

Syllabus Chem 29A, Organic Chemistry Laboratory V. Cornel, Reedley College, Fall 2012, #56558 and #55719

Lab TTh 8:00-10:50 am or 2:00-4:50pm in PHY-77

Office: PHY-78, phone # 559-638-3641 ext 3449

email: vmcornel3@verizon.net using "CHEM29" or "O-chem" as the subject

Office hours: 10-11am MWF

Course web site: blackboard.reedleycollege.edu

Course corequisite: Chem 28A

Textbooks:

1. Svoronos/Sarlo, Organic Chemistry Laboratory Manual, 2nd edition.
2. McMurray: Organic Chemistry. A Biological Approach. 2nd edition

Required Materials:

1. A lab research notebook or notebook.
2. Safety glasses with Z-87 safety code
3. A lab coat or apron.
4. Box of latex gloves (or latex-free, powder free)

Course objectives and outcomes: Students will become familiar with safety procedures and lab equipment for semi-micro organic experiments. They will be capable of synthesizing and purifying organic compounds, of measuring melting points, refractive index, and optical activity. They will learn hands-on how to work with a Gas Chromatograph Mass Spectrometer, a Fourier Transform Infrared Spectrophotometer and Nuclear Magnetic Resonance Spectrometer. Extensive time will be spent on identification of unknown compounds by analyzing their MS, IR and NMR spectra. Through interactive computer programs the students will receive extensive support in thoroughly understanding the concepts taught in the organic chemistry lecture (Chem 28A).

Homework: Students are expected to come to lab well prepared. This means that the steps to be taken to properly complete the experiment are written down in the lab notebook ahead of time. Typically, the theoretical explanations in the lab manual are too brief to fully comprehend the experiment. Therefore preparation reading McMurray's text on the subject is highly recommended.

Lab reports: Your lab notebook needs to be complete at all times and could be requested by the university you are transferring to. The Aim, Method, Reaction Mechanism, Physical Data (melting point, refractive index etc.), Observations, Percent Yield, and Conclusion should all be recorded. Show the theoretical yield and percent yield calculations. Certain questions at the end of each lab also need to be completed individually using your textbook. I will give assistance, but not the answers to the questions. The lab report (including answers to the questions) or a good photocopy of it needs to be handed in within one week of the class completing the experiment.

This semester two experiments are finalized with a formal lab report using the observations and data collected in the experiment. The extensive lab reports are a write-up of the experiment, and written in the format of a research paper with an abstract (summary) and references. The student will need to use resources in the library and the internet to find appropriate theoretical background information. An electronic copy of the abstract and background needs to be e-mailed to the instructor, and a printed copy of the report must be submitted to the instructor or

switchboard by the due dates in the lab schedule. Lab reports will be checked for plagiarism using "Turnitin".

Lab materials: Expensive grounded glassware and other delicate lab supplies will be made available. Students will be held responsible for their own desk inventory.

Attendance: Attendance at all labs is mandatory. In accordance with Community College policy role will be taken every lab session. Students will only be allowed to drop one laboratory assignment (and not one that is used for a Formal Report). You will be dropped if you miss more than 25% of the classes before the drop date without contacting the instructor.

Cancelled Classes: If the instructor is absent, and official yellow "class cancellation" notice and instructions will be posted on the door of the classroom. We will try and put a timely announcement on Blackboard and the Reedley College website.

Make-up labs If you have to miss a lab you may be able to make arrangements with the instructor or lab technician to complete it (if the chemicals are still available), or complete it the next lab period. 10% will be deducted for the inconvenience of having to do a make-up lab for the student. Only one make-up lab will be allowed per student. If you do not complete an experiment (drying, purifying your product or analyzing it) you may be able to make arrangements with the instructor or lab technician to complete it (with no points deducted).

Grading: To determine the final grade in this class the average of the formal reports will count towards 30%, the average of the two lab quizzes 15%, and the individually graded labs towards 55% of your final grade. For each lab report you will also be graded on the quality and the yield of the product, the working technique and effort, the amount of assistance the student required and the efforts to reach the experimental goal. General grade break-off : A 90% and up; B 80-89%; C 70-79%; D 60-69%; F 59% and lower.

Drop date: The drop date is Friday October 12, 2012. After this date a letter grade A-F will have to appear on your transcripts. If you are dropped from the class before Friday September 3, 2012 you avoid receiving a W.

Lab rules: It is MANDATORY to use a lab coat and safety glasses at any time that you are in the lab. You are required to have read each experiment, including the Safety Tips before you enter the lab. The Aim and Method needs to be written out before you enter the lab and will be checked. You will receive safety instructions on how to perform the experiment. It is imperative that you not be late in lab, you would be a hazard to others if you miss the safety instructions.

Coming in late means you loose 10% for that lab. You need to go over the safety instructions with the instructor before you may start the lab. End lab time is set: 10:50 am and 4:50p.m. sharp. Copying of experimental data and answers to questions in lab reports is considered fraudulent behavior and will result in a zero grade for the copier and the originator. **Students work in pairs, but your lab reports must be done individually or both students will loose points.**

Student Learning Outcomes:

1. read and follow instructions in an organic laboratory manual, safely handling organic chemicals and glassware with ground-glass joints.
2. determine physical properties of organic compounds such as melting point and refractive index.
3. synthesize simple organic compounds such as but not limited to cyclohexene, t-butylchloride, alcohols and acids.

4. analyze organic molecules using a gas chromatograph and infrared spectrometer and interpret the spectra.
5. write three formal laboratory reports in the form of research papers.

Lab Content:

Each of the following experiments will take 4-6 hours. Alternative experiments may be substituted.

A. Laboratory safety

- MSDS sheets
- ground glass equipment

B. Physical Properties

- determination of melting points
- determination of refractive indexes.

C. Distillation

- simple distillation
- fractional distillation

D. Extraction and recrystallization

- extraction of a mixture of benzoic acid, p-dichlorobenzene and methylene chloride
- extraction of myristicin from nutmeg or
- isolation of caffeine from tea
- separation of a mixture of acetanilide, sodium chloride and charcoal using filtration and recrystallization

E. Alkenes and alkynes

- synthesis of cyclohexene
- synthesis of *cis*-1,2-cyclohexanediol from cyclohexene
- synthesis and reactions of acetylene

F. The sodium fusion test

- tests for sulfur, halogens and nitrogen

G. Alkyl halides and the nucleophilic aliphatic substitution

- qualitative tests of alkylhalides using acetylene
- synthesis of t-butylchloride
- solvolysis of t-butyl chloride: a kinetic experiment

H. Equilibrium constant

- reaction of a carboxylic acid and an alcohol

I. Alcohols

- Grignard reaction: synthesis of 2-methyl-2-hexanol
- qualitative tests for alcohols
- Williamson Ether synthesis: preparation of phenacetin from acetaminophen

J. Spectroscopy

- GC and IR experiments
- Analysis of MS and NMR spectra

K. Stereochemistry

- using the molecular model box
- using a variety of computer programs

Important: If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact me as soon as possible.

CHEM29A Fall 2011 T/Th

	Date	Lab
1	Aug 14	Read Preface and pages 1-3. Lab safety quiz. Get familiar with MSDS sheets.
	Aug 16	Practice Lewis Structures, molecular modeling and chemical bonds
2	Aug 21	Molecular Orbital lab (handout). Read McMurray Chapter 1.
	Aug 23	Exp. 3.1 C Melting Point Determination. Read Ch. 3 pgs 19-21. Exp. 3.3 Refractive Index (using digital RI). Read pgs 26-28 <i>Due 8/30</i>
3	Aug 28	Exp. 4.1 parts I and II. Simple Distillations. Read pgs 29-31 thoroughly. <i>Due 9/6 together with Exp 4.2</i>
	Aug 30	Exp. 4.2 Fractional Distillation. <i>Due 9/6</i>
4	Sep 4	Exp. 6.2 Extraction. Read pgs 54-56 <i>Due 9/11. No questions</i>
	Sep 6	Exp. 6.3 Re-crystallization. Read pgs 66-69 <i>Due 9/13</i>
5	Sep 11	Exp. 6.5 Isolation of Caffeine from Tea. <i>Due 9/18</i>
	Sep 13	CHEMDRAW exercises – to be used for Formal reports. Due today. Bring USB drive to save work
6	Sep 18	Chapter 2.1 and 2.2 Stereochemistry and Molecular models. <i>Due 9/25</i>
	Sep 20	Chapter 2: Stereochemistry in more depth: the R/S designation, Fischer projection formulas and meso-compounds. <i>Due 9/27</i>
7	Sep 25	Exp. 7 Equilibrium constant. Read Ch. 7 pgs 78-79. <i>Due 10/2</i>
	Sep 27	Exp. 14.3 Preparation of Phenacetin from Acetaminophen. Read pgs 185-187. <i>Due 10/4.</i>
8	Oct 2	Exp. 8 Sodium Fusion Test. Read Ch. 8 pg 83 <i>Due 10/9 Q 1a,b and 2</i>
	Oct 4	Exp. 10.1 Synthesis of Cyclohexane. Read Ch. 10 pgs 123-125. <i>Due 10/11 All Q except 2b</i>
9	Oct 9	Exp. 10.4 Oxidation of Cyclohexene to Adipic Acid Do Formal Report 1 on this lab, Due 10/16 Q 2a,b, 4, 5(2a,b)
	Oct 11	Exp. 11 Reactions of Acetylene and the Qualitative Tests of Hydrocarbons and Alkyl Halides. Acetylene will be synthesized for you. Read Ch. 11 pgs 141-142. <i>Due 10/18 Q1, 2(a,b,c) and 4</i>
	Oct 12	Drop Date. Last day to drop class. After this date a grade will be given.
10	Oct 16	Lab Quiz 1
	Oct 18	Exp. 13.1 The Synthesis of t-Butyl Chloride. Read Ch.13 pg 151 <i>Due 10/25 Q 2, 3</i>
11	Oct 23	Exp. 13.2 The Solvolysis of t-Butyl Chloride. Read Ch 13 pgs 154-156. <i>Due 10/30</i>
	Oct 25	Exp. 14.2 Qualitative tests for Alcohols. Read Ch 14 pgs 180-183 <i>Due 11/1 Q 1(a,b), 2(b,d), 3(a,b,c)</i>
12	Oct 30	Introduction to Infrared Spectroscopy. Read Chapter 9.1 in lab book. pgs 89-92 Analysing samples using the Infrared Spectrometer. <i>Due 11/6</i> Dry glassware for 14.1
	Nov 1	Exp 14.1 Alcohols. The Grignard Reaction. Read Ch. 14 pgs 175-177. <i>Due 11/8 Q1,2a,b,e (and acid)</i>
13	Nov 6	Finish 14.1 and nomenclature worksheet. Worksheet due today.
	Nov 8	Exp. 15.2 Friedel-Crafts Alkylation: A Microscale Synthesis. Do Formal Report 2 on this reaction. Read pgs 192-193 <i>Due 10/15 Q1,2</i>

14	Nov 13	Introduction to Mass Spectroscopy (handout). <i>Due 11/20 Q4,6</i>
	Nov 15	Analysing samples using the Gas Chromatography Mass Spectrometer <i>Due 11/22</i>
15	Nov 20	Introduction to NMR. Read McMurray 12.1-3, 8-11 Lab 9: Q1,2,9 <i>Due 11/27</i>
	Nov 22	Thanksgiving Holiday
16	Nov 27	Analysis of unknown compounds by combination of MS, IR and NMR. <i>Due today</i>
	Nov 29	Analysis of unknown compounds by combination of MS, IR and NMR. <i>Due today</i>
17	Dec 4	Lab Quiz 2
	Dec 6	Nomenclature and Functional Group worksheet <i>Due today</i>