credits: 2 **Lecture Hours: 1** **Laboratory Hours: 3**

Required Materials

Textbook:
Experimental Organic Chemistry: A Miniscale and Microscale Approach. Gilbert, et al. 6th edition. Cengage Publishing. ISBN: 9781305080461

Course Outcomes
Upon completing the course, the student will be able to:

Continued: Safety in the Organic Laboratory
- Use proper procedures and regulations for safe handling and use of chemicals in the organic chemistry laboratory

Continued: Lab notebook
- Maintain a lab notebook and demonstrate proper recording, organization, and interpretation of scientific data

Application of Laboratory techniques from CHM 245
- Formulate and perform the laboratory synthesis, purification, and characterization of the organic compounds studied; applying techniques covered in CHM 245.

1H and 13C NMR Spectroscopy
- Interpret spectra and identify compounds

Synthesis and analysis
- Preparation and analysis of a variety of organic compounds.
- Perform theoretical yield, percent yield, and percent recovery calculations.
- Potential reactions to be studied include: Grignard reaction, EAS reaction, Fischer esterification, aldol condensation, polymers
- Additional lab experiments that could be included: Synthesis of biodiesel,

- Diels-Alder, oxidation/reduction reactions, free radical halogenation, synthesis of aspirin, hydroboration-oxidation of alkenes

Mechanism

- Propose mechanisms for all reactions.

Theoretical understanding

- Explain the theoretical basis of all techniques and state reasons for use of specific reagents.

Major Topics to be Included

Continued: Safety in the Organic Laboratory
Continued: Lab notebook
Application of Laboratory techniques from CHM 245
1H and 13C NMR Spectroscopy
Synthesis and analysis
Mechanism
Theoretical understanding

Topical Description

Exp. #	Reading Assignments	Experiments
1	Organometallic Chemistry (Sect. 19.1-19.2; pages 715-719) (Sect. 19.3-19.4; pages 725-727)	A. Preparation of Grignard Reagents (Pages 719-721) C. Preparation of Triphenylmethanol (pages 728-729)
2	Electrophilic Aromatic Substitution (Sect. 15.1; pages 499-500) Nitration of Bromobenezene (page 518-520) Exercises: 3, 4, 5, 17 (page 524-526)	A. Nitration of Bromobenzene (Pages 520-523)
3	Relatives Rates Electrophilic Aromatic Substitution	A. Relative Rates of Electrophilic Aromatic Bromination (pages 533-536)

	(Sect. 15.5; page 528-533) Exercises: 1, 11, 12 (Page 536)	
4	Esterification of Acid (handout)	Synthesis of Methyl Salicylate
5	Reduction of Carbonyl Compounds; Preparation of Alcohols (Sect. 17.4; page 651-652) Exercises 1, 2, 3, 6, 7, 9, 10 (page 655-656)	Reduction of 9-Fluorenone (page 652-655)
6	The Cannizzaro Reaction (Sect. 16.3; page 613-614) Exercises: 1, 2, 5, 6, 7, 8, 9 (page 617-618)	Base-Catalyzed Oxidation-Reduction of Aldehydes by the Cannizzaro Reaction (page 615-617)
7	Preparation of Aldehydes and Ketones by Oxidation of Alcohols (Sect. 16.2; page 587-593)	A. Oxidation of Cyclododecanol to Cyclododecanone (page 593-595)

After finishing Exp. #7, we will talk about #8 below that will be the lab for the rest of the semester.

8 Identifying Organic Compounds (Chapter 25; page 833-904) (8 weeks)
Each student (or pair) will receive six singles and two doubles unknowns. Follow systematic procedure for identification of organic compounds as outlined in the lab textbook, page 835-846.
Pay attention to page 842 – the solubility data can be a great help.
Classification Tests for Functional Group Identification are summarized on page 844-845.
<u>No derivatives will be prepared.</u>
Procedure for classification tests for function groups begins on page 856.

Notes to Instructors

1. Approved safety goggles are required to be worn in the laboratory. The laboratory working area also includes the instrumentation room. ***NO GOGGLES—NO LAB***.

2. Each lab report is grade on a scale from 0 – 100. Pre-lab questions are worth approximate 10 percent and post-lab questions, if any, are worth approximately 15 percent of each lab grade. Lab reports are due one week from the date of completion. These reports must be typed on 8 ½ x 11 letter-size paper. The format for writing lab reports will be explained in the class before each lab. Five points will be taken off per school day for each late lab report.

3. The final grade for CHM 245 will be based on the following:

Lab Reports	=	75%
Unknown Lab Report	=	15%
Final Exam	=	10%

Grading Scale		
100% - 90%	=	A
89.9% - 80%	=	B
79.9% - 70%	=	C
69.9% - 60%	=	D
Less than 60%	=	F

ADA Statement (PDF)
Title IX Statement (PDF)