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CHM 245

Organic Chemistry Lab I

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Dean's Review:

Dean's Signature: _____ Date Reviewed: ____/____/____

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Revised: Fall 2016

CHM 245

Organic Chemistry Lab I

COURSE OUTLINE

Prerequisites:

CHM 112

Course Description:

Corequisite: CHM 241. Includes qualitative organic analysis. Lecture 1 hour. Laboratory 3 hours. Total 4 hours per week.

Semester Credits: 2 Lecture Hours: 1 Lab/Recitation Hours: 3

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Course Outcomes

At the completion of this course, the student should be able to:

Determine the melting points and boiling points of chemical substances

Separate mixtures of substances using distillation, recrystallization, and chromatography

Perform extractions to isolate organic compounds

Perform syntheses and use isolation techniques to obtain products

Perform qualitative analyses

Visualize the practical application of the reactions presented in CHM 241

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Required Materials:

Lab Textbook

Textbook:

Experimental Organic Chemistry. A Miniscale and Microscale Approach 5th ed., Gilbert and Martin, Cengage, ISBN #: 9781439049143

Textbook website for pre-lab exercises.

The following supplementary materials are available:

1. Textbook website

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Topical Description:

Experiment # and Reading Assignments

Experiment Name

1. Melting Point (Sect. 2.7; page 38-41) (Sect. 3.3; page 113-117) Exercises: 1, 2, 7, 10, 11, 14, 15 (page 119-121)	Determination of Capillary Tube Melting Points (page 118-119)
2. Simple and Fractional Distillation (Sect. 2.13, 2.14; page 55-59) (Sect. 4.3; page 131-133) (Sect. 4.4; page 135-141) Exercises: 1, 4, 5, 6, 7, 8, 10, 13 (page 143-144)	A. Simple Distillation Miniscale (page 133-134) B. Fractional Distillation of a Binary Mixture (page 141-143)
3. Steam Distillation (Sect. 2.16; page 64-65) (Sect 4.5; page 141-143) (Sect 4.6; page 147-149) Exercises: 1, 2, 4, 8, 9 (page 150-151)	Distillation Using an External Steam Source (Figure 2.45; page 65) Procedure: Steam Dist'n of Citral from Lemon Grass Oil (page 149-150)
4. Recrystallization (Sect 3.2; page 94-101) Exercises: 6, 7, 8, 10, 12, 13 15, 17, 18, 19, 21, 23, 24 (page 110-112)	A. Solvent Selection (page 101-103) B. Recrystallization of Impure Solids 1) Benzoic acid (page 103-104)
5. Extraction (Sect. 2.21; page 75-81) (Sect. 5.2, 5.3; page 154-161) Exercises: 3, 4, 5, 6, 11, 18, 19, 20 (page 167-170)	Experimental Procedure for Extraction (B) Two-Base Extraction (page 162-163)
6. Chromatography (Sect. 6.1; page 179-180) (Sect. 6.3; page 188-192) Exercises: 3, 7, 8, 11, 12, 13, 14, 17 (page 194-195)	Column Chromatography (page 192-194)



7. Introduction to Spectroscopy; Infrared Spectroscopy
(Chapter 8, page 237-261)
(This is only a reading assignment. No lab report due)

7. Alkynes (2 week lab)
(Sect. 11.3; page 410-412)
(Sect. 11.4; page 416-417)
Exercises: 4, 5 (page 414)
Exercises: 2 (page 418)

Preparation of 3-hydroxy-3-methyl-2-butanone
(page 412-413)
Formation of a Silver Acetylide and Its
Decomposition (page 417)

8. Nucleophilic Aliphatic Substitution
(Sect: 14.4; page 465-467)
Exercises: 1, 2, 3, 4, 15; (page 470-471)

Preparation of 1-Bromobutane
(page 467-468)

9. Nucleophilic Aliphatic Substitution
(Sect. 14.1-14.3; page 461-465)
(Sect. 14.5; page 473-475)
Exercises: 1, 2,3,7,13,14 (page 477-479)

A. Preparation of 2-chloro-2-methylbutane
(page 475-76)

10. Dehydrohalogenation of Alkyl Halides
(Sect. 10.2; page 338-340)
Exercises: 2, 4, 5, 6, 8 (page 344)

A. Elimination of Alcoholic Potassium
Hydroxide (page 341-343)

11. Dehydration of Alcohols
(Sect. 10.3; page 348-352)
Exercises: 2,3,4,5,6,7,13,16 (page 355-357)

A. Dehydration of 4-Methyl-2-Pentanol
(page 352-353)

12. Bromination: Hydrogen Abstraction Selectivity
(Sect. 9.3; page 324-326)
Exercises: 1, 2,3,4,8,9,13 (page 328-329)

Relative Rates of Free-Radical Chain
Bromination
(page 326-328)

13. Organometallic Chemistry
(Sect. 19.1-19.2; page 639-643)
(Sect. 19.3-19.4; page 649-652)
Exercises: 24,25,27,29 (page 662)

A. Preparation of Grignard Reagent
(page 643-645) (use n-butyl bromide)
D. Preparation of 2-methyl-3-heptanol
(page 658-660)



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Notes to Instructors

1. Approved safety goggles are still required to be worn in the laboratory. The laboratory working area also includes the weighing room and the sinks. **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%
Final Exam	=	25%

Grading Scale

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

